ARCHAEOLOGICAL SERVICES WYAS

Land close to Stirton with Thorlby North Yorkshire

Gradiometer Survey

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Northern Archaeological Associates

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Land close to Stirton with Thorlby,

North Yorkshire.

(SD 9545 5350)

Gradiometer Survey

Contents

Summary

An area of 1 hectare was surveyed, using a fluxgate gradiometer, along the line of a water pipe corridor immediately south of a late medieval homestead whose location is still indicated by low earthworks. Two discrete anomalies of possible archaeological origin were identified on the extreme northern edge of the site. However, these are ouside the projected pipe corridor.

Archaeological Services WYAS

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1. Introduction

1.1 Archaeological Services (WYAS) was commissioned by Mr P. Abramson of Northern Archaeological Associates to carry out a geophysical survey on pasture lying between the A 65(T) to the north and the Leeds and Liverpool Canal to the south approximately 1.5km north-west of the villages of Stirton and Thorlby (see Figs 1 & 2).

1.2 The area for survey formed a strip 180m long by 60m wide aligned along the corridor of a water pipeline whose projected route runs adjacent to, and immediately south of, the site of a late medieval homestead.

1.3 This homestead is described as comprising a late medieval earthwork enclosing a 12th to 14th century building and two 17th to 18th century buildings. The site was reported ploughed and rotovated in 1978 with subsequent filedwalking producing several complete pots and an iron knife.

1.4 At the time of the survey, April 28th 1998, low earthworks, mostly immediately north of the survey area, were visible in the field which was under recently reseeded pasture.

1.5 The main aim of the survey was thus to establish whether any archaeological features associated with the homestead extended either south or west of the recorded enclosure and if so to characterise any such remains.

2. Results & Discussion

2.1 The gradiometer data is presented as a greyscale plot at a scale of 1:2500 in Figure 2. The data are also presented as dot density and X - Y trace plot formats at a scale of 1:500 in Appendix 3.

2.2 The most apparent characteristic of the gradiometer data is that it is exceptionally 'quiet' with little variation in the background soil magnetic susceptibility. There are even exceptionally few dipolar responses ('iron spikes'), caused by ferrous material in the topsoil, which are ubiquitous across most sites. This is indicative of the land being having been under pasture for a considerable length of time. The exception to this is the small cluster of 'iron spikes' adjacent to the dry stone wall that separates the two survey areas. These responses are not thought to be archaeologically significant.

2.3 Two possible positive isolated responses have been identified on the northern edge of the main survey area. As the responses are seen only on the very last traverse it is impossible to make a confident interpretation. However, they could be archaeological possibly indicating pits or areas of burning.

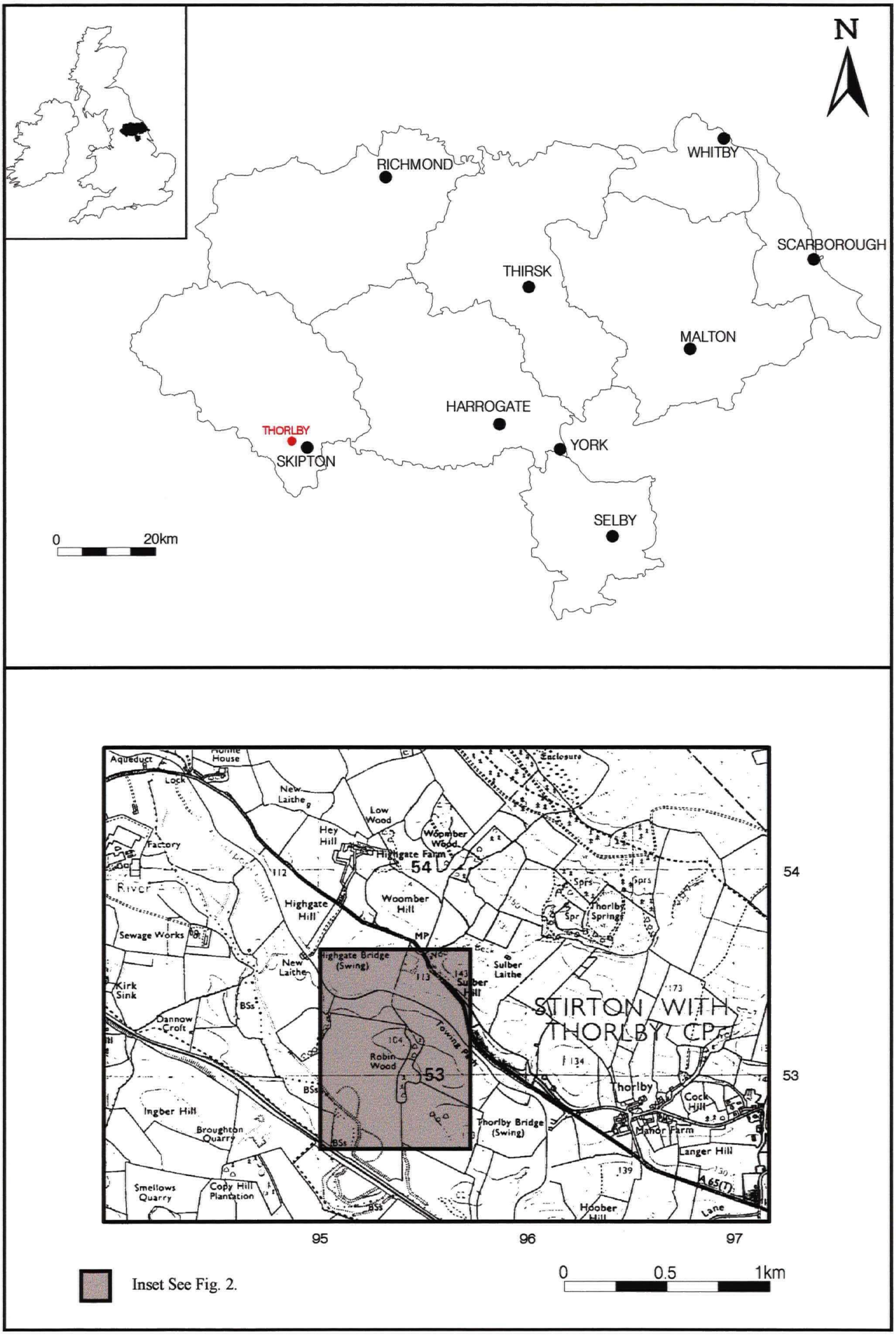

Fig. 1. Site Location

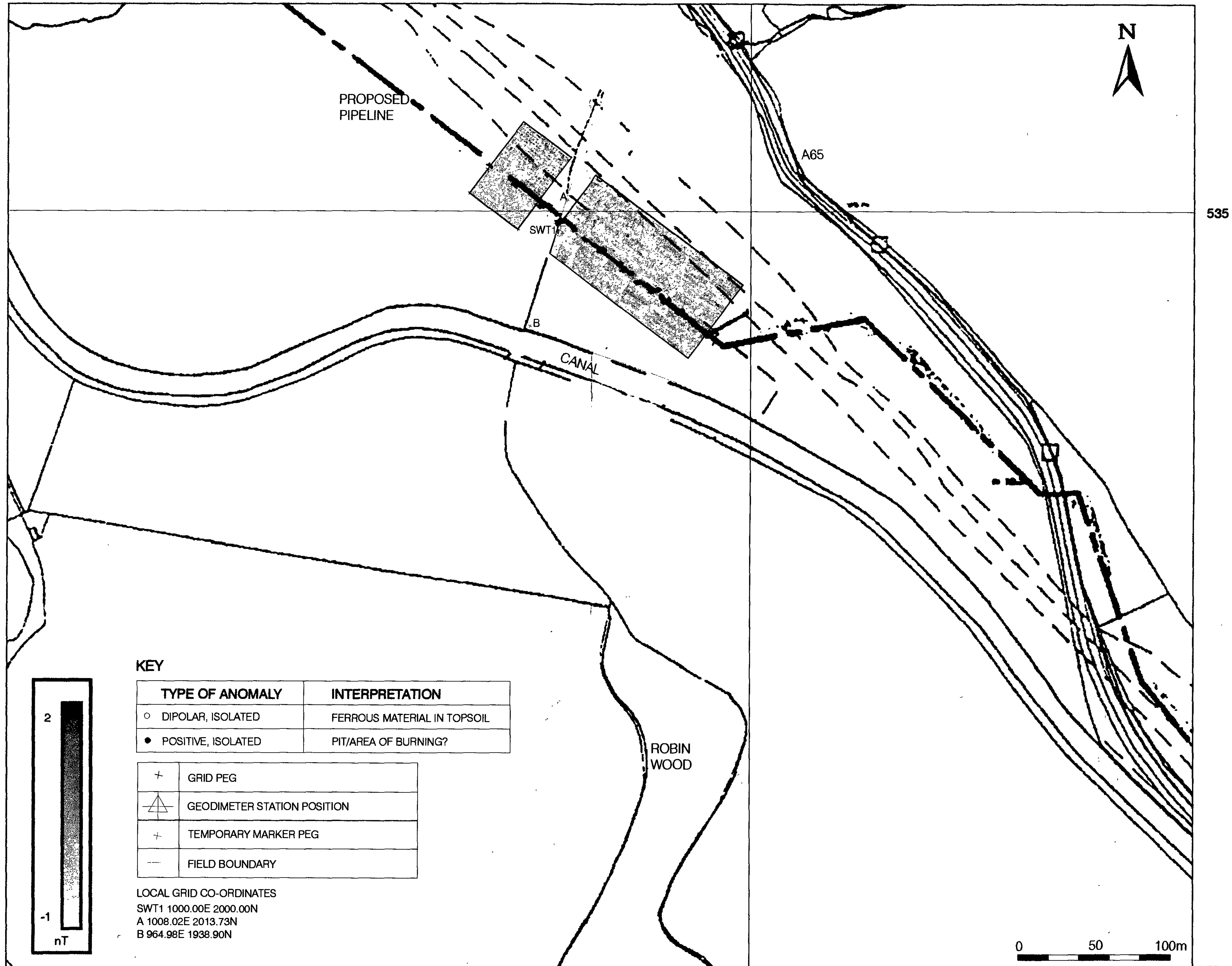

Fig. 2. Site location showing gradiometer data (greyscale) and survey location information

3. Conclusions

3.1 Only two discrete isolated anomalies have been identified that are thought might be archaeological and these are located to the north of *(i.e outside)* the pipe corridor.

3.2 It would appear that the extent of the homestead is delimited by the existing earthworks and that any surviving archaeological remains are located immediately north of the route of the pipeline.

3.3 There is no evidence for the site extending either to the south or the west of the identified earthwork.

The results and subsequent interpretation of geophysical surveys should not be treated as an absolute representation of the underlying archaeology. It is normally only possible to prove the archaeological nature of anomalies through intrusive means such as by trial excavation.

Acknowledgements

Report
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Graphics
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Appendices

Appendix 1 Gradiometer survey: technical information and methods
Appendix 2 Survey location information
Appendix 3 Gradiometer data plots (1:500)

Appendix 1

Gradiometer survey: technical information and methods

1. Technical Information

1.1 Iron makes up about 6% of the Earth's crust and is mostly dispersed through soils, clays and rocks as chemical compounds. These compounds have a weak, measurable magnetic response which is termed its magnetic susceptibility. Human activities can redistribute these compounds and change (enhance) others into more magnetic forms. These anthropogenic processes result in small localised anomalies in the Earth's magnetic field which are detectable by a gradiometer.

1.2 In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for the more magnetic compounds to concentrate in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected. Less magnetic material such as masonry or plastic service pipes which intrude into the topsoil will tend to give a negative magnetic response relative to the background level.

1.3 The magnetic susceptibility of the soil can also be enhanced significantly by heating. This can lead to the detection of features such as hearths, kilns or burnt areas.

1.4 High, sharp responses are usually due to iron objects in the topsoil. These produce a rapid change from positive to negative readings ("iron spikes").

1.5 The types of response mentioned above can be divided into five main categories which are described below:

Iron Spikes (Dipolar Anomalies)
These responses are referred to as dipolar and are caused by buried or surface iron objects. Little emphasis is usually given to such responses as iron objects of recent origin are common on agricultural sites. Occasionally, however, iron spikes can indicate the presence of smithing activity by detecting hammerscale.

Rapid, strong variations in magnetic response
Also referred to as areas of magnetic disturbance, these can be due to a number of different types of feature. They are often associated with burnt material, such as industrial waste or other strongly magnetised material. It is not always easy to determine their date or origin without supporting information.

Positive, linear anomalies
The strength of these responses varies depending on the underlying geology. They are commonly caused by ancient ditches or more recent agricultural features.

Isolated positive responses
These usually exhibit a magnitude of between 2nT and 300nT and, depending on their response, can be due to pits, ovens or kilns. They can also be due to natural features on certain geologies. It can, therefore, be very difficult to establish an anthropogenic origin without an intrusive means of examining the features.

Negative linear anomalies
These are normally very faint and are commonly caused by features such as plastic water pipes which are less magnetic than the surrounding soils and geology. They too can be caused by natural features on some geologies.

2. Methodology

2.1 There are two main methods of using the fluxgate gradiometer for commercial evaluations. The first of these is referred to as *scanning* and requires the operator to visually identify anomalous responses whilst covering the site in widely spaced traverses, typically 10-15m apart. The instrument logger is not used and there is therefore no data collection. This method is used as a means of selecting areas for detailed survey when only a percentage sample of the whole site is to be surveyed. Scanning can also be used to map out the full extent of features located during a detailed survey.

2.2 The second method is referred to as *detailed survey* and employs the use of a sample trigger to automatically take readings at predetermined points, typically at 0.5m intervals, on zig-zag traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation.

2.3 During this survey a Geoscan FM36 fluxgate gradiometer and ST1 sample trigger were used to take readings at 0.5m intervals on zig-zag traverses 1m apart within 20m by 20m square grids. Eight hundred readings were taken in each grid and in-house software (Geocon Version 9) was used to interpolate the "missing" line of data so that 1600 readings in total were obtained for each complete grid.

Appendix 2

Survey location information

1. Layout procedure

1.1 A baseline was established along the projected centre line of the pipe corridor. A grid 120m long by 60m wide was then laid out to the east of the dry-stone wall using an optical square and 60m tapes such that 25m of the survey area lay to the south of this baseline and 35m to the north. The baseline was extended to the west of the wall, leaving a gap of 20m between blocks, and a second block, 40m by 60m, laid out in the same way.

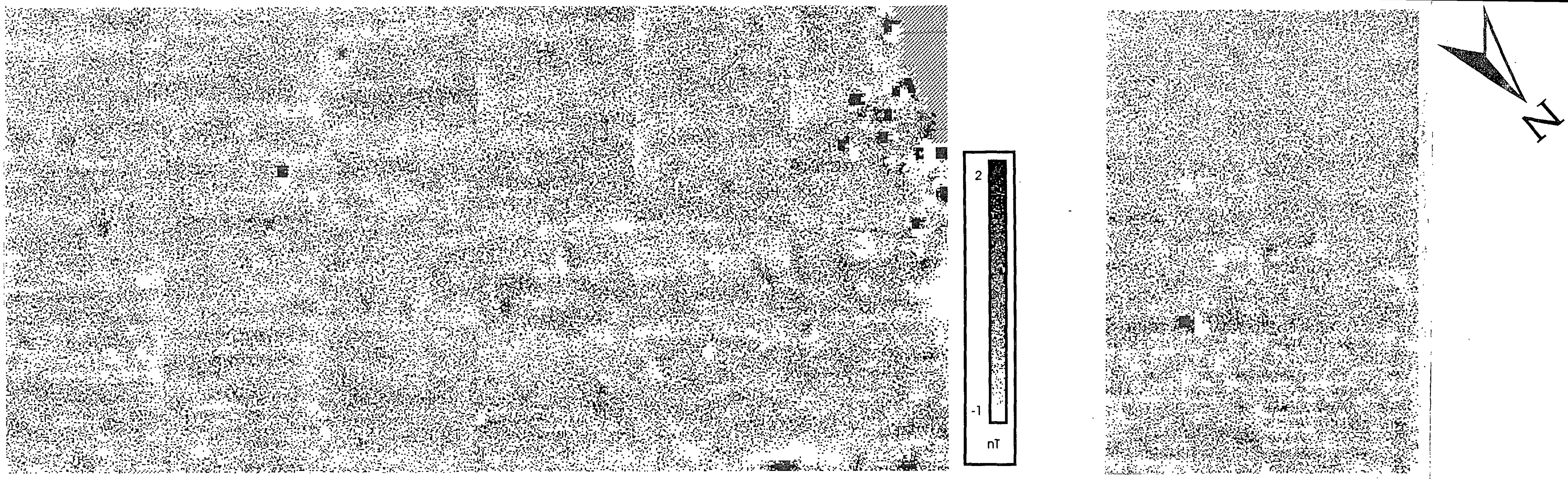
1.2 On completion of the geophysical survey both these site grids were surveyed in relative to the Leeds and Liverpool Canal and the existing field boundaries using a Geotronics 600 series Geodimeter.

1.3 Two semi-permanent marker pegs were left on site for re-location purposes. Their positions and local grid co-ordinates are given on Figure 2.

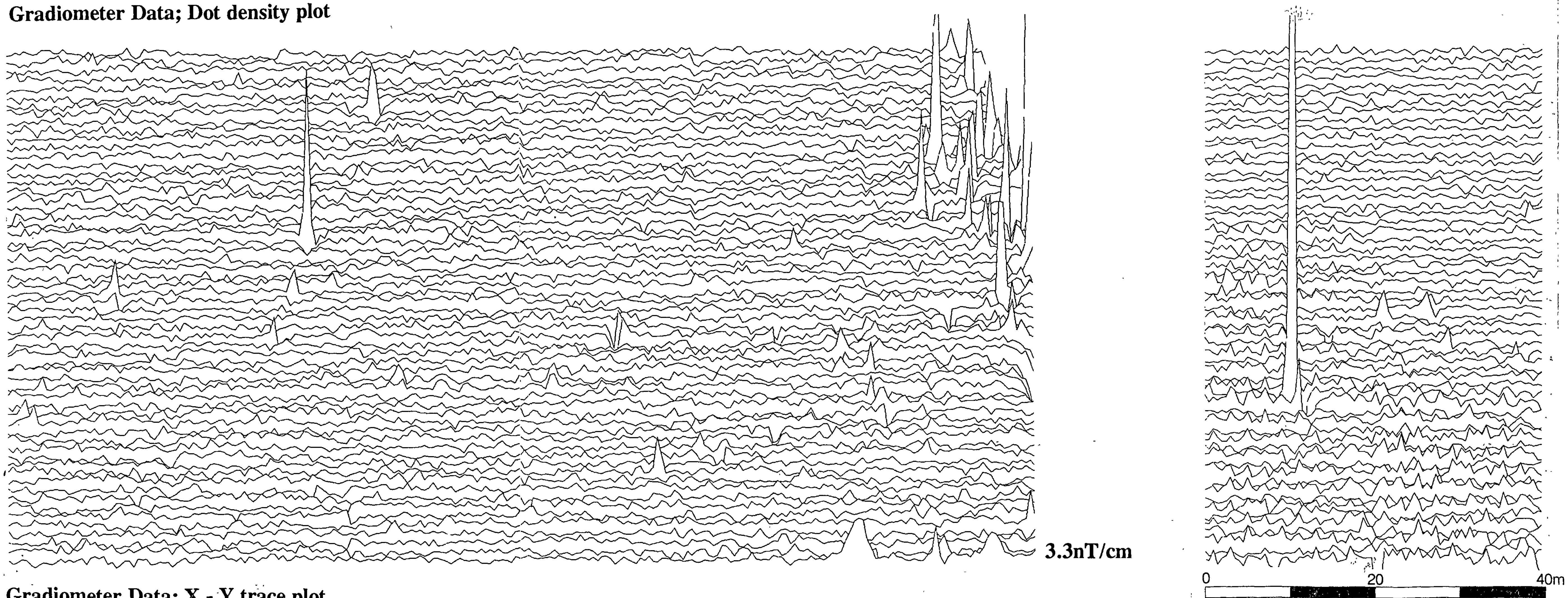
It should be noted that the co-ordinates given on Figure 2 are local points relative to the set out position of the Geodimeter. These are accurate to +/- 0.01m. No Ordnance Survey co-ordinates were provided by the client.

Appendix 3

Gradiometer data plots (1:500)



Gradiometer Data; Dot density plot



Gradiometer Data; X - Y trace plot

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