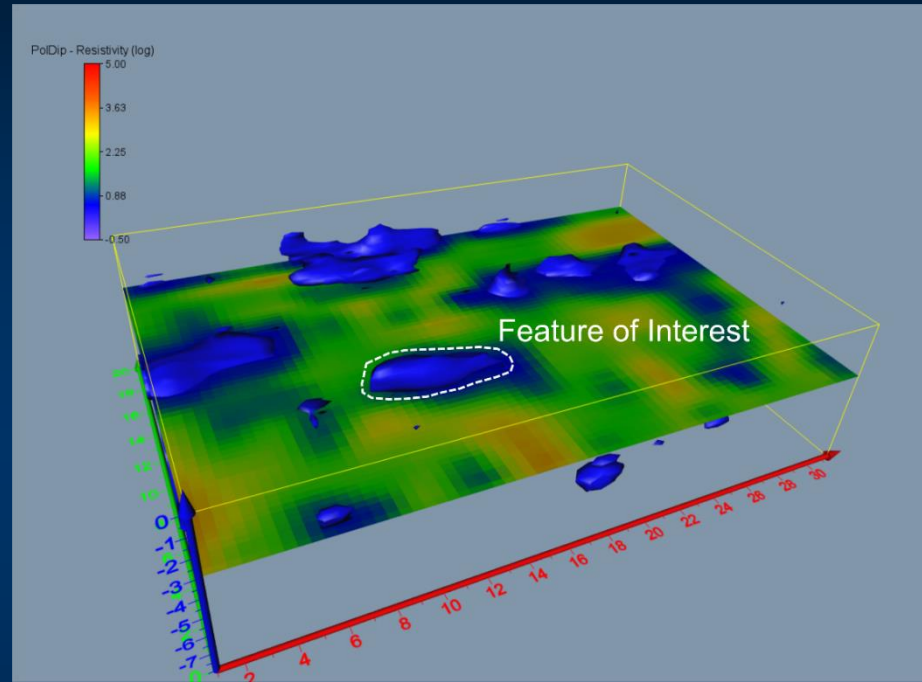


Forensic Applications of Electrical Resistivity Tomography: Lessons from the Beaumont Investigation



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The “Beaumont Children” Case

- Jane, Grant and Arnna Beaumont disappeared from the beach at Glenelg, South Australia, on 26 January 1966
- Children have never been found despite the largest criminal investigation in Australia’s history with more than 100 suspects
- Considered a pivotal moment in Australia’s social history
- Still subject to a \$1 million reward and the focus of great public interest



Alleged Involvement of Harry Phipps

- Prominent Adelaide businessman and owner of New Castalloy factory
- Lived near Glenelg beach and matched description of man seen with children on the day of their disappearance
- Subsequently accused by son of killing the Beaumont children
- Approached the Harkin brothers to dig hole on factory site the day after Beaumont children disappeared



The Castalloy Site

- Still active factory (now making motorcycle wheels) in Adelaide
- Extensive anthropogenic modification since 1966
- Area of interest is not covered by buildings but has had extensive fill added to elevate the site above flooding
- Previously investigated using GPR and excavation but examination of aerial photographs shows the wrong site was dug



Methodology

- 20 x 31.5 survey grid over area of interest
- 1m spaced GPR profiles with Mala X3M 500Mhz antenna
- 1m spaced ERT profiles with 0.5m electrode spacing with ZZ FlashRES 64 collecting Pole-Dipole and Dipole-Dipole arrays
- Positioning with Leica RTK and robotic total station



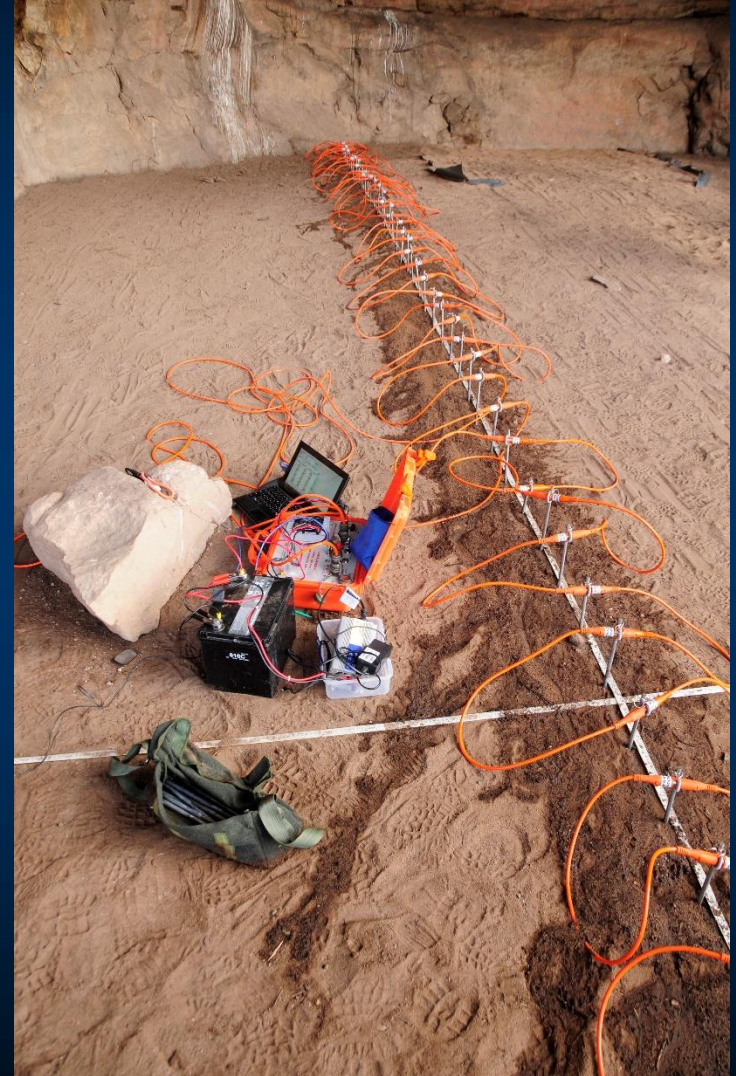
Ground Penetrating Radar (GPR)

- Measures dielectric permittivity (conductivity) of the subsurface
- Detects many forensic and geological features
- Produces 2D or 3D data
- Processing intensive but produces high value data



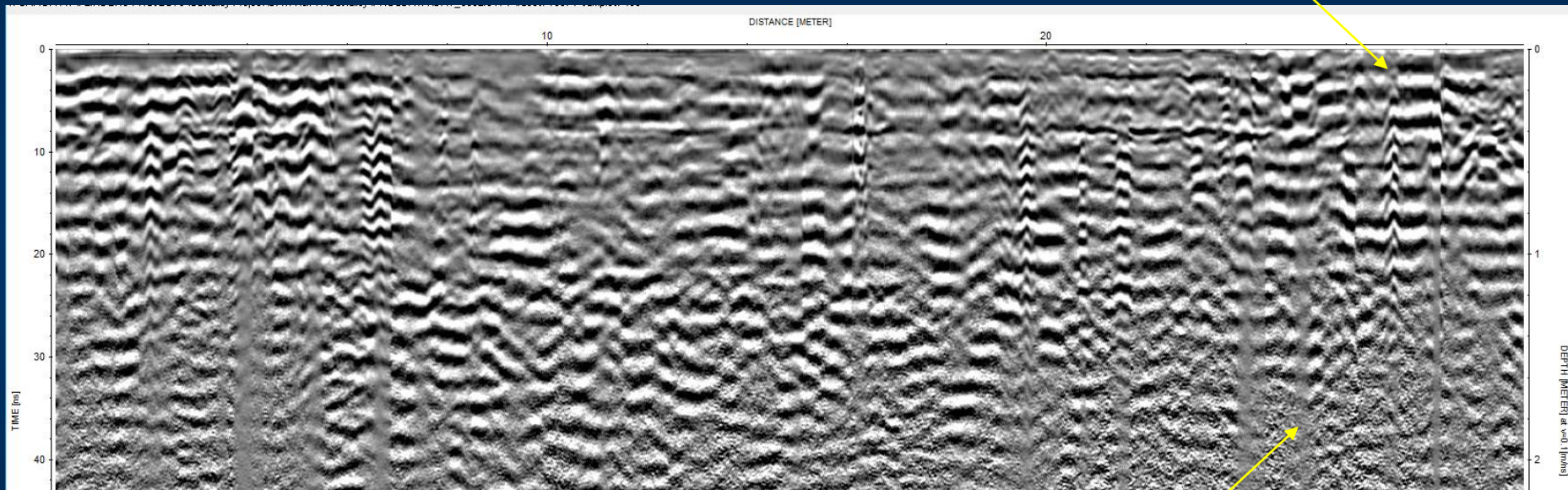
Electrical Resistivity Tomography (ERT)

- Measures resistivity of the subsurface
- Detects some forensic and geological features
- Produces 2D or 3D data
- Slow and labor intensive to collect but excellent for sites where depth is a problem for GPR



GPR Results (Line 1)

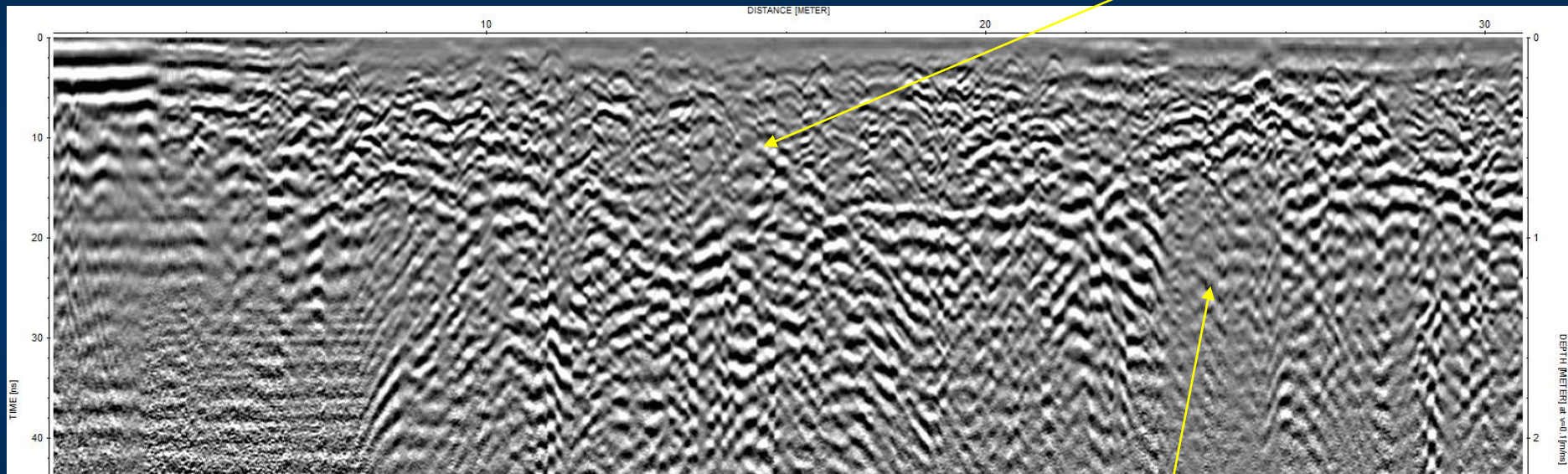
Lots of Services



Signal Attenuation at Depth

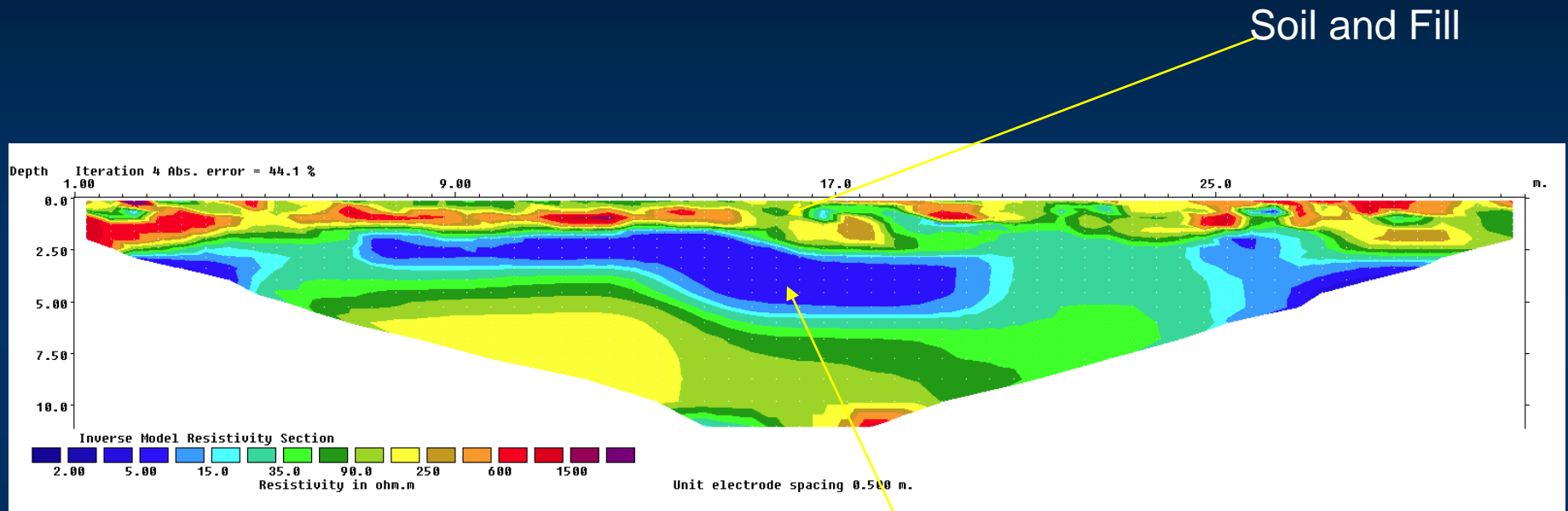
GPR Results (Line 20)

Extensive, very disturbed, fill

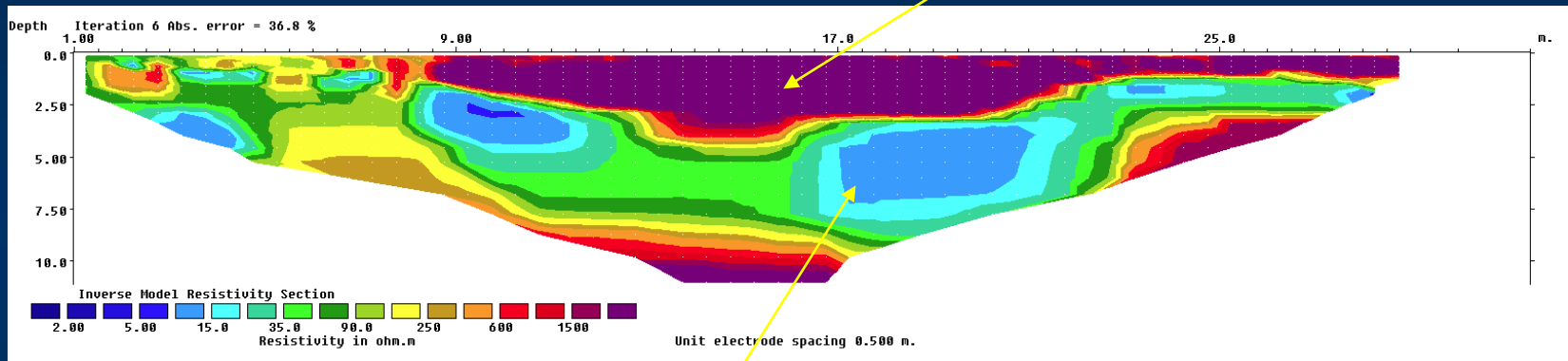


Soil Disturbance

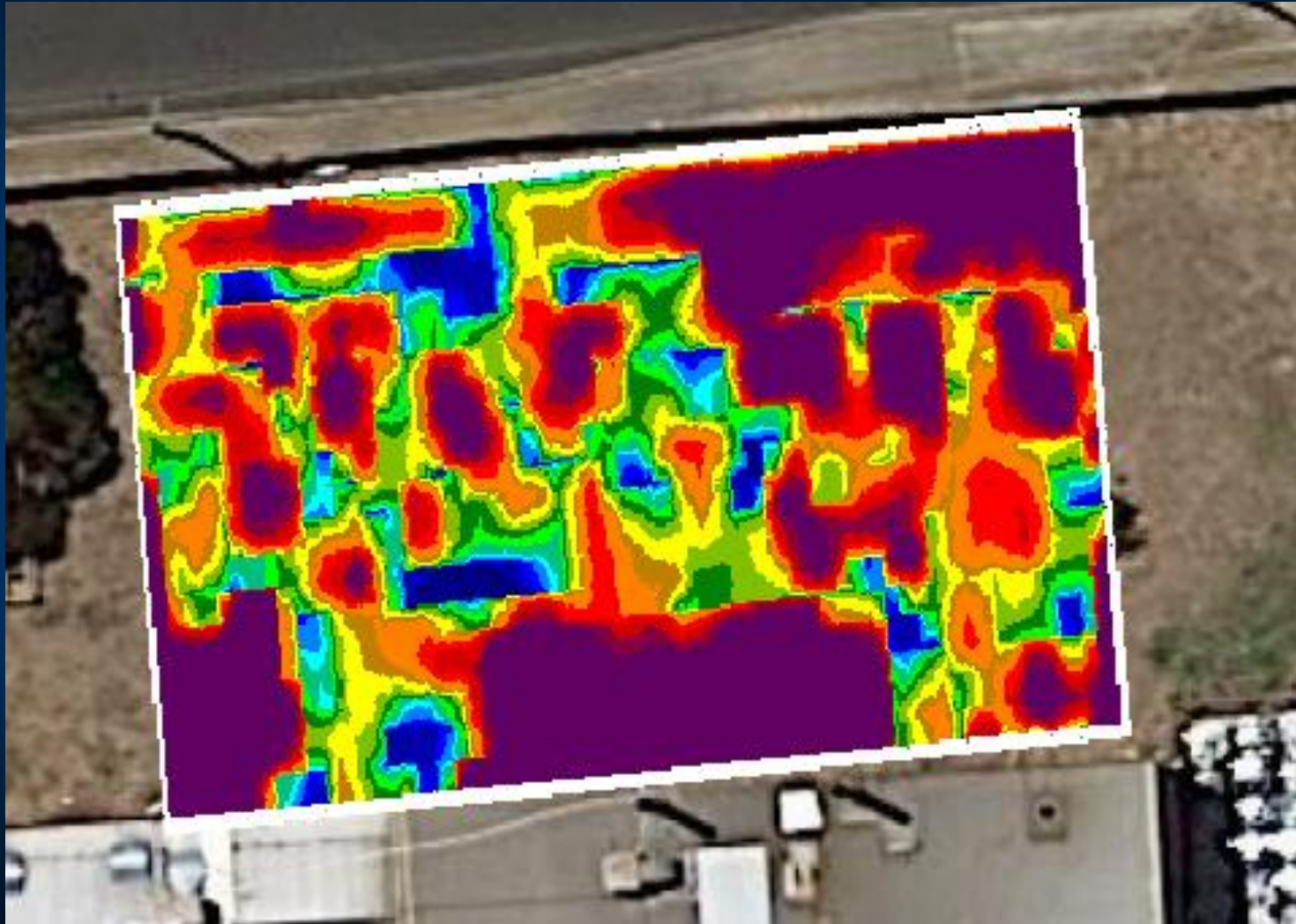
ERT Results (Line 1)



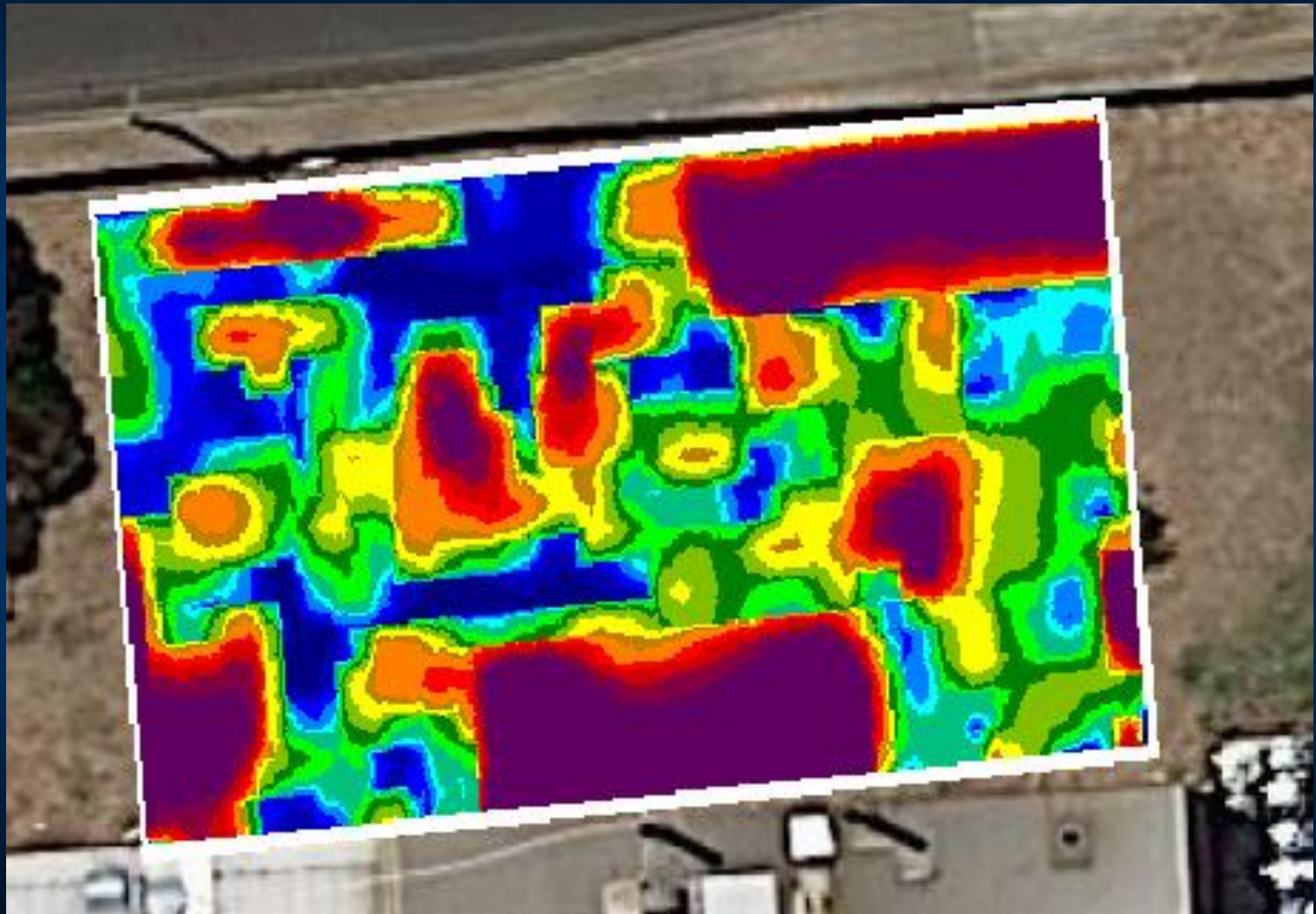
ERT Results (Line 21)



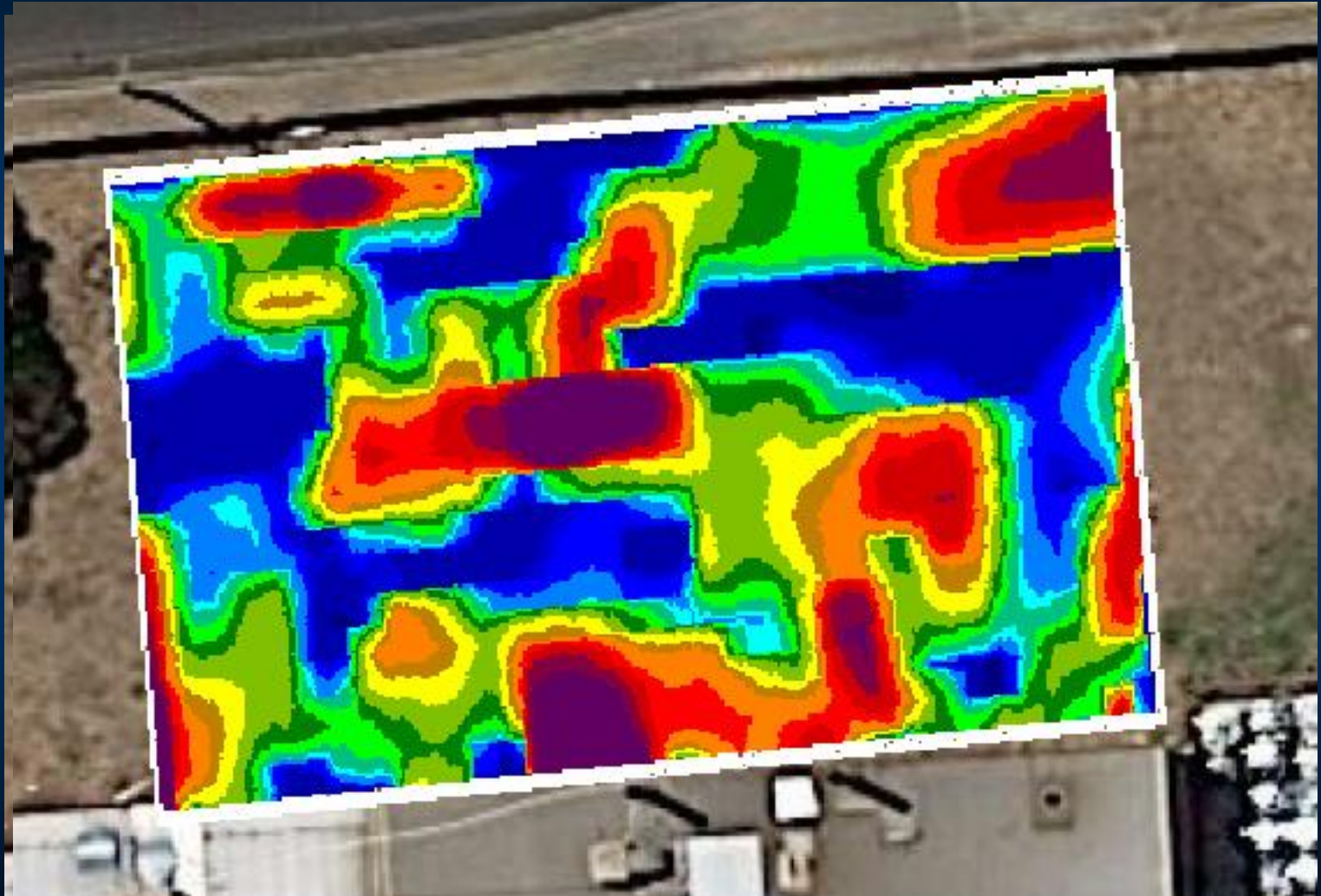
ERT Results (1.25-1.5m depth)



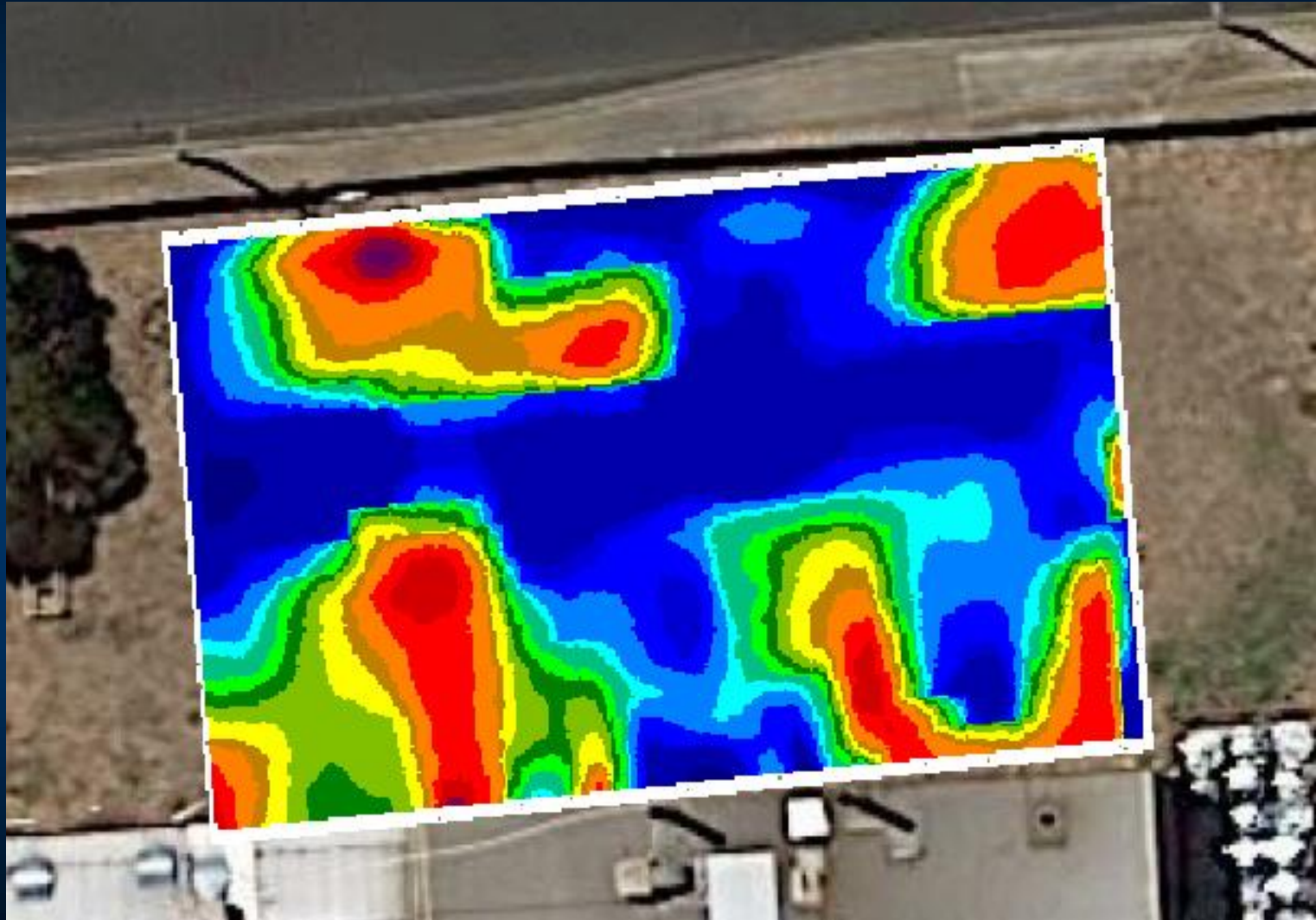
ERT Results (1.75-2m depth)



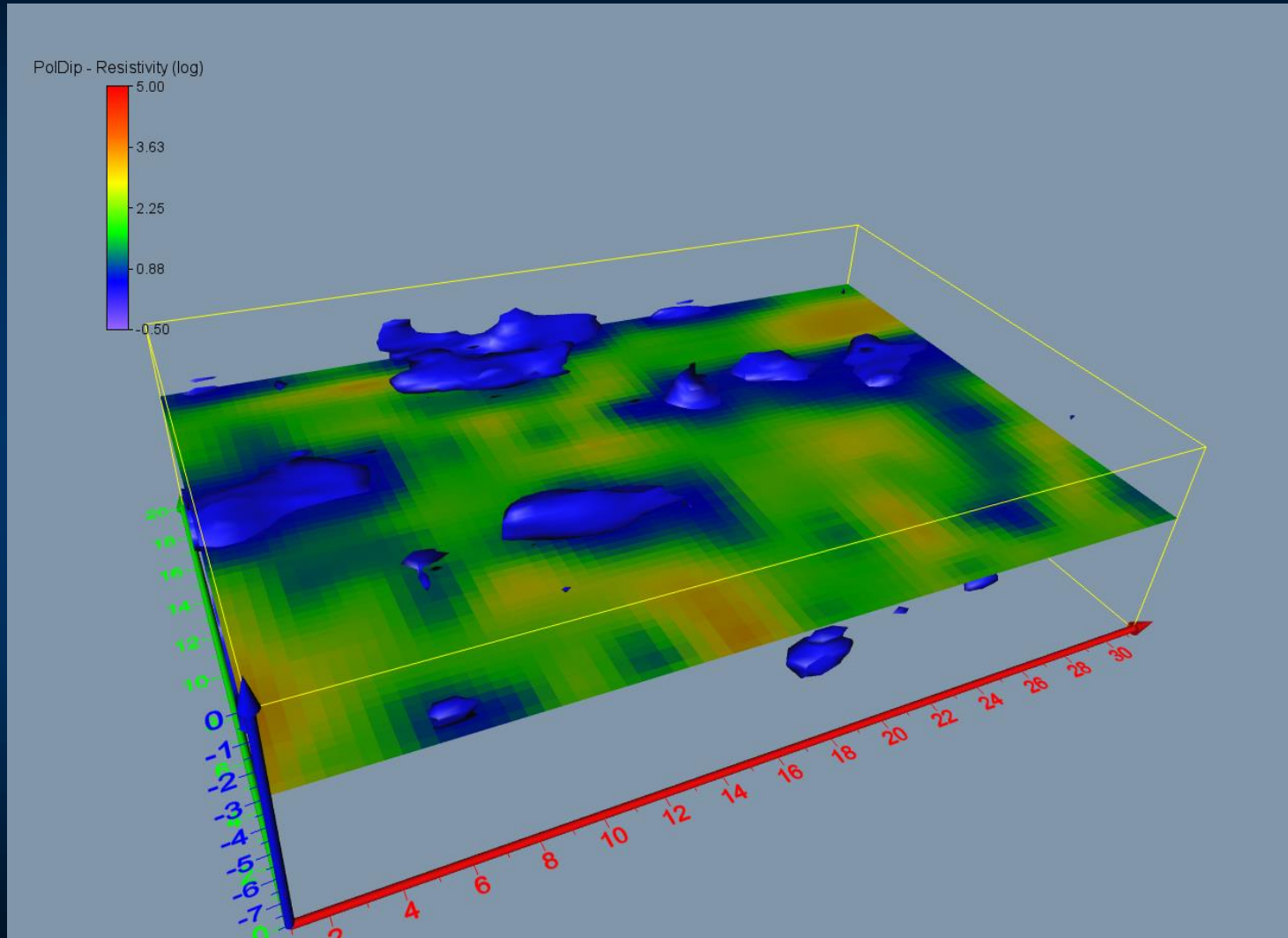
ERT Results (2.5-3m depth)



ERT Results (3.5-4m depth)

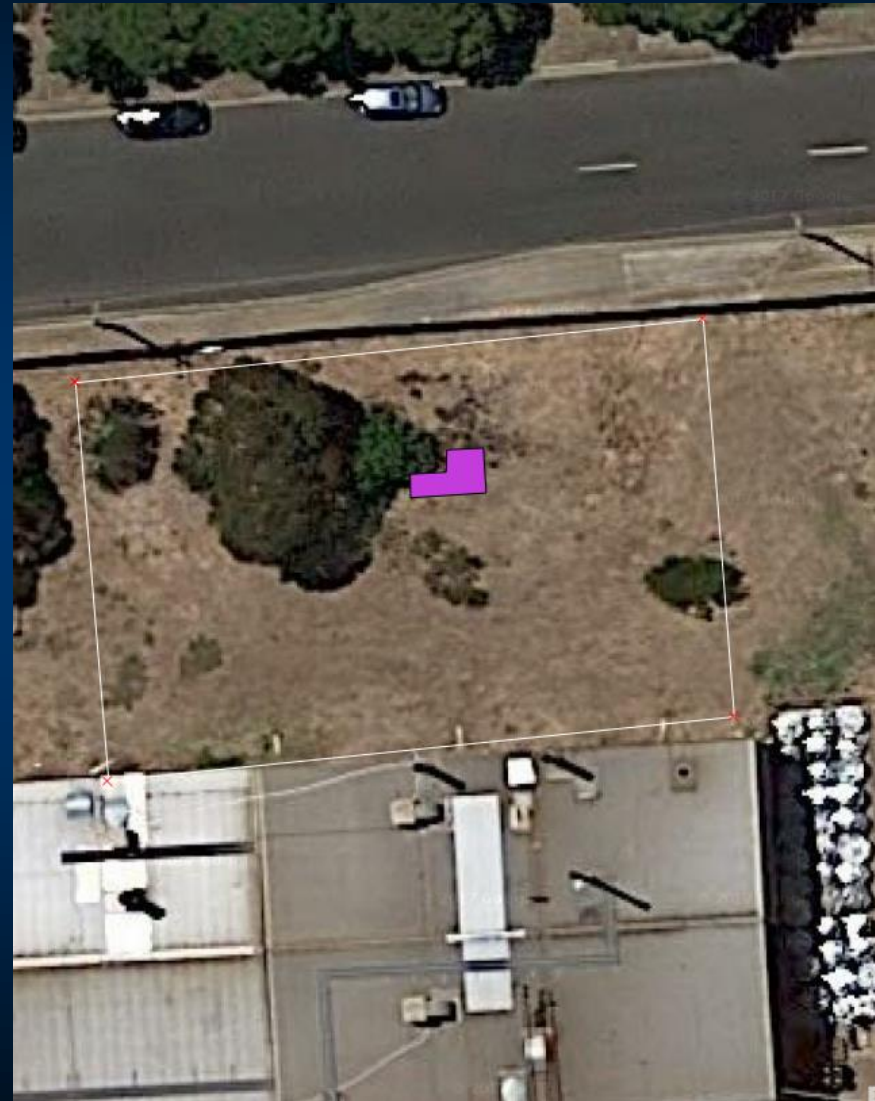


ERT Results in 3D



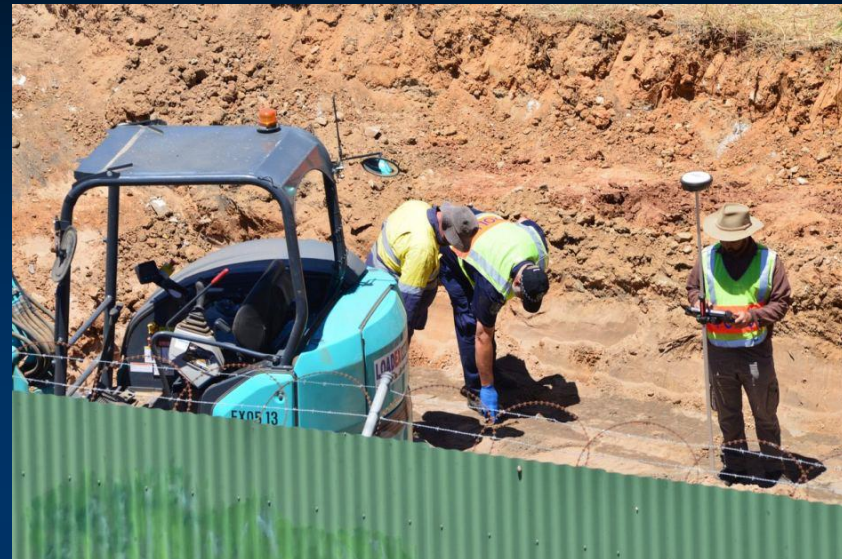
Excavation Recommendation

- Conductive anomaly with one area of ~ 1.9 - ~ 1.1 m and another of ~ 1.8 x ~ 2.2 m was identified based on depth, shape and position on site.
- Anomaly had a larger than expected resistivity contrast from the background value compared to modelling but still of interest.
- Leaked to media who responded in a non-sensational and responsible fashion.....



Excavation Results

- Feature was a moist, organic rich, pit containing some bone and domestic rubbish
- ERT exactly identified the dimensions of feature
- Disappointing results in terms of Beaumont case but “technical success” in terms of showcasing ERT method



Questions?

