ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
CgMs Consulting

Land at Derby Road Doveridge Derbyshire

geophysical survey

report 4008
December 2015

Durham University

Contents

Figures

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1. Summary

The project

1.1 This report presents the results of a geophysical survey conducted in advance of an application for proposed residential development south of Derby Road, Doveridge, Derbyshire. The works comprised 4.75ha of detailed geomagnetic survey.

1.2 The works were commissioned by CgMs Consulting and conducted by Archaeological Services Durham University.

Results

1.3 Very faint traces of former ridge and furrow cultivation have been detected, which correspond to very slight ridge and furrow earthworks noted on the ground.

1.4 No other features of likely archaeological interest have been identified in the survey.

1.5 Modern features including land drains, a feed trough, inspection covers and telegraph poles are present throughout the area.

2. Project background

Location (Figure 1)

2.1 The proposed development area (PDA) was located south of Derby Road, Doveridge, Derbyshire (NGR centre: SK 11451 34424). One survey of 4.75ha was conducted in one land parcel. There are small areas of woodland in the north and east of the PDA, which were not surveyed. To the south and south-east was the village of Doveridge; to the west was Hall Drive and agricultural land. Derby Road flanked the northern side of the site, with further agricultural land and the A50 road beyond.

Development proposal

2.2 The area is proposed for residential development.

Objective

2.3 The principal aim of the survey was to assess the nature and extent of any sub-surface features of potential archaeological significance within the PDA, so that an informed decision may be made regarding the nature and scope of any further scheme of archaeological works that may be required in relation to the application for development.

2.4 The regional research framework *East Midlands Heritage: an updated research agenda and strategy for the historic environment of the East Midlands* (Knight *et al.* 2012) contains an agenda for archaeological research in the region, which is incorporated into regional planning policy implementation with respect to archaeology. This research has the potential to inform regional research priorities within the framework.

Methods statement

2.5 The surveys have been undertaken in accordance with a Written Scheme of Investigation provided by Archaeological Services Durham University (ref. DH15.483), approved by the Development Control Archaeologist at Derbyshire County Council, and with national standards and guidance (see para. 5.1 below).

Dates

2.6 Fieldwork was undertaken on 30th November and 1st December 2015. This report was prepared for December 2015.

Personnel

2.7 Fieldwork was conducted by Patricia Voke (supervisor) and Tessi Loeffelmann. The geophysical data were processed by Patricia Voke. This report was prepared by Patricia Voke, with illustrations by David Graham, and edited by Duncan Hale, the Project Manager.

Archive/OASIS

2.8 The site code is **DDR15**, for **D**overidge **D**erby **R**oad 20**15**. The survey archive will be retained at Archaeological Services Durham University and a copy supplied on CD to the client for deposition with the project archive in due course. Archaeological Services Durham University is registered with the **O**nline **A**cces**S** to the **I**ndex of archaeological investigation**S** project (**OASIS**). The OASIS ID number for this project is **archaeol3-233183**.

3. Historical and archaeological background

3.1 A detailed archaeological desk-based assessment has been conducted for the proposed development (CgMs Consulting 2015); the results of that assessment are summarised here.

3.2 There are no known non-designated assets from the prehistoric, Roman, Saxon, Medieval and Post-Medieval periods within the PDA, and only a small number recorded within a 1km radius of the PDA.

3.3 There are no designated assets (Scheduled Monuments, Listed Buildings, Conservation Areas, Registered Parks and Gardens or Registered Battlefields) within the PDA.

3.4 Based on current evidence available in the HER and HEA, a low potential has been identified for Prehistoric, Roman and Saxon/Early Medieval activity on the study site.

3.5 Medieval ridge and furrow is recorded on the PDA and the land is known to have been used as parkland throughout the Post-Medieval period. Archaeological features related to the Medieval and Post-Medieval use of the study site are considered to be of local significance.

3.6 Any features pre-dating these periods that may survive may have been truncated by the Medieval ploughing activity and are therefore also likely to be of local significance at best.

3.7 The assessment considered the potential for yet-to-be discovered archaeological assets from all archaeological periods to be low/nil.

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised one field of pasture. It was not possible to survey a small area around a tree in the south-east of the PDA, nor a small area in the north-western corner due to an animal pen.

4.2 Telegraph poles, inspection chambers and trees were noted throughout the area. Several geotechnical test pits were also noted throughout the survey area.

4.3 The area was predominantly level, though with a slight uphill rise in the north. Elevations were between approximately 97m OD in the south and 104m OD in the north.

4.4 The underlying solid geology of the area comprises Triassic mudstone of the Mercia Mudstone Group, which is overlain by Pleistocene glaciofluvial terrace deposits of sand and gravel.

5. Geophysical survey

Standards

5.1 The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in archaeological field evaluation* (David, Linford & Linford 2008); the Chartered Institute for Archaeologists (CIfA) *Standard and Guidance for archaeological geophysical survey* (2014); the CIfA Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service & Digital Antiquity *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2013).

Technique selection

5.2 Geophysical survey enables the relatively rapid and non-invasive identification of sub-surface features of potential archaeological significance and can involve a suite of complementary techniques such as magnetometry, earth electrical resistance, ground-penetrating radar, electromagnetic survey and topsoil magnetic susceptibility survey. Some techniques are more suitable than others in particular situations, depending on site-specific factors including the nature of likely targets; depth of likely targets; ground conditions; proximity of buildings, fences or services and the local geology and drift.

5.3 In this instance, based on desktop work, it was considered possible that cut features such as ditches and pits might be present on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) might also be present.

5.4 Given the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record anomalies in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

Field methods

5.5 A 30m grid was established across the survey area and related to the Ordnance Survey National Grid using a Leica GS15 global navigation satellite system (GNSS) with real-time kinematic (RTK) corrections typically providing 5-10mm accuracy.

5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 dual fluxgate gradiometers. A zig-zag traverse scheme was employed and data were logged in 30m grid units. The instrument sensitivity was nominally 0.03nT, the sample interval was 0.25m and the traverse interval was 1m, thus providing 3,600 sample measurements per 30m grid unit.

5.7 Data were downloaded on site into a laptop computer for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

Data processing

5.8 Geoplot v.3 software was used to process the geophysical data and to produce both a continuous tone greyscale image and a trace plot of the raw (minimally processed) data. The greyscale image and interpretations are presented in Figures 2-4; the trace

plot is provided in Figure 5. In the greyscale image, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. A palette bar relates the greyscale intensities to anomaly values in nanoTesla.

5.9 The following basic processing functions have been applied to the geomagnetic data/each dataset: [only include those used]

clip	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
zero mean traverse	sets the background mean of each traverse within a grid to zero; for removing striping effects in the traverse direction and removing grid edge discontinuities
de-stagger	corrects for displacement of geomagnetic anomalies caused by alternate zig-zag traverses
de-spike	locates and suppresses iron spikes in gradiometer data
interpolate	increases the number of data points in a survey to match sample and traverse intervals; in this instance the data have been interpolated to 0.25m x 0.25m intervals

Interpretation: anomaly types

5.10 A colour-coded geophysical interpretation plan is provided. Two types of geomagnetic anomaly have been distinguished in the data:

positive magnetic	regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches
dipolar magnetic	paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including fences and service pipes) and/or fired structures such as kilns or hearths

Interpretation: features

5.11 A colour-coded archaeological interpretation is provided.

5.12 Occasional linear, weak, positive and negative magnetic anomalies have been detected throughout the survey area aligned approximately north/south. These most likely reflect former ploughing and correspond with faint traces of ridge and furrow earthworks noted on the ground.

5.13 No other features of likely archaeological interest have been identified in the survey.

5.14 Occasional small and weak positive magnetic anomalies have been recorded throughout the survey but these almost certainly reflect natural variation within the glaciofluvial deposits.

5.15 Many weak, linear, positive magnetic anomalies have been detected throughout the survey area. The anomalies are evenly spaced at approximately 15m intervals and arranged in herring-bone patterns. These anomalies almost certainly reflect land drains.

5.16 The only other anomalies detected here are small, discrete dipolar magnetic anomalies. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments; some correspond to telegraph poles and inspection covers for monitoring boreholes. A discrete dipolar anomaly centrally located in the survey area corresponds to a concrete trough. Dipolar magnetic anomalies along the edges of the survey area reflect the adjacent metal fences and buildings.

6. Conclusions

6.1 Approximately 4.75ha of detailed geomagnetic survey was undertaken on land south of Derby Road, Doveridge, Derbyshire, prior to an application for proposed residential development.

6.2 Very faint traces of former ridge and furrow cultivation have been detected, which correspond to very slight ridge and furrow earthworks noted on the ground.

6.3 No other features of likely archaeological interest have been identified in the survey.

6.4 Modern features including land drains, a feed trough, inspection covers and telegraph poles are present throughout the area.

7. Sources

CgMs Consulting 2015 *Land South of Derby Road, Doveridge, Derbyshire.* **CP/RAJS/20526**

CIfA 2014 *Standard and Guidance for archaeological geophysical survey*. Chartered Institute for Archaeologists

David, A, Linford, N, & Linford, P, 2008 *Geophysical Survey in Archaeological Field Evaluation*. English Heritage

Gaffney, C, Gater, J, & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*. CIfA Technical Paper **6**, Chartered Institute for Archaeologists

Knight, D, Vyner, B, & Allen, C, 2012 *East Midlands Heritage: an updated research agenda and strategy for the historic environment of the East Midlands*. Nottingham Archaeol. Monographs **6**

Schmidt, A, 2013 *Geophysical Data in Archaeology: A Guide to Good Practice*. Archaeology Data Service & Digital Antiquity, Oxbow

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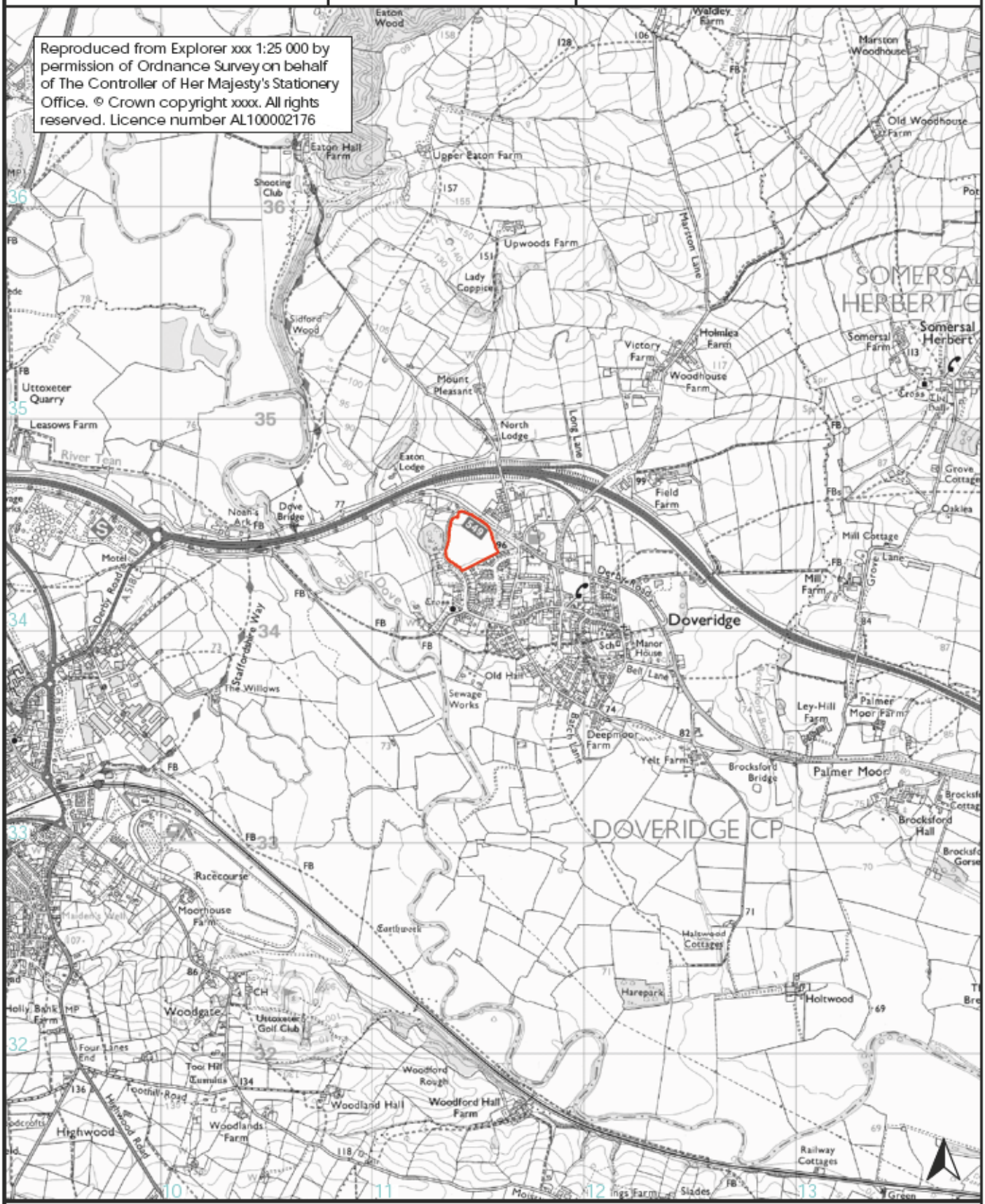
Figure 1: Site location

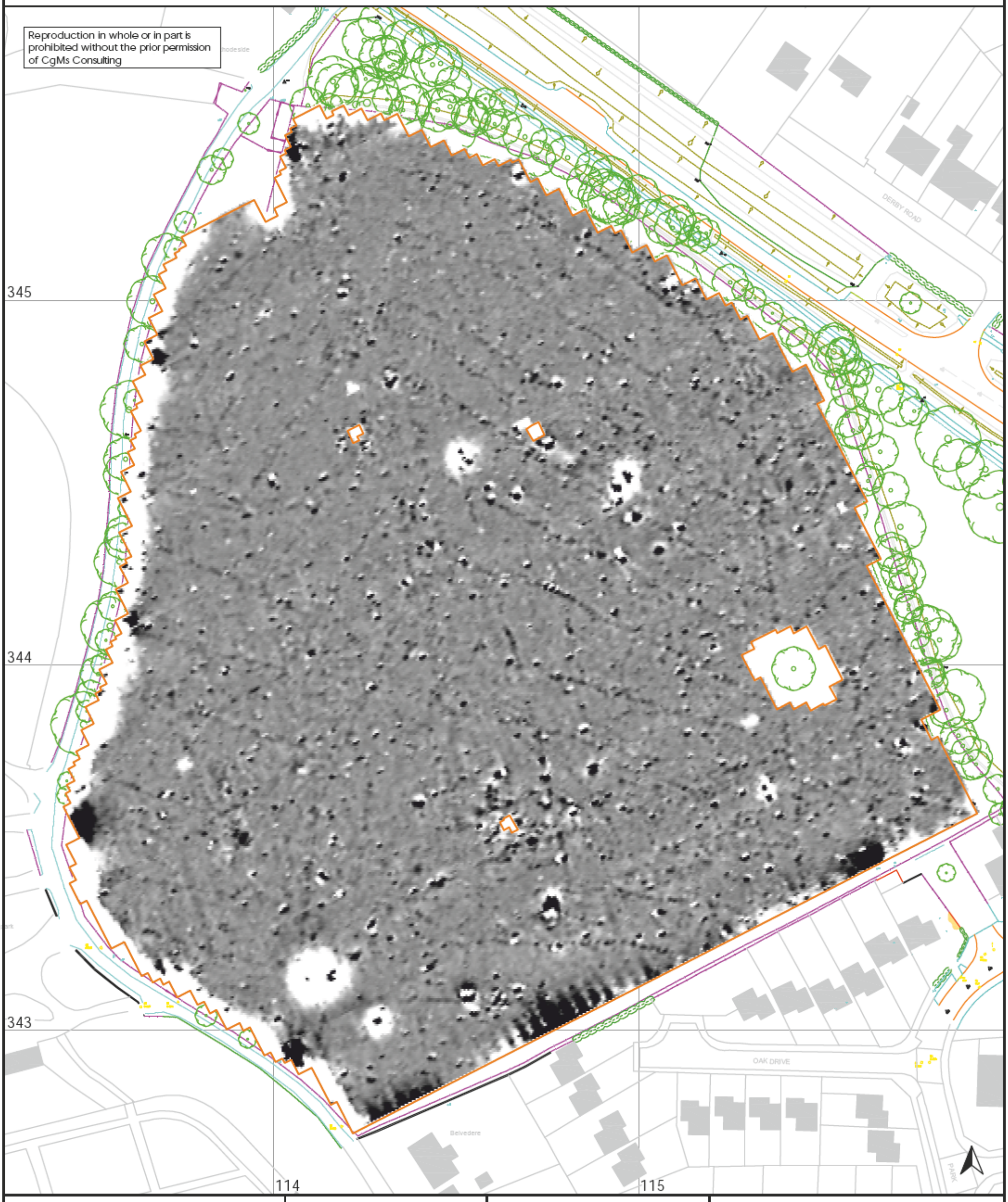


site location

0 1km
scale 1:25 000 for A4 plot

magnetic survey

-3 nT 4



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0 50m
scale 1:1000 for A3 plot

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Figure 2: Geophysical survey

magnetic survey

dipolar magnetic anomaly

negative magnetic anomaly

positive magnetic anomaly

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0 50m
scale 1:1000 for A3 plot

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Figure 3: Geophysical interpretation

magnetic survey

trough

land drain

telegraph pole

former ploughing

inspection cover

345

344

343

114

115

DERBY ROAD

OAK DRIVE

Belvedere

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0 50m
scale 1:1000 for A3 plot

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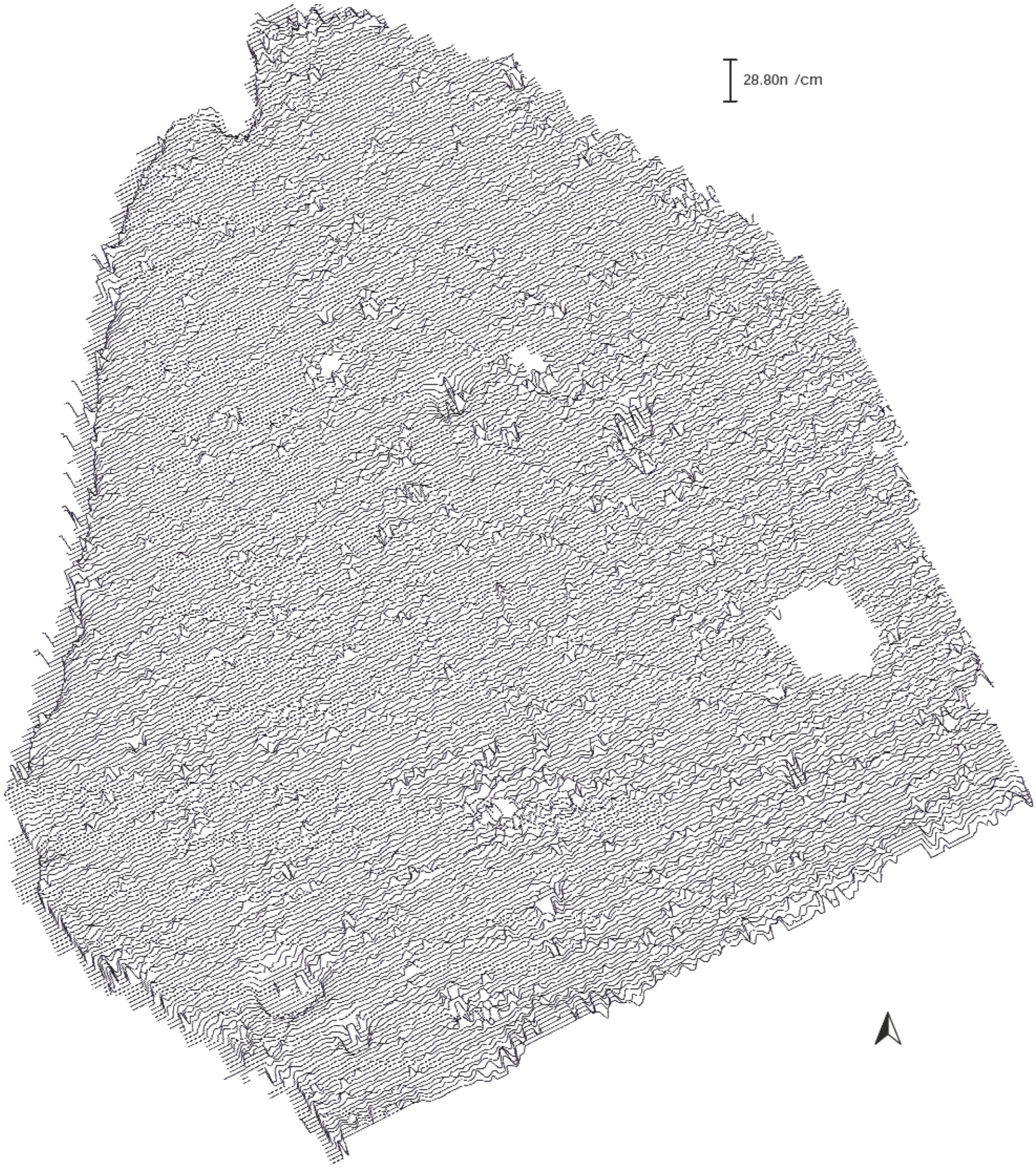
Figure 4: Archaeological interpretation



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0 50m
scale 1 1000 for A3 plot

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