

Classification: Limiting Factors and Lessons Learned

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Limiting Factors

What to consider:

- Terrain, Vegetation
 - Anomaly density
 - Percentage of anomalies that are TOI
 - Project Objectives
 - Project team
-
- Is Classification going to work at all?



Terrain and Vegetation



MetalMapper at Ellis



MPV at New Boston



TEMTADS at Ft. Bliss

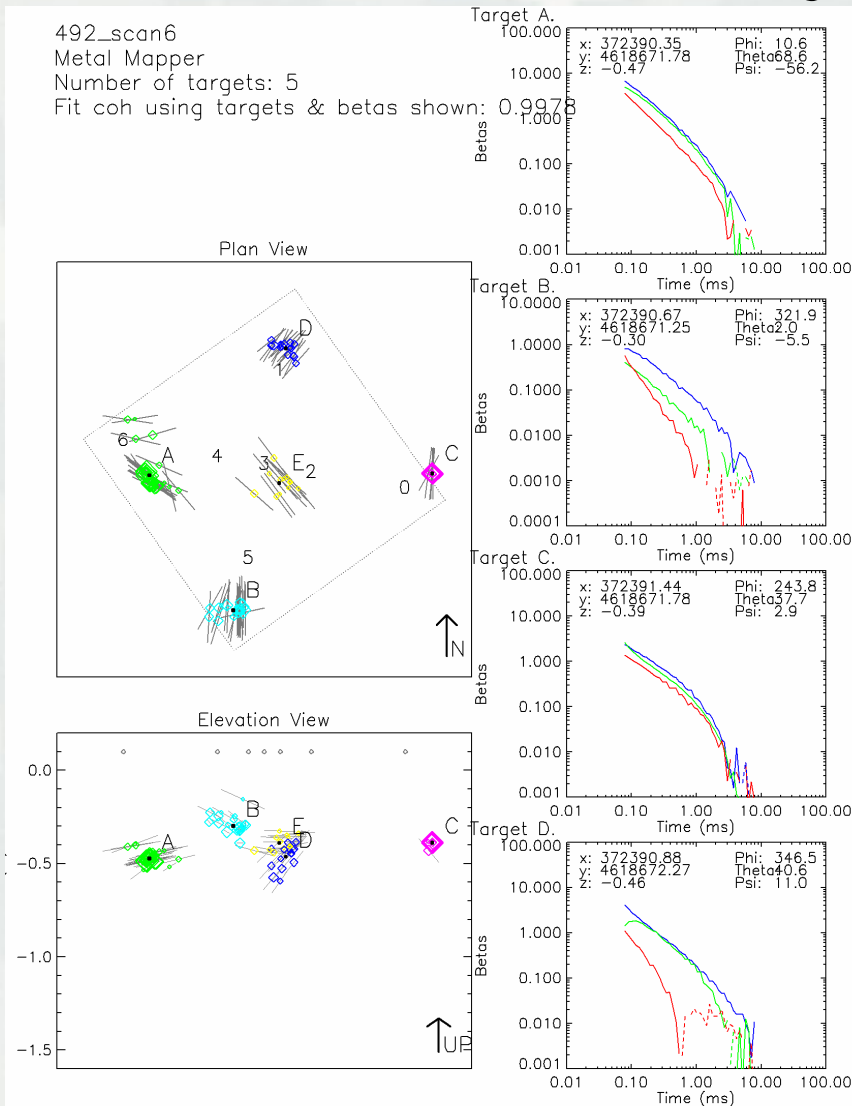


TEMTADS at Spencer



Anomaly Density

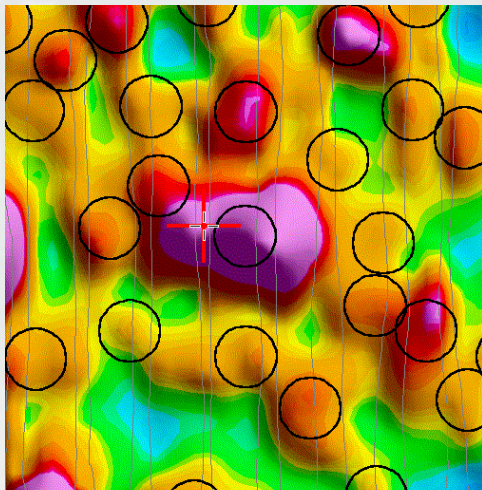
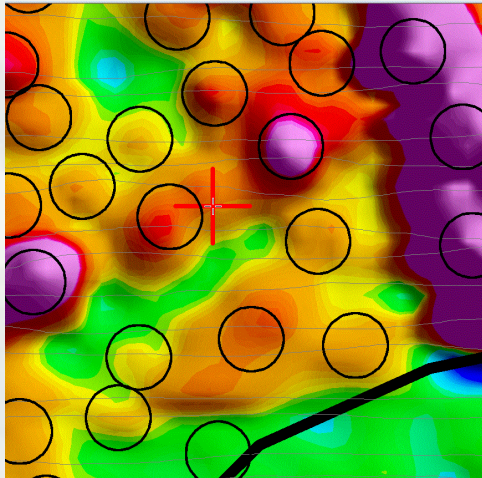
492_scan6
Metal Mapper
Number of targets: 5
Fit coh using targets & betas shown: 0.997



- Data doesn't have unlimited information
 - ▶ 1-5 items under coil
 - ▶ anomalies/acre ???
 - ▶ Characterization
- Potential problem areas
 - ▶ Heavily used impact areas
 - ▶ OBOD grounds



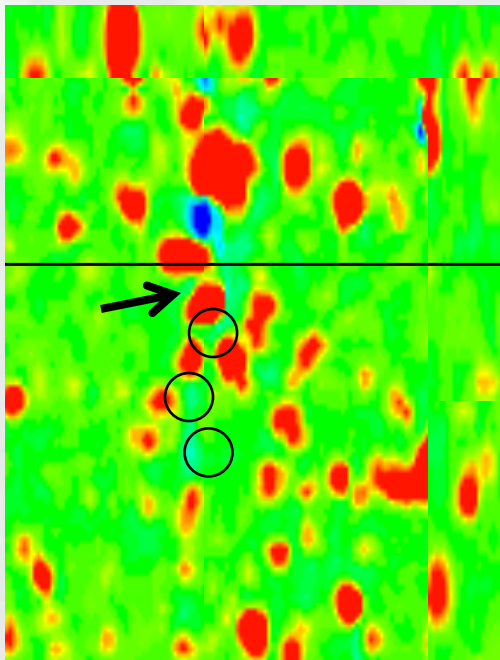
Target Selection



- Target selection must be approached differently for classification
- Sites with high density and/or large TOI need extra targets selected
- Typically you can rely on dig crews to clear large foot prints
- 1m radius vs. 0.4m radius



Dynamic Advanced Sensor Anomaly Resolution



TEMTADS
2x2

- TEMTADIUS
DYNAMICUS!
ool,
not a magic wand

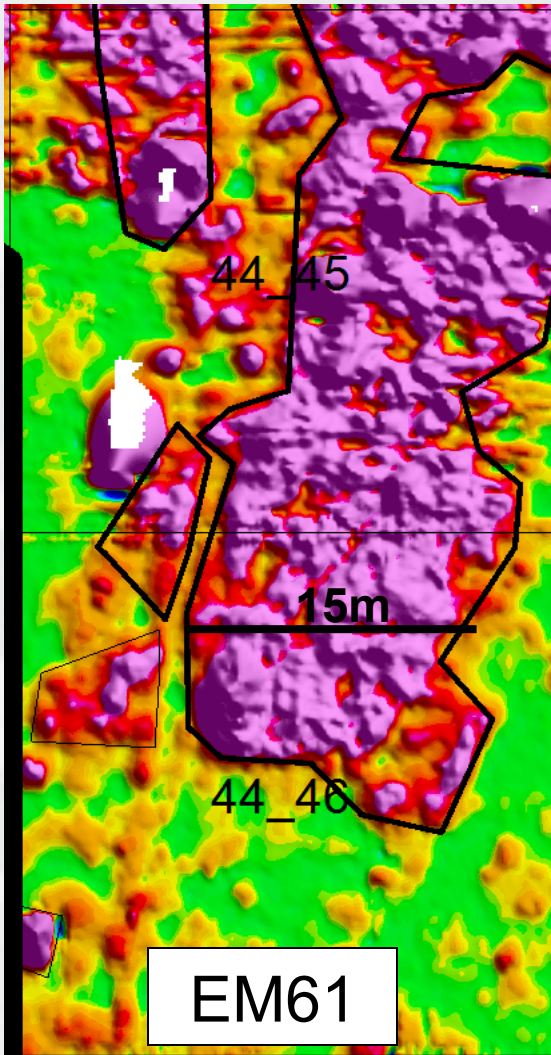
- Where it works
best:



high
sm
siz
interest



Dynamic Anomaly Resolution



- Where it may not work:
 - ▶ Sites with high density, large footprint, large amplitude anomalies
 - ▶ 155mm projectiles mixed with tons of fragments
 - ▶ Pits and trenches

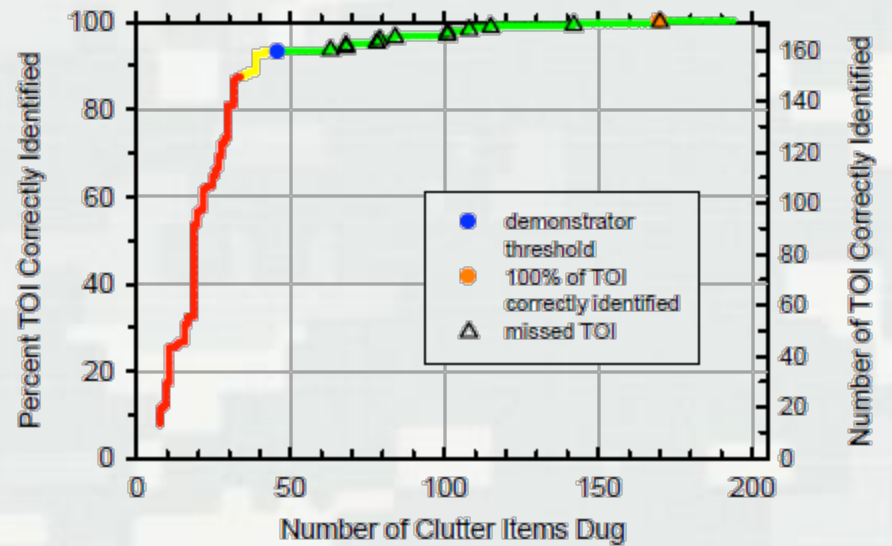
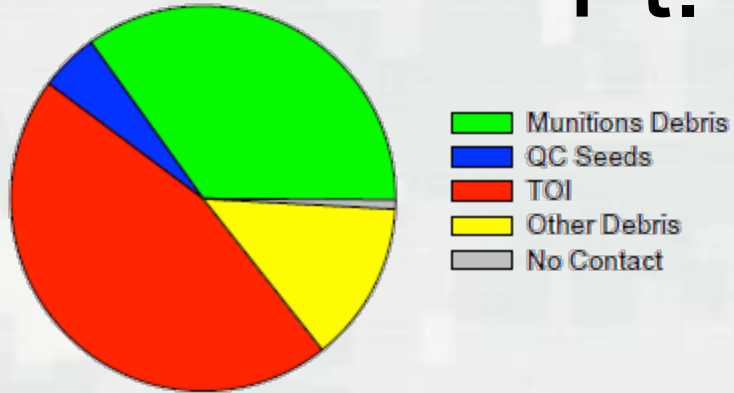


High Percentage TOI

- Is it worth it? Will we save money?
- How many digs do we need to save to make this economical?
- Site specific cost evaluation
 - ▶ Standard site: estimate 30-40% reduction in # of digs to break even
 - ▶ Chemical site or expensive evacuations could lower this percentage



Ft. Rucker

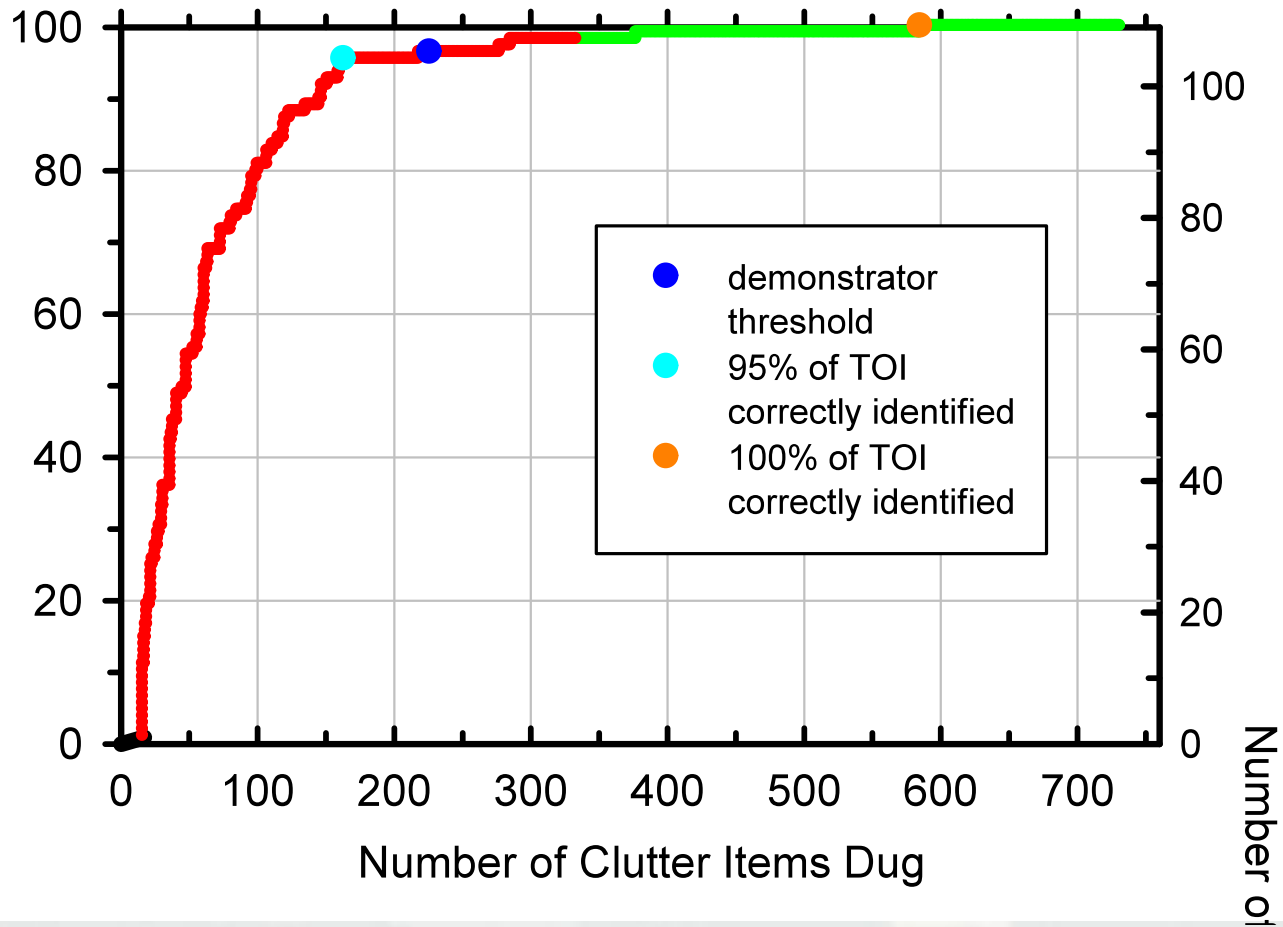


Project Objective

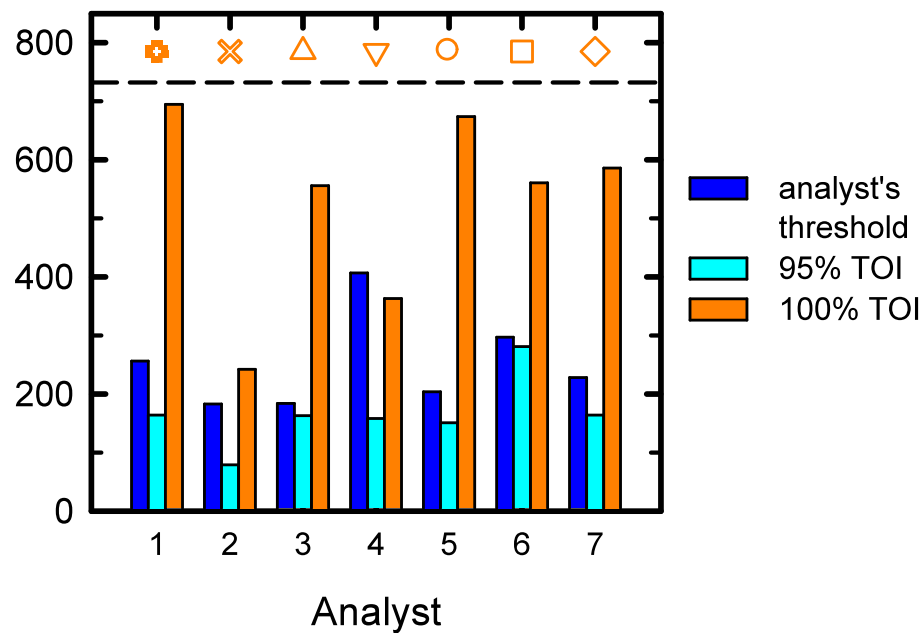
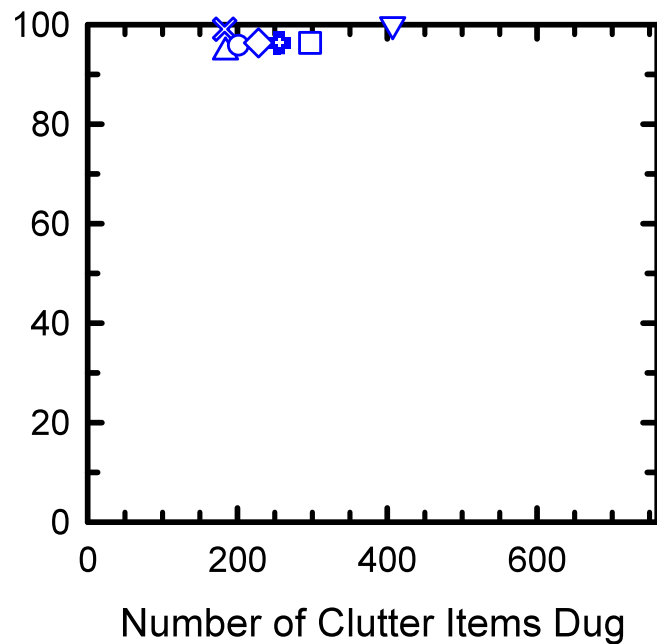
- 100% removal action
 - ▶ A miss is unacceptable
 - ▶ Site conditions must allow for high quality data collection and analysis
- RI Characterization
 - ▶ Could afford a miss, but data quality needs to be high to ensure confidence in the classification is high
 - ▶ Site conditions may not need to be perfect
 - ▶ May be used to feed FS
- Other: Remove 75-95% percent UXO
 - ▶ Limiting factors create difficult classification conditions
 - ▶ Classification decisions are designed to meet project objective



MMR



MMR



- Only one got 100%, and dug over 50%
- The average analyst would have had to dig 70% of the targets to get 100%



Project Team

- What makes them “Qualified”?
 - ▶ Production experience
 - ▶ Have made their mistakes already or are you willing to pay them to make mistakes?
 - Do you have someone qualified to catch their mistakes?
- What to look for:
 - ▶ Specific personnel
 - Processing and field
 - ▶ Detailed Plan
 - ▶ SOPs



No Experience + No details = Poor Quality

- From a Draft Work Plan:

“The MetalMapper will be used in mapping mode to collect dynamic data over predefined grids. The system will be configured in a manner which will allow it to be towed using either a tractor or all-terrain vehicle. Data points will be positioned using PPK GPS equipment mounted over adjacent to the survey coils. Instrument readings and position data will be collected using a field computer and applicable software. Survey grids will be located in areas which are easily accessible to the instrument and the towing vehicle.”

THAT IS ALL THEY SAID ABOUT IT!





My Experience

What we started with:

- We had trained personnel with no production experience
- We developed a vague work plan with general SOPs
- We did not have a well defined system in place to manage data efficiently
- We had a site with 30,000 targets

What we initially got:

- We could collect <100 targets a day
- We collected data with the transmitters off on several occasions
- We accidentally broke equipment due to lack of experience
- We unnecessarily recollected several targets due to poor file management



My Experience

What we did about it:

- We learned from our mistakes
- We implemented a better in-field QC process
- We developed detailed SOPs
- We developed a database system to manage data

What we can do now:

- We collect >200 unique targets plus real-time recollects in a day
- We can take a 100'x100' grid with around 500 targets from starting MM data collection to producing a dig-list in one week
- **We are now ready to be hired**



Recap

Questions to ask yourself:

- What classification instrument is appropriate for my terrain and vegetation?
- What is the nature of the anomaly density on my site?
- Will I still have to dig the majority of the targets?
- Do I need to consider collecting dynamically with TEMTADS or MetalMapper?
- Do I need to remove 100% of the hazard? The majority of the hazard? Or just characterize my site?
- Are the people I hired qualified? Have they done this before?



Lessons Learned



Lessons Learned: Field

- Test your equipment before bringing to the field
- Field practices
 - ▶ Train people well up front
 - ▶ Good rotation of personnel
 - ▶ Plan around weather
- Seed before the detection survey
 - ▶ Allows processor to look at the EM61 data to make decisions
- Tighter line spacing for EM61 data is critical
 - ▶ Increasing from 0.5m to 0.75m added 50% more targets at Beale
 - ▶ Or use advanced sensors



Lessons Learned: Communication

- Constant communication is vital
 - ▶ Between team members
 - ▶ With stakeholders and regulators
 - ▶ Be able to explain why you are doing what you are doing
- Make sure your classification workflow incorporates your dig team's schedule
 - ▶ May need to classify by grid
 - ▶ Provide one dig list, not several iterations
- Verification Digs
 - ▶ Work with the regulators ahead of time to develop a plan
 - ▶ Use common sense when selecting verification digs
 - Statistics involving random selection result in too many digs
 - Think about where we expect failures
 - Sample thresholds



Lessons Learned: Planning

- Develop a plan that allows for some flexibility
 - ▶ New TOI
 - ▶ Unexpected site conditions
- Know what you are looking for
 - ▶ We can detect deeper than we can classify
- Magnetic geology
 - ▶ Take more backgrounds
 - ▶ Select background locations from the detection survey



Prepare for Murphy's Law

- Things will go wrong...stuff will break
- We just need to be prepared to handle it
 - ▶ Proper planning
 - ▶ Smart people
 - ▶ QC/QA
 - ▶ Know important failure points



Together...



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