Staxton,

North Yorkshire

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Geophysical Survey 1987

West Yorkshire Archaeology Service

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Staxton,

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Introduction

The village of Staxton is situated approximately 5 miles west of Scarborough and lies at the foot of the Wolds escarpment in the Vale of Pickering (TA 01857925).

The region is well known for its variety and quantity of archaeological features which range from the prehistoric period onwards. Many of these features are visible only as cropmarks, but it is clear from their density and form that the area has been intensively occupied for several millennia. The village of Staxton itself lends its name to a medieval pottery industry, and Staxton ware is commonly found on archaeological sites in the North of England. Kiln sites associated with the pottery industry have been found in Staxton and their provenance has been reported to the archaeological authorities.

The situation of the field, bounded on the north by the village main street and on the south by a probable former 'back lane' suggests earlier occupation on the site by tenements. Earthworks in the adjacent field to the east may substantiate this view. Should this be the case, all visible evidence of their remains have been removed by subsequent ploughing. The scant remains of a small rectilinear building, well hidden by long grass, was located during the course of the survey. It is likely to have been the building shown in the centre of the field in Fig. 1.

The present survey was undertaken in advance of a proposed development in the field, and non-destructive geophysical techniques were used to assess the nature of any sub-surface deposits which may have been present.

Techniques

The two techniques used for the survey are both non-destructive and utilise the effects of electrical resistance and magnetic field variations to plot the position of anomalies beneath the ground.

Resistivity

This method uses the principle that the soil will offer a resistance to an electric current which is passed through the ground. The degree of resistance is generally a function of the soil's moisture content with wetter soil having a low resistance and dryer soil a higher resistance. This effect is used to archaeological advantage when it is realized that buried archaeological features can be conveniently divided into those constructed with earth and timber and those which contain stone. The former, such as backfilled ditches, are often more moisture retentive and will therefore show on the instrumentation as low resistance areas, whilst for the latter, such as buried walls, the opposite is true.

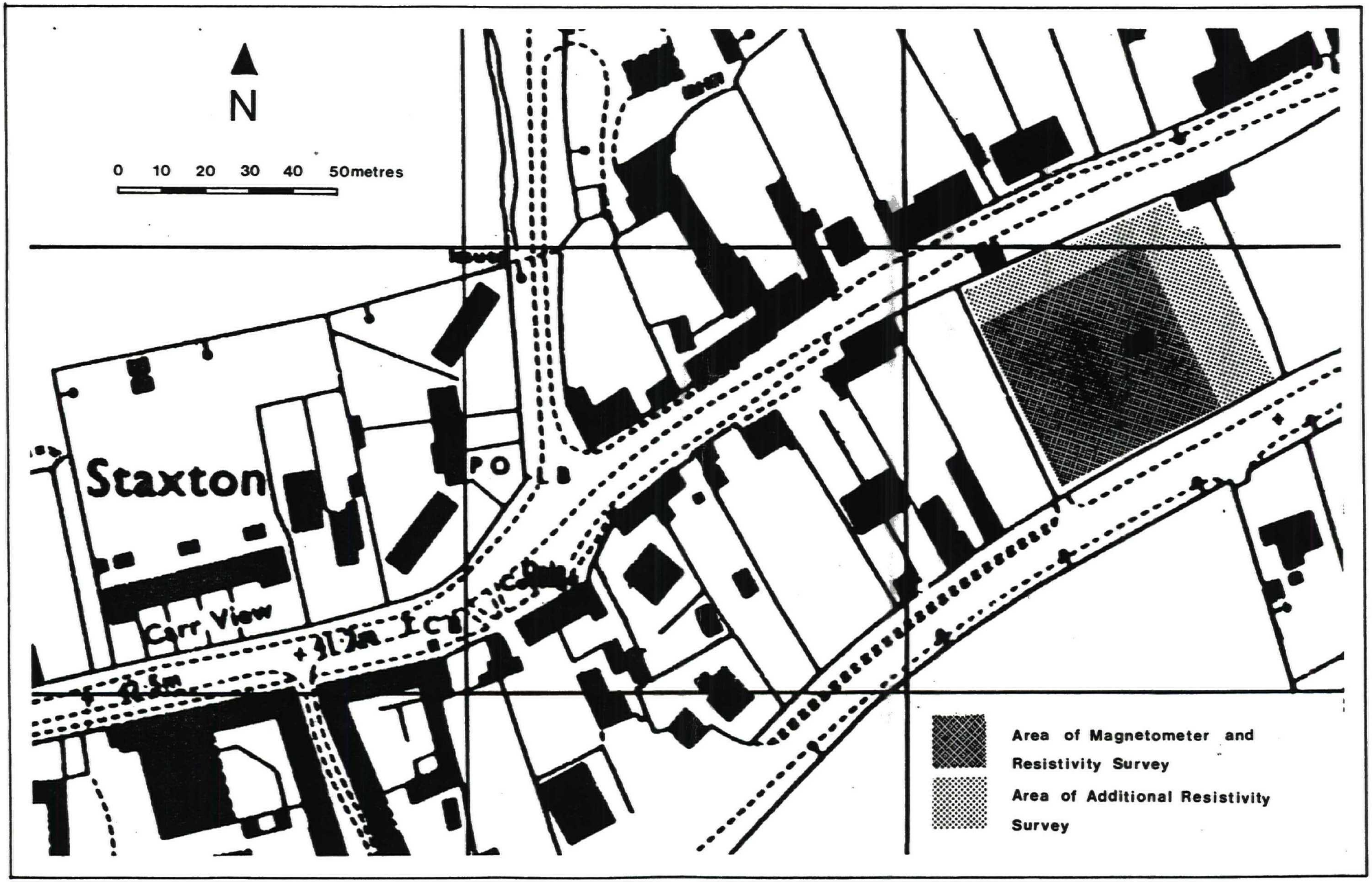


Fig 1 Location Plan of the Survey Area

The clarity of the signal is dependent on several factors, including the depth of overburden covering the feature, the magnitude of the feature, and, as mentioned above, the moisture content of the feature relative to the natural around it.

Magnetometry

The fluxgate gradiometer utilizes magnetic, rather than electrical principles for detecting buried features. The gradiometer is able to detect the changes in the earth's magnetic field that are created by features such as ditch fillings, kilns and stonework. The method relies largely on the effect of magnetic susceptibility - whereby certain materials are more readily magnetized than others when they are placed within a magnetic field. Limestone for example, has a low magnetic susceptibility and would therefore register on the gradiometer as a low, or negative reading. The humic fillings of ditches or the burnt linings of kilns on the other hand are more susceptible and will register strongly on the meter.

Apparatus

The survey instrumentation has recently been designed and produced specifically for archaeological purposes by Geoscan Research of Bradford, West Yorkshire. The resistivity equipment comprises a digital RM4 resistivity meter which is coupled to a DL10 data logger. These are attached to a lightweight frame which incorporates two mobile probes with a separation of 0.5m. A pair of remote probes linked to the frame by cable is positioned not less than 15m from the nearest survey point in any grid square. The data logger automatically logs and stores the readings taken by the resistivity meter and after 800 readings the data is dumped on to a portable Epson HX-20 computer. This has its own power supply and can therefore be used in the field.

The gradiometer instrumentation consists of an FM18 fluxgate gradiometer with a built-in data logger capable of storing up to 4000 readings. Once this has been achieved, the data is dumped on to the Epson.

Presentation

The presentation of the results is a two stage operation. The basic data is assembled in the field and stored on the Epson which is loaded with "Geoplot" software. This allows the data to be printed out during the survey in a form which is useful for initial assessement purposes but unsuitable for precise interpretation. After completion of the survey the data stored on micro-cassette is transferred to a a larger machine with a more sophisticated "Dotplot" programme. Here, manipulation of the readings is undertaken with the aim of discerning the archaeological anomalies from the mass of background values.

The most widely preferred method of presentation is a dot-density print-out, where the numeric value of each reading is assigned a particular number of dots. The random distribution of these dots within a defined area (i.e. the space allocated on the screen for a one-metre square), is repeated for every reading and results in a visually informative display of the data. The identification, description and interpretation of the results are discussed towards the end of the report.

Method

An east-west base line was constructed which followed the alignment of the southern field boundary. The area was gridded into 20 x 20 metre squares or fractions thereof and readings were taken at one-metre intervals. A zig-zag traverse was used for resistivity whilst a parallel traverse was adopted for the gradiometer. Readings were taken at one metre intervals.

A maximum area of 2332 square metres was surveyed by resistivity and areas of greatest potential were then re-surveyed with the gradiometer.

Field Conditions

At the time of the resistivity survey the field was covered with long grass with frequent clumps of nettles and thistles. The soil was extremely moist due to rain before and during the survey. Two days later, at the time of the gradiometer survey, weather conditions had improved slightly, but the ground was still moist.

When visible, the soil was a mid-brown sand with frequent chalk gravel inclusions.

Results

Resistivity

The histograms of the resistivity readings showed a normal distribution. A plot of the complete data shows two areas of probable anomalies (Fig. 2).

A A 54 metre band of low readings *c.* 4 metres wide but flaring out at the western end.

B A rectilinear array of low readings *c.* 6.50 x 3.25 metres.

Filtering out of the low frequency readings largely reduces the background noise and the resulting edge enhancement revealed discrete areas of high resistance values (Fig. 3).

C A spread of high readings *c.* 11 x 5 metres and seemingly cut by the anomaly at **B**.

D A rectilinear array of high readings *c.* 10.0 x 6.5 metres.

Magnetometry

The magnetometer survey covered an area of 1600 square metres before poor weather conditions led to its abandonment. However, four complete 20 x 20 metre squares were surveyed which tied in with the four full squares of the resistivity survey.

Fig. 4 shows:

aa A narrow strip of high readings within a lighter band of lower readings, stretching across the length of the survey area.

bb An area of low readings surrounded by linear high values.

cc A thin band of low readings stretching northwards for *c.* 30 metres.

No further information was obtained by contrast stretching (Fig. 5).

Discussion

A number of features were located by both of the survey methods. The strongest of these is the east-west aligned lateral feature on the southern edge of the survey area

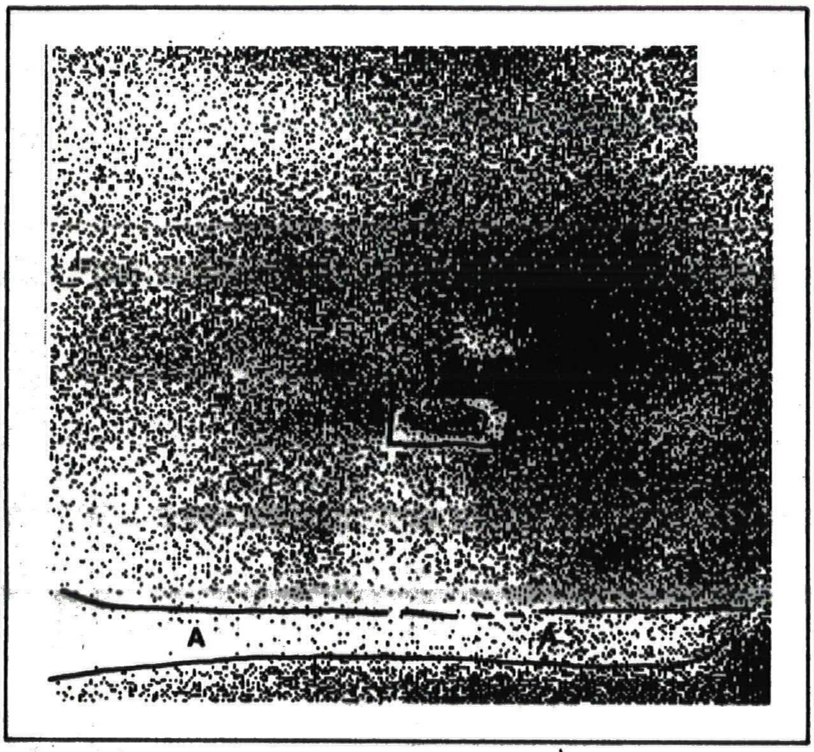
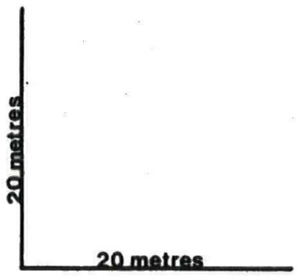


Fig 2

Resistivity Data

Plotting Limits 64·5 to 160 ohms



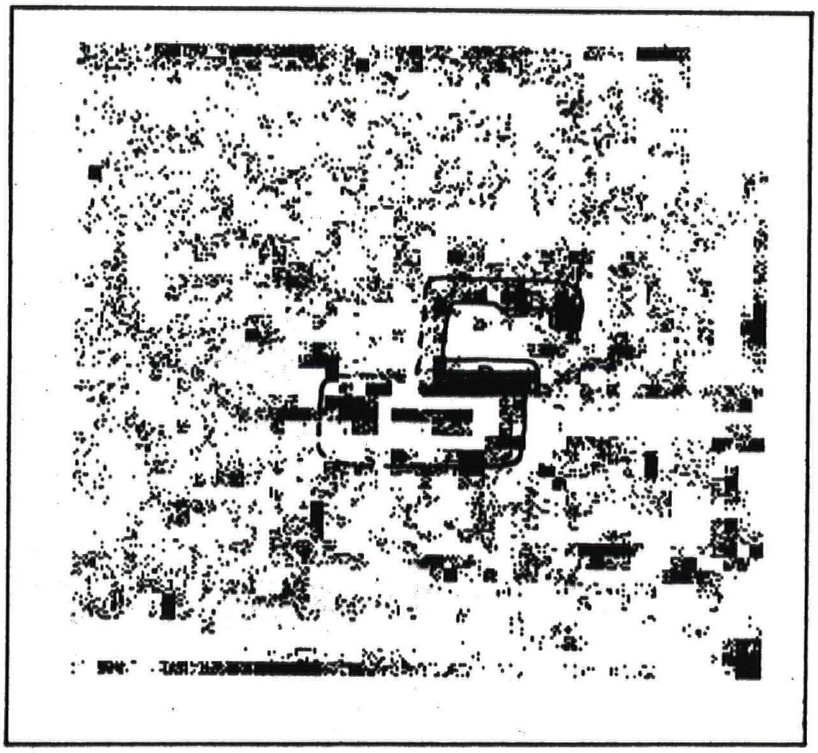


Fig 3

Resistivity Data

Plotting Limits 32 to 39 ohms

5 x 5 High Pass Filter

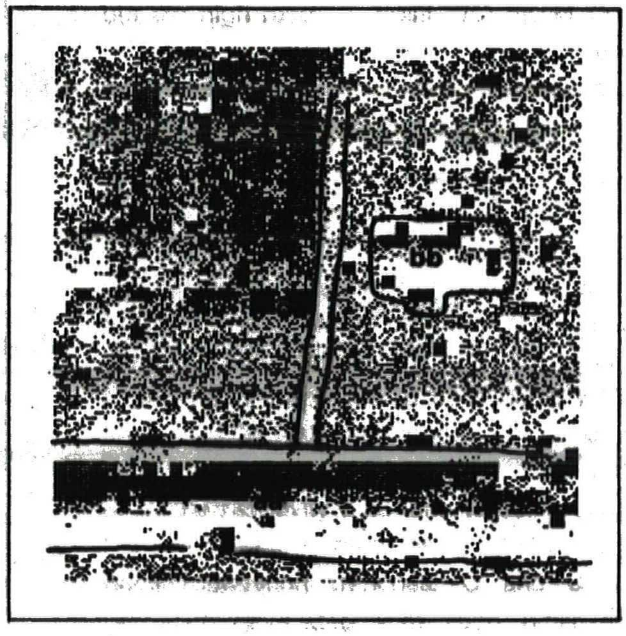
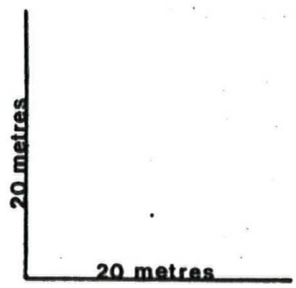


Fig 4

Gradiometer Data

Plotting Limits −19 to 18nT



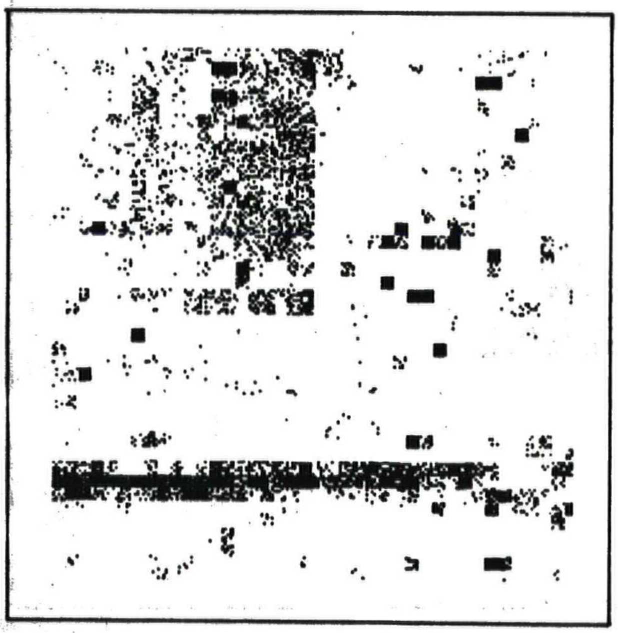


Fig 5

Gradiometer Data

Plotting Limits 3 to 34nT

(**A/aa**). Resistivity shows it as a ditch averaging *c.* 4 metres in width, becoming more diffuse towards the western end of the field.The same feature was found by the gradiometer, but the high readings point to a metallic object within the fill. The regularity and size of the readings indicate that a service pipe might have been laid along this line.

North of the ditch, a rectilinear area of low readings at **B/bb** are likely to be the foundation trenches of a small rectangular building which was situated in the middle of the field and shown on the ordnance survey map (see Fig. 1). Whereas it is likely to be of a recent date, it appears to be situated within and possibly cutting through an area of stonework at **C**. Adjacent to this to the north at **D**, the resistivity data, and to some extent the magnetometry readings, located stone or brick foundation trenches. **C** and **D** are probably associated with each other and formed the walls and floors of a building once situated in the field. It is impossible to ascertain the age of the building from the survey, but a possible post-medieval date may be inferred from its position in the middle of the field rather than fronting onto the main street.

The north-south orientated feature at **cc** located by the gradiometer is consistent with stonework and may represent a field boundary.

Conclusion

A combination of resistivity and magnetometry survey methods were applied to the site. From the results it appears that there are features relating to occupation in the field. Some of these may be related to the earthworks in the adjacent field to the east.

The remains of a stone or brick building are likely to be present towards the centre of the field with a possible field boundary situated to its west. Their date cannot be confidently ascribed to the medieval period due to their position in the centre of the field.

Evidence for pottery production, such as kilns, would most likely be located by magnetometry, but no readings compatible with this type of feature were recognized. It must be stressed however, that due to adverse weather conditions and time considerations, the margins of the field could not be surveyed by this method.

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