Military Munitions Response Program
Advanced Geophysical Classification Treatability Study
Hawthorne Army Depot, NV

M2S2 Webinar

February 26, 2015

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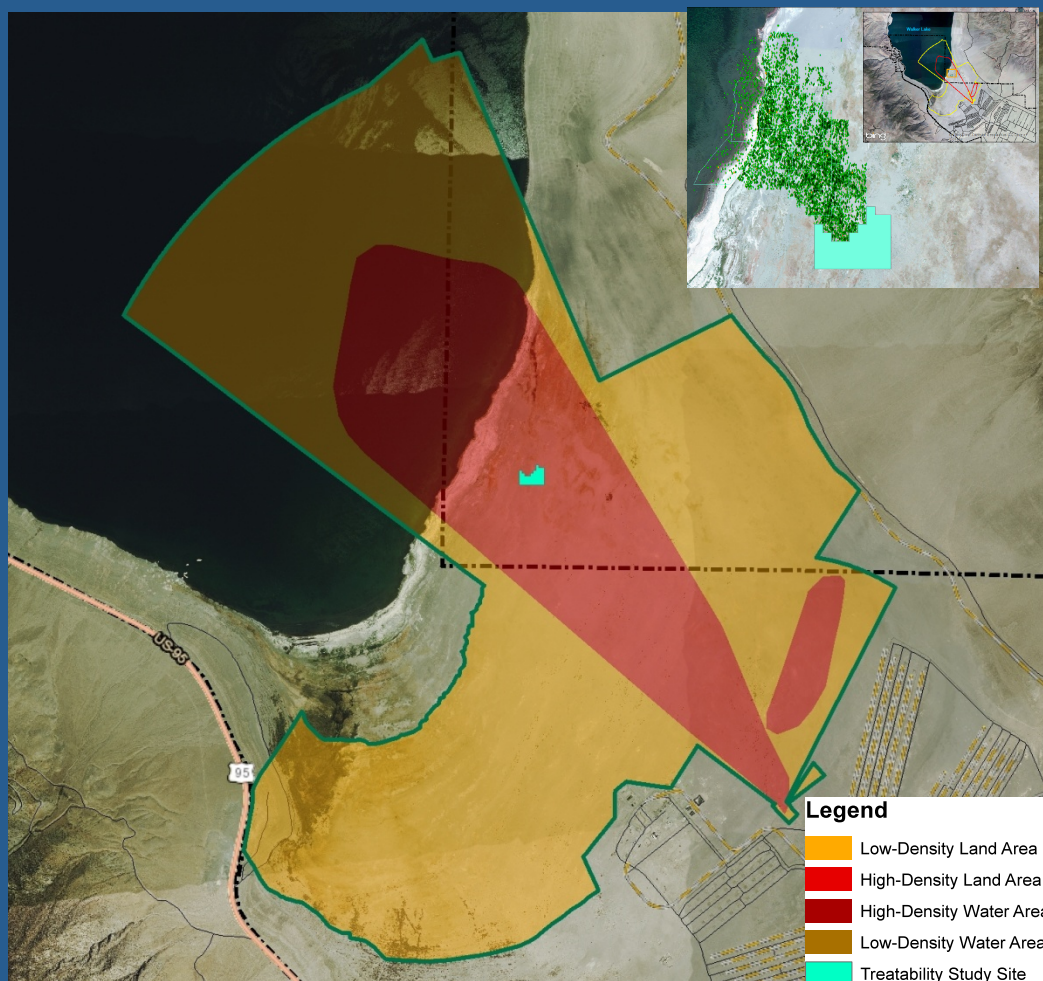
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Walker Lake Land Test Range Treatability Study

- Objective of this demonstration was to perform treatability study using the MetalMapper electromagnetic induction sensor classification approach as part of the remedial investigation (RI) and feasibility study (FS) at Hawthorne Army Depot .

- The classification method is included in the FS as a remedial alternative.

- This site was selected for the program because of its relatively flat and tree-less terrain, high density of munitions debris and MEC items, and an opportunity to involve a stakeholder community including state regulators in the classification pilot program.

Walker Lake Land Test Range MRS

Legend
- Low-Density Land Area
- High-Density Land Area
- High-Density Water Area
- Low-Density Water Area
- Treatability Study Site

- Realigned MRS is 10,269 acres (6,653 acres of land and 3,616 acres of water)
- High Density Land area covers over 1,975 acres.
- Potential TOI
  - 2.25-in rockets
  - 2.75-in rockets
  - 3.5-in rockets
  - 4.5-in rockets
  - 5-in rockets
  - 7.2-in rockets
  - 300-lb depth charges
- RAO is 2.75-in rocket at 2 ft

Treatability Study Elements

- Pre-survey site prep (surface sweep, IVS, site seeding)
- Dynamic MetalMapper detection survey
- Detection survey data processing and target selection
- Cued data collection over detection survey targets
- Cued survey data processing, classification, and dig list development
- Intrusive investigation – validation grid and TOI-only excavations
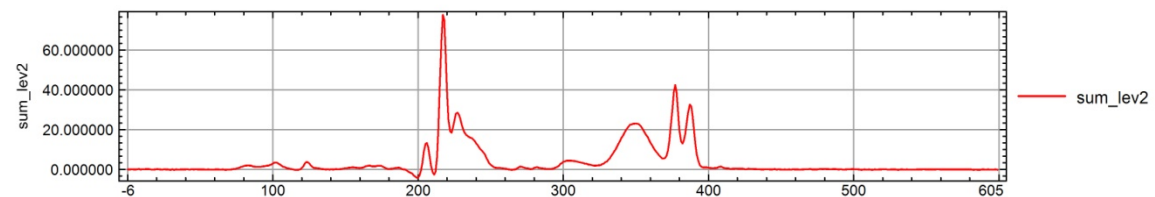- Treatability Study results

Test Pit Data Collection

- Based on 2.75-in rocket warhead at 2 ft, horizontal orientation

- Summed time gates 5-9; averaged 5 middle receivers

- 23 mV/A response determined through testing

- Used 20 mV/A as threshold
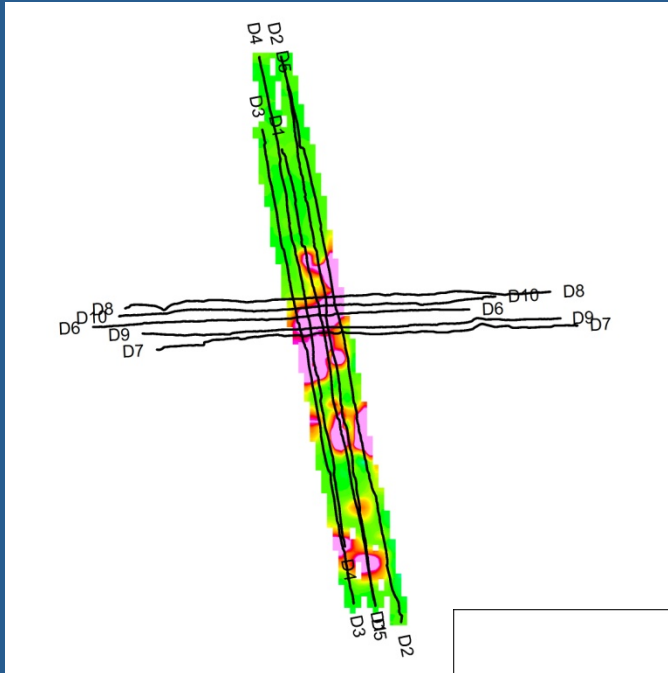
2.75-in Rocket Test Pit Data

database: s:\ES\shared\estcp rifs sites\hawthorne treatability study\Field\metalmapper\test pit - ivs\rocket test.gdb line/group: D2   2015/02/12
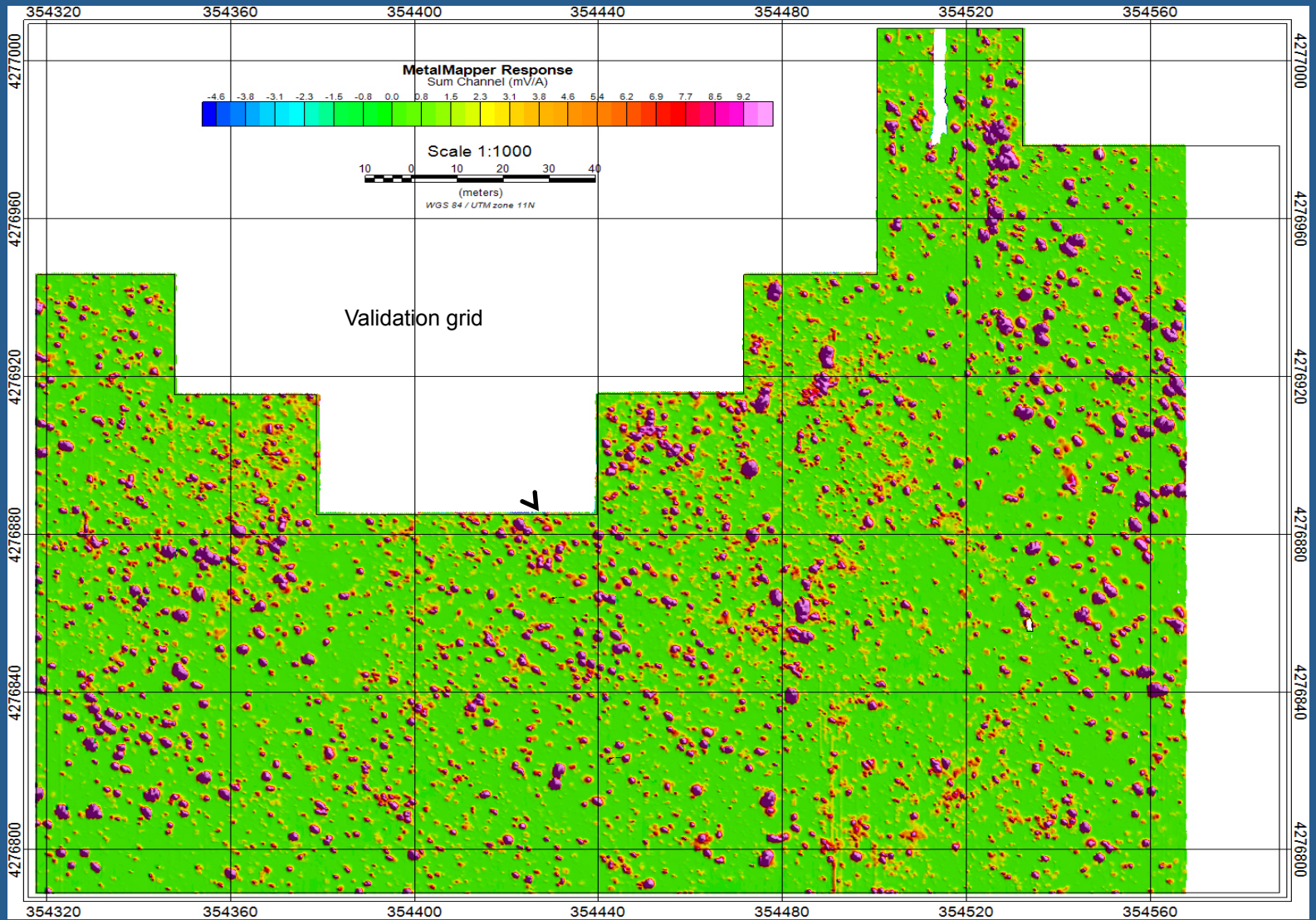
MetalMapper Detection Survey

- DQOs were generally based off of existing USACE detection survey guidance (IVS response, coverage, point to point, seed detection and offset)

- Equipment failures resulted in only 9 of 10 intended acres covered

Detection Survey Results

# Detection Survey Target Selection

- 2,948 anomalies selected using 20 mV/A threshold

- Used size filter to remove smaller anomalies

- Final list for cued survey included 1,880 targets

- All seeds correctly identified; two TOI recovered during intrusive not detected in dynamic (below required depth of detection)

- 39 native TOI below 2 feet were picked in detection survey and classified correctly
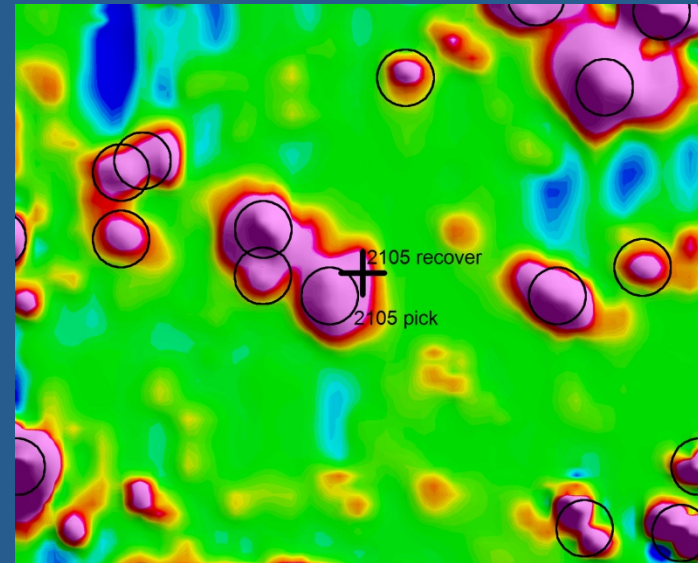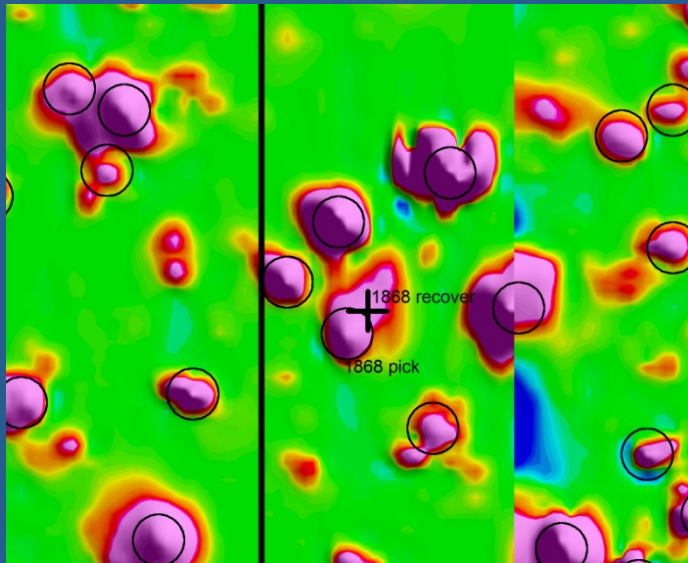
MetalMapper Cued Survey and Classification

- 1,800 of 1,880 targets collected

- Library Match Digs:
  - 3-curve Library match > 0.6
  - 2-curve Library match > 0.7
  - 1-curve Library match > 0.8

- Targets added at the discretion of the analyst
  - noisy data with confidence metrics close to the thresholds
  - location within feature space, particularly large objects (demo pits, depth charges)

- Can't Analyze targets
  - All 3 curves identified as poor by analyst/ bad fit
  - Detection data looks real (not noise spike, anomaly present on multiple lines)

- No dig:
  - Targets not meeting the above criteria

10

TOI Results in Feature Space
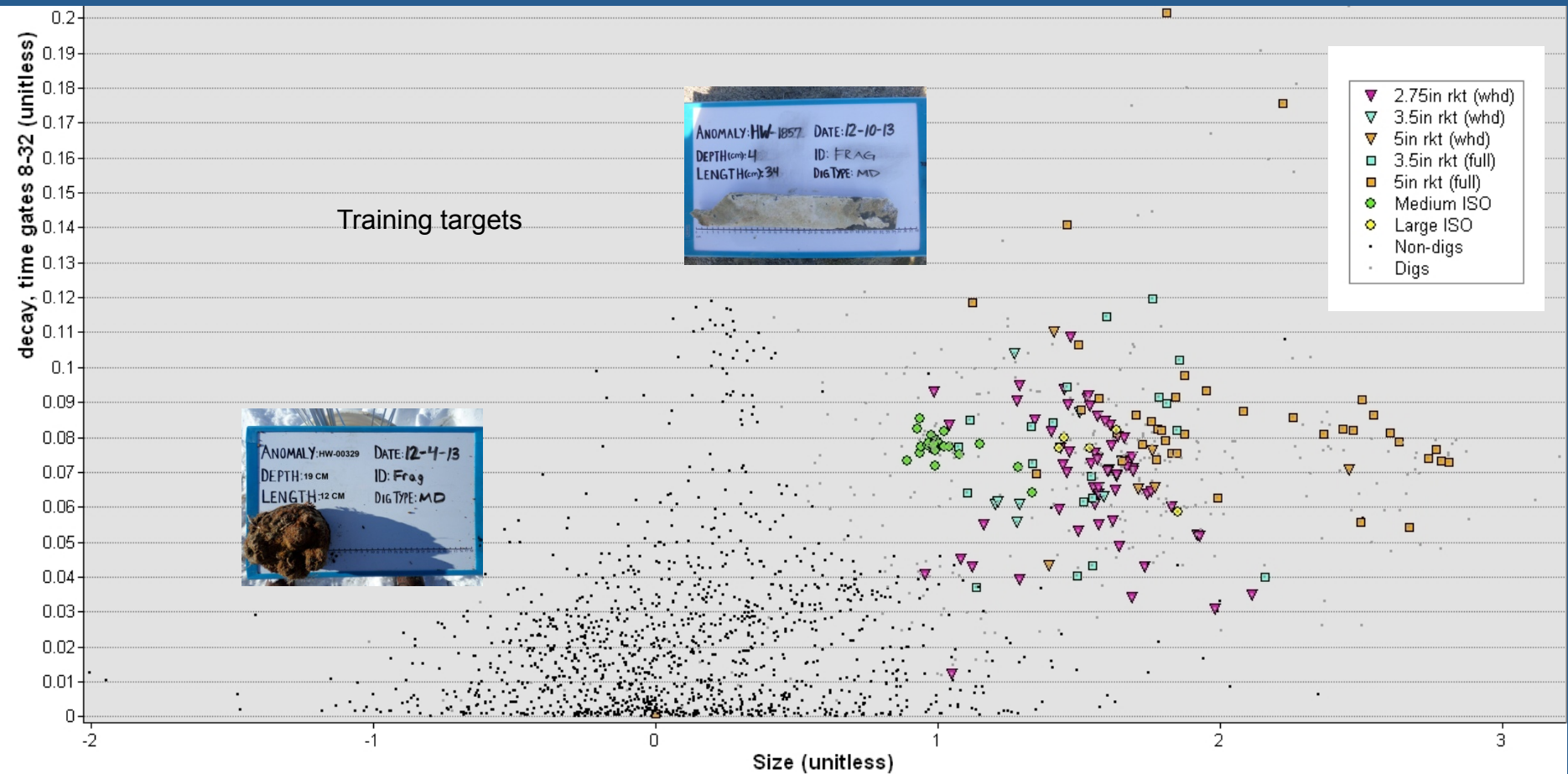
Validation Grid Results

477 targets. All excavated regardless of classification

Classification Results

2% 1%

18%

0%

1%

78%

- Non-Dig
- Can't Analyze
- Training
- Priority 1
- Priority 2
- Priority 4
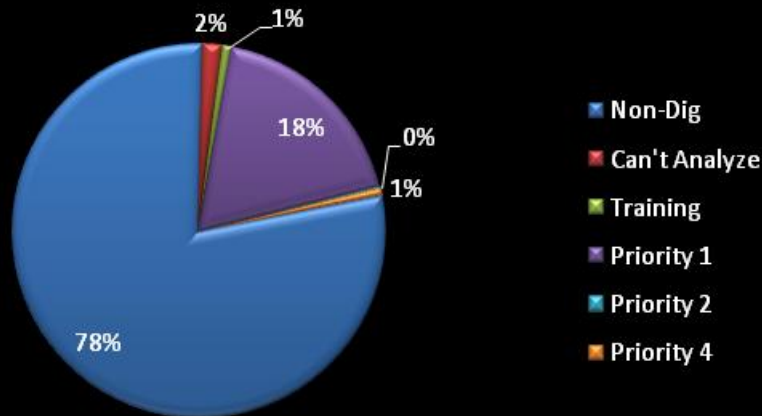
- 78% reduction in overall digs
- 68% of "dig" targets were TOI
- 93% reduction in clutter digs

Non-Validation Grid Results

- 75% classified as non-TOI
- Subset of classified TOI dug (134 of 307)
- 82% of investigated targets were TOI

Dig Results

15%

7%

78%

- Classified Non-Dig; Non-TOI
- Classified Dig; TOI
- Classified Dig; Non-TOI

Classification Treatability Study

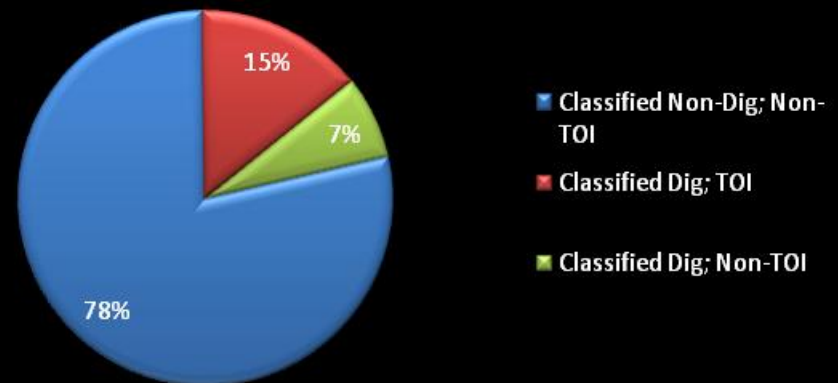|	Traditional	Using Classification
Total Anomalies	10,000	10,000
Total Digs	10,000	2,180
Total TOI Digs	1,487	1,487
Total Non-TOI Digs	8,513	693
Digs Saved	0	7,820
Cost Assumptions: All other costs equal. MetalMapper Adds $39/anomaly and Intrusive costs $200/anomaly (higher site specific costs)		
MetalMapper Costs	$0	$390,000
Intrusive Costs	$2,000,000	$436,000
Subtotal	$2,000,000	$826,000

- Walker Lake Land Test Range High-Density Area is ~1,700 acres. Assuming an average of 100 anomalies/acre that is 170,000 anomalies
- Assuming ~$1.15M saved for each 10,000 anomalies. Using classification could potentially save up to ~$19.6 Million.

Hawthorne Army Depot Advanced Classification Treatability Study:
A State Regulator's Crash Course in Advanced Classification

Raquel Diedrichsen
Nevada Division of Environmental Protection

Agenda

- My Background with Advanced Classification
- Tools I Used To Get Up To Speed
- My Perception of the Demonstration Plan
- Terminology that I Needed Clarified
- Big Question that Arose from the Treatability Study
- Path Forward at the Hawthorne Army Depot

Advanced Classification - WHAT?

- May 2013 – informed of Technical Project Planning (TPP) Meeting for the Feasibility Study (FS) phase of the Military Munitions Response Program (MMRP) at Hawthorne Army Depot
  - Advanced Classification Treatability Study may be conducted at Hawthorne Army Depot Walker Lake Land Test Range Munitions Response Site (MRS)
- June 24, 2013 – FS TPP Meeting #1
- September 2013 – First Draft of the Demonstration Plan for Advanced Classification (work plan) received for review
- October 2013 – NDEP concurred with third version of Demonstration Plan
- October 2013 – Blind seeding begins at Hawthorne Army Depot Walker Lake Land Test Range MRS
- December 2013 – Intrusive investigation completed

Tools for Getting Up to Speed on Advanced Classification

- ESTCP website
  - https://www.serdp-estcp.org/Tools-and-Training/Munitions-Response/Classification-in-Munitions-Response
    - "Implementing Classification on a Munitions Response Project" – posted April 2012
- Treatability Study Meeting at Hawthorne Army Depot
- ITRC documents
  - Geophysical Classification for Munitions Response
    - http://itrcweb.org/GuidanceDocuments/GCMR-1.pdf
      - Introductory Fact Sheet, October 2012
      - Technical Fact Sheet, June 2013
      - Regulatory Fact Sheet, October 2014
- Advanced Classification Advisory Group meeting, March 2014
- Site Visit, November 2013

Site Visit

Demonstration Plan (Work Plan)

Work Plan Is:

- Scientific
- Research oriented
- Complex
- More geared to those familiar with geophysics and advanced classification

Work Plan Needs To:

- Provide more background/explanation
- Maintain complexity, but gear it to stakeholders
- Provide clearer explanations of terminology

Terminology Clarification

- Cued Data Collection
  - Collecting data with advanced sensor over detection survey targets

VS.

- Classification
  - Process of using data from detection/dynamic surveys and cued data collection to make decision about whether buried metal is a Target of Interest (TOI) or clutter or debris (using library matching, statistical classifier)

- Advanced Sensor
  - MetalMapper
  - TEMTADS
  - MPV
  - BUD

VS.

- Traditional Sensor
  - EM61

20

Terminology Clarification

- Detection Survey
  - Done with EM61, Advanced Sensor, Schonstedt

vs.

- Dynamic Survey
  - Detection survey done with an advanced sensor

- Anomaly
  - Geophysical response clearly different than background

vs.

- Target
  - Anomaly selected for further investigation based on it being above thresholds for response and size

Big Question

WHAT DO WE DO

WHEN MUNITIONS ITEMS

CAN BE DETECTED AND CLASSIFIED

WITH ADVANCED CLASSIFICATION

BELOW THE DEPTH IN THE

REMEDIAL ACTION OBJECTIVE?

Remedial Action Objectives (RAOs)

- Zero accidents resulting from commercial/ industrial worker interaction with surface and subsurface munitions and explosives of concern (MEC) to 3 feet below ground surface (bgs)

- Zero accidents resulting from recreational user and site visitor interaction with surface and subsurface MEC to 1 foot bgs

Recommended Remedial Alternative

- Surface MEC removal to 1 foot bgs using analog detection methods in low-density area

  (surface removal is 1 foot due to shifting sands)

  – Use on-call MEC support to achieve RAO of 3 feet during future intrusive activity

- Subsurface MEC removal to 2 feet bgs using Advanced Classification for protection of recreational users and site visitors in high-density area

  (shifting sands and expectation of digging 1 foot)

  – Use on-site MEC support to achieve RAO of 3 feet during future intrusive activity

Advanced Sensor Detection Depth

- MetalMapper detected and classified targets of interest (TOI) at the Walker Lake Land Test Range MRS below 2 feet
- MEC removal only recommended to 2 feet

NDEP will request

IF TARGETS OF INTEREST (TOI) HAVE BEEN DETECTED AND CLASSIFIED, REMOVE THEM.

Path Forward at the
Walker Lake Land Test Range MRS

NDEP has concurred

with the use of

Advanced Classification

as the Remedial Alternative

in the High-Density Area at the

Walker Lake Land Test Range MRS