

**Q** Please outline the scope of subsurface investigation services that Zetica offers for drill sites



Zetica offers a one-stop shop for clients who require accurate identification and mapping of above and below-ground features. We offer a full range of services, from non-intrusive elements such as desk studies, topographic and geophysical surveys through to more intrusive investigations involving boreholes and trial pits. The more intrusive aspects tend to be carried out by our clients, but if required we can provide the whole scope of services.

**Q** Where are your main markets for these services?

We have a range of client types, from multinational firms to independent construction companies. Most are engineering or drilling contractors/consultants in the UK who require surveys as part of infrastructure or development projects. They need a better idea of what to expect before they start drilling operations.

We also provide services on a worldwide basis and have found that many of our clients abroad tend to be large construction companies, utility providers or infrastructure companies that require more specialist

# The importance of being

Carly Lovejoy speaks to Mike Sainsbury, managing director of Zetica, on the market for subsurface site investigation services in the UK and abroad

services such as UXO (unexploded ordnance) assessments, engineering geophysical surveys or tracing of important underground infrastructure such as pipelines.

We have found that the stakeholders of large infrastructure or proposed development projects are proactive in identifying potential risks as part of due diligence exercises. They are also interested in an accurate asset plan of above and below-ground features. A lot of the international work that we do is at the request of UK consultants or companies that know us well, and have a particular issue they want assistance with.

**Q** How does the nature of the survey undertaken differ, depending on the type of drilling used and the location of the drill site? What sort of factors must be taken into account?

Often, the type of drilling that will be used will not affect the type of survey required, but it is often an indicator of the anticipated ground conditions at the site. When considering the most appropriate survey

technique, we have to consider the target and the anticipated ground conditions. Many investigation companies do not do this; they would use the same approach to surveying a brownfield site as a greenfield site and expect to get the same results.

In practice the interference from background noise (such as from made ground) will reduce the effectiveness of the survey and make it more likely that the target is missed.

For example: non-intrusive surface-based surveying techniques might be viable for greenfield projects, but brownfield sites will often require more intrusive techniques such as probing or ground access. For brownfield sites, it is particularly important to use a spectrum of survey tools and techniques that have been selected to give the best possible image of the conditions underground, as a feature which might be missed by one technique could be picked up by another.

It will also give the client much better confidence in the results obtained. Zetica's Ground Check service is especially good for sites where a range of techniques might be needed as it combines desk

# Prepared

study information, with above and below-ground 3D site-mapping techniques, and targeted ground investigation services. We see the verification of survey results post-project as vital.

## Q How has the use of site surveys grown in the UK market and what are the risks posed by not implementing them?

The use of non-intrusive surveys has improved over the last few years, especially for buried hazards such as utility services. Some drilling contractors come to us just needing a borehole position cleared. However, thorough site surveys can save clients money in the long term, reducing the number of disruptions to drilling, and protecting the health and safety of employees. Some smarter contractors will use non-intrusive geophysical survey techniques to reduce the number of exploratory points required, which can lower the cost of drilling services needed. However, this is relatively rare and if this does happen it is usually because their clients have requested it.

We are now seeing much greater awareness as to the hazards posed by UXO and UXBs (unexploded bombs), and many contractors will ask clients if an appropriate survey has been performed before arriving on site. Presumably, there are still some drilling projects that go ahead without the use of subsurface site surveys though, which is extremely risky.



A 500kg UXB, detected and removed by Zetica

## Q In your opinion, what is the value of a proper subsurface survey to a drilling contractor? How do the benefits and costs weigh up?

The aim of a survey is to create a better understanding of buried hazards across a site and what the contractor might encounter when drilling there, which is invaluable really. A non-intrusive survey gives them a good idea of what lies beneath the surface and reduces the likelihood of any surprises later on.

Things such as UXOs, utility services, underground storage tanks or poor ground conditions, which have not been anticipated and designed around, can not only cause costly delays and, in some cases, the need for a project redesign, but they can also pose a huge risk to the safety of workers on site. Unlike excavating, you cannot see what you are drilling through until it's too late, so it is very important to be prepared.

A survey might seem like an added expensive initially, but the results always pay off for all parties – properly targeted boreholes, based on measured changes in subsurface conditions and safer drilling.



Unexploded WWII bombs are frequently found in the UK – the MOD disposes of a couple each month

## Q How often are UXBs found on drilling/ construction sites in the UK and abroad? What is the scale of this problem?

This question was asked during our involvement with a CIRIA (construction industry research and information association) guidance group, which was responsible for the new guidance for UXO. We collated information on the number of UXOs encountered during surveying. Over a two-year period, Zetica and the other company had detected over 15,000 ordnance items! There are also a large number that are discovered each year by other companies and the authorities, so you can see that they are a fairly common occurrence.

Obviously, concentrations are higher in certain areas, particularly greater metropolitan areas, ports and military sites. Unexploded WWII bombs are frequently found around the UK, with the MoD estimating that it disposes of a couple each month. There is much better awareness now among contractors when it comes to UXOs and UXBs.

Zetica's UXB risk maps, which are free from our website, are often the first port of call when a company is looking to understand whether a site has →

a UXB risk. Zetica also has other online tools, such as a UXB risk probability calculator and a bomb-depth calculator, to help clients assess the need for a further, in-depth desk study.

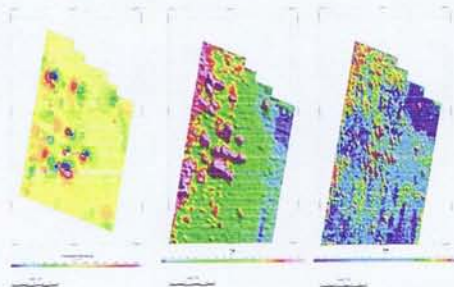
## Q What can Zetica do to help minimise the risk posed by UXBs to both contractors and drilling operations?

To begin with, we would carry out a detailed risk assessment of the site in question. Once a thorough desk study is complete the client will have a much better understanding of the level of risk involved with drilling across different areas of the site, and the options available to them going forward.

There is currently a big issue in the UK site investigation industry with desk studies conducted by companies who primarily do UXO removal. I have seen three studies recently on which clients have asked us for a second opinion.

Despite the site coming back clear on the desk surveys, the investigation companies have deemed them high-to-moderate risk and recommended further intrusive work. If you are able to conclude that a site was not bombed, surely it should be deemed low risk?

Zetica does not rely on follow-on work for income, and has a reputation for providing objective and unbiased desk surveys. We have worked with many of our customers on multiple projects and believe this is testimony of their satisfaction. If a significant UXB risk is identified, Zetica can tailor its range of risk mitigation services according to the proposed works,



*UXO Survey results (grids from left): magnetometer; electromagnetic coarse; electromagnetic fine course*

site conditions and the client's risk tolerance. We can provide basic options such as a toolbox talk on the detection and clearance of any UXO.

The most common approaches used to mitigate UXB risk for drilling are MagCone and MagDrill. MagCone is a CPT (cone penetration test)-based technique, which uses a magnetometer in the cone tip to detect ferrous metallic objects. The limitation with this technology is that in dense strata, such as gravel, the cone cannot be pushed deep enough. On average, a large bomb such as a 500kg could penetrate up to 6m into gravel, whereas the MagCone system cannot.

In this situation, we advise the use of the MagDrill-based systems that utilise drilling-based techniques to advance the magnetometer into the ground. We are aware that some companies still use a MagCone-type technique in gravel and push the probe as far as they can (maybe only 1-2m) and

then clear the location anyway. This is potentially very dangerous.

In the next month we are planning to launch an online map of London, identifying areas where MagCone and MagDrill are more appropriately used. This will help contractors ensure they are getting the most appropriate service, regardless of which surveying company they choose.

In other situations, such as on military land, our approach might be slightly different. A wide range of UXO might be expected, including ordnances made from ferrous and/or non-ferrous materials. As a magnetometer will not detect non-ferrous objects, an electromagnetic technique is used instead. It is vital for surveying companies to understand what they are searching for, as using the wrong technique could mean that UXOs will be missed.

An example that shows this is a small investigation of a 30x30m site that had originally been cleared by another UXO specialist using a magnetometer. We used an electromagnetic technique and found 1,200 pieces of ordnance that had not been detected.

## Q Could you give some recent examples of how these techniques and technologies have been applied at drill sites?

We recently completed a contract in Beckton, east London, where we cleared 400 borehole and piling positions using the MagCone system. Another advantage for our client was the early indication of in-ground obstructions, which were identified, and would have affected other, later piling operations.

**Q Currently, what is the general attitude of drilling companies towards the use of subsurface site assessments in the UK and how does this differ to those seen abroad?**

The attitude towards site surveying is generally very good among drilling contractors, but it is their clients that still need convincing. Contract tendering is extremely competitive and, although some contractors would prefer to budget for a more comprehensive site survey, it is usually the lowest bid that wins the contract. In the US we have seen a movement towards the more widespread use of geophysical surveys in site investigation. Boreholes are used to confirm the geophysics results. The resolution of such surveys is better, and the method is generally much more effective as it allows boreholes and trial pits to be optimally located. It is a much smarter way of investigating. I would not expect the UK to move fully toward this approach, but there must be a comfortable middle ground that would suit the UK market.

**Q How broad is the current offering of site investigation services for the UK drilling market? Are there many companies offering comprehensive services or do most specialise in one particular type of surveying?**

There are a number of UK-based companies that offer a wide range of surveying services. Zetica's approach is different as we try to promote the greater integration of these services, with the aim of providing a comprehensive subterranean image of a site. We will always suggest a cost-effective combination of tools and techniques tailored to each situation.

**Q How has Zetica's involvement with the Site Safe Alliance helped the company to expand its services for customers, and how will this new venture benefit the UK drilling market?**

The aim of joining the Site Safe Alliance in June this year was to offer our customers a suite of investigation techniques, which are applied objectively from a single source. There is no incentive to use any particular alliance member, so customers know they are getting a truly objective recommendation and are not tied to the one technique, which would be available from some suppliers. So, for example, if a UXO risk assessment concludes a moderate-to-high risk, we can involve one of our alliance partners who can help. Vinci, for example, has a huge rig fleet for investigative drilling and Lankelma has the biggest CPT fleet in the UK. One of the main reasons we joined the Site Safe Alliance was encouragement from clients who realised the highly credible team that would be achieved by the alliance. We had already been working with our partners for over ten years in a less formal capacity.

**Q How do you see the market for subsurface site assessments developing over the next ten years, both in the UK and abroad?**

I think the use of subsurface site surveys will increase, but not as quickly as we would like. It is very hard for contractors to convince clients to invest in surveys because of the initial cost. However, by mapping risk areas and filling in the dots between boreholes, the overall cost of development can be optimised with much less chance of delay due to unknown subsurface obstructions. The more that project stakeholders get involved, the better we can expect these numbers to become.

More specific surveys for a particular target (such as utility services) are becoming routine now and it is likely that this trend will continue, but better specifications are needed from clients. The best way to improve this is to educate them as to which survey techniques are available and which are most appropriate for certain situations. For example, we are encouraging our clients to use The Survey Association's guide for utility services. This defines six levels of survey for utility service detection and the techniques involved. This makes it much easier for us to communicate with clients and also helps them to better assess quotes from surveying companies.

UXO detection in the UK is very poorly regulated at the moment and because of the recession many people are cutting corners. For example, we have our own test site in Oxfordshire, where we have a range of targets buried. These include a 50kg WWII German bomb – the most common type dropped during WWII – at a depth of 2m. The bomb is buried in clean soil with no man-made objects that could cause interference (so ideal conditions for detection). But still, for some orientations, it is not possible to identify the bomb location using the results of a surface-based magnetometer survey across the area.

A lot of UXO specialists buy similar instruments and use them to clear boreholes down to 9-10m, which is clearly not possible and completely unsafe. It would be good to see better regulation for these surveys in the future.

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*Zetica is an industry leading provider of site investigation solutions for engineering and environmental applications. For more information visit [www.zetica.com](http://www.zetica.com)*