

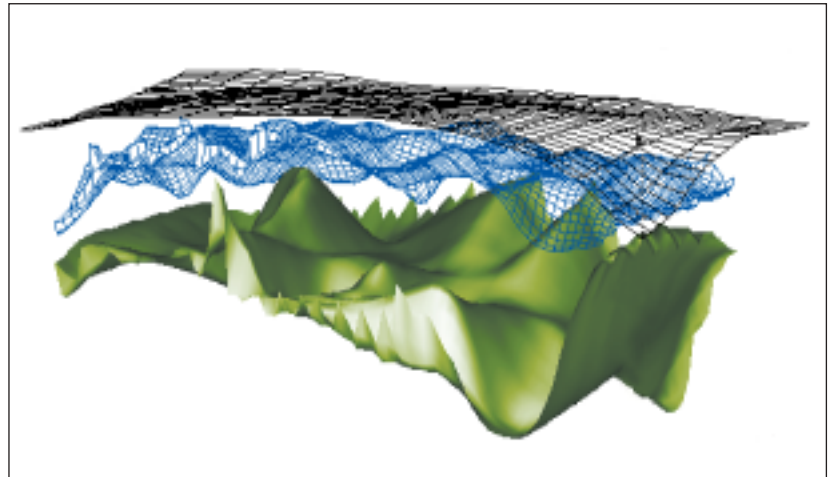
# LANDFILL

## DEFINING UNKNOWN PROBLEMS

Accurate delineation of landfill geometry, site edges and buried features can provide vital data for responsible site management, remedial work, reclamation and environmental compliance. Zetica's use of an array of surface, airborne and satellite scanning techniques provides key information for detailed interpolation to reveal the subsurface environment.

This can disclose important boundaries between waste material, fluid migration pathways, hot spots caused by methane generation, leachate seepage, compaction levels, and ferrous and radioactive deposits. Hydrogeological information – on fracture systems and groundwater table topography – can also be disclosed that may affect landfill construction.

As part of construction quality assurance (CQA), Zetica also confirms the integrity of geomembranes to regulatory requirements. As statutory standards for landfill control become increasingly stringent, swift, cost-effective and accurate environmental monitoring is proving to be a highly effective tool for ensuring legal compliance.



Zetica's assessment of leachate geometry at a landfill enabled the accurate containment and remediation of contamination at source. The base and surface of the leachate are indicated by green and blue layers. The ground surface is in black

### BOUNDARY LIMITS

Zetica accurately defined the boundary between landfill material, a pulverised fly ash (PFA) lining and quaternary gravels in a large site in the south of England. The survey also showed areas of leachate saturation and off-site leachate migration.

As a result, a cut-off wall was positioned around the site to contain the movement of site material. Geophysical profiles and soundings were integrated with conventional, site-perimeter borehole data to provide a total picture of the landfill's performance.

By processing data on-site, Zetica ensured immediate quality control of survey results. This significantly reduced turnaround time between field work and the interpolation of results, putting important decision-making information at the client's disposal in real time.

### NON-INTRUSIVE GEOMEMBRANE SCREENING

Detailed electrical profiling of a geomembrane in Northern Ireland recently identified the location of holes less than 5 mm in diameter to an accuracy of 40 cm. A wet-layers survey was also included. Zetica's techniques are highly effective in detecting leaks in both uncovered membranes and those protected by soil.

By combining conventional CQA and leak surveys, Zetica provided both the operator and regulator with proof of engineering containment. This approach enables membrane integrity to be monitored throughout site active lifetime and beyond.



The subsurface environment: fluid migration pathways, methane hotspots and potentially hazardous deposits may be hidden beneath a typical landfill site

## A GLOBAL PROFILE

Zetica has extensive UK, European and global experience, working wherever an informed understanding of the sub-site environment supports engineering improvement and investment work.

Successfully completed projects include:

- Greenwich Millennium Village – mapping buried foundations and evidence of disturbed ground
- A55 Anglesey – detailed mapping of depth to bedrock, bedrock rippability and voids on proposed road route
- M20, Kent – locating subsurface channel cross-cutting motorway and shallow voids
- Manchester – detailed mapping of edges of closed landfill, base of landfill and thickness of saturated leachate layer
- Newcastle – mapping buried foundations, contamination and unexploded ordnance on former power station site
- Cork, Ireland – mapping services on ring road for road developments as well as depth to bedrock and evidence of sinkholes in tunnel landfall area
- USAF/RAF bases, UK – detection of buried pits, unexploded ordnance and mapping of buried services
- Copenhagen, Denmark – detailed detection of unexploded ordnance on naval firing range prior to large-scale property development
- Projects in Europe, North America, South America, Africa and Asia

**Selected clients include:**

**Shell Global Solutions**

**BAE Systems**

**WSP Engineering**

**Royal Air Force**

**Defence Estates**

**Taylor Woodrow plc**

**AEA Technology plc**

**British Airways Authorities**

**Norwest Holst Soil Engineering**

**Dragon Mineral Resources**

**BHP Mineral Exploration**

**Environmental consultancies**

**Engineering consultancies**

**Local authorities**



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