Geophysical Survey

Magnetometry

Geophysical survey allows us to 'see' through the soil to detect the presence of buried archaeological features. Surveys can be done relatively quickly and the results allow us to target sites for test pits and other lines of investigation, removing the need to dig large areas. During the project we will be carrying out two types of geophysical survey – magnetometry and resistance. In this factsheet we look at magnetometry.

Magnetometry – (the science bit)

A magnetometer measures the strength of the earth's magnetic field to identify changes in the field strength of soils and sediments. Magnetometry works on the principle that soils contain iron oxides which, depending on their state, might be weakly or strongly magnetised. The backfilling or silting up of ditches with topsoils with contrasting levels of magnetic susceptibility to that of the local bedrock or substrate, and fired clay structures such as pottery kilns and hearths, which have their own magnetic properties, can be detected by a magnetometer. The degree of magnetic contrast is ultimately dependent on the amount of iron oxides in the soil, but variations of as little as 0.1 nanoTesla (nT) in an Earth field strength of about 48,000 nT can be detected by a magnetometer.

Important: A magnetometer is capable of detecting extremely small amounts of magnetic material and anyone carrying out a magnetometer survey should ensure they are completely 'non-magnetic'. Some spectacles, small staples in shoes and trainers, zips, belts and even the small metal eylets on ladies underwear can be detected by the magnetometer and distort the survey readings. Good survey clothing includes tracksuit bottoms and sweatshirts (without zips or clips), and wellies.

The Survey Area

We will provide all the necessary equipment, training and assistance to enable you to carry out your surveys.

The area to be surveyed is most commonly laid out as a series of 10m, 20m or 30m grid squares. The grids are laid out using the 3-4-5 triangle method and the corner of each grid is marked by a wooden cane. The canes are also used for 'sighting in' additional grids.

Two other pieces of equipment are used to help us carry out our survey: A 'trapeze' which comprises two poles (we use plastic piping) with washing lines at each end which extend the full length of the grid. The lines are marked at 1m intervals to help us pace ourselves as we walk with the magnetometer.

Two further lines are used which run between the canes at the top and bottom of each grid square. These also have markers which show where to place the trapeze.

Figure 1

As the person carrying out the survey completes the lines the trapeze is moved across the grid square until the entire grid has been surveyed

In Figure 1 the trapeze has been placed on the line ready to begin the survey.

Carrying out the Survey

Grids are usually walked in a zig-zag pattern (up and down). The magnetometer takes readings every metre which is signalled by a beeping noise. These readings correspond to 1m markers on the trapeze (Figure 2).

The magnetometer operator adjusts his/her walking speed so that the markers and beeps correspond. This might take a little practice, but the walking speed can be adjusted on the magnetometer and most people find a walking speed they are comfortable with.

Figure 2

The Results

When the survey is completed the results are downloaded to a computer and can be presented in a number of ways. A common way is to use grey-scale plots in which archaeological features such as pits and ditches are represented as darker elements.

In Figure 3 a square ditched enclosure was surveyed (indicated by the darker lines). Within the enclosure the survey detected a number of other features, possibly pits and hearths.

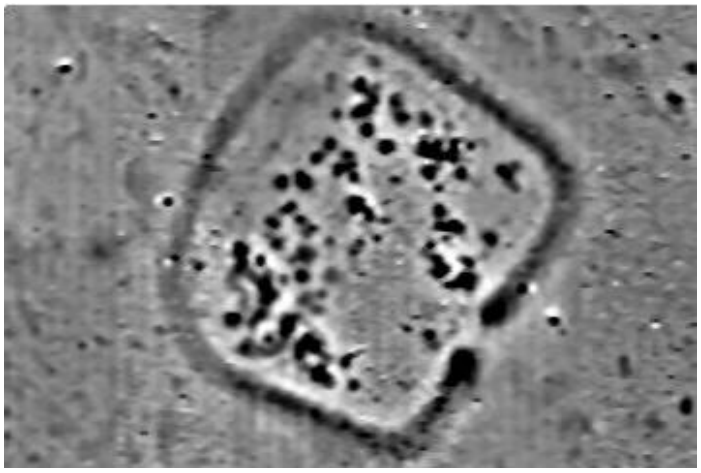

Figure 3. Possible Iron Age enclosure, West Berkshire