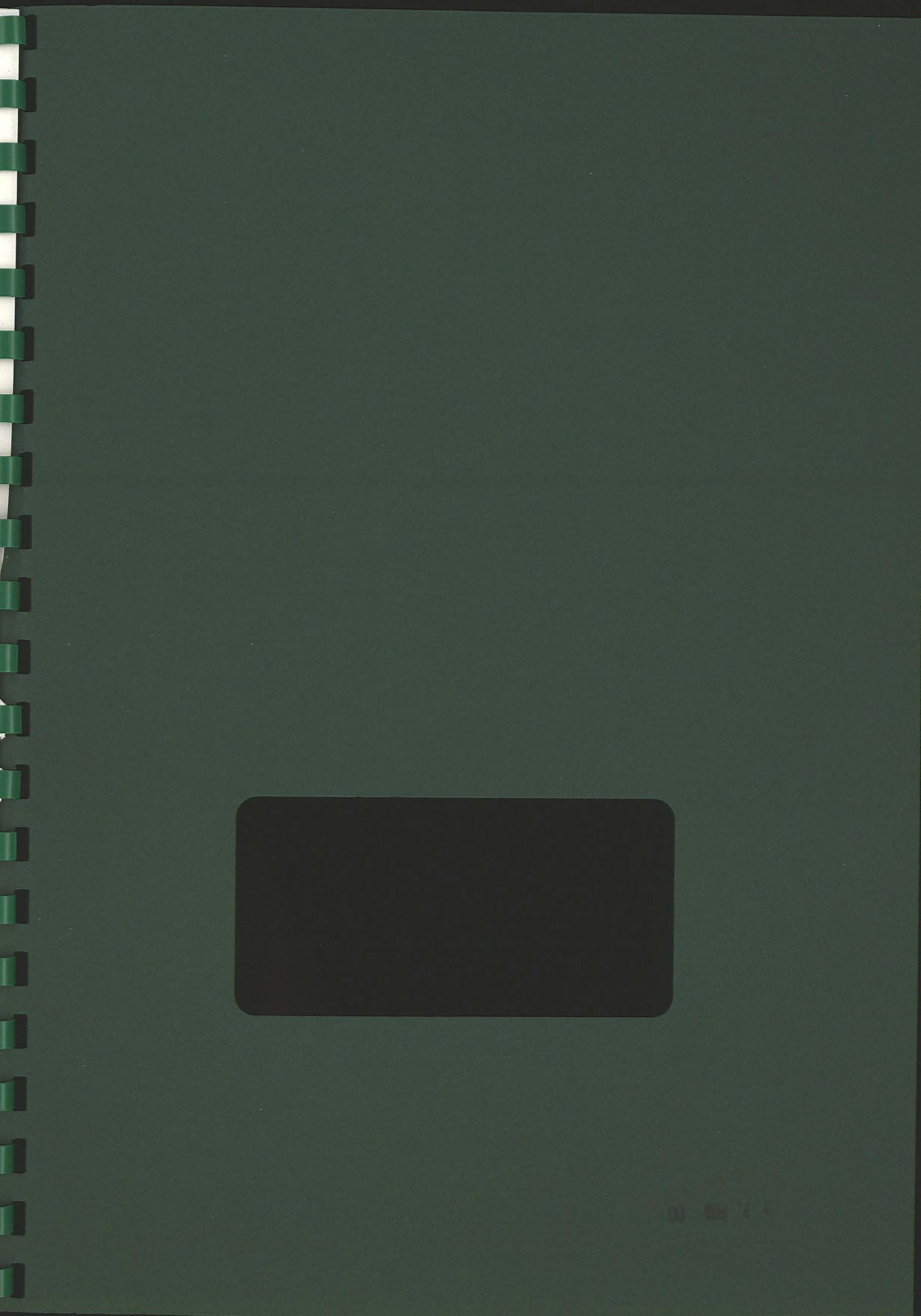


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**FLUXGATE GRADIOMETER SURVEY  
LAND OFF GREEN LANE  
WOODHALL SPA  
LINCOLNSHIRE**



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**FLUXGATE GRADIOMETER SURVEY  
LAND OFF GREEN LANE  
WOODHALL SPA  
LINCOLNSHIRE**

Report prepared for Hugh Bourn Developments (Wragby) Ltd  
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January 2000

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## Contents

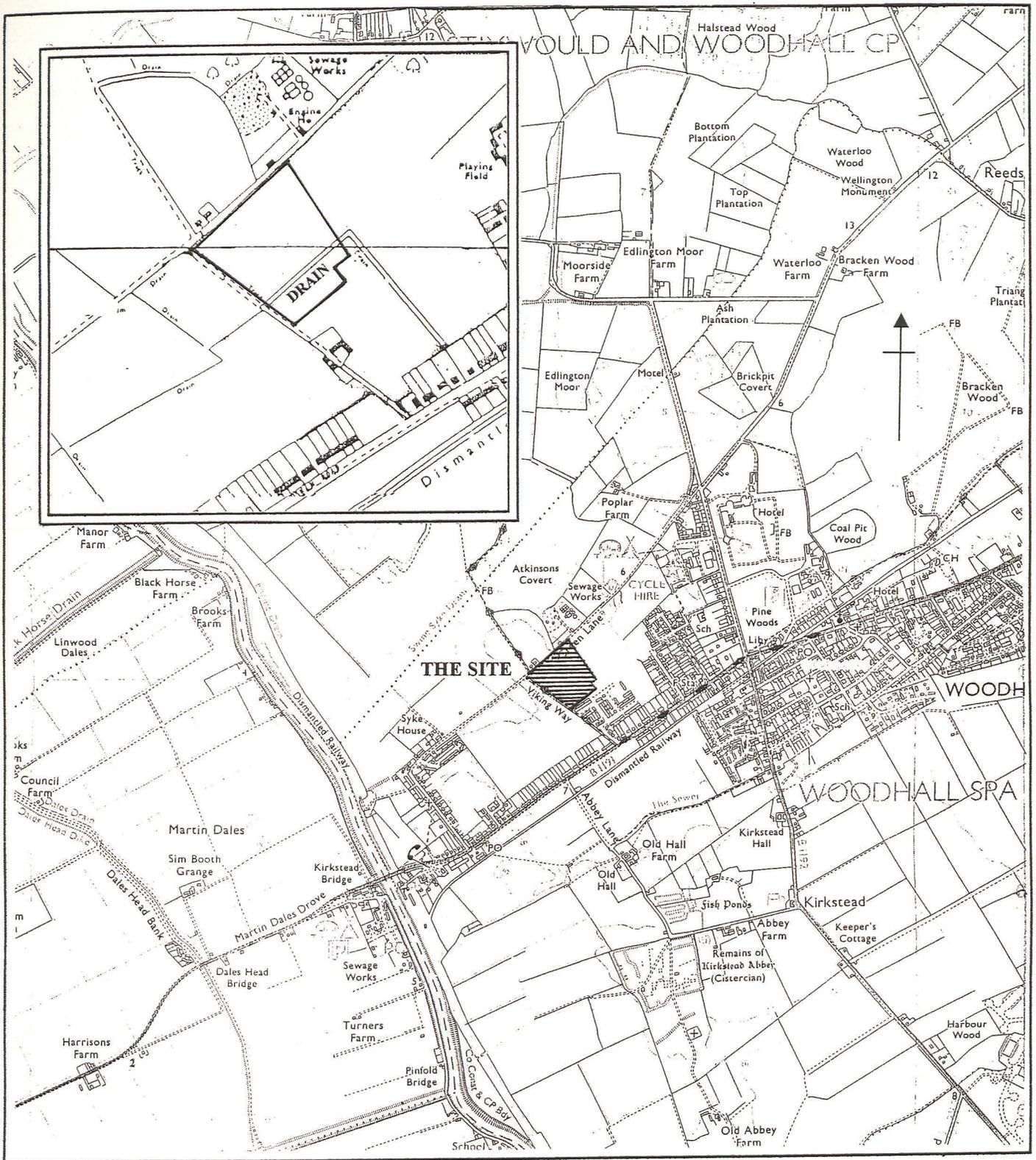
<i>Summary</i>	1
1.0 Introduction	2
2.0 Location and description	2
3.0 Methodology	2
4.0 Results	3
5.0 Conclusions	4
6.0 Acknowledgements	4
7.0 Appendices	4
7.1 References	4
7.2 Summary of survey parameters	5

## Illustrations

- Fig.1 Location of survey area. Scale 1: 25000.
- Fig.2 Location of survey grids. Scale 1:2000.
- Fig.3 Greyscale image. Scale 1:1000.
- Fig.4 Interpretive plan. Scale 1:1000.
- Fig.5 Smoothed greyscale image. Scale 1:1000.
- Fig.6 Trace plot of raw data. Scale 1:1000.

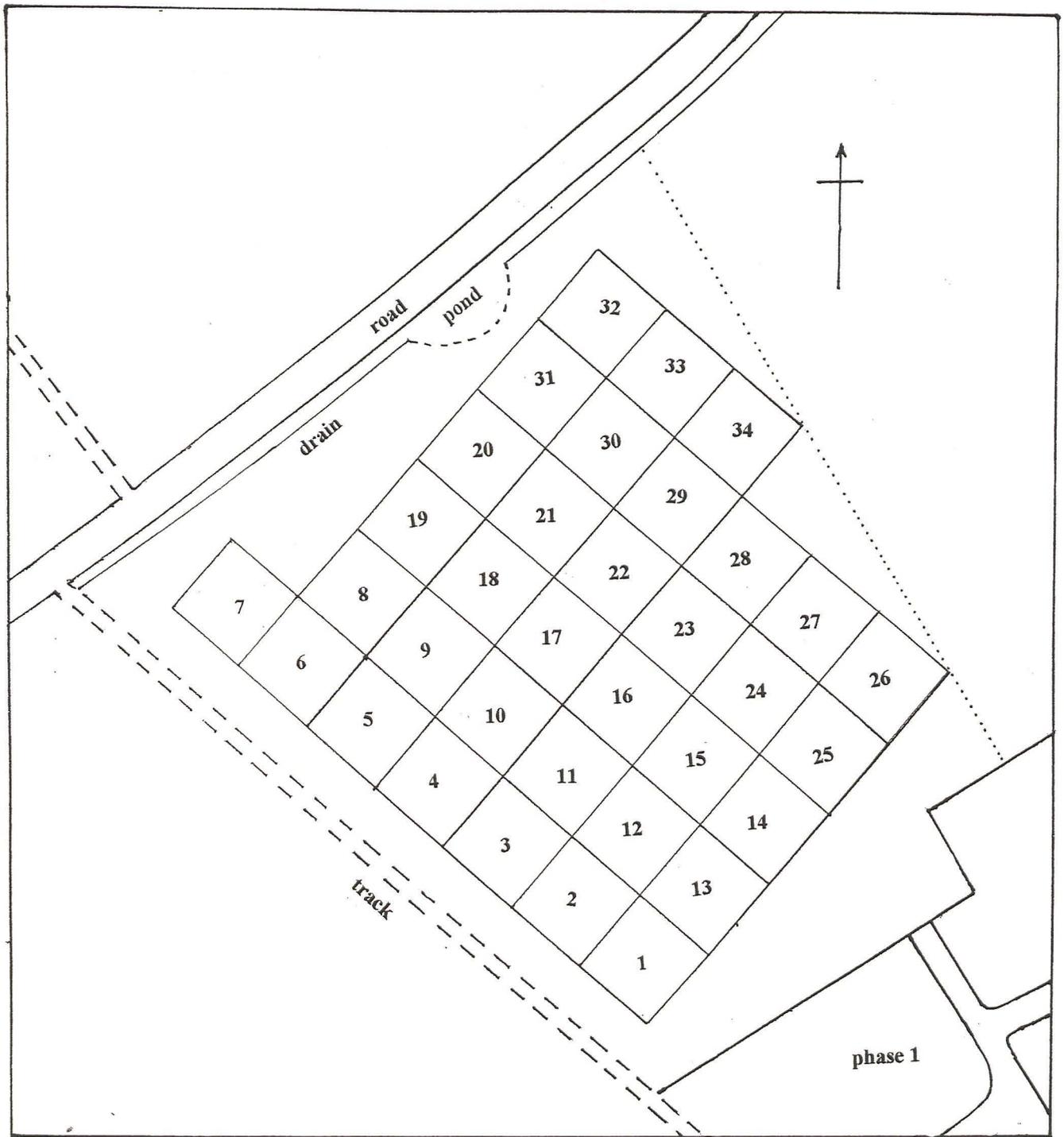
## *Summary*

- *A fluxgate gradiometer survey was undertaken to evaluate the archaeological potential of land off Green Lane, Woodhall Spa, Lincolnshire*
- *A small number of diffuse linear anomalies were detected, possibly representing earlier field boundaries, or enclosures of possible archaeological significance*
- *Areas of faint, random anomalies were detected: possibly of geological origin*
- *A backfilled drain and rubble filled pit of limited archaeological significance were detected*
- *It is concluded that most of the site, based on magnetic data, would appear to be of limited archaeological potential; the exception possibly being an arrangement of linears on the north-east side of the survey*



Scale 1:25000 Inset 1:10000

Fig.1 Site Location



Scale 1:2000

Fig.2 Location of grids

## 1.0 Introduction

A fluxgate gradiometer survey was commissioned by Pre-Construct Archaeology (Lincoln), on behalf of Hugh Bourn Developments (Wragby) Ltd. to evaluate the archaeological potential of land off Green Lane, Woodhall Spa, Lincolnshire. This work was undertaken as part of an application for planning permission for residential development.

This survey was carried out in accordance with a requirement of East Lindsey District Council, and a specification prepared by Pre-Construct Archaeology. The work follows the guidelines set out in the English Heritage document '*Geophysical Survey in Archaeological Field Evaluation*', 1995.

## 2.0 Location and description

Woodhall Spa lies approximately 25km south-east of Lincoln, 5km south-west of Horncastle on the flood plain of the Rivers Bain and Witham in the district of East Lindsey. The proposed development site, a sub-rectangular unit of agricultural land measuring approximately 4 hectares, is located on the west side of the town, south of Green Lane and sandwiched between existing residential developments by Hugh Bourne Developments Ltd (west side) and Broadgate Builders Ltd (east side). The site centres on NGR TF 1840 6297.

The land is predominately flat and ground cover comprises a young cereal crop to the north-east and remnants of a sugar beet crop to the south-west. It is bounded by houses to the south-east, a drain to the north-west, a path to the south-west and arable land to the north-east. A small pond is situated in the north-east corner (Fig.2).

This part of Lincolnshire falls within a rich archaeological zone although, because of the complex nature of post-glacial deposits (sands and gravels), archaeological remains can prove elusive to detection.

Neolithic stone axes have been recorded in the vicinity of the site, and a Neolithic pebble mace was found further to the west, closer to the course of the River Witham.

In 1964, a Late Bronze spearhead was found on the east bank of the river, and cropmarks in the general vicinity of the development are thought to be of prehistoric date. Despite the proximity of known archaeological resources, several recent phases of investigation in this part of the town have produced relatively limited results. A gradiometer survey by The University of Leicester Archaeological Services in 1998 on land immediately west of the site did not identify any potential archaeological remains (Butler 1998). Evaluation by Lindsey Archaeological Services (geophysics and trial excavation) of land situated to the east of the site also failed to identify any significant archaeological remains (N. Field, pers.com.).

## 3.0 Methodology

Detailed area survey using a fluxgate gradiometer is a non-intrusive means of evaluating the archaeological potential of a site. The fluxgate gradiometer detects

magnetic anomalies caused by areas of high or low magnetic susceptibility. These areas are caused by changes in the composition of the subsoil or the underlying geology. Archaeological features are the result of man-made changes to the composition of the soil and the introduction of intrusive materials such as brick and stone. These features will create detectable magnetic anomalies. In addition, activities which involve heating and burning will create magnetic anomalies, as will the presence of ferrous metal objects. By examining the anomalies detected by a fluxgate gradiometer survey, geophysicists can often translate the data into archaeological interpretation.

The area survey was conducted using a *Geoscan Research* fluxgate gradiometer (model FM36) with an electronic sample trigger set to take 4 readings per metre (a sample interval of 0.25m). The zigzag traverse method of survey was used, with 1m wide traverses across 30m x 30m grids. The base line was established by measuring 15m out from the track along the south-western edge of the site and 28m south-east of Green Lane. Pegs were placed along the base line. The sensitivity of the machine was set to detect magnetic variation in the order of 0.1 nanoTesla.

The data from the survey was processed using *Geoplot* version 3.0. It was desloped (a means of compensating for sensor drift during the survey by subjecting the data to a mathematical bias sloping in the opposite direction of the bias created by sensor drift), and clipped to reduce the distorting effect of extremely high or low readings caused by ferrous metals on the site. The results are plotted as greyscale images.

The survey was carried out by David Bunn and Andrew Hardwick on the 20<sup>th</sup>, 21<sup>st</sup> and 24<sup>th</sup> January 2000. The weather was sunny and mild. The area surveyed measured 3 hectares.

#### 4.0 Results

The site was predominately magnetically quiet, excluding an area to the south-east (Fig.3 and Fig.4, 1) where substantial amounts of brick rubble were noted and a 'linear' (Fig.4: 2) which extends southwest from anomaly 1. These anomalies reflect the location of a former drain (Fig.1: inset). Scatters of discrete anomalies either side of linear 2 (Fig.4: red) are probably associated with this feature.

A number of diffuse anomalies (Fig.4: 3,4,5) were detected in the north part of the survey. Linear 3 extends over the site south-east/north-west, as does a shorter linear (Fig.4: 4) immediately to the west. Anomaly 5, to the east, may also be associated with anomaly 3, although the link is more tenuous.

Anomaly 6 is comparatively positive, lying to the north at the edge of the survey in a slight depression that borders a pond.

Anomaly 7 represents a strong dipolar and is probably of modern origin; likewise, this applies to the smaller discrete anomalies scattered across the site (Fig.4: red).

Faint positive linears (Fig.4: 8) to the south-west may be data collection errors. However, they are perpendicular to the traverse direction (south-west/north-east) and

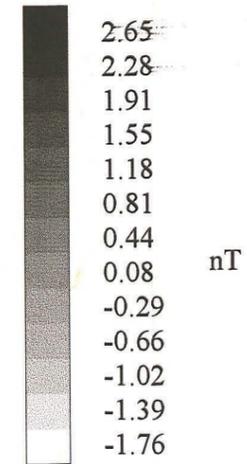
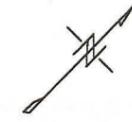
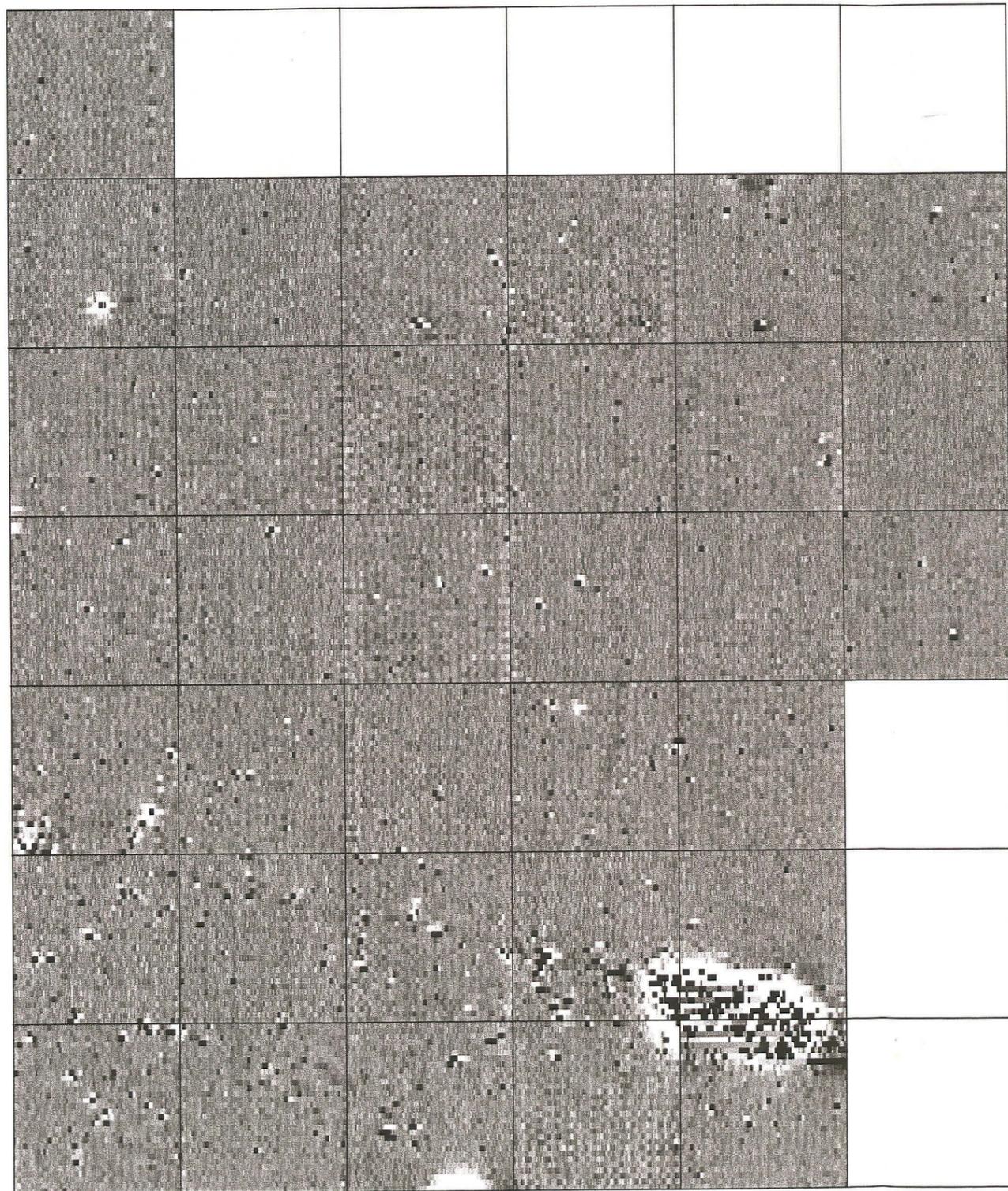
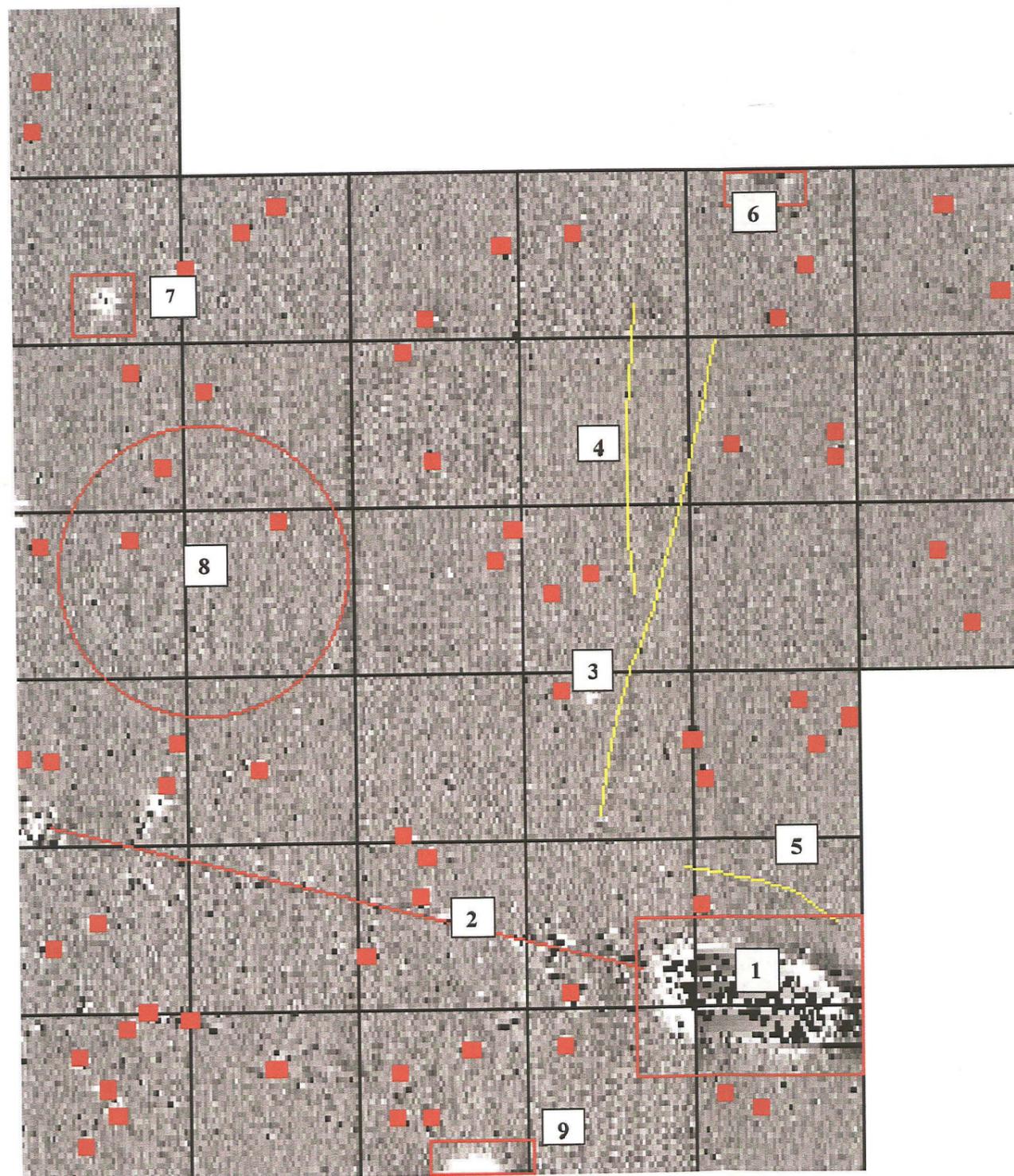


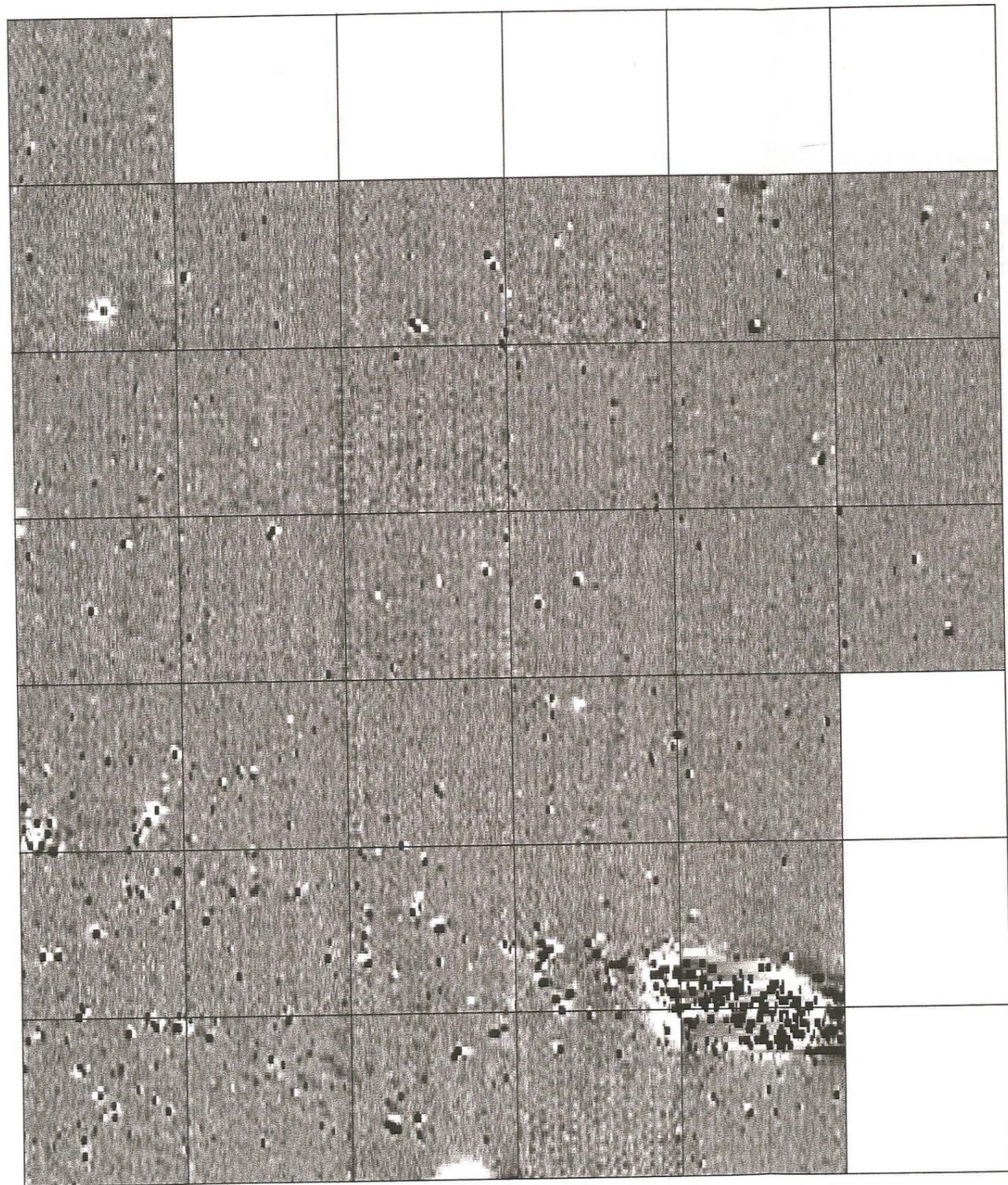
Fig.3 Greyscale image



■ Discrete anomalies

Scale 1:1000

Fig.4 Interpretive plan



40m

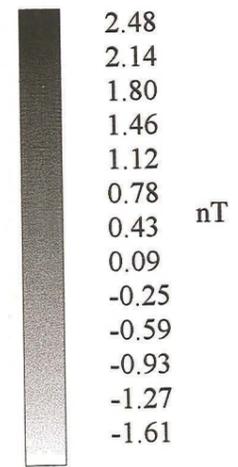


Fig.5 Smoothed greyscale image



40m

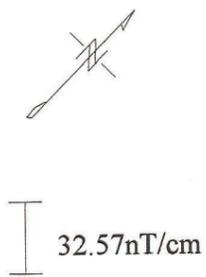


Fig.6 Trace plot of clipped data

parallel to the field boundary, possibly reflecting agricultural activity, for example, rig and furrow.

Negative anomaly 9 was detected close to an electricity pole sited immediately south-east of the survey.

The survey is characterised by a series of magnetically weak and random anomalies that become more discernable in the smoothed greyscale image (Fig.5). However, it should be stressed that any interpretation of anomalies highlighted by smoothed images must be treated with caution.

## 5.0 Conclusions

The diffuse, linear anomalies towards the north of the site (3,4.5) may be archaeologically significant. They could conceivably represent earlier field boundaries or some form of enclosure.

The faint, less discernable anomalies (Fig.5) appear to be random in form and may have geological origins

Anomaly 7, in a lower area of the site adjacent to a pond, may be a remnant of the pond itself, which may have contracted over time.

Dipolar anomalies are a common feature of the gradiometer survey, as ferrous objects (litter) are often encountered in the top soil.

Detailed survey by gradiometry is only capable of detecting features that alter the magnetic susceptibility of soils or are magnetically different to the soils around them. It remains a possibility that there are archaeological features within the survey area that are not detectable.

## 6.0 Acknowledgements

Pre-Construct Geophysics would like to thank Hugh Bourn Developments (Wragby) Ltd for this commission.

## 7.0 Appendices

### 7.1 Bibliography

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## 7.2 Summary of survey parameters

Instrument:	Geoscan Research Fluxgate Gradiometer FM 36 with Sample Trigger ST1.
Resolution:	0.1 nT
Grid size:	30m x 30m
Sample interval:	0.25m
Traverse interval:	1m
Traverse method:	Zigzag