WYAS Archaeological Services

Land off London Road

Great Glen

Leicestershire

Geophysical Survey

Report no. 2920
December 2016

Client: Bovis Homes

Land off London Road, Great Glen, Leicestershire

Geophysical Survey

Summary

A cart-based magnetometer survey was undertaken on a pasture field dominated by prominent ridge and furrow to the immediate south of London Road, Great Glen, in advance of the proposed development of the site. Anomalies commensurate with ridge and furrow and magnetic disturbance have been detected. In addition, a former field boundary which bisects the survey area has been revealed, as have possible features which may have an archaeological origin. The archaeological potential of the site is considered to be low to moderate.

WYAS
Archaeological Services

Report Information

Client:	ECUS Ltd
Address:	3 Blackburn Road, Sheffield, S61 3DW
Report Type:	Geophysical survey
Location:	Great Glen
County:	Leicestershire
Grid Reference:	SP 64754 98015
Period(s) of activity:	Prehistoric? / Medieval/ Modern
Report Number:	2920
Project Number:	6574
Site Code:	GGL16
OASIS ID:	archaeol11-xxxxx
Date of fieldwork:	November and December 2016
Date of report:	December 2016
Project Management:	Christopher Sykes BA MSc
Fieldwork:	Mark Evans BSc
	Alastair Trace BSc MSc
	Rebecca Goulding BSc MSc
Report:	Christopher Sykes
Illustrations:	Christopher Sykes & Emma Brunning BSc MCIfA
Photography:	Mark Evans
Research:	Christopher Sykes

Authorisation for distribution: ----------

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Contents

List of Figures

List of Plates

1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by James Thomson of ECUS Limited, on behalf of Bovis Homes (the Client), to undertake a geophysical (magnetometer) survey on land off London Road, Great Glen, Leicestershire to inform an outline planning application, for residential development of the site. Guidance contained within the National Planning Policy Framework (DCLG 2012) was followed, in line with current best practice (CIfA 2014; David *et al*. 2008). The survey was carried out between the 30th November and 6th December 2016 to provide additional information on the archaeological resource of the Proposed Development Area (PDA).

Site location, topography and land-use

The overall PDA totals approximately 10ha. The survey area is located to the west of Great Glen, and approximately 10km to the southeast of Leicester. It is bound by London Road to the north, the A6 bypass to the south, and fields to the west and east. The survey area undulates because of the ridge and furrow, and slopes from c. 122m above Ordnance Datum (aOD) in north to c.112m aOD in the southeast. The site is centred at SP 64754 98015.

Soils and geology

The underlying geology of the site is of the Charmouth mudstone formation, with superficial deposits of Oadby member - Diamiction. The overlying soils are considered to be of the Ragdale (712g) classification of soils, described as chalky till of slowly permeable seasonally waterlogged fine loams over clays (SSEW 1983).

2 Archaeological and Historical Background

Aside from ridge and furrow there are no known archaeological assets within the PDA. An archaeological Desk-based Assessment for a survey area to the east of Great Glen, did conclude that the landscape held archaeological potential from prehistory to the medieval period. Archaeological investigations in the area have included excavation in advance of the A6 bypass, and a geophysical survey, performed by ASWYAS in 2013, to the southeast of the hamlet.

3 Aims, Methodology and Presentation

The aim of the geophysical survey was to gather sufficient information to establish the presence/absence, character, extent and date of any archaeological remains within the site, and to inform further investigative strategies should they become necessary.

The general objectives of the geophysical survey were:

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

Magnetometer survey

The magnetometer survey was undertaken using a Sensys Magneto MXPDA cart-based instrument. The instrument has 5 fluxgate gradiometers spaced 0.5m apart with readings recorded at 20Hz. The gradiometers have a range of recording between 0.1nT and 10,000nT. They are linked to a Trimble R6 RTK dGPS system with data recorded by Sensys Magneto MXPDA software on a rugged PDA device. The data was stored on an SD memory card within the PDA and later downloaded to a computer for processing and interpretation. MAGNETO (Sensys Gmbh) and MAGNETO software was used to process and present the data. Further details are given in Appendix 1.

Reporting

A general site location plan, incorporating the 1:50000 Ordnance Survey (OS) mapping, is shown in Figure 1. Figure 2 displays processed magnetometer data and plate locations at a scale of 1:2500. Figure 3 is an overall interpretation of the data at the same scale. Figures 4 to 9 display processed greyscales and interpretations of the three sectors at a scale of 1:1000. Figure 10 is a 3D visualisation of the geophysical data, in order to understand a topographical aspect of the site.

Technical information on the equipment used, data processing and survey methodologies are given in Appendix 1. Technical information on locating the survey area is provided in Appendix 2. Appendix 3 describes the composition and location of the archive. A copy of the completed OASIS form is included in Appendix 4.

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

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

4 Results and Discussion – (see Figures 3 to 9)

Ferrous anomalies

Ferrous anomalies, as individual 'spikes', or as large discrete areas 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 rural sites, often being present as a consequence of manuring or tipping/infilling. There is no obvious pattern or clustering to their distribution in this survey to suggest anything other than a random background scatter of ferrous debris in the plough-soil.

In the northeast corner of the field (Sector 3, Figs 8-9) there is an area of significant disturbance. Similarly around the periphery of the field, a service and magnetic responses indicative of material within the boundary hedges has been detected.

Agricultural anomalies

Ridge and furrow is prominent in the PDA and of substantial breadth and depth that any anomalies of archaeological origin are likely to have been obscured. Figure 10 is able to give an indication of the terrain. Orientation of the ridge and furrow follows that of the field boundaries. This is further re-enforced with ridge and furrow in Sector 3 (Figs 8-9) which terminates along its western extent at a former field boundary. Analysis of first edition mapping shows that this boundary appears on mapping from 1886, but has been removed by 1966 editions (NLS 2016).

Within Sector 2 (Figs 6-7) a series of linear anomalies indicative and characterising of field drains have been identified.

Possible archaeological anomalies

A number of semi-circular anomalies have been detected, largely in Sector 2 (Figs 6-7) which have an undetermined origin. It is unlikely that they are archaeological in origin because of their size (c.1m), however their position in the landscape and form means that a possible archaeological origin has been assigned.

The results and subsequent interpretation of data from the surveys should not be treated as an absolute representation of the underlying archaeological and non-archaeological remains. Confirmation of the presence or absence of archaeological remains can only be achieved by direct investigation of sub-surface deposits.

5 Conclusions

The area of survey is covered in prominent ridge and furrow, the breadth and depth of which is likely to obscure any clear archaeological anomalies. It dominates the dataset. However within the data, a number of anomalies which appear to be semi-circular in shape have been detected. Their size means they are not likely to be archaeological in origin, however, the strength of the response in the dataset, in comparison to the ridge and furrow means that they may have possible archaeological potential. They may be related to the linear responses which have been indicated. Former field boundaries and field drains have been indicated along with areas of magnetic disturbance. Based on the geophysical dataset the archaeological potential of the site is deemed to be low to moderate.

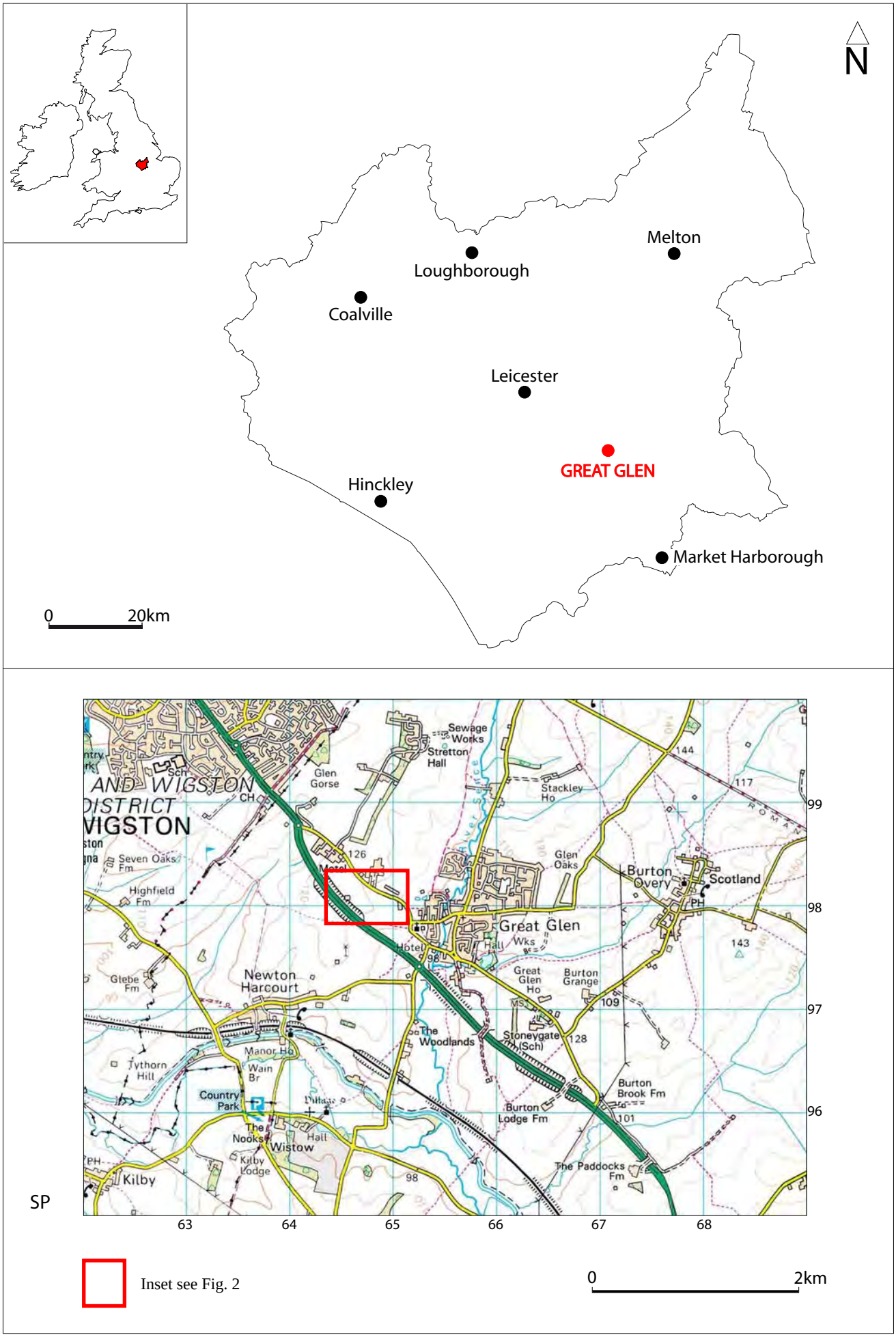

Fig. 1. Site location

PROJECT ID: 6574_GGL16	
	SURVEY BOUNDARY
	SECTOR BOUNDARY
1	LOCATION AND DIRECTION OF PLATES
1	VIEWPOINTS OF FIG 10

SECTOR 1
SEE FIGS 4-5

SECTOR 2
SEE FIGS 6-7

SECTOR 3
SEE FIGS 8-9

N

2.0
-1.0
nT

298200
298000
297800

464400
464600
464800
465000
465200

0 100m

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Fig. 2. Survey location showing greyscale magnetometer data (1:2500 @ A3)

PROJECT ID: 6574_GGL16	
	SURVEY BOUNDARY
	SECTOR BOUNDARY

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	DIPOLAR LINEAR	SERVICE PIPE
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	FIELD DRAIN
	LINEAR TREND	RIDGE AND FURROW
	LINEAR TREND	FORMER FIELD BOUNDARY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?
	LINEAR TREND	ARCHAEOLOGY?

SECTOR 1
SEE FIGS 4-5

SECTOR 2
SEE FIGS 6-7

SECTOR 3
SEE FIGS 8-9

N

298200

298000

297800

464400 464600 464800 465000 465200

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0 100m

Fig. 3. Overall interpretation of magnetometer data (1:2500 @ A3)

PROJECT ID: 6574_GGL16

SECTOR BOUNDARY

N

298200

2.0

-1.0

nT

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464600

464800

0 50m

Fig. 4. Processed greyscale magnetometer data; Sector 1 (1:1000 @ A3)

PROJECT ID: 6574_GGL16	
	SECTOR BOUNDARY

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	DIPOLAR LINEAR	SERVICE PIPE
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	FIELD DRAIN
	LINEAR TREND	RIDGE AND FURROW
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?

N

298200

Archaeological Services W Y A S
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 383 7500 Fax:0113 383 7501

464600

464800

0 50m

Fig. 5. Interpretation of magnetometer data; Sector 1 (1:1000 @ A3)

PROJECT ID: 6574_GGL16

SECTOR BOUNDARY

N

298000

297800

2.0

-1.0

nT

Archaeological Services W Y A S
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 383 7500 Fax:0113 383 7501

464600

464800

0 50m

Fig. 6. Processed greyscale magnetometer data; Sector 2 (1:1000 @ A3)

PROJECT ID: 6574_GGL16

SECTOR BOUNDARY

N

298000

297800

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
—	DIPOLAR LINEAR	SERVICE PIPE
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	FIELD DRAIN
	LINEAR TREND	RIDGE AND FURROW
	LINEAR TREND	FIELD BOUNDARY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?
	LINEAR TREND	ARCHAEOLOGY?

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Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 383 7500 Fax:0113 383 7501

464600

464800

0 50m

Fig. 7. Interpretation of magnetometer data; Sector 2 (1:1000 @ A3)

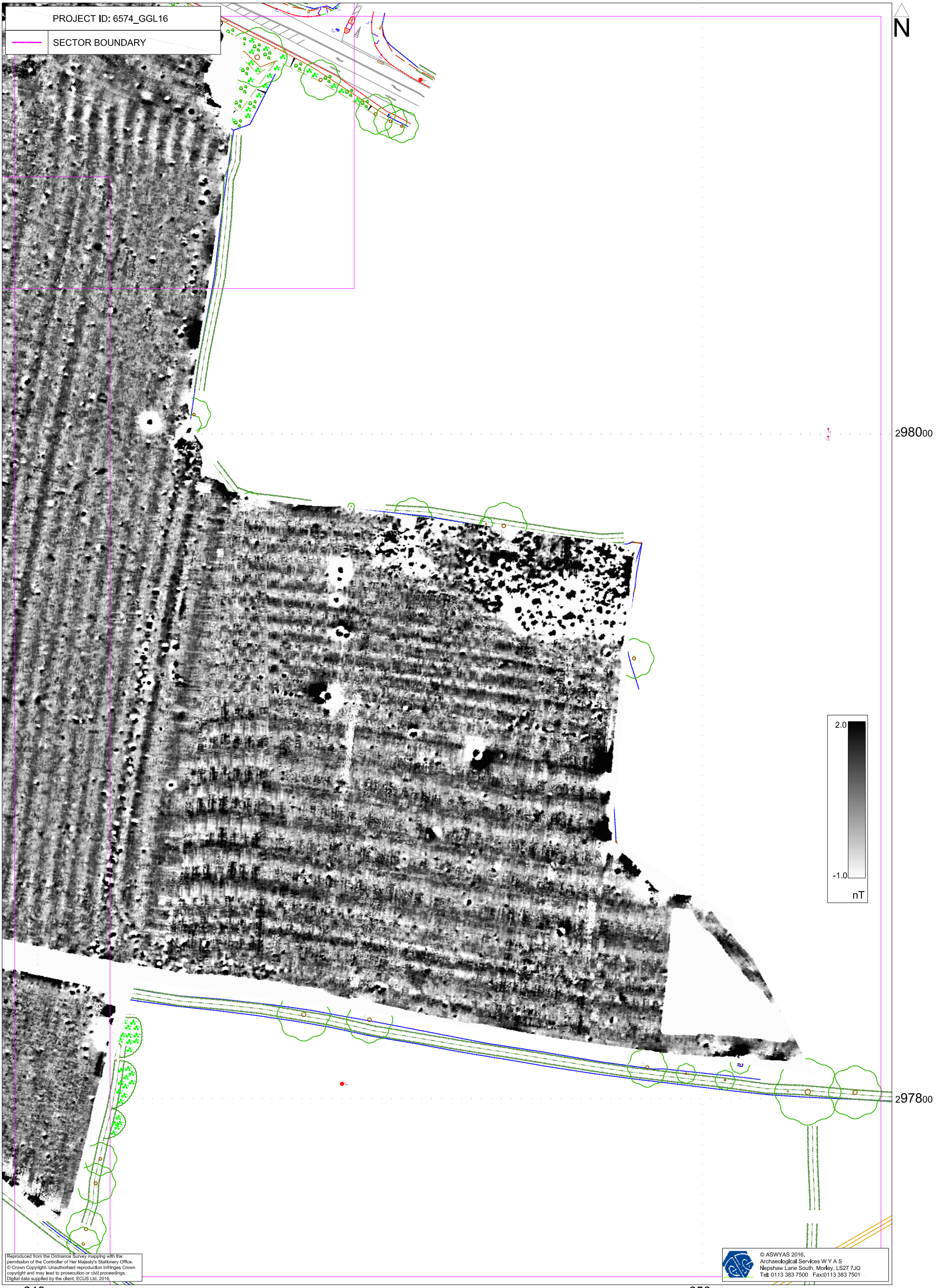

Fig. 8. Processed greyscale magnetometer data; Sector 3 (1:1000 @ A3)

PROJECT ID: 6574_GGL16

SECTOR BOUNDARY

TYPE OF ANOMALY		INTERPRETATION
	DIPOLAR ISOLATED	FERROUS MATERIAL
	DIPOLAR LINEAR	SERVICE PIPE
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	RIDGE AND FURROW
	LINEAR TREND	FORMER FIELD BOUNDARY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?
	LINEAR TREND	ARCHAEOLOGY?

N

298000

297800

464800

465000

0 50m

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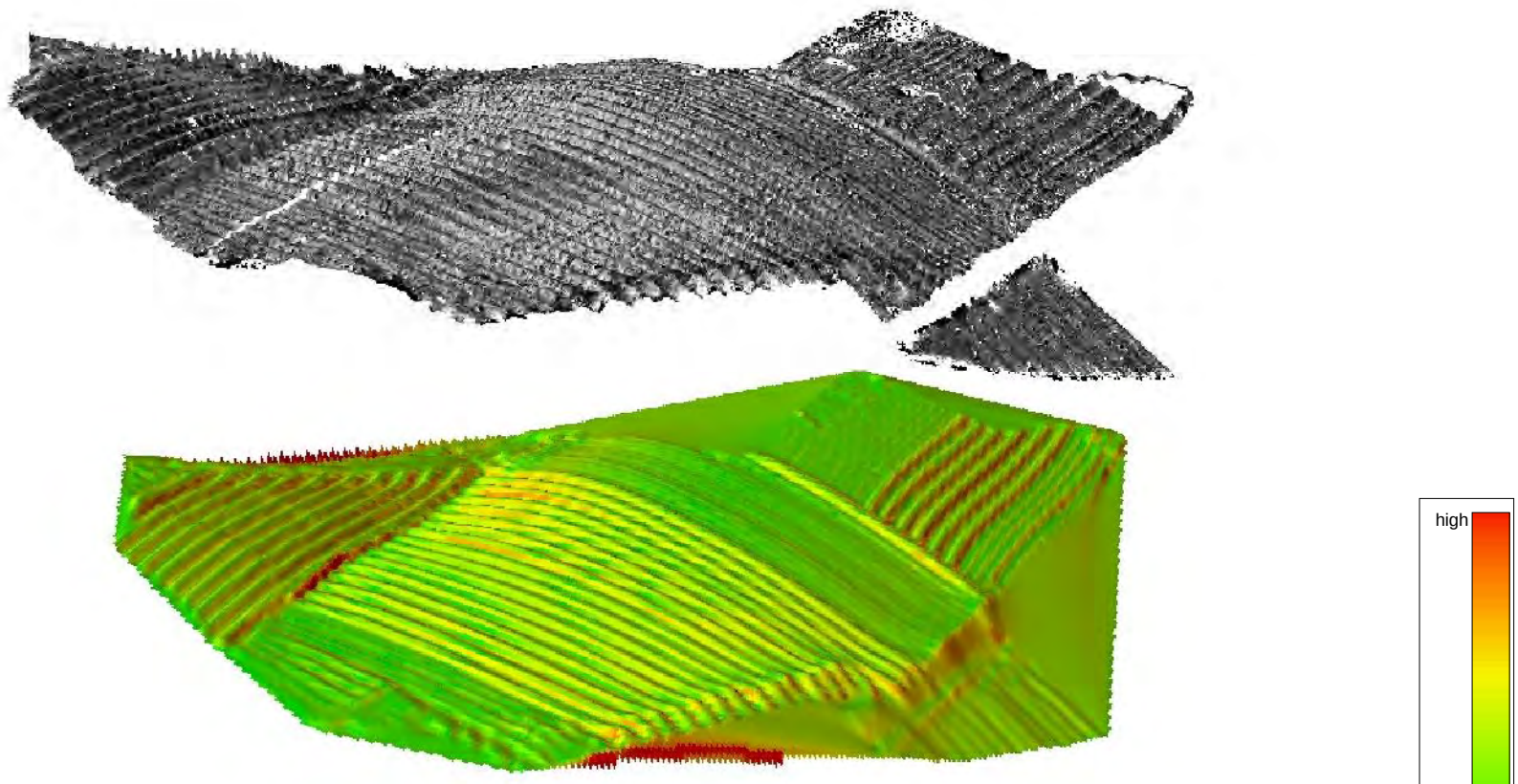
Tel: 0113 383 7500 Fax:0113 383 7501

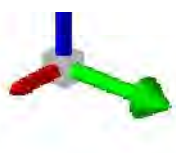
Fig. 9. Interpretation of magnetometer data; Sector 3 (1:1000 @ A3)

PROJECT ID: 6574_GGL16

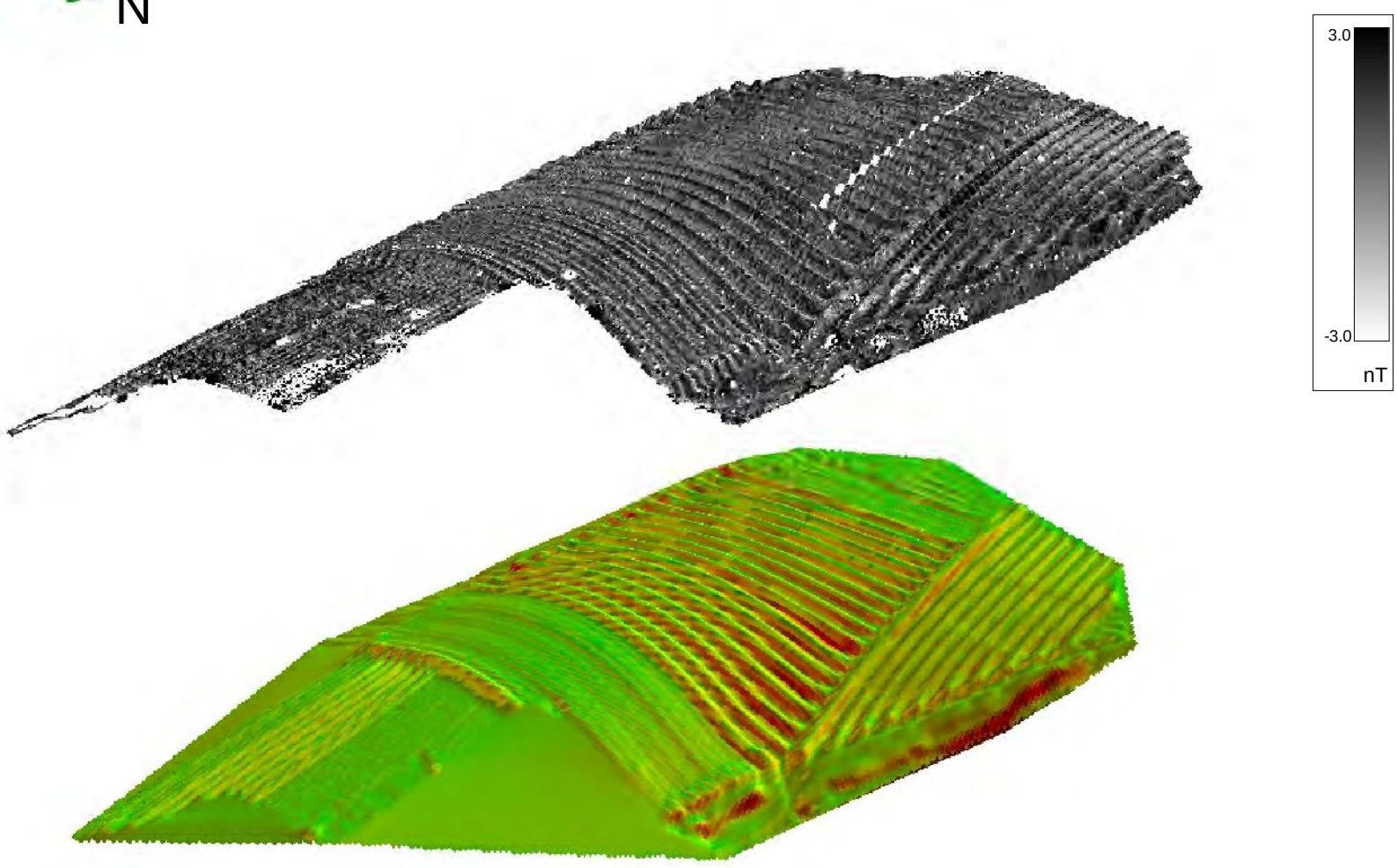
N



Viewed looking northeast with illumination at an azimuth of 45° and an altitude of 21°



N



Viewed looking northwest with illumination at an azimuth of 45° and an altitude of 21°

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Fig. 10. Topographical contextulisation (not to scale)

Plate 1. General view of survey area, looking west

Plate 2. General view of survey area, looking west

Plate 3. General view of survey area, looking east

Plate 4. General view of survey area, looking west

Appendix 1: Magnetic survey - technical information

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. Areas of human occupation or settlement can then be identified by measuring the magnetic susceptibility of the topsoil because 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 and the fermentation and bacterial effects associated with rubbish decomposition. The area of enhancement is usually quite large, mainly due to the tendency of discard areas to extend beyond the limit of the occupation site itself, and spreading by the plough.

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 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.

Methodology: Gradiometer Survey

The magnetometer survey was undertaken using a Sensys Magneto MXPDA cart-based instrument. The instrument has 5 fluxgate gradiometers spaced 0.5m apart with readings recorded at 20Hz. The gradiometers have a range of recording between 0.1nT and 10,000nT. They are linked to a Trimble R6 RTK dGPS system with data recorded by Sensys Magneto MXPDA software on a rugged PDA device. The data was stored on an SD memory card

within the PDA and later downloaded to a computer for processing and interpretation. MAGNETO (Sensys Gmbh) software was used to process and present the data

Data Processing and Presentation

The detailed gradiometer data has been presented in this report in processed greyscale format. The data in the greyscale images has been interpolated and selectively filtered to remove the effects of drift in instrument calibration and other artificial data constructs and to maximise the clarity and interpretability of the archaeological anomalies.

MAGNETO was used to produce the greyscale images. All greyscale plots are displayed using a linear incremental scale.

The results and subsequent interpretation of data from geophysical surveys should not be treated as an absolute representation of the underlying archaeological and non-archaeological remains. Confirmation of the presence or absence of archaeological remains can only be achieved by direct investigation of sub-surface deposits

Appendix 2: Survey location information

An initial survey station was established using a Trimble VRS differential Global Positioning System (Trimble R6 model). The cart data was geo-referenced using the geo-referenced survey station with a Trimble RTK differential Global Positioning System (Trimble R6 model). The accuracy of this equipment is better than 0.01m. The survey grids were then super-imposed 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 co-ordinates are measured off hard copies of the mapping rather than using the digital co-ordinates.

Archaeological Services WYAS cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

Appendix 3: Geophysical archive

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2000), and graphics files (Adobe Illustrator CS2 and AutoCAD 2008) files; and
- a full copy of the report.

At present the archive is held by Archaeological Services WYAS 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 Leicestershire Historic Environment Record).

Appendix 4: Oasis form

OASIS DATA COLLECTION FORM: England

List of Projects | Manage Projects | Search Projects | New project | Change your details | HER coverage | Change country | Log out

Printable version

OASIS ID: archaeol11-271400

Project details

Project name	Land off London Road, Great Glen
Short description of the project	A cart-based magnetometer survey was undertaken on a pasture field dominated by prominent ridge and furrow to the immediate south of London Road, Great Glen, in advance of the proposed development of the site. Anomalies commensurate with ridge and furrow and magnetic disturbance have been detected. In addition, a former field boundary which bisects the survey area has been revealed, as have possible features which may have an archaeological origin. The archaeological potential of the site is considered to be low to moderate.
Project dates	Start: 28-11-2016 End: 02-12-2016
Previous/future work	No / Not known
Any associated project reference codes	GGL16 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Grassland Heathland 3 - Disturbed
Monument type	RIDGE AND FURROW Post Medieval
Monument type	- None
Significant Finds	- None
Significant Finds	- None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	Planning condition
Position in the planning process	Not known / Not recorded
Solid geology	OOLITE - UNDIFFERENTIATED
Drift geology	LACUSTRINE CLAYS, SILTS AND SANDS
Techniques	Magnetometry

Project location

Country	England
Site location	LEICESTERSHIRE OADBY AND WIGSTON OADBY Land off London Road, Great Glen
Postcode	LE8 9FL
Study area	10 Hectares
Site coordinates	SP 64255 98031 52.575936496798 -1.05170877378 52 34 33 N 001 03 06 W Point
Height OD / Depth	Min: 112m Max: 122m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	ECUS Ltd
Project design originator	Archaeological Services WYAS
Project director/manager	C. Sykes
Project supervisor	Evans, M.
Type of sponsor/funding body	Landowner

Project archives

Physical Archive Exists?	No
Digital Archive recipient	ASWYAS
Digital Archive ID	SMM16
Digital Contents	"Survey"
Digital Media available	"Images raster / digital photography","Survey","Text","Geophysics"
Paper Archive Exists?	No

Entered by	Christopher Sykes (christopher.sykes@aswyas.com)
Entered on	15 December 2016

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