



**BARNBURGH LANE
GOLDTHORPE
SOUTH YORKSHIRE**

GEOPHYSICAL SURVEY

**Work undertaken for
SLR Consulting**

January 2012

**Report produced by
S J Malone BSC PhD MIFA**

**OASIS Ref: archaeo11-117008
National Grid Reference: 446699 403817**

APS Report No: 5/12

**ARCHAEOLOGICAL
PROJECT
SERVICES**



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1. SUMMARY

Detailed magnetic gradiometer survey was undertaken for SLR Consulting, acting on behalf of Gleeson Developments Ltd, in connection with proposed residential development on land at Barnburgh Lane, Goldthorpe, South Yorkshire. The survey totalled 4ha.

Few clearly archaeological features have been identified within the geophysical survey. A pattern of probable drainage features can be seen within the northwest of the field. A perpendicular anomaly is similar in character and may form part of this drainage pattern. A few other possible linear features are highlighted, two of which do appear to match the locations of features recorded from aerial photography, but these are generally rather ill-defined and their interpretation is less clear. A number of discrete pit-like features are also highlighted but the range of background variation is quite large and the interpretation of these too is difficult on the basis of form alone. There is considerable modern disturbance especially adjacent to the road and two modern services run along the field edges.

2. INTRODUCTION

2.1 Definition of an Evaluation

Geophysical survey is a non-intrusive method of archaeological evaluation. Evaluation is defined as ‘*a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site. If such archaeological remains are present Field Evaluation defines their character and extent, quality and preservation, and it enables an assessment of their worth in a*

local, regional, national or international context as appropriate’ (IFA 2008).

2.2 Background

Archaeological Project Services was commissioned by SLR Consulting on behalf of Gleeson Developments Ltd to undertake detailed magnetometer survey totalling 4ha on land at Barnburgh Lane, Goldthorpe, South Yorkshire. The site is the subject of a planning application to develop the land for housing. The survey was carried out between the 5th and 9th January 2012.

2.3 Topography and Geology

Goldthorpe is located 20km northeast of Sheffield and 11km west of Doncaster in the Barnsley District of South Yorkshire. The site lies on the southeast edge of the village on the south side of Barnburgh Lane at NGR 446699 403817 (Fig. 1). It is bounded by Barnburgh Lane to the north, by Engine Lane to the east, by pasture to the south and southwest and by 20th century residential development to the northwest.

The site is situated between c. 25m and 35m AOD on the south-facing slope of the valley of the River Dearne. The bedrock geology comprises sandstone, siltstone and mudstone of the Pennine Middle Coal Measures Formation. The site is currently arable agricultural land.

2.4 Archaeological Background

Previous desk-based assessment has outlined the archaeological background to the site (SLR 2011).

There is little evidence for prehistoric activity in the vicinity, but there are extensive areas of enclosures, trackways and field systems of presumed Iron Age or

Romano-British date around the Site.

The Site itself contains two cropmarks or groups of cropmarks. These are undated but their orientation suggests that they are related to neighbouring Iron Age or Roman field systems.

The remains of 18th century probable coal-mining are recorded in historic mapping from the vicinity of the southern end of the Site but their location is not accurately recorded. They seem most likely to lie beyond the Site boundary.

3. AIMS AND OBJECTIVES

The aims and objectives of the survey were:

Aims

- to contribute to establishing the extent and significance of any archaeological remains which may exist within the Site.

Objectives

- to establish the location, and extent of any archaeological features which provide suitable magnetic responses; and
- to identify the extent of any areas devoid of archaeological features.

4. GEOPHYSICAL SURVEY

4.1 Methods

Location and layout of the survey area is shown in Figure 2. Weather and ground conditions during the survey were variable with heavy rain early in the first day but dry thereafter. The field had previously been under arable cultivation but had been left as stubble with only low vegetation.

Survey was undertaken in accordance with English Heritage (2008) and IfA (2010) guidelines and codes of conduct.

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 c. 49,000nT can be accurately detected using this instrumentation, although in practice instrument interference and soil noise can limit sensitivity.

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 representing pits and ditches can be seen where they contain more topsoil which is normally richer in magnetic iron oxides and provides a contrast with the natural subsoil (but this can vary 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. It should be noted that not all features will be responsive and absence of anomalies does not necessarily indicate absence of archaeological features.

Magnetometers measure changes in the Earth's magnetic field. With two sensors configured as a gradiometer the recorded values indicate the difference between two magnetic measurements separated by a fixed distance. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame with a 1m separation between the sensing elements

giving a strong response to deep 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 processing techniques carried out on the 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 = 3SD; Spike replacement = mean

3. Clip (excludes extreme values allowing better representation of detail in the mid range): -3 to 3nT.

4.2 Results

The presentation of the data for the site involves a print-out of the raw or minimally processed data as greyscale and trace plots (Figs 3, 4; clipped for display but otherwise unprocessed), together with greyscale plots of the processed data (Fig. 5, 7). Magnetic anomalies have been identified and plotted onto interpretative drawings (Figs 6, 8) and are described below.

Positive linear anomalies

Positive anomalies of probable archaeological origin are sparse. A series of very straight parallel linear anomalies **A** perhaps represent drainage features. Perpendicular linear anomaly **B** may also form part of this pattern (one or two of the lines at **A** appear to stop against this). A few other possible linear features are highlighted. Although **C** does appear to match the location of Cropmark **B**, in general these are ill-defined and lacking any clear pattern.

Area positive anomalies

A number of area positive anomalies are highlighted where these are strong and fairly well defined. These may represent pit features, however background variation is quite wide hindering interpretation of discrete elevated responses.

Negative linear anomalies

The linear negative response at **D** matches

the alignment of the possible drainage features at **A** and, despite the differing response, probably forms part of the same pattern. A linear response at **E** possibly matches part of Cropmark A, but this corner of the field suffers from strong modern disturbance and the response not entirely clear.

Modern/magnetic disturbance

Strong bipolar responses occur alongside Barnburgh Lane and along the western and eastern boundaries. The latter both probably reflect routes of modern services along these boundaries: a manhole is evident close to the western boundary at **F**; a smaller access point close the field entrance off Engine Lane. Other localised area responses perhaps reflect recent ground disturbance – evident in places – or larger buried items. Other, more diffuse, areas are noted, reflecting the generally ‘noisy’ response across the field.

Iron spikes (discrete bipolar anomalies)

Iron items within the topsoil give a distinctive localised bipolar (strong positive with associated strong negative) response. Such items usually derive from relatively recent management or agricultural use of the land – broken or discarded pieces of agricultural machinery or other modern debris. These are fairly widely scattered but a concentration towards the north and northwest perhaps reflects modern debris alongside the road.

5. DISCUSSION

Few clearly archaeological features have been identified within the geophysical survey. A pattern of probable drainage features – very straight and parallel – can be seen within the northwest of the field (possibly extending across towards the east side). A perpendicular anomaly is similar in character and may form part of this

drainage pattern. A few other possible linear features are highlighted. Two of these do appear to match the locations of features recorded from aerial photography but otherwise only short, disconnected and rather ill-defined lengths can be seen and their interpretation is less clear. A number of discrete pit-like features are also highlighted but the range of background variation is quite large and the interpretation of these too is difficult on the basis of form alone. There is considerable modern disturbance especially adjacent to the road and two modern services run along the field edges.

6. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge the assistance of Gavin Kinsley of SLR who commissioned the project on behalf of Gleeson Developments Ltd and provided background information on the site. Tom Lane edited the report.

7. PERSONNEL

Project coordinator: Steve Malone
 Geophysical Survey: Andy Failes, Jonathon Smith, Bryn Leadbetter
 Survey processing and reporting: Steve Malone

8. BIBLIOGRAPHY

Clark, A., 1996 *Seeing Beneath the Soil*, London, 2nd edn

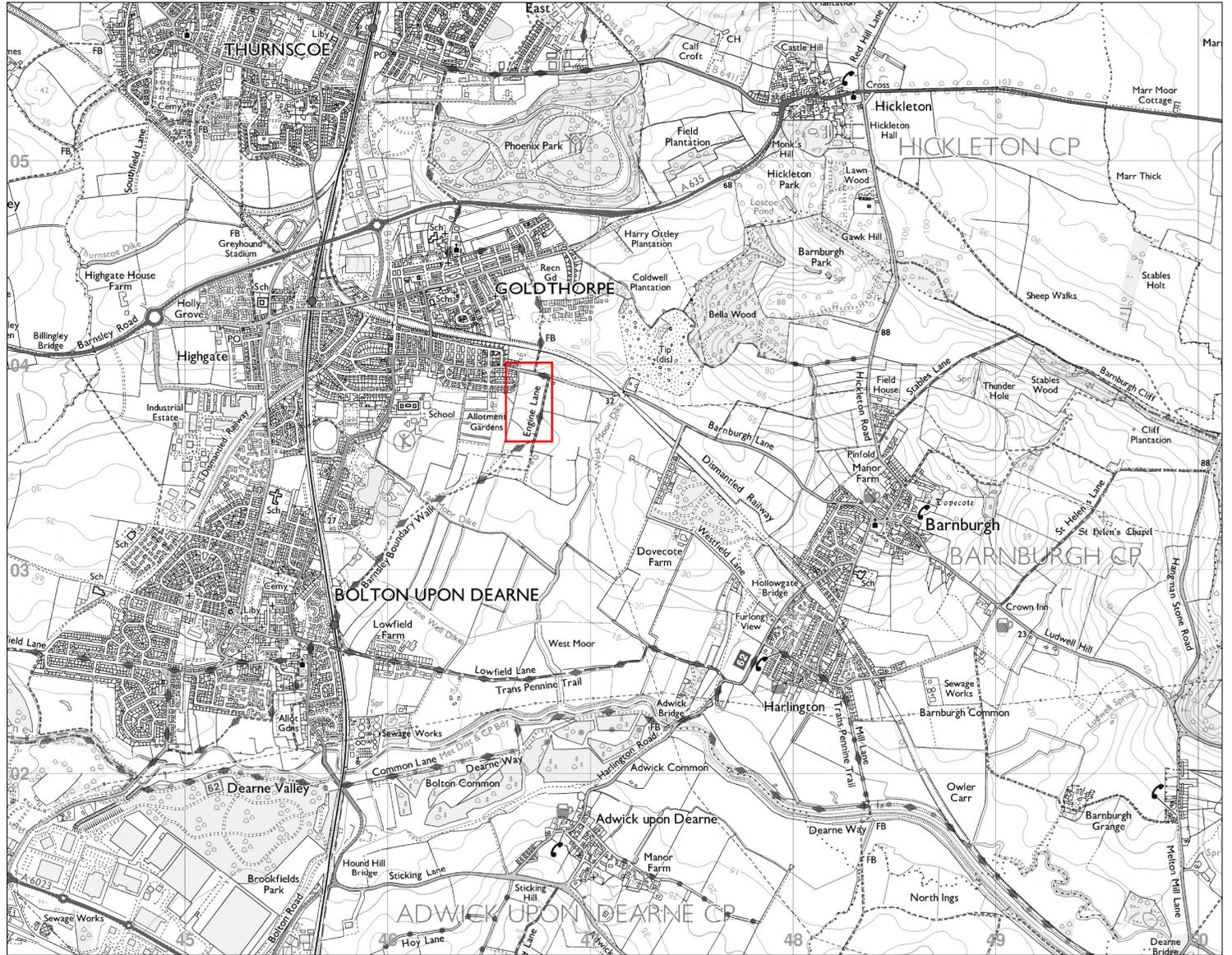
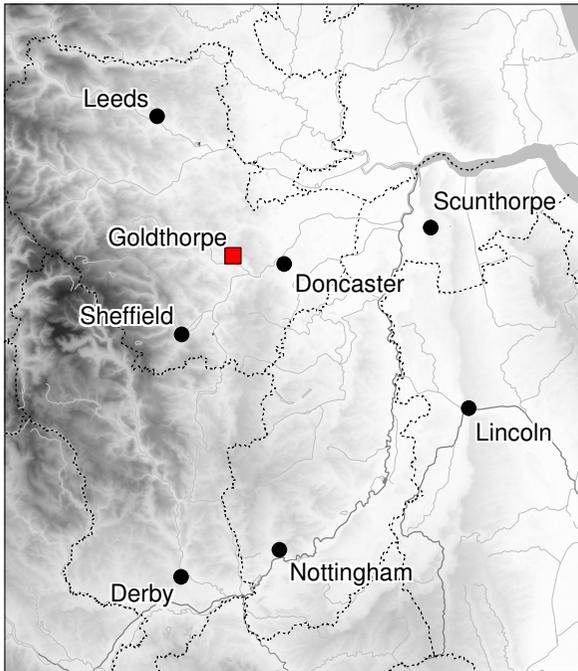
English Heritage, 2008 *Geophysical Survey in Archaeological Field Evaluation*

IFA, 2011 *Standard and Guidance for Geophysical Survey*

SLR 2011, *Barnburgh Lane, Goldthorpe, South Yorkshire. Archaeological Assessment*, SLR Ref : 403.03044.00001

9. ABBREVIATIONS

APS	Archaeological Project Services
BGS	British Geological Survey
EH	English Heritage
IfA	Institute for Archaeologists
HER	Historic Environment Record
SM	Scheduled Monument



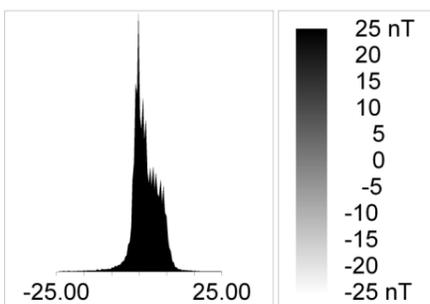
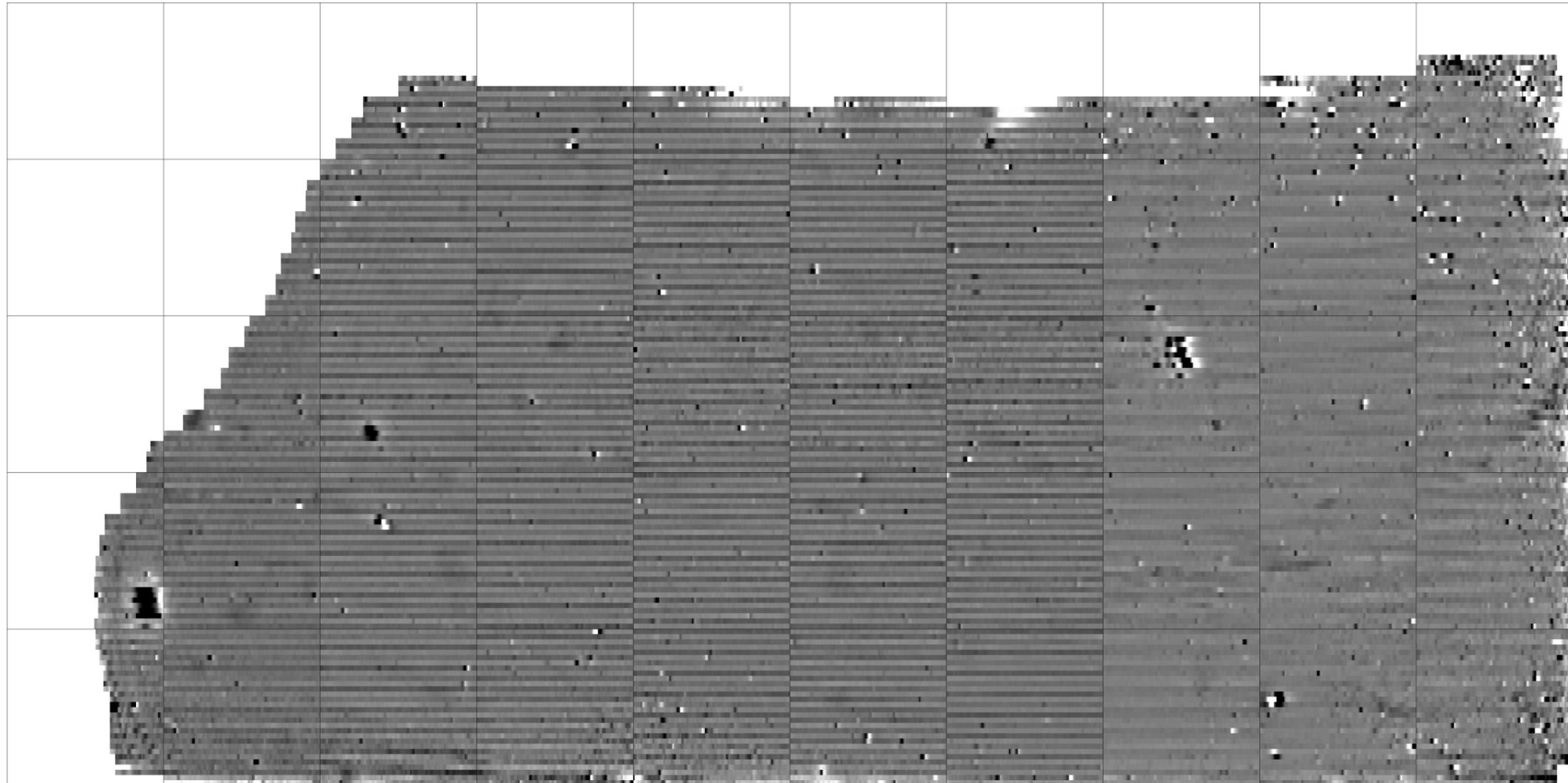
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 Archaeological Project Services		
Project: Goldthorpe Barnburgh Lane		
Scale: varies	Drawn by: SJM	Report No: 5/11

Figure 1 Site location map

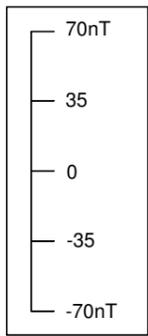
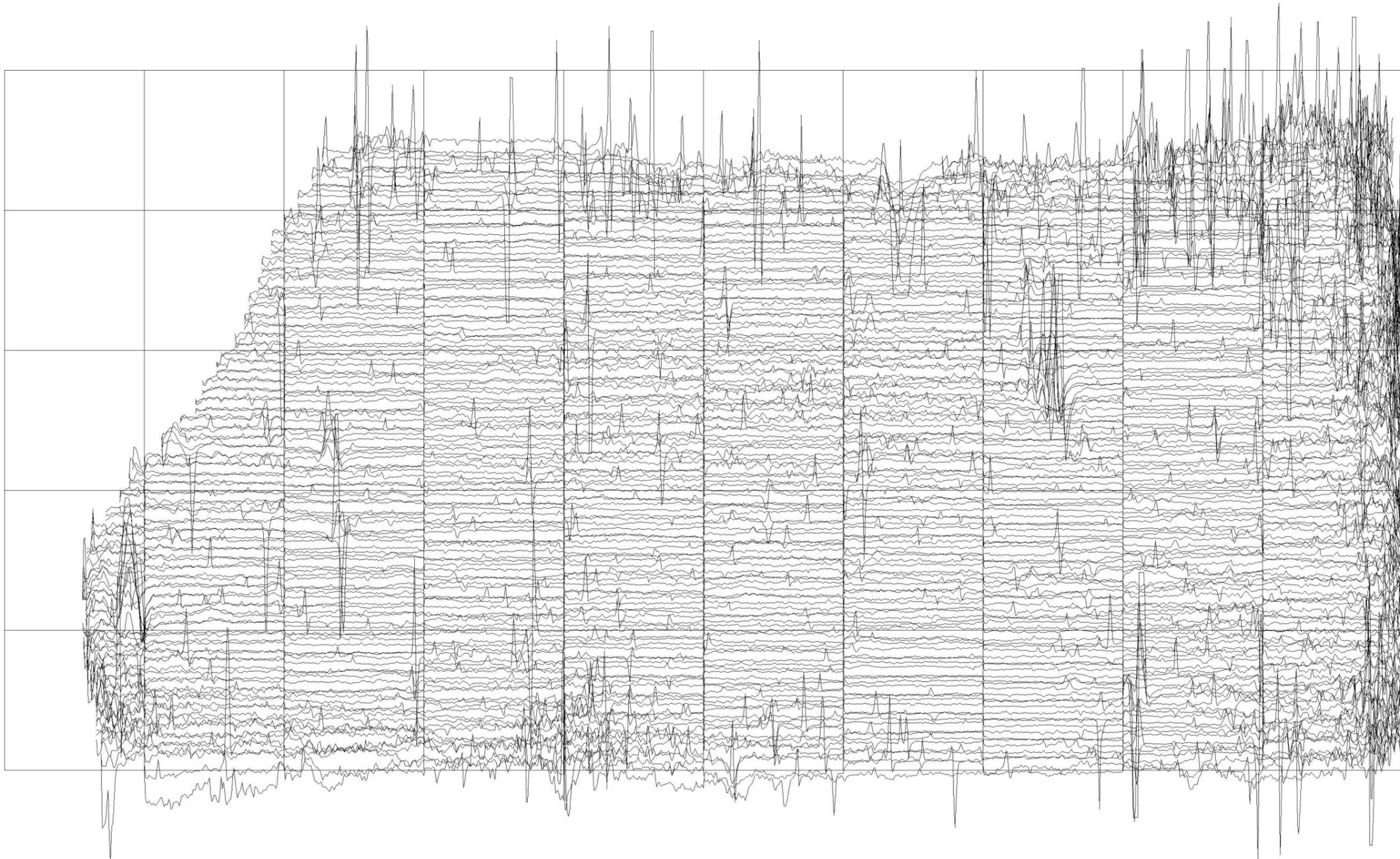


Figure 2 Location and layout of survey area



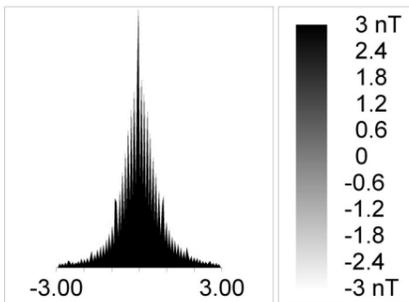
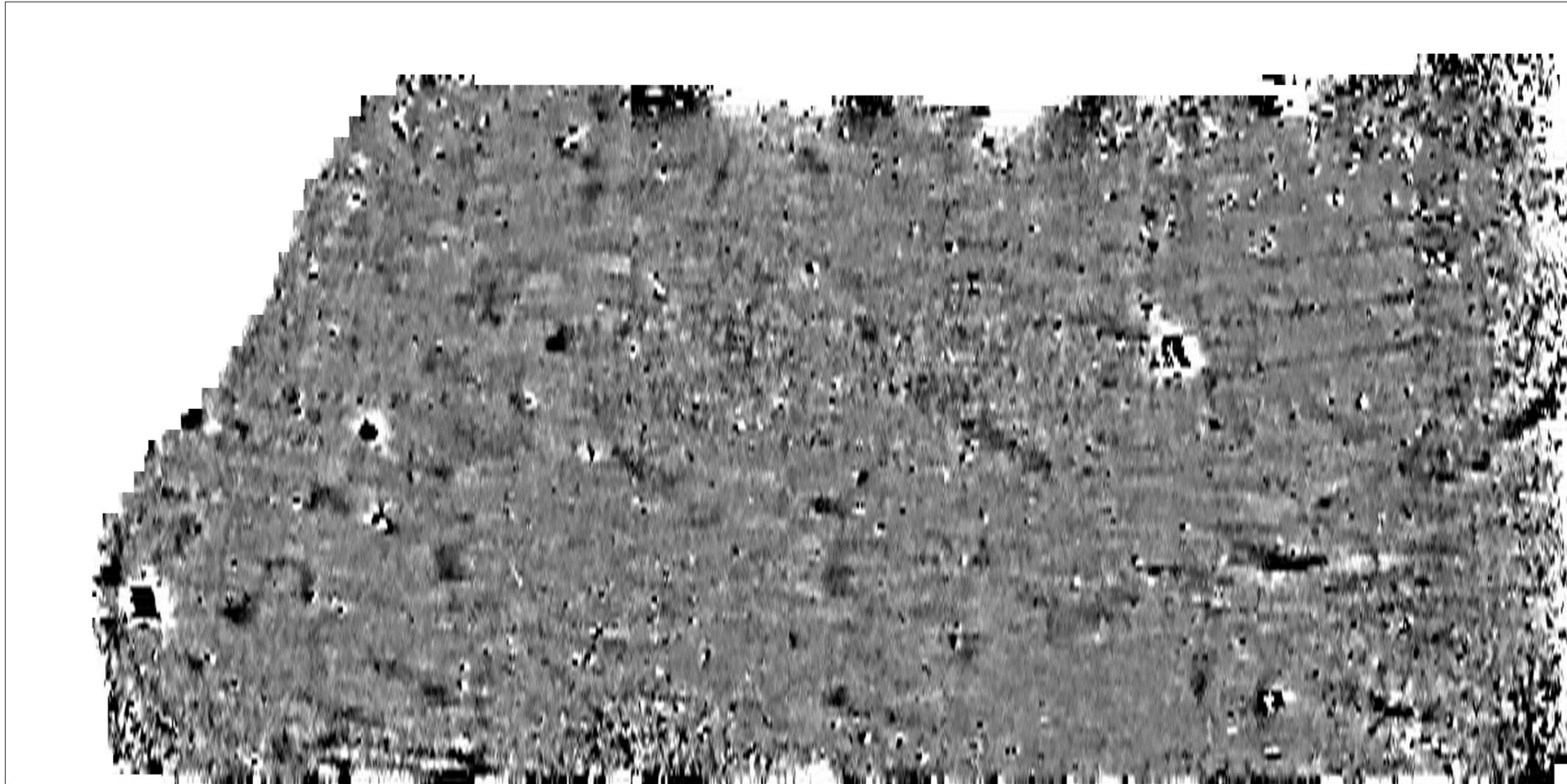
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Figure 3 Minimally processed data greyscale plot



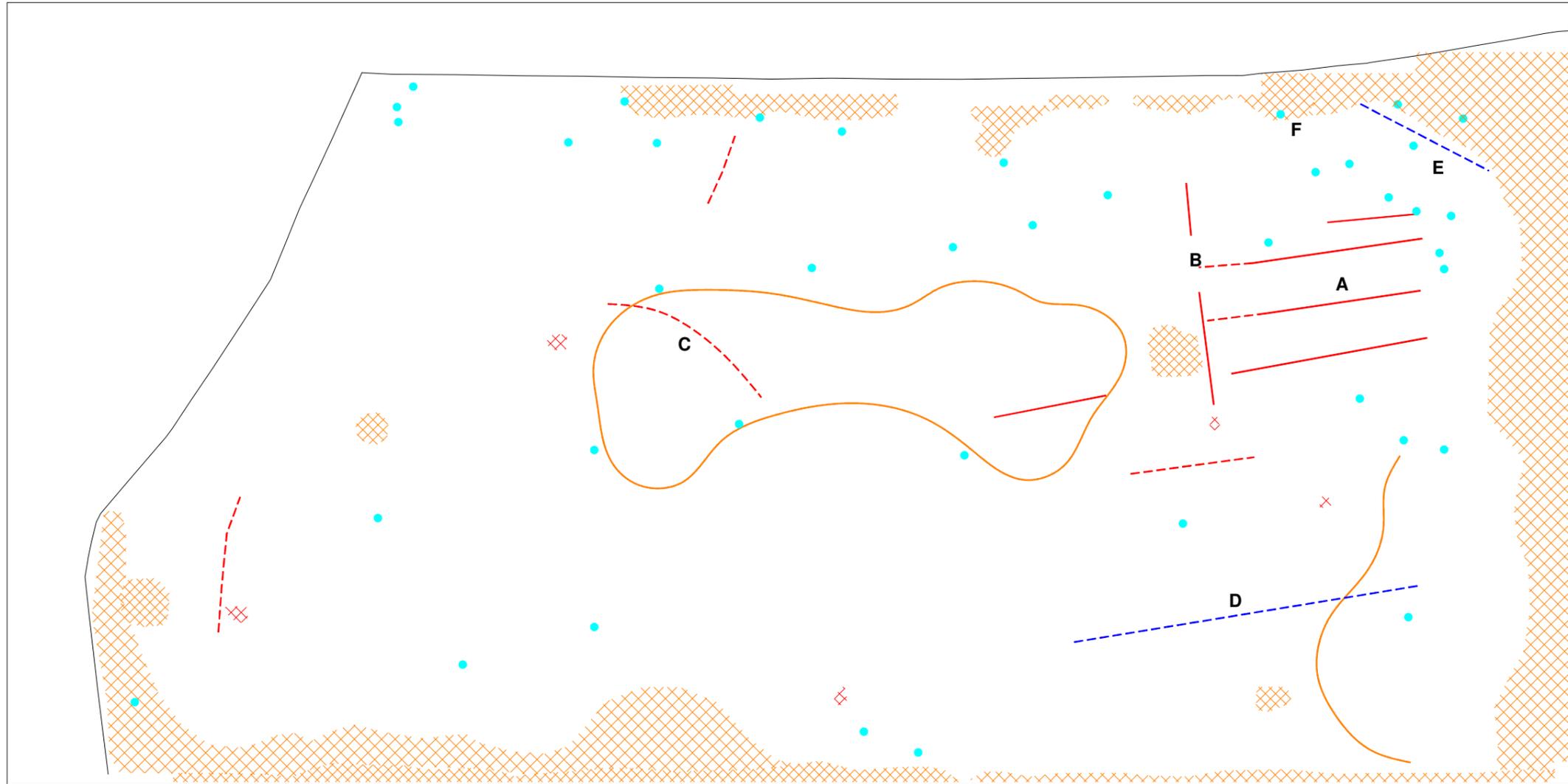
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Figure 4 Unprocessed data trace plot (clip +/-100nT)



	Archaeological Project Services
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Scale 1:1000	Drawn by: SM Report No: 5/12

Figure 5 Processed data greyscale plot



positive linear anomaly	
positive area anomaly	
negative linear anomaly	
ferrous response	
magnetic disturbance	



	Archaeological Project Services
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Figure 6 Interpretative plot

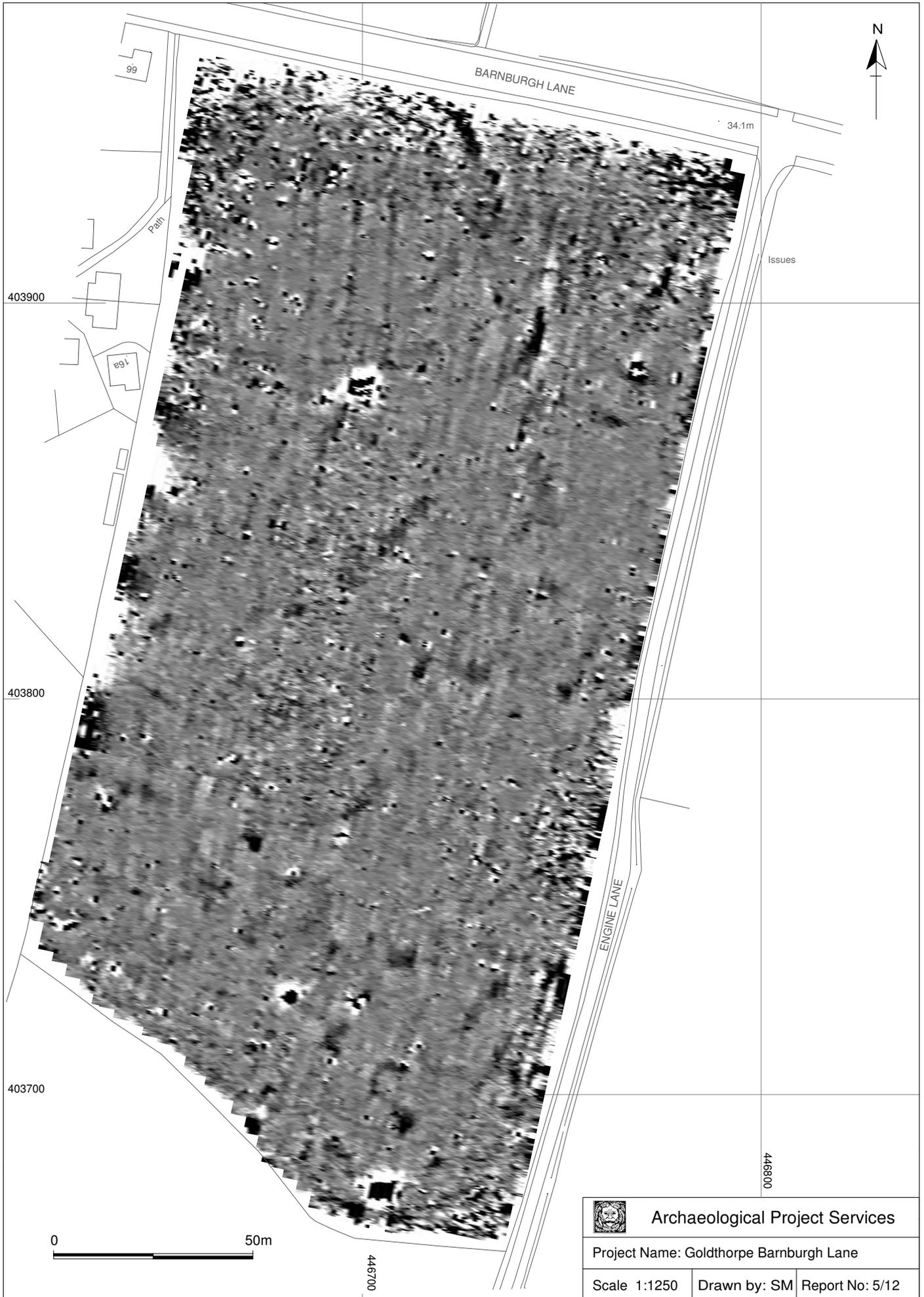


Figure 7 Processed data greyscale overlain on base map

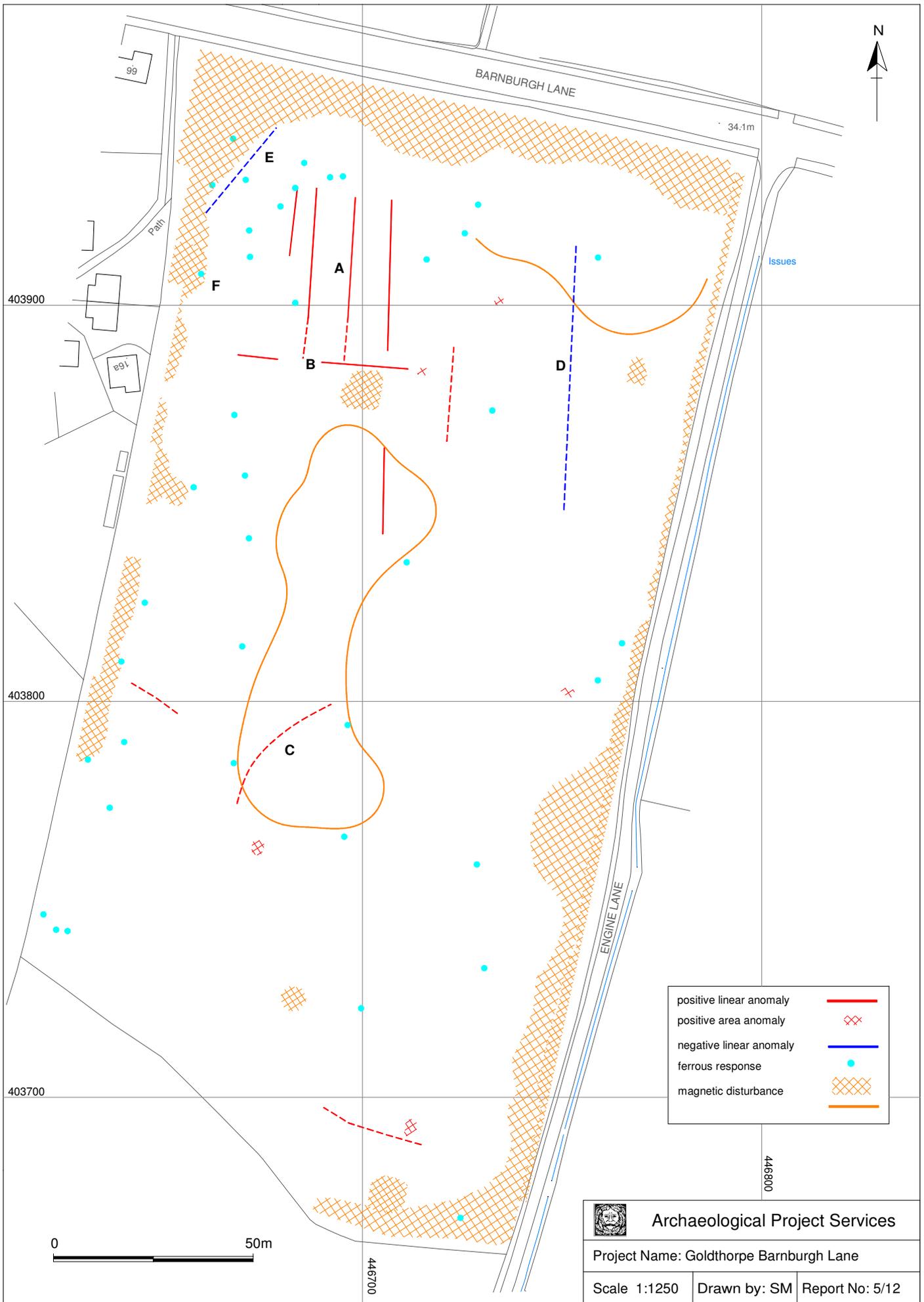


Figure 8 Interpretative plot overlain on base map

Appendix 1 THE ARCHIVE

The archive consists of:

- 3 Daily record sheets
- 1 Report text and illustrations
- Digital data

File names	gobl12-01-a.xgd gobl12-01.xgd gobl12-02-a.xgd gobl12-02.xgd gobl12-03-a.xgd gobl12-03.xgd gobl12-04-a.xgd gobl12-04.xgd gobl12-05-a.xgd gobl12-05.xgd gobl12-06-a.xgd gobl12-06.xgd gobl12-07.xgd gobl12-08.xgd gobl12-09.xgd gobl12-10.xgd gobl12-11-a.xgd gobl12-11.xgd gobl12-12-a.xgd gobl12-12.xgd gobl12-13-a.xgd gobl12-13.xgd gobl12-14-a.xgd gobl12-14.xgd gobl12-15-a.xgd gobl12-15.xgd gobl12-16-a.xgd gobl12-16.xgd	gobl12-17-a.xgd gobl12-17.xgd gobl12-18-a.xgd gobl12-18.xgd gobl12-19-a.xgd gobl12-19.xgd gobl12-20-a.xgd gobl12-20.xgd gobl12-21-a.xgd gobl12-21.xgd gobl12-22.xgd gobl12-23.xgd gobl12-24.xgd gobl12-25.xgd gobl12-26-a.xgd gobl12-26.xgd gobl12-27-a.xgd gobl12-27.xgd gobl12-28-a.xgd gobl12-28.xgd gobl12-29-a.xgd gobl12-29.xgd gobl12-30-a.xgd gobl12-30.xgd gobl12-31-a.xgd gobl12-31.xgd gobl12-32.xgd gobl12-33.xgd	gobl12-34.xgd gobl12-35.xgd gobl12-36-a.xgd gobl12-36.xgd gobl12-37-a.xgd gobl12-37.xgd gobl12-38-a.xgd gobl12-38.xgd gobl12-39-a.xgd gobl12-39.xgd gobl12-40-a.xgd gobl12-40.xgd gobl12-41-a.xgd gobl12-41.xgd gobl12-42-a.xgd gobl12-42.xgd gobl12-43-a.xgd gobl12-43.xgd gobl12-44-a.xgd gobl12-44.xgd gobl12-45-a.xgd gobl12-45.xgd gobl12-46-a.xgd gobl12-46.xgd gobl12-47-a.xgd gobl12-47.xgd gobl12-c1.xcp
Explanation of codes used in file names	<p>xgd files are magnetometer grids, named with site code and number in the order surveyed. Grids rotated to first traverse north are suffixed with "-a"</p> <p>xcp files are composites containing record of all the data and processes used to produce the end product</p>		
Description of file formats	All files are in plain text xml format with header data defining survey and processing parameters		
List of codes used in files	D indicates a "dummy" value within the composite data		
Hardware, software and operating systems	ArcheoSurveyor 2.5.15 running under Windows XP Service Pack 3		
Date of last modification	09/01/12		
Indications of known areas of weakness in data			

All primary records are currently kept at:

Archaeological Project Services, The Old School, Cameron Street, Heckington, Sleaford, Lincolnshire NG34 9RW

The ultimate destination of the project archive is:

Cannon Hall Museum, Bark House Lane, Cawthorne, Barnsley, S75 4AT

Site Code: GOBL12
Accession no: A.2240