WYAS Archaeological Services

Land off Gartree Road

Oadby

Leicestershire

Geophysical Survey

Report no. 3114
April 2018

Client: Cotswold Archaeology

Land off Gartree Road
Oadby
Leicestershire

Geophysical Survey

Summary

A geophysical (magnetometer) survey, covering approximately 11.5 hectares, was undertaken within fields either side of Gartree Road, Oadby. The survey area has detected no magnetic anomalies of definite archaeological interest. Some agricultural responses in the form of field drains and former field boundaries have been identified. The possible archaeological anomalies are tentative and are likely to be natural in origin.

Therefore based on the geophysical survey, the archaeological potential of the site is considered to be low.

WYAS
Archaeological Services

Report Information

Client:	Cotswold Archaeology
Address:	Unit 8 Fingle Drive, Stonebridge, Milton Keynes, MK13 0AT
Report Type:	Geophysical Survey
Location:	Oadby
County:	Leicestershire
Grid Reference:	SK 628 019
Period(s) of activity:	Modern
Report Number:	3114
Project Number:	8267
Site Code:	GRO17
OASIS ID:	Archaeol11-314526
Date of fieldwork:	3rd – 5th April 2018
Date of report:	April 2018
Project Management:	Emma Brunning BSc MCIfA
Fieldwork:	Christopher Sykes BA MSc MCIfA
	Alastair Trace BSc MSc
	Jake Freeman BA
Report:	David Williams
Illustrations:	Alastair Trace

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

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1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by Cotswold Archaeology to undertake a geophysical (magnetometer) survey on land either side of Gartree Road, Oadby Leicestershire. This is in advance of a proposed residential development. 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 3rd – 5th April 2018.

Site location, topography and land-use

The survey area straddles Gartree Road, 1.4km to the north of the centre of Oadby (see Figure 1). The survey area encompasses parts of two agricultural fields to the south of Gartree Road and small grassed areas suitable for survey around established buildings to the west of the Stoughton Grange Rural Centre to the north of Gartree Road. The areas total approximately 11.5 ha, centred on NGR SK 628 019. The southern survey area gently slopes from 94m above Ordnance Datum (aOD) in the north-western corner to 109m aOD in the south eastern corner. The northern survey area lies at 100m aOD.

Soils and geology

The bedrock geology of the survey area is mapped as mudstone of the Blue Lias Formation, a sedimentary bedrock formed approximately 191 to 210 million years ago in the Jurassic and Triassic Periods. Superficial deposits are recorded as Diamicton of the Oadby Member formed up to 2 million years ago in the Quaternary Period. (BGS 2018). The soils in the area are classified as slowly permeable seasonally wet and slightly acid but base-rich loamy and clayey soils (CSAI 2018).

2 Archaeological Background

A full Heritage Desk-Based Assessment (DBA) has been prepared by Cotswold Archaeology. The DBA identified potential for buried archaeological remains within the survey area. The northern area has potential for archaeological remains of medieval, post-medieval and modern buildings and features associated with the monastic complex and later mansion known as Stoughton Grange – including the access drive that once led to the former mansion from Gartree Road. The southern area has potential for archaeological remains of later prehistoric and/or Romano-British activity associated with the settlement excavated at the University of Leicester Recreation Ground to the east – as well as remains of medieval, post-medieval and modern agricultural land use.

3 Aims, Methodology and Presentation

The main aim of the geophysical survey was to provide additional information and to gather sufficient information to establish the presence/absence, character, and extent, of buried archaeological remains within the survey area and to inform further strategies should they be necessary.

To achieve this, a magnetometer survey covering all available parts of the survey area was undertaken (see Fig. 2).

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 site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble R6 model). The survey was undertaken using Bartington Grad601 magnetic gradiometers. These were employed taking readings at 0.25m intervals on zig-zag traverses 1.0m apart within 30m by 30m grids, so that 3600 readings were recorded in each grid. These readings were stored in the memory of the instrument and later downloaded to computer for processing and interpretation. Geoplot 3 (Geoscan Research) 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 shows a more detailed site location plan at a scale of 1:2000. The processed and minimally processed data, together with an interpretation of the survey results are presented in Figures 3 to 5 inclusive at a scale of 1:1500.

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 Figs 3 to 5)

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.

Linear dipolar anomalies run in an east to west direction through the southern part of the southern survey area, these anomalies may represent buried furrows. Further dipolar anomalies are located in the northern survey area close to the buildings of Stoughton Grange Rural Centre. These anomalies are likely to represent services.

Agricultural anomalies

Several linear trends have been identified across the south-western part of the site. These have been interpreted as having an agricultural origin being caused by infilling of former boundaries, field drains or ploughing. A former field boundary, which is shown on the First Edition OS Map dated 1886, has also been identified to the east of the spinney in the southern part of the site. To its south is another linear that appears to be made up of small discrete areas of higher magnitude responses. These could well be the remains of a post fence or temporary fencing, though it does not share the same alignment as the recorded field boundary to its north.

Possible archaeological anomalies

The anomalies categorised with a possible archaeological origin are predominantly located in the eastern part of the southern survey area. While these have been given a possible archaeological origin a natural or geological origin cannot be ruled out.

The possible archaeological anomalies do not appear to form any coherent groupings and as such their interpretation is tentative.

5 Conclusions

The survey area has detected no magnetic anomalies of particular archaeological interest. Some agricultural responses in the form of field drains and former field boundaries have been identified. The possible archaeological anomalies are tentative and as likely to be natural in origin.

Overall the archaeological potential of the survey area is considered to be low.

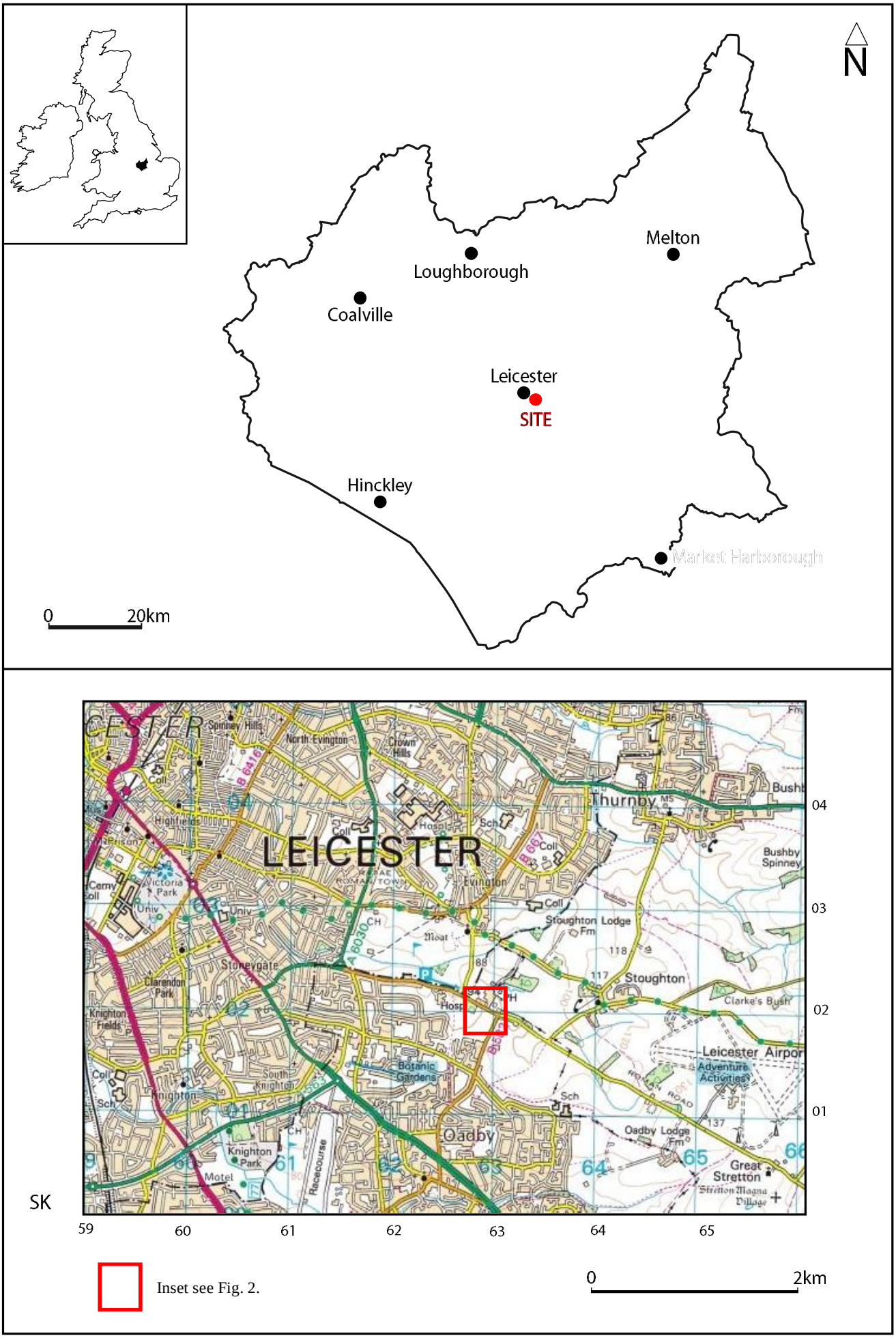

Fig. 1. Site location

PROJECT ID: 8267_GRO18	
	SURVEY BOUNDARY
1	LOCATION AND DIRECTION OF PLATES

N

3020 00

4630 00

2.0

-1.0

nT

0 50m

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Fig. 2. Site location showing greyscale magnetometer data (1:2000 @ A3)

Fig. 3. Processed greyscale magnetometer data (1:1500 @ A3)

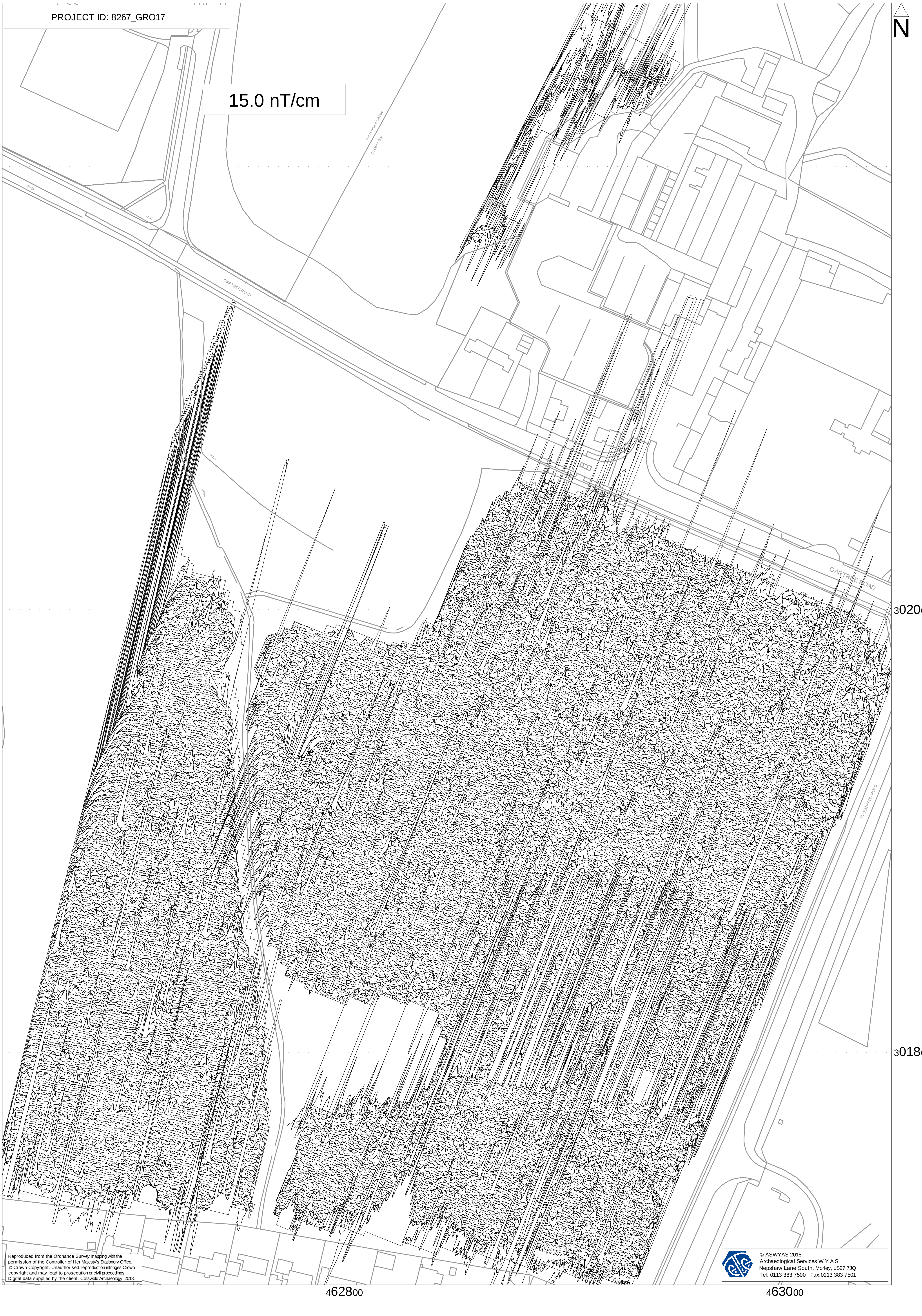

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Fig. 4. XY trace plot of minimally processed magnetometer data (1:1500 @ A3)

PROJECT ID: 8267_GRO17

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
—	DIPOLAR LINEAR	SERVICE PIPE
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	FIELD DRAINS / FIELD BOUNDARIES / FURROWS
	LINEAR TREND	PLOUGHING
	MAGNETIC ENHANCEMENT	GEOLOGY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?

N

3022 00

3020 00

3018 00

GARTREE ROAD

STOUGHTON ROAD

Drain

Boundary at Un Bdy

Co Const Bdy

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4628 00

4630 00

0 50m

Fig. 5. Interpretation of magnetometer data; (1:1500 @ A3)

Plate 1. General view of northern area, looking south-west

Plate 2. General view of southern area looking south

Plate 3. General view of western area, looking south

Plate 4. General view of southern area, looking north

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 main method of using the fluxgate gradiometer for commercial evaluations is referred to as ***detailed survey*** and requires the surveyor to walk at an even pace carrying the instrument within a grid system. A sample trigger automatically takes readings at predetermined points, typically at 0.25m intervals, on traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation.

During this survey a Bartington Grad601 magnetic gradiometer was used taking readings on the 0.1nT range, at 0.25m intervals on zig-zag traverses 0.5m apart within 30m by 30m square grids. The instrument was checked for electronic and mechanical drift at a common point and calibrated as necessary. The drift from zero was not logged.

The gradiometer data have been presented in this report in processed greyscale format. The data in the greyscale images have 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.

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 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 CS6 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

OASIS ID: archaeol11-314526

Project details

Project name	Gartree Road, Oadby
Short description of the project	A geophysical (magnetometer) survey, covering approximately 11.5 hectares, was undertaken within fields either side of Gartree Road, Oadby. The survey area has detected no magnetic anomalies of definite archaeological interest. Some agricultural responses in the form of field drains and former field boundaries have been identified. The possible archaeological anomalies are tentative and are likely to be natural in origin. Therefore based on the geophysical survey, the archaeological potential of the site is considered to be low.
Project dates	Start: 03-04-2018 End: 05-04-2018
Previous/future work	No / Not known
Any associated project reference codes	8267 - Sitecode
Type of project	Field evaluation
Current Land use	Cultivated Land 1 - Minimal cultivation
Monument type	NONE None
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded
Solid geology (other)	Mudstone
Drift geology (other)	acidic loamy clays
Techniques	Magnetometry

Project location

Country	England

Site location	LEICESTERSHIRE OADBY AND WIGSTON OADBY Land off Gartree Road, Oadby
Study area	11.5 Hectares
Site coordinates	SK 628 019 52.610887552418 -1.072444696679 52 36 39 N 001 04 20 W Point
Height OD / Depth	Min: 94m Max: 109m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Cotswold Archaeology
Project design originator	Cotswold Archaeology
Project director/manager	E Brunning
Project supervisor	A. Trace

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Cotswold Archaeology
Digital Contents	"Survey"
Digital Media available	"Geophysics","Images vector","Survey","Text"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Land off Gartree Road, Oadby
Author(s)/Editor(s)	Williams, D
Date	2018
Issuer or publisher	ASWYAS
Place of issue or publication	Leeds
Description	A4 report with A3 figures

Entered by	Emma Brunning (emma.brunning@aswyas.com)
Entered on	16 April 2018

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