

AFUS/01



# A50 GROWTH SCHEME, UTTOXETER, STAFFORDSHIRE PROJECT A

GEOPHYSICAL SURVEY

commissioned by AMEY

May 2016





# A50 GROWTH SCHEME, UTTOXETER, STAFFORDSHIRE PROJECT A

## GEOPHYSICAL SURVEY

commissioned by AMEY

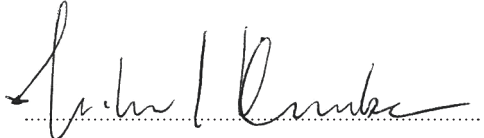
May 2016

project info

**HA JOB NO.** AFUS/01  
**NGR** SK 07603 34921  
**PARISH** Uttoxeter  
**LOCAL AUTHORITY** Staffordshire  
**OASIS REF.** headland5-226366

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## PROJECT SUMMARY

Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey covering 7.7 hectares on agricultural land north-west of Uttoxeter, Staffordshire, to provide information about the archaeological potential of the the A50 Growth Scheme (Project A). The survey has identified parallel linear trend anomalies which reflect the extant ridge and furrow earthworks to the east and south-east of Parks Farm. No obvious archaeological anomalies have been identified by the survey although a short linear anomaly to the north of the A50 may be caused by a ditch of unknown origin. Parts of the area have been affected by modern infilling. On this basis, the archaeological potential of the site is considered to be low although the proposed development will have a direct impact on the historic agricultural landscape.



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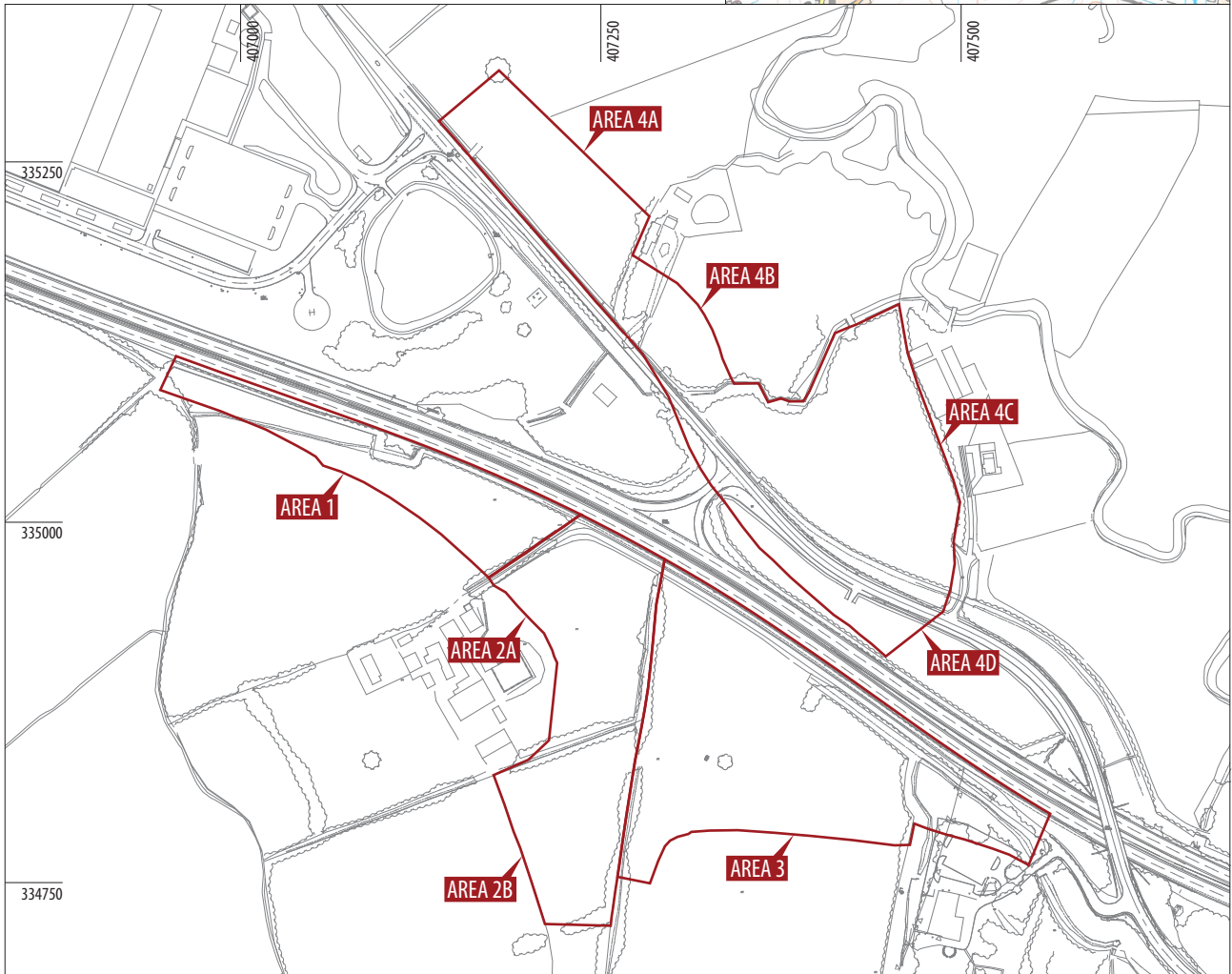
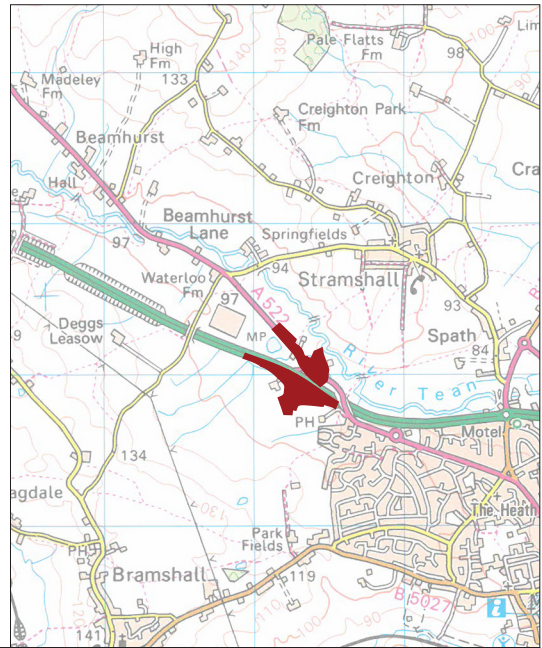
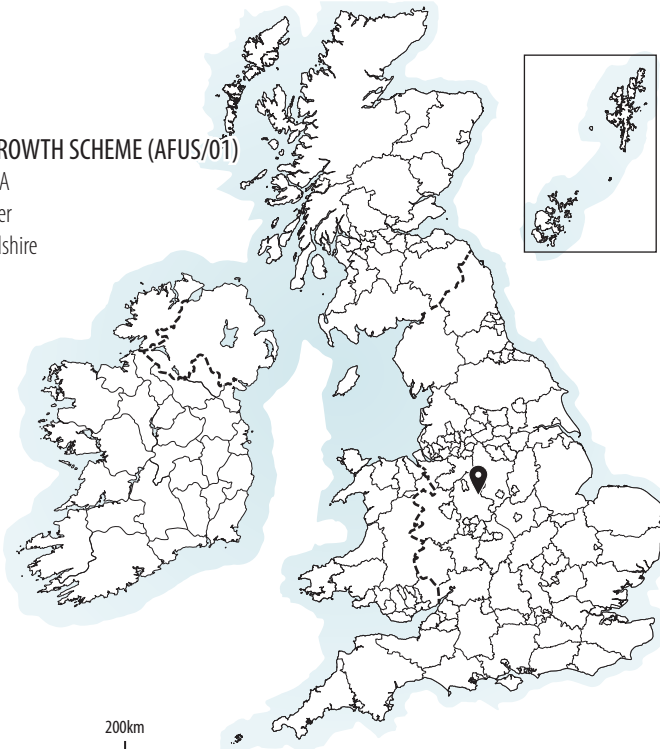
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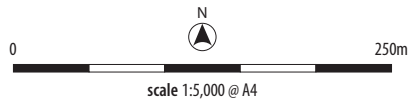
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**A50 GROWTH SCHEME (AFUS/01)**

Project A  
Uttoxeter  
Staffordshire



KEY  
[Red outline] geophysical survey boundary



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# A50 GROWTH SCHEME, UTTOXETER, STAFFORDSHIRE

## PROJECT A

### GEOPHYSICAL SURVEY

#### 1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by AMEY to undertake a geophysical (magnetometer) survey on land to the north-west of Uttoxeter, Staffordshire, for the A50 Growth Scheme (Project A). The project includes the construction of a new grade separated junction on the A50 at the A522 Uttoxeter Road. The work was undertaken in accordance with a Written Scheme of Investigation prepared by Staffordshire County Council (SCC 2015), with a Project Design (Headland Archaeology 2015) submitted to and approved by the client, with guidance within the National Planning Policy Framework (DCLG 2012) and in line with current best practice (David et al. 2008). The survey was carried out between July 9th and July 14th 2015 in order to provide additional information on the archaeological potential of the site.

#### 1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The proposed development area (PDA) is located to the north-west of Uttoxeter, centred at NGR SK 07603 34921. The geophysical survey area comprises four areas (Area 1 – Area 4) which are subdivided into eight irregularly-shaped parcels of land. Area 1, Area 2 and Area 3 are bound to the north by the A50 whereas Area 4 is north of the A50, being largely bound to the south by the A522 Uttoxeter Road (see **ILLUS 1**). At the time of the survey, the fields were under pasture (see **ILLUS 2** to **ILLUS 10** inclusive).

The survey area is located on a slight north-facing gradient being at 100m above Ordnance Datum (aOD) at the southern limit of the survey area and 92m aOD towards the floodplains of the River Tean in the north of the PDA.

#### 1.2 GEOLOGY AND SOILS

The underlying bedrock comprises of the Mercia Mudstone Group. These are overlain by superficial deposits of alluvium to the north-east of the A50, and a mixture of till and glaciofluvial deposits (sand and gravel) to the south (British Geological Survey 2015). The soils are classified in the Soilscape 22 association, characterised as loamy soils with naturally high groundwater (Landis 2015).

#### 2 ARCHAEOLOGICAL BACKGROUND

A Desk Based Assessment (MOLA 2014) raised the possibility that prehistoric remains may survive within the area of the scheme, stating that:

‘Recent archaeological investigation at Uttoxeter Quarry to the north-east of the site has revealed extensive evidence pertaining to the prehistoric utilisation of the landscape from the Neolithic to the Bronze Age period, including evidence for funerary monuments, field systems and a spread of burnt flint associated with a trough. It is considered that there is a moderate potential for prehistoric features within the study area, particularly on the lighter gravel soils close to the River Tean.’

In addition, the assessment concluded that the scheme would have a direct impact on the historic landscape around Parks Farm where extant areas of ridge and furrow and former field boundaries pertain to remnants of the medieval open field system of agriculture, and post medieval field systems dating to the 18th or 19th centuries.



**ILLUS 2** General view of Area 1 (west), looking west    **ILLUS 3** General view of Area 1 (east), looking east    **ILLUS 4** General view of Area 2A, looking south-east    **ILLUS 5** General view of Area 2B, looking north-east    **ILLUS 6** General view of Area 3, looking south-east

### 3 AIMS, METHODOLOGY AND PRESENTATION

The main aim of the geophysical survey was to provide additional information on the archaeological potential of the site, to inform the further design of a mitigation programme.

The general archaeological objectives of the geophysical survey were:

- › to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- › to therefore model the presence/absence and extent of any buried archaeological features; and
- › to prepare a report summarising the results of the survey.

#### 3.1 MAGNETOMETER SURVEY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. Features such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the Earth's magnetic field. In mapping these slight variations, detailed plans of sites can be obtained as buried features often produce reasonably characteristic anomaly shapes and strengths (Gaffney and Gater, 2003). Further information on soil magnetism and the interpretation of magnetic anomalies is provided in Appendix 1.

Bartington Grad601 magnetic gradiometers were used during the survey, taking readings at 0.25m intervals on zig-zag traverses 1m apart within 30m by 30m grids, so that 3,600 readings were recorded in each grid. These readings were stored in the memory of the instrument and later downloaded to computer for processing and





**ILLUS 7** General view of Area 4A, looking south-east    **ILLUS 8** General view of Area 4B, looking west    **ILLUS 9** General view of Area 4C, looking north-west  
**ILLUS 10** General view of Field 4D, looking north-west

interpretation. Geoplot 3 (Geoscan Research) software was used to process and present the data.

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble GeoXR model).

## 3.2 REPORTING

A general site location plan is shown in **ILLUS 1** at a scale of 1:5,000. **ILLUS 2** to **ILLUS 10** inclusive are general site location photographs. **ILLUS 11** is a large scale (1:2,500) survey location plan displaying the processed greyscale magnetometer data, and the proposed A50 Growth Scheme. An overall interpretation of the data is shown in **ILLUS 13** at the same scale. Detailed data plots ('raw' and processed) and interpretative illustrations are presented at a scale of 1:1,500 in **ILLUS 12** to **18** inclusive.

Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the site archive.

The survey methodology, report and any recommendations comply with the Project Design and guidelines outlined by English Heritage (David et al. 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations reproduced from Ordnance Survey mapping are with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

The illustrations in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All illustrations are presented to most suitably display and interpret the data from this site based on the experience and knowledge of management and reporting staff.

## 4 RESULTS AND DISCUSSION

Generally, a variable magnetic background response has been identified across the geophysical survey area with notable increases in response throughout Area 1, Area 3, Area 4D and Area 4C. The background response in Area 4C is elevated as a result of variations in the alluvial superficial deposits whereas modern infilling is thought to account for the variable magnetic background to the south of the A50. The anomalies identified by the survey are discussed below and cross-referenced to specific examples depicted on the interpretative figures, where appropriate.

### 4.1 FERROUS/MODERN ANOMALIES

Ferrous anomalies, characterised as individual 'spikes', are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris or material is common on most sites, often being present as a consequence of manuring or tipping/infilling. During the course of the fieldwork, the survey team were advised by the farmer at Parks Farm that Area 1, Area



3 and Area 4D were infilled with material during the construction of the A50 in the 1980's. Whilst unconfirmed, the magnetic data appears to corroborate this report with high-magnitude amorphous anomalies and large ferrous spikes being identified throughout these areas (see **ILLUS 13**, **ILLUS 14** and **ILLUS 15**). It should be noted that any low magnitude anomalies of archaeological potential, if present, may be masked within this broad magnetic background.

Broad areas of amorphous magnetic disturbance within Area 2 correspond to ferrous debris, most of which was visible on the ground surface during the survey (wire, fencing, gate). A broad, high magnitude anomaly, A, within the centre of Area 2A corresponds to a telegraph pole.

Elsewhere, magnetic disturbance at the perimeters of the survey area is caused by ferrous material within, or forming part of, the adjacent field boundaries.

## 4.2 AGRICULTURAL ANOMALIES

Analysis of historical OS mapping indicates that the PDA has changed considerably since the publication of the first edition OS map in 1882. Notwithstanding the construction of the A50 in the 1980's, five former field boundaries have been removed to facilitate larger fields. Two of these former boundaries were formed by a sinuous watercourse and manifest in Area 4B and Area 4C as curvilinear anomalies, B and C (see **ILLUS 16**, **ILLUS 17** and **ILLUS 18**). A north/south aligned boundary has been removed from within Area 1 and two boundaries have been removed from within Area 3. None of these former boundaries have been detected as magnetic anomalies by the geophysical survey. It is likely that, if the former boundaries survive as soil-filled ditches, they are masked by the broader, higher magnitude anomalies caused by the material deposited during the construction of the A50.

Broadly-spaced, faint parallel linear trends can be seen on a north-east/south-west alignment throughout Area 2A and Area 2B (see **ILLUS 13**, **ILLUS 14** and **ILLUS 15**). The anomalies are typical of the medieval and post medieval practice of ridge and furrow cultivation and correspond to extant linear earthworks which were observed throughout these fields (see **ILLUS 4** and **ILLUS 5**). The characteristic striping in the data is due to the contrast between the former ridges and the in-filled furrows. No ploughing headlands are visible in the data and faint linear trends on the same north-east/south-west alignment are visible extending into the west of Field 3. It is possible, therefore, that the ridge and furrow regimes predate the extant north-south field boundary.

## 4.3 GEOLOGICAL ANOMALIES

Throughout the site numerous discrete, low magnitude, anomalies have been identified. In theory any of these anomalies could be due to an archaeological pit. However, the sheer number of these anomalies and their relatively even distribution precludes an archaeological interpretation and it is thought that the anomalies are caused by variations in the composition of the soils and superficial deposits from which they derive. The anomalies increase in size and density within Area 4C (see **ILLUS 16**, **ILLUS 17** and **ILLUS 18**) where they appear on a general north-west/south-east orientation. These anomalies are caused by alluvium (sand, gravel and silts) deposited during episodes of flood/waterlogging associated with the adjacent River Tean and its tributaries.

## 4.4 POSSIBLE ARCHAEOLOGICAL ANOMALIES

A short linear anomaly, D, has been identified on an east/west alignment in the north of Area 4C. The anomaly is thought to be due to a soil-filled ditch and since it does not correspond to any features shown on historical mapping, it has been ascribed a possible archaeological interpretation. However, no clear archaeological pattern is visible in the data and it is possible that the ditch is agricultural in origin, perhaps being caused by a field drain.

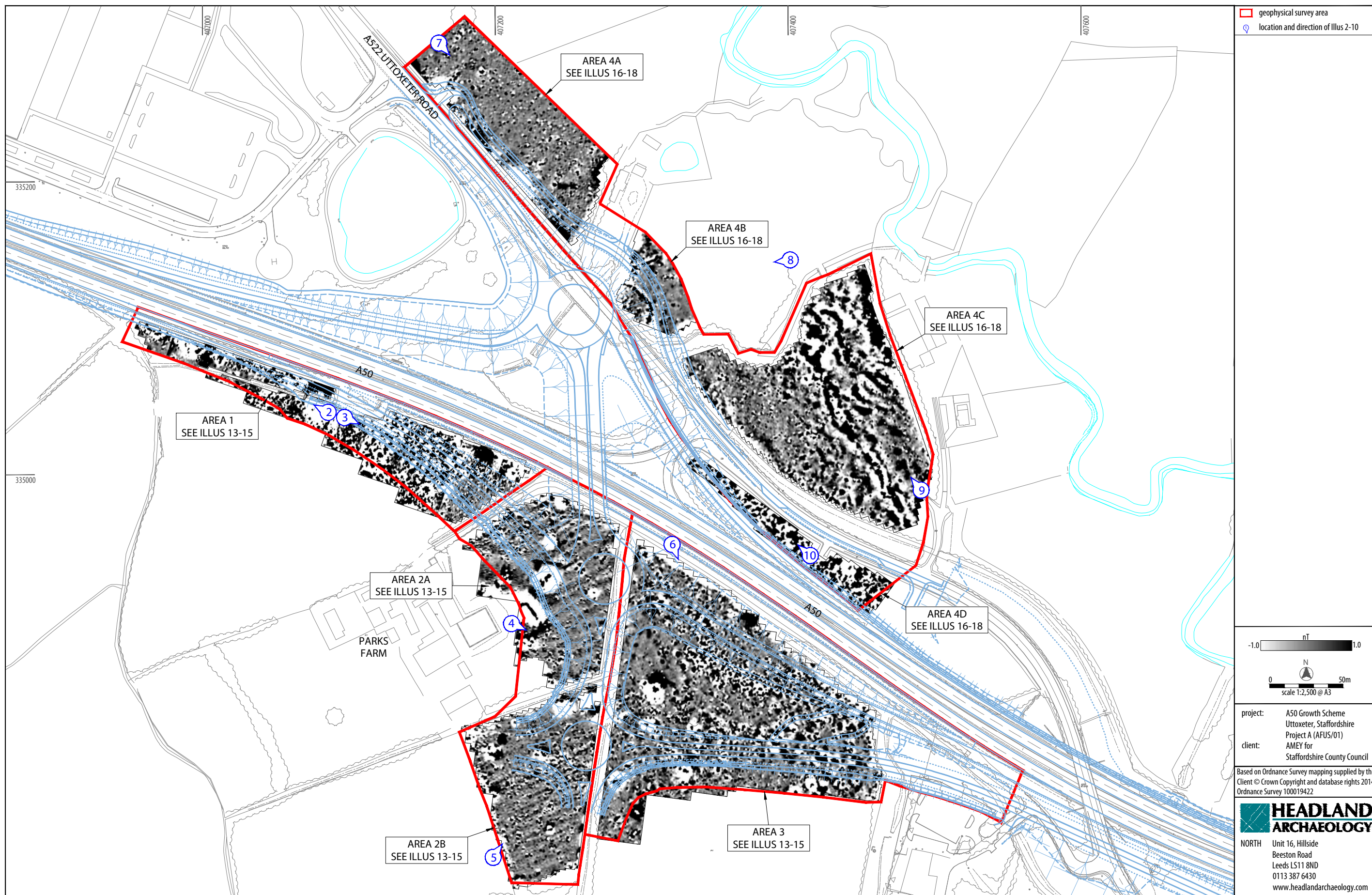
## 5 CONCLUSION

The geophysical survey has identified ridge and furrow anomalies throughout Area 2A and Area 2B which correspond to upstanding earthworks in these locations. In the adjacent field, faint linear anomalies have been identified on the same alignment which may indicate a continuation of this regime of cultivation. However, interpretation is hampered by the presence of broad high magnitude anomalies which are thought to result from modern in-filling. No anomalies of obvious archaeological potential have been identified by the survey, although a short linear anomaly may be due to a ditch of unknown origin. Therefore, based on the results of the geophysical survey, the archaeological potential of the site is considered to be low although ridge and furrow anomalies relate to the historic agricultural landscape and are likely to be of local interest.

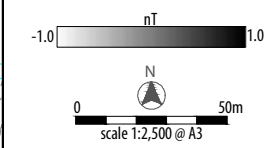
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□ geophysical survey area  
📍 location and direction of Illus 2-10



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 client: AMEY for  
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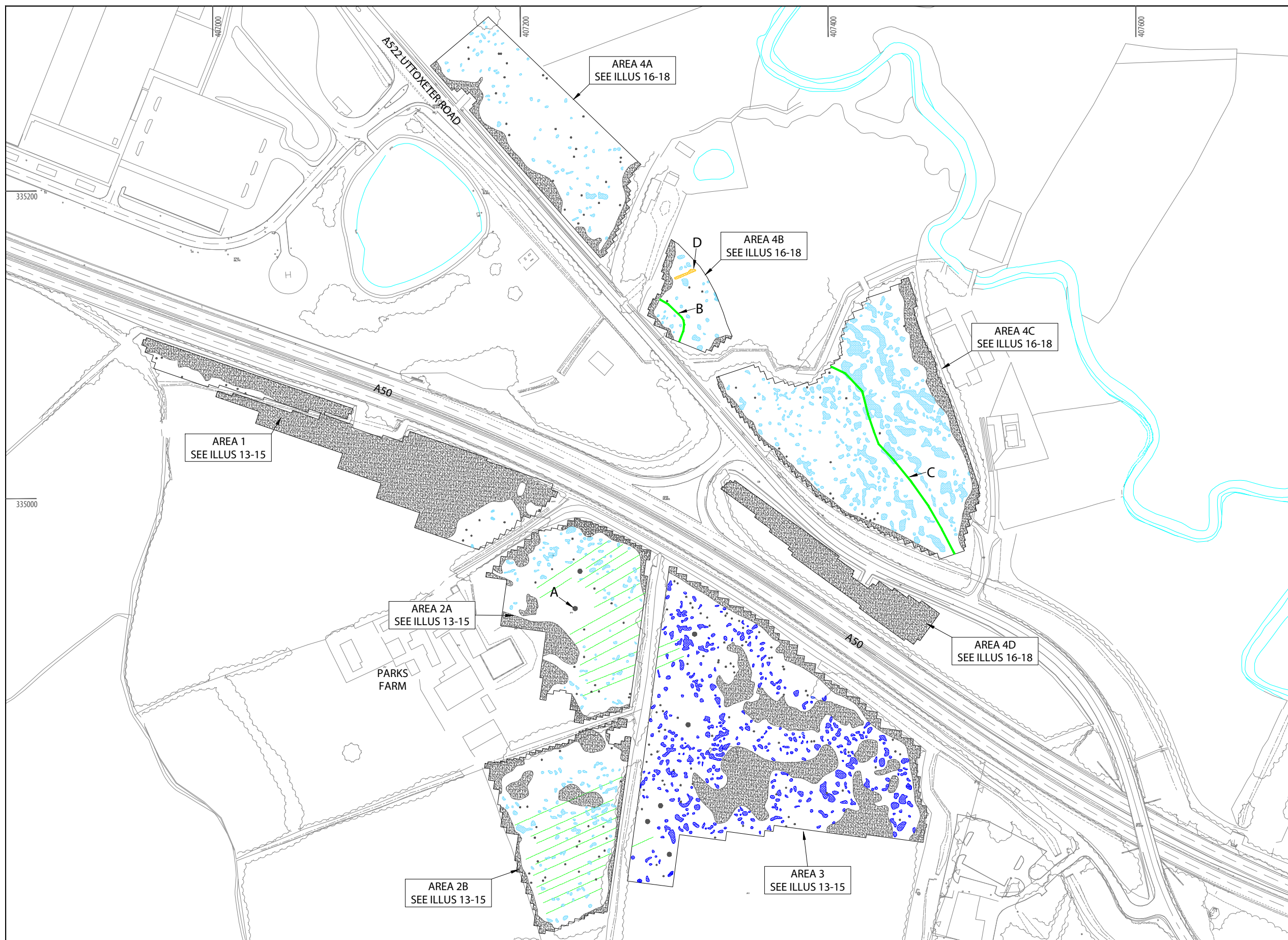
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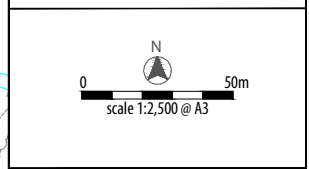
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Illus 11  
 Survey location showing processed greyscale magnetometer data and proposed A50 Growth Scheme





TYPE OF ANOMALY	INTERPRETATION
● dipolar isolated	ferrous material
■ magnetic disturbance	ferrous material
■ magnetic enhancement	modern?
— linear trend	ridge and furrow
— linear	former f/boundary
■ magnetic enhancement	geology
■ magnetic enhancement	archaeology?



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Project A (AFUS/01)  
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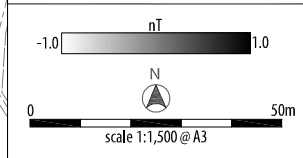
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Illus 12  
Overall interpretation of magnetometer data





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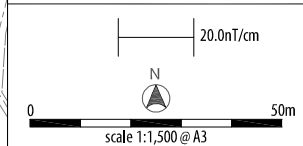
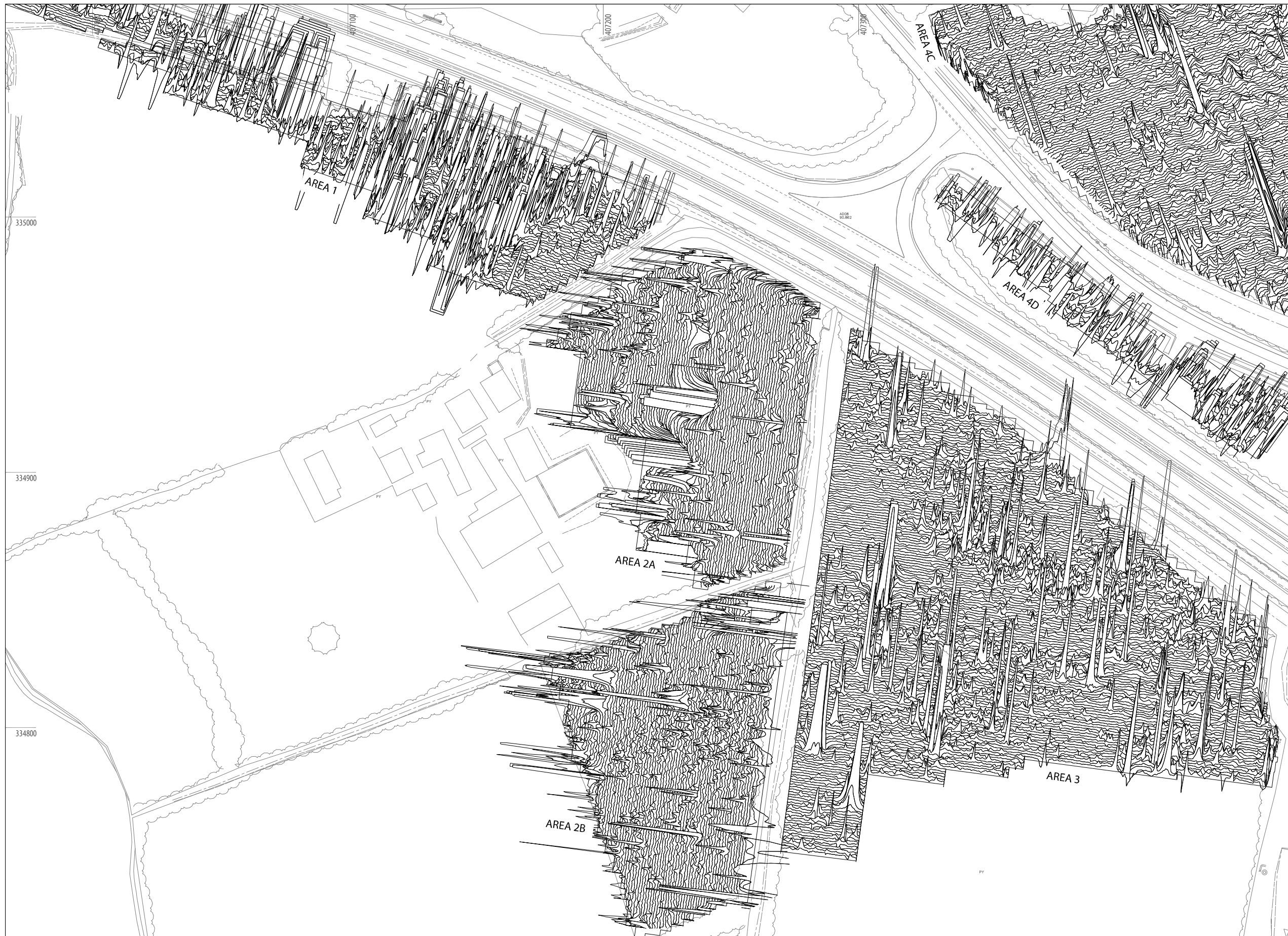
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Illus 13  
 Processed greyscale magnetometer data; Area 1, Area 2 and Area 3





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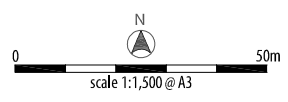
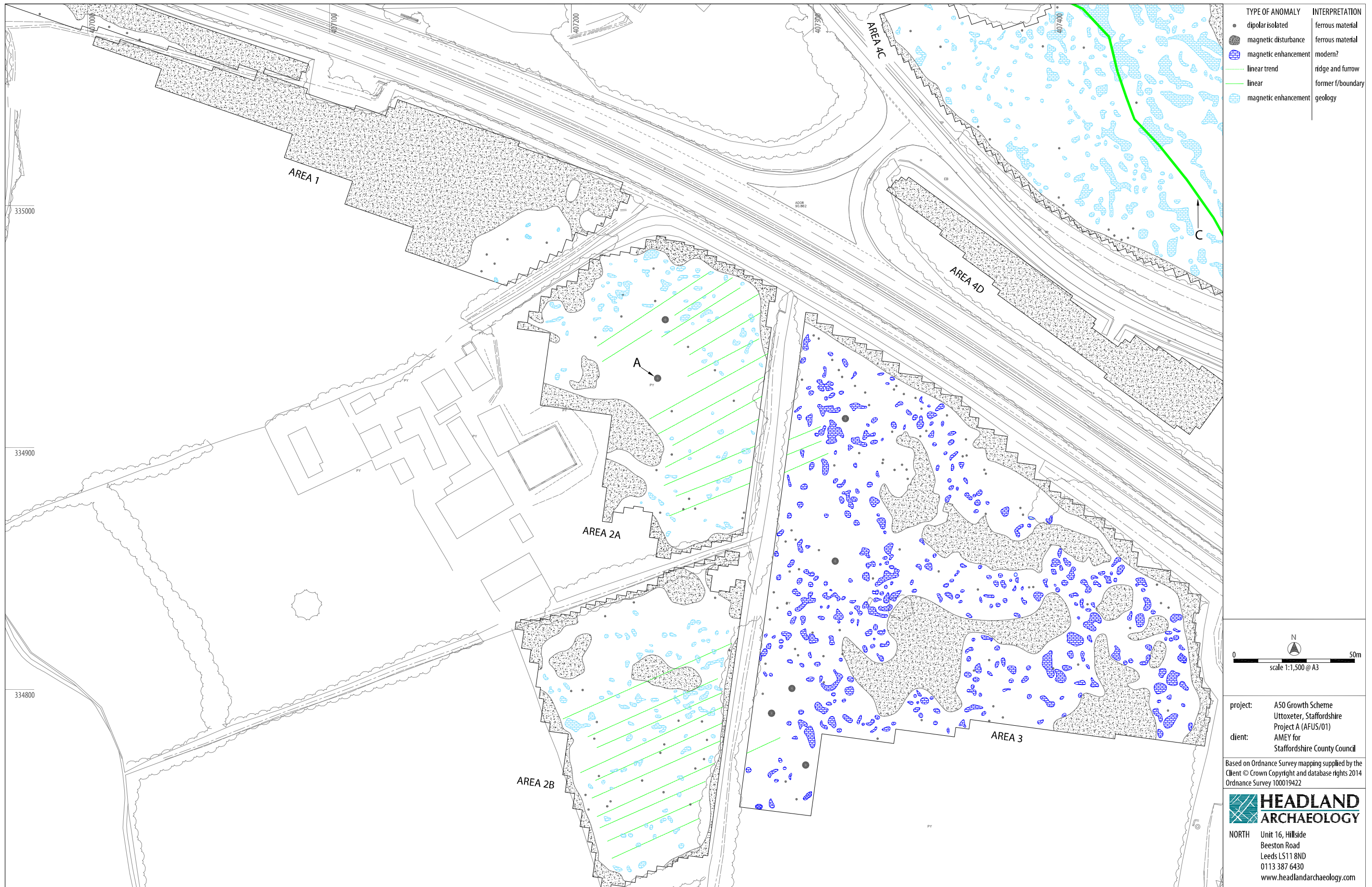
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Illus 14  
 XY trace plot of minimally processed magnetometer data; Area 1, Area 2 and Area 3





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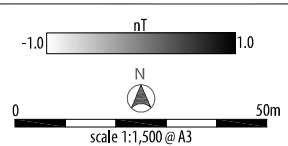
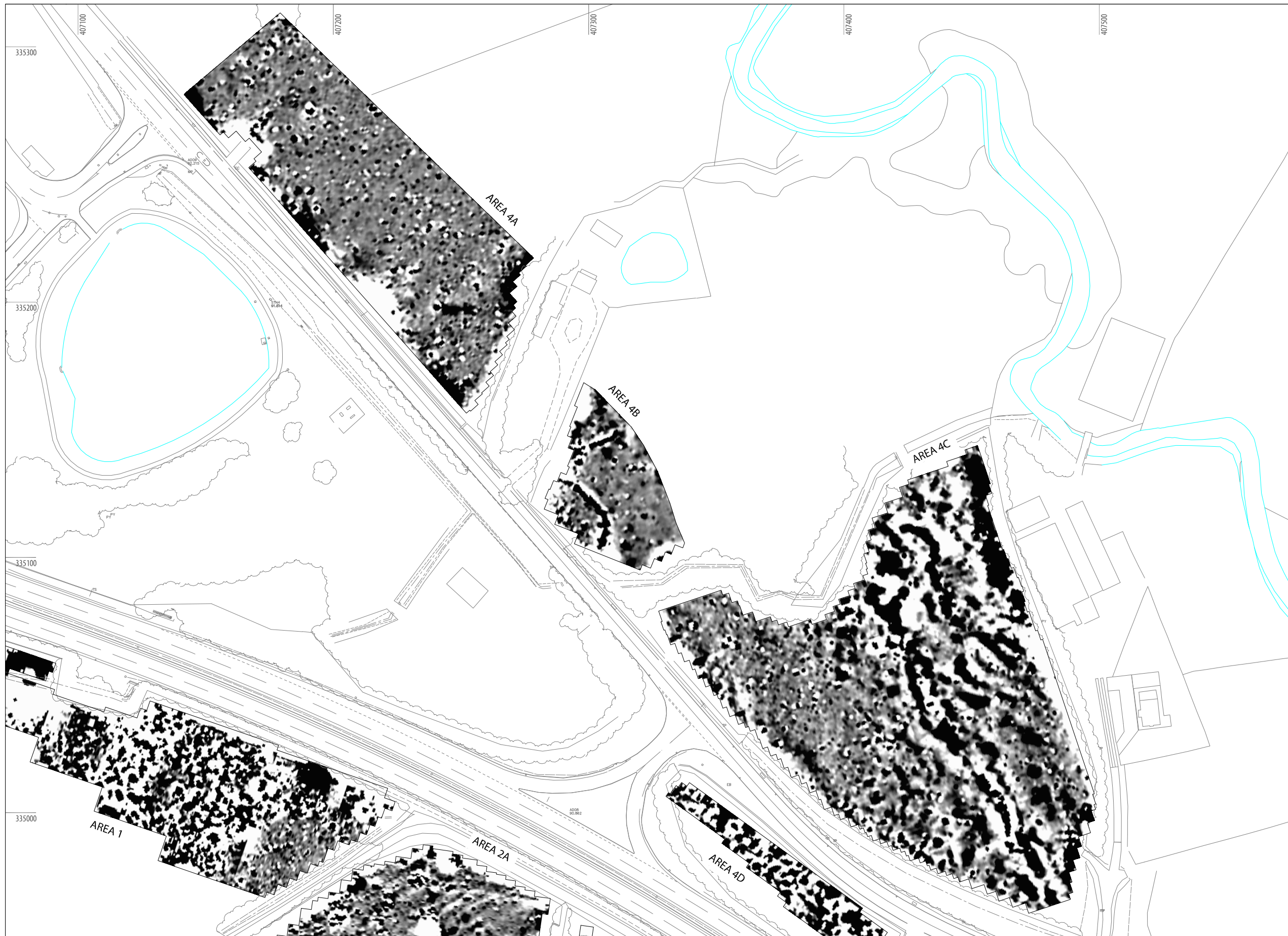
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Illus 15 Interpretation of magnetometer data; Area 1, Area 2 and Area 3





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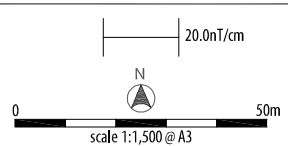
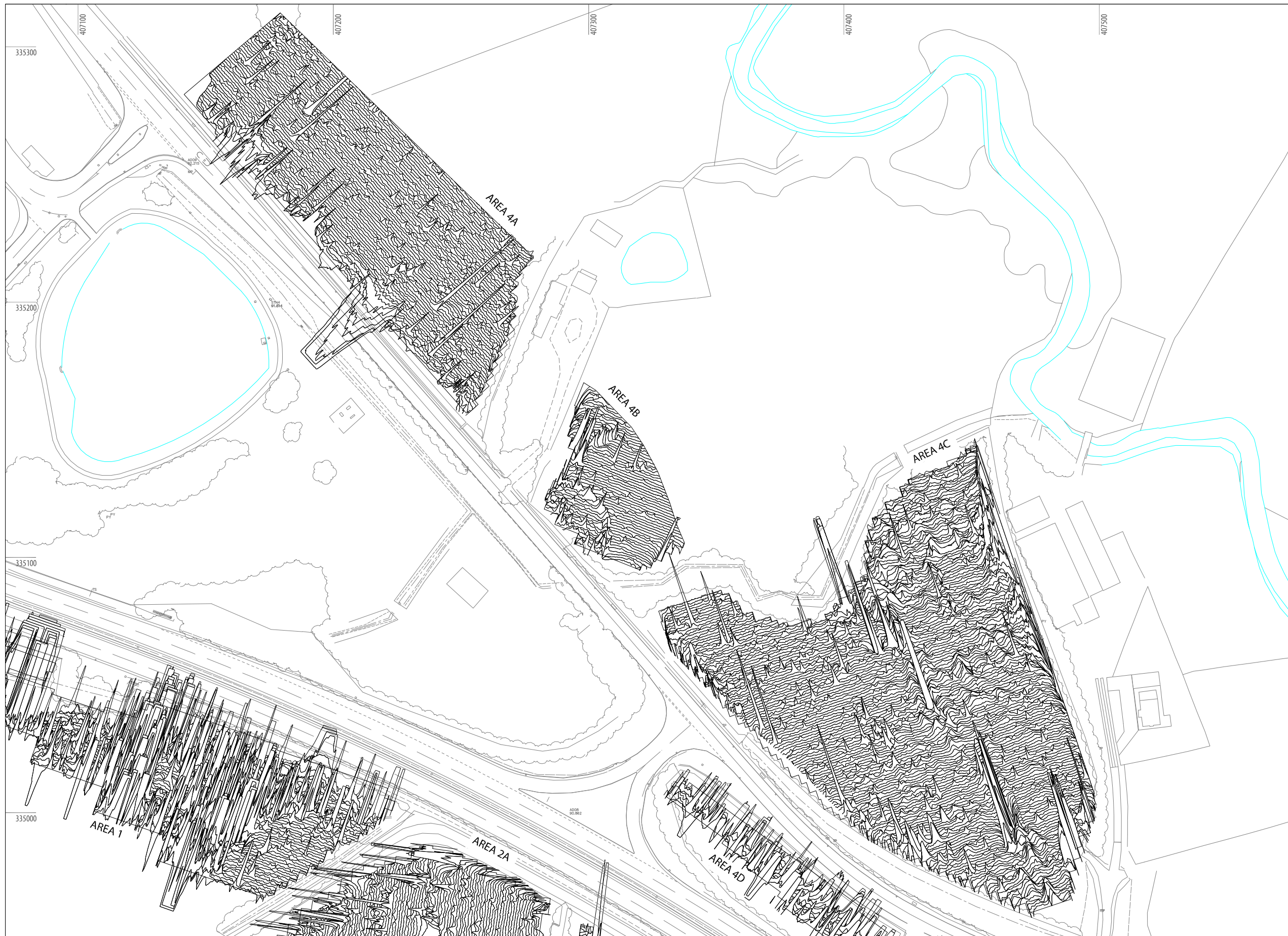
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Illus 16  
 Processed greyscale magnetometer data; Area 4





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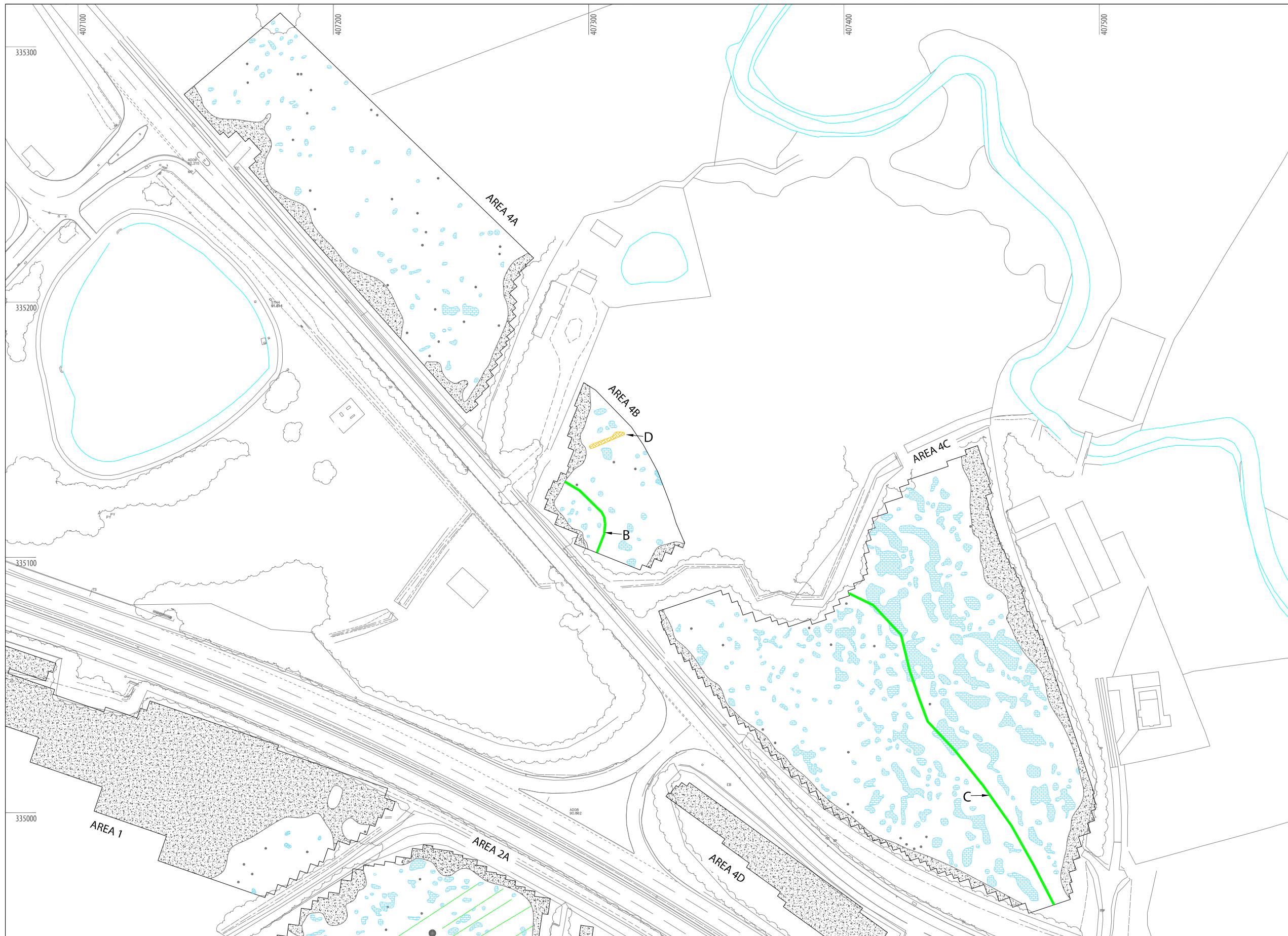
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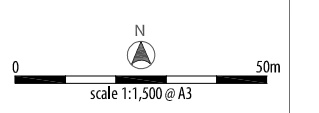
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Illus 17  
 XY trace plot of minimally processed magnetometer data; Area 4





TYPE OF ANOMALY	INTERPRETATION
● dipolar isolated	ferrous material
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Illus 18  
 Interpretation of magnetometer data; Area 4

## 7 APPENDICES

### APPENDIX 1 MAGNETOMETER SURVEY

#### Magnetic susceptibility and soil magnetism

Iron makes up about 6% of the Earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haemetite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms so that by measuring the magnetic susceptibility of the topsoil, areas where human occupation or settlement has occurred can be identified by virtue of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

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 magnetic ferrous compounds to become concentrated 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.

The magnetic susceptibility of a soil can also be enhanced by the application of heat. This effect can lead to the detection of features such as hearths, kilns or areas of burning.

#### Types of magnetic anomaly

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

#### *Isolated dipolar anomalies (iron spikes)*

These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

#### *Areas of magnetic disturbance*

These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

#### *Linear trend*

This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

#### *Areas of magnetic enhancement/positive isolated anomalies*

Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response (sometimes only visible on an XY trace plot) on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

#### *Linear and curvilinear anomalies*

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

## APPENDIX 2 SURVEY LOCATION INFORMATION

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble 5800 model). The accuracy of this equipment is better than 0.01m. The survey grids were then superimposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if coordinates are measured off hard copies of the mapping rather than using the digital coordinates.

Headland Archaeology cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

## APPENDIX 3 GEOPHYSICAL SURVEY ARCHIVE

The geophysical archive comprises:-

- › an archive disk containing the raw data in XYZ format, a raster image of each greyscale plot with associate world file, and a PDF of the report

At present the archive is held by Headland Archaeology (UK) Ltd although it is anticipated that it may eventually be lodged with the Archaeology Data Service (ADS). Brief details may also be forwarded for inclusion on the English Heritage Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the relevant Historic Environment Record Office).

## APPENDIX 4 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID: headland5-226366

**PROJECT DETAILS**

Project name	A50 GROWTH SCHEME, UTTOXETER,,,, Staffordshire: Project A
Short description of the project	Headland Archaeology (UK) Ltd undertook an earthwork survey on agricultural land north-west of Uttoxeter, Staffordshire, to provide information about the archaeological potential of the A50 Growth Scheme (Project A). The survey has identified low parallel linear earthworks within three separate areas which are indicative of the medieval agricultural practice of ridge and furrow cultivation. A former watercourse survives as a low winding earthwork and a low mound with brick visible in the topsoil may have some archaeological potential.
Project dates	Start: 15-07-2015 End: 15-07-2015
Previous/future work	Yes / Not known
Any associated project reference codes	AFUS15-02 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Grassland Heathland 5 - Character undetermined
Monument type	N/A None
Monument type	N/A None
Significant Finds	N/A None
Significant Finds	N/A None
Methods & techniques	"Topographic Survey"
Development type	Road scheme (new and widening)
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded

**PROJECT LOCATION**

Country	England
Site location	STAFFORDSHIRE EAST STAFFORDSHIRE UTTOXETER A50 GROWTH SCHEME, UTTOXETER,,,, Staffordshire: Project A
Postcode	ST14 5DT
Study area	6.17 Hectares
Site coordinates	SK 07603 34921 52.911343885639 -1.886929563701 52.54 40 N 001 53 12 W Point

**PROJECT CREATORS**

Name of Organisation	Headland Archaeology
Project brief originator	AMEY
Project design originator	Headland Archaeology
Project director/manager	Kimber, M
Project supervisor	Harrison, D
Type of sponsor/funding body	Developer

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**PROJECT ARCHIVES**

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Physical Archive Exists?	No
Digital Archive Exists?	No
Digital Media available	"Survey"
Paper Archive Exists?	No
Paper Media available	"Report"

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**PROJECT BIBLIOGRAPHY 1**

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Publication type	Grey literature (unpublished document/manuscript)
Title	A50 GROWTH SCHEME, UTTOXETER,,,, Staffordshire: Project A; Earthwork Survey
Author(s)/Editor(s)	Harrison, D.
Date	2015
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Place of issue or publication	Leeds
Description	A4 bound report
Entered by	David Harrison (david.harrison@headlandarchaeology.com)
Entered on	14 October 2015





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