



HGL



*Restoring the Environment.
Protecting Our Future.*



Case Study: The identification of a high use area using analog sensors where digital geophysical mapping did not

JOSH DEFRATES AND LAEL FEIST

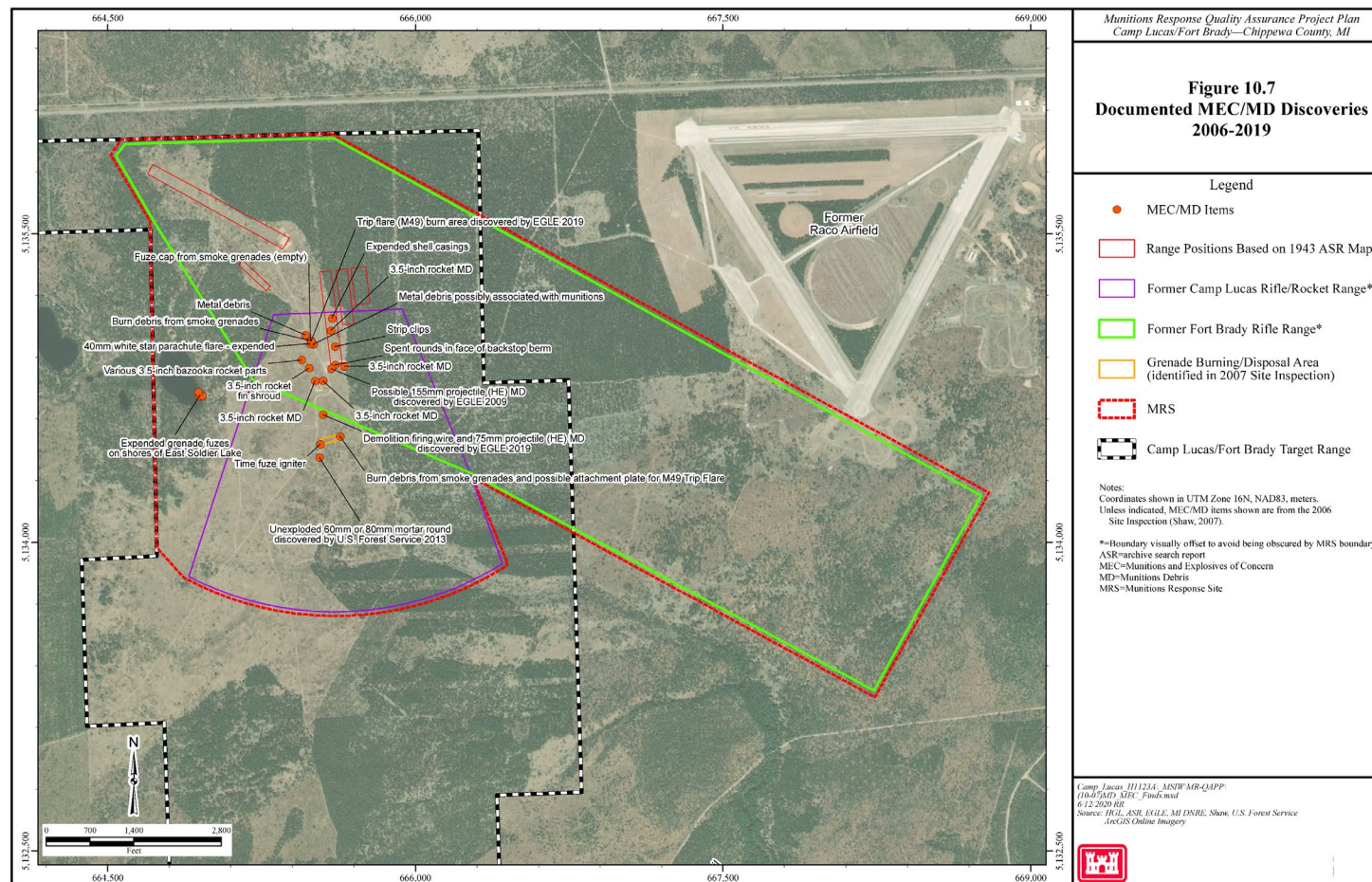
Overview

- ▶ How the CERCLA process enabled the detection of the High Use Area (HUA) through key decisions during the Site Inspection (SI) and Systematic Project Planning
- ▶ How transect intrusive investigations led to the identification of the HUA.
- ▶ Technological applications to improve detection of HUAs
- ▶ How intrusive investigations along transects, including analog methods, can be an important tool in site characterization.

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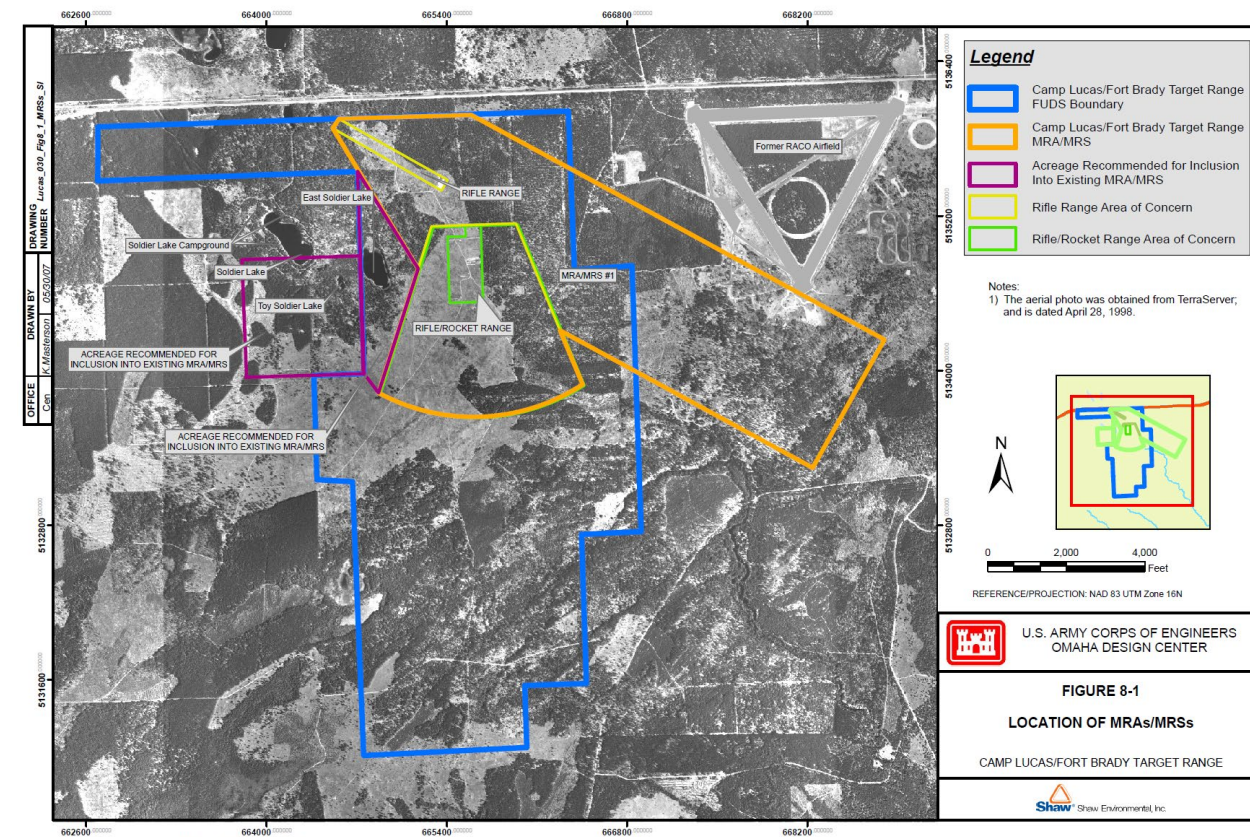
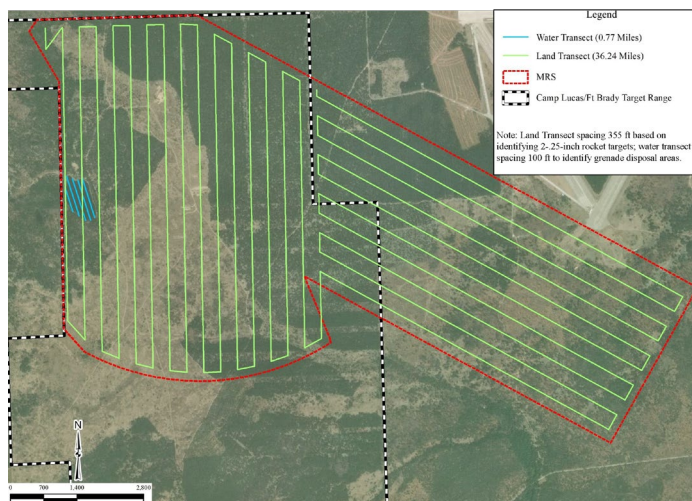
Conceptual Site Model (CSM)

- ▶ 1,000-yard Rifle Range used from 1895-1944.
 - ▶ Small arms
- ▶ Rocket Range used from 1951-1962.
 - ▶ 2.25-inch rifle grenades, 2.36 and 3.5-inch rockets
- ▶ Disposal of grenades and 20mm, 75mm, 90mm projectiles. Possibly 155mm projectiles.
- ▶ **Mortar training during WWII, location unknown.**
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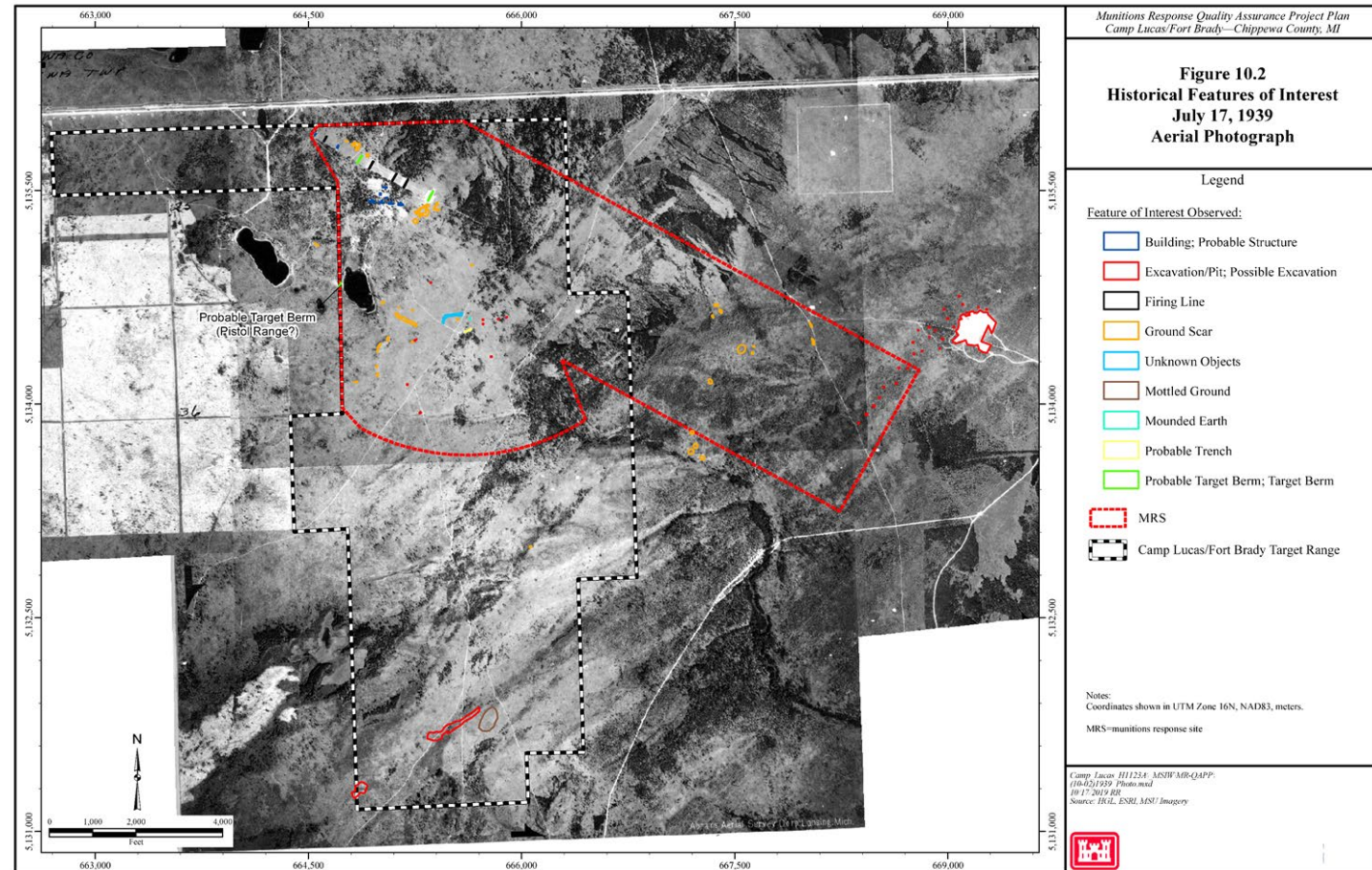
Site Inspection (SI) 2007

- ▶ Recommended area west of the Rifle/Rocket range to the FUDS boundary be added to the MRS (triangle-shaped area) to include East Soldier Lake where expended grenade fuzes were found.
 - ▶ This area was **added** to the MRS
- ▶ Also recommended adding an area outside the FUDS boundary to the MRS where ground scarring was observed.
 - ▶ This recommendation was **not adopted**, and the RI was to occur only within the new MRS boundary .



Systematic Project Planning Meeting #2

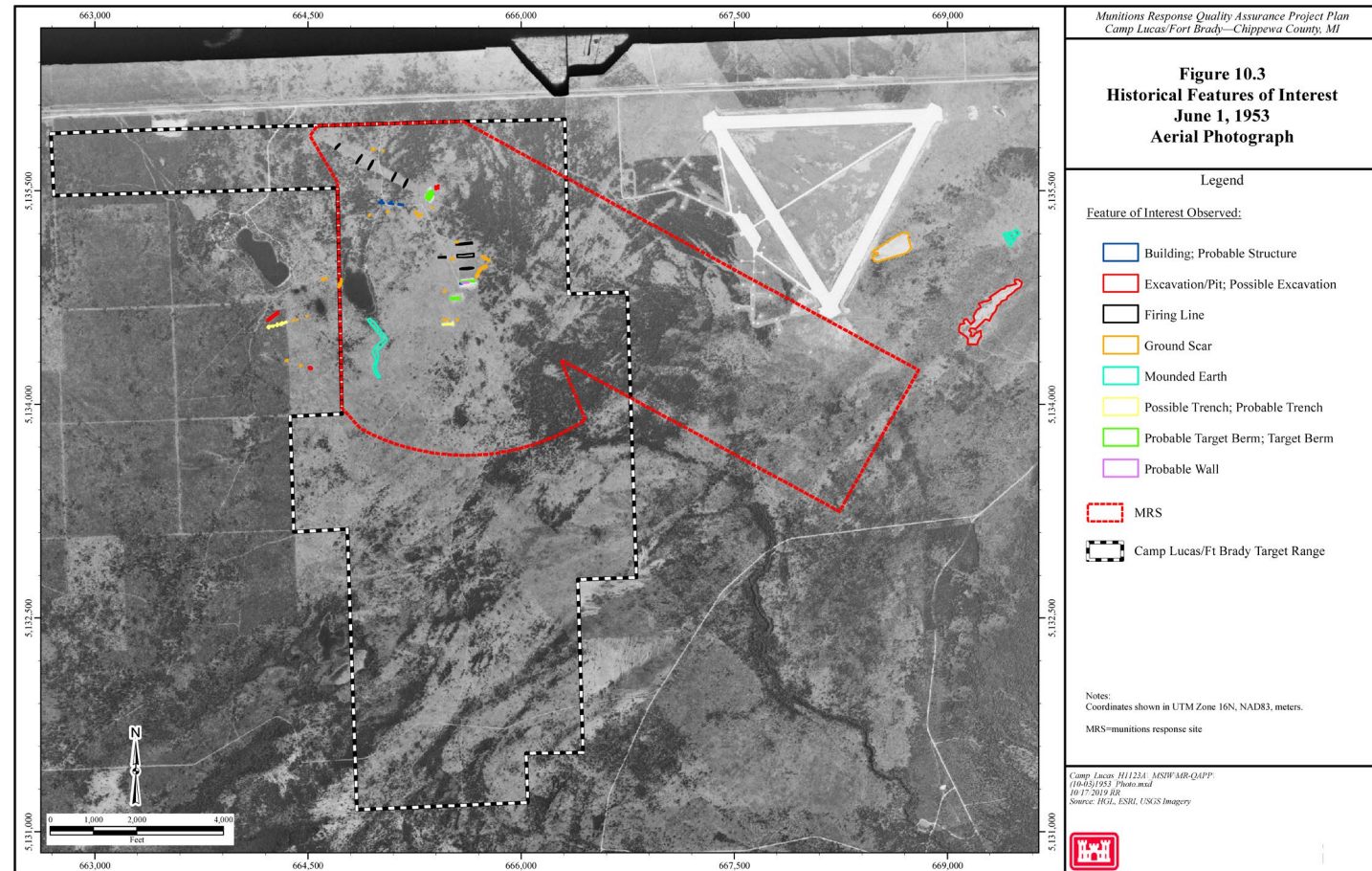
- ▶ State regulator asked why the additional area recommended in the SI was not added to the planned investigation.
- ▶ HGL performed a stereoscopic aerial image review from available imagery.
 - ▶ 1939: nothing observed outside the MRS.



WS 10-11

Systematic Project Planning Meeting #2 (Continued)

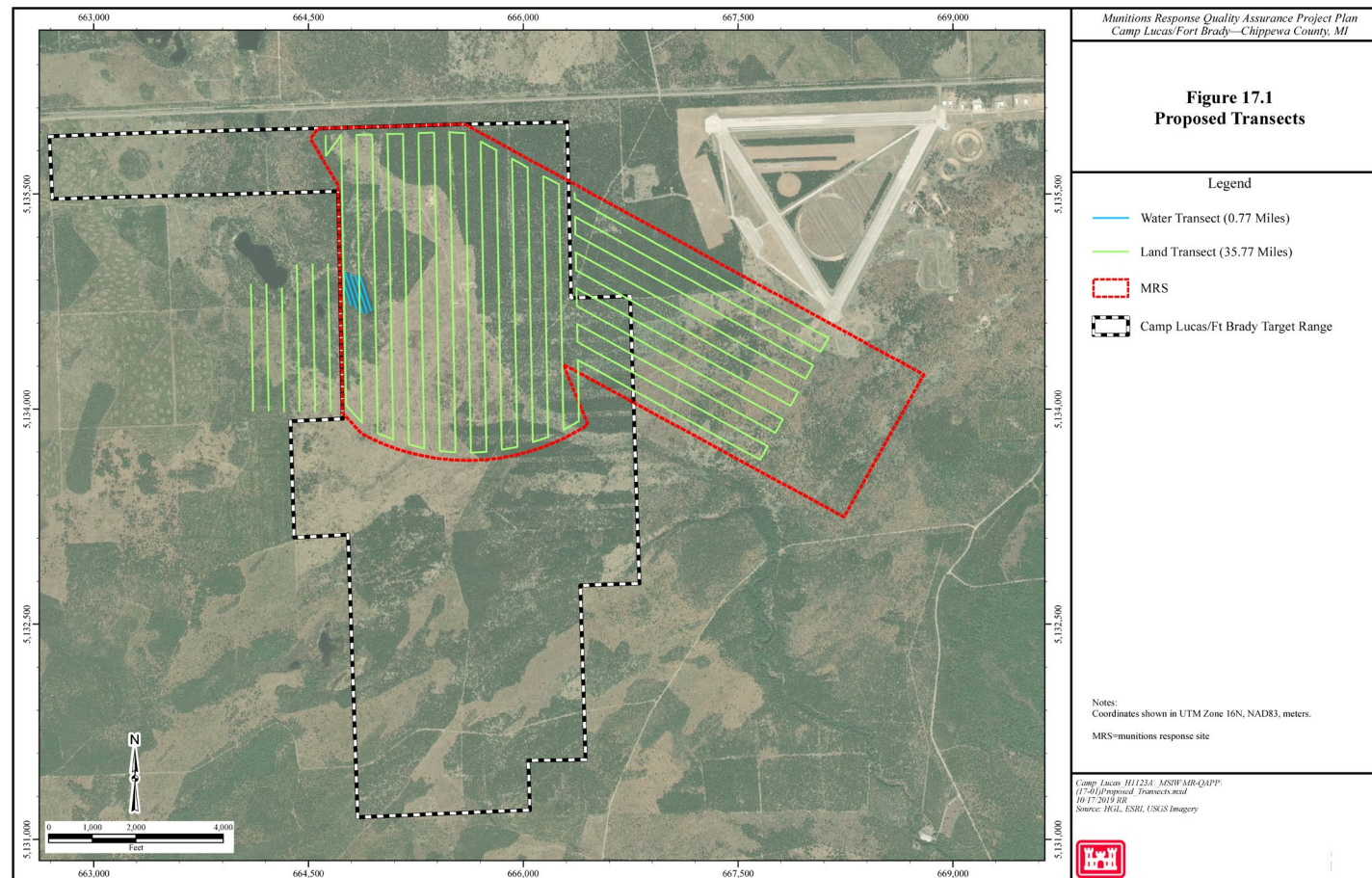
- ▶ State regulator asked why the additional area recommended in the SI was not added to the planned investigation.
- ▶ HGL performed a stereoscopic aerial image review from available imagery.
 - ▶ 1939: nothing observed outside the MRS.
 - ▶ 1953: several potential excavation pits, trenches, and ground scars observed.
- ▶ Added additional transects outside the MRS boundary.



WS 10-13

Transect Design

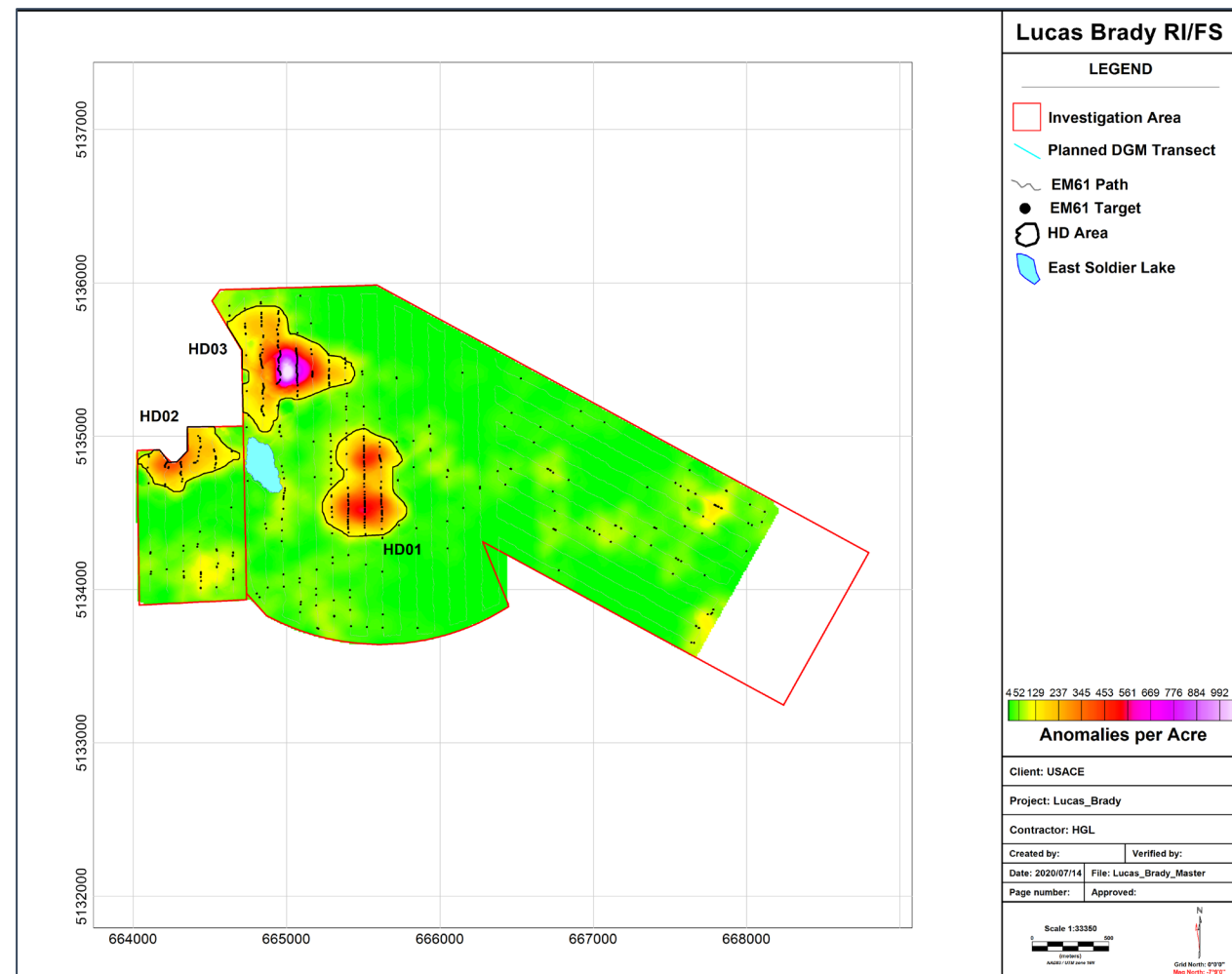
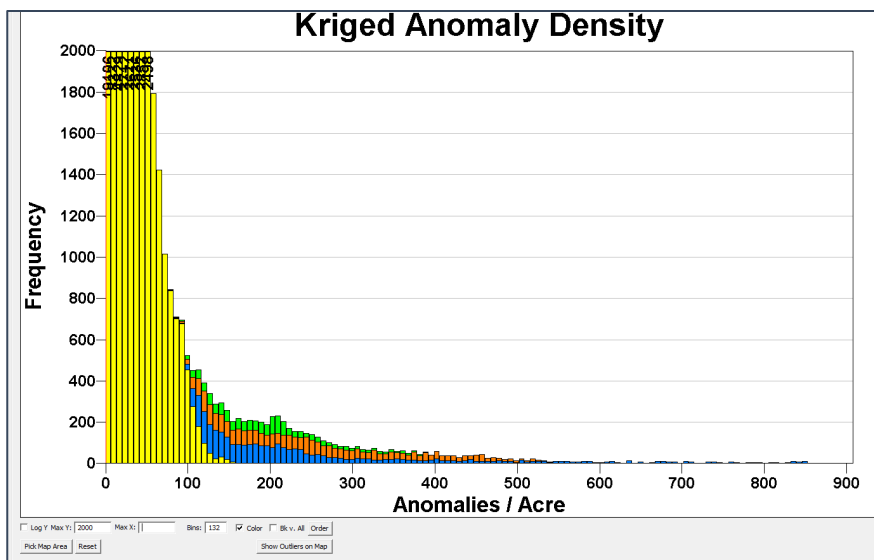
- ▶ Assumptions:
 - ▶ Smallest munition of concern: 2.25-inch rifle grenade = 110m target radius
 - ▶ Background Density: 60 anomalies per acre (APA)
 - ▶ Average Target area density above background: 500 APA
- ▶ Transect Spacing needed for 100% probability of traversal and detection: **108m**.
- ▶ Analog intrusive investigations would follow DGM collection.
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WS 17-3

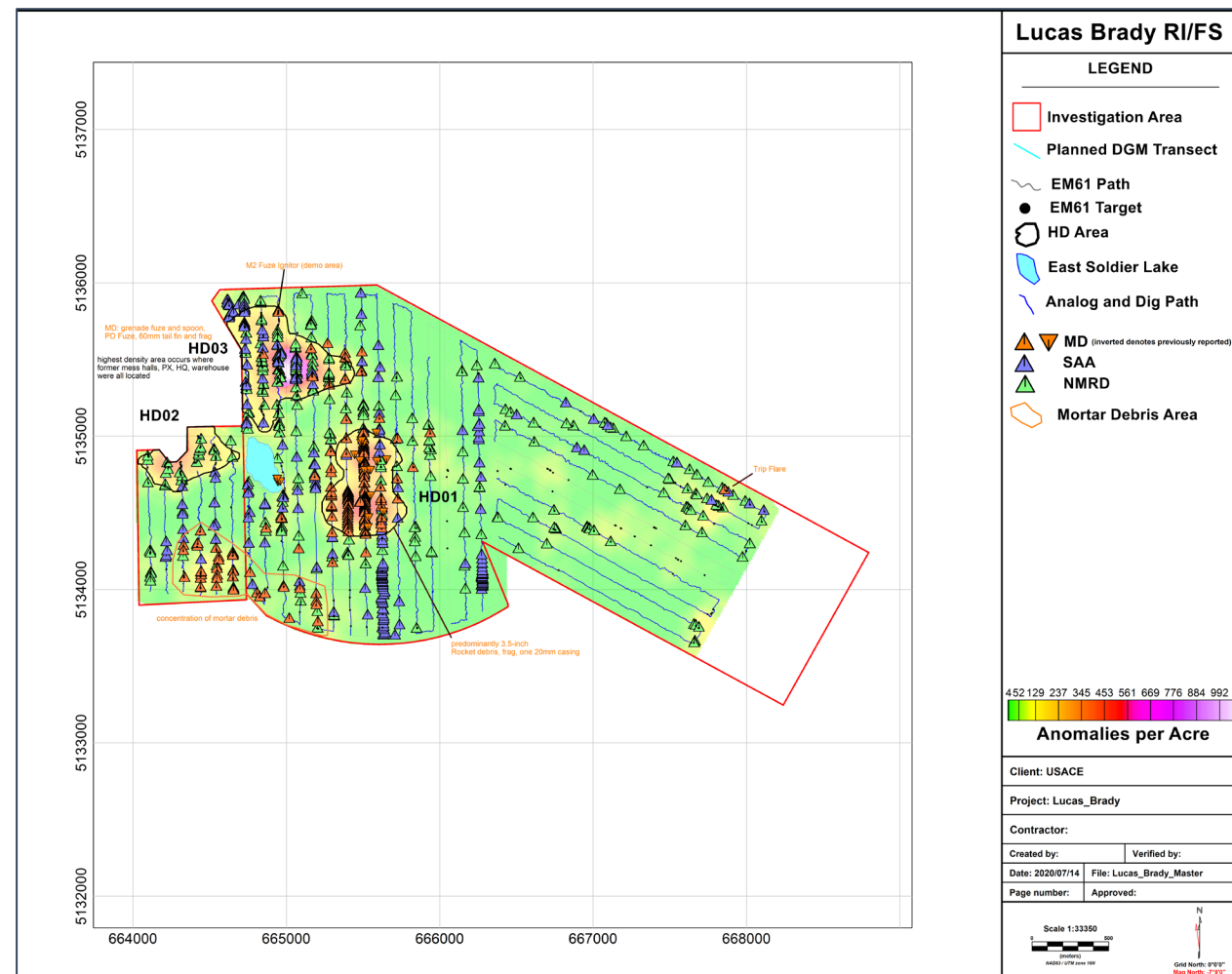
Initial VSP Analysis

- ▶ EM61 targets selected at 5.0 mV on the sum of channels 1-4 (5x noise).
- ▶ Used a 236m diameter window in the VSP analysis for 108m spaced transects to ensure 3 transects in each window.
- ▶ Minimum target size of 9 acres, corresponding to a 110m target radius (2.25-inch [surface-fired]).
- ▶ Critical Density picked at 110 anomalies per acre (APA), though 200 is more prominent.



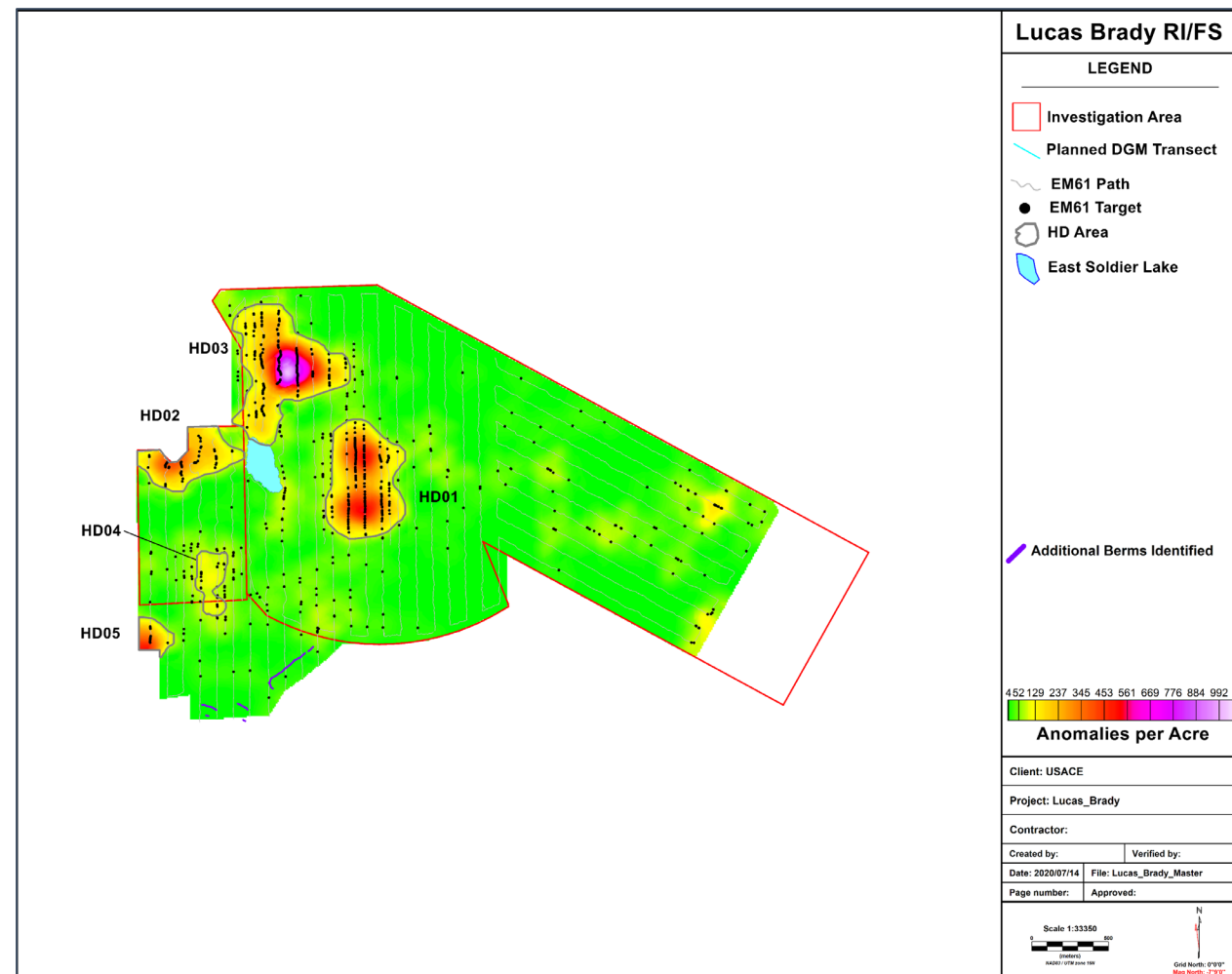
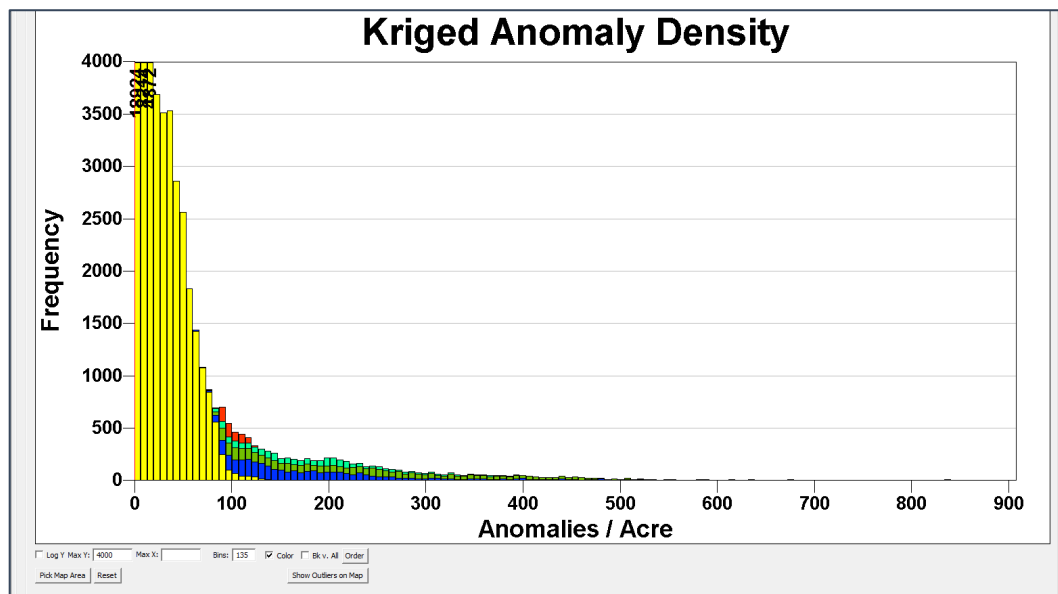
Analog Intrusive Results

- ▶ Found abundant 3.5-inch rocket frag in HD01 where it was anticipated from CSM.
- ▶ No munitions debris in HD02, which surrounds a campground.
- ▶ Isolated hand grenade frag, M2 fuze ignitors and a of 60mm mortar frag found in HD03 piece.
 - ▶ Highest density area in HD03 correlates to the camp's former buildings.
- ▶ **Concentration of 60mm and 81mm mortar tailfins, fuzes and frag found in southwest portion of site.**
 - ▶ No HD area identified in this area.
 - ▶ Expanded the investigation south and added transects in between existing transects to refine the HD area boundaries.
 - ▶ Reevaluated the VSP analysis and Critical Density.
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Final VSP Analysis

- ▶ Critical density of 90 APA identified HD04, which was associated with the 60mm and 81mm mortar debris.
- ▶ 90 APA was picked by adjusting the number of bins in the histogram in order to find a lower critical density to ensure HD04 was identified.
- ▶ **Without the addition of the western area**, it is very unlikely the anomaly density in the SW would have prompted step-outs to identify HD04.
 - ▶ **Intrusive investigations along transects would have led to the identification of HD04 if the western area was not added.**

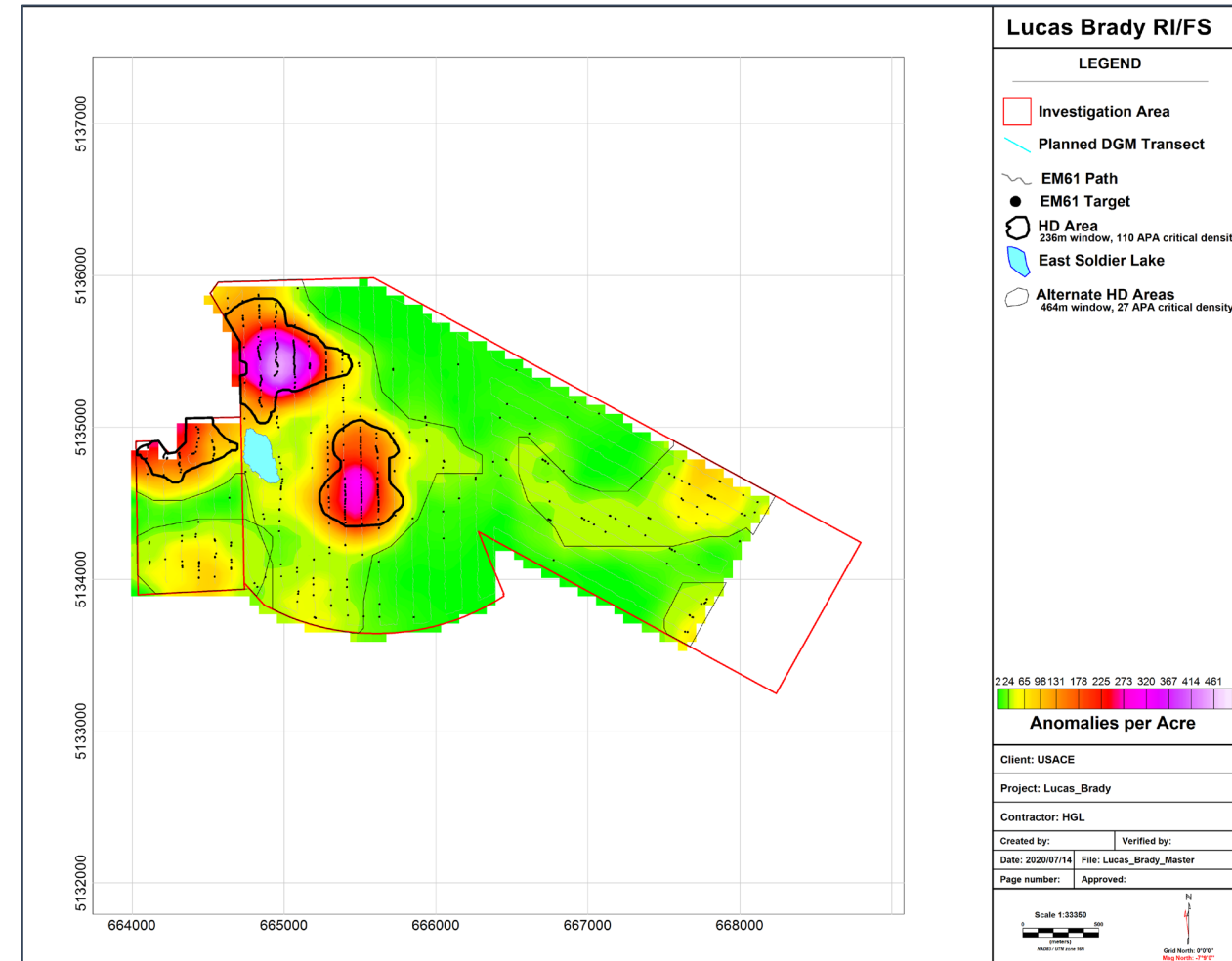
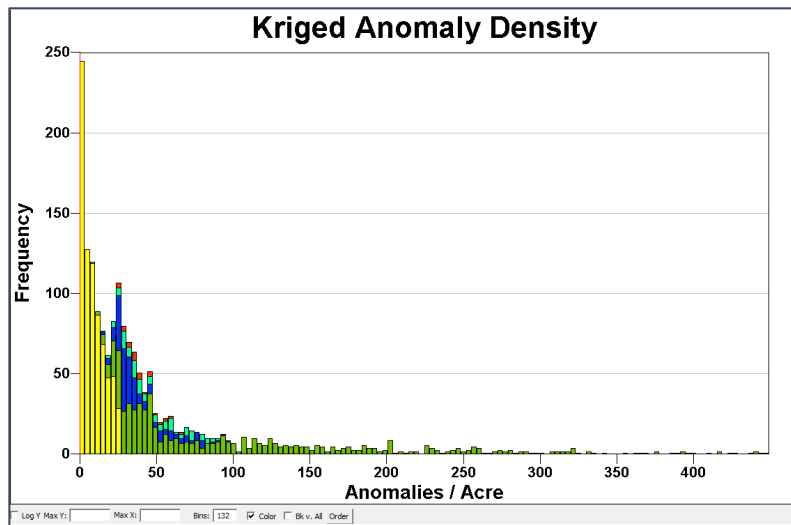


The background of the slide is a photograph of a white egret standing in a marshy area with tall green grasses and water. The entire image is overlaid with a semi-transparent green filter. The text is centered horizontally and vertically over the image.

HOW TO ENSURE THIS DOES NOT
HAPPEN AGAIN?

Perform Alternate VSP Analyses

- ▶ Several analyses were performed, but the search window was not substantially changed.
- ▶ Several analyses need to be performed using different parameters, preferably by two analysts working independently.
- ▶ After the field work was complete, used a wider window of 464m to ensure 5 transects in each window.
- ▶ A critical density of 27 APA was picked, which identified the mortar HUA. This critical density threshold is much more distinguished.

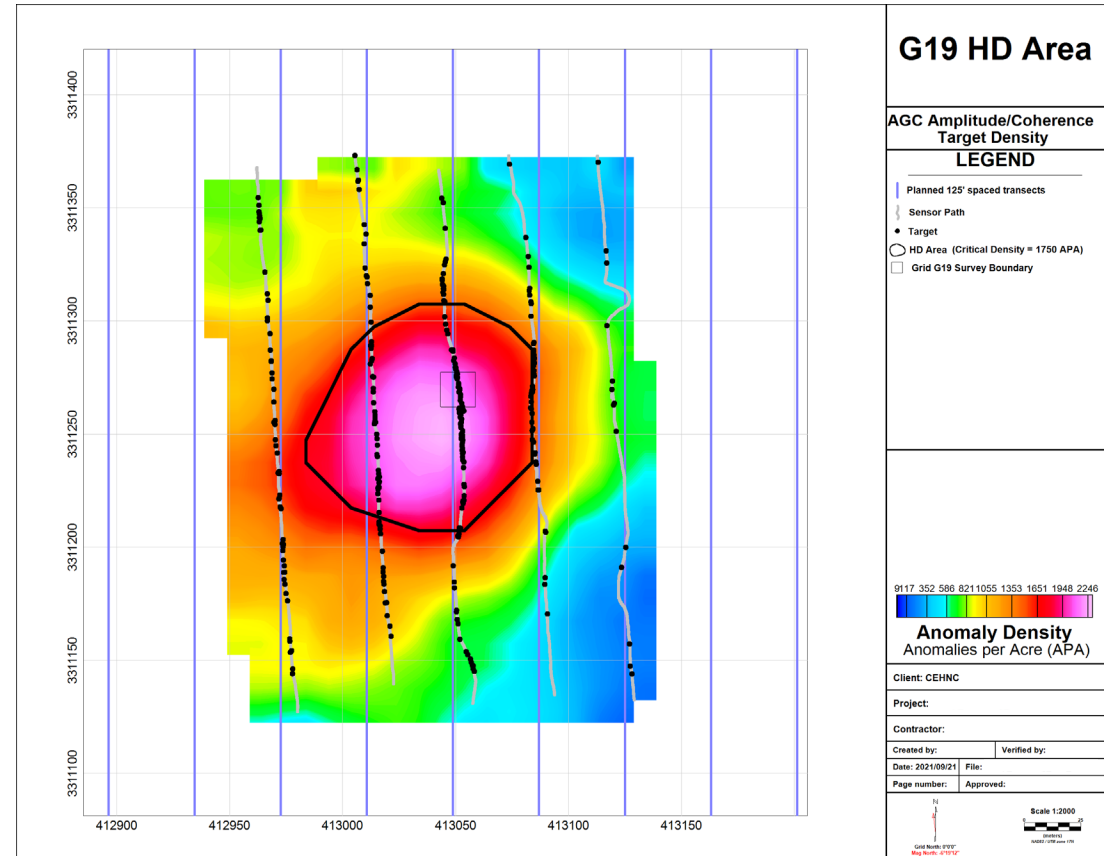
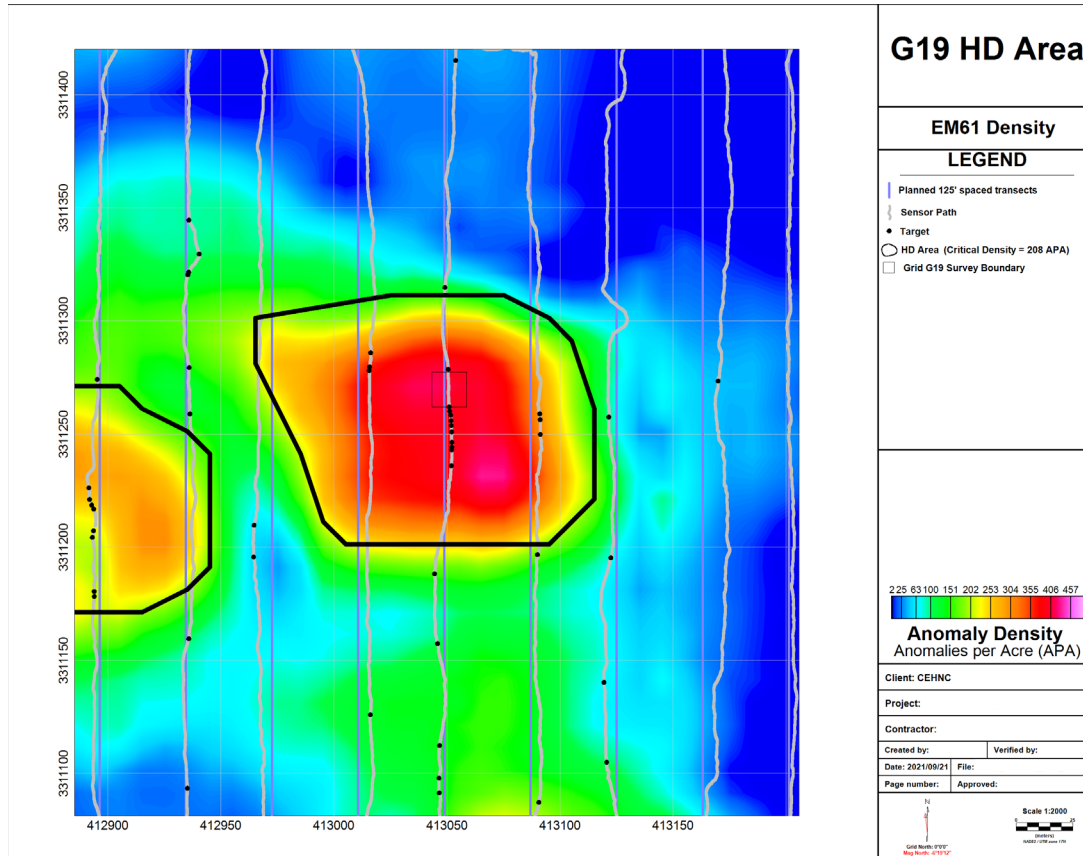


Use an AGC Sensor for Density Transects



EM61

MM2x2

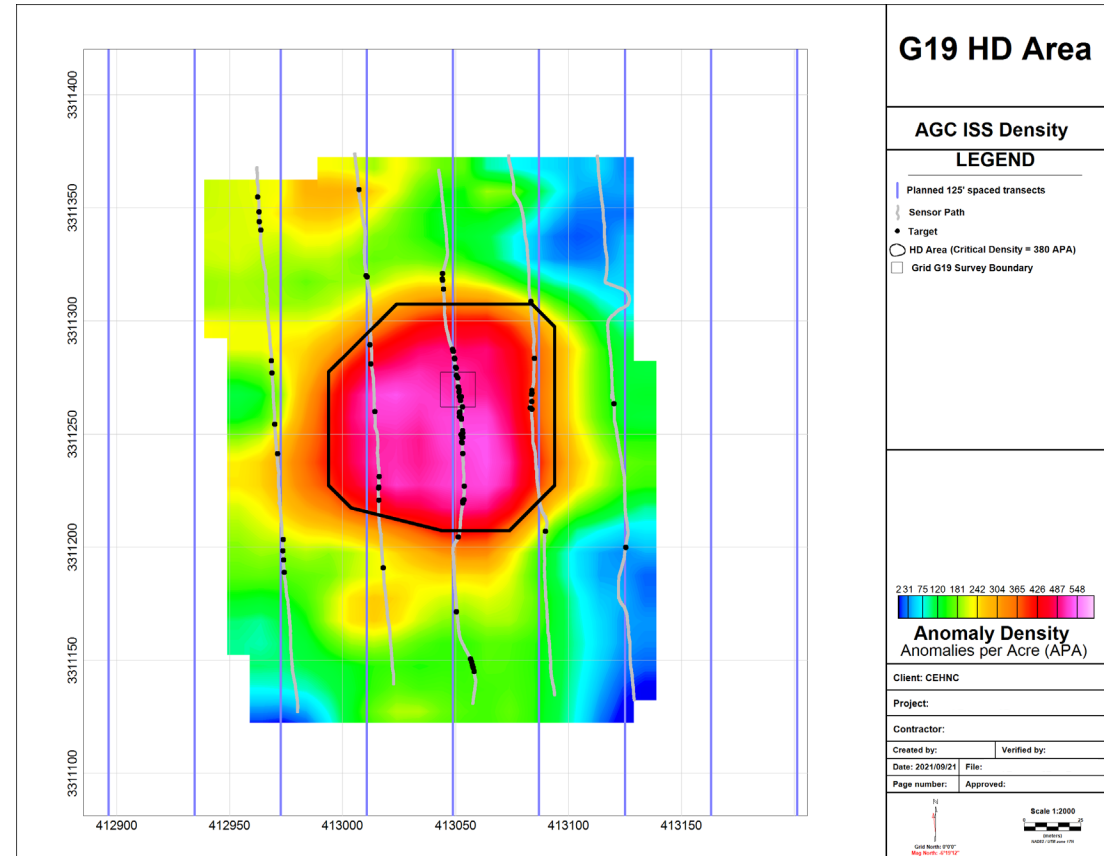
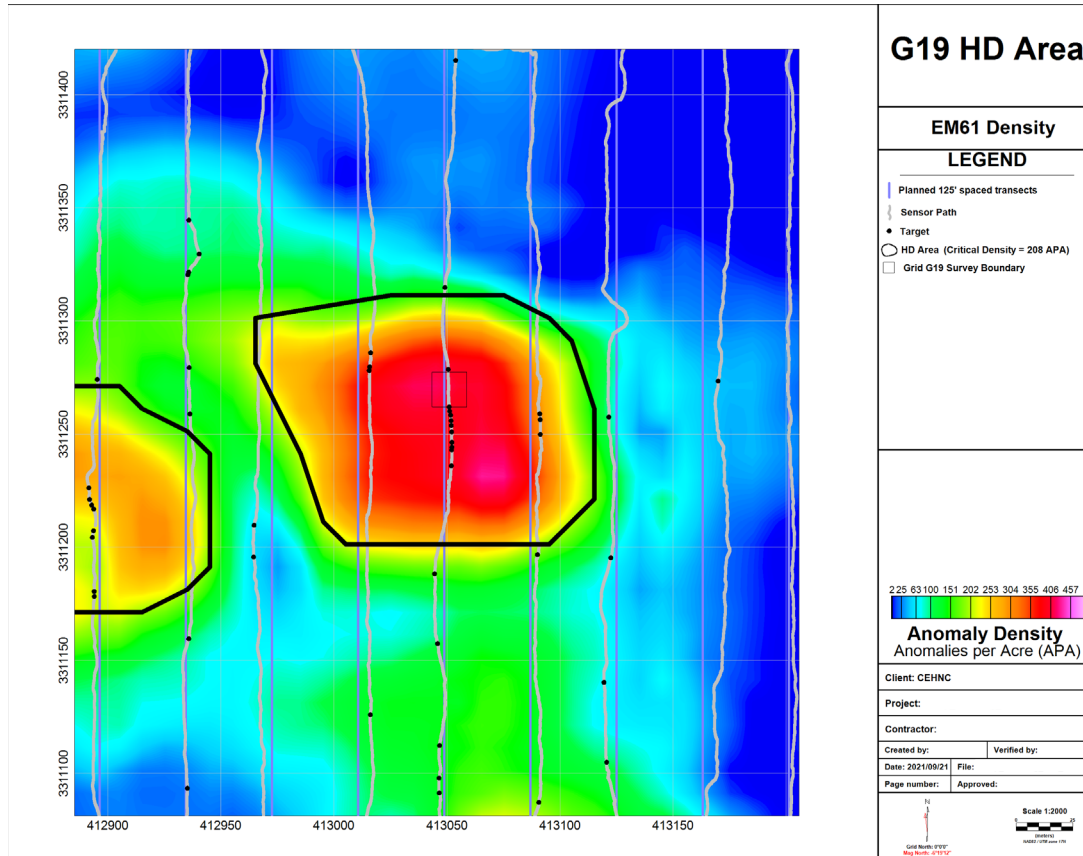


Use an AGC Sensor for Density Transects (Continued)



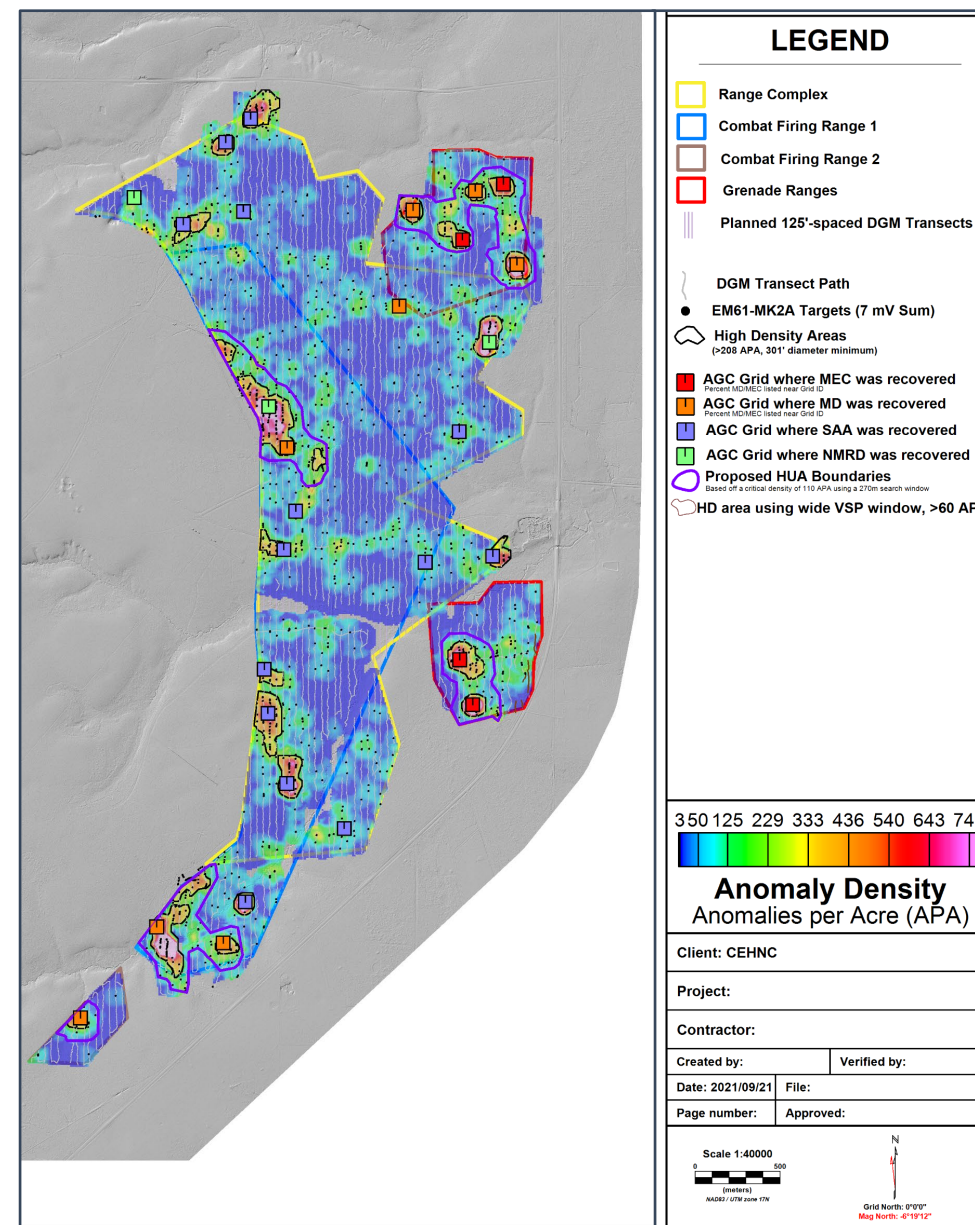
EM61

MM2x2



Intrusive investigations along transects: What are some other benefits?

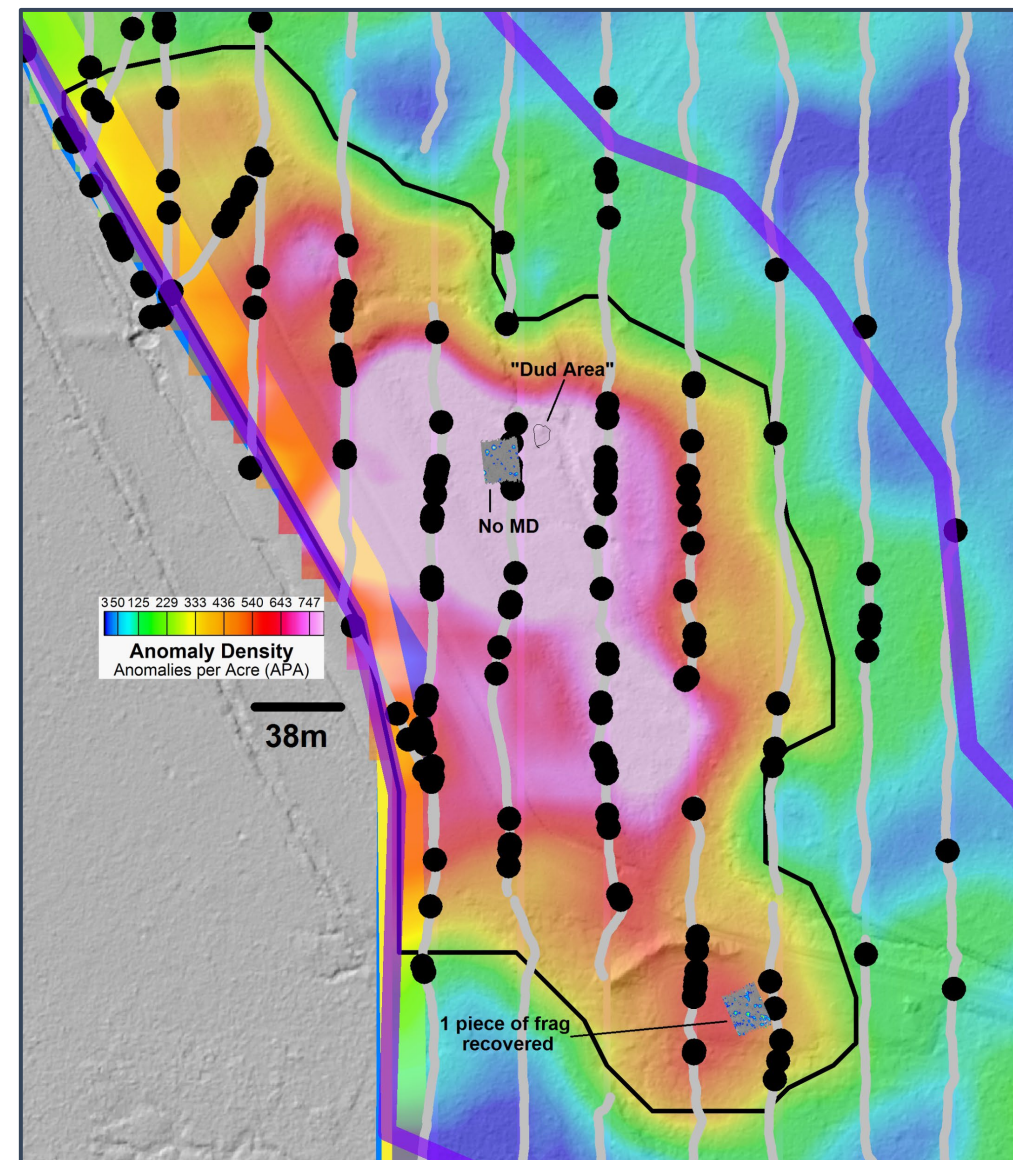
- ▶ Often, there aren't enough grids budgeted for all the areas you'd like to place a grid. If you run multiple VSP analyses, you'll likely end up with far more HD areas than anticipated.
- ▶ Optional Tasks to add AGC grids/transects.
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Intrusive investigations along transects: What are some other benefits? (Continued)

- ▶ Coming up empty-handed.
- ▶ Some HD areas have several lobes which could be non-munitions and munitions related, what if you place a grid in the non-munitions related lobe?
- ▶ Transect investigations can help fill in the gaps and guide better grid placement.

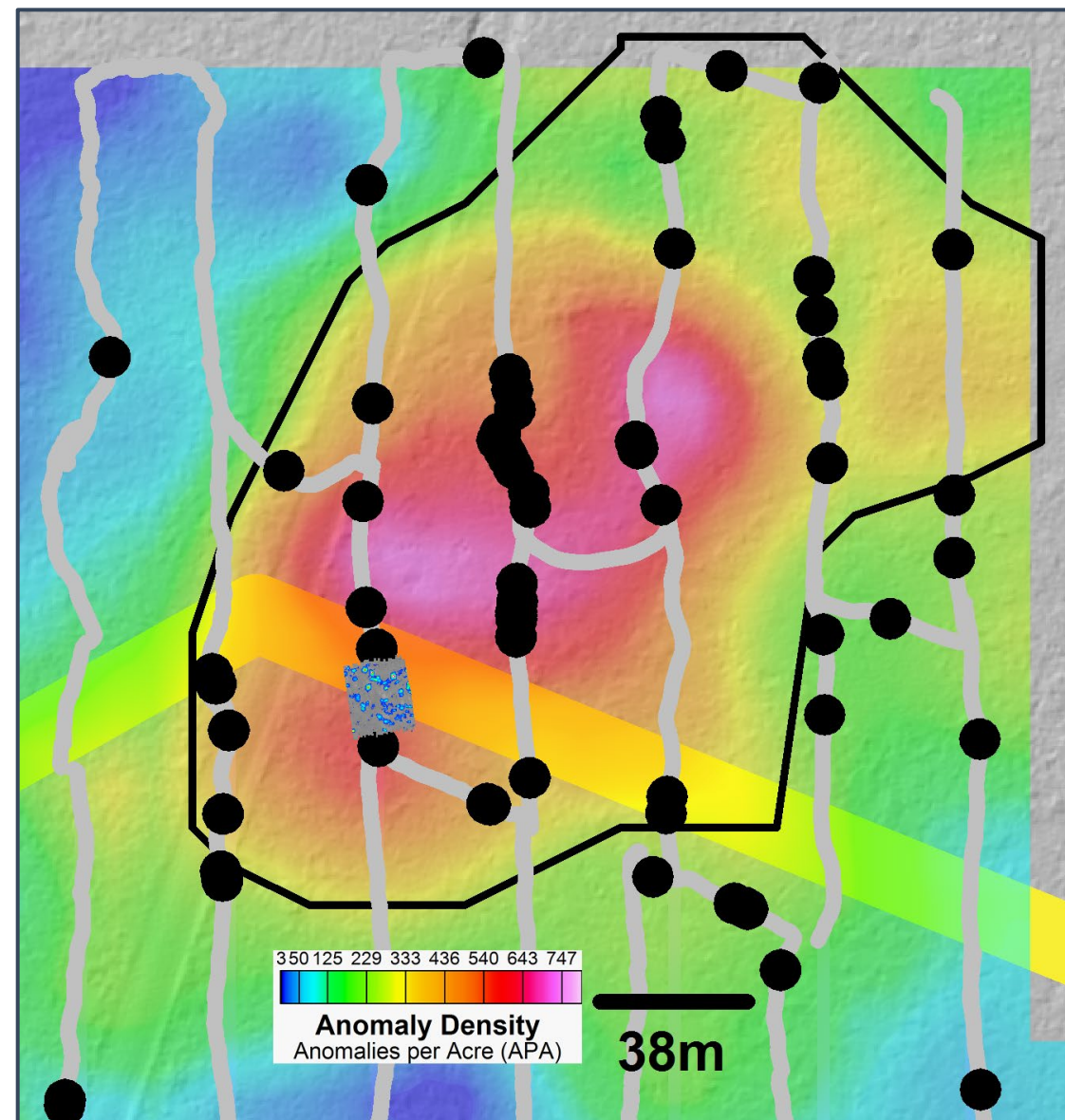
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Intrusive investigations along transects: What are some other benefits? (Continued)

- ▶ No more October Surprises
- ▶ Early investigations along transects could reduce surprises and identify the need for step-outs early in the investigation.
 - ▶ Typically grid investigations occur at the end of the project. This is especially true with AGC data where the dig team may be waiting for the final ranked dig list.
 - ▶ AGC sensors and operators likely off-site. ESP amendment may be needed.
- ▶ Helpful for areas with incomplete ROE or inaccessible areas where a complete anomaly density picture cannot be produced.

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Intrusive investigation along transects

- ▶ Reacquire and dig transect anomalies.
 - ▶ SLAM positioning should allow for accurate reacquisition under canopy.
 - ▶ For heavily vegetated sites, this could be very expensive to achieve <math><0.40\text{m}</math> accuracy.
 - ▶ Transect segments could be selected for intrusive investigation to fill-in potential data gaps or for boundary resolution.
- ▶ If site conditions make reacquiring anomalies cost-prohibitive, analog investigations can still provide valuable data.

Analog intrusive investigation along transects

- ▶ Quality concerns regarding analog investigations could be minimized by not allowing the results to influence the initial characterization strategy.
- ▶ Keep analog results blind to the PDT’s “characterization team” until the initial VSP analyses are completed, and the grid locations and rationale are documented.
 - ▶ If evidence of munitions use exists where there are no proposed grids, the characterization team:
 - ▶ Revisits their analysis and assumptions (including CSM);
 - ▶ Re-analyzes the density data and critical density thresholds;
 - ▶ Adds additional grids/transects;
 - ▶ Expands the investigation boundary, if needed.
 - ▶ Regardless of the analog investigation results, none of the originally proposed grid locations are relocated or discarded.

Questions?



Thank you.

