

Ordnance Reef (HI-06) Sea Disposed Military Munitions Site Wai'anae, O'ahu, Hawai'i

Office of the Deputy Assistant Secretary
of the Army (Environment, Safety and
Occupational Health)
&
Pacific Ocean Division,
U.S. Army Corps of Engineers

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Presenters

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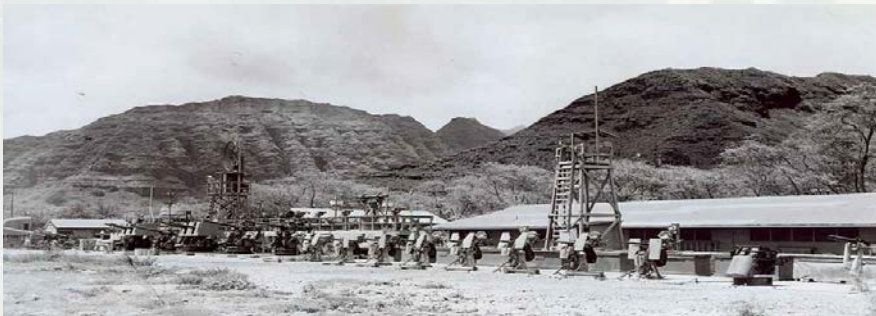
Pacific Ocean Division (POD)

U.S. Army Corps of Engineers

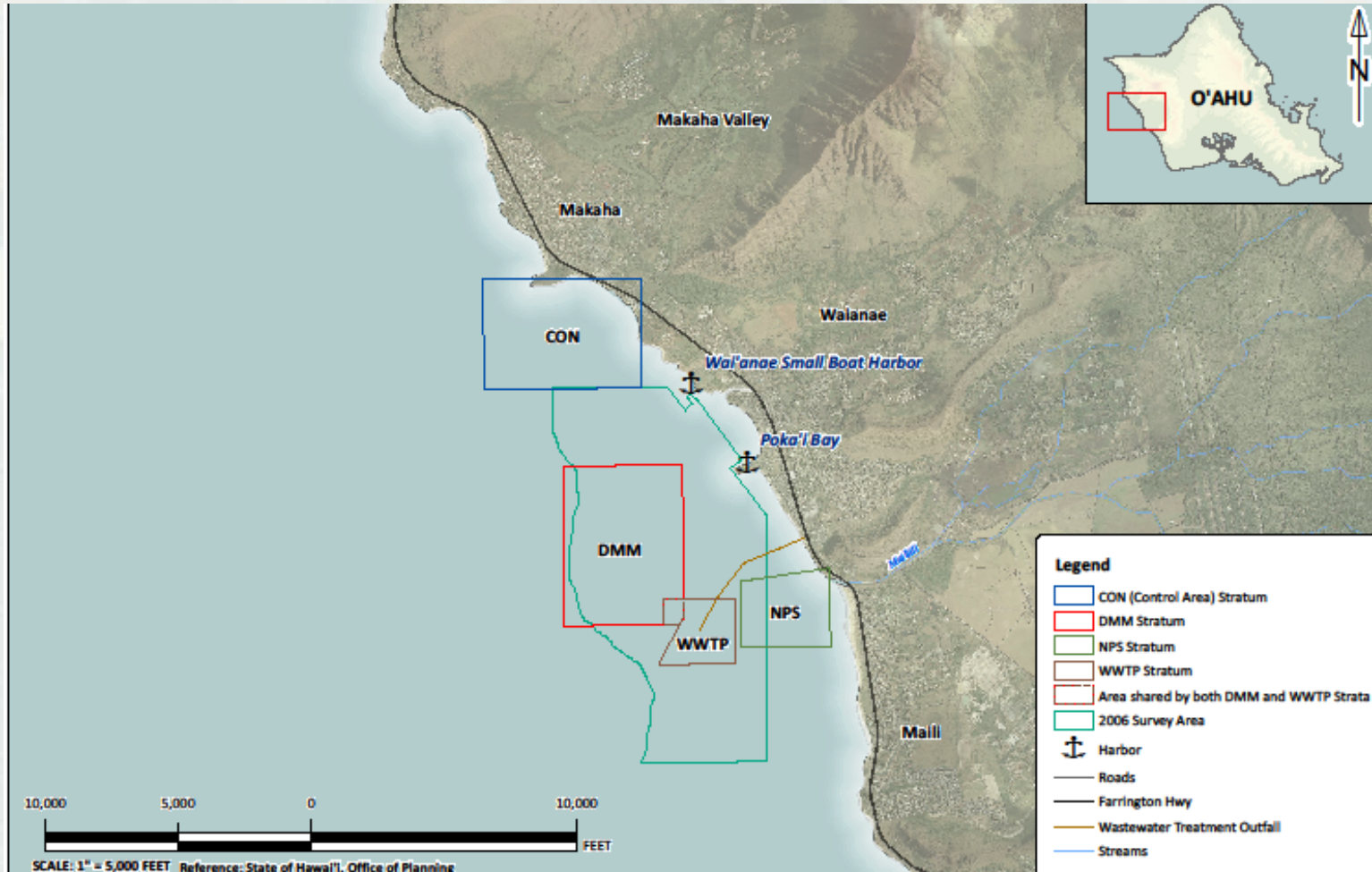


Agenda

- **Location**
- **Background and Site History**
- **Authority**
- **Remedial Investigation-Like Study**
- **Technology (Removal and At-sea Demilitarization) Demonstration**
- **Associated Research and Activities**
- **Summary and Websites**



Site Location



Background

- 1996**: Reports of munitions at Pokai Bay, Wai'anae Sewage Treatment Plant
- 2002**: USACE surveys military munitions present at Pokai Bay; none found to pose an imminent and substantial hazard
- 2005**: Community raises concerns with presence of military munitions
- 2006**: National Oceanic and Atmospheric Administration (NOAA) conducts Army-sponsored screening-level survey of Ordnance Reef (HI-06)
- 2007**:
- NOAA's Screening-level Survey Report released to the public
- Ordnance Reef Coordinating Council (ORCC) established
- 2009**: University of Hawaii (UH) conducts sampling for remedial investigation (RI)-like (sediment, seawater and biota)
- 2011**:
- Technology demonstrations conducted
- Draft RI-like study submitted
- 2012**: Follow-on investigation



Authority for Research at HI-06

FY07 John Warner National Defense Authorization Act (NDAA), P.L. 109-364, Sec 314, Research on Effects of Ocean Disposal of Munitions

- **Required DoD to:**
 - ✓ Identify disposal sites
 - ✓ Identify navigation and safety hazards
 - ✓ Research effects of disposed military munitions on:
 - The Ocean Environment
 - Those Who Use It

- **Studies at HI-06 done as research and development**

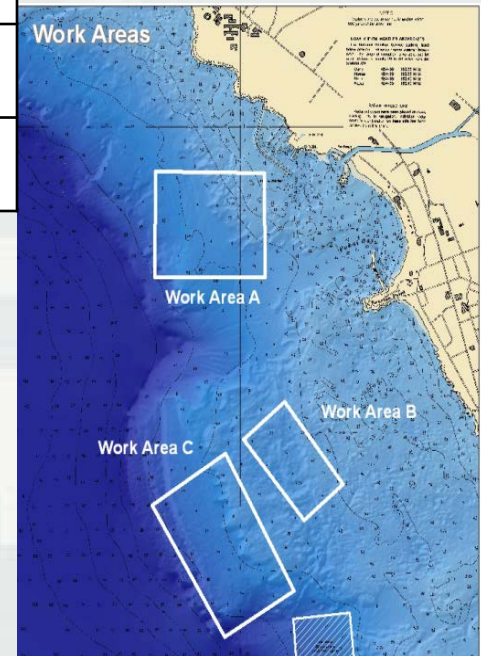


Military Munitions Present at HI-06

	Small Arms	Above .50 caliber to 105 mm	Larger than 105 mm, bombs, rockets, etc.
Area A	14	0	0
Area B	229	1,461	0
Area C	12,557	6,061	874
Total	12,800	7,525	874

Estimated quantities based on NOAA's 2011 Coral Survey

Military munitions present are discarded military munitions (DMM) not unexploded ordnance (UXO)



2006 NOAA Screening-level Survey

- Disposal area bounded to depth of about 300 + feet
- Munitions observed at depths from 24 feet to the survey's maximum depth (approximately 320 feet)
- Samples (97 sediment and 49 fish) collected and analyzed
- DNT detected in four sediment samples
- Explosives not detected in biota
- Low enhancement of metals in sediment
- Explosive hazards low, if munitions left undisturbed
- Health hazard low, but data gaps exist
- There was no evidence of widespread contamination from munitions – some localized enrichment



Scoping of RI-like Study

- **Community concerns based on results of 2006 NOAA Screening-level Survey:**
 - ✓ **Are fish safe to eat?**
 - **Fish caught not representative of those eaten locally**
 - **“Whole fish” analysis not reflective of local use**
 - **Sampling not representative of seasonal differences**
 - **Detection limits for some metals too high**
- **Study question: “Do munitions at Ordnance Reef pose an unacceptable risk to human health or the environment?”**



Contaminants of Potential Concern (COPC)

- TNT
- 2,4-Dinitrotoluene (DNT)
- 2,6-DNT
- 2-amino (Am)-4,6-DNT
- 4-Am-2,6-DNT
- RDX
- Picric acid
- Nitroglycerin
- Phthalates
- Pyrene
- Arsenic (speciated)
- Copper
- Lead

Added for second round:

- 2,4-dinitrophenol
- Picramic acid



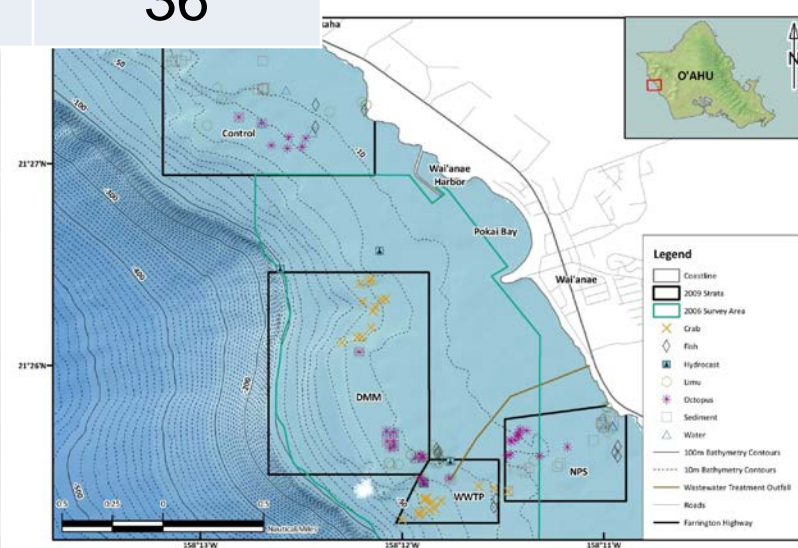
Stratified Sampling Approach

- **Other sources of potential contamination considered were stormwater runoff, the municipal sewage outfall, and building materials deposited for an artificial reef**
- **Investigation used four strata to separate impacts:**
 - ✓ **Control - Natural (no DMM) reef (CON)**
 - ✓ **Wastewater treatment plant outfall pipe (WWTP)**
 - ✓ **Coastal non-point source stream discharge (NPS)**
 - ✓ **Munitions disposal area on reef (DMM)**



Sampling Coverage

Sample Type	Samples
Sediment	46
Seawater	16
Fish	79
Octopus	36
Crab	28
Seaweed (limu)	36



Risk Assessment

- **Hawaiians tend to consume a greater amount of seafood than other Americans (54 g/day)**
- **Interviews resulted in the use of two-seafood consumption levels in the risk assessment:**
 - ✓ **HI-06 Average (84 g/day 10% from site)**
 - ✓ **HI-06 High-end (161 g/day 100% from site)**
- **Unlikely DMM area could support the rate of consumption used in the Human Health Risk Assessment (HHRA)**



Technology Demonstration

- **Preliminary actions**
 - ✓ **Environmental Assessment (EA) - Findings of No Significant Impact (FONSI)**
 - ✓ **NOAA Coral Avoidance and Minimization of Injury Plan (CAMIP)**
- **Demonstration**
 - ✓ **Remotely Operated Underwater Munitions Recovery System (ROUMRS)**
 - ✓ **Energetic Hazards Destruction System (EHDS)**



Technology Demonstrations

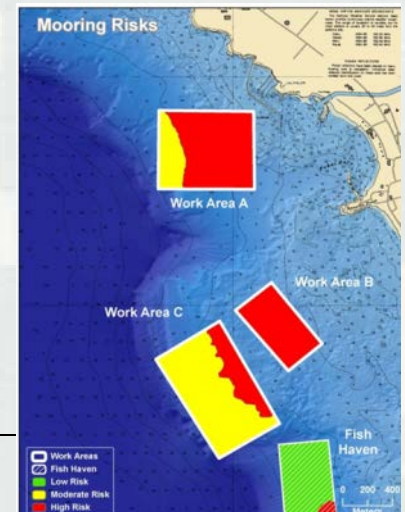
- ROUMRS
- EHDS
- Underwater Portable Acoustic Contraband Detector (PACD)
- In-situ explosive detection (Hammerhead)
- Corrosion assessment



NOAA's CAMIP

- Impacts to coral and other benthic habitats was a major concern
- NOAA's survey of sea-disposed munitions and coral
 - ✓ Assisted Army in development of best management practices
 - ✓ Identified relative risk to coral and other benthic habitats
 - ✓ Led to more efficient use of field time
 - ✓ Allowed NOAA to better protect resources
- Minor injuries to corals — mitigate with coral nursery

Coral \ Relief	Majority of area sand or uncolonized hard bottom	Coral colonies present, but substantial space to for ROV	Coral colonies abundant, little space for ROV	Presence of large coral colonies
Little to no relief	Low	Low	Low to moderate	High
Low vertical relief	Low	Low to moderate	Moderate to high	High
High vertical relief	Low	Low to moderate	Moderate to high	High



ROUMRS and EHDS Concept of Operations

ROUMRS Process Steps

Deploy ROV, document site and stage salvage basket on seafloor

Transit ROV to UWMM, tentatively identify and recover to ROV hopper

Retract ROV hopper and transit to salvage basket

Transfer UWMM from ROV hopper to salvage basket

Once salvage basket is full, rig lift bag and towline and use ROV to activate lift

Surface craft tows submerged salvage basket to DSV for munitions demilitarization (EHDS)

EHDS Process Steps

Lift Salvage Basket on to DSV deck

Identify and inventory salvage basket contents

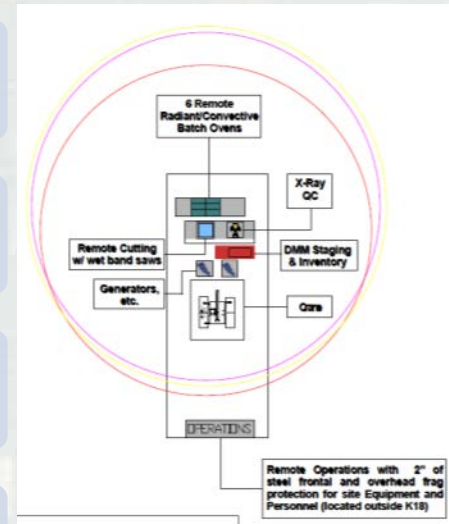
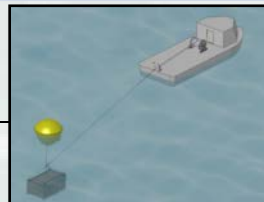
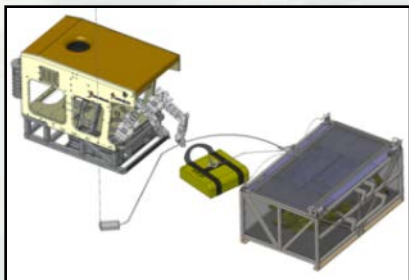
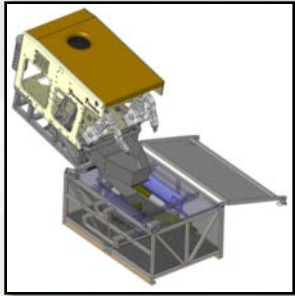
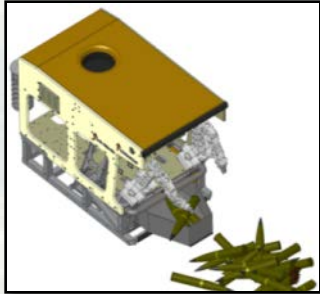
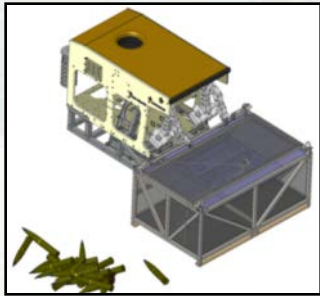
X-Ray and segregate munitions by size and fill

Use remotely operated, water cooled, band saw to cut munitions

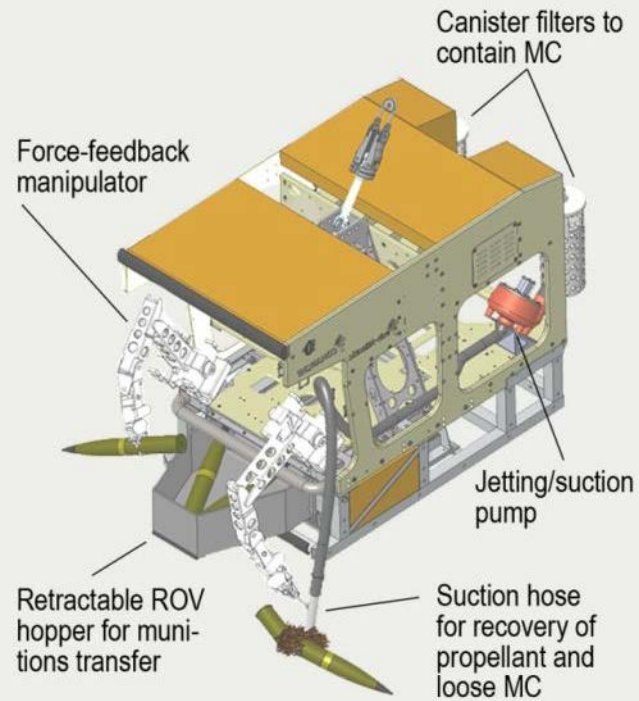
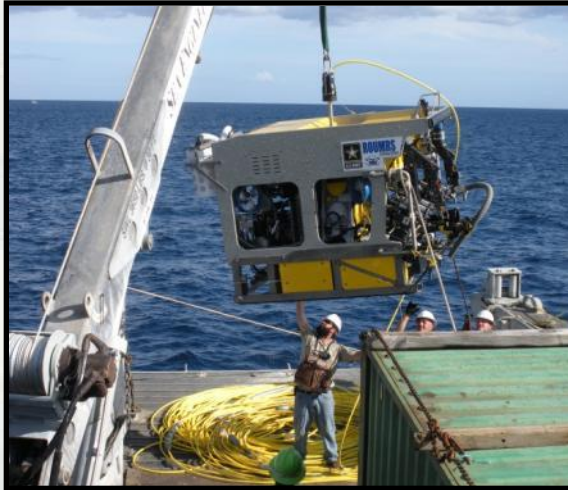
Load RCBO and heat to appropriate temperature to degrade energetics

Inspect and certify treated materials as safe or retreat, recycle scrap

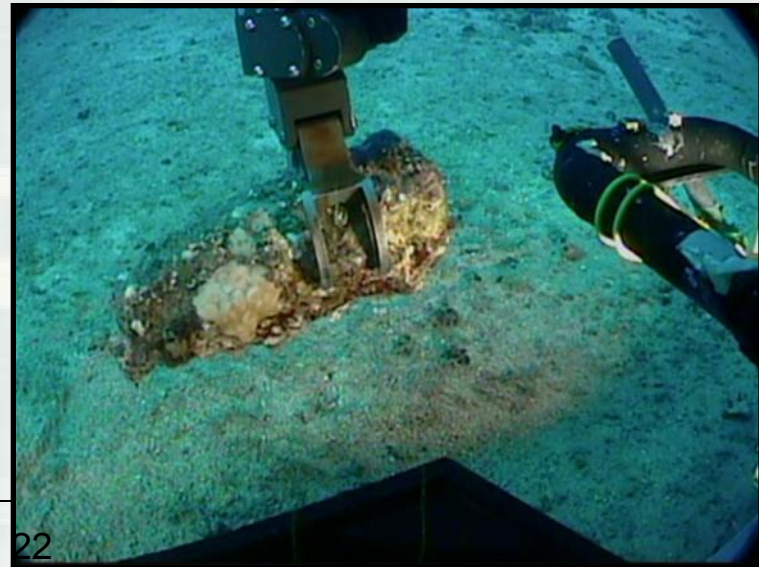
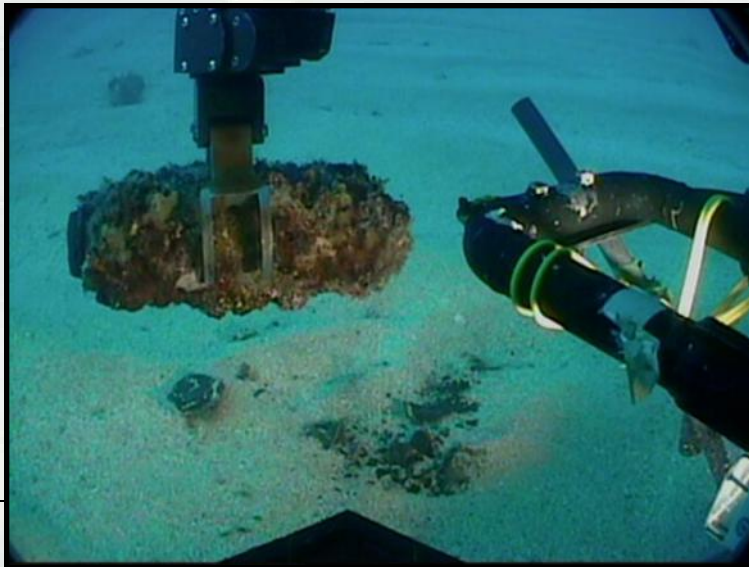
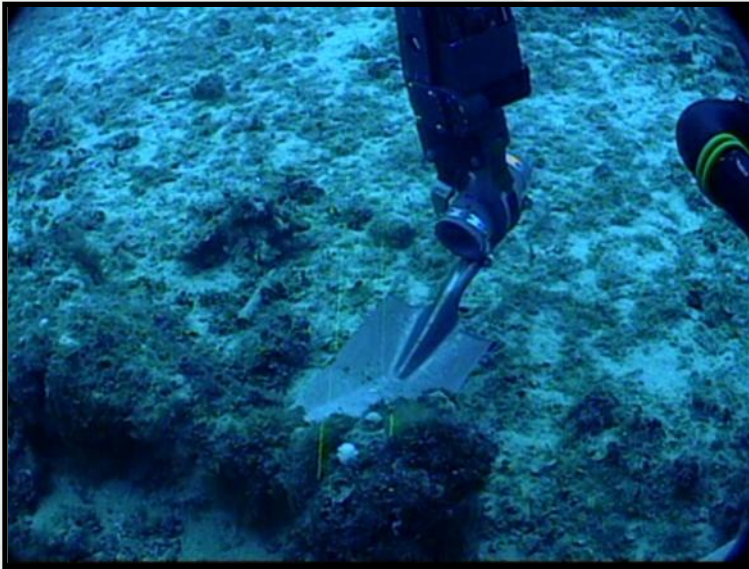
Lower salvage basket into water for reuse



ROUMRS

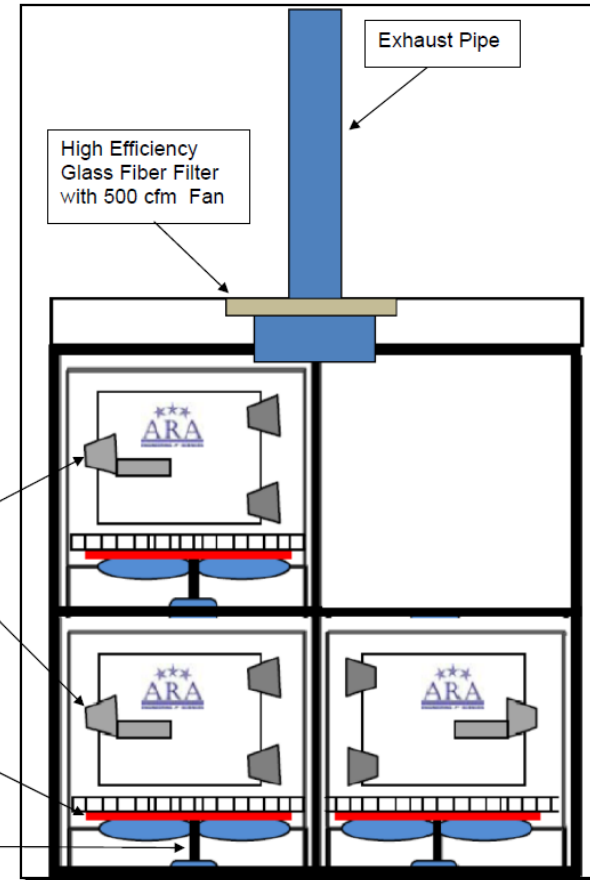


ROUMRS Operations – Underwater Recovery

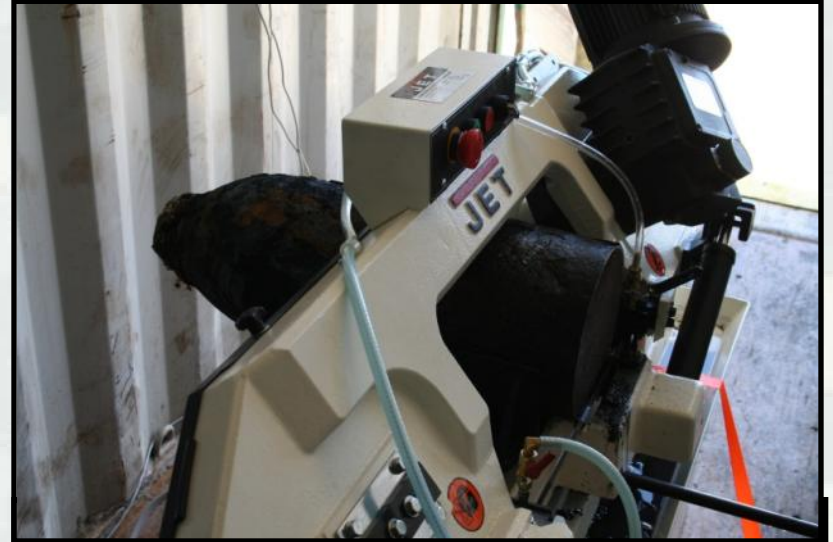


RONG®

EHDS



EHDS Identification and Remote Cutting



Technology Demonstration Results

▪ ROUMRS:

- ✓ Able to survey sea-disposal areas and recover sea-disposed munitions
- ✓ Recovered:
 - 80 suspected munitions (138 items encrusted to bottom)
 - 2,300 small arms
- ✓ ROV is capable of supporting numerous scientific tools and research efforts

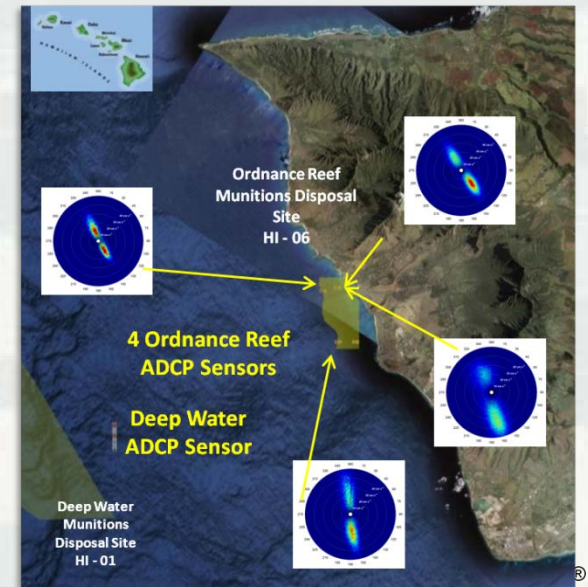
▪ EHDS:

- ✓ Proved the at-sea disposal concept to be effective and a viable tool for future use
- ✓ Destroyed:
 - 74 medium to large caliber munitions and 2,300 small arms
 - 330 pounds of explosives and 135 pounds of propellant



Associated Research and Activities

- Survey of Propellants Washing Ashore
- NOAA Current Study and Modeling
- Community Outreach and UXO Awareness (3Rs)
- Ordnance Reef Coordinating Council (ORCC)
- Media Engagements



Conclusions

- **Community engagement is time consuming, but critical to success**
- **A holistic approach to site characterization is necessary**
- **Impacts from the sea-disposed munitions at Ordnance Reef do not appear to be significant**
- **Tools are available for the recovery and at-sea demilitarization of munitions**
- **Research is ongoing (corrosion, impact assessment)**
- **For a number of reasons (e.g., explosives safety) it is best to leave underwater munitions alone**
- **Explosives safety education is a valid risk management tool**



Questions?

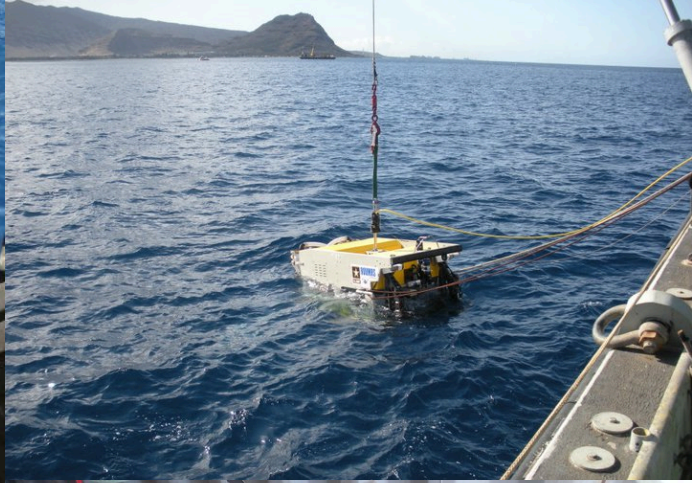




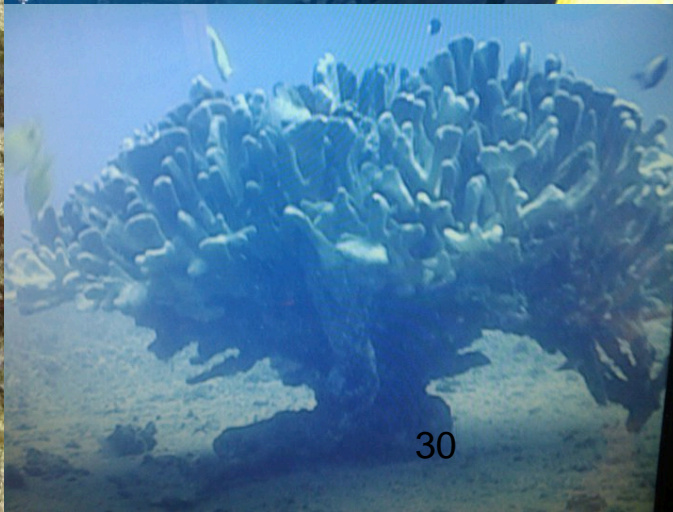
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Mahalo!



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Back-up Slides



Web Sites for Additional Information

- **HI-06 Ordnance Reef**

- ✓ <http://www.ordnancereefhawaii.org/>

- ✓ <https://www.facebook.com/pages/Ordnance-Reef-Hawaii/169281289801652>
(Facebook)

- **HI-05 Hawaii Undersea Military Munitions Assessment (HUMMA)**

- ✓ <http://hummaproject.com/>

