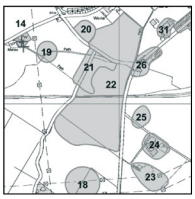
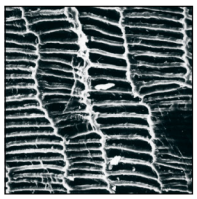
CHNS18










LAND ADJACENT TO M1, COURTEENHALL, NORTHAMPTONSHIRE

GEOPHYSICAL SURVEY

commissioned by Courteenhall Estates

November 2018

HEADLAND ARCHAEOLOGY

REGISTERED ORGANISATION CIfA

LAND ADJACENT TO M1, COURTEENHALL, NORTHAMPTONSHIRE

GEOPHYSICAL SURVEY

commissioned by Courteenhall Estates

November 2018

This report adheres to the quality standard of ISO 9001:2015

PROJECT INFO:

HA Project Code **CHNS18** / Parish **Courteenhall** / Local Authority **South Northamptonshire** / OASIS Ref. **headland5-328784** / ADS Ref. **1001514** / Northamptonshire County Council Event No **ENN109234**

PROJECT TEAM:

Project Manager **David Harrison** / Author **David Harrison** / Fieldwork **Mark Evans, Olivier Vansassenbrouk** / Graphics **Beata Wieczorek-Oleksy, Olivier Vansassenbrouk, Rafael Maya Torcelly**

Approved by **David Harrison** D Harrison.....

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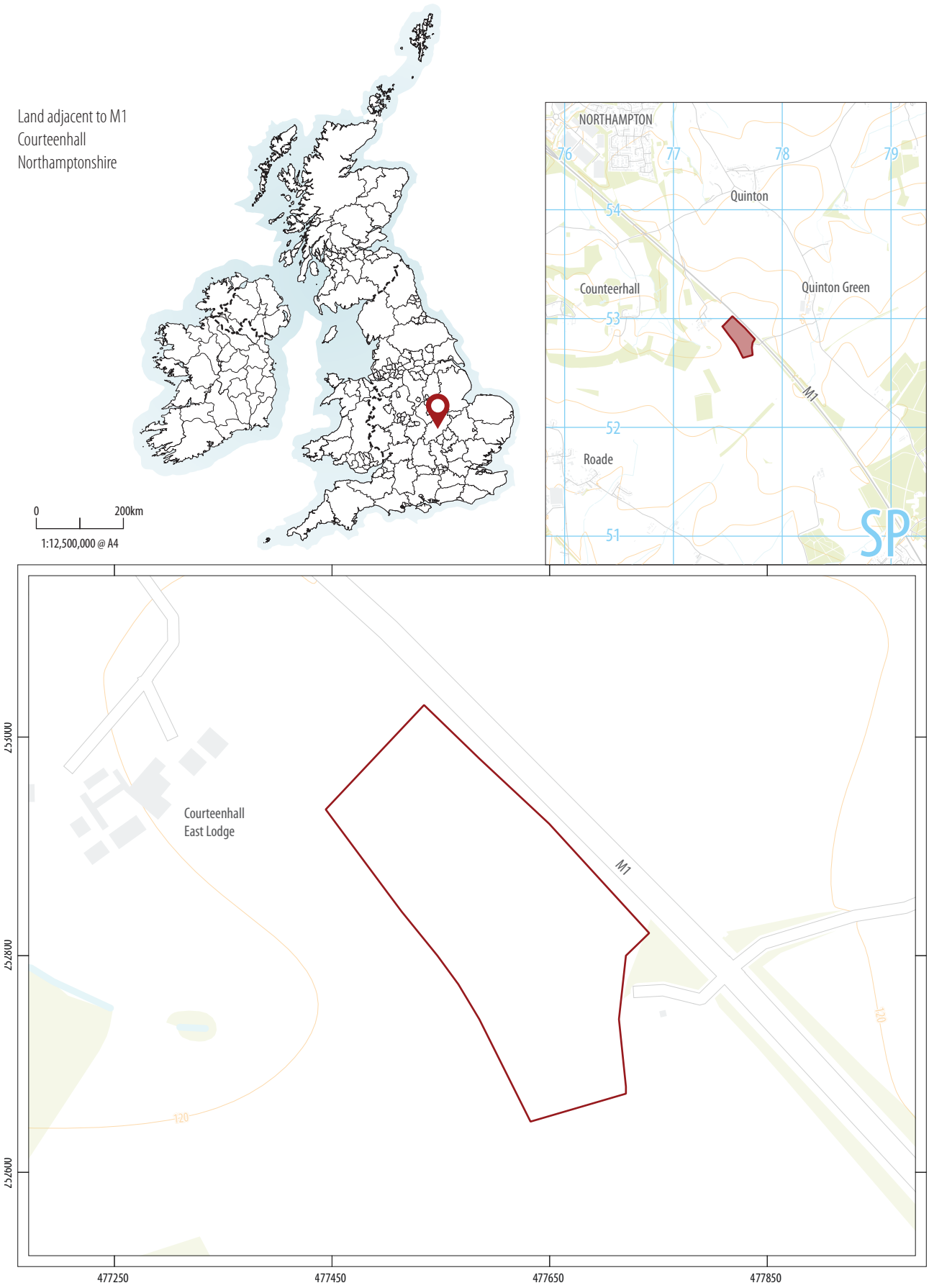
HEADLAND ARCHAEOLOGY

PROJECT SUMMARY

Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey of a 5 hectare site adjacent to the M1 at Courteenhall, Northamptonshire, to provide information on the archaeological potential of the site in advance of the construction of a proposed poultry shed and associated infrastructure. The survey has not identified any anomalies of any archaeological potential with the dataset dominated by linear anomalies reflecting medieval and/or post medieval ploughing, land division and modern land drainage. A service pipe has been identified in the south of the site. Therefore, on the basis of the geophysical survey, the archaeological potential of the site is assessed as low, corroborating the results of the Desk-Based Heritage Assessment.

CONTENTS

LIST OF ILLUSTRATIONS



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ILLUS 1 Site location

LAND ADJACENT TO M1, COURTEENHALL, NORTHAMPTONSHIRE

GEOPHYSICAL SURVEY

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by Courteenhall Estates (the Client), to undertake a geophysical (magnetometer) survey on land adjacent to the M1, Courteenhall, where a poultry shed and associated infrastructure is proposed. The survey was undertaken in order to inform planning proposals by assessing the heritage potential of the geophysical survey area and, therefore the impact of any proposed development on the historic environment.

The work was undertaken in accordance with Written Scheme of Investigation (Dyulgerski 2018), with guidance within the National Planning Policy Framework (DCLG 2012) and in line with current best practice (Chartered Institute for Archaeologists 2014, Europae Archaeologia Consilium 2015).

The survey was carried out on the 5th September 2018.

1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The Geophysical Survey Area (GSA) is located on the south-eastern limits of the parish of Courteenhall, centred on SP 7771 5280 (see Illus 1). It comprises a broadly rectangular parcel of land within the south of an arable field which is bounded by hedges and further fields to the west and south and by the M1 motorway to the east. The northern limit of the GSA is unbound. At the time of the survey the field was fallow having recently been harvested (see Illus 2 and Illus 3).

The site is flat at 124m Above Ordnance Datum.

1.2 GEOLOGY AND SOILS

The bedrock geology comprises Bilsworth Limestone Formation overlain by superficial deposits of Oadby Member – diamicton (NERC 2018).

The soils are classified in the Soilscape 9 association, characterised as lime-rich loams and clays with impeded drainage (Cranfield University 2018).

2 ARCHAEOLOGICAL BACKGROUND

A Desk-Based Heritage Assessment (Prospect Archaeology 2018) concluded that the site has moderate potential for the presence of unrecorded remains from the later prehistoric and Roman periods and a low potential for remains from all other periods.

Analysis of historical Ordnance Survey (OS) maps (Old-maps 2018) indicates that the division of land within the GSA has remained unchanged since the publication of the first edition OS map in 1885.

ILLUS 2 Geophysical Survey Area, looking south-east

Earlier Estate maps and tithe maps from the mid-19th century show the GSA as being sub-divided into three smaller fields.

3 AIMS, METHODOLOGY AND PRESENTATION

The general aim of the geophysical survey was to provide sufficient information to establish the presence/absence, character and extent of any archaeological remains within the GSA. This will therefore enable an assessment to be made of the impact of the proposed development on any sub-surface archaeological remains, if present.

The specific 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 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 was programmed to take readings at a frequency of 10Hz (allowing for a 10–15cm sample interval) on roaming traverses (swaths) 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 V3.0.32.4 (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 1:10,000. Illus 2 and Illus 3 are site condition photographs. Illus 4 is a 1:1,500 survey location plan showing the direction of survey as GPS swaths. Large-scale, fully processed (greyscale) data, minimally

ILLUS 3 Geophysical Survey Area, looking north

processed data (greyscale) and improved (XY traceplot) data, and an accompanying interpretative plot are presented at a scale of 1:1,500 in Illus 5 – 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 (Dyulgerski 2018), guidelines outlined by Europae Archaeologia Consilium (EAC 2015) and by the Chartered Institute for Archaeologists (ClfA 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.

4 RESULTS AND DISCUSSION

The ground conditions were generally good (see Illus 2 and Illus 3) and contributed to a high standard of data throughout.

The survey has detected a relatively homogenous magnetic background throughout the dataset which is characterised by frequent discrete areas of magnetic enhancement. These are caused by localised variations in the depth and composition of the soils. Against this background, numerous linear and discrete anomalies have been identified and these are discussed below and cross-referenced to specific examples on the interpretive figures, 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 is common on most sites, often being present as a consequence of manuring or tipping/infilling. There is no obvious clustering to these ferrous anomalies which might indicate an archaeological origin. Far more probable is that the 'spike' responses are likely caused by the random distribution of ferrous debris in the upper soil horizons. Two large spike anomalies (TP1 and TP2; see Illus 7) are caused by buried footings from former telegraph poles, as shown on 20th century OS maps.

The high magnitude dipolar linear anomaly (SP1; see Illus 7) aligned east/west across the south of the GSA locates a buried service pipe.

Magnetic disturbance around the field edges is due to ferrous material within, or adjacent to the boundaries and is of no archaeological interest.

4.2 AGRICULTURAL ANOMALIES

Analysis of historical OS mapping indicates that three field boundaries have been removed from the GSA since the publication of the Estate of Sir William Wake in Courteenhall in 1835. One of these former boundaries has been detected by the survey as a faint linear anomaly (FB1; see Illus 7) aligned north-east/south-west towards the north of the GSA. The anomaly is caused by the magnetic contrast between the soil-fill of a ditch and the surrounding soils. Two other former boundaries have not been detected by the survey. The reason for this is not clear but is probably due to the partial or complete removal of the former boundaries by later ploughing.

Parallel linear trend anomalies are identified throughout the GSA on differing alignments. Most of these are typical of field drains with the herring-bone pattern of drains along the north-eastern boundary particularly characteristic of modern drainage practices. More closely-spaced north-east/south-west aligned linear anomalies, slightly curved in appearance, are typical of 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 surrounding soil. Other isolated linear trends which are identified parallel with the existing boundaries are interpreted as agricultural in origin and may also be due to land drains.

4.3 GEOLOGICAL ANOMALIES

Numerous low magnitude discrete anomalies are identified across the GSA. These are likely to be due to variation in the depth and composition of soils.

5 CONCLUSION

The survey has successfully evaluated the site and has not identified any anomalies of any archaeological potential. The data is dominated by linear anomalies reflecting medieval and/or post medieval ploughing, land division and modern land drainage. A service pipe has been identified in the south of the site. On the basis of the geophysical survey, the archaeological potential of the site is assessed as low, corroborating the results of the Desk-Based Heritage Assessment.

6 REFERENCES

Chartered Institute for Archaeologists (ClfA) 2014 ***Standard and guidance for archaeological geophysical survey*** (Reading) http://www.archaeologists.net/sites/default/files/ClfAS%26GGeophysics_2.pdf accessed 11 September 2018

Cranfield University 2018 ***Cranfield Soil and Agrifood Institute Soilscapes*** http://www.landis.org.uk/soilscapes/ accessed 11 September July 2018

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Dyulgerski, K ***Land Adjancent to M1, Courteenhall, Northamptonshire; Written Scheme of Investigation for Geophysical Survey*** [unpublished client document] Headland Archaeology Ref CHNS18

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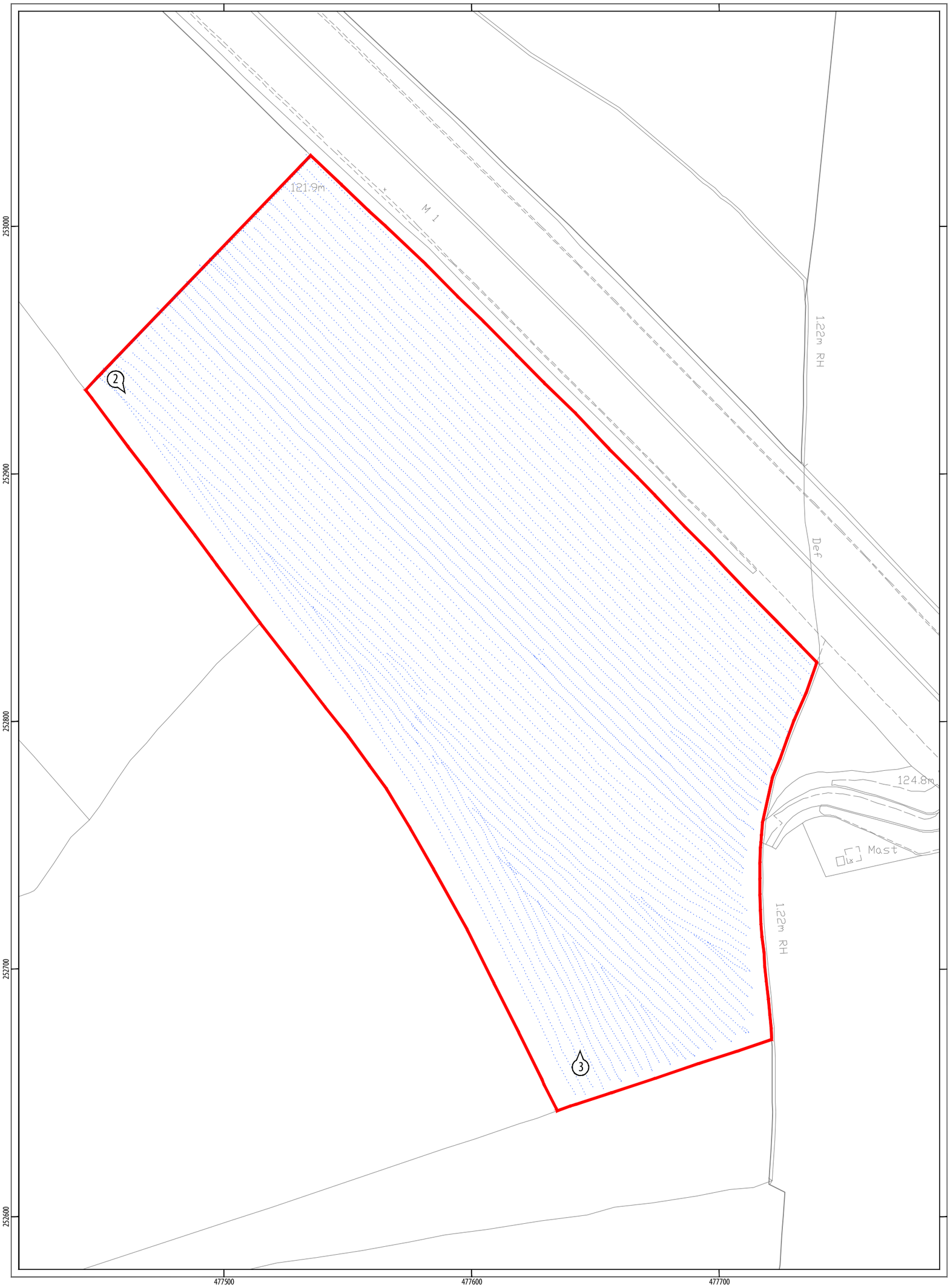
Standards Working Party of Northamptonshire Archaeological Archives Working Group 2014 Northamptonshire Archaeological Archives Standard 2014



Geophysical Survey Area
GPS Swaths
Location and direction of ILLUS 2-3

0 50m
1:1,500 @ A3

PROJECT CHNS18
Land adjacent to M1
Courteenhall
Northamptonshire

CLIENT Courteenhall Estates

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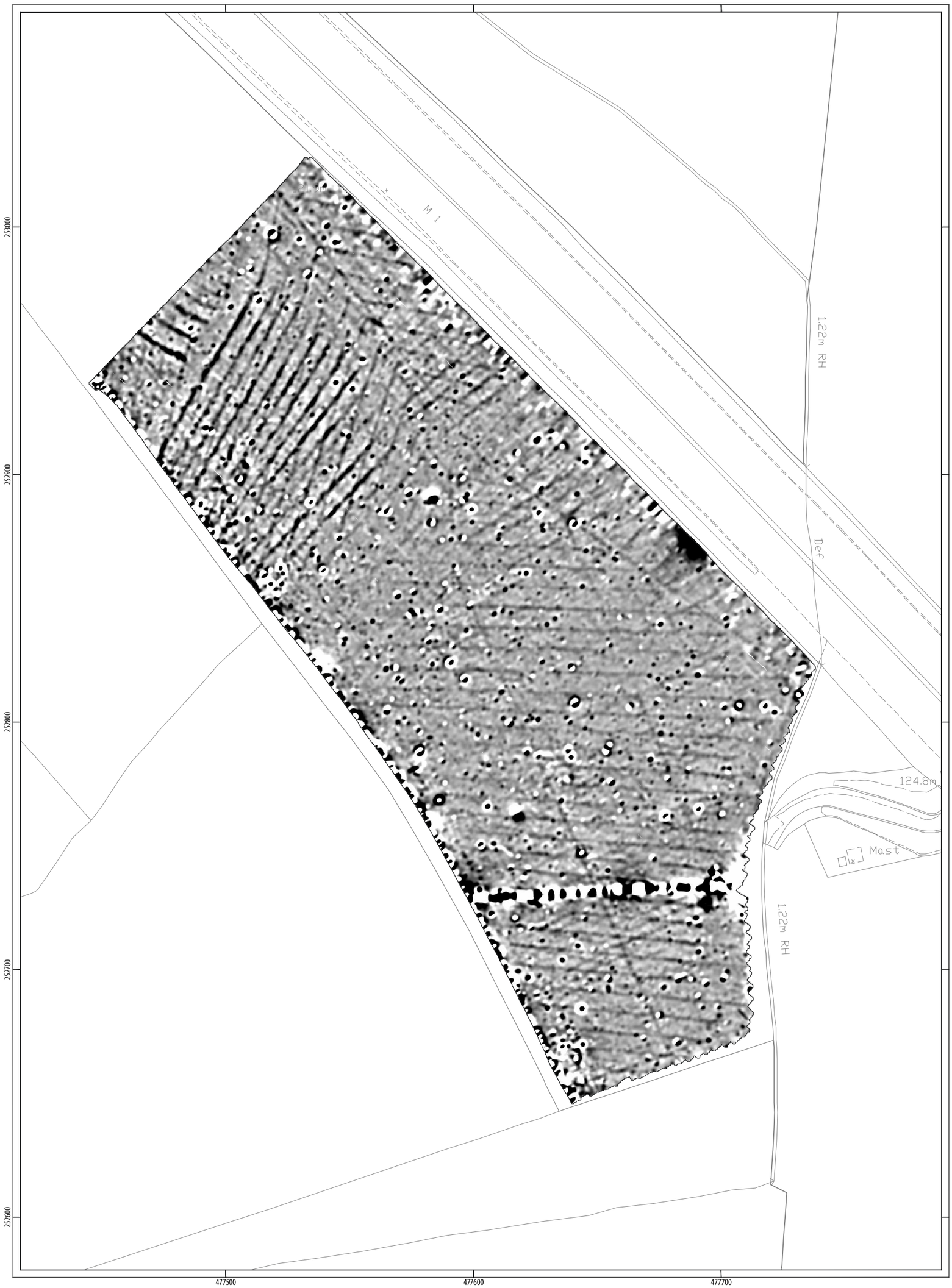
ILLUS 4 Survey location showing GPS swaths (1:1,500)



nT
-1.0 2.0

0 50m
1:1,500 @ A3

PROJECT **CHNS18**
Land adjacent to M1
Courteenhall
Northamptonshire

CLIENT Courteenhall Estates

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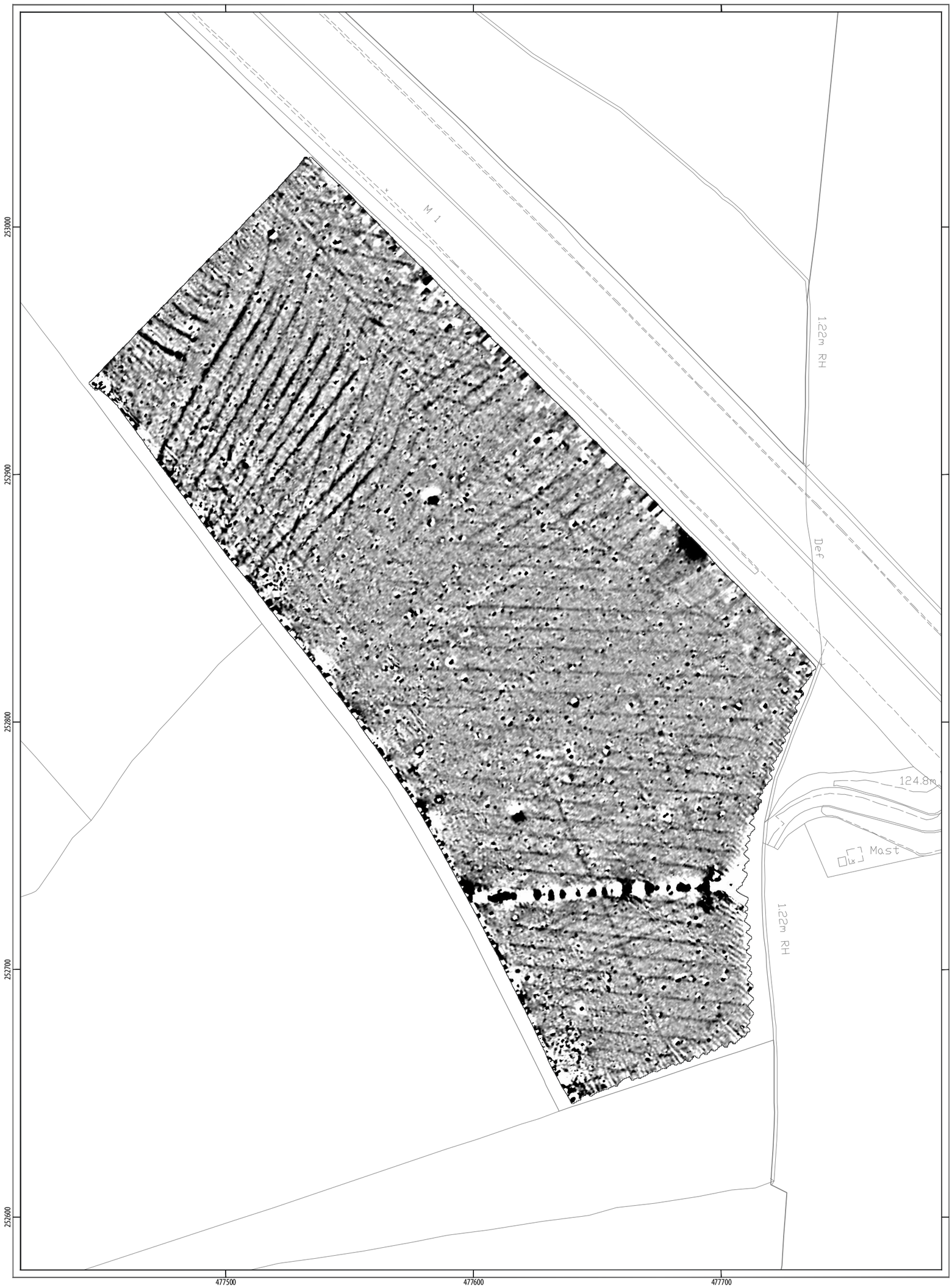
ILLUS 5 Processed greyscale magnetometer data (1:1,500)



nT
-1.0 2.0

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1:1,500 @ A3

PROJECT CHNS18
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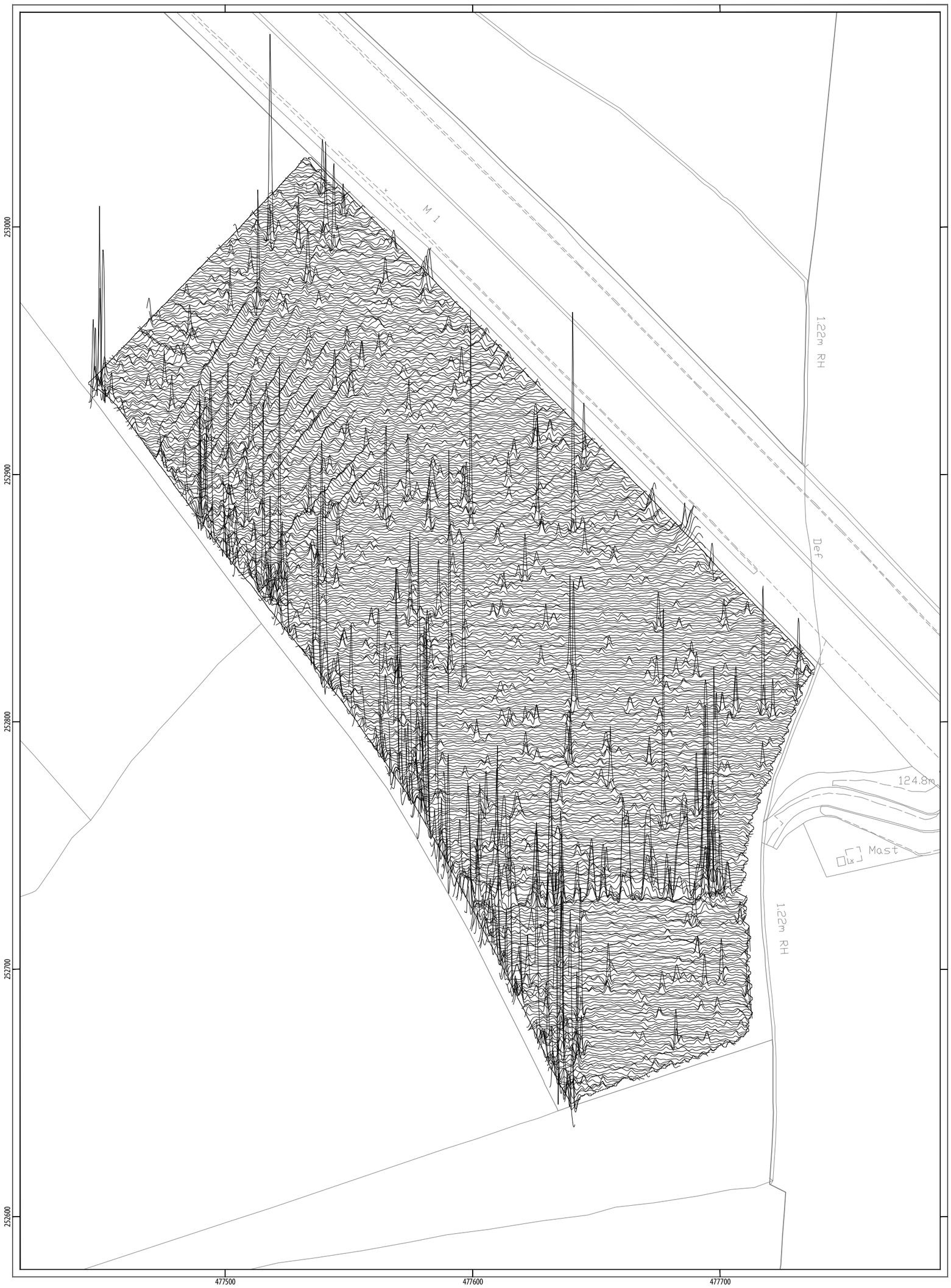
ILLUS 6 Minimally processed greyscale magnetometer data (1:1,500)



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0 50m

1:1,500 @ A3

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ILLUS 7 7 XY trace plot of improved magnetometer data (1:1,500)

TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
linear trend	ridge and furrow
linear trend	field drain
linear trend	agricultural trend

TYPE OF ANOMALY	INTERPRETATION
linear	former field boundary
magnetic enhancement	geology

ABBREVIATIONS

FB Former Boundary
SP Service Pipe
TP Telegraph Pole

0 50m
1:1,500 @ A3

PROJECT CHNS18
Land adjacent to M1
Courteenhall
Northamptonshire

CLIENT Courteenhall Estates

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ILLUS 8 Interpretation of magnetometer data (1:1,500)

7 APPENDICES

APPENDIX 1 MAGNETOMETER SURVEY

Appendix 1.1 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. In addition, the raw data has been deposited with the Archaeology Data Service (ADS) in accordance with the Northamptonshire Archaeological Archives Standard (Standards Working Party of Northamptonshire Archaeological Archives Working Group 2014).

APPENDIX 4 DATA PROCESSING

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

Data collected using RTK GPS-based methods cannot be produced without minimal processing of the data – the data is interpolated to project the data onto a regular grid.

A high pass filter has been applied to the processed 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 filter is not applied to the minimally processed greyscale data.

The improved XY trace plot data has been de-striped to correct for slight variations in instrument calibration drift and any other artificial data. The data has also been clipped to remove extreme values and to improve data contrast..

APPENDIX 5 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID: headland5-328784

Project details	
Project name	Land adjacent to M1, Courteenhall, Northamptonshire
Short description of the project	Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey of a 5 hectare site adjacent to the M1 at Courteenhall, Northamptonshire, to provide information on the archaeological potential of the site in advance of the construction of a proposed poultry shed and associated infrastructure. The survey has not identified any anomalies of any archaeological potential with the dataset dominated by linear anomalies reflecting medieval and/or post medieval ploughing, land division and modern land drainage. A service pipe has been identified in the south of the site. Therefore, on the basis of the geophysical survey, the archaeological potential of the site is assessed as low, corroborating the results of the Desk-Based Heritage Assessment.
Project dates	Start: 05-09-2018 End: 05-09-2018
Previous/future work	Not known / Not known
Any associated project reference codes	CHNS18 - Contracting Unit No.
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - 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	Farm infrastructure (e.g. barns, grain stores, equipment stores, etc.)
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded
Solid geology (other)	Bilswoth Limestone Formation
Drift geology (other)	Oadby Member - diamicton
Techniques	Magnetometry
Project location	
Country	England
Site location	NORTHAMPTONSHIRE SOUTH NORTHAMPTONSHIRE COURTEENHALL Land adjacent to M1, Courteenhall
Postcode	NN7 2QF
Study area	5 Hectares
Site coordinates	SP 7771 5280 52.167580083408 -0.863659833138 52 10 03 N 000 51 49 W Point
Project creators	
Name of Organisation	Headland Archaeology
Project brief originator	Headland Archaeology
Project design originator	Headland Archaeology
Project director/manager	Harrison, D
Project supervisor	Vansassenbrouck, O.
Type of sponsor/funding body	Developer

Project archives	
Physical Archive Exists?	No
Digital Archive recipient	In house
Digital Contents	"Survey"
Digital Media available	"Geophysics"
Paper Archive Exists?	No
Paper Media available	"Report"
Project bibliography 1	
Publication type	Grey literature (unpublished document/manuscript)
Title	Land adjacent to M1, Courteenhall, Northamptonshire; Geophysical Survey
Author(s)/Editor(s)	Harrison, D.
Date	2018
Issuer or publisher	Headland Archaeology
Place of issue or publication	Leeds
Description	A4 glue bound report
Entered by	David Harrison (david.harrison@headlandarchaeology.com)
Entered on	18 September 2018

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