# GEOPHYSICAL SURVEY AT BOSTON ROAD KIRKBY LA THORPE LINCOLNSHIRE

## PHASE 2

**Work undertaken for**
**Central Networks**

**May 2009**

**Report produced by**
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National Grid Reference: **TF 0875 4600**

APS Report No: **40/09**

ARCHAEOLOGICAL PROJECT SERVICES

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## CONTENTS

List of Figures



### List of Figures

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## 1. SUMMARY

*A further phase of gradiometer survey was undertaken over the revised location of a new electricity substation, access routes and pylon location on the north side of Boston Road east of Sleaford, in the parish of Kirkby La Thorpe.*

*The site lies in close proximity to areas of significant late Iron Age and Roman settlement. However, few clearly archaeological features were noted. Two linear/curvilinear features can be seen along the northern boundary, but most of the variation within the survey data is geological in origin, or due to modern agricultural activities on the site.*

## 2. INTRODUCTION

### 2.1 Background

Archaeological Project Services was commissioned by Central Networks to undertake detailed gradiometer survey of land alongside Boston Road, Kirkby La Thorpe as part of proposals to construct an electricity substation at the site. The site initially selected was subject to earlier survey (Area 1: Malone 2009). Revised proposals led to the need for further survey which was undertaken on 27th April 2009.

### 2.2 Topography and Geology

Kirkby La Thorpe lies 3km east of Sleaford in the North Kesteven District of Lincolnshire. The site lies c. 1km west of the village along the Boston Road heading into Sleaford (Fig. 1). The survey area comprised some 2500m$^2$ on the north side of the road, centred on TF 0875 4600.

The site lies on level ground at c. 10m OD. Soils at the site are mapped as coarse and fine loamy and sandy soils of the Ruskington Association developed on glaciofluvial drift (Hodge et al. 1984, 304).

### 2.3 Archaeological Setting

The site lies c. 1km east of the major Iron Age and Roman settlement at Sleaford. Recent archaeological investigations eastwards along Boston Road show that considerable activity extended eastwards of the town along a Roman predecessor of Boston Road (Field forthcoming; Rowe 2008). Roman remains were encountered in the near vicinity during evaluation works in the field to the west (Rowe 2008).

## 3. AIMS

The aim of the survey was to locate any features of possible archaeological significance in the proposed development area in order to contribute to the management of the potential archaeological resource of the site.

## 4. METHODS

The fieldwork was carried out on 27th April 2009. Weather and ground conditions during the survey were dry. The ground was covered with a low cereal crop. The survey consisted of two blocks: Area 2 170m x 60m, covering the potential substation location north of the existing plantation; and Area 3, 210m x 10m (widening to 30m) covering cabling and access routes and the site of a proposed new pylon (Figs 1, 7).

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. Although the changes in the magnetic field resulting from differing features in the soil are usually weak,

changes as small as 0.2 nanoTesla (nT) in an overall field strength of 48,000nT can be accurately detected using this instrumentation.

The mapping of anomalies in a systematic manner allows an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies such as pits and ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil (but this can be variable depending on the nature of the underlying deposits). Wall foundations can show as negative anomalies where the stone is less magnetic than the surrounding soil, or as stronger positive and negative anomalies if of brick, but are not always responsive to the technique.

Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame. Each gradiometer has a 1m separation between the sensing elements so enhancing the response to weak anomalies.

*Sampling interval and data capture*
Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid. The Grad 601 has a typical depth of penetration of 0.5m to 1.0m although a greater range is possible where strongly magnetic objects have been buried in the site.

Readings are logged consecutively into the data logger which is downloaded daily either into a portable computer whilst on site or directly to the office computer. At the end of each job, data is transferred to the office for processing and presentation.

*Processing and presentation of results*
Processing is performed using specialist ArchaeoSurveyor software. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. 'Despiking' is also performed to remove the anomalies resulting from small iron objects often found on agricultural land. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following shows the basic processing carried out on all processed gradiometer data used in this report:

1. DeStripe (sets the background mean of each traverse within a grid to zero and is useful for removing striping effects)

2. Despike (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)
Parameters: X radius = 1; Y radius = 1; Threshold = 3 std. dev.; Spike replacement = mean

3. Clip (excludes extreme values allowing better representation of detail in the mid range): -4 to 4nT for Area 2 and -5 to 5nT for Area 3.

## 5. RESULTS

The presentation of the data for the site involves a print-out of the raw data as greyscale and trace plots (Figs 2, 4),

together with a greyscale plot of the processed data (Figs 3, 5, 6). Magnetic anomalies have been identified and plotted onto the interpretative drawing for the site (Figure 7) and are described below.

*Geological responses*
Background responses owing to variations in the underlying natural dominate the plots. These are evident as amorphous positive and negative responses, sometimes approximating to a linear form but diffuse and ill-defined.

*Positive linear anomalies of probable archaeological origin*
Two positive responses along the northern edge of the survey area may represent archaeological features. These are linear (or perhaps slightly curvilinear) running roughly north-south. They fall within the 10m-wide strip surveyed along the access/cabling route and given the limited area surveyed here and the variability of the natural background, interpretation can only be tentative.

*Discrete positive anomalies*
Discrete positive responses are difficult to interpret owing to the variability of the natural background which gives rise to stronger responses than possible archaeological features. None have been highlighted as of possible archaeological origin.

*Modern disturbance*
A linear response running north-south along the western edge of the plot gives a relatively strong bi-polar response and probably relates to a buried service or pipe. A series of parallel north-south and east-west responses further to the east probably reflect agricultural use of the land.

*Iron spikes (discrete bipolar anomalies)*
Iron items within the topsoil/ploughsoil give a distinctive localised bipolar (strong negative and positive) response. Such items usually derive from relatively recent agricultural use of the land – broken or discarded pieces of agricultural machinery etc. These are fairly widely disctibuted across the survey area.

## 6. DISCUSSION

Magnetic survey has had limited success on the site owing to the variability of the natural background which gives rise to stronger responses than possible archaeological features. Very similar responses were observed in survey immediately to the west and subsequent trial trenching confirmed the natural origin of all but the most clearly defined features (Rowe 2008).

Two possible curvilinear features (perhaps part of the same feature) were identified along the northern edge of the survey area. These are the only magnetic responses with clear archaeological potential, but further investigation would be necessary in order to characterise and date any of these magnetic anomalies.

## 7. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge the assistance of Alec Tuplin of Bruton Knowles and Mike Kershaw of Central Networks who commissioned the project and liaised with the landowner over access.

## 8. PERSONNEL

Project coordinator: Steve Malone
Field survey: Steve Malone, Jonathon Smith
Survey processing and reporting: Steve Malone

## 9. BIBLIOGRAPHY

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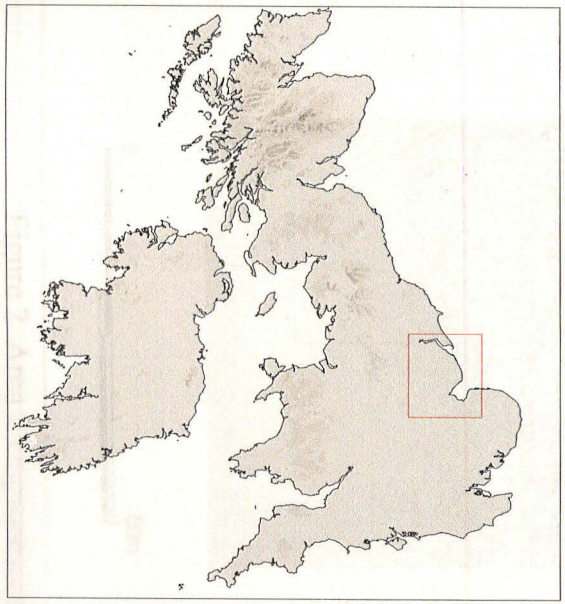
## 10. ABBREVIATIONS

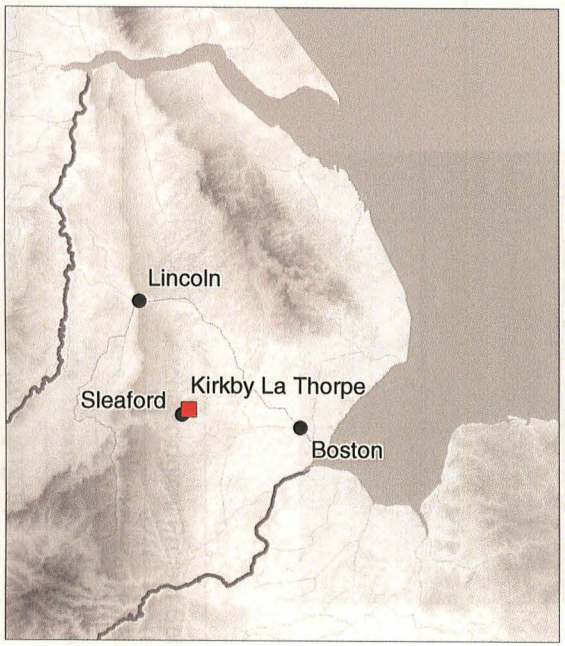
APS Archaeological Project Services

EH English Heritage

IFA Institute of Field Archaeologists

OS Ordnance Survey





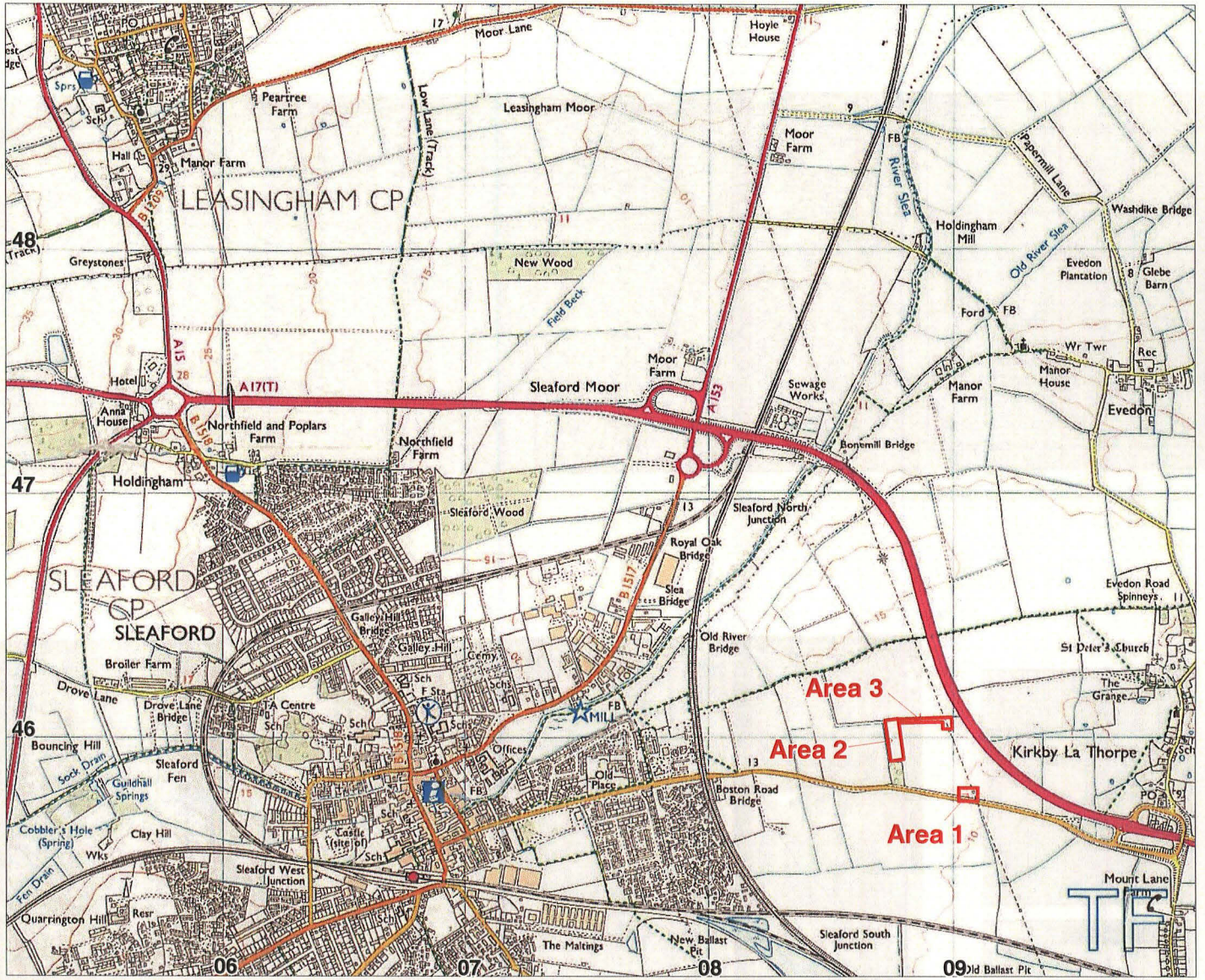






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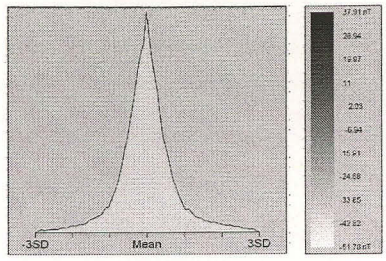
Figure 1 Site location map



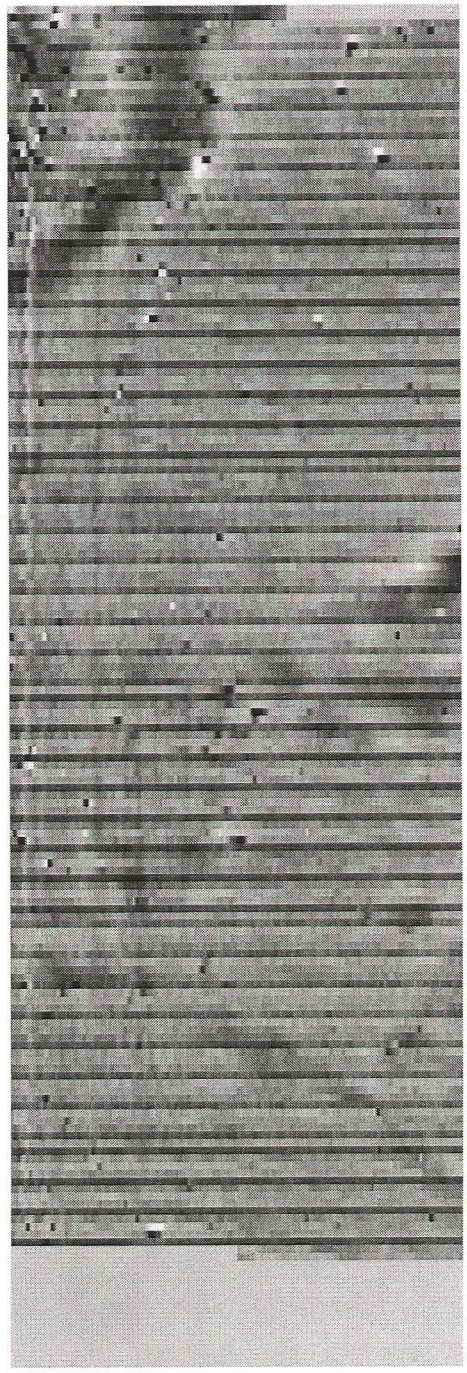



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Figure 2 Area 2 Unprocessed data: trace plot (left); greyscale (right)

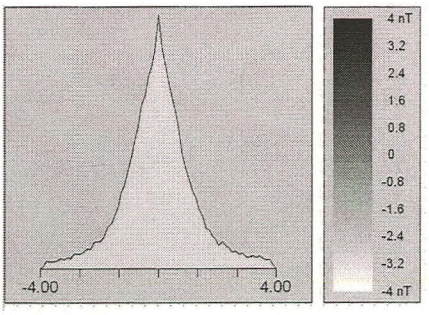


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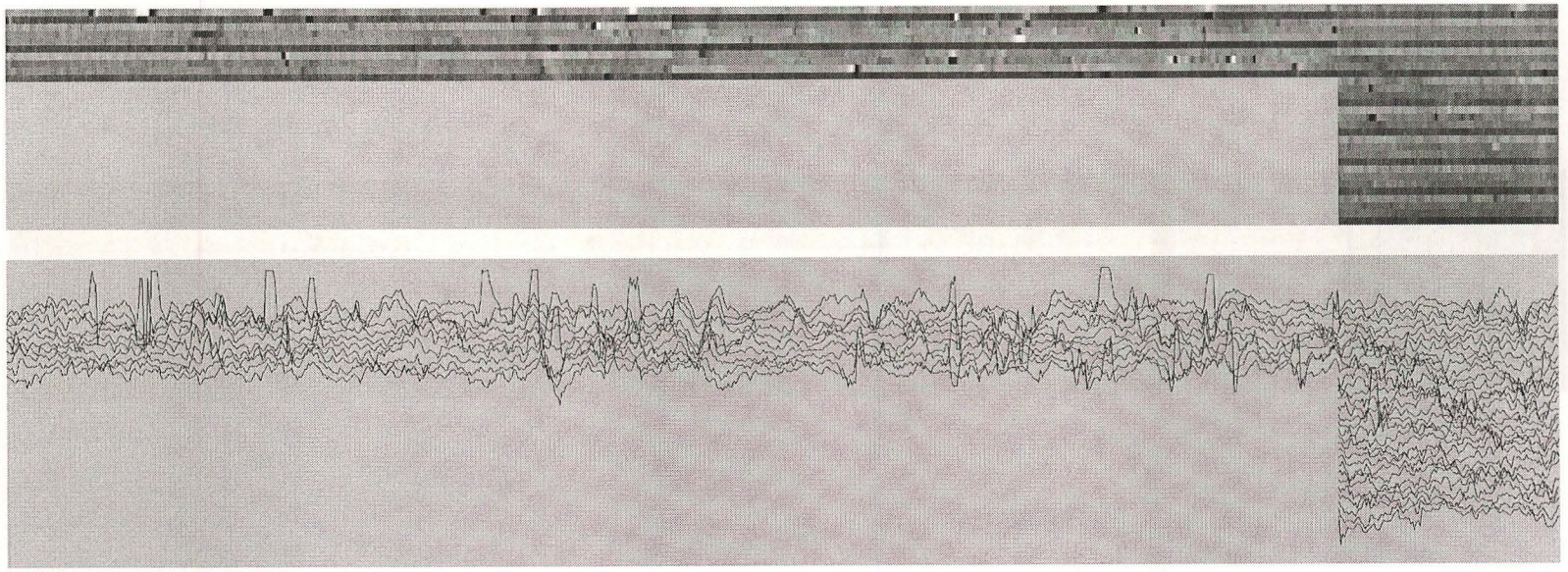
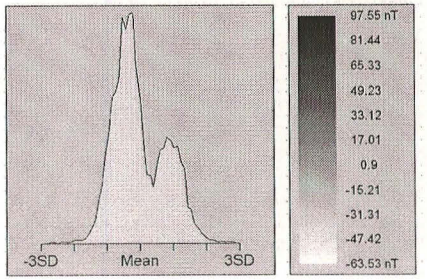
Figure 3 Area 2 Processed data greyscale plot









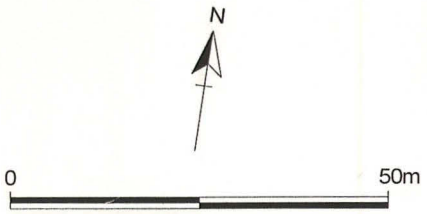



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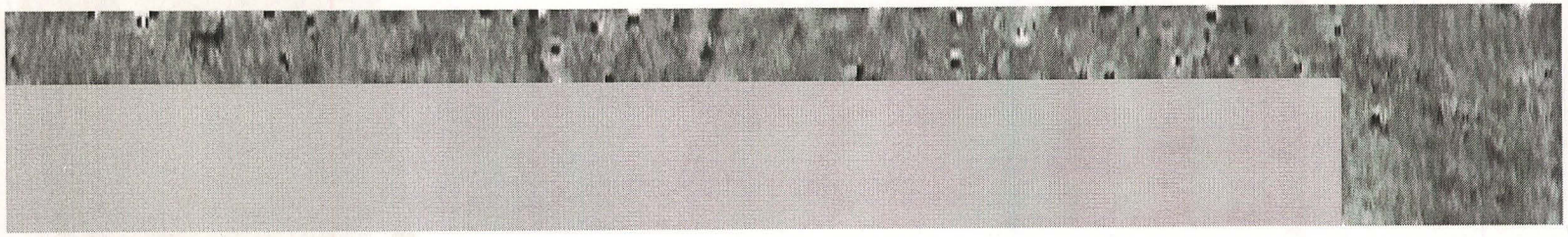
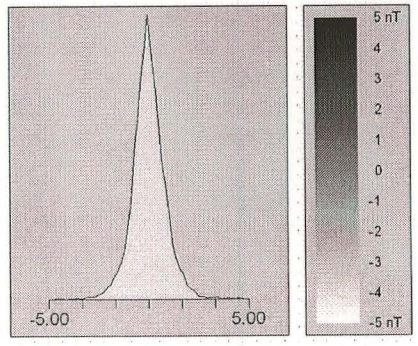
Figure 4 Area 3 Unprocessed data: greyscale and trace plot





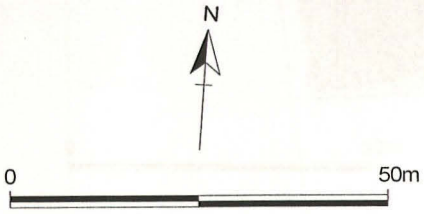




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Figure 5 Area 3 processed greyscale plot

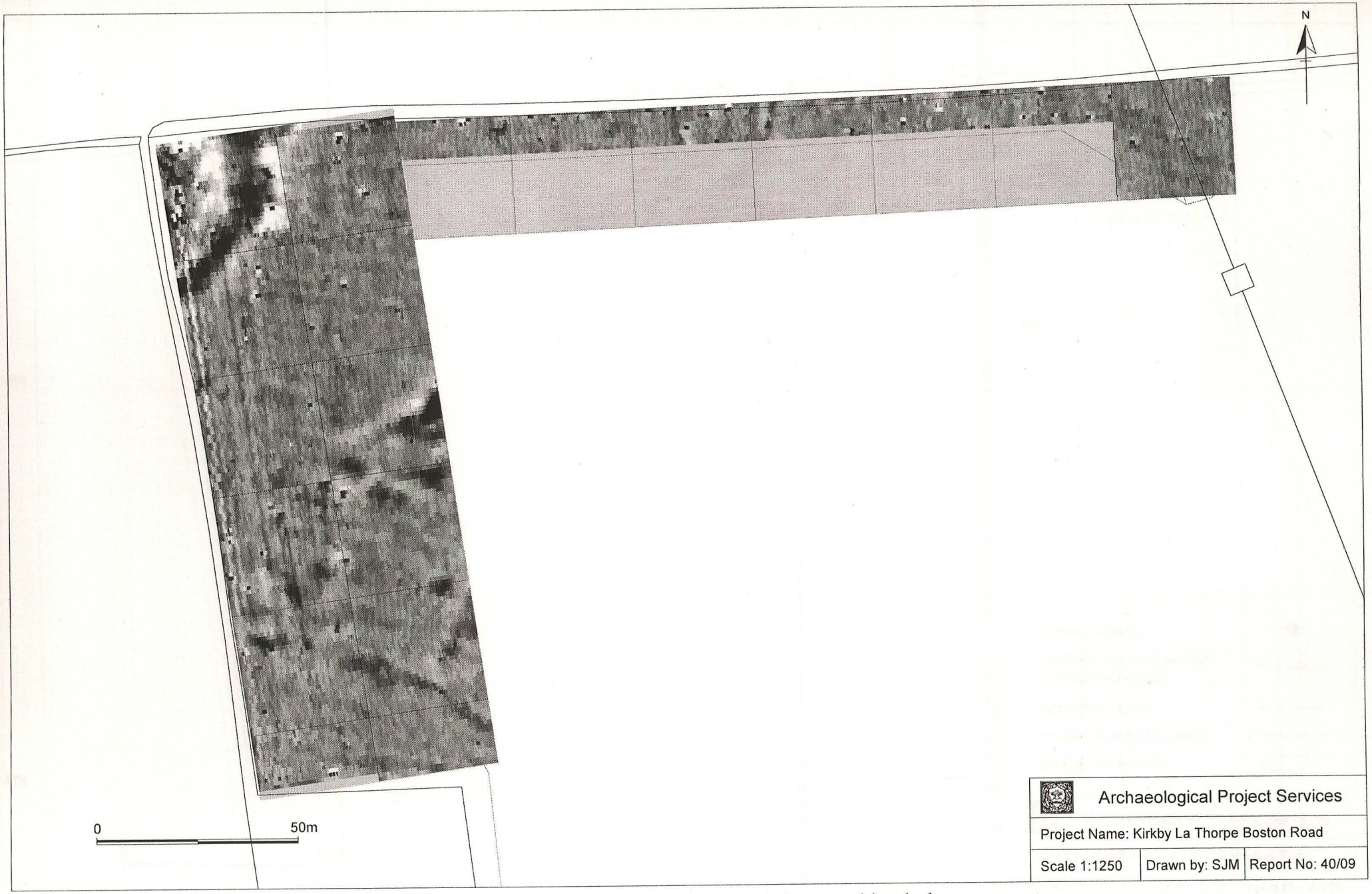


Figure 6 Areas 2 and 3 processed data combined plot

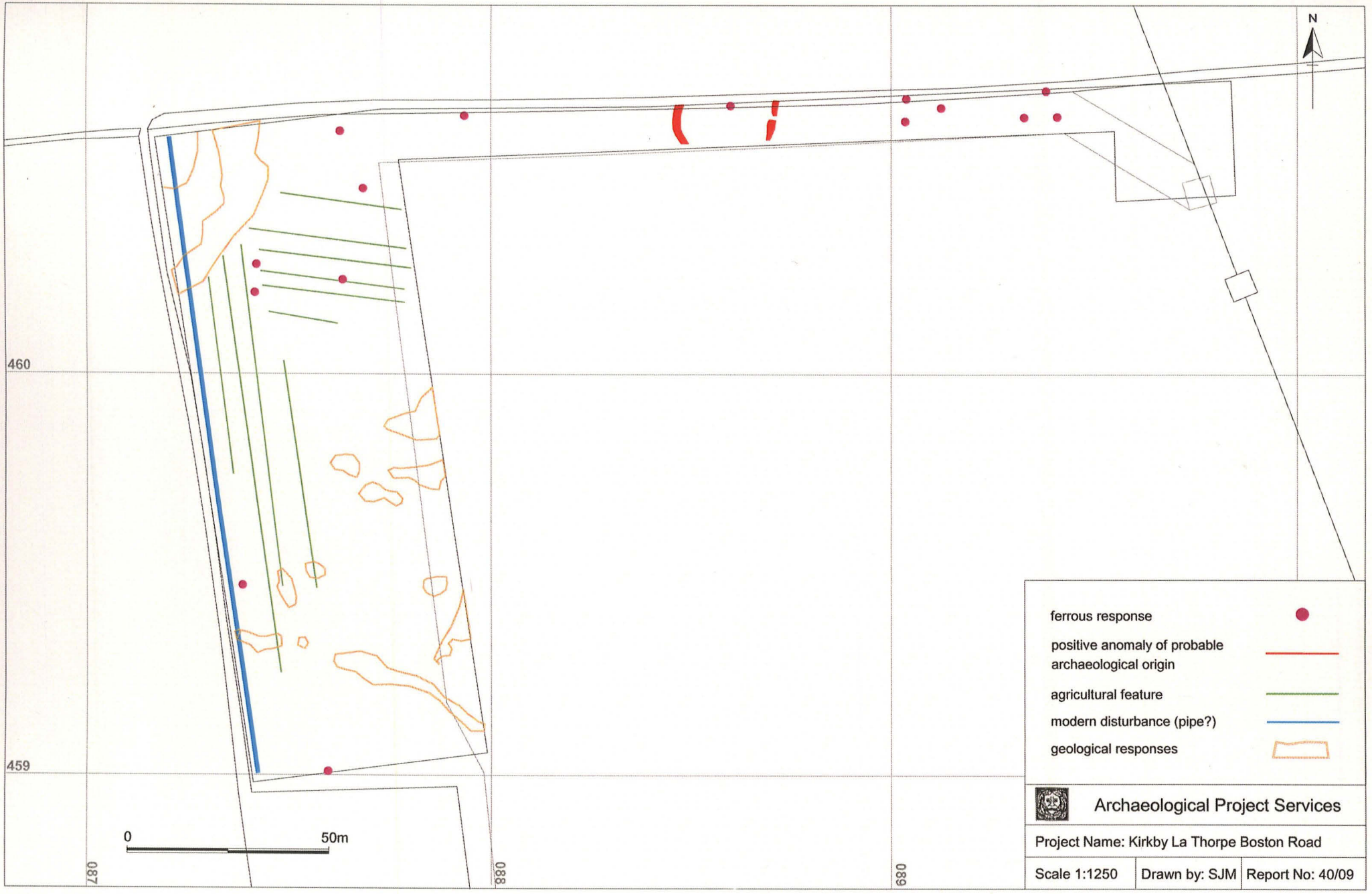


Figure 7 Areas 2 and 3 interpretative plot