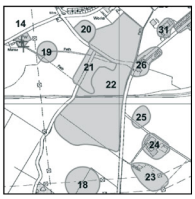
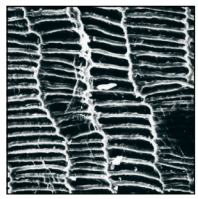
CHSD/01










LAND AT WOODLANDS LANE, CHELLASTON, DERBYSHIRE

GEOPHYSICAL SURVEY

commissioned by Orion Heritage Ltd

September 2016

HEADLAND ARCHAEOLOGY

REGISTERED ORGANISATION CIfA

LAND AT WOODLANDS LANE, CHELLASTON, DERBYSHIRE

GEOPHYSICAL SURVEY

commissioned by Orion Heritage Ltd

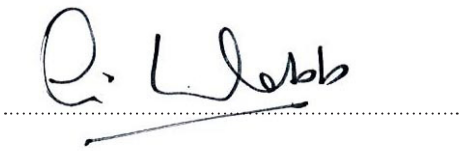
September 2016

project info

HA JOB NO.	CHSD/01
NGR	SK 3855 2968
PARISH	Swarkestonet
LOCAL AUTHORITY	South Derbyshire
OASIS REF.	headland5-262050

project team

PROJECT MANAGER	Sam Harrison
AUTHOR	David Harrison
FIELDWORK	Alex Schmidt, Charlotte Palmer Craggs
GRAPHICS	Beata Wieczorek-Oleksy, David Harrison
APPROVED BY	Alistair Webb– Project Manager



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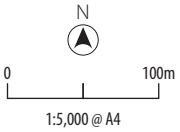
PROJECT SUMMARY

Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey covering 2 hectares at Woodlands Lane, Chellaston, Derbyshire, in advance of a proposed residential development. The survey has identified anomalies which are typical of ridge and furrow cultivation and which correspond to low linear earthworks. These anomalies may be of local historical interest but are not thought to be of any archaeological significance. No anomalies of definite archaeological potential have been identified although two high magnitude anomalies within the east are ascribed some archaeological potential, perhaps being due to pits. Therefore, based solely on the results and interpretation of the magnetic data, the archaeological potential across most of the site is considered to be low, corroborating the results of the desk-based assessment, whilst a moderate potential is ascribed to the two possible pits.

CONTENTS

LIST OF ILLUSTRATIONS



KEY

- proposed development boundary
- scheduled monument

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ILLUS 1 Site location

LAND AT WOODLANDS LANE, CHELLASTON, DERBYSHIRE

GEOPHYSICAL SURVEY

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by Orion Heritage Ltd (the Consultant) to undertake a geophysical (magnetometer) survey on land at Woodlands Lane, Chellaston, Derbyshire. The survey will inform forthcoming archaeological strategy in advance of a proposed residential development.

The work was undertaken in accordance with a Written Scheme of Investigation (Headland Archaeology 2016), provided to the Consultant, with guidance contained within the National Planning Policy Framework (DCLG 2012) and in line with current best practice (English Heritage 2008).

The survey was carried out on August 26th 2016 in order to provide information on the archaeological potential of site.

1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The proposed development area is located on the south-eastern periphery of Chellaston, Derbyshire, south of Woodlands Lane and centred at SK 3855 2968 (see Illus 1). It is located within a single trapezoidal-shaped field which is bound by mature field boundaries on all sides with open farmland beyond. The site is located on the western slopes of a low hill being at 75m above Ordnance Datum (aOD) in the east and 66m aOD in the west. At the time of the survey the site was under long grass (see Illus 2).

1.2 GEOLOGY AND SOILS

The underlying bedrock geology comprises Branscombe Mudstone Formation which is overlain by glaciolacustrine deposits of clay, silt and sand (NERC 2016).

The soils are classified in the Soilscape 18 association, characterised as slowly permeable, seasonally wet loams and clays (Cranfield University 2016).

2 ARCHAEOLOGICAL BACKGROUND

An Archaeological Desk Based Assessment (CgMs 2015) concluded that:

> '…the site has moderate potential for peripheral remains associated with a scheduled prehistoric settlement [Ref. 1007024] that lies to the south-east of the site… The site also contains the slight earthwork remains of ridge and furrow, which are considered to be of local significance. The site has low potential for remains of all other archaeological periods.'

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 any proposed development on any potential sub-surface archaeological remains.

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

3.1 MAGNETOMETER SURVEY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. A feature such as a ditch, pit or kiln

ILLUS 2 General view of survey area, looking south-east

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 & 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 is programmed to take readings at a frequency of 10Hz (allowing for a 10–15cm sample interval) on roaming traverses 4m apart. These readings are stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system is 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 has been used to collect and export the data. Terrasurveyor V3.0.29.3 (DWConsulting) software has been used to process and present the data.

Marker canes were laid out using a Trimble VRS differential Global Positioning System (Trimble GeoXR model).

3.2 REPORTING

A general site location plan is shown in Illus 1 at a scale of 1:5,000. Illus 2 is a general site condition photograph to show the ground conditions at the time of the survey. Illus 3 shows the survey location, the location of the scheduled monument and the direction and location of Illus 2.

Detailed data plots (greyscale and XY trace) and an interpretative illustration are presented at a scale of 1:1,250 in Illus 4, Illus 5 and Illus 6.

Technical information on 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. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 4.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Headland Archaeology 2016) and guidelines outlined by English Heritage (English Heritage 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations reproduced from Ordnance Survey (OS) mapping are with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

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

4 RESULTS AND DISCUSSION

Magnetic background

A moderate level of background magnetic variation has been detected across the surveyed area. Against this background numerous anomalies have been identified. These are discussed below and cross-referenced to the interpretative drawings, where appropriate.

4.1 FERROUS ANOMALIES

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

The high magnitude dipolar linear anomaly (SP see Illus 4–6) aligned north-west/south-east within the east of the field locates a buried service pipe.

Within the north-east corner of the field a high magnitude linear band of magnetic disturbance, T, corresponds to an extant footpath and a farm track which is shown on the first edition Ordnance Map (1882). The disturbance is caused by ferrous material (e.g. brick, tile, concrete) within the metalled surface of the former track.

Other areas of magnetic disturbance around the perimeter of the survey area and field edges can be attributed to the proximity of post and wire fencing and/or other ferrous material within or close to the boundaries.

4.2 AGRICULTURAL ANOMALIES

Parallel linear trends are visible on an east/west orientation throughout the survey area. The trends correspond to low linear earthworks and are due to the medieval and post-medieval practice of ridge and furrow cultivation. The anomalies are caused by the magnetic contrast between the soil-filled furrows and the ploughed-down ridges.

4.3 POSSIBLE ARCHAEOLOGICAL ANOMALIES

A rectangular-shaped anomaly (P1 see Illus 4–6) has been identified close to the eastern site boundary. No definite archaeological pattern is discernible and the anomaly may be modern or agricultural in origin but, given the local archaeological context (being 100m north-west of the scheduled monument), an archaeological origin cannot be discounted. The anomaly may be caused by a soil-filled pit. An adjacent high-magnitude anomaly, P2, at the edge of the survey area, may have similar origins.

5 CONCLUSION

No anomalies of definite archaeological potential have been identified by the geophysical survey. Anomalies which are caused by ridge and furrow cultivation have been identified throughout. These anomalies are likely to be of local historical interest but are not thought to be of any archaeological significance. Two high magnitude anomalies at the eastern boundary of the site cannot definitely by ascribed a modern, agricultural or geological origin and therefore an archaeological origin remains possible. Whilst no archaeological pattern is discernible, the anomalies may be caused by soil-filled pits. Therefore, based on the results and interpretation of the geophysical data, the archaeological potential across most of the site is considered to be low, corroborating the results of the Desk Based Assessment. A moderate potential is ascribed to the two possible pits.

6 REFERENCES

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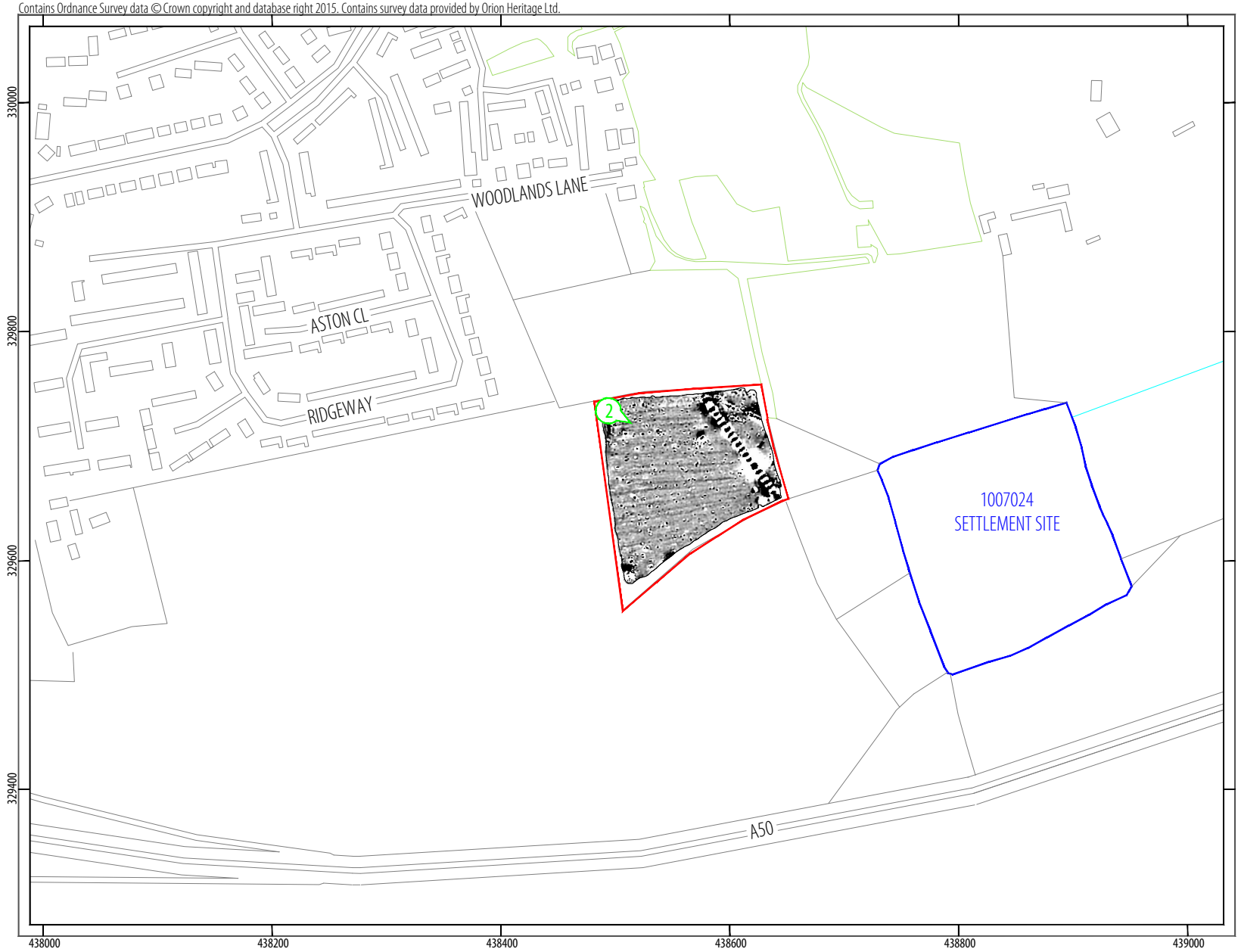

proposed development area
scheduled monument
location and direction of ILLUS 2

nT
-1.0 2.0

N
0 100m
scale 1:5,000 @ A4

PROJECT CHSD/01
Land at Woodlands Lane
Chellaston
Derbyshire

CLIENT Orion Heritage Ltd

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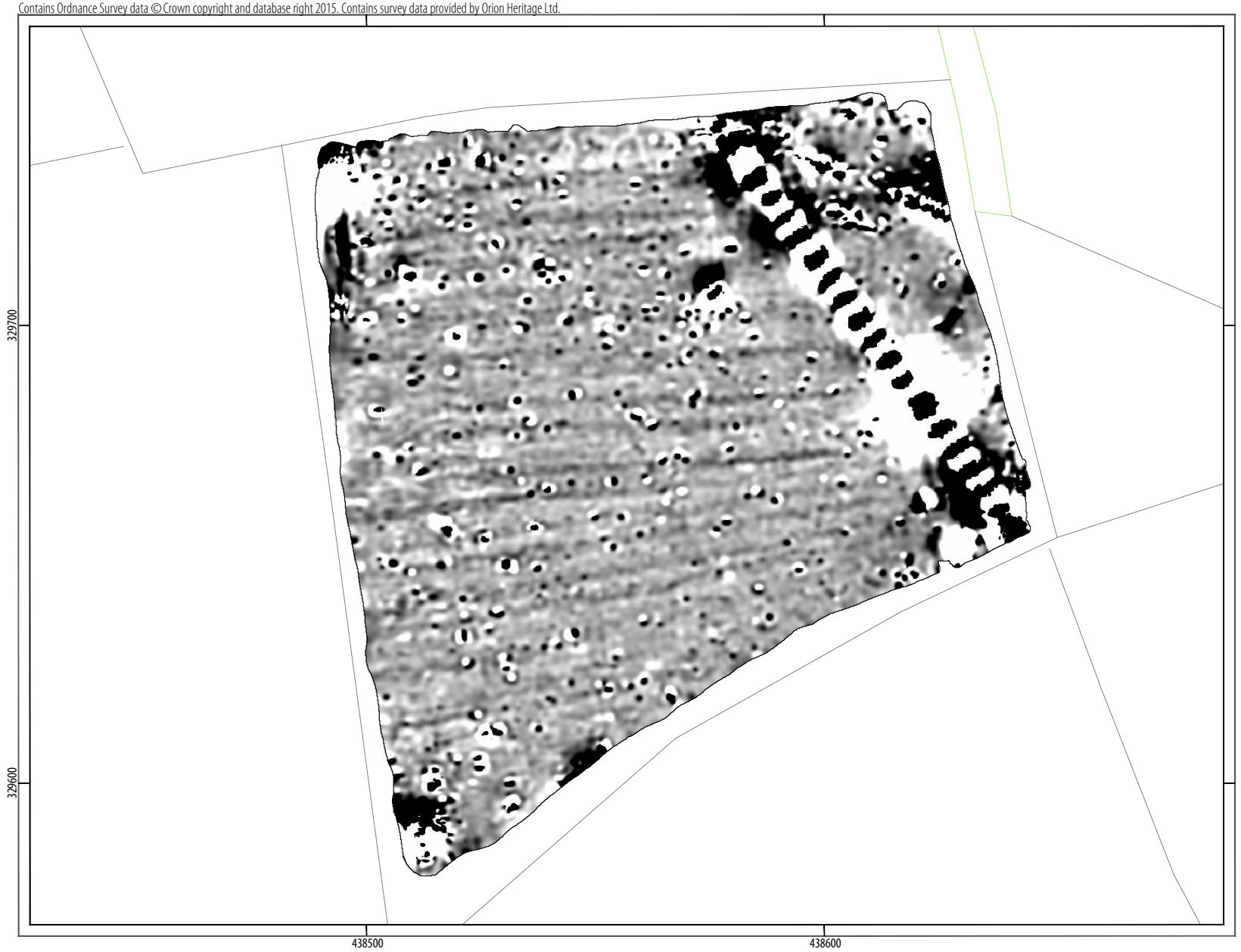
ILLUS 3 Survey location showing processed greyscale magnetometer data



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Land at Woodlands Lane
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Derbyshire

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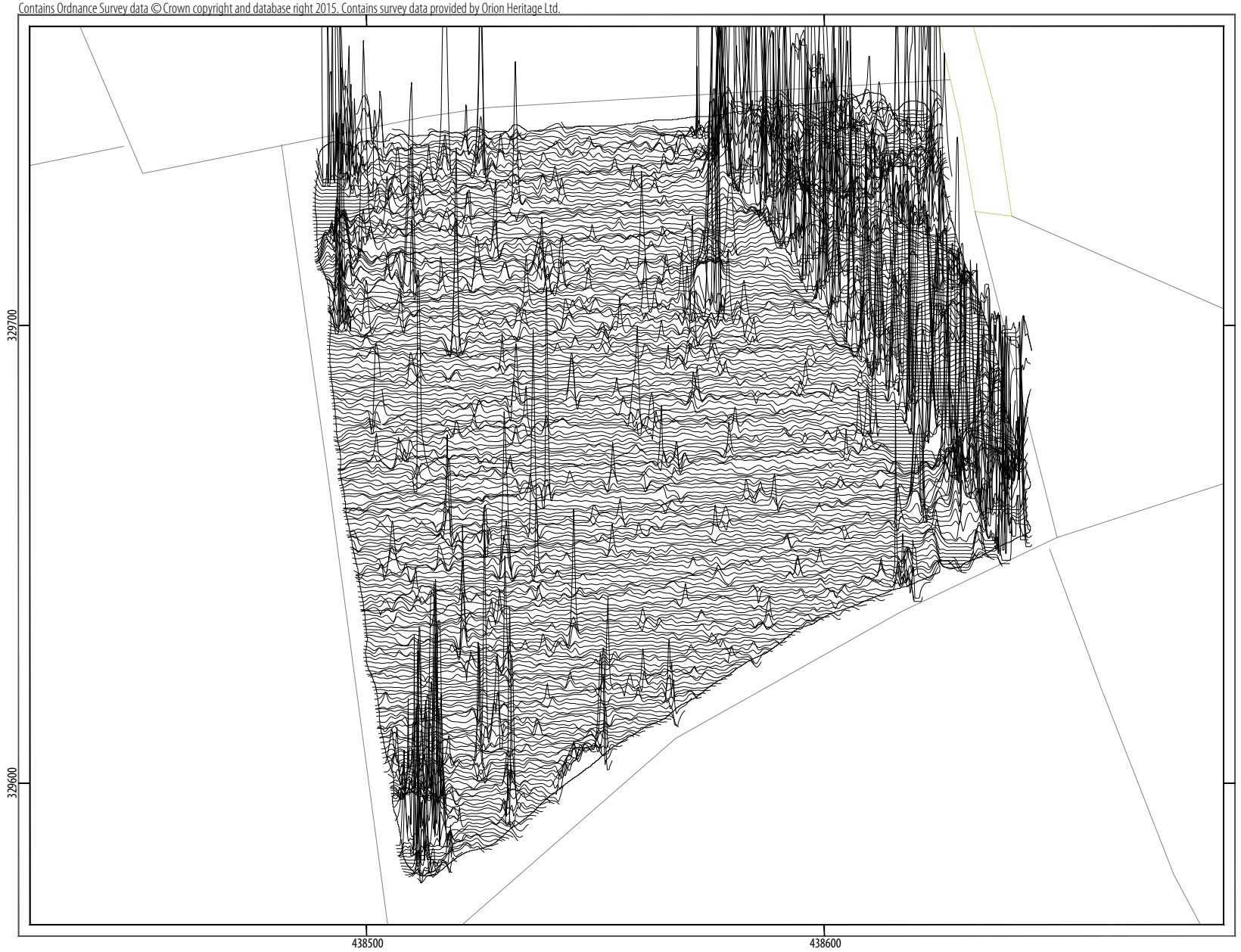
ILLUS 4 Processed greyscale magnetometer data



15.0nT/cm

[Data clipped to -2.0 to 50.0nT/cm]

N

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scale 1:1,250 @ A4

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Derbyshire

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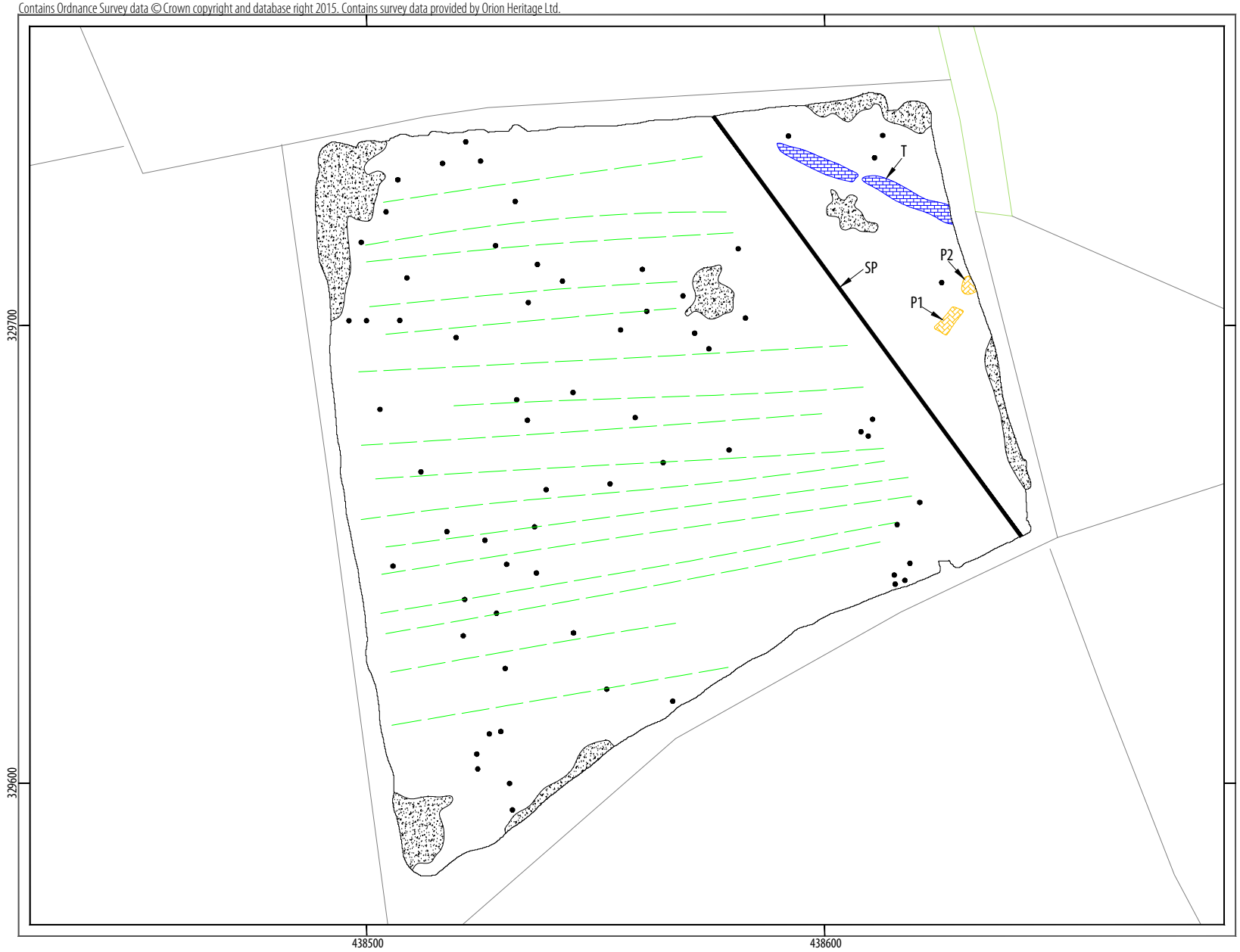
ILLUS 5 XY trace plot of magnetometer data



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	trackway
dipolar linear	service pipe
linear trend	ridge and furrow
magnetic enhancement	archaeology?

ABBREVIATIONS

P	pit
SP	service pipe
T	trackway

N

0 25m

scale 1:1,250 @ A4

PROJECT CHSD/01
Land at Woodlands Lane
Chellaston
Derbyshire

CLIENT Orion Heritage Ltd

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ILLUS 6 Interpretation of magnetometer data

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.

APPENDIX 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.

APPENDIX 3 GEOPHYSICAL SURVEY ARCHIVE

The geophysical archive comprises:

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

The project will be archived in-house in accordance with recent good practice guidelines (http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_3). The data will be stored in an indexed archive and migrated to new formats when necessary.

APPENDIX 4 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID: headland5-262050

PROJECT DETAILS	
PROJECT NAME	Land at Woodlands Lane, Chellaston
SHORT DESCRIPTION OF THE PROJECT	Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey covering 2 hectares at Woodlands Lane, Chellaston, Derbyshire, in advance of a proposed residential development. The survey has identified anomalies which are typical of ridge and furrow cultivation and which correspond to low linear earthworks. These anomalies may be of local historical interest but are not thought to be of any archaeological significance. No anomalies of definite archaeological potential have been identified although two high magnitude anomalies within the east are ascribed some archaeological potential, perhaps being due to pits. Therefore, based solely on the results and interpretation of the magnetic data, the archaeological potential across most of the site is considered to be low, corroborating the results of the desk-based assessment, whilst a moderate potential is ascribed to the two possible pits.
PROJECT DATES	Start: 26-08-2016 End: 26-08-2016
PREVIOUS/FUTURE WORK	Not known / Not known
ANY ASSOCIATED PROJECT REFERENCE CODES	CHSD-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	Not known / Not recorded
SOLID GEOLOGY (OTHER)	Branscombe Mudstone Formation
DRIFT GEOLOGY	LACUSTRINE CLAYS, SILTS AND SANDS
TECHNIQUES	Magnetometry

PROJECT LOCATION	
COUNTRY	England
SITE LOCATION	DERBYSHIRE SOUTH DERBYSHIRE SWARKESTONE Land at Woodlands Lane, Chellaston
POSTCODE	DE73 6UL
STUDY AREA	2 Hectares
SITE COORDINATES	SK 3855 2968 52.862898144259 -1.4273276465795 2 51 46 N 001 25 38 W Point

PROJECT CREATORS	
NAME OF ORGANISATION	Headland Archaeology
PROJECT BRIEF ORIGINATOR	Consultant
PROJECT DESIGN ORIGINATOR	Headland Archaeology
PROJECT DIRECTOR/MANAGER	Harrison, S

PROJECT SUPERVISOR	Schmidt, A
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	Land at Woodlands Lane, Chellaston, Derbshire: Geophysical Survey
AUTHOR(S)/EDITOR(S)	Harrison, D.
DATE	2016
ISSUER OR PUBLISHER	Headland Archaeology
PLACE OF ISSUE OR PUBLICATION	Leeds
DESCRIPTION	A4 bound report
ENTERED BY	David Harrison (david.harrison@headlandarchaeology.com)
ENTERED ON	9 September 2016

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