



Gap EOD

Gap Explosive Ordnance Detection Pty Ltd



UltraMAG projects

Ettamogah, NSW - June 2014

Majura, QLD - September 2014

Noosa, QLD - September 2014

Molonglo, ACT - Nov-Dec 2014

Noosa, QLD - October 2015

Ettamogah – Former Army Depot



TM-7 magnetometer pedestrian array

June 2014: Gap EOD surveyed 42 Ha at the former Army Depot Ettamogah to detect barrels of hazardous chemicals and clusters of 20 mm ordnance.

To survey areas with steep topography and protected habitats, 12.7 Ha was covered using the mobile and minimal-impact pedestrian quad-sensor TM-7 magnetometer array.



Majura, Fire-break Surveys



TM-7 magnetometer pedestrian array

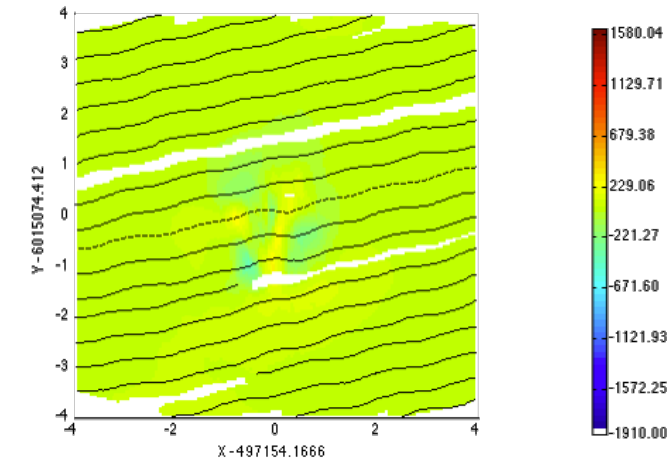
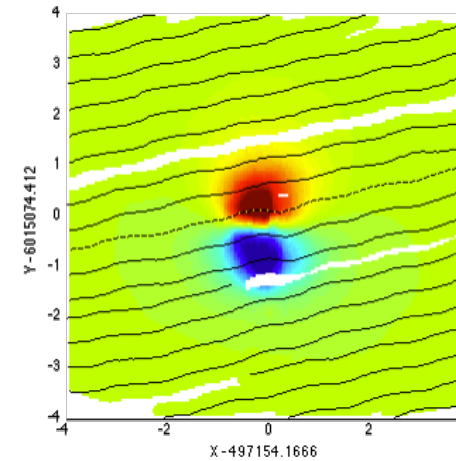
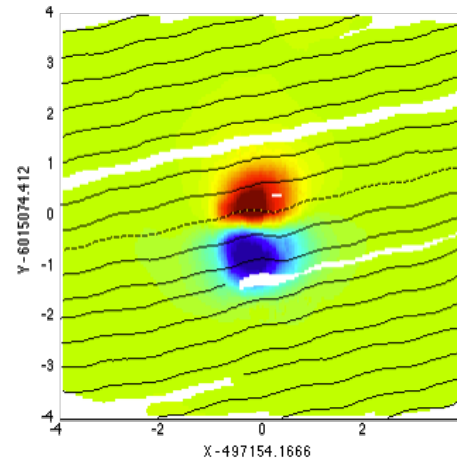
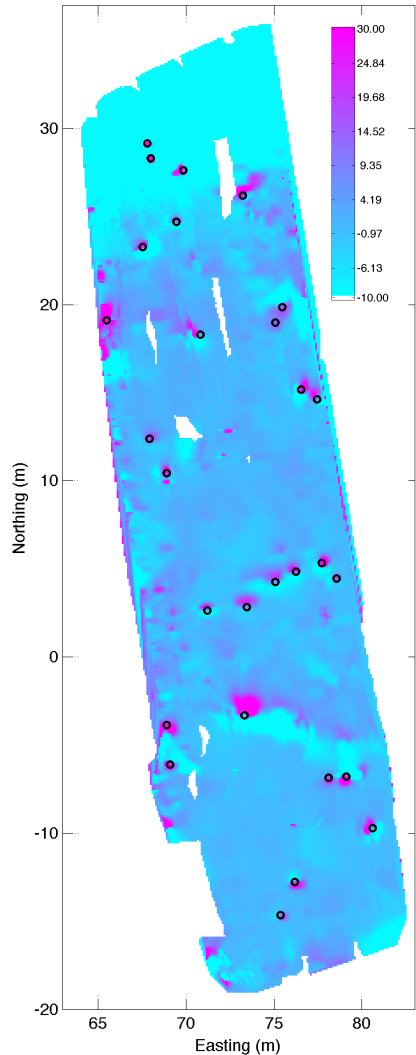
September 2014: Gap EOD carried out a magnetometer survey to clear a fire-break at the Majura Army Training Area



Majura, Fire-break Surveys



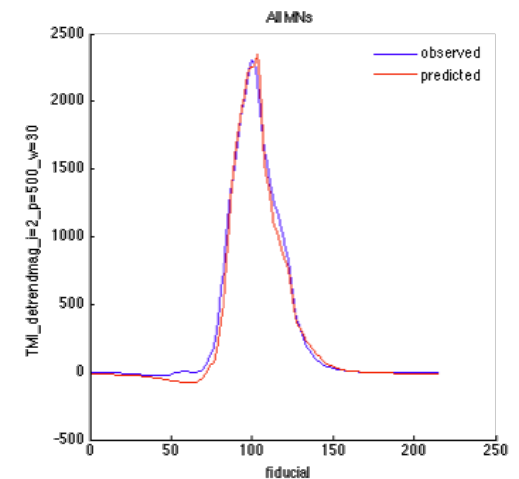
TM-7 magnetometer pedestrian array



Processed data (left) shows numerous suspicious anomalies

Targets are further analysed through dipole inversion and characterization tools

The example (right) shows observed, predicted and residual data and a comparison of observed and predicted profile data over the center of the anomaly



Noosa, Fire-break Surveys

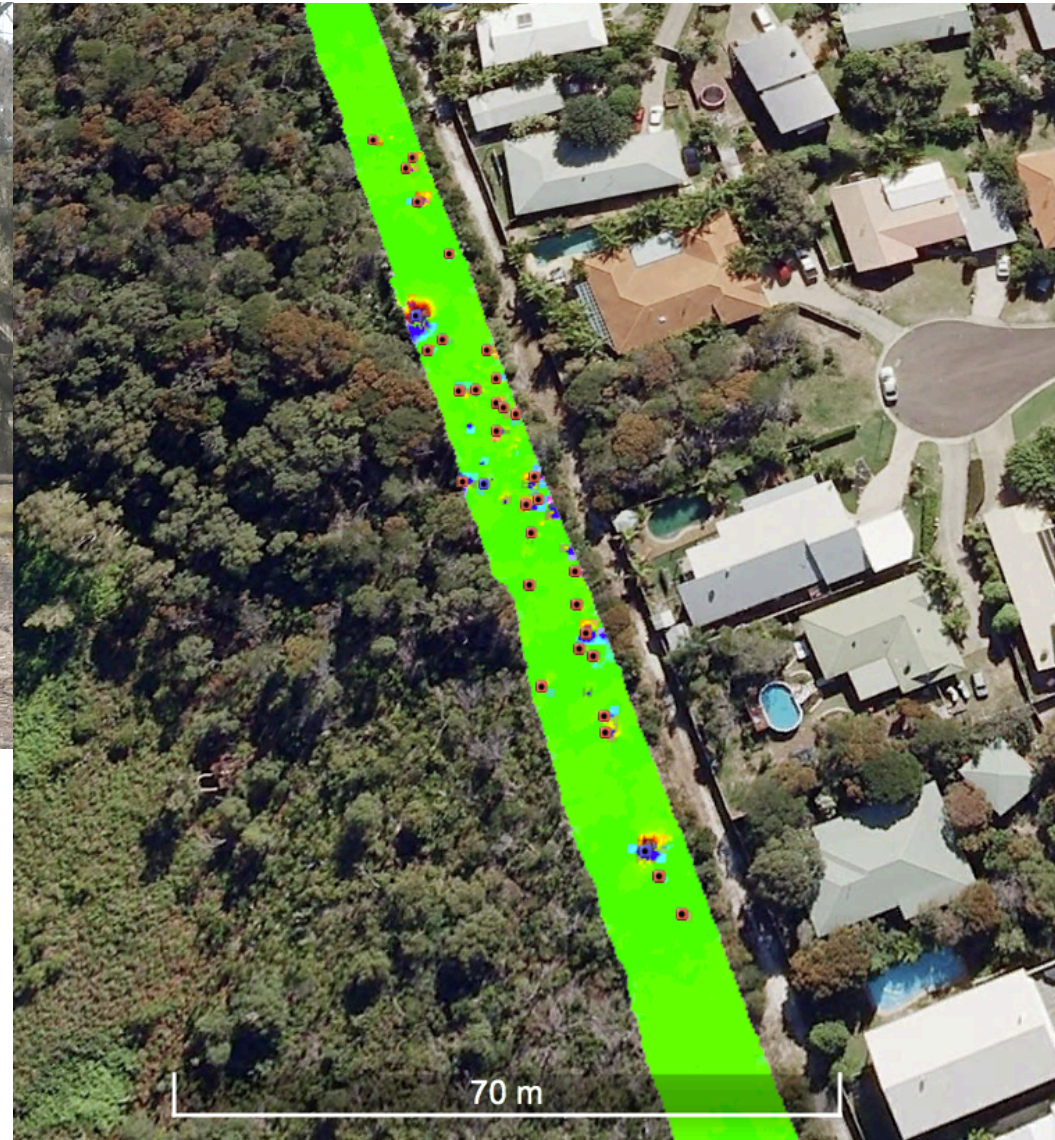


TM-7 magnetometer pedestrian array



September 2014 & October 2015: Gap EOD carried out magnetometer surveys to clear fire-break buffers along the edge of the Noosa National Park to allow safe access to fire-trucks

Processed data show anomalies near a fire-brigade access point

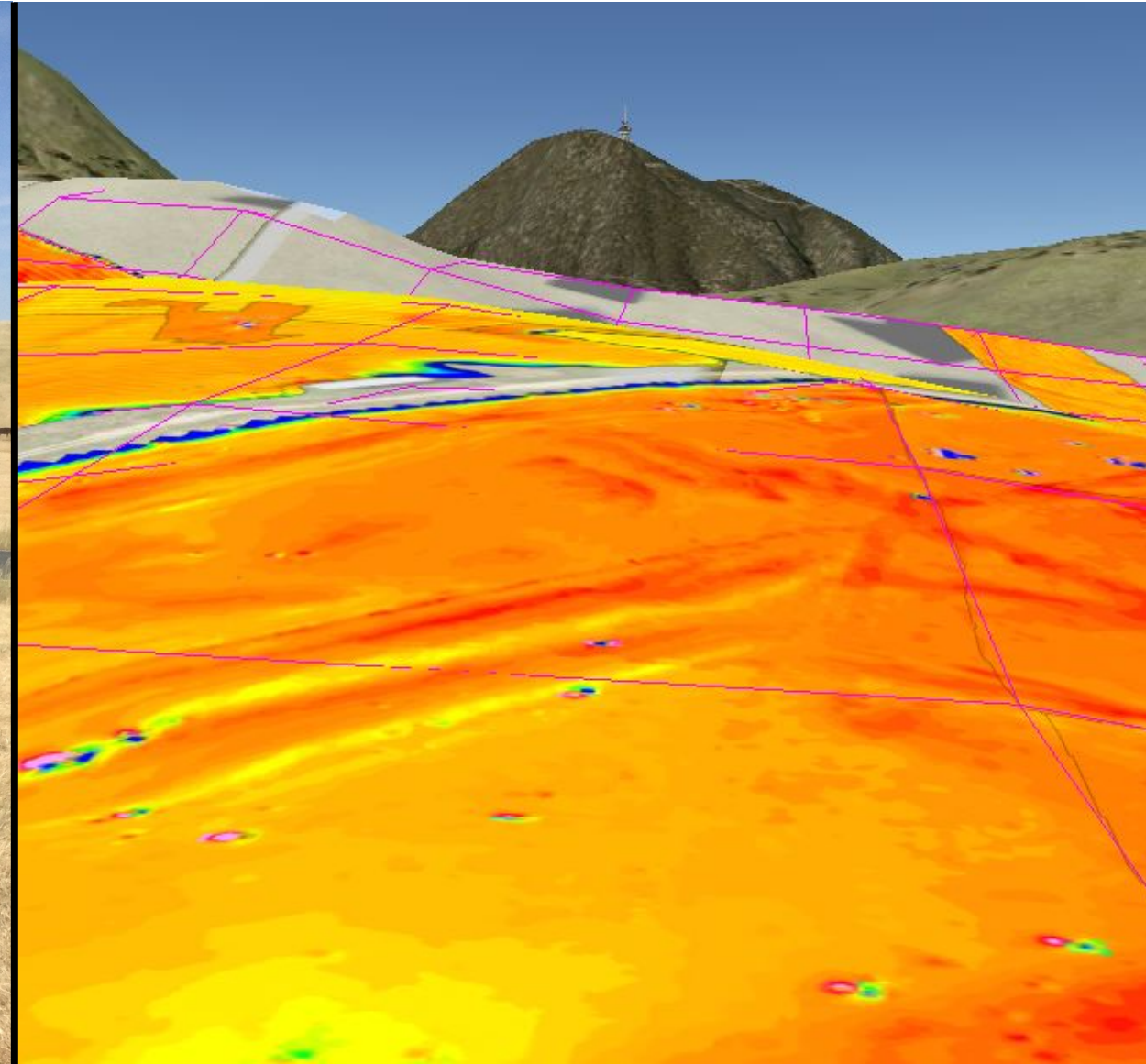
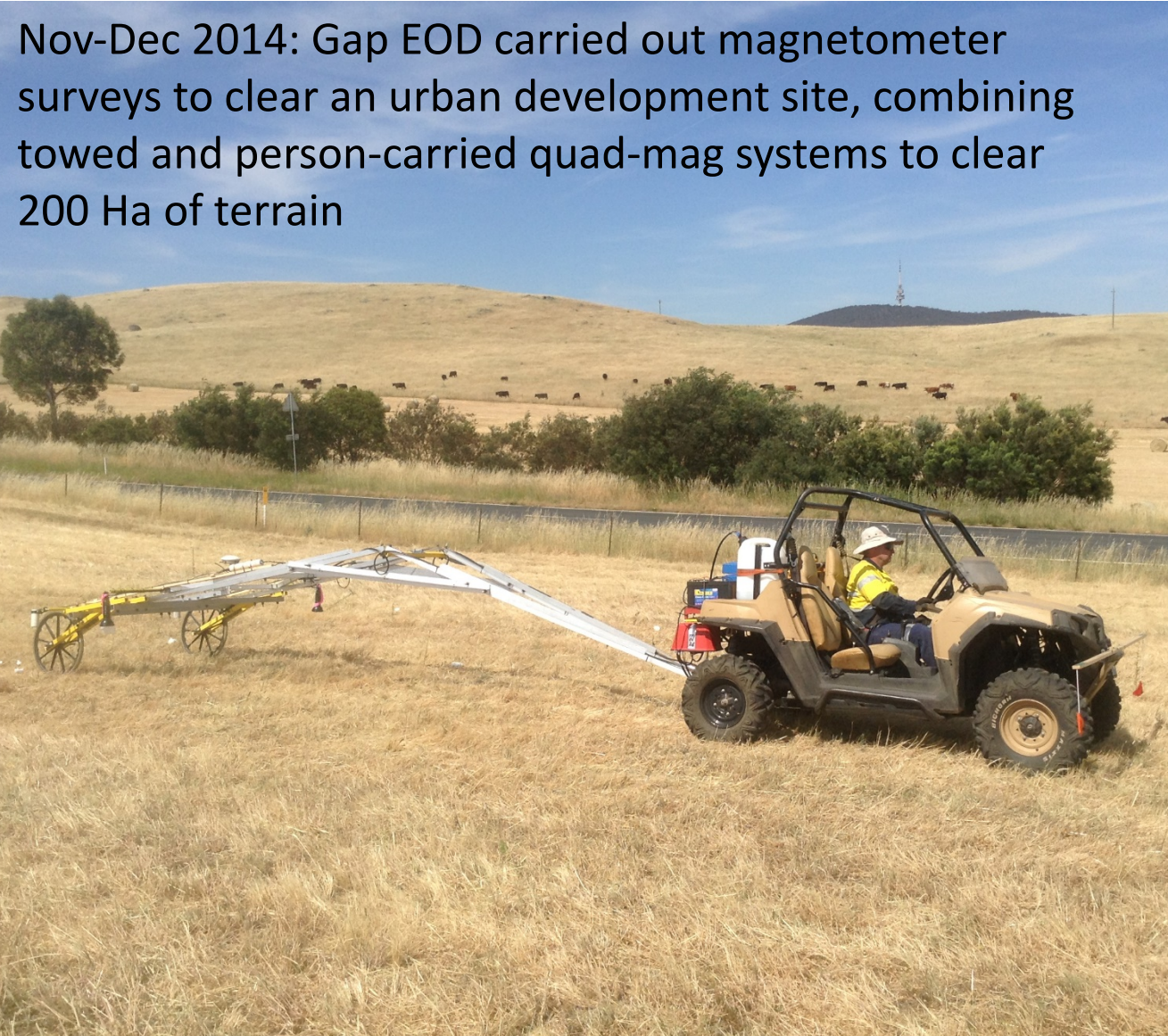


Molongolo, ACT



TM-7 magnetometer quad sensor arrays

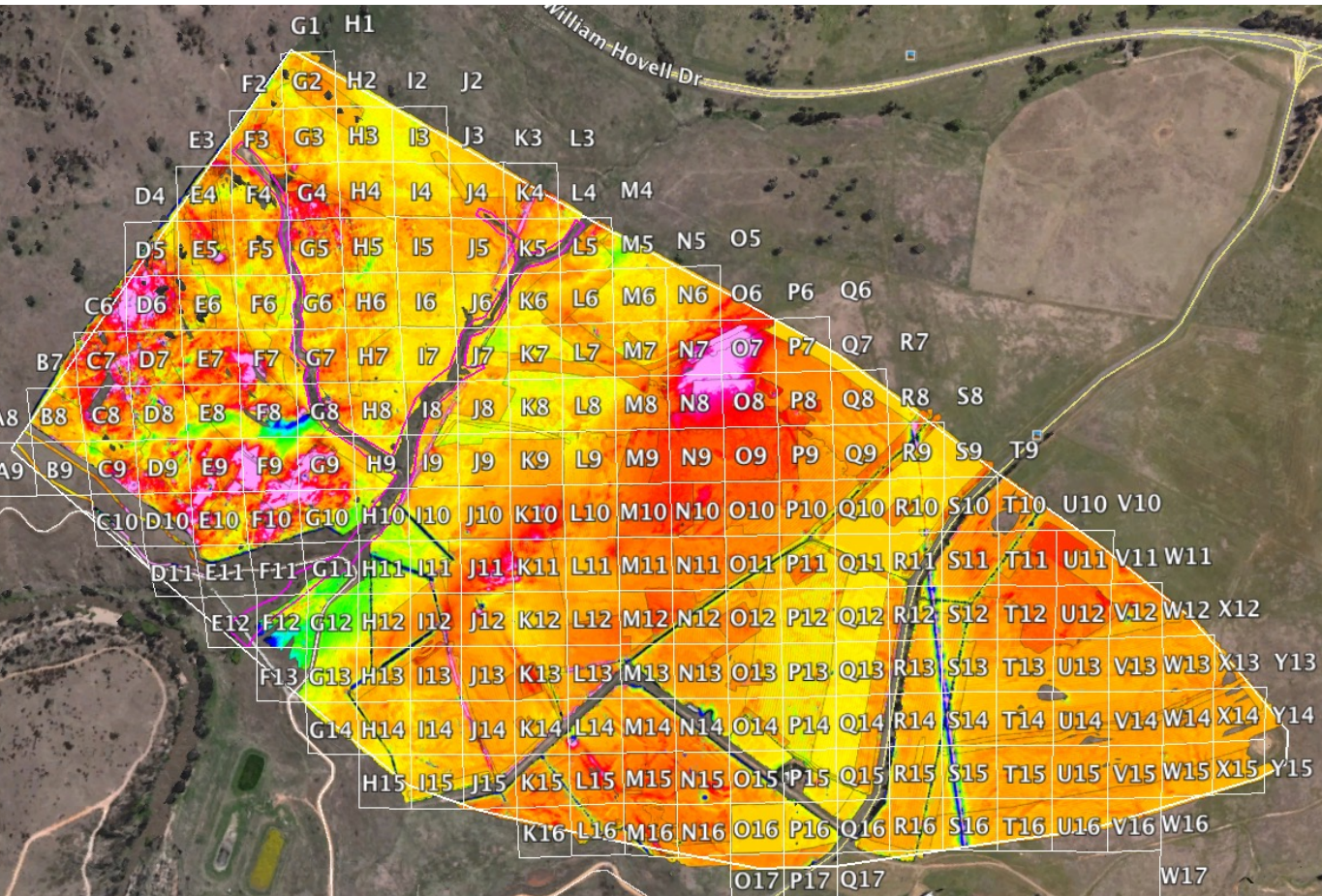
Nov-Dec 2014: Gap EOD carried out magnetometer surveys to clear an urban development site, combining towed and person-carried quad-mag systems to clear 200 Ha of terrain



Molongolo, ACT



TM-7 quad-map pedestrian array



The towed system was used for efficient 100% coverage of large open areas. The pedestrian system was used in steep terrain and around dense vegetation



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UltraTEM projects

Ettamogah, New South Wales for AECOM - June 2014

Columboola, New South Wales for AECOM - July 2014

Sepon, Laos trial for GICHD- December 2014

Williamtown RAAF Airbase, NSW- Feb-May 2015

Sanxai, Laos for Sanxai Minerals - March 2015

Peregian Springs, QLD for MilSearch - December 2015

Karara Mine, WA for Downer Group – December 2016

Sepon, Laos for MMG - Ongoing since August 2014

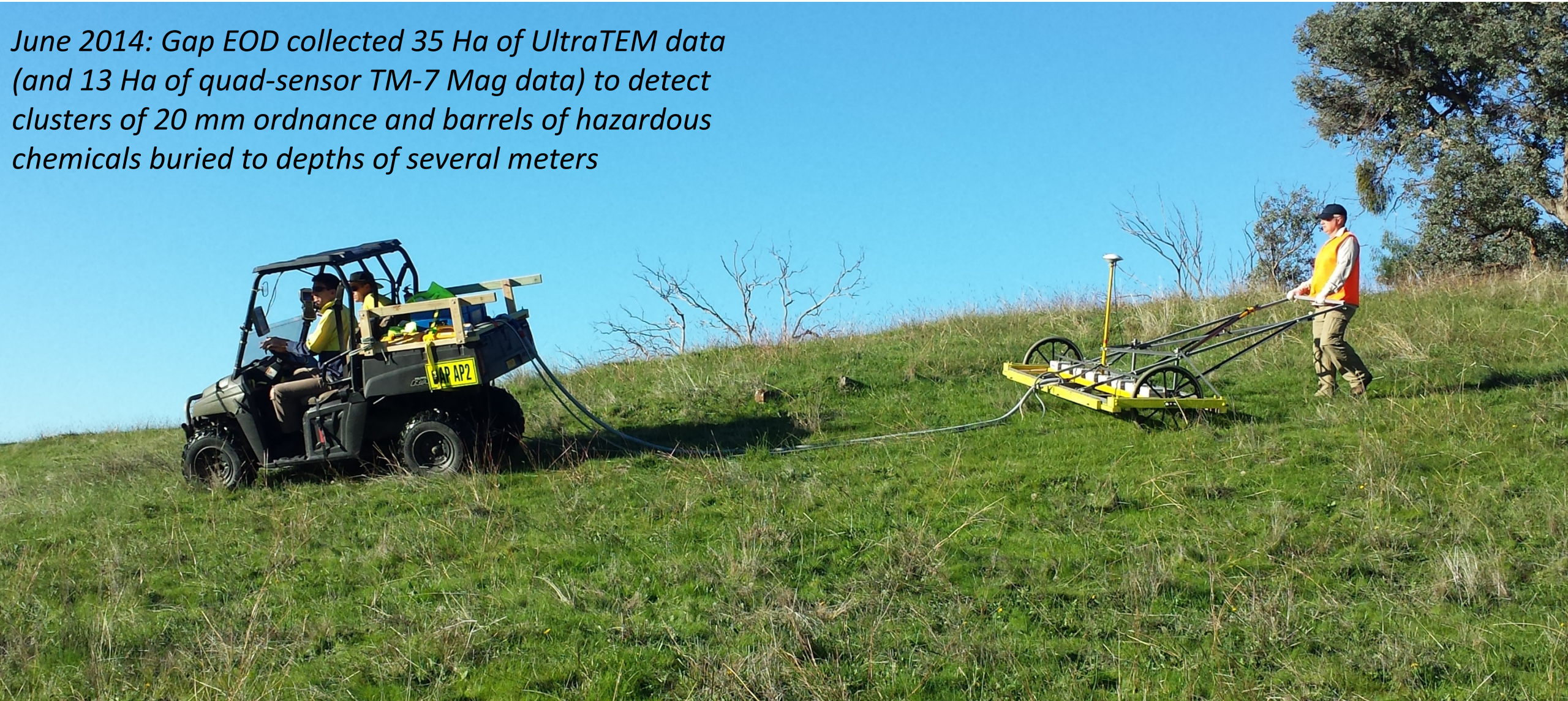
Cape Preston, WA for Citic-Pacific Mine - Ongoing since August 2014

Ettamogah – Former Army Depot



UltraTEM towed-array ordnance detection

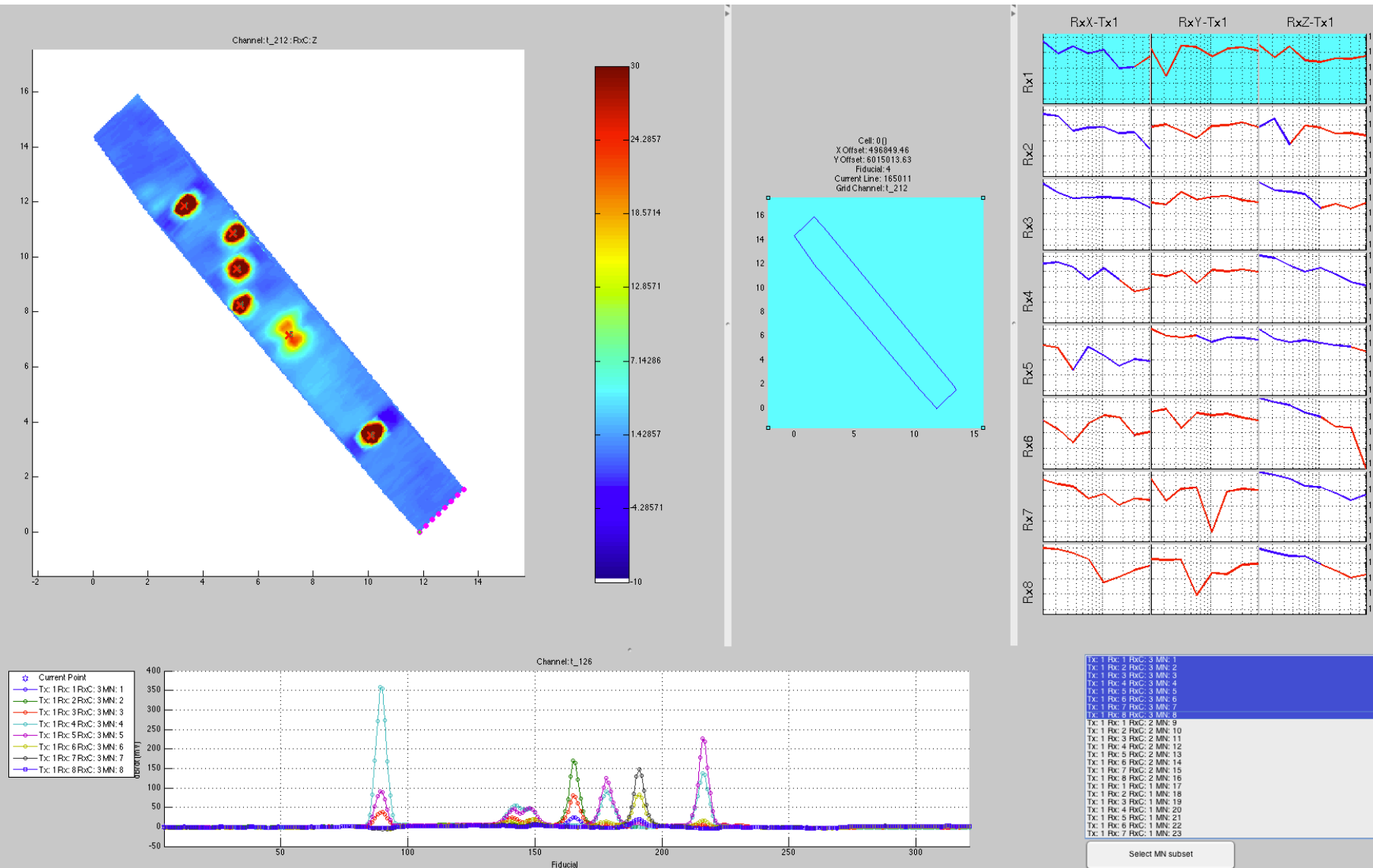
June 2014: Gap EOD collected 35 Ha of UltraTEM data (and 13 Ha of quad-sensor TM-7 Mag data) to detect clusters of 20 mm ordnance and barrels of hazardous chemicals buried to depths of several meters



Ettamogah – Former Army Depot



UltraTEM towed-array ordnance detection



To ensure optimal target detection performance throughout a field survey, an **Instrument Verification Strip (IVS)** is set up.

Columboola



UltraTEM towed-array UXO detection



July 2014: Gap EOD collected 30.8 Ha of UltraTEM data to detect potential hazardous items along the rights-of-way for coal seam gas pipelines

Williamstown RAAF Airbase



UltraTEM towed array UXO and munitions detection

*The UltraTEM form factor can be modified to **suit project needs**.*

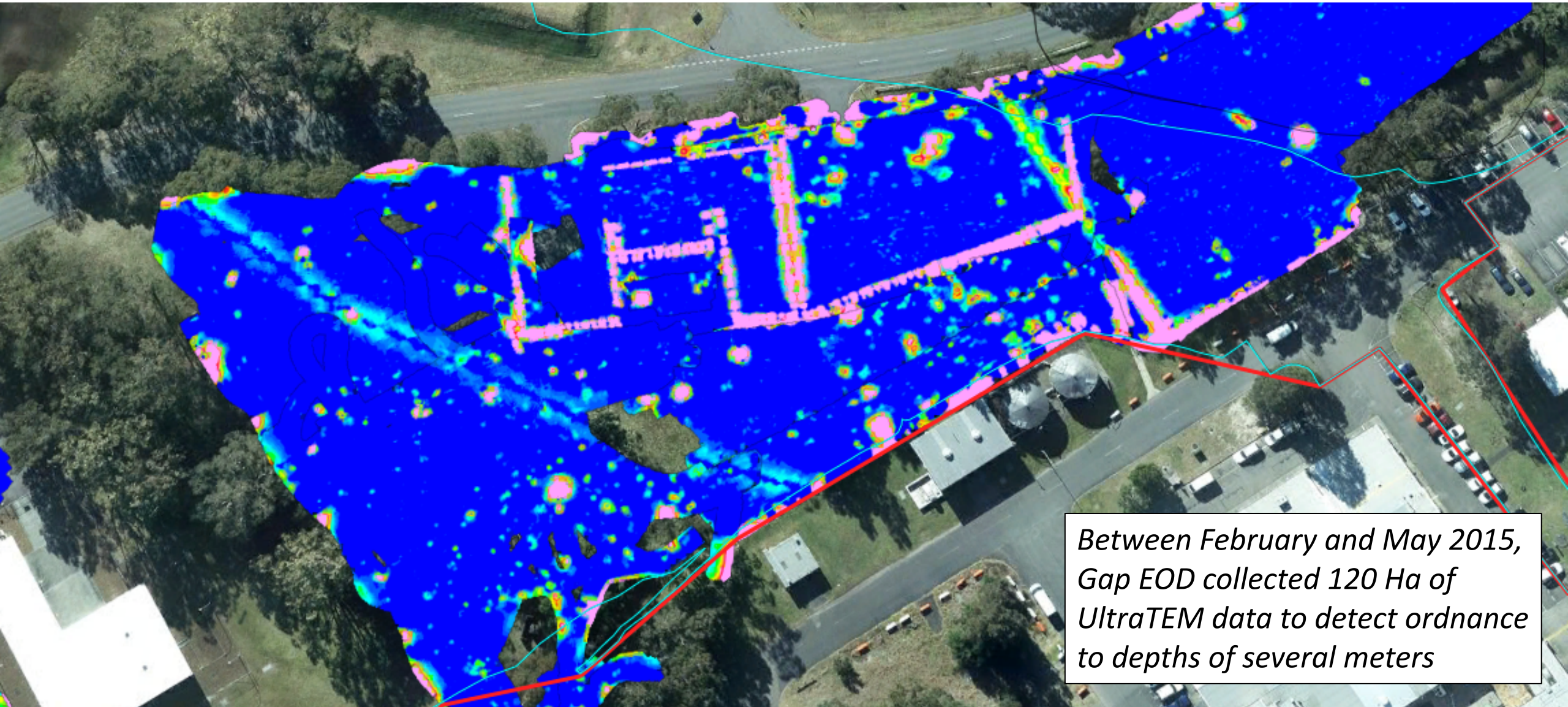
An 8-sensor towed-array ensures detection of targets with a wide range of sizes and depths, while maintaining a high coverage rate.



Williamstown RAAF Airbase



UltraTEM towed array UXO and munitions detection



Between February and May 2015, Gap EOD collected 120 Ha of UltraTEM data to detect ordnance to depths of several meters

Peregian Springs, Sunshine Coast



New UltraTEM II electronics

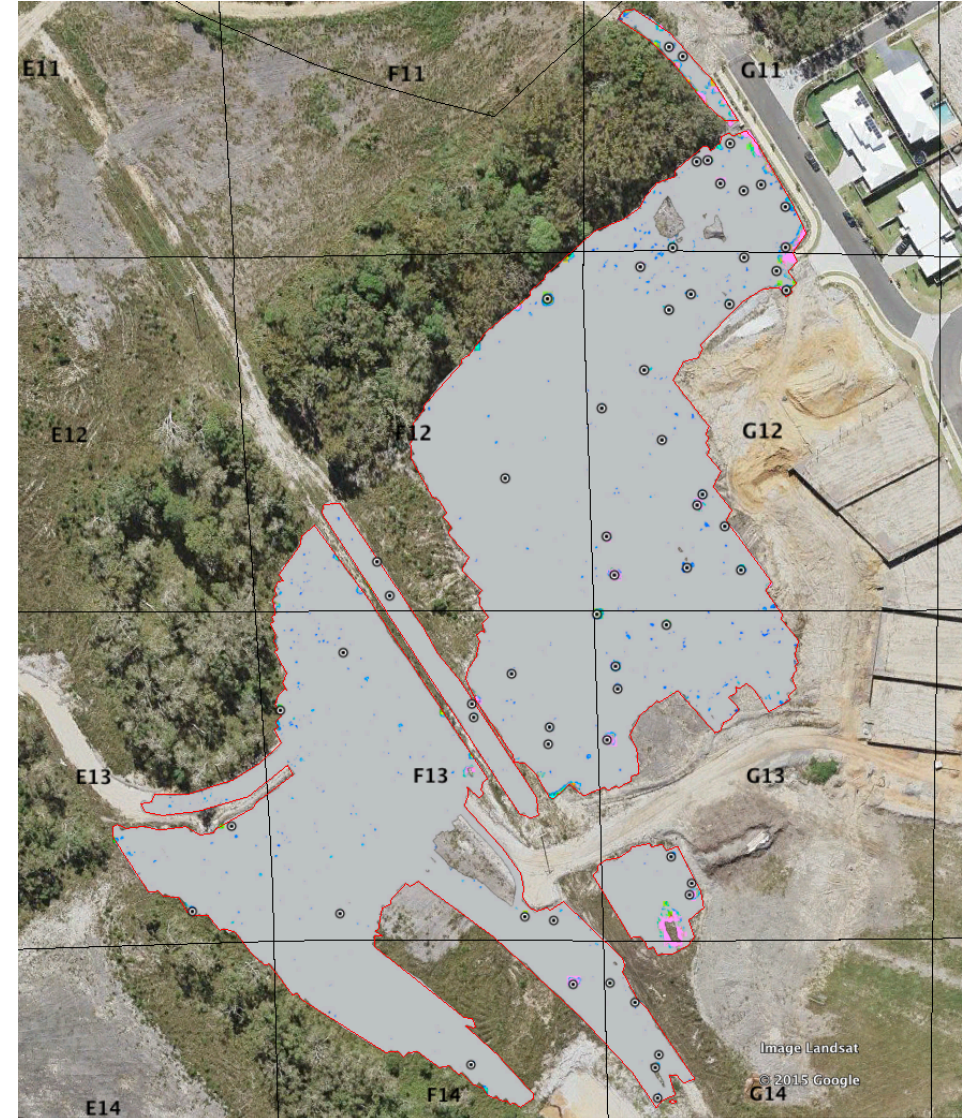
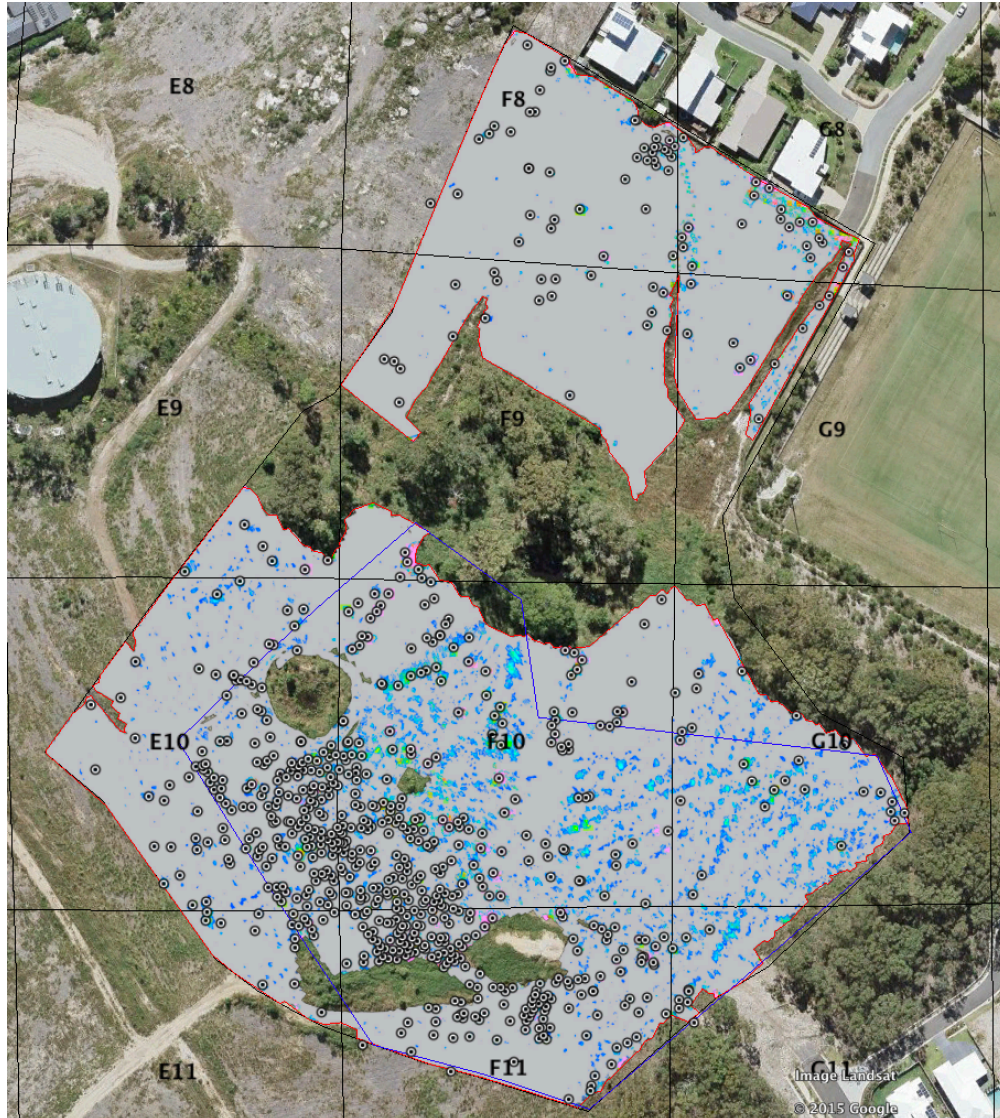


The new sensor has better signal to noise characteristics, is lower power, lighter weight and much more reliable and rugged.

Peregian Springs, Sunshine Coast



UltraTEM II buried metal detection



Citic Pacific, Karratha, WA



UltraTEM large-loop GET detection

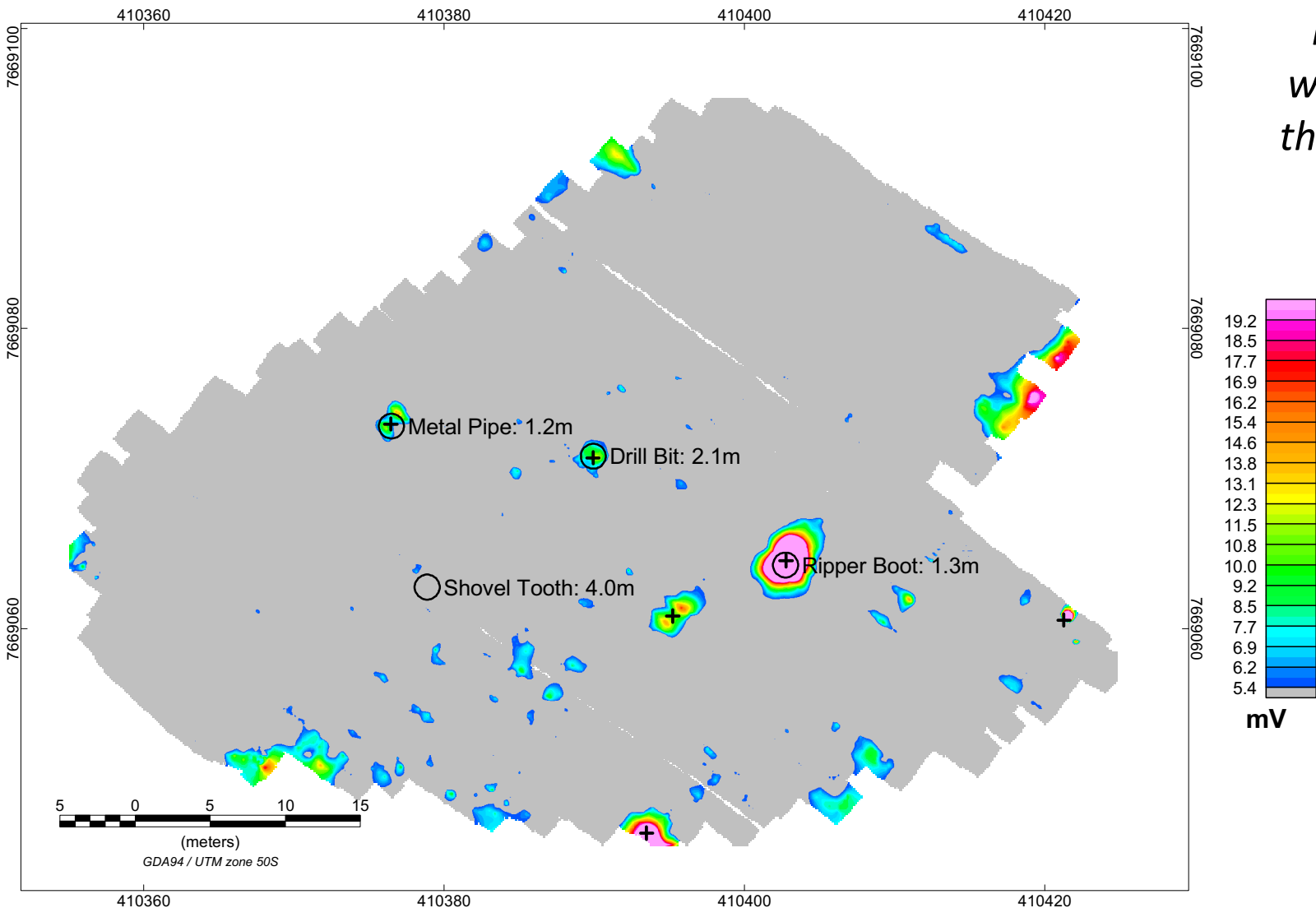
Since August 2014: At the Sino Iron Project of Citic-Pacific Mining, Gap EOD uses the UltraTEM to detect **Ground Engaging Tools** (GET) that are lost in magnetite stockpiles



Citic Pacific, Karratha, WA



UltraTEM large-loop GET detection



*In 2014 (2x) and 2015, the UltraTEM system was used for **full sweeps** of the top surface of the stock piles, down to depths of at least 3 m*



Karara Mine, WA



UltraTEM large-loop GET detection

December 2016: Contract miners Downer EDI Limited engaged Gap EOD, UltraTEM to detect **Ground Engaging Tools** (GET) lost in magnetite stockpiles. Significant damage to crushing and processing equipment was avoided.

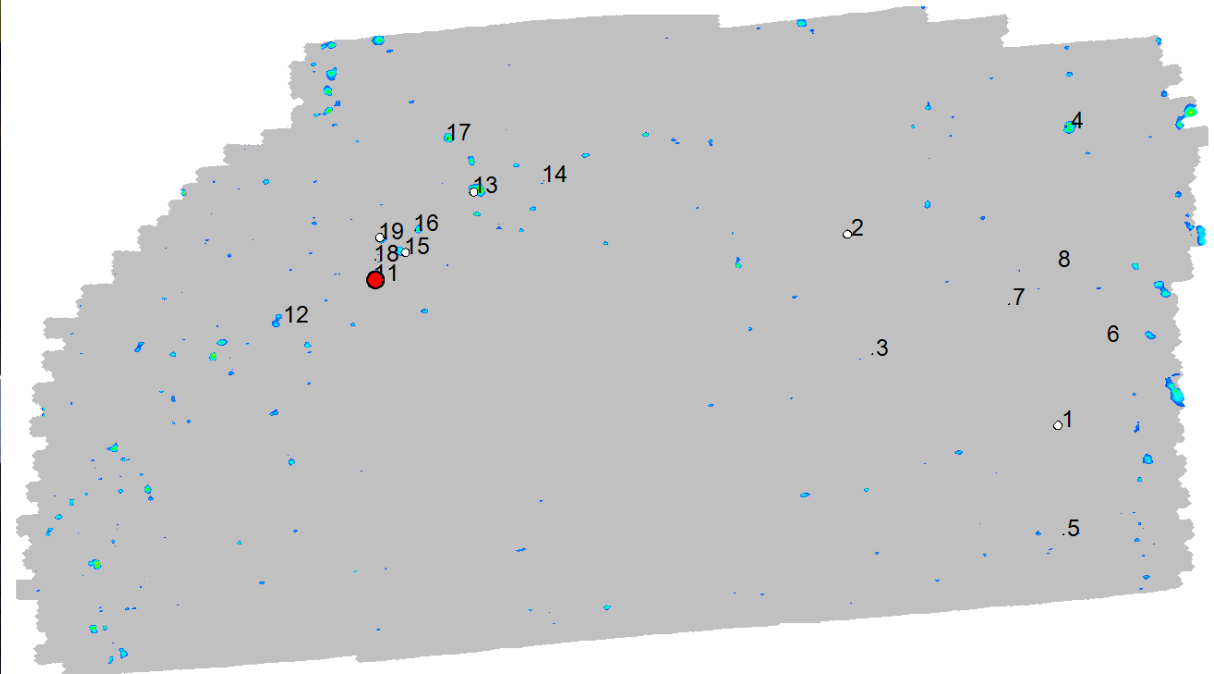


Karara Mine, WA



UltraTEM large-loop GET detection

Multiple large metal items were detected and removed from the stockpile



Laos



UXO detection



BLU-26 'bombies'

During the Vietnam war, Laos became the most heavily bombed country in the world.

Two million tonnes of ordnance was dropped on Laos, including around 280 million 'bombies'. Many of these cluster munitions did not explode and remain a serious hazard to the population.

December 2014: Gap EOD participated in a BLU-26 submunition detection trial, organized by the Geneva International Center for Humanitarian Demining (GICHD) with support from MMG/LXML Sepon and UXOLaos

These trials have demonstrated the capabilities of the UltraTEM system in the Laos environment. The system has since been successfully used for various projects in Laos.

Sanxai, Laos



UltraTEM moving-loop UXO detection



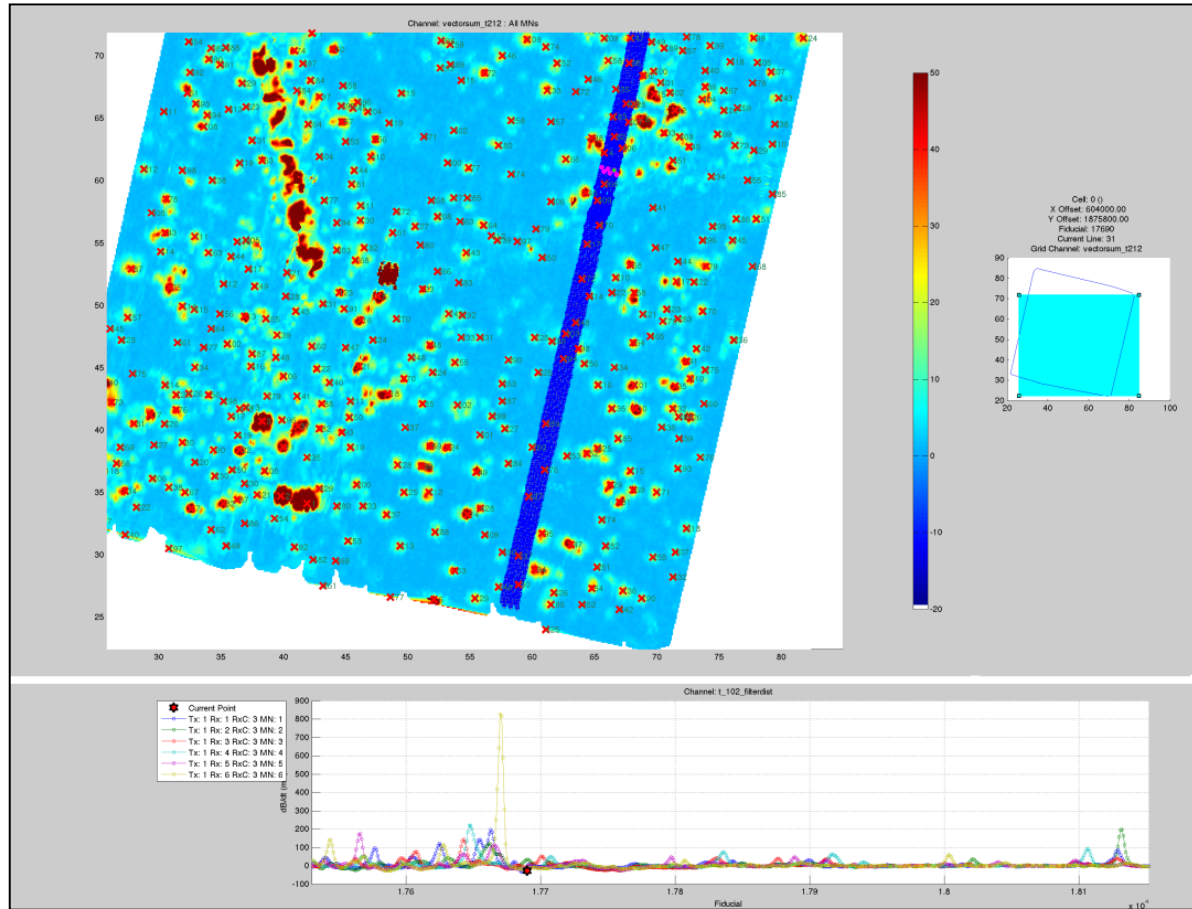
March 2015: Gap EOD used the UltraTEM moving-loop system for road clearance surveys for Lao Sanxai Minerals (a Rio Tinto affiliated company operating in Laos)

The UltraTEM system operated by local staff

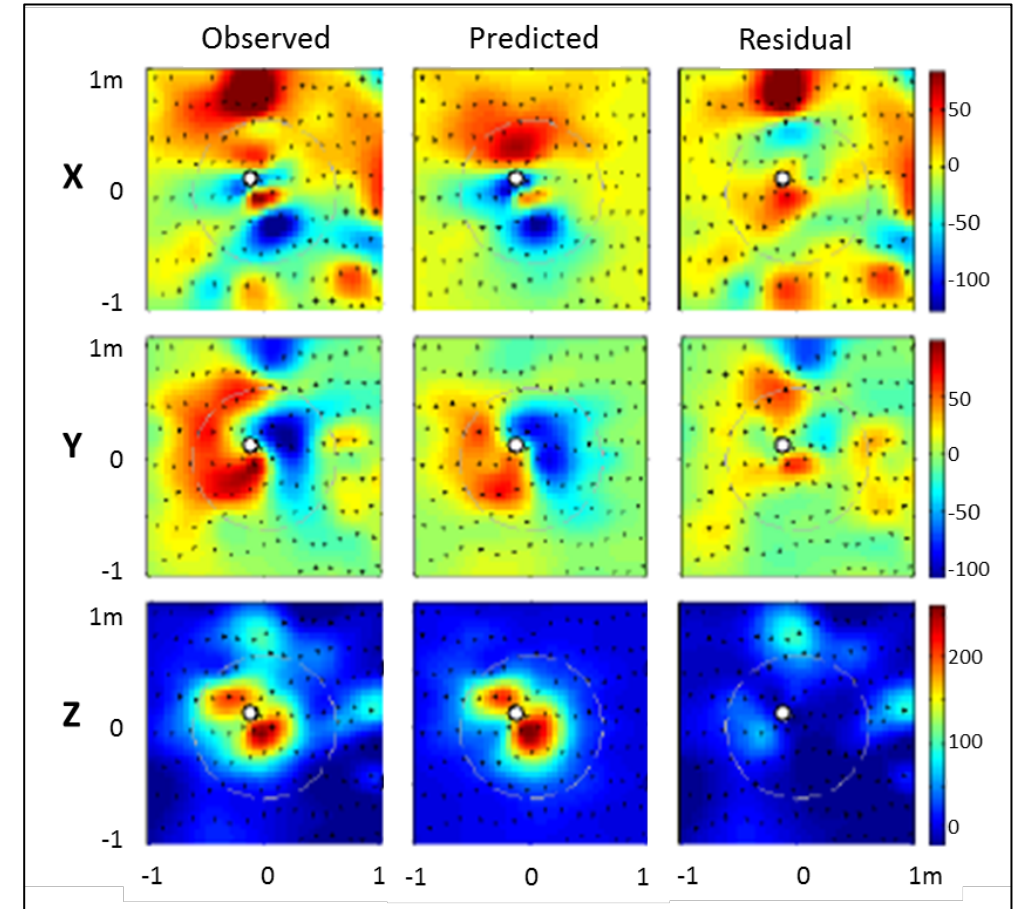
Sanxai, Laos



UltraTEM moving-loop UXO detection



Dynamic display tool in the UXOLab software interface



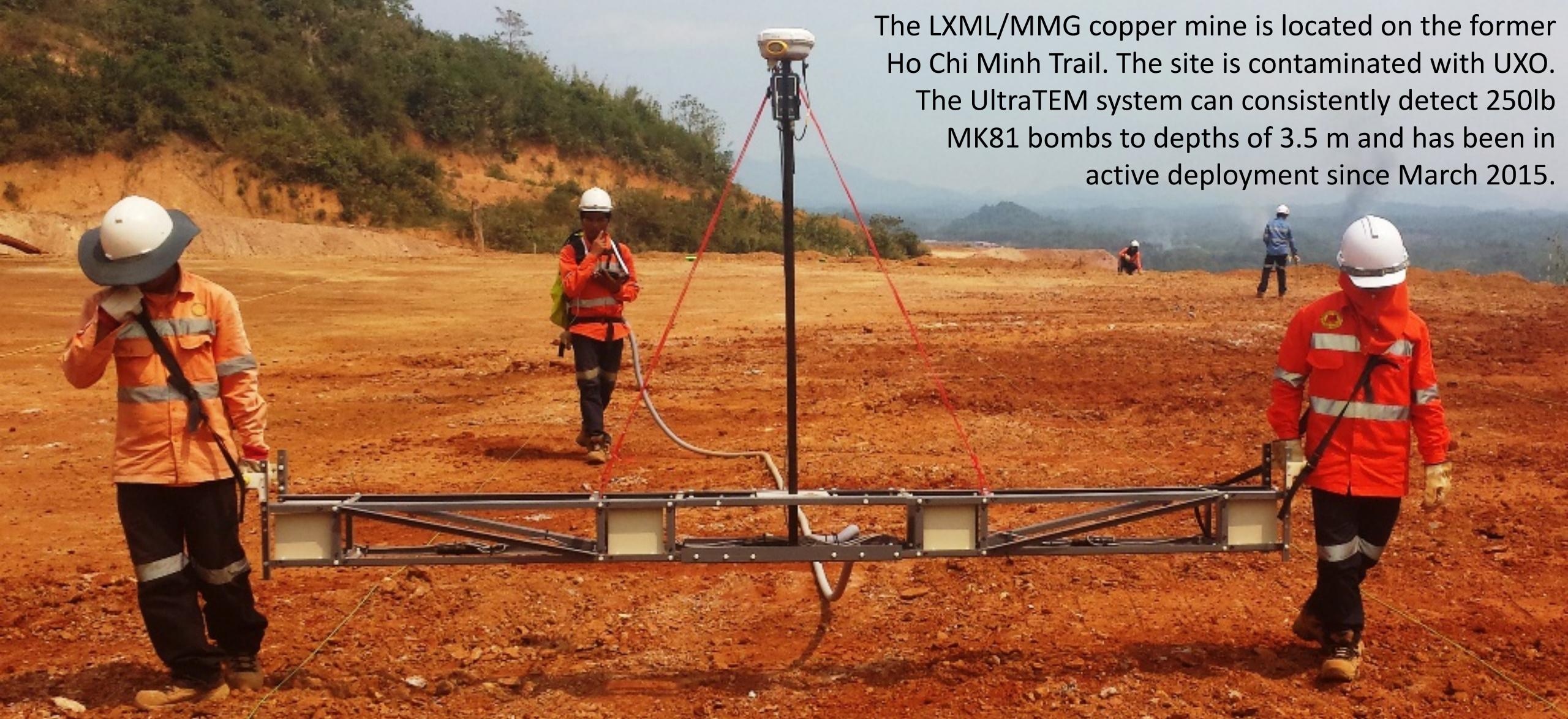
Inversion of three-component UltraTEM data

MMG-LXML Sepon, Laos PDR



UltraTEM large-loop deep bomb detection

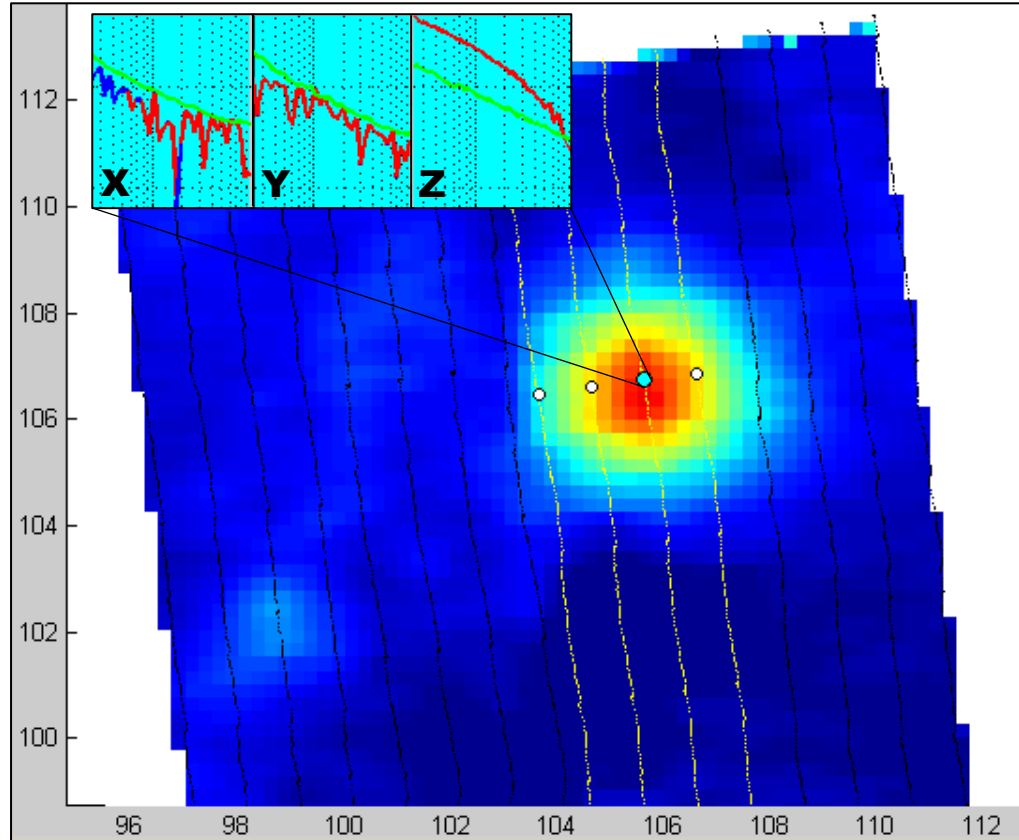
The LXML/MMG copper mine is located on the former Ho Chi Minh Trail. The site is contaminated with UXO. The UltraTEM system can consistently detect 250lb MK81 bombs to depths of 3.5 m and has been in active deployment since March 2015.



MMG-LXML Sepon, Laos PDR

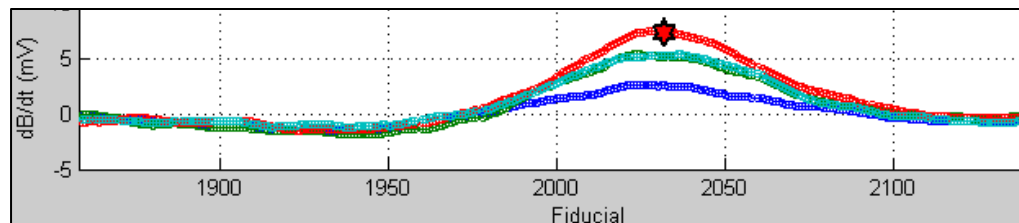


UltraTEM large-loop deep bomb detection



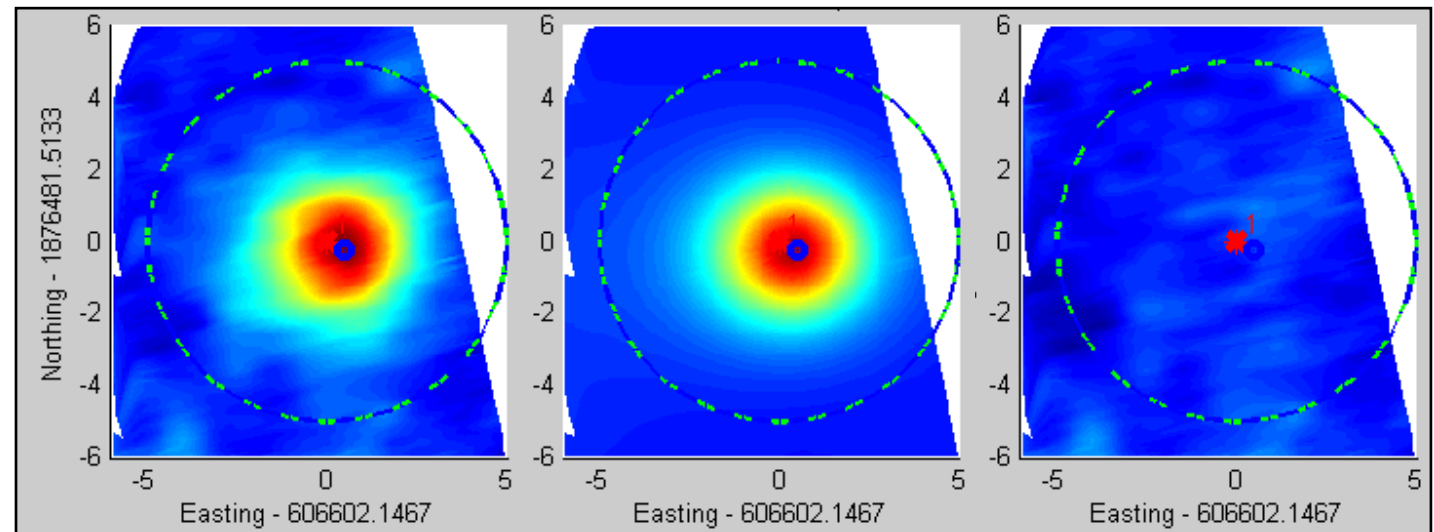
MK81 at 2.6 m:

gridded data, profiles, and 3-component time decays



Inversion results:

observed and predicted data and misfit





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UltraTEM-Fluxgate

Germany, NE Europe for Heinrich Hirdes – Ongoing since July 2014

Sepon, Laos for MMG - Ongoing since August 2014

Heinrich Hirdes, Germany

UltraTEM-Fluxgate B-field borehole bomb detection



Since July 2014: The UltraTEM-Fluxgate borehole system is used by Heinrich Hirdes Boskalis for characterization of WW-II aircraft bombs prior to expensive excavation works

Heinrich Hirdes, Germany

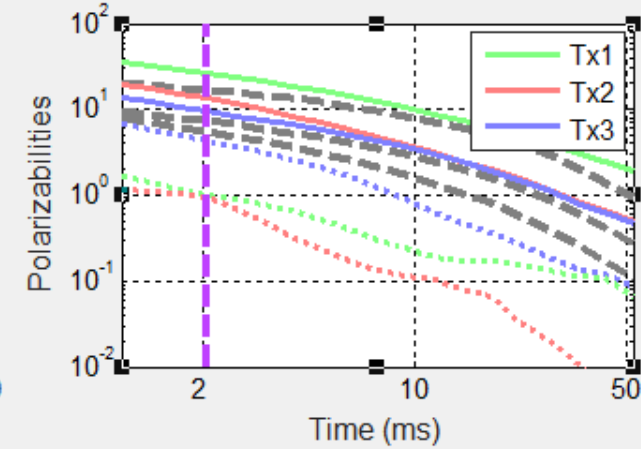
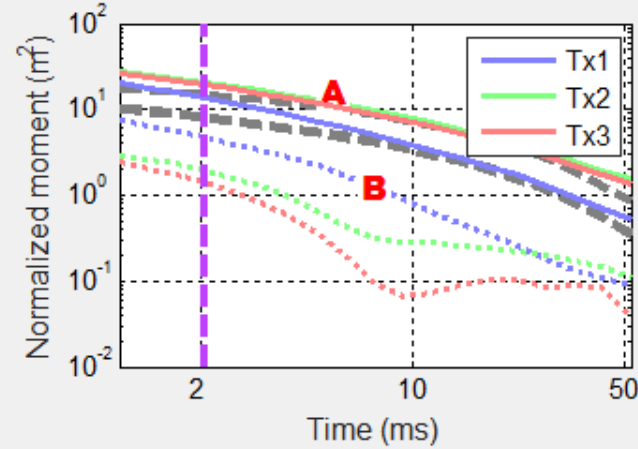
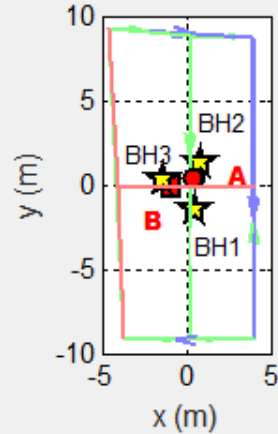
UltraTEM-Fluxgate B-field borehole bomb detection



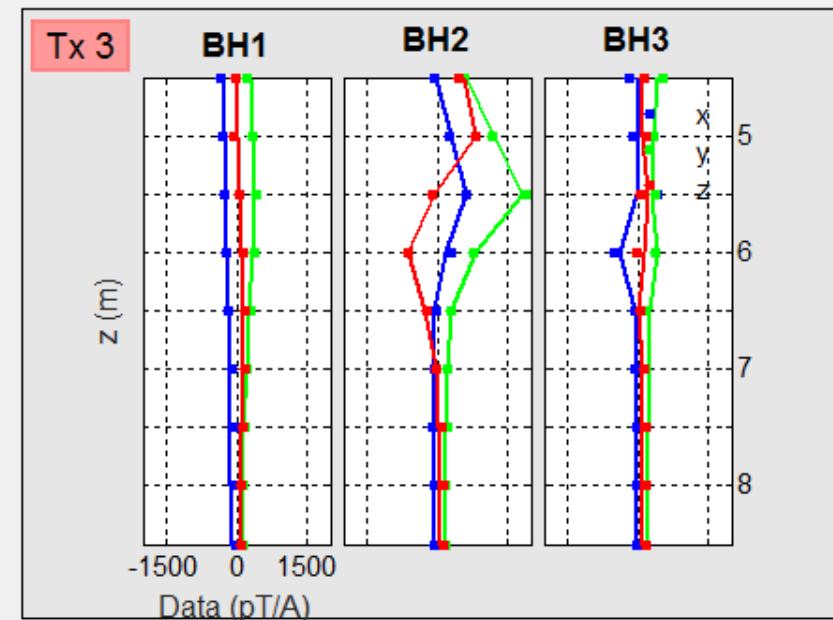
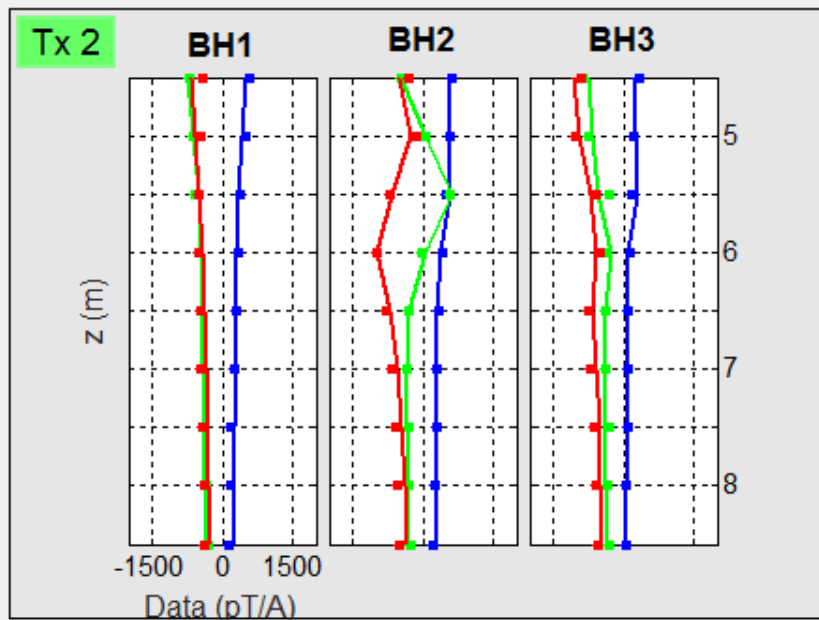
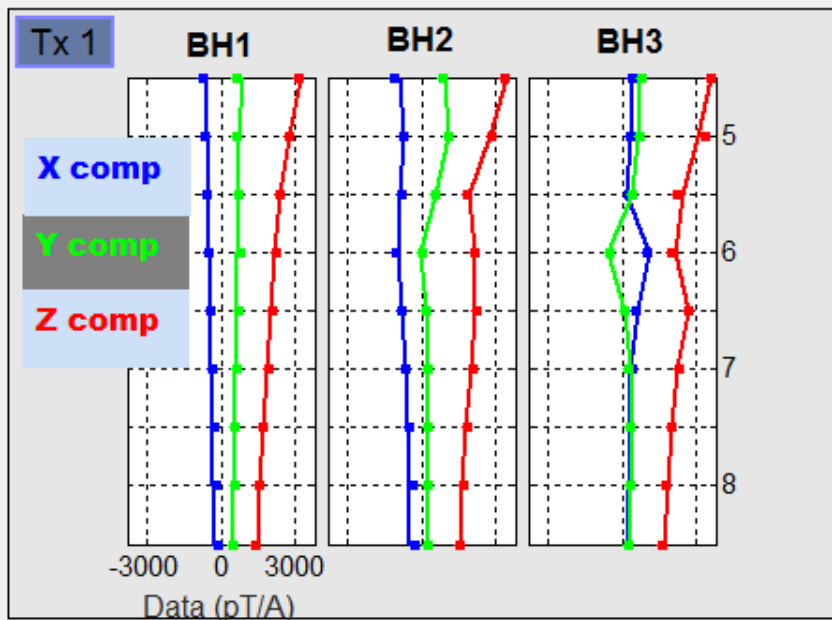
Rostock, Hartestrasse-27.dat

$z_{\text{est}} = 5.43, 5.95 \text{ m}$

(4/5) Dipole+background model
Channel 15 (2.05 ms)



Reference:
GP 500 UK



MMG-LXML Sepon, Laos PDR

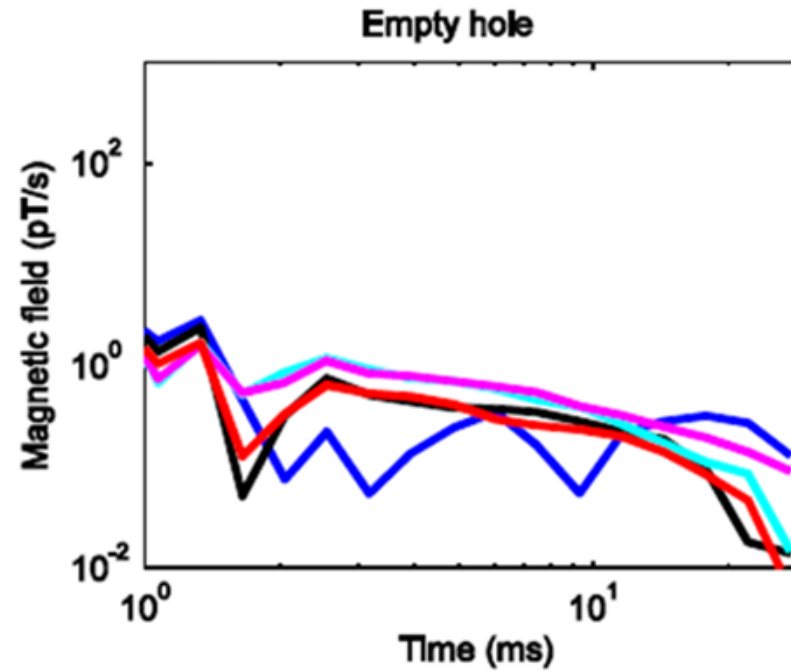
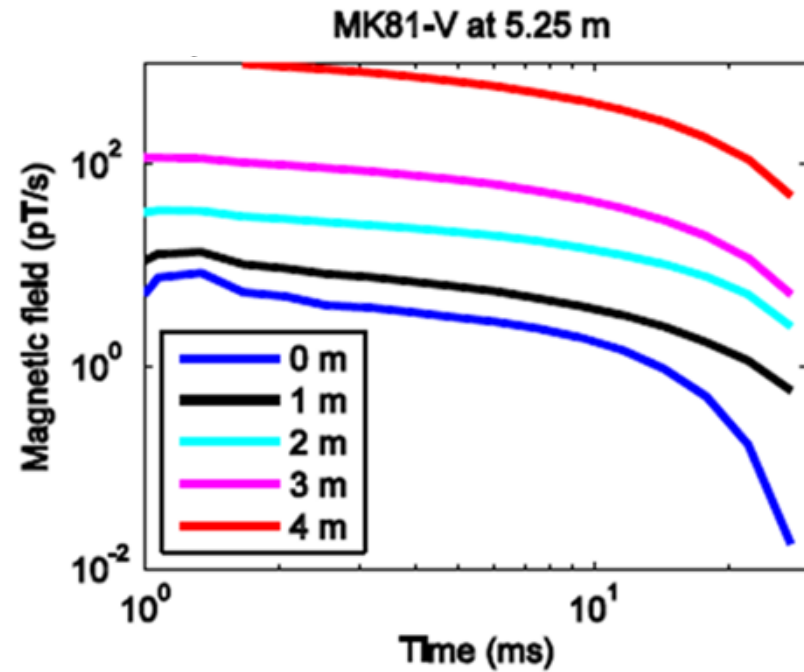
UltraTEM-Fluxgate B-field borehole bomb detection



The LXML/MMG copper mine site, located on the former Ho Chi Minh Trail, is contaminated with UXO. The UltraTEM-Fluxgate borehole system supports the ore-grade drilling program.

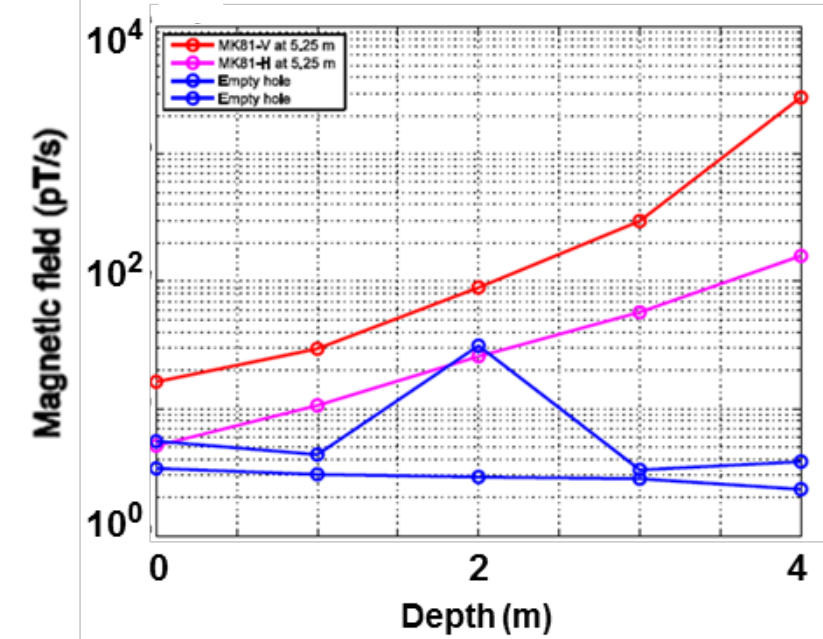
MMG-LXML Sepon, Laos PDR

UltraTEM-Fluxgate B-field borehole bomb detection



Time-decay curves for borehole fluxgate measurements at different depths:

Left: a borehole with UXO below
Right: an "empty" borehole



Amplitude of vertical component data:

Amplitude increases with depth for two holes above UXO (red/pink); no trend for 'empty' holes (blue)

Wafi-Golpu Project, PNG



UltraTEM man-carried moving loop survey

114 areas along a proposed pipeline development to be deemed clear of
UXO to a depth of 3m.
2 x 2m moving loop system deployed



Wafi-Golpu Project, PNG



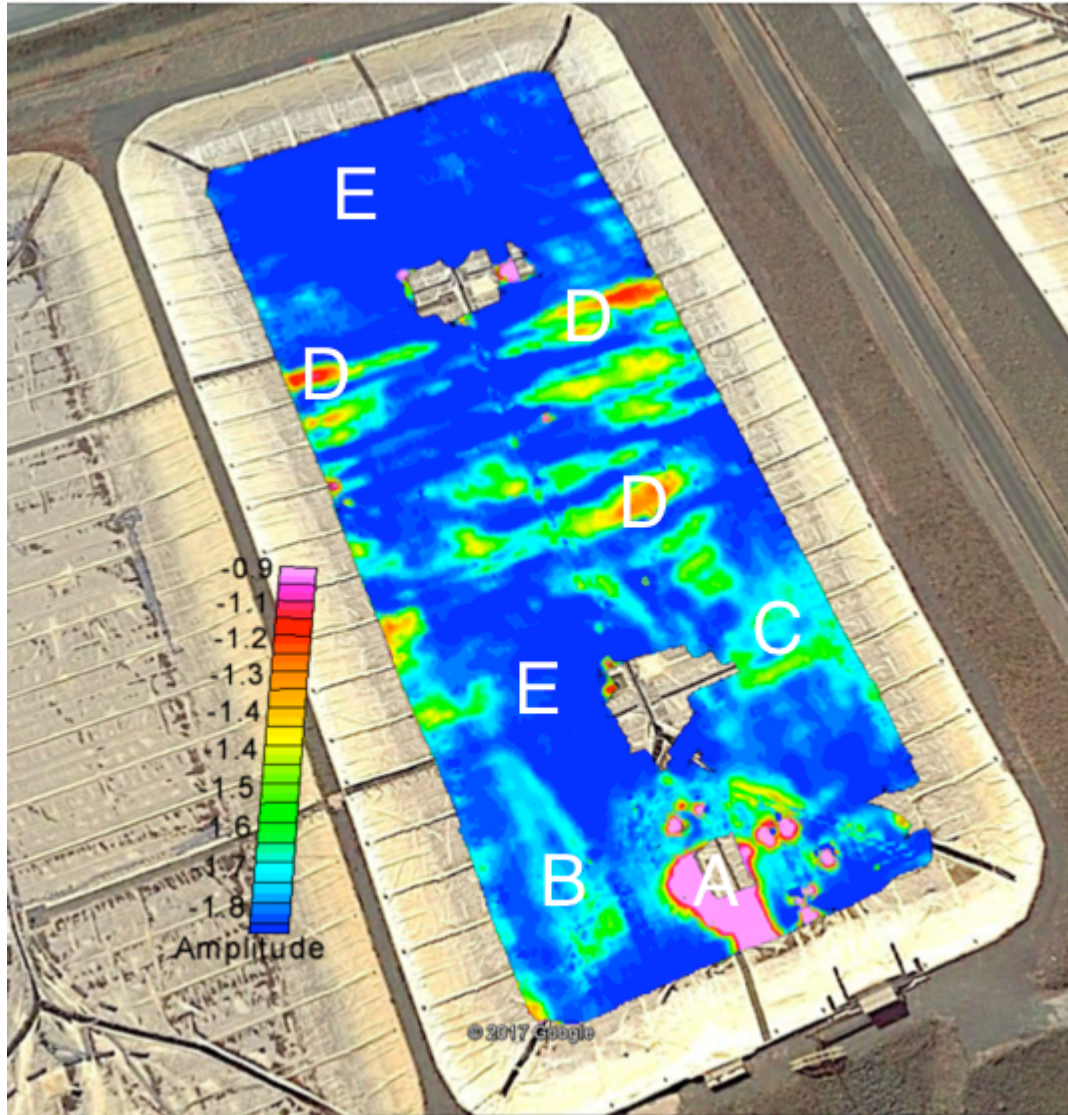
UltraTEM moving-loop UXO detection

Preliminary processing completed while on site
using BTField

Gladstone caustic soda bladder



UltraTEM Pushcart survey



Trial conductivity survey for remnant caustic solution underneath a large storage bladder.

Williamstown RAAF Airbase



UltraTEM Pushcart UXO survey



1.4Ha UltraTEM II survey. Targets of interest down to 30mm round at 30cm.

Recovered items included 30mm chain link, 50 calibre casings, 20mm rounds and primers.

Buried services clearly located for the client.