Munitions with Sensitive Fuzes Field Study

Impact Area Munitions Response Area

Former Fort Ord, California

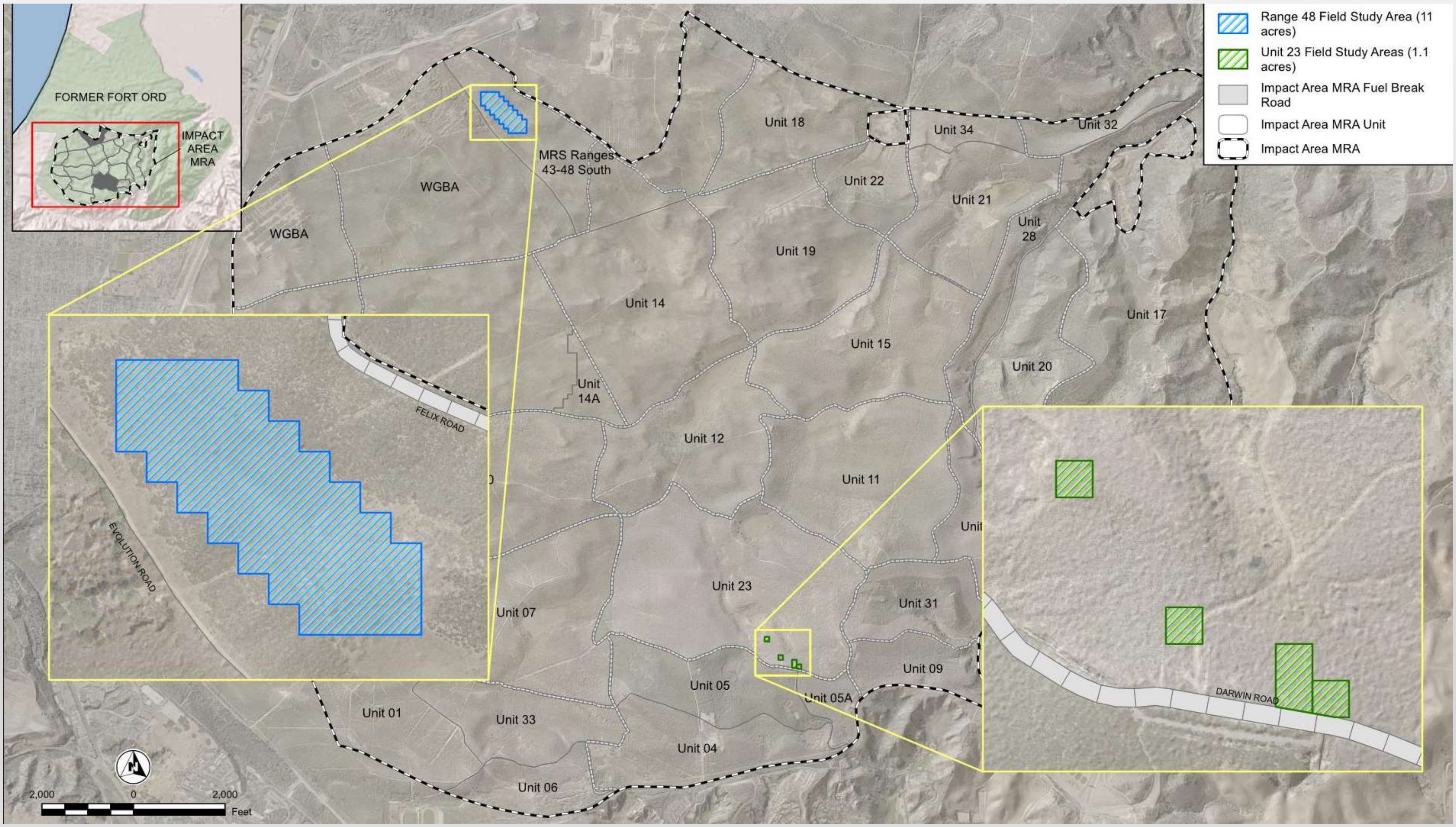
Field Study Objective

Identify the most efficient and cost-effective MEC remediation method for areas with high anomaly density and evidence of munitions with sensitive fuzes.

Advanced Geophysical Classification

- Multiple transmitter and receiver coils to illuminate subsurface anomaly sources from numerous angles and positions
- Rich dataset can be inverted to extract intrinsic features of the anomaly sources
- Polarizabilities can be compared to a library of known signatures to classify the anomaly sources as targets of interest (TOI) or non-TOI prior to intrusive investigation
- Result: Identify subsurface anomaly sources that have a low likelihood of being munitions items and can be safely left in place
- Typically requires a two-step survey process:
  - Dynamic detection survey to identify subsurface anomalies
  - Cued (static) data acquisition to measure the robust data required for classification

Field Study Areas



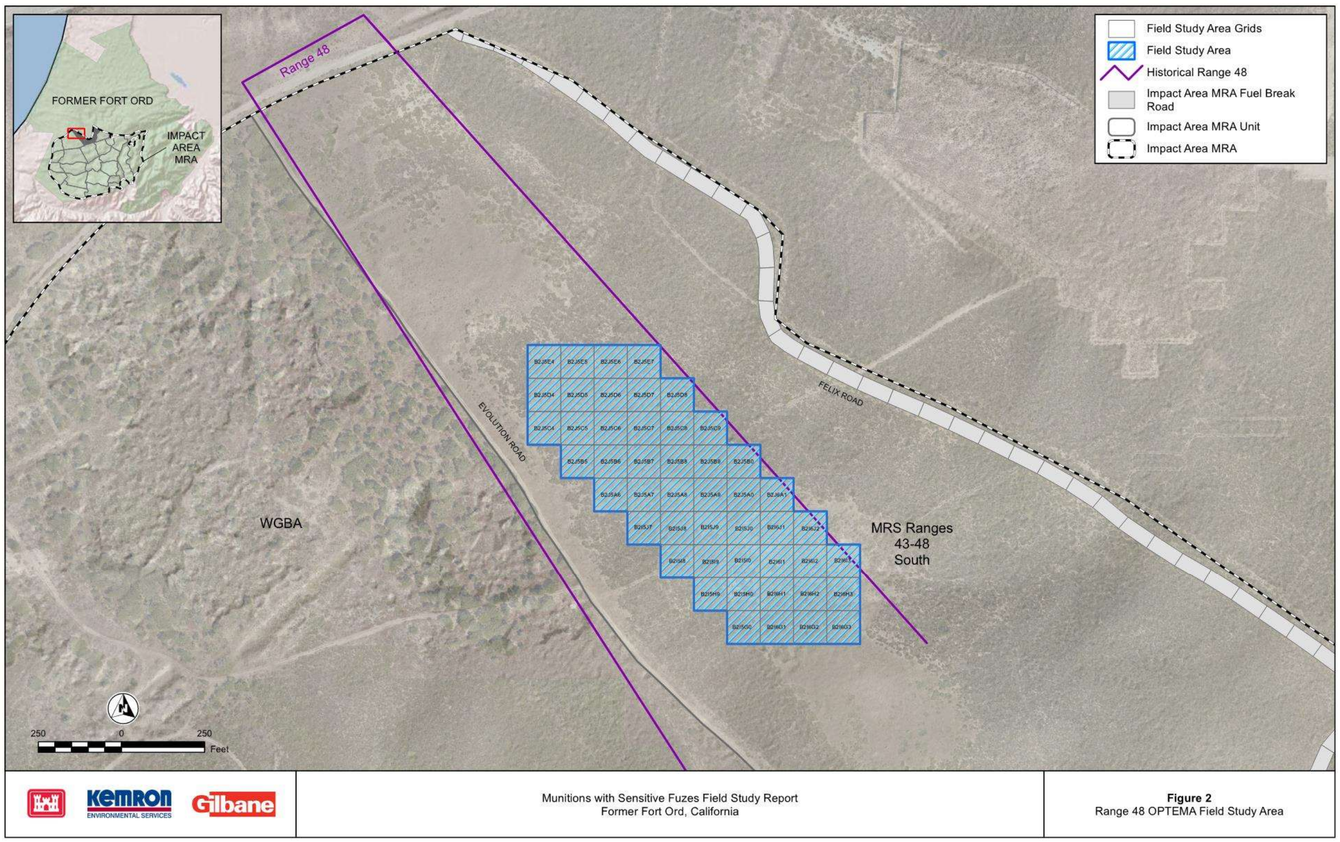
Field Study Summary

- AGC is a viable approach when anomaly density is 2,900 anomalies per acre or lower.
- Efficiency decreases with subsurface anomaly densities greater than 2,100 anomalies per acre.
- Cost effectiveness of AGC generally increases with anomaly density.

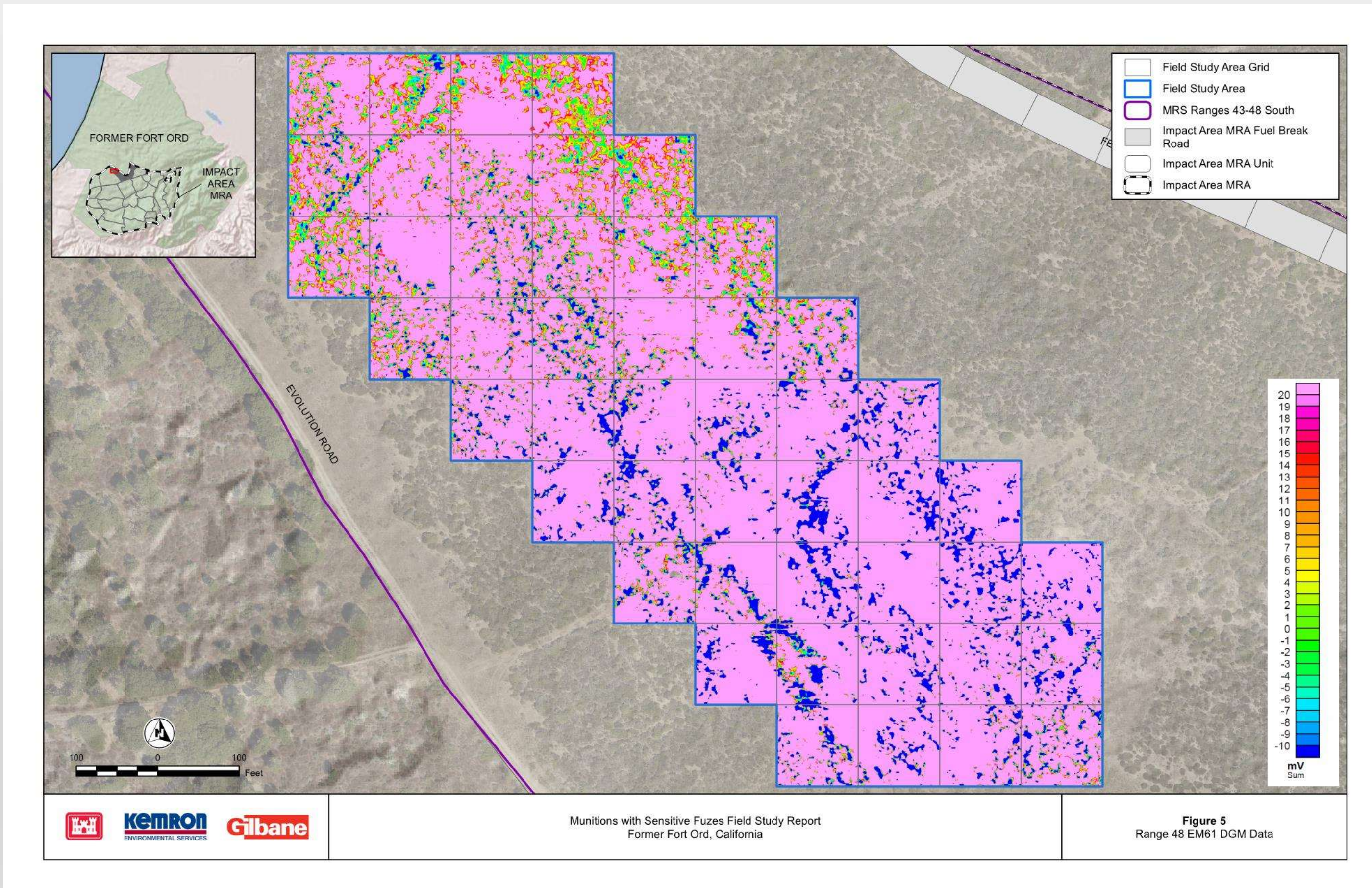
Performance Objectives

Performance Objective	Metric	Data Required	Success Criteria
Maximize correct classification of Targets of Interest (TOI)	Number of TOI identified for intrusive investigation	• Ranked classification lists • Results of intrusive investigation	Correct identification of all TOI for intrusive investigation
Maximize correct classification of non-TOI	Number of non-TOI eliminated from intrusive investigation	• Ranked classification lists • Results of intrusive investigation	Reduction of false positives (intrusively investigated non-TOI) by 50%
Establish anomaly density threshold for each geophysical system	Subsurface anomaly density	• Dynamic DGM survey data • Detection target list	Performance objectives can be met at given subsurface anomaly density

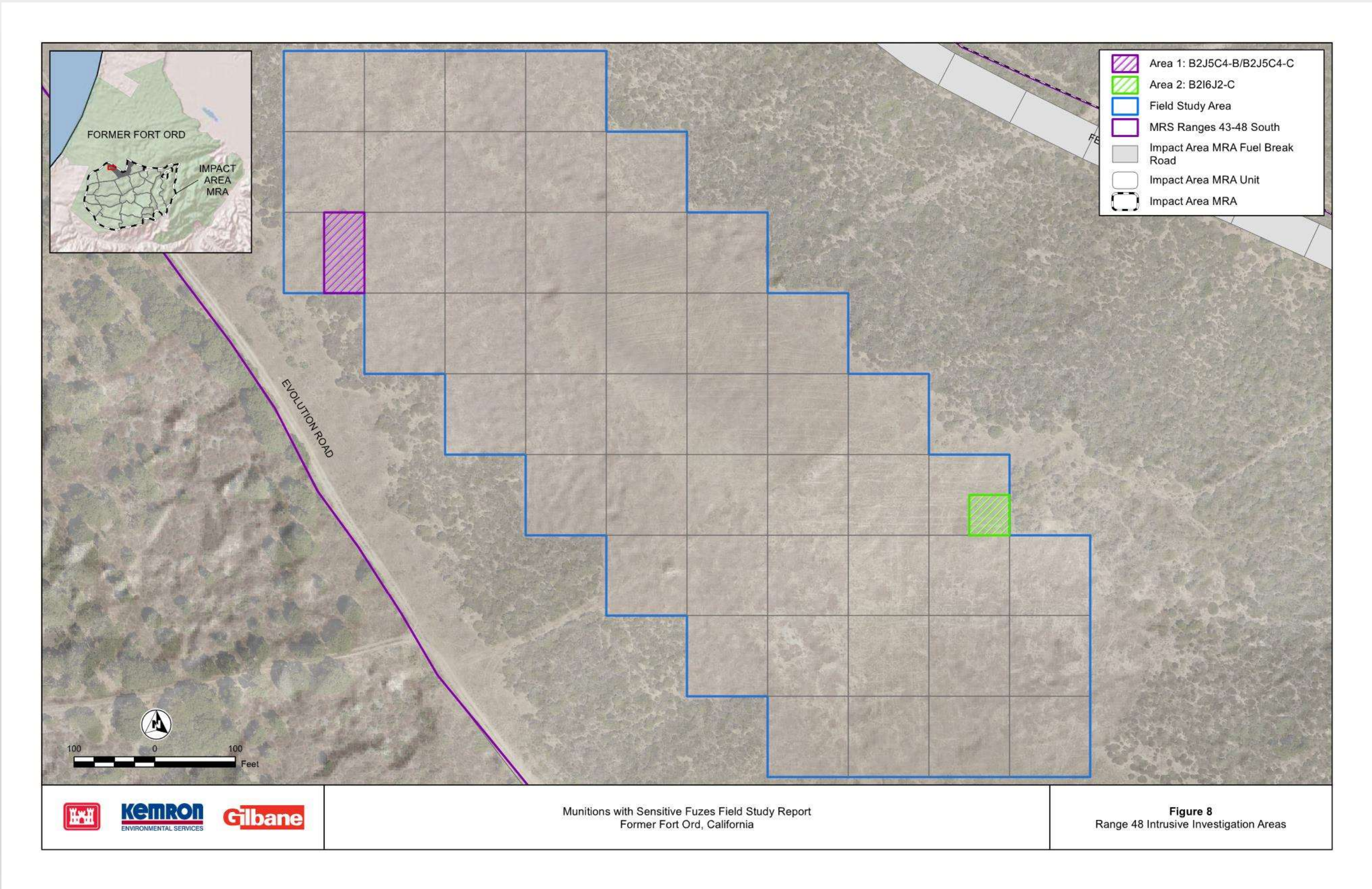
Range 48 – OPTEMA Study



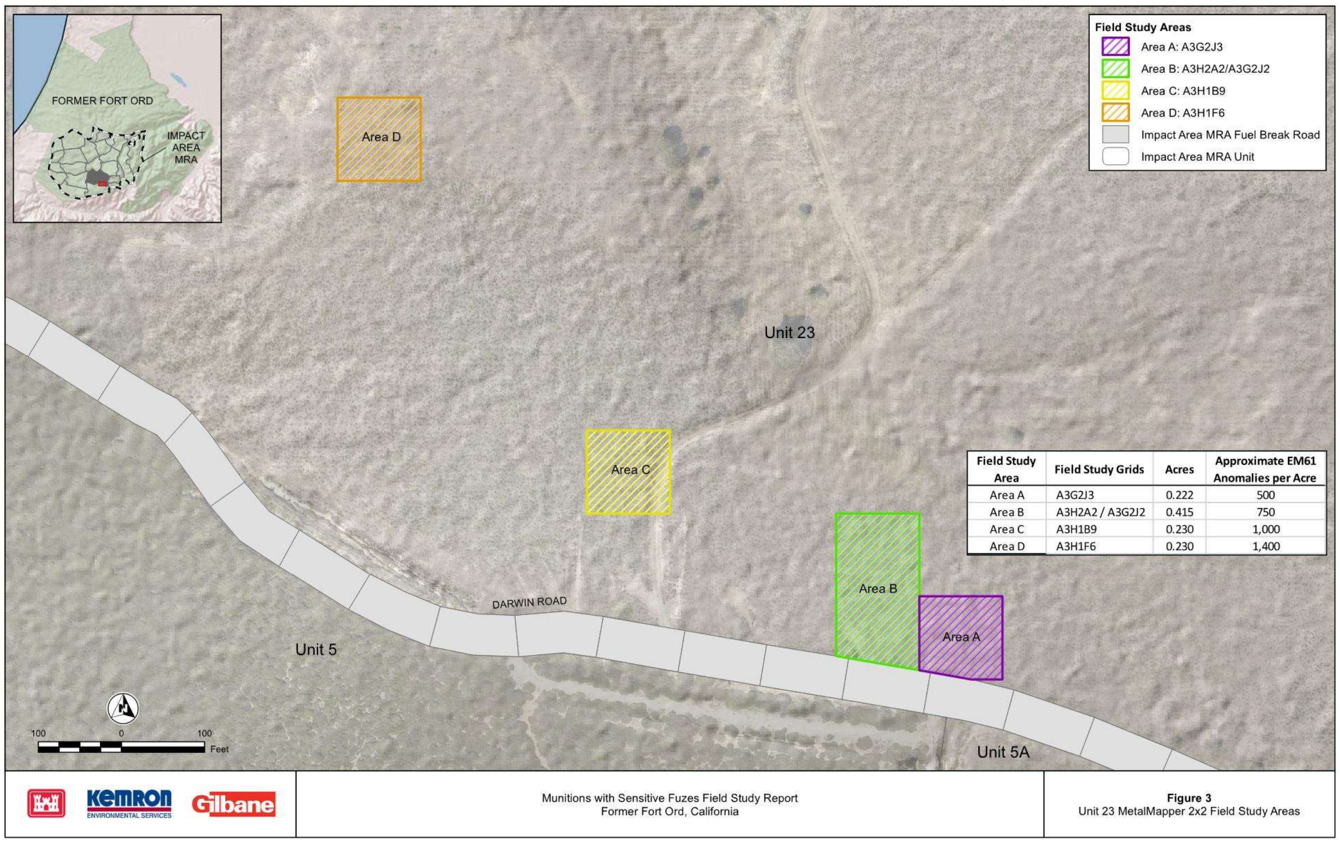
Range 48 – EM61 Survey



Range 48 – Intrusive Investigation

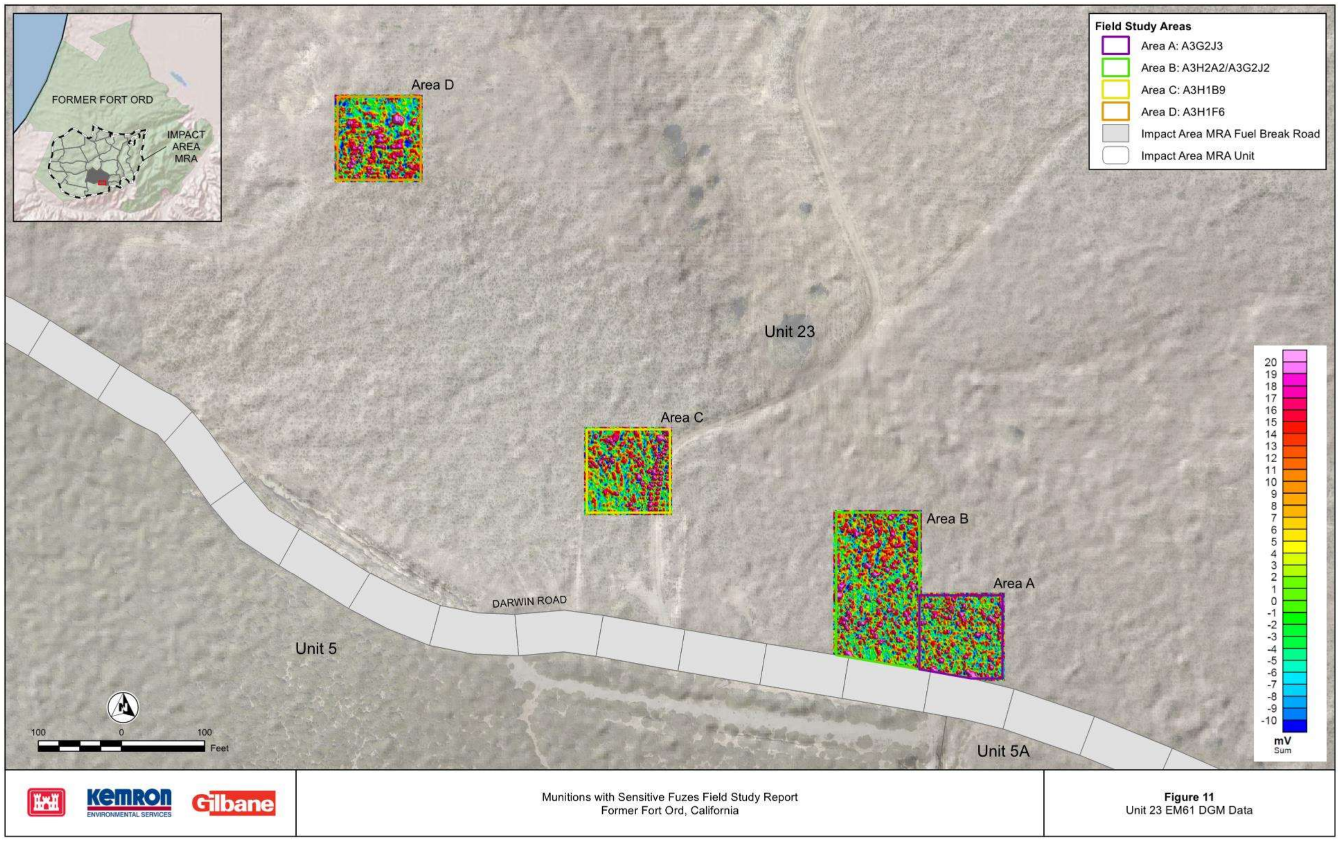


Unit 23 – MM2x2 Study

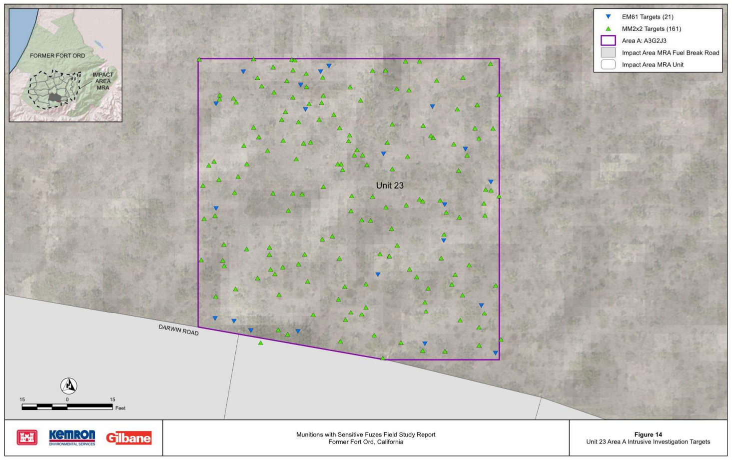


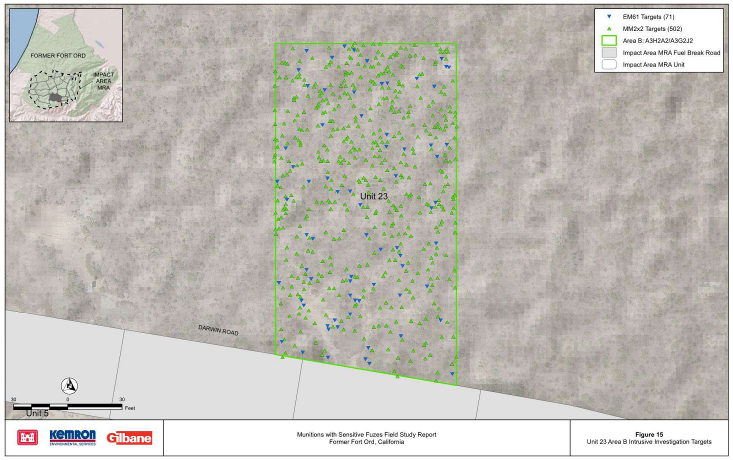
Field Study Area	Field Study Grids	Acres	Approximate EM61 Anomalies per Acre
Area A	A3G2J3	0.222	500
Area B	A3H2A2 / A3G2J2	0.415	750
Area C	A3H1B9	0.230	1,000
Area D	A3H1F6	0.230	1,400

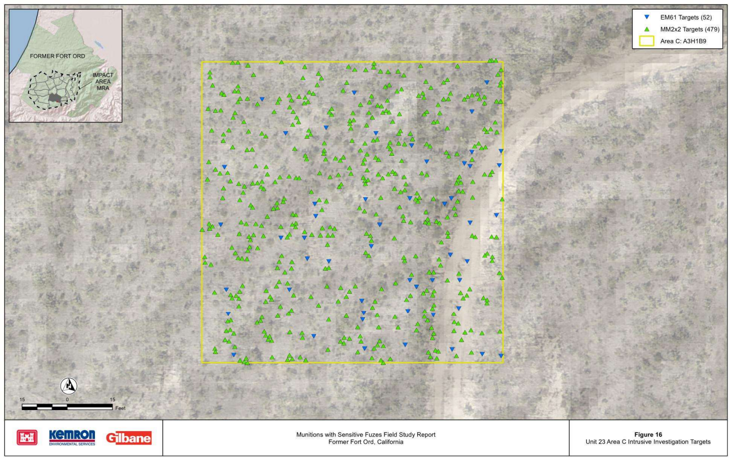
Unit 23 – EM61 Survey

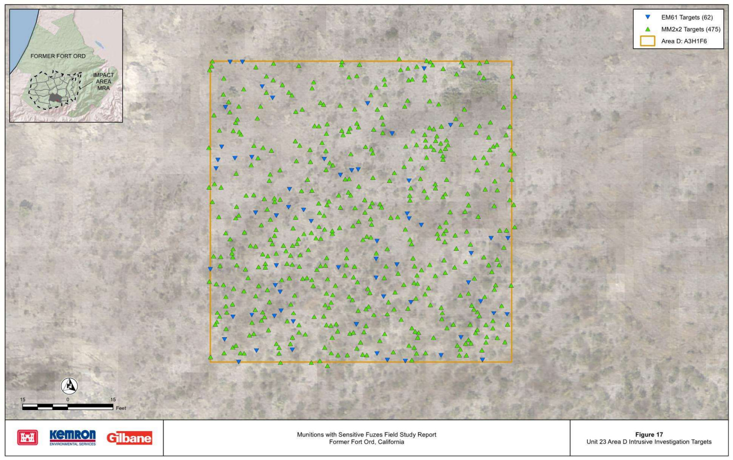


Unit 23 – Intrusive Investigation









Quality Control/Quality Assurance

- Blind seeding (QC/QA)
- Performance seeding (QC)
- Daily instrument verification strip testing
- Field QC inspections
- Data processing and analysis (QC/QA)
- Intrusive investigation of selected target anomalies

Performance Assessment Range 48 OPTEMA Study

- Field Study Area 1 (2,900 anomalies/acre)
  - 80% of TOI correctly classified
  - 81% clutter rejection
- Field Study Area 2 (5,600 anomalies/acre)
  - 26% of TOI correctly classified
  - 43% clutter rejection

Performance Assessment
Unit 23 MM2x2 Study

- Field Study Area A (725 anomalies/acre)
  - 100% of TOI correctly classified
  - 88% clutter rejection
- Field Study Area B (1,116 anomalies/acre)
  - 100% of TOI correctly classified
  - 88% clutter rejection

Performance Assessment
Unit 23 MM2x2 Study

- Field Study Area C (2,082 anomalies/acre)
  - 100% of TOI correctly classified
  - 86% clutter rejection
- Field Study Area D (2,065 anomalies/acre)
  - 100% of TOI correctly classified
  - 52% clutter rejection
  - Lower efficiency due to variation in background response across the field study area

Considerations for Future Actions

- Anomaly density discrepancies
- Chi-square analysis
- Varying background response
- Density threshold assumptions