



FRISBY ON THE WREAKE, MELTON BOROUGH, LEICESTERSHIRE

GEOPHYSICAL SURVEY

commissioned by Fisher German LLP on behalf of The Cook Partnership

March 2017





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project in

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PARISH Frisby on the Wreake

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PROJECT SUMMARY

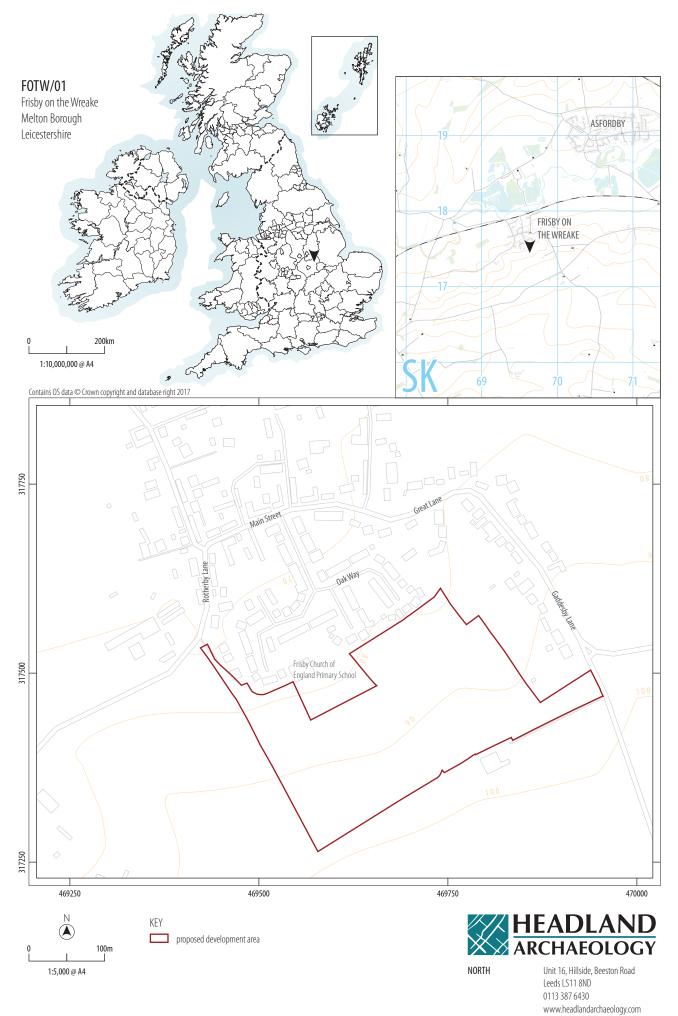
Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey, covering 7 hectares, on land south of Frisby on the Wreake, Leicestershire, to inform a planning application for a proposed development. No anomalies of archaeological potential have been identified by the survey. Parallel linear anomalies have been identified throughout the site which are characteristic of the medieval and post-medieval practice of ridge and furrow cultivation. These are thought to be of low archaeological value but may be of local historical interest. Elsewhere, anomalies have been identified which are due to localised variations within the soils and superficial deposits and to ferrous contamination of the upper soil horizons. Therefore, based on the results and interpretation of the geophysical survey, the archaeological potential of the site is assessed as low, corroborating the results of the Desk-Based Assessment.

CONTENTS

1	INTRO	INTRODUCTION			
	1.1	SITE LOCATION, TOPOGRAPHY AND LAND-USE	1		
	1.2	GEOLOGY AND SOILS	1		
2	ARCH	AEOLOGICAL BACKGROUND	1		
3	AIMS	, METHODOLOGY AND PRESENTATION	1		
	3.1	MAGNETOMETER SURVEY	Ź		
	3.2	REPORTING	Ź		
4	RESU	LTS AND DISCUSSION	3		
	4.1	FERROUS AND MODERN ANOMALIES	3		
	4.2	AGRICULTURAL ANOMALIES	3		
	4.3	GEOLOGICAL ANOMALIES	4		
5	CONC	LUSION	2		
6	REFERENCES		4		
7	APPENDICES				

LIST OF ILLUSTRATIONS

ILLUS 1 SITE LOCATION	VII
ILLUS 2 FIELD 1, LOOKING NORTH	2
ILLUS 3 FIELD 3, LOOKING NORTH	3
ILLUS 4 SURVEY LOCATION SHOWING GPS SWATHS (1:2,000)	Ĺ
ILLUS 5 SURVEY LOCATION SHOWING CONTOURS AND SUPERFICIAL GEOLOGY (1:2,000)	7
LLLUS 6 PROCESSED GREYSCALE MAGNETOMETER DATA (1:1,500)	Ç
LLLUS 7 XY TRACE PLOT OF MINIMALLY PROCESSED MAGNETOMETER DATA (1:1,500)	11
ILLUS 8 INTERPRETATION OF MAGNETOMETER DATA (1:1,500)	13



FRISBY ON THE WREAKE, MELTON BOROUGH, LEICESTERSHIRE

GEOPHYSICAL SURVEY

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by Fisher German LLP (The Consultant), on behalf of The Cook Partnership (The Client), to undertake a geophysical (magnetometer) survey of land to the immediate south of Frisby on the Wreake. The survey was carried out in order to inform a planning application for a proposed residential development.

The work was undertaken in accordance with a Written Scheme of Investigation (Headland Archaeology 2017), approved by Teresa Hawtin (Senior Planning Archaeologist at Leicestershire County Council), and was undertaken in accordance with guidance contained within the National Planning Policy Framework (DCLG 2012). All work was also undertaken in line with current best practice (Chartered Institute for Archaeologists 2014, English Heritage 2008).

The survey was carried out between February 20th and February 21st 2017 in order to provide information on the archaeological potential of the site.

1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The proposed development area (PDA) comprises of four fields (F1–F4) within a single parcel of land, centred at SK 6976 1733 (see Illus 1). It is bound to the north by residential properties fronting onto Oak Way, Ash Way and Hall Orchard Lane, and by mature field boundaries on all other sides, except in the south-west where the PDA is unbound.

The topography undulates locally but generally lies on a north-facing slope between 98m above Ordnance Datum (aOD) in the south and 80m aOD in the north.

At the time of the survey the fields were under pasture (see Illus 2–3). Low linear ridge and furrow earthworks were observed throughout F2–F4 but were less apparent within F1.

1.2 GEOLOGY AND SOILS

The underlying bedrock geology comprises mudstone of the Blue Lias Formation. This is mainly overlain by diamicton of the Oadby Member with deposits of clay silt and sand of the Rotherby Member in the north-west. Two bands of Head (deposits of clay, silt, sand and gravel) occupy linear topographical features in the east of F1 and F3 respectively (see Illus 5; NERC 2017).

The soils are classified in the Soilscape 9 association, characterised as lime-rich loams and clays with impeded drainage (Cranfield University 2017).

2 ARCHAEOLOGICAL BACKGROUND

A Desk-Based Assessment (Headland Archaeology 2016) has identified no designated heritage assets within the PDA. Ridge and Furrow earthworks of probable post-medieval date are known across the majority of the site. These are thought to be of low archaeological value but may be of local historical interest.

3 AIMS, METHODOLOGY AND PRESENTATION

The main aim of the geophysical survey was to provide sufficient information to enable an assessment to be made of the impact of the proposed development on any sub-surface archaeological remains, if present.

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.



ILLUS 2 Field 1, looking north

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. A feature 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.

The survey was undertaken using four Bartington Grad601 sensors mounted at 1m intervals (1m traverse interval) onto a rigid carrying frame. The system was programmed to take readings at a frequency of 10Hz (allowing for a 10–15cm sample interval) on roaming traverses 4m apart. These readings were stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system was linked to a Trimble R8s Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for each data point.

MLGrad601 and MultiGrad601 (Geomar Software Inc.) software was used to collect and export the data. Terrasurveyor V3.0.31.0 (DWConsulting) software was used to process and present the data.

3.2 REPORTING

A general site location plan is shown in Illus 1 at a scale of 1:5,000. Illus 2-3 are site condition photographs. Illus 4 is a 1:2,000 scale

survey location plan showing the GPS swath data. Contours and superficial geology data (after NERC 2017) is presented at the same scale in Illus 5.

Detailed data plots of the fully processed data (greyscale), the minimally processed data (XY traceplot) and an accompanying interpretative plot, are presented at a scale of 1:1,500 in Illus 6 to Illus 8 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. Data processing details are presented in Appendix 4. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 5.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Headland Archaeology 2017) and guidelines outlined by Historic England (English Heritage 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations from Ordnance Survey mapping are reproduced 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.



ILLUS 3 Field 3, looking north

4 RESULTS AND DISCUSSION

The ground conditions across the survey area were good and the overall quality of the data collected was good throughout.

A moderate level of background magnetic variation has been recorded throughout the PDA with localised areas of magnetic enhancement thought to be caused by variations in the depth and composition of the soils and the superficial deposits from which they derive.

Against this background numerous anomalies have been identified. These are discussed below and cross-referenced to specific anomalies on the interpretative drawings, where appropriate.

4.1 FERROUS AND 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 is common on most sites, often being present as a consequence of manuring or tipping/infilling. There is no apparent clustering to these ferrous anomalies and they are consequently not considered to be of any archaeological significance.

Two large 'spikes' (TP see Illus 8) within the south of F1 correspond to telegraph poles.

Magnetic disturbance around the field edges is due to ferrous material within or close to the adjacent field boundaries and is of no

archaeological interest. The broader area of magnetic disturbance (GD1 see Illus 8) within the north-west of F1 corresponds an area of ground disturbance which is visible on historical satellite images (Infoterra Ltd and Bluesky 2017) and is also of no archaeological interest.

Within the south-east of F1 a curving high magnitude anomaly (GD2) of uncertain origin is identified. However, given the high magnitude of the anomaly and location between two telegraph poles a modern origin seems likely, perhaps being due to ground disturbance.

4.2 AGRICULTURAL ANOMALIES

Analysis of historical mapping indicates that the division and layout of land within the PDA has remained unchanged since the publication of the first edition Ordnance Survey map in 1884.

F2–F4 are dominated by evenly-spaced, east/west aligned, high magnitude parallel linear anomalies which correspond to the low linear earthworks observed during the course of the survey. The anomalies are characteristic of the medieval and post-medieval practice of ridge and furrow cultivation. The striped appearance in the data is due to the magnetic contrast between the former ridges and the soil-filled furrows. Lower magnitude north/south aligned trends are visible throughout F1. The ridge and furrow anomalies may be of local historic interest but are unlikely to be considered as any more than low archaeological value.

Low magnitude linear trends within the south of F1 are typical of modern field drains. The high magnitude linear anomaly in the south-west of F3 appears to run between a field boundary and a pond and is also likely to relate to drainage/water management.

4.3 GFOLOGICAL ANOMALIES

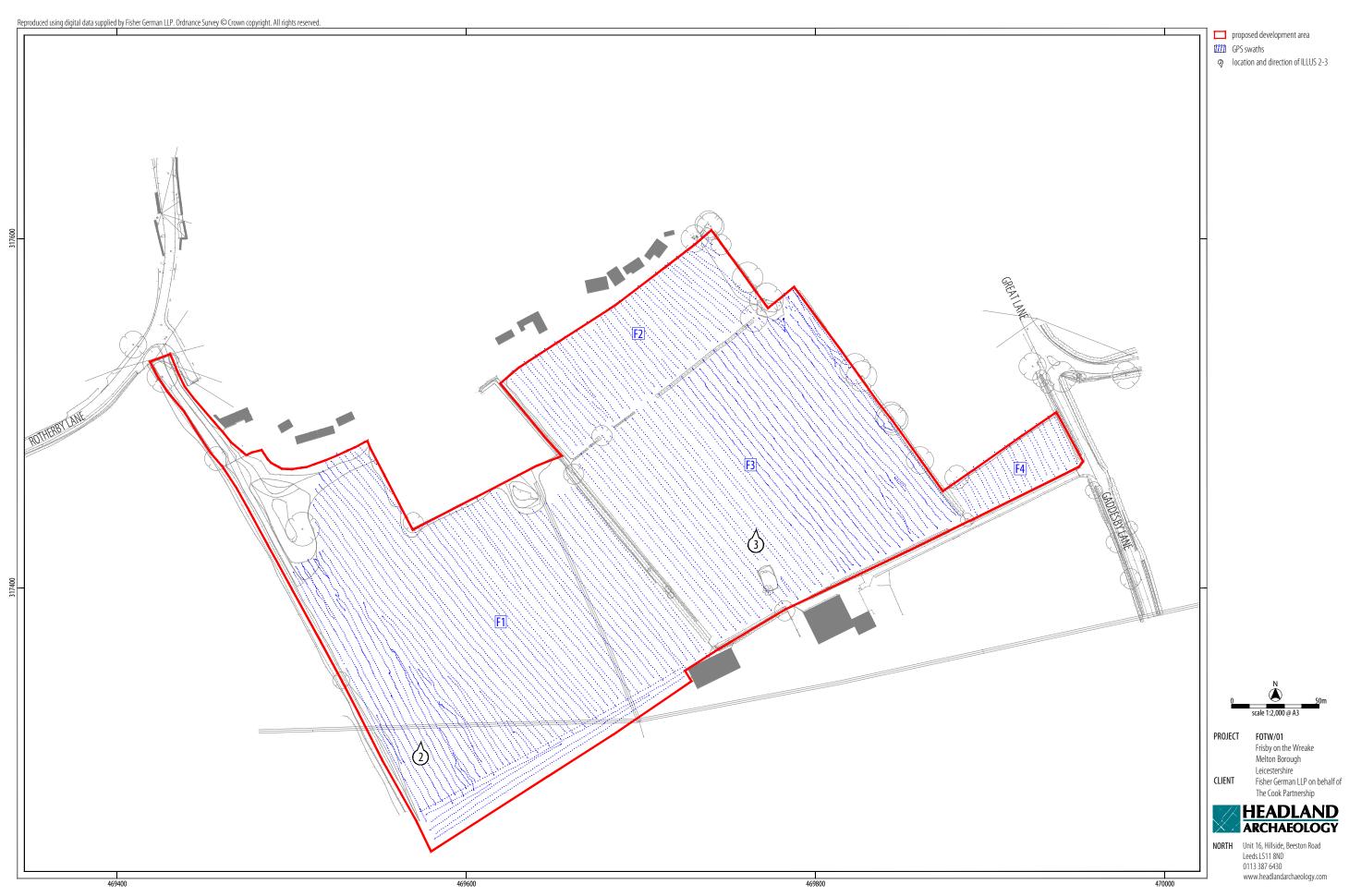
The magnetic background varies little across the PDA although it is notable that less variation has been detected in the east of F1 and F3. This is thought to be due to the low magnetic contrast in the superficial deposits of Head in these locations. Elsewhere the magnetic background is characterised by numerous discrete areas of magnetic enhancement which are caused by localised variations in the depth and composition of the soils. Low magnitude curvilinear trends (GV1 and GV2) within the south of F1 correspond closely to the location of boundaries between the superficial deposits.

5 CONCLUSION

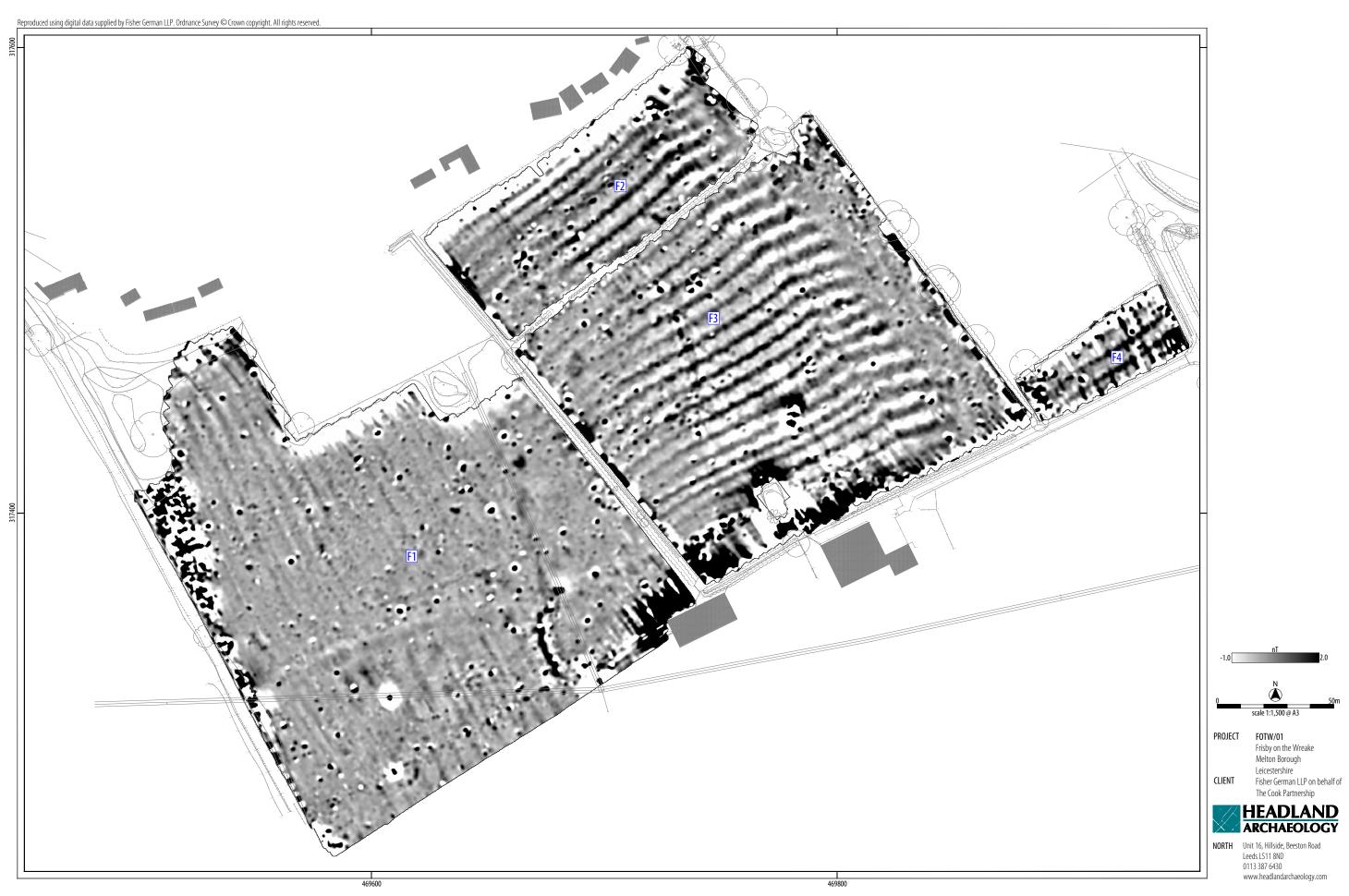
The geophysical survey has successfully evaluated the survey area and has provided further evidence for ridge and furrow cultivation throughout the site. The ridge and furrow may be of local historical interest but it is thought to be of low archaeological value. No anomalies of archaeological potential have been identified and therefore, based on the results and interpretation of the magnetic data, the archaeological potential of the site is assessed as low, corroborating the results of the Desk-Based Assessment.

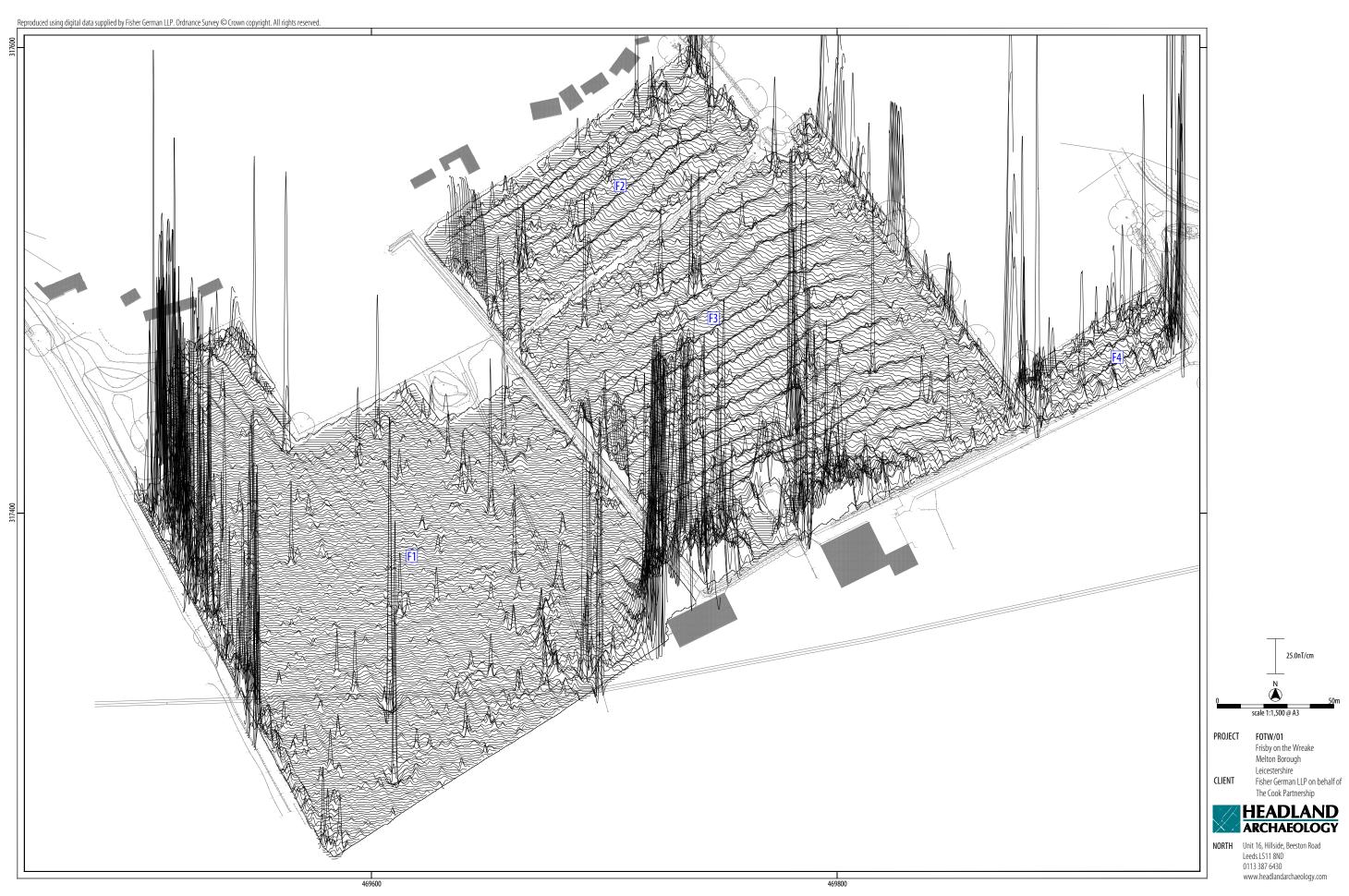
REFERENCES 6

- Chartered Institute for Archaeologists (ClfA) 2014 Standard and guidance for archaeological geophysical survey [online document] Accessed 22 February 2017 from http://www.archaeologists.net/sites/ default/files/CIfAS&GGeophysics_1.pdf
- Cranfield University 2017 Cranfield Soil and Agrifood Institute Soilscapes [online] Accessed 22 February 2017 from www.
- Department of Communities and Local Government (DCLG) 2012 National Planning Policy Framework [online document] Accessed 22 February 2017 from https://www.gov.uk/
- English Heritage 2008 Geophysical Survey in Archaeological Field Evaluation: Research and Professional Services Guidelines (2nd edition) [online document] Accessed 22 February 2017 evaluation/geophysics-guidelines.pdf
- Gaffney, C & Gater, J 2003 Revealing the Buried Past: Geophysics for **Archaeologists** The History Press: Stroud
- Headland Archaeology 2016 Frisby on the Wreake, Melton Borough: Desk-Based Assessment [unpublished Headland document (FRIS16/01)]
- Headland Archaeology 2017 Frisby on the Wreake, Melton Borough, Leicestershire: Written Scheme of Investigation for Geophysical Survey [unpublished Headland document (FOTW/01)]
- Infoterra Ltd and Bluesky 2017 Google Earth V 7.1.2.2041 (image date January 1 2002) [online] Frisby on the Wreake (52° 44'59.05'N, 0° 58'17.70'W, Eye alt 806m. Accessed 22 February 2017 from
- Natural Environment Research Council (NERC) 2017 British Geological Survey [online] Accessed 22 February 2017 from http://www.











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 haematite. 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.

APPFNDIX 2 SURVEY LOCATION INFORMATION

An initial survey base station was established using a Trimble VRS differential Global Positioning System (dGPS). The magnetometer data was georeferenced using a Trimble RTK differential Global Positioning System (Trimble R8s model).

Temporary sight markers were laid out using a Trimble VRS differential Global Positioning System (Trimble R8s model) to guide the operator and ensure full coverage. The accuracy of this dGPS equipment is better than 0.01m.

The survey data 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 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.

GEOPHYSICAL SURVEY ARCHIVE APPFNDIX 3

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.

The project will be archived in-house in accordance with recent good practice guidelines (http://guides.archaeologydataservice. ac.uk/g2qp/Geophysics 3). The data will be stored in an indexed archive and migrated to new formats when necessary.

APPENDIX 4 DATA PROCESSING

The gradiometer data has been presented in this report in processed greyscale and minimally processed XY trace plot format.

Data collected using RTK GPS-based methods cannot be produced without minimal processing of the data. The minimally processed data has been interpolated to project the data onto a regular grid and de-striped to correct for slight variations in instrument calibration drift and any other artificial data.

A high pass filter has been applied to the greyscale plots to remove low frequency anomalies (relating to survey tracks and modern agricultural features) in order to maximise the clarity and interpretability of the archaeological anomalies.

The data has also been clipped to remove extreme values and to improve data contrast.

2017 by Headland Archaeology (UK) Ltd File Name: FOTW-01-Report-v3.pdf

APPENDIX 5 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID: headland5-278039

PROJECT DETAILS

Project name Frisby on the Wreake, Melton Borough, Leicestershire

Short description of the project Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey, covering 7 hectares, on land south of Frisby on the Wreake, Leicestershire, to

inform a planning application for a proposed development. No anomalies of archaeological potential have been identified by the survey. Parallel linear anomalies have been identified throughout the site which are characteristic of the medieval and post-medieval practice of ridge and furrow cultivation. These are thought to be of low archaeological value but may be of local historical interest. Elsewhere, anomalies have been identified which are due to localised variations within the soils and superficial deposits and to ferrous contamination of the upper soil horizons. Therefore, based on the results and interpretation of the geophysical survey, the

archaeological potential of the site is assessed as low, corroborating the results of the Desk-Based Assessment.

Project dates Start: 20-02-2017 End: 21-02-2017

Previous/future work No / Not known

Any associated project reference codes FOTW-01 - Contracting Unit No.

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 ""Geophysical Survey"

Development type Housing estate

Prompt National Planning Policy Framework - NPPF

Position in the planning process Pre-application

Solid geology (other) Blue Lias Formation

Drift geology (other)Oadby Member; Rotherby Member; Head

Techniques Magnetometry

PROJECT LOCATION

Country England

Site location LEICESTERSHIRE MELTON FRISBY AND KIRBY Frisby on the Wreake, Melton Borough

Postcode LE14 2NG
Study area 7 Hectares

Site coordinates SK 6976 1733 52.748741668881 -0.966393489333 52 44 55 N 000 57 59 W Point

FRISBY ON THE WREAKE, MELTON BOROUGH, LEICESTERSHIRE FOTW/01

PROJECT CREATORS Name of Organisation Headland Archaeology Project brief originator Headland Archaeology Project design originator Headland Archaeology Project director/manager Harrison, S Project supervisor Bishop, R Type of sponsor/funding body Developer PROJECT ARCHIVES Physical Archive Exists? No Digital Archive Exists? No Digital Media available "Geophysics" Paper Archive Exists? No Paper Media available "Report" PROJECT BIBLIOGRAPHY 1 Publication type Grey literature (unpublished document/manuscript) Title Frisby on the Wreake, Melton Borough, Leicestershire: Geophysical Survey Author(s)/Editor(s) Harrison, D. Date 2017

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