

GBG Australia

UST Investigations

RTA

GHD Pty Ltd

DPWS(NSW)

Ground Water Technologies

Landfill Location

Egis Consulting

Baulkham Hills Council

Ordinance/Waste Location

Department of Defense

State Rail Authority

Utility Location

SACL

Department of Defense

Tract Consulting

Various Local Councils

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applications for

GEOPHYSICAL TECHNIQUES

A number of geophysical methods are now available to provide a means of non-invasive, non-destructive investigation of the physical and chemical nature of the subsurface. These types of techniques may be included in many site investigations where powerful and cost-effective investigation can enable well informed decision making.

LANDFILLS

Location of buried landfill sites

Detection and mapping of leachate migration from landfill sites

Void and cavity detection

MINEWORKINGS

Location of buried historical shafts and adits

Determination of void infill

Determination of groundwater levels

Location of tip and fill zones in the subsurface

Determination of spoil- tip structure

CONTAMINATED SITES

Location and mapping of water table

Location of buried drums and UST's

Determination of depth to bedrock

WATER AND SEWAGE INFRASTRUCTURE

Utility location

Determination of concrete/masonry integrity and thickness within pipes

Location of voids around pipes (Stormwater / Sewer)

Location of dam and revetment leakage

Determination of geotechnical conditions

Location of voids under reservoirs / bunds

MISCELLANEOUS

Archeological investigations

Mapping of aggregate resources

Location of buried foundations / slabs etc.

Risk assessment for site demolition

Forensic investigations



Shallow Geophysics for

ENVIRONMENTAL ASSESSMENT



GBG Australia

GBG Australia specialise in applying shallow geophysical investigation techniques for assessment of environmental sites. We offer our clients innovative methods of revealing subsurface information over large areas whilst minimizing both costs and disturbances on the site.

Company Expertise

GBG Australia is a subsidiary of one of the United Kingdoms foremost non destructive investigation companies – GBG UK Ltd. The UK partner has pioneered the application of shallow geophysical techniques to the precision investigation environmental sites and engineered structures in the UK, Europe and the USA since 1982. GBG Australia staff originally ran the CMP-GBG Joint Venture with CMPS&F and GHD for the last 10years, GBG Australia is now an Independent consultant company and the Australian office of GBG UK.

Our office is based in Sydney N.S.W. from where we undertake investigations across Australia and South East Asia for Federal, State and Local government bodies as well as private companies and asset owners.

range of

GEOPHYSICAL SERVICES

EM SYSTEMS FOR ENVIROMENTAL SITE INVESTIGATION

EM31 Ground Conductivity



EM31

This investigation site was an old landfill site owned and maintained by a local authority. The council wished to assess the feasibility of development on the old landfill site. As part of the assessment the Southern boundary of the landfill with the local lithology needed to be delineated. The extent of the area in which this boundary may occur was some 380m x 80m. This could have been achieved by test pitting but it would have entailed numerous pits in this area which would have: disturbed the landfill (breaking the capping layer), been both time consuming and expensive, and inconvenienced the present tenants of the site. Therefore decision was undertaken to carry out a shallow geophysical investigation using an EM31 ground conductivity system. A technique that has been use successfully both here and abroad for similar investigations.

Methodology

The data was collected by continuous sampling along parallel North – South transects. The system was used in the vertical dipole mode which gives an estimated investigation depth of 6m. The data was collected on a digital data logger and location reference was by fiducial markers set out on a 10m grid. The entire area was profiled in 1 day.

Analysis was carried out and the results sent to a contour presentation software package such as Geosoft or Surfer. Using the contour package, plots of the Quadrature phase and In phase results were printed out and then inserted into a scaled CAD plan of the investigation site.

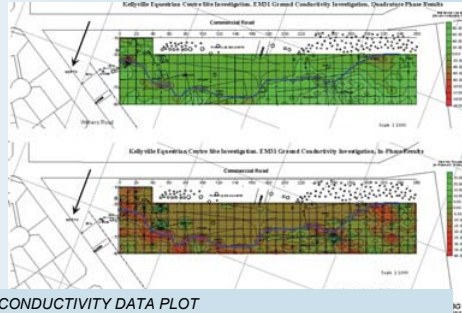
Results



TYPICAL WASTE MATERIAL FOUND BURIED BENEATH SITE

The plot shows a clear boundary (marked by a thick blue line) between the landfill and the local lithology. It is more distinct in the in phase response indicating reasonable quantities of buried metal or conductive material which stops abruptly in the plot. These results were then ground truthed by limited trenching during a small program of physical investigation work carried out on the site.

CONDUCTIVITY DATA PLOT



EM61 TIME DOMAIN METAL DETECTION



EM61 IN USE

This investigation site was an area of fill material approximately 2 Ha in size, located adjacent to an old industrial plastics manufacturing plant. The site was already undergoing remediation for proposed development, when an excavation stumbled upon a buried 44 Gallon drum containing organic chemical resins. In order to limit the variation and extent of further remediation there was a requirement to utilise a quick, effective and accurate technique to locate any further buried drums in the large area of fill material.

Methodology

The EM61 time domain metal detector can detect both ferrous and non ferrous metallic objects to a depth of 3-4 m. The method works by inducing a pulse of electromagnetic energy into the ground and measuring the resultant decay times of eddy currents between pulses. It will take longer for eddy currents to decay in metallic objects than the surrounding ground.

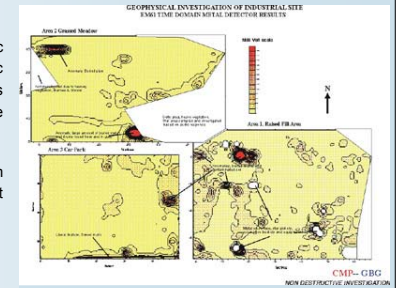
The site was split into 3 areas, each area was then traversed in one direction at 1 m centers. The collected data is logged automatically with a trigger chainage at approximately 200mm centers. Data collection on site was completed in 1.5 days.



EXCAVATED DRUMS AND RESIN

Results

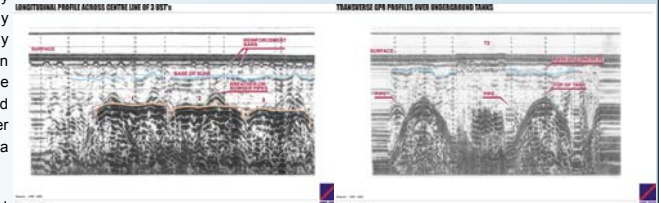
The collected data was processed then output to a contouring package such as Geosoft or Surfer. The resultant contour plot of the site can generally be ready within 3-4 hours of completion of the data collection. The contour plot indicates variations in recorded millivoltage across the site, generally caused by metallic objects. Excavation of plotted anomalies revealed a further 20 drums buried along with resin on the site.



CONTOUR PLOT OF EM61 RESULTS

GROUND PENETRATING RADAR FOR UST LOCATION

Ground penetrating radar or GPR is a relatively new shallow geophysical technique that has only recently become both a popular and commercially available method for Geotechnical and Non Destructive applications. GBG Australia utilise this technique widely in both engineering and environmental applications and have found over the last 18 years of investigation that it is both a versatile and useful tool.



TWO DATA PROFILES THAT ARE CLASSC EXAMPLES OF THE REFLECTION EXPECTED FROM LARGE METAL UST'S UNDER A REINFORCED CONCRETE SLAB PAVEMENT

One application that GPR appears ideally suited for is the location of underground storage tanks (UST's). Many sites suspected of containing UST's contain large amounts of "cultural clutter" such as: power lines, steel structures, reinforced concrete and, in the case of service stations probably traffic!! This can make detection with more traditional geophysical methods impossible. GPR is generally not effected by this clutter and the reinforcement in a slab has to very dense to completely negate its use. It also has the added advantage of being able to detect metallic and non metallic tanks.

Generally GPR is used to profile a site to a depth of 1-2 m. The investigation can provide the information quickly, often without the need for post processing, thus enabling the tank locations to be marked on site. The results can also be plotted from the profiles on a plan view of the site for presentation in reports or tender documents. The plan of the site is normally presented in CAD in a readily understandable format.

The investigation can generally be tailored to a site or budget requirement and are dependant on; location of the site, size of area to be investigated, type of presentation requirement.

Limitations:

- Heavy clay or conductive soils can limit the depth of penetration and resolution of the GPR systems.
- Very dense reinforcement will limit the depth of penetration and resolution of the GPR systems.
- Contamination of soils surrounding tanks can effect the resolution of subsurface detail (although this may in itself be useful information).



GPR EQUIPMENT