Munitions Response Program Update and Lessons Learned

Presented By
Bryan Harre
NAVFAC EXWC

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Logistics

- **Submit all questions via chat box throughout the presentation**
- **Presentation is being recorded**
- **Complete the webinar survey (main feedback mechanism)**

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Speaker Introduction

Bryan Harre
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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.

Speaker Introduction

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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

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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

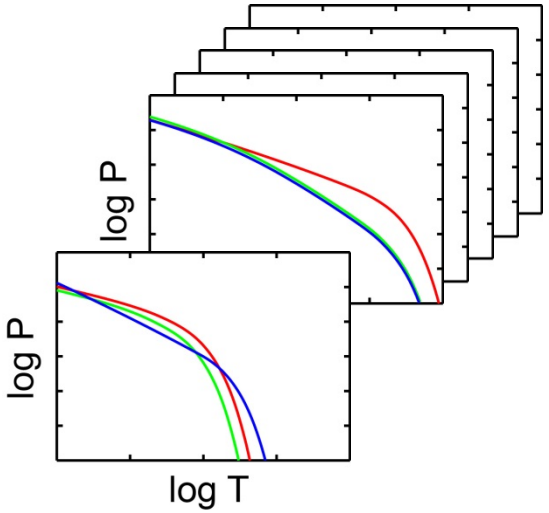
WWII-era 81-mm mortar, Photo courtesy of US Navy.

Advanced Geophysical Classification (AGC) Overview

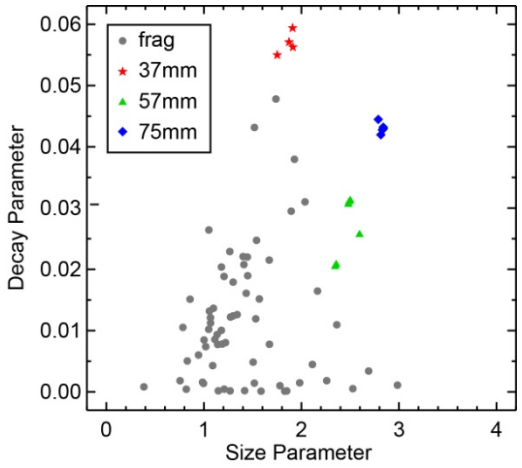
- **Sort buried metal into two classes**
- **Because we cannot see buried objects, we must rely on attributes determined from geophysical data**

AGC Overview - Stages in the Classification Process

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



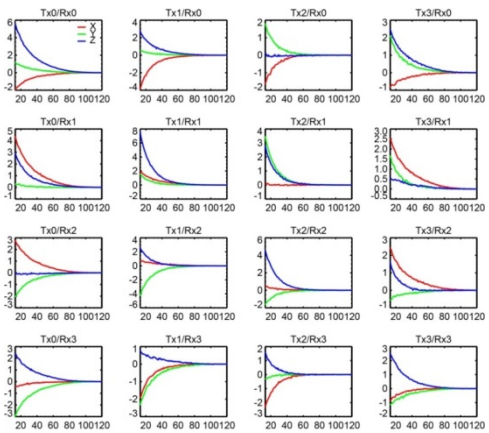
2. Extract target features from the measured responses
   - Data Inversion
   - Target polarizabilities



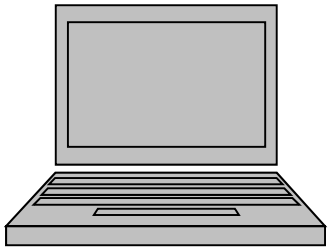
3. Classify targets based on the features
   - Statistical classifiers
   - Library matching

AGC Overview - Parameter Extraction (Geophysical Inversion)

Calculate magnetic polarizability (β) using EMI response model for a single source or multiple sources



Sensor Data

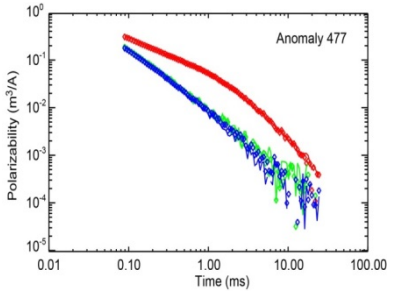


$$V(t) = \mu_0 n_R n_T I_0 \mathbf{C}_R \bullet \mathbf{C}_T \mathbf{P}(t)$$

EMI Response Model (Dipole Model)

Extrinsic Properties

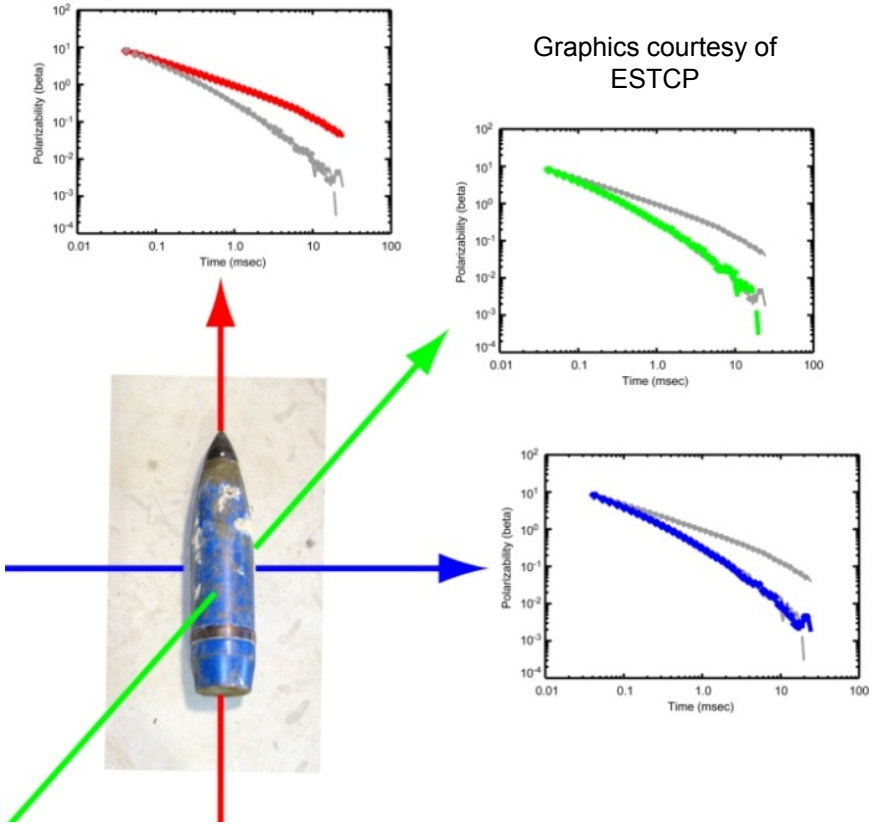
location & orientation



Intrinsic Response

AGC Overview - Principal Axis Responses

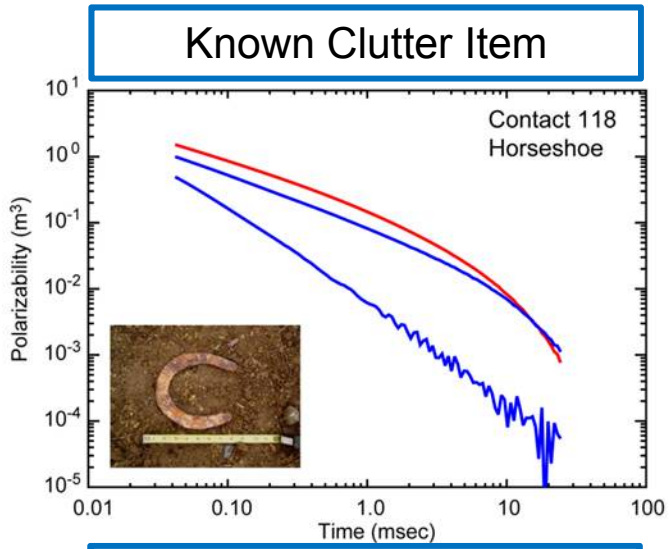
- Normalized response (polarizability) for excitation in object's principal axis directions are the fundamental EMI attributes
- UXO items are symmetrical, so two of the principal axis responses are the same
- Irregular clutter items have three different principal axis responses

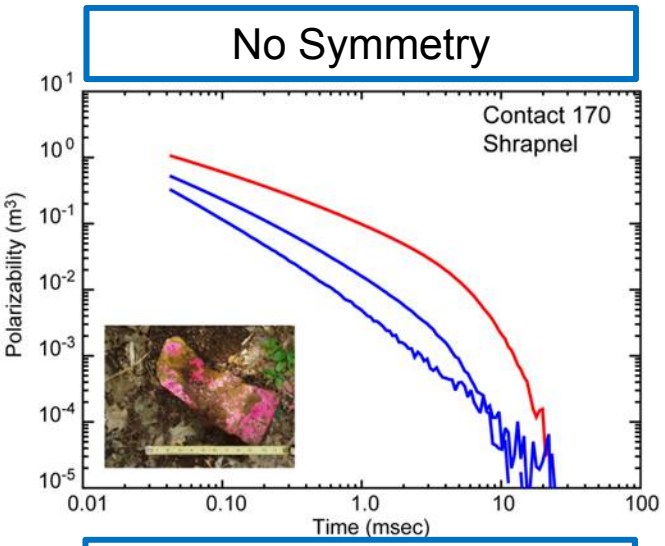


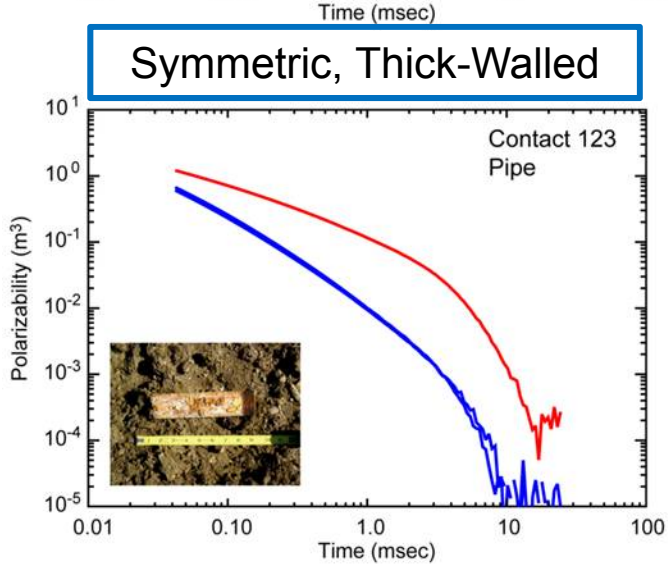
Graphics courtesy of ESTCP

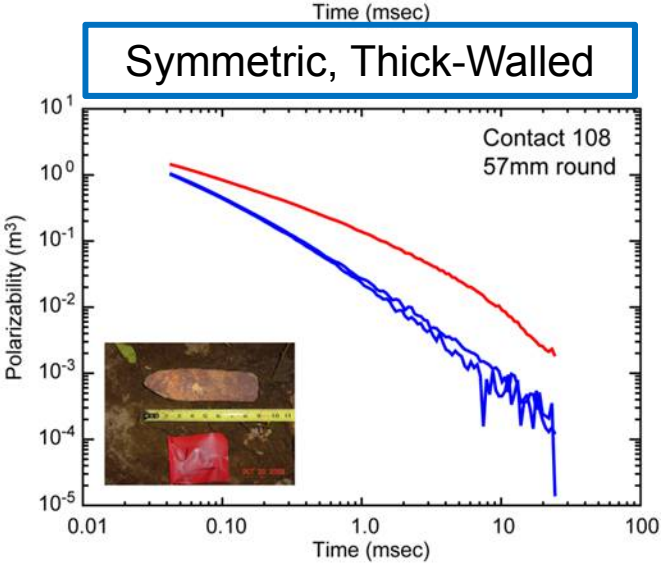
AGC Overview - Polarizability Examples "EMI Fingerprints"

Graphics courtesy of ESTCP

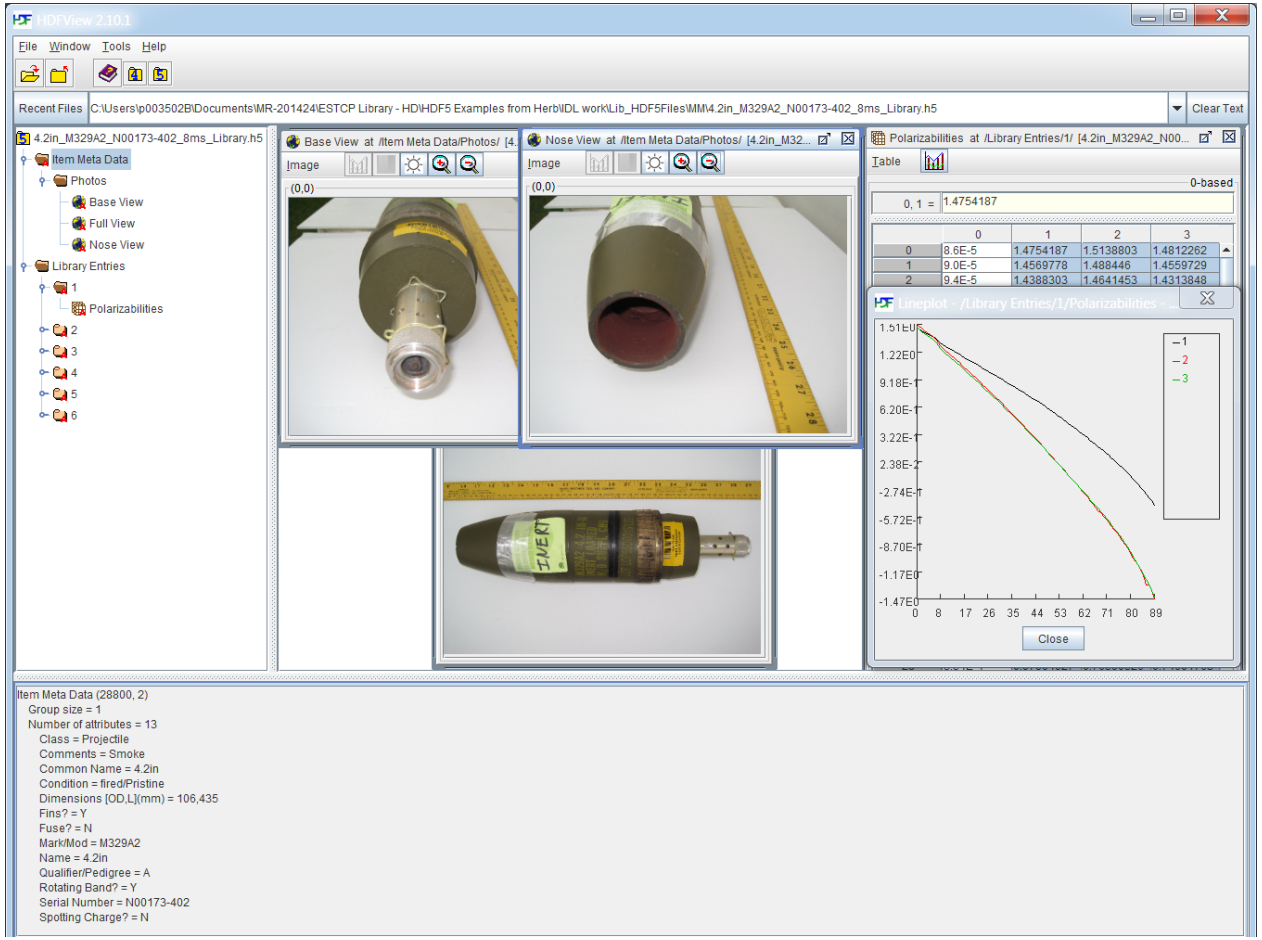








AGC Overview - Target of Interest (TOI) Library Match



Collection of TOI signatures:

1. **metadata,**
2. **sensor data, and**
3. **polarizations**

Originally ESTCP generated
DoD maintained

AGC Overview - TOI Dig Sheet

Source ID	Metric Match	Type
GU-3	0.999	ISO
GU-12	0.998	105mm
GU-124	0.971	4.2in
GU-383	0.962	105mm
GU-465	0.955	Lg ISO
GU-470	0.952	4.2in
GU-534	0.923	75mm
GU-621	0.908	75mm
GU-663	0.896	Lg ISO
GU-719	0.885	105mm
GU-755	0.876	81mm
GU-799	0.749	
GU-810	0.732	
GU-845	0.645	
GU-868	0.622	
GU-884	0.618	
GU-1007	0.512	
GU-1111	0.451	
GU-1112	0.421	

Dig

Do Not Dig

start digging

?

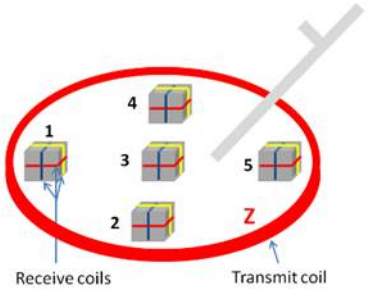
Sensor Availability

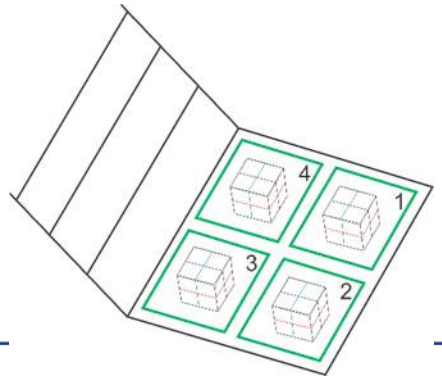
Multiple coils measure the complete response of buried items (spatially and temporally)

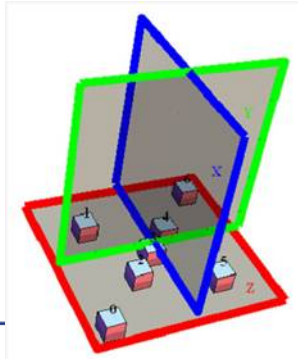
Man-portable

Cart-mounted

Vehicle-towed







Defense Advanced Geophysical Classification Accreditation Program (DAGCAP)

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
CH2MHill, 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)

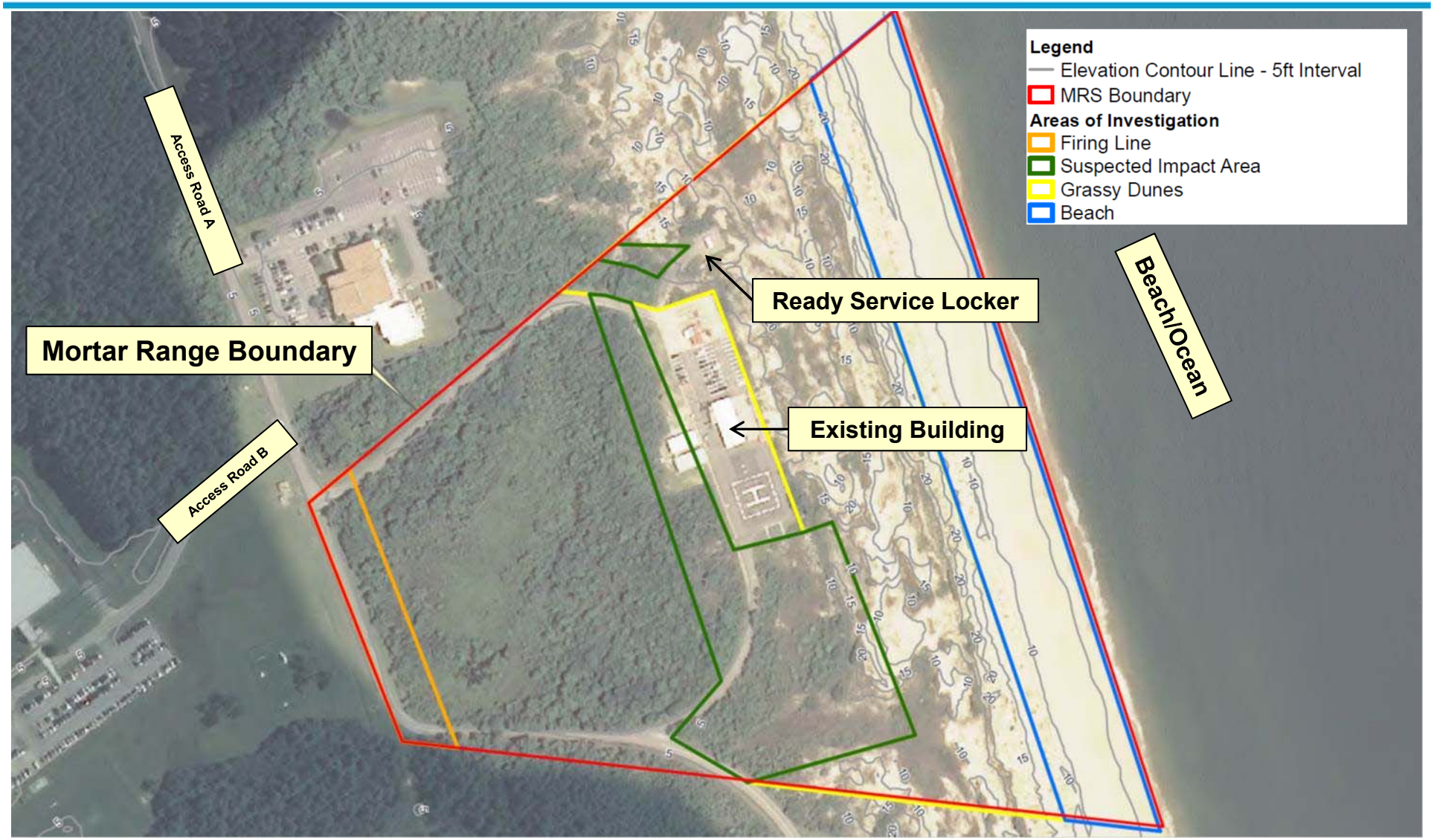
Poll Question #1

- **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



AGC Lessons Learned – Site A

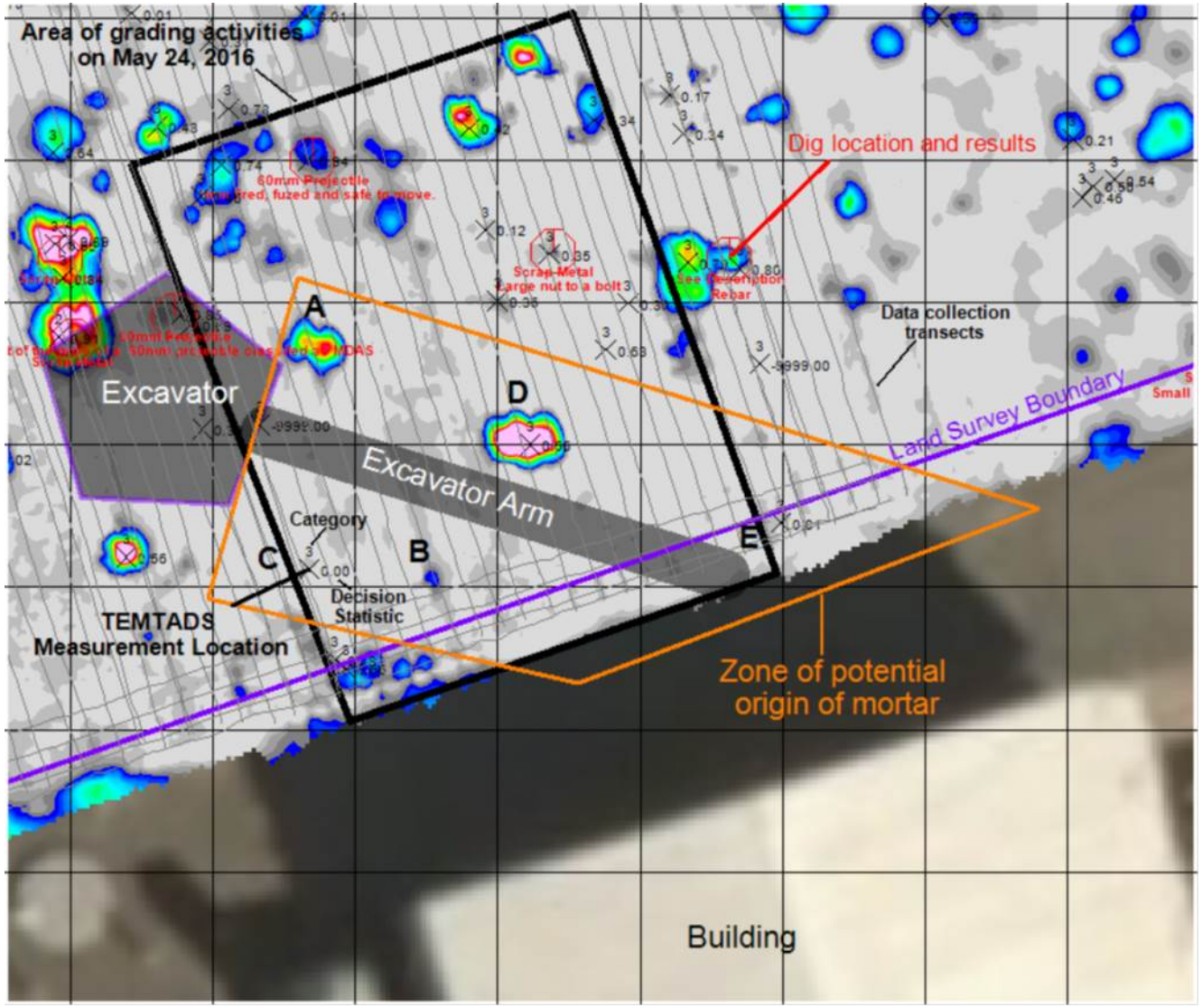
- A MILCON project was planned to replace an existing building within the site
  - Existing building supports mission-critical training element
    - Project phased to allow use of existing building during construction
- Limits of disturbance for construction is within the estimated impact area of the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

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

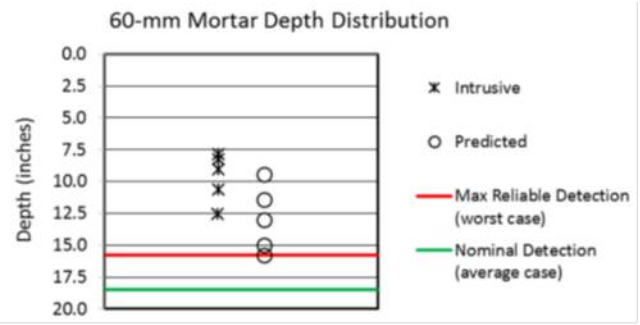
AGC Lessons Learned – Site A



AGC Lessons Learned – Site A

AGC Lessons Learned – Site A

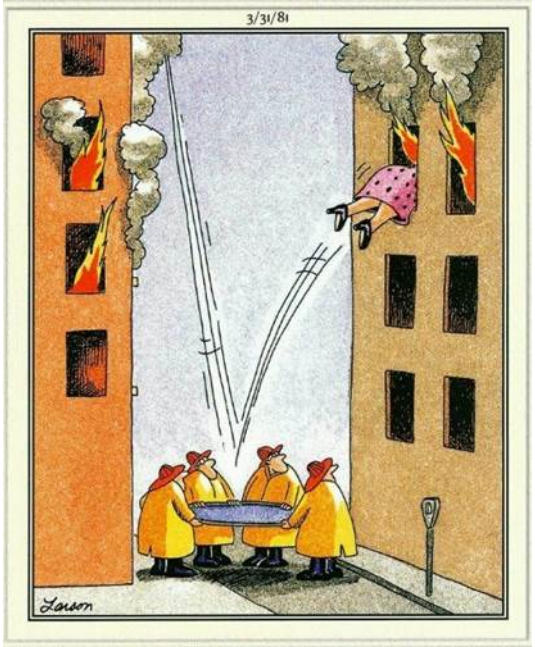
- An investigation was used instead of a removal action to clear the site
- Technological limitations of AGC/EMI not fully understood by project personnel prior to implementation
  - AGC/EMI investigation not capable of achieving known needs for the MILCON as executed
    - Estimated max depth of detection 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



Vertical CSM for 60-mm Mortars from project data usability assessment

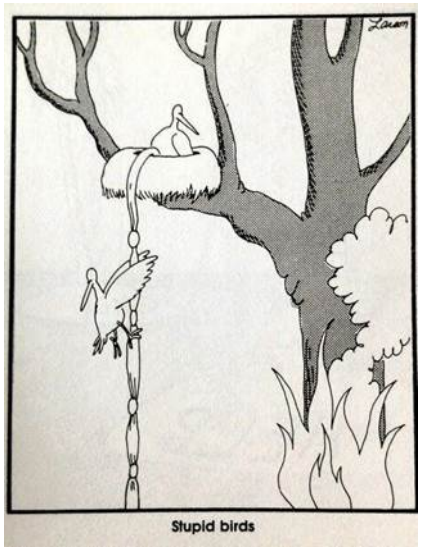
AGC Lessons Learned – Site A

- 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

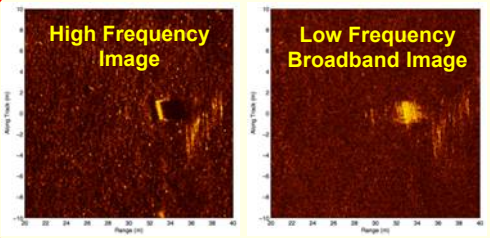
Small Synthetic Aperture Minehunter (SSAM)

Search-Classify-Map (SCM)

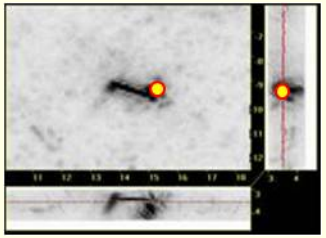
Bluefin12 BMI System
Bottom Object Scanning Sonar
Real-time Tracking Gradiometer
Underwater E-O Imager

REMUS 600 BMI System
Laser Scalar Gradiometer
Marine Sonics Sonar
Underwater EO Imager

Buried Mine Identification (BMI)



DATA PRODUCTS



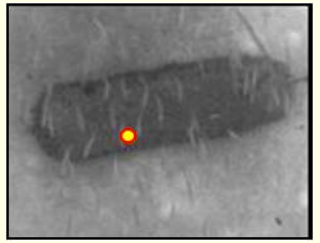


Photo and graphics courtesy of US Navy.

Advanced Navy Technology Lessons Learned

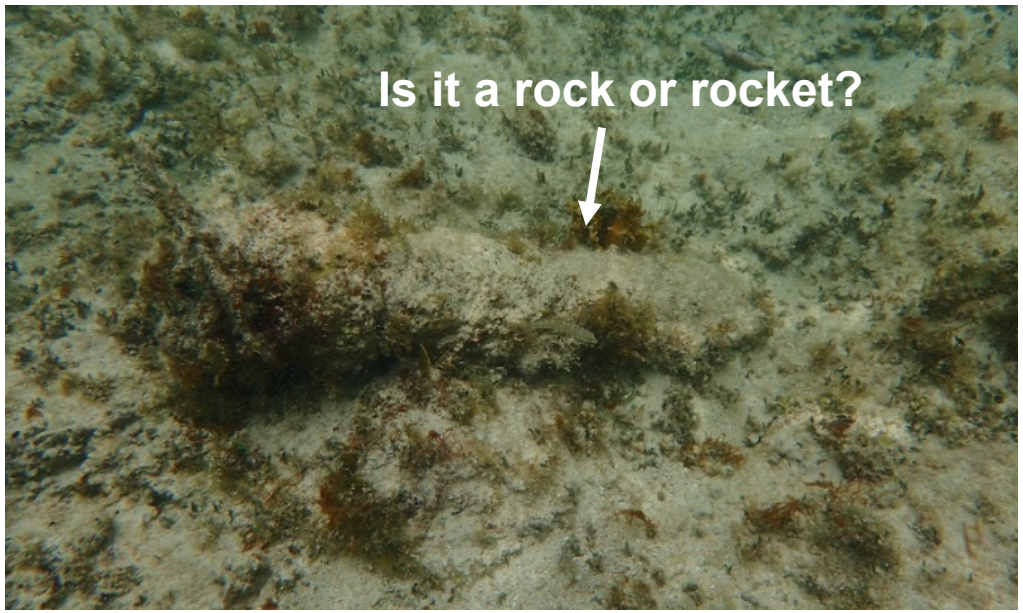
- Involve the UXO contractor early in project planning
  - Need to understand investigation technique and extent of project to write a good report
  - Can help in project planning by asking relevant questions
- Schedule flexibility is key requirement
  - Weather delays can and will happen
  - Navy assets 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

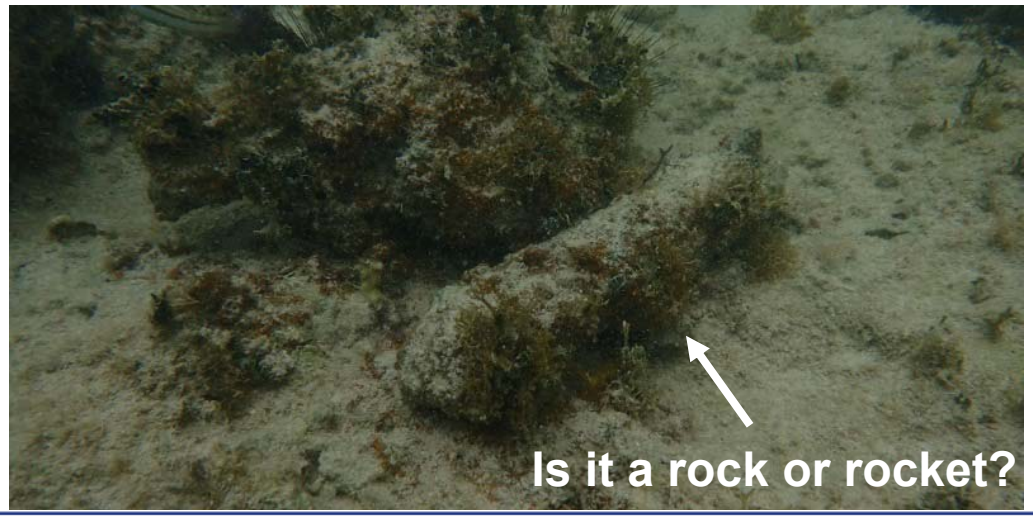
Advanced Navy Technology Lessons Learned

- 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?





Poll Question

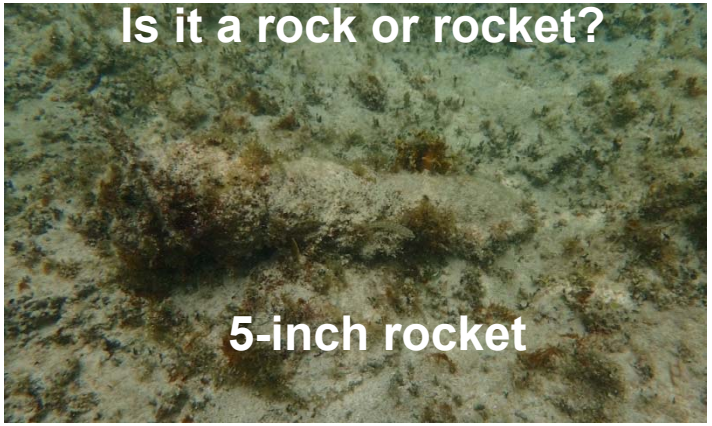
- **2. Was the top picture a rock or a rocket? Answer is either a rock or rocket**

Poll Question

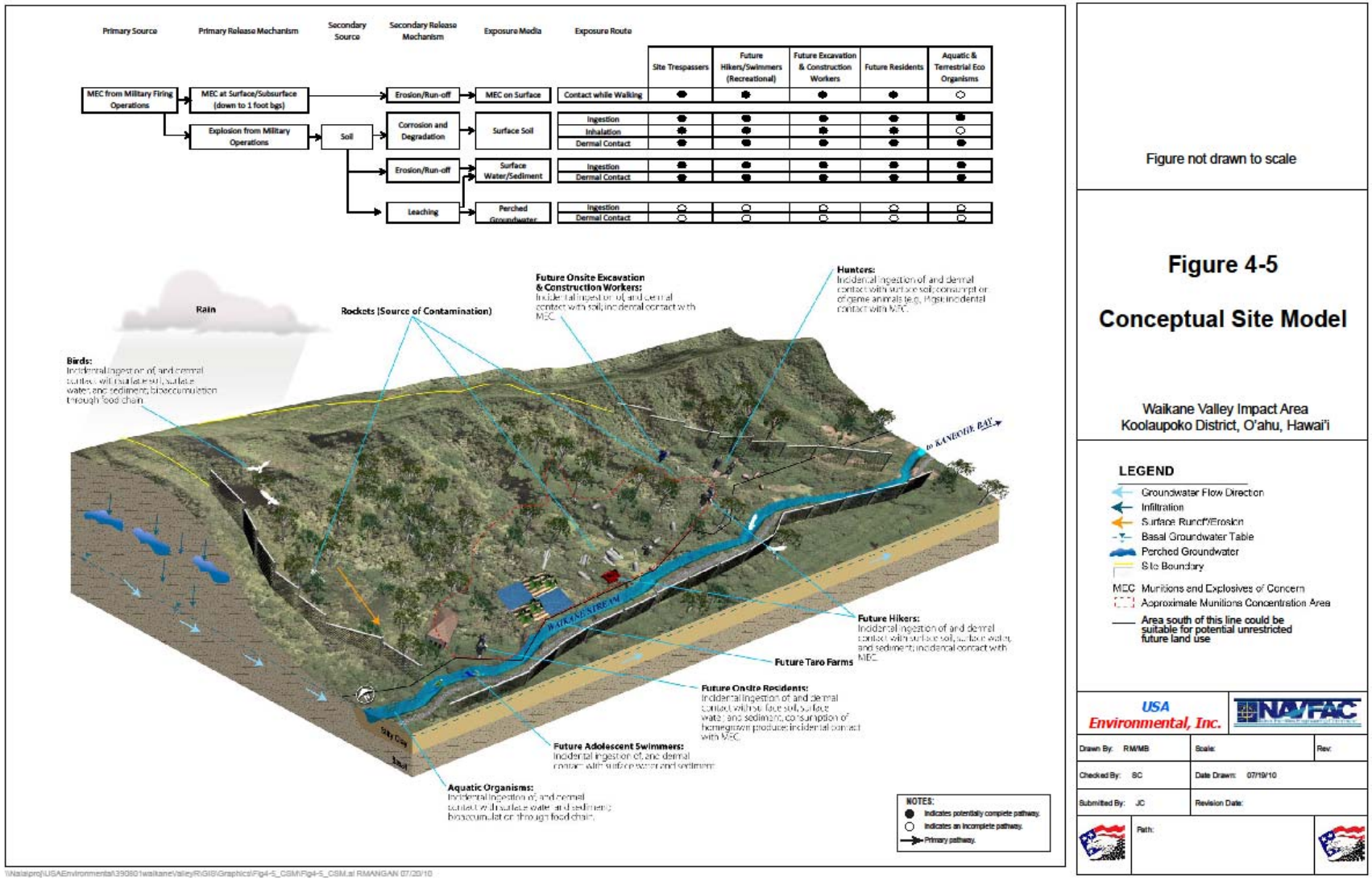
- **3. Was the bottom picture a rock or a rocket? Answer is either a rock or rocket**

Underwater Lessons Learned

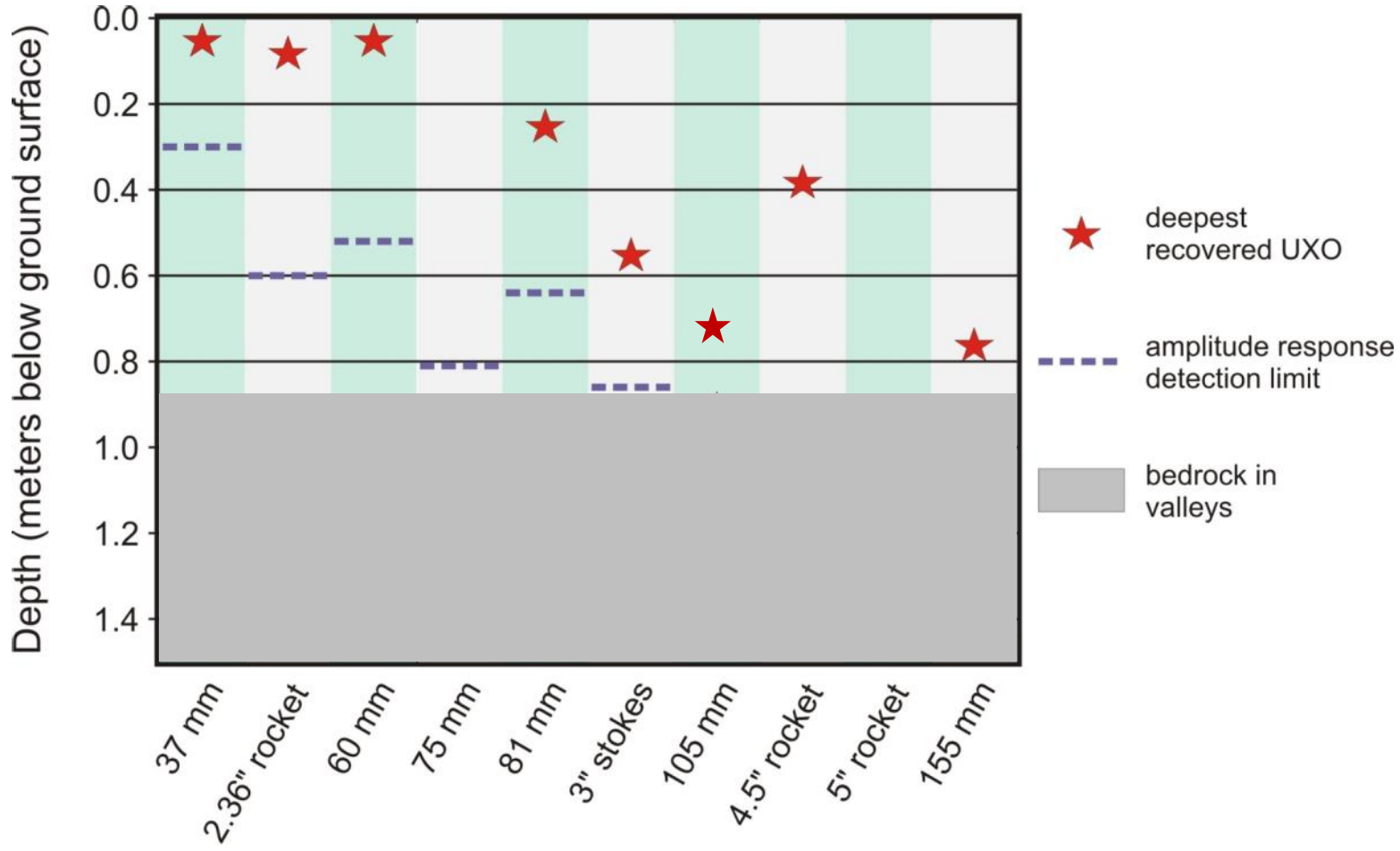
- Just because it looks like a rocket doesn't mean it is a rocket.
  - Never conduct just a visual underwater survey
  - Once you identify an item as MEC underwater it is very hard to convince the project team otherwise.
- EVEN THE EXPERTS CAN BE WRONG!



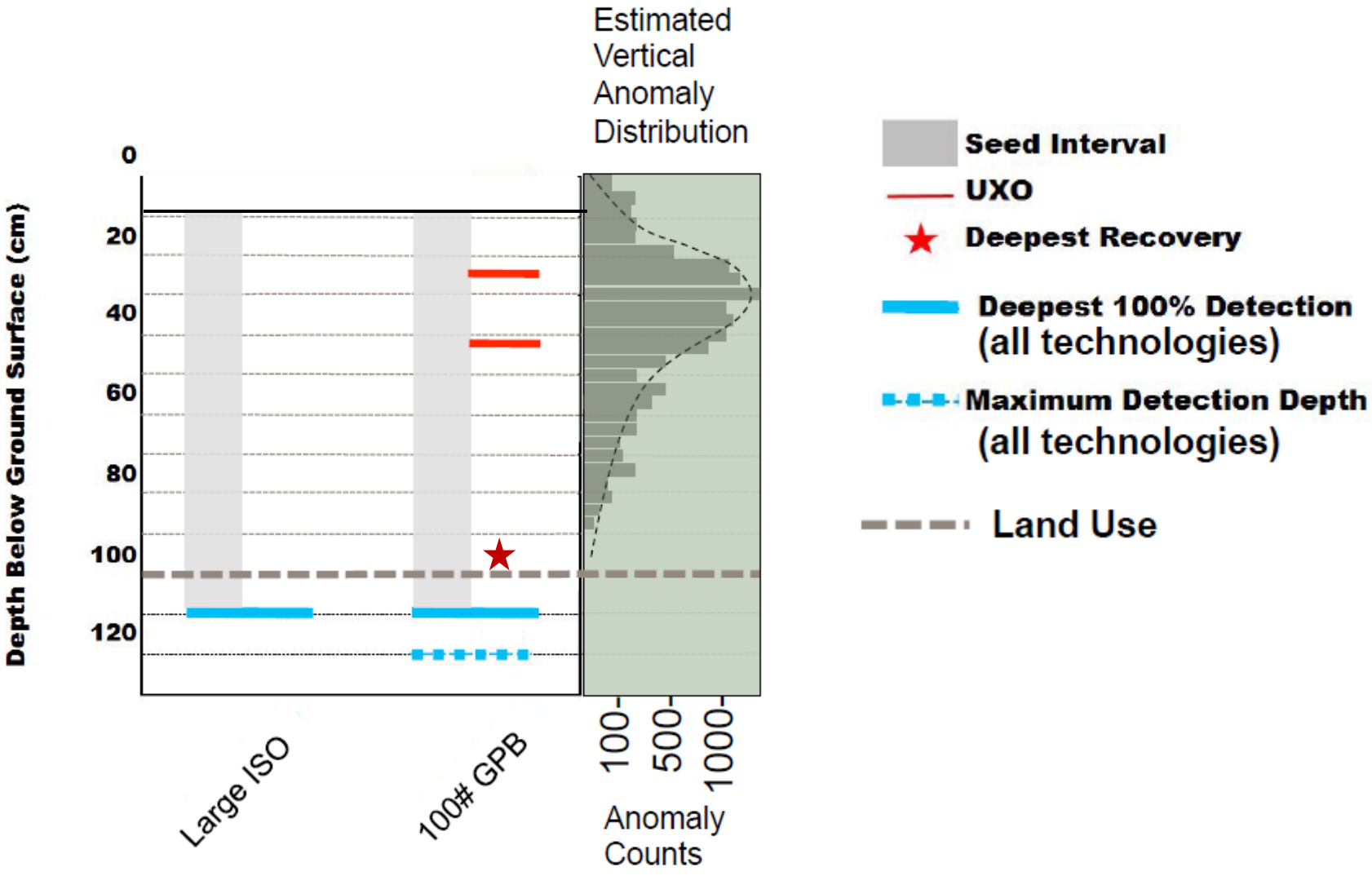
Vertical Conceptual Site Model (VCSM) - Traditional CSM w/Horizontal Extent



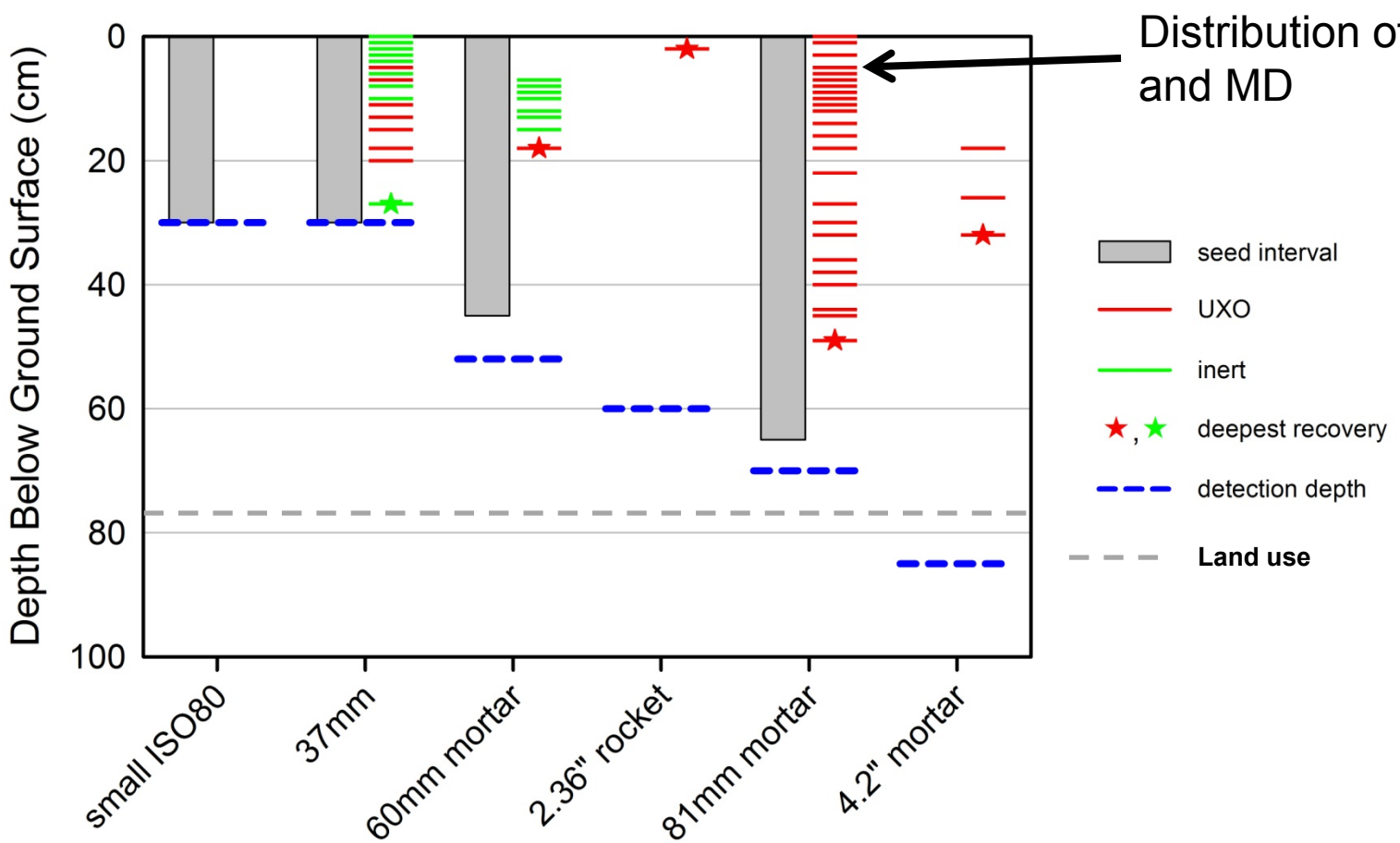
Basic VCSM – Vertical Distribution of MEC



VCSM – Vertical Distribution of MEC w/Data

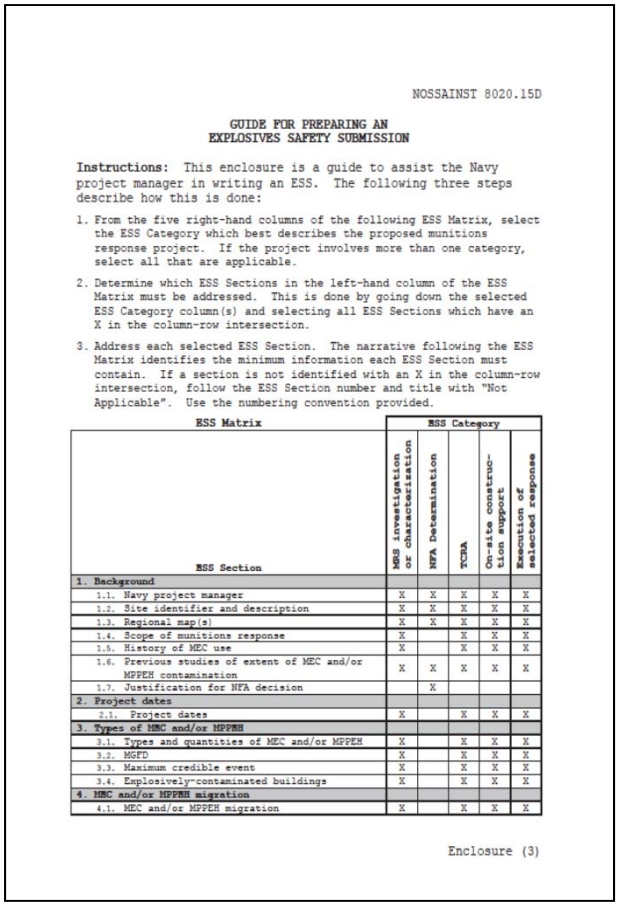


VCSM - After Action VCSM



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



NOSSAINST 8020.15D

GUIDE FOR PREPARING AN EXPLOSIVES SAFETY SUBMISSION

Instructions: This enclosure is a guide to assist the Navy project manager in writing an ESS. The following three steps describe how this is done:

1. From the five right-hand columns of the following ESS Matrix, select the ESS Category which best describes the proposed munitions response project. If the project involves more than one category, select all that are applicable.
2. Determine which ESS Sections in the left-hand column of the ESS Matrix must be addressed. This is done by going down the selected ESS Category column(s) and selecting all ESS Sections which have an X in the column-row intersection.
3. Address each selected ESS Section. The narrative following the ESS Matrix identifies the minimum information each ESS Section must contain. If a section is not identified with an X in the column-row intersection, follow the ESS Section number and title with "Not Applicable". Use the numbering convention provided.

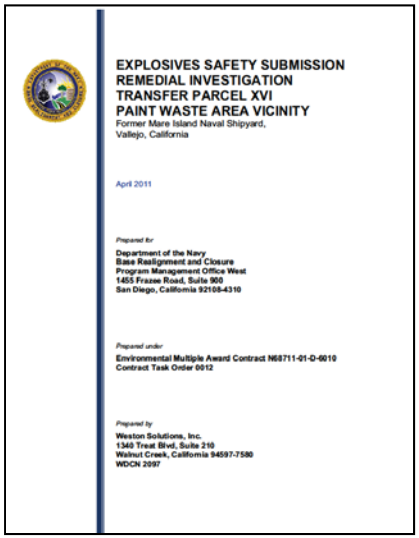
ESS Matrix	ESS Category				
ESS Section	MRS investigation or characterization	NFA Determination	TCRA	On-site construction support	Execution of selected response
1. Background					
1.1. Navy project manager	X	X	X	X	X
1.2. Site identifier and description	X	X	X	X	X
1.3. Regional map(s)	X	X	X	X	X
1.4. Scope of munitions response	X		X	X	X
1.5. History of MEC use	X		X	X	X
1.6. Previous studies of extent of MEC and/or MPPEH contamination	X	X	X	X	X
1.7. Justification for NFA decision		X			
2. Project dates					
2.1. Project dates	X		X	X	X
3. Types of MEC and/or MPPEH					
3.1. Types and quantities of MEC and/or MPPEH	X		X	X	X
3.2. MGFD	X		X	X	X
3.3. Maximum credible event	X		X	X	X
3.4. Explosively-contaminated buildings	X		X	X	X
4. MEC and/or MPPEH migration					
4.1. MEC and/or MPPEH migration	X		X	X	X

Enclosure (3)

Excerpt from Encl (3) of NOSSAINST 8020.15 (series).

Sample ESS and AAR

- 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)



EXPLOSIVES SAFETY SUBMISSION
REMEDIAL INVESTIGATION
TRANSFER PARCEL XVI
PAINT WASTE AREA VICINITY
Former Mare Island Naval Shipyard,
Vallejo, California

April 2011

Prepared for
Department of the Navy
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

Prepared under
Environmental Multiple Award Contract N68711-01-D-6010
Contract Task Order 0012

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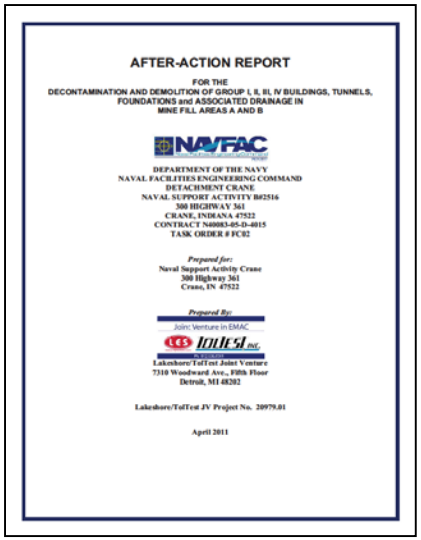
WDCN 2097



AFTER-ACTION REPORT

FOR THE
DECONTAMINATION AND DEMOLITION OF GROUP I, II, III, IV BUILDINGS, TUNNELS, FOUNDATIONS and ASSOCIATED DRAINAGE IN MINE FILL AREAS A AND B

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
DETACHMENT CRANE
NAVAL SUPPORT ACTIVITY B02516
300 HIGHWAY 361
CRANE, INDIANA 47522
CONTRACT N40083-05-D-4015
TASK ORDER # FC02

Prepared for:
Naval Support Activity Crane
300 Highway 361
Crane, IN 47522

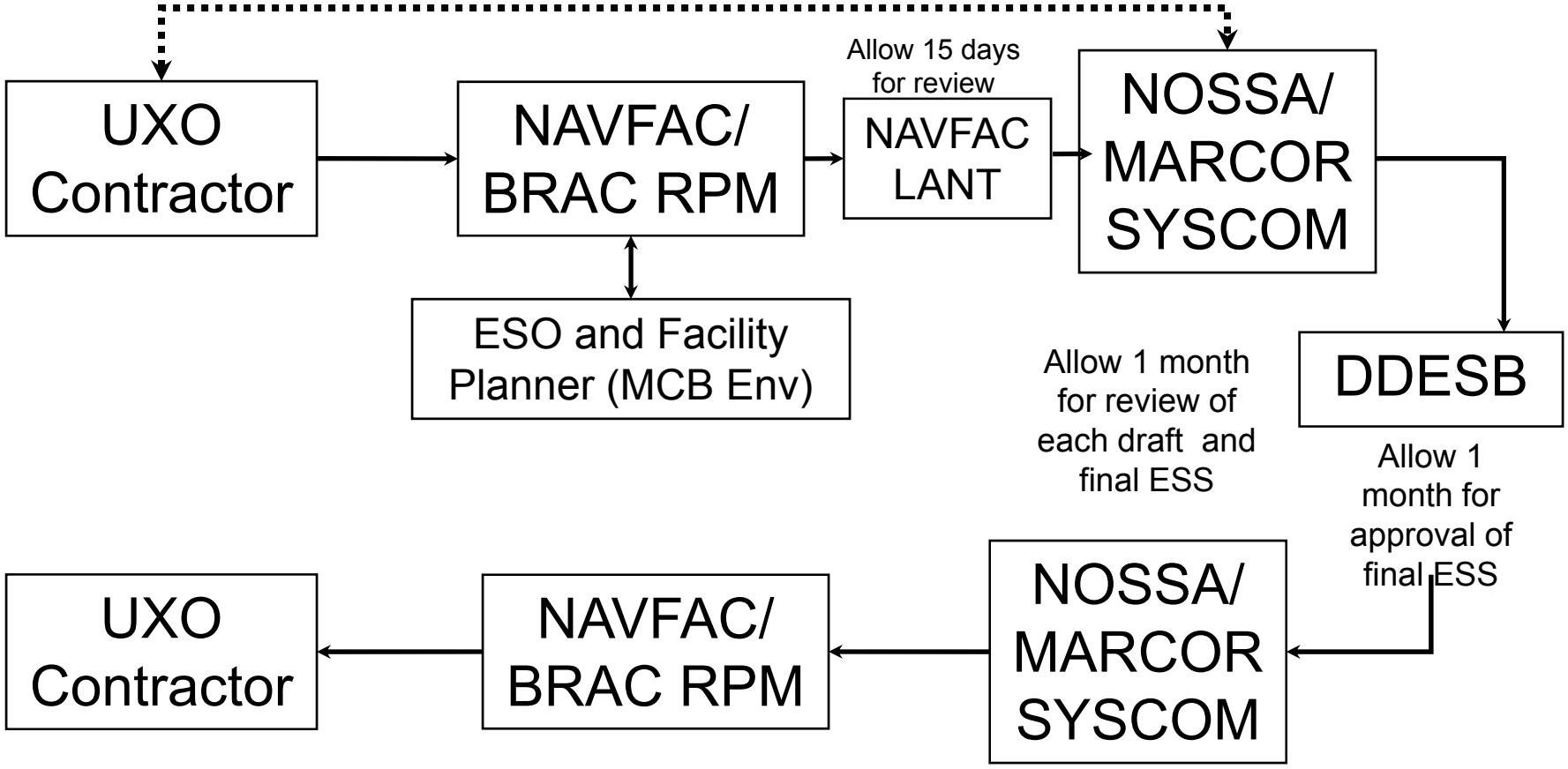
Prepared By:
Joint Venture in EMAC
Lakeshore/TolTest Joint Venture
7310 Woodward Ave., Fifth Floor
Detroit, MI 48202

Lakeshore/TolTest JV Project No. 20979.01

April 2011

ESS Review and Approval Process

- Submit ESS package WebESS



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

Poll Question

- **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
NAVFAC EXWC: Bryan Harre – bryan.harre@navy.mil
NAVFAC LANT: Stacin Martin – stacin.martin@navy.mil
Questions ?

Supplemental Information

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!**