Munitions Response Program
Update and Lessons Learned

Presented By
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NAVFAC Atlantic
Logistics

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Mr. Harre is a Senior Environmental Engineer at the Naval Facilities Engineering and Expeditionary Warfare Center (EXWC) of the Naval Facilities Engineering Command (NAVFAC). His past duties have exposed him to various innovative remediation technologies including remediation of small arms ranges, alternative land-fill covers, remediation of perchlorate contaminated groundwater, coastal contaminate migration monitoring, and advanced geophysical classification for munitions response. Mr. Harre has a B.S. in Chemical Engineering.
Mr. Martin is a Physical Scientist at the Naval Facilities Engineering Command (NAVFAC) Atlantic with the Vieques Restoration Section. He has experience directly managing both Munitions Response and Installation Restoration Program sites as a Remedial Project Manager. Currently he provides munitions response technical support across the Navy. Mr. Martin has a B.S. in Geology.
OER2 Webinar Series

• Why Attend?
  – Obtain and hear about the latest DOD and DON’s policies/guidance, tools, technologies and practices to improve the ERP’s efficiency
  – Promote innovation and share lessons learned
  – FEEDBACK to the ERP Leadership

• Who Should Attend?
  – ERP Community Members: RPMs, RTMs, Contractors, and other remediation practitioners who support and execute the ERP
  – Voluntary participation

• Schedule and Registration:
  – Every other month, 4th Wed (can be rescheduled due to holidays)
  – Registration link for each topic (announced via ER T2 email)

• Topics and Presenters:
  – ERP community members to submit topics (non-marketing and DON ERP-relevant) to POCs (Gunarti Coghlan – gunarti.coghlan@navy.mil or Tara Meyers – tara.meyers@navy.mil)
  – Selected topic will be assigned Champion to work with presenter
Munitions Response Program
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Discussion Topics

• Advanced Geophysical Classification (AGC) Overview
• Defense Advanced Geophysical Classification Accreditation Program (DAGCAP)
• AGC Project Lessons Learned
• Underwater Lessons Learned
• Using the Vertical Conceptual Site Model (VCSM)
• Explosives Safety Submission (ESS) and Munitions Response (MR) Document Reviews

WWII-era 81-mm mortar, Photo courtesy of US Navy.
Advanced Geophysical Classification (AGC) Overview

- Sort buried metal into two classes
- Because we cannot see buried objects, we must rely on attributes determined from geophysical data
AGC Overview - Stages in the Classification Process

1. Measure target responses with suitable sensor
   - Classification-specific EMI

2. Extract target features from the measured responses
   - Data Inversion
   - Target polarizabilities

3. Classify targets based on the features
   - Statistical classifiers
   - Library matching
AGC Overview - Parameter Extraction
(Geophysical Inversion)

Calculate magnetic polarizability ($\beta$) using EMI response model for a single source or multiple sources.

$V(t) = \mu_0 n_R n_T I_0 C_R \cdot C_T P(t)$

Sensor Data

EMI Response Model (Dipole Model)

Extrinsic Properties
- location & orientation

Intrinsic Response

Extrinsics Properties
• Normalized response (polarizability) for excitation in object’s principal axis directions are the fundamental EMI attributes
• UXO items are symmetrical, so two of the principal axis responses are the same
• Irregular clutter items have three different principal axis responses
AGC Overview - Polarizability Examples

“EMI Fingerprints”

Known Clutter Item

No Symmetry

Symmetric, Thick-Walled

Symmetric, Thick-Walled

Graphics courtesy of ESTCP
Collection of TOI signatures:
1. metadata,
2. sensor data, and
3. polarizations

Originally ESTCP generated
DoD maintained
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Start digging?
Multiple coils measure the complete response of buried items (spatially and temporally)

Man-portable  Cart-mounted  Vehicle-towed
DoD Policy Requires AGC contractors to be accredited
• 9 companies are now accredited
  – Passed Quality Systems Documentation
  – Passed APG field test of data analysis
• Accredited companies are
  Parsons
  CH2M Hill, now Jacobs
  TetraTech
  TPMC White River
  APTIM
  AcornSI/Naeva
  Black Tusk Geophysics
  Arcadis
  Weston
• Several more companies applying for review and APG test this year
• Not all companies have passed the test
• For Navy third party QA, not required to be accredited, but it sure would be a good thing. (e.g. What happens when it turns into a he said/she said type of dispute)
Poll Question #1

1. Have you used the AGC technology on a munitions response site? Answers either Yes or No
AGC Lessons Learned – Site A

• The Preliminary Assessment identified the area as a “suspected” MEC area
  • Two moving target machine gun ranges were present in the southeastern portion of Site A, as observed on 1942 and 1943 aerials
  • Ranges were replaced by two mortar ranges after 1943
• No records documenting munitions use were found for the southern most range (Site A)
  • Munitions estimated based on the range boundaries and time period of use
  • Assumed .30 and .50 caliber small arms ammunition (SAA) and 60-mm and 81-mm mortars fired at site
AGC Lessons Learned – Site A

Legend
- Elevation Contour Line - 5ft Interval
- MRS Boundary
- Areas of Investigation
  - Firing Line
  - Suspected Impact Area
  - Grassy Dunes
  - Beach

Mortar Range Boundary
Access Road A
Access Road B
Ready Service Locker
Existing Building
Beach/Ocean
AGC Lessons Learned – Site A

• A MILCON project was planned to replace an existing building within the site
  • Existing building supports mission-critical training element
    • Project phased to allow use of existing building during construction
  • Limits of disturbance for construction is within the estimated impact area of the mortar range
    • No known/documentated history of MEC removal prior construction of existing building and pavement

• In 2015, an Advanced Geophysical Classification (AGC) Survey was conducted to support planned MILCON activities and serve as removal action
  • Asphalt removed from the Phase 1 portion of the site prior to AGC
  • MEC and MPPEH was recovered
AGC Lessons Learned – Site A

• Following completion of the AGC investigation, Phase 1 of the MILCON project started in early 2016
• MILCON provided figure showing footprint of AGC investigation (top image to the right)
• Site was graded and 88 wood pylons were removed without construction support
• MILCON contractor operating excavator identified a mortar in the teeth of the bucket when performing grading/earthwork along the edge of the asphalt cut in May 2016
  • Operator recognized potential MEC as a result of previous experience
  • MILCON contractor not aware of the site history or existing ESS (for the RI, AGC, and MILCON construction support)
• Construction stopped until path forward could be identified
AGC Lessons Learned – Site A
AGC Lessons Learned – Site A

Approximate location of mortar when MR support arrived at site (after being released from excavator bucket)

Approximate area from where the contractor indicated bucket had been when mortar was encountered
AGC Lessons Learned – Site A

• An investigation was used instead of a removal action to clear the site
• Technological limitations of AGC/EMI not fully understood by project personnel prior to implementation
  • AGC/EMI investigation not capable of achieving known needs for the MILCON as executed
    • Estimated max depth of detection for a 60-mm is approximately 26 inches (using 11x diameter rule of thumb for detection), meanwhile known need for removal up to 36 inches into native soil
    • Several steps in the process indicated the approach would not be successful to meet MILCON needs were overlooked
• AGC was conducted without removing base material for pavement, adding 8-12 inches of separation between items and sensors
AGC Lessons Learned – Site A

- Information passed from EV to CI was unclear/not fully understood
  - Need for continued construction support not completely received by CI
  - Footprint of AGC investigation not provided in adequate detail to CI
- MILCON not adequately prepared for work on a MR site
  - MILCON CI personnel believed that all MEC issues had been addressed
  - MILCON contract did not identify MEC/UXO as being potentially present at the site as a result of the site history
  - MILCON contractor did not know ESS and associated work approaches/limitations existed
AGC Lessons Learned – Site A

- Investigations should not be used to clear sites
- ESSs for investigations should not be amended to accommodate a removal action
- While AGC employs more sensors, the detection depth for a given item does not increase
- Data Usability Assessment must be performed concurrent with AGC investigation
- Extent of sites, MR or otherwise, need to be adequately defined within base master planning systems and use restrictions must be applied appropriately
Advanced Navy Technology Lessons Learned

**Buried Mine Identification (BMI)**
- Bluefin12 BMI System
  - Bottom Object Scanning Sonar
  - Real-time Tracking Gradiometer
  - Underwater E-O Imager
- REMUS 600 BMI System
  - Laser Scalar Gradiometer
  - Marine Sonics Sonar
  - Underwater EO Imager

**Small Synthetic Aperture Minehunter (SSAM)**
- Search-Classify-Map (SCM)

**DATA PRODUCTS**
- High Frequency Image
- Low Frequency Broadband Image

Photo and graphics courtesy of US Navy.
• Involve the UXO contractor early in project planning
  • Need to understand investigation technique and extent of project to write a good report
  • Can help in project planning by asking relevant questions

• Schedule flexibility is key requirement
  • Weather delays can and will happen
  • Navy assets may be needed in other areas

• Quality process and documentation are critical
  • DQOs/PQOs need to discussed and documented, preferably in the same format as our MR QAPPs
  • Still work to do in developing standardized QA/QC processes
• QA/QC processes like the terrestrial quality processes need to be developed
  • Underwater equivalent of the instrument verification strip
  • Blind seeding in the production area
  • Repeat lines of data
• Underwater vegetation can impact the survey
  • Density determines if investigation instrument can be used
  • Removal not always desired or possible
• Salinity changes affect the ballasting requirements

Kelp forest. Photos courtesy of NOAA.
Is It a Rock or a Rocket?

Is it a rock or rocket?
• 2. Was the top picture a rock or a rocket? Answer is either a rock or rocket
• 3. Was the bottom picture a rock or a rocket? Answer is either a rock or rocket
Underwater Lessons Learned

- Just because it looks like a rocket doesn’t mean it is a rocket.
  - Never conduct just a visual underwater survey
  - Once you identify an item as MEC underwater it is very hard to convince the project team otherwise.

- EVEN THE EXPERTS CAN BE WRONG!
Vertical Conceptual Site Model (VCSM) - Traditional CSM w/Horizontal Extent

Figure 4-5
Conceptual Site Model

Waikane Valley Impact Area
Koolau District, Oahu, Hawaii

LEGEND

USA Environmental, Inc.
Basic VCSM – Vertical Distribution of MEC

Depth (meters below ground surface)

- 37 mm
- 2.36" rocket
- 60 mm
- 75 mm
- 81 mm
- 3" stokes
- 105 mm
- 4.5" rocket
- 5" rocket
- 155 mm

- Deepest recovered UXO
- Amplitude response detection limit
- Bedrock in valleys
VCSM – Vertical Distribution of MEC w/Data

Estimated Vertical Anomaly Distribution

- Seed Interval
- UXO
- Deepest Recovery
- Deepest 100% Detection (all technologies)
- Maximum Detection Depth (all technologies)

Depth Below Ground Surface (cm)

- 0
- 20
- 40
- 60
- 80
- 100
- 120

Anomaly Counts

- Large ISO
- 100# GPB

Land Use
VCSM - After Action VCSM

Distribution of MEC and MD

Depth Below Ground Surface (cm)

seed interval
UXO
inert
deepest recovery
detection depth
Land use

small ISO80
37mm
60mm mortar
2.36" rocket
81mm mortar
4.2" mortar
Navy Explosives Safety Submissions (ESS)
Policies and Procedures

• NOSSAINST 8020.15D is being updated as we speak
  • Including CSM in ESS
  • Changes to AAR
• Instructions for completing the ESS are in NOSSAINST 8020.15 (series) enclosure 3

• NAVFAC WebESS Pre-Submittal Review Process Guidance (3/17)
  • Purpose of review is to improve the quality of ESSs prior to NOSSA review
  • WebESS review by NAVFAC Echelon III
• Samples of both docs are located on the NAVFAC ERB portal and on EXWC’s DVDs distributed to MRWG members

– Both documents are in the ESS and AAR formats required by NOSSAINST 8020.15 (series)
• Submit ESS package WebESS

UXO Contractor -> NAVFAC/BRAC RPM -> NAVFAC LANT -> NOSSA/MARCOR SYSCOM

Allow 15 days for review

ESO and Facility Planner (MCB Env)

UXO Contractor -> NAVFAC/BRAC RPM

Allow 1 month for review of each draft and final ESS

NOSSA/MARCOR SYSCOM -> DDESB

Allow 1 month for approval of final ESS
Explosives Safety Submissions (ESS) and Document Reviews

• ESS Review Process
  • All ESSs are submitted through NOSSA’s WebESS
  • All comment and response submittal transactions are completed through the WebESS
  • When a draft ESS is submitted a notification goes to the NAVFAC internal review team (15 day review duration)
  • Reviews of ESSs for BRAC sites is optional
  • Pre-submittal review of an ESS is available by contacting NAVFAC LANT
  • Following NAVFAC review and revision the ESS will go to NOSSA via the WebESS
• 4. Have you used WebESS? Answers either Yes or No
Poll Question

3. If you used WebESS, did you like WebESS? Answers either yes or no
Explosives Safety Submissions (ESS) and Document Reviews

• Munitions Response Document Reviews
  • Currently there are required internal reviews of ESSs, Quality Assurance Project Plans (QAPPs), and Remedial Alternatives Analysis (RAAs) by NAVFAC.
  • Reviews of other MR documents by SMEs is recommended.

• QAPP and RAA reviews are accomplished through NIRIS using the same process as IR submittals

• Other Munitions Response Documents
  • It is recommended and advisable to engage SMEs during the entire site planning and execution process
  • Internal reviews and support can be obtained by contacting your FEC Munitions Response Workgroup representative to determine the most suitable SME to assist with your project
## Contacts and Questions

### Points of Contact

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<thead>
<tr>
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### Questions ?
Helpful Resources

• SERDP –ESTCP Munitions Response Website
  www.serdp-estcp.org

• NAVFAC Munitions Response Reference DVD
  NAVFAC RI/FS Guidance

• Interstate Technology and Regulatory Council
  Geophysical Classification document
  Quality Considerations for Munitions Response

• DENIX Website
  Current list of accredited contractors
  www.denix.osd.mil
Questions
Wrap Up

• Please complete the feedback questionnaire at the end of this webinar. We are counting on your feedback to make this webinar series relevant!

• Next OER2 Webinar Info….

  Title: Five Year Review Refresher
  Presenter: Donna Caldwell (NAVFAC LANT)
  Date: 17 October 2018
  Time: 1100-1200 (PDT)

• Thank you for participating!