WYAS Archaeological Services

WREN Manufacturing Facility

Barton-upon-Humber

North Lincolnshire

Geophysical Survey

Report no. 3285
May 2019

Client: Wren Kitchens Factory Extension
Barton on Humber

WREN Manufacturing Facility, Barton-Upon-Humber, North Lincolnshire

Geophysical Survey

Summary

A geophysical (magnetometer) survey, was undertaken on approximately 13 hectares of land located to the north of Barrow Road, Barton-Upon-Humber, North Lincolnshire. Responses of a possible archaeological origin have been recorded in the west of the survey area. A swathe of magnetic material has been identified as having a geological origin. Former field boundaries and land drains have also been detected. The archaeological potential of the survey area is deemed to be moderate.

WYAS Archaeological Services

Report Information

Client:	Wren Kitchens Factory Extension Barton on Humber
Address:	FKX Ltd, PO BOX 95, York, YO43 4YZ
Report Type:	Geophysical Survey
Location:	Barton-Upon-Humber
County:	North Lincolnshire
Grid Reference:	TA 05272 22051
Period(s) of activity:	Roman, Post-medieval, Modern
Report Number:	3285
Project Number:	8729
Site Code:	WRN19
OASIS ID:	archaeol11-352136
Date of fieldwork:	May 2019
Date of report:	May 2019
Project Management:	Alastair Trace BSc MSc
Fieldwork:	Amy Chatterton BSc MA
	Jake Freeman BA
	Clare Asplin BA
	Michael Offley BSc
Report:	Alastair Trace and Emma Brunning BSc MCIfA
Illustrations:	Christopher Sykes BA MSc MCIfA
Photography:	Alastair Trace
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Authorisation for distribution: ----------

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1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by Prospect Archaeology Limited on behalf of Wren Kitchens Factory Extension Barton on Humber, to undertake a geophysical (magnetometer) survey on land north of Barrow Road, Barton-Upon-Humber, East Ridings. Guidance contained within the National Planning Policy Framework (MHCLG 2018) was followed, in line with current best practice (CIfA 2014; David *et al*. 2008). The survey was carried out between the 29th April and 1st May 2019 to provide additional information on the archaeological resource of the Proposed Development Area (PDA).

Site location, topography and land-use

The survey area is approximately centred on National Grid Reference TA 05272 22051 and located to the north of Barrow Road, and to the east of a large factory complex to the east of Barton-Upon-Humber (Fig. 1). The proposed geophysical survey area is approximately 13 hectares. The PDA lies on level ground which slopes from Barrow Road to the estuary, from 18m above Ordnance Datum (aOD) in the south to 4m in the north. Current land use is agricultural vegetation. Data were unable to be collected in a small strip at the southern end due to overgrown vegetation.

Soils and geology

The underlying geology of the site is of the Welton Chalk Formation, characterised as a sedimentary bedrock formed approximately 90 to 101 million years ago in the Cretaceous Period. Superficial deposits have been recorded as Till, Devensian – Diamicton to the south of the site, and Tidal Flat Deposits – Clay and Silt to the north of the site; both deposits formed up to 2 million years ago in the Quaternary period (BGS 2019).The overlying soils belong to the Burlingham 2 (572o) described as stagnogleyic argillic brown earths (SSEW 1983).

2 Archaeological Background

The following information has been taken from a Written Scheme of Investigation prepared by Prospect Archaeology 2019.

There is only slight evidence of prehistoric activity to the west of the survey area which consists of a spot find of a late Neolithic or Early Bronze Age perforated stone adze (HER 442).

Iron Age and Roman activity close to the site is more plentiful. A mid-late Iron Age landscape comprising enclosures and a possible droveway was uncovered west of Falkland Way (HER 21250). Excavations also revealed a mid-Iron Age vessel and a human cremation.

A 2nd to 3rd century Romano-British settlement site (HER 16314) was discovered in 1992 prior to construction of the Kimberley Clark factory. The settlement lay alongside a trackway, flanked by ditches. It was roughly square within which were smaller enclosures. There were two main alignments of features, pointing to at least two main phases of occupation, maintaining its original boundaries until sometime after the 3rd century, after which its limits were redefined and the outer ditches established on a slightly different orientation.

The 1797 enclosure map shows the site was contained within a large field set aside for tithes. Early Ordnance Survey maps show the tithe field was divided into smaller rectangular fields within the same boundaries to the north and south. The layout seen on the 1887 OS map remained the same until 1992 when the Kimberley Clark factory was built. At some point after 1994 the drain crossing the easternmost two fields was filled in creating a single field.

3 Aims and Methodology

The aims and objectives of the programme of geophysical survey were to gather sufficient information to establish the presence/absence, character and extent, of any archaeological remains within the specific area to inform an assessment of the archaeological potential of the site. To achieve this aim, a magnetometer survey covering all amenable parts of the PDA 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. Bespoke in-house 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 at a scale of 1:5000 with Figure 3 displaying an overall interpretation at the same scale. The minimally processed data, together with an interpretation of the survey results are presented in Figures 4 to 9 inclusive at a scale of 1:1000.

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 4 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.

Magnetic disturbance along the western edge of the survey area which is due to metal fencing within the boundary.

Geological anomalies

The survey has detected a number anomalies that have been interpreted as geological in origin. It is thought that the responses have been detected because of the variation in the composition and depth of the deposits of superficial material in which they derive.

Agricultural anomalies

A former field boundary has been identified in across the width of the survey area, which corresponds with first edition mapping of the area. A handful of ploughing trends can be seen in the southeast of the dataset.

Linear parallel responses in the north of the area relate to field drainage and is a typical response to the fired clay pipes that are used.

Possible archaeological anomalies

A collection of anomalies have been identified as having a possible archaeological origin. They occur along the western boundary of the survey area.

Possible anomaly **A** appear as a lower case 'h' immediately south of the archaeological features. Its proximity to the archaeology and distinct magnetic form suggest an origin which could be archaeological. It may also be a feature which is associated with a field system in existence prior to first edition mapping.

Anomalies labelled as **B** are revealed as former field divisions. They are not recorded on first edition mapping of the area suggesting an archaeological origin, however it is possible that they could be later disturbance, associated with the insertion of a service.

In the south-western corner of the survey area, a collection of responses (**C**) has been detected. They may have archaeological origins, although these magnetic responses do have a similar signature to anomalies characterised as geology.

5 Conclusions

The geophysical survey has detected a number of magnetic anomalies. Across the site there are dispersed and isolated magnetic responses indicative of ferrous anomalies. A former field boundary has been identified, across the width of the survey area. Field drains have also been detected in the north.

Geological anomalies, characteristic of the topography of the survey area, have also been identified throughout the survey area.

Possible archaeological anomalies have been identified within the dataset. They have a magnetic response different from other anomalies. They are likely to represent former field boundaries which pre-date first edition mapping.

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

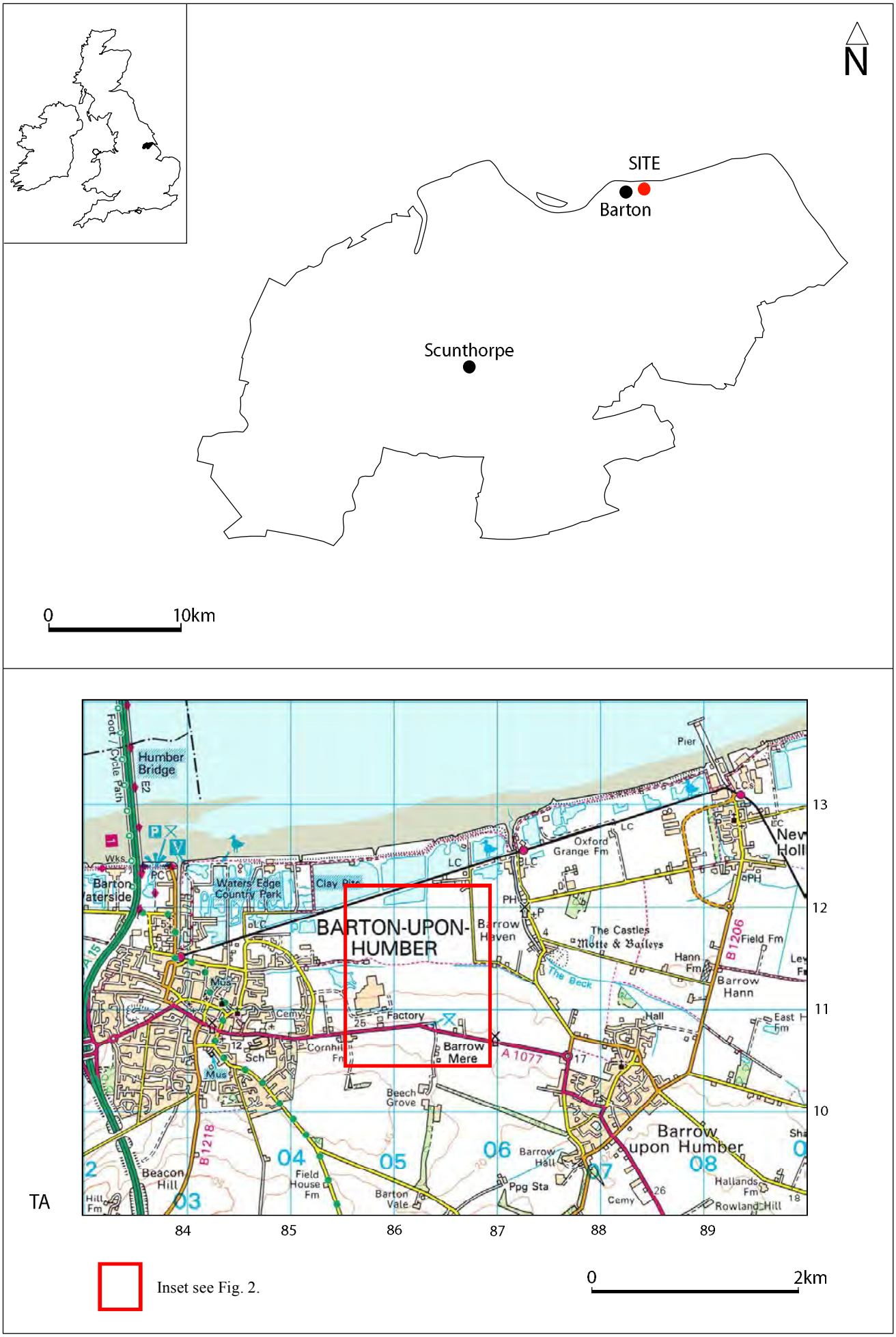

Fig. 1. Site location

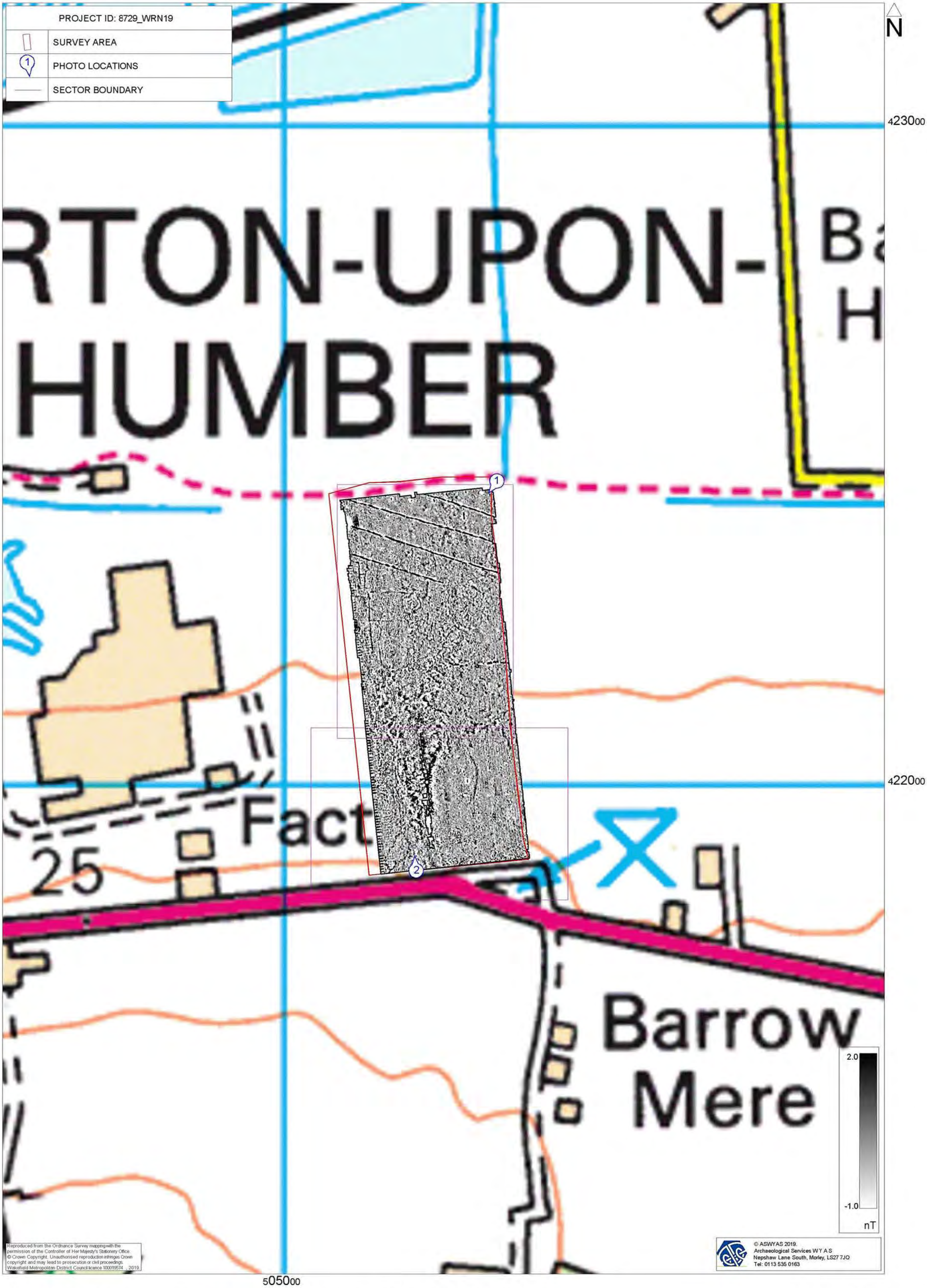

Fig. 2. Survey location showing processed greyscale magnetometer data (1:5000 @ A3)

Fig. 3. Overall interpretation of magnetometer data (1:5000 @ A3)

PROJECT ID: 8729_WRN19

SURVEY AREA

SECTOR BOUNDARY

N

422400

422200

505200

2.0

-1.0

nT

Archaeological Services W Y A S
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 535 0163

0 50m

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

PROJECT ID: 8729_WRN19

SURVEY AREA

SECTOR BOUNDARY

N

422400

422200

505200

20.0 nT/cm

0 50m

Archaeological Services W Y A S
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 535 0163

Fig. 5. XY trace plot of minimally processed magnetometer data; Sector 1 (1:1000 @ A3)

PROJECT ID: 8729_WRN19

SURVEY AREA

N

4224 00

4222 00

5052 00

A

B

B

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	AGRICULTURAL
	LINEAR TREND	FIELD DRAIN
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?

Archaeological Services W Y A S
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 535 0163

0 50m

Fig. 6. Interpretation of magnetometer data; Sector 1 (1:1000 @ A3)

PROJECT ID: 8729_WRN19

SECTOR BOUNDARY

N

422000

2.0

-1.0

nT

5052**00**

5054**00**

0 50m

Archaeological Services W Y A S
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 535 0163

Fig. 7. Processed greyscale magnetometer data; Sector 2 (1:1000 @ A3)

PROJECT ID: 8729_WRN19

SECTOR BOUNDARY

N

422000

20.0 nT/cm

Archaeological Services W Y A S
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 535 0163

505200

505400

0 50m

Fig. 8. XY trace plot of minimally processed magnetometer data; Sector 2 (1:1000 @ A3)

PROJECT ID: 8729_WRN19	
	SECTOR BOUNDARY

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?

N

422000

C

Archaeological Services W Y A S
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 535 0163

5052**00** 5054**00**

0 50m

Fig. 9. Interpretation ofmagnetometer data; Sector 2 (1:1000 @ A3)

Plate 1. General overview of site, facing southwest

Plate 2. General view of site, facing 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.

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 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 North Lincolnshire Historic Environment Record).

Appendix 4: Oasis form

OASIS DATA COLLECTION FORM: England

OASIS ID: archaeol11-352136

Project details

Project name	WREN Manufacturing Facility
Short description of the project	A geophysical (magnetometer) survey, was undertaken on approximately 13 hectares of land located to the north of Barrow Road, Barton-Upon-Humber, North Lincolnshire. Responses of a possible archaeolocal origin have been recorded in the west of the survey area. A swathe of magnetic material has been identified as having a geological origin. Former field boundaries and land drains have also been detected. The archaeological potential of the survey area is deemed to be moderate.
Project dates	Start: 09-05-2019 End: 10-05-2019
Previous/future work	Not known / Yes
Any associated project reference codes	WRN19 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 2 - Operations to a depth less than 0.25m
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	Not recorded
Prompt	Planning condition
Position in the planning process	Not known / Not recorded
Solid geology	CHALK (INCLUDING RED CHALK)
Drift geology	RAISED BEACH AND MARINE DEPOSITS
Techniques	Magnetometry

Project location

Country	England
Site location	NORTH LINCOLNSHIRE NORTH LINCOLNSHIRE BARTON UPON HUMBER WREN Manufacturing Facility
Postcode	DN18 6DD
Study area	13 Hectares
Site coordinates	TA 05272 22051 53.684058584019 -0.405837922494 53 41 02 N 000 24 21 W Point
Height OD / Depth	Min: 4m Max: 18m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Prospect Archaeology Ltd
Project design originator	ASWYAS
Project director/manager	A. Trace
Project supervisor	J Freeman
Type of sponsor/funding body	Landowner

Project archives

Physical Archive Exists?	No
Digital Archive recipient	ASWYAS
Digital Contents	"none"
Digital Media available	"Geophysics","Images raster / digital photography","Survey"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	WREN MANUFACTURING FACILITY
Author(s)/Editor(s)	Brunning, E.
Date	2019
Issuer or publisher	ASWYAS
Place of issue or publication	Leeds

Entered by	Chris Sykes (christopher.sykes@aswyas.com)
Entered on	21 May 2019

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