ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
CgMs Consulting

Land off Moseley Road
Hallow
Worcestershire

geophysical survey
HER: WSM 67632

report 4034
January 2016

Durham University

Contents

1.	Summary	1
2.	Project background	2
3.	Historical and archaeological background	2
4.	Landuse, topography and geology	3
5.	Geophysical survey	3
6.	Conclusions	5
7.	Sources	5

Figures

Figure 1:	Site location
Figure 2:	Geophysical survey
Figure 3:	Geophysical interpretation
Figure 4:	Archaeological interpretation
Figure 5:	Trace plots of geomagnetic data

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1. Summary

The project

1.1 This report presents the results of geophysical surveys conducted in support of an application for residential development on land south of Moseley Road, Hallow, Worcestershire. The works comprised approximately 5.9ha of detailed geomagnetic survey.

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

Results

1.3 Traces of former ridge and furrow cultivation have been identified in the south-east of the survey area.

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

2. Project background

Location (Figure 1)

2.1 The proposed development area (PDA) was located on land south of Moseley Road, Hallow, Worcestershire (NGR centre: SO 82216 59037). Six surveys totalling 5.9ha were conducted. Directly south-east of the PDA was the village of Hallow. To the north, west and east was agricultural land, with the City of Worcester approximately 5km to the south.

Development proposal

2.2 The area is proposed for residential development.

Objective

2.3 The principal aim of the surveys was to assess the nature and extent of any sub-surface features of potential archaeological significance within the proposed development area, 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 This survey informs regional research priorities as set out in *The Archaeology of the West Midlands: a framework for research* (Watt 2011).

Methods statement

2.5 The surveys have been undertaken in accordance with instructions from the client, a Written Scheme of Investigation provided by Archaeological Services Durham University (ref. DH16.1) and national standards and guidance (see para. 5.1 below).

Dates

2.6 Fieldwork was undertaken on 11th and 12th January 2016. This report was prepared for January 2016.

Personnel

2.7 Fieldwork was conducted by Richie Villis (supervisor) and Patricia Voke. The geophysical data were processed by Patricia Voke. This report was prepared by Patricia Voke, with illustrations by Janine Watson, and edited by Duncan Hale, the Project Manager.

Archive/OASIS

2.8 The Worcestershire WSM HER number is **WSM 67632**. The site code is **HMR16**, for **H**allow **M**oseley **R**oad **16**. 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 **archaeol3-238356.**

3. Historical and archaeological background

3.1 A detailed archaeological desk-based assessment is currently in preparation (CgMs Consulting forthcoming).

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised one field of pasture (Area 1) and one field of arable (subdivided into several small enclosures; Areas 3, 4, 5 and 6). A further small area (Area 2) was surveyed in the north-east of the PDA, which currently contains caravans; it was not possible to survey parts of this area due to farm buildings, caravans and agricultural machinery.

4.2 The PDA was predominantly level in the south; the northern area occupied a north-west facing slope, with elevations between approximately 38-46m OD.

4.3 The underlying solid geology of the area comprises Triassic mudstone of the Merica Mudstone Group, which are overlain by sand and gravel in the east.

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, it was considered likely that cut features such as ditches and pits could be present on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) could 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 each 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 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 continuous tone greyscale images and trace plots of the raw (minimally processed) data. The greyscale images and interpretations are presented in Figures 2-4; the trace plots are provided in Figure 5. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. Palette bars relate the greyscale intensities to anomaly values in nanoTesla.

5.9 The following basic processing functions have been applied to the geomagnetic data:

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
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

General comments

5.11 A colour-coded archaeological interpretation plan is provided.

5.12 Small, discrete dipolar magnetic anomalies have been detected in all of the survey areas. These almost certainly reflect items of near-surface ferrous and/or fired

debris, such as horseshoes and brick fragments, and in most cases have little or no archaeological significance. A sample of these is shown on the geophysical interpretation plan, however, they have been omitted from the archaeological interpretation plan and the following discussion. The small scale and relatively low frequency of these anomalies is unlikely to have adversely affected the detection of deeper features of potential archaeological significance.

Area 1

5.13 A large dipolar magnetic anomaly has been detected in the east of the area which corresponds to a metal sheep trough.

Area 2

5.14 Strong, positive magnetic anomalies in the south and east of Area 2 reflect the adjacent metal hay shed and several caravans.

5.15 A concentration of dipolar magnetic anomalies in the north of this area reflect a track and agricultural machinery.

Area 3

5.16 A strong dipolar anomaly has been detected in the north-east of the survey area; this reflects the adjacent metal field boundary and gate.

Area 4

5.17 Only small, discrete dipolar magnetic anomalies have been detected in this area.

Area 5

5.18 Larger dipolar magnetic anomalies have been detected in the north-eastern corner of Area 5. These anomalies reflect larger near-surface ferrous items and are unlikely to represent features of archaeological significance.

Area 6

5.19 A series of parallel, weak, positive magnetic anomalies has been detected in this area, oriented approximately north-east/south-west. These anomalies almost certainly reflect traces of former ridge and furrow cultivation.

6. Conclusions

6.1 Approximately 5.9ha of detailed geomagnetic survey was undertaken on land south of Moseley Road, Hallow, Worcestershire, prior to proposed development.

6.2 Traces of former ridge and furrow cultivation have been identified in the south-east of the survey area.

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

7. Sources

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

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

Watt, S, (ed) 2011 *The Archaeology of the West Midlands: a framework for research*. Oxford

Worcester City Council 2007 *An outline resource assessment and research framework for the archaeology of Worcester*. Worcester City Council

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Figure 1: Site location

magnetic survey

-3 nT 4

Areas 1, 4, 5 and 6

-5 nT 8

Areas 2 and 3

592

591

590

589

821

822

823

Moseley Road

Area 1

Area 2

Area 3

Area 4

Area 5

Area 6

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0 50m
scale 1:1250 for A3 plot

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Figure 2: Geophysical survey

magnetic survey

dipolar magnetic anomaly

positive magnetic anomaly

592

591

590

589

821

822

823

Moseley Road

Area 1

Area 2

Area 3

Area 4

Area 5

Area 6

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0 50m
scale 1:1250 for A3 plot

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Figure 3: Geophysical interpretation

magnetic survey

ridge and furrow

sheep trough

592

591

590

589

821

822

823

Moseley Road

Area 1

Area 2

Area 3

Area 4

Area 5

Area 6

sheep trough

caravans

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0 50m
scale 1:1250 for A3 plot

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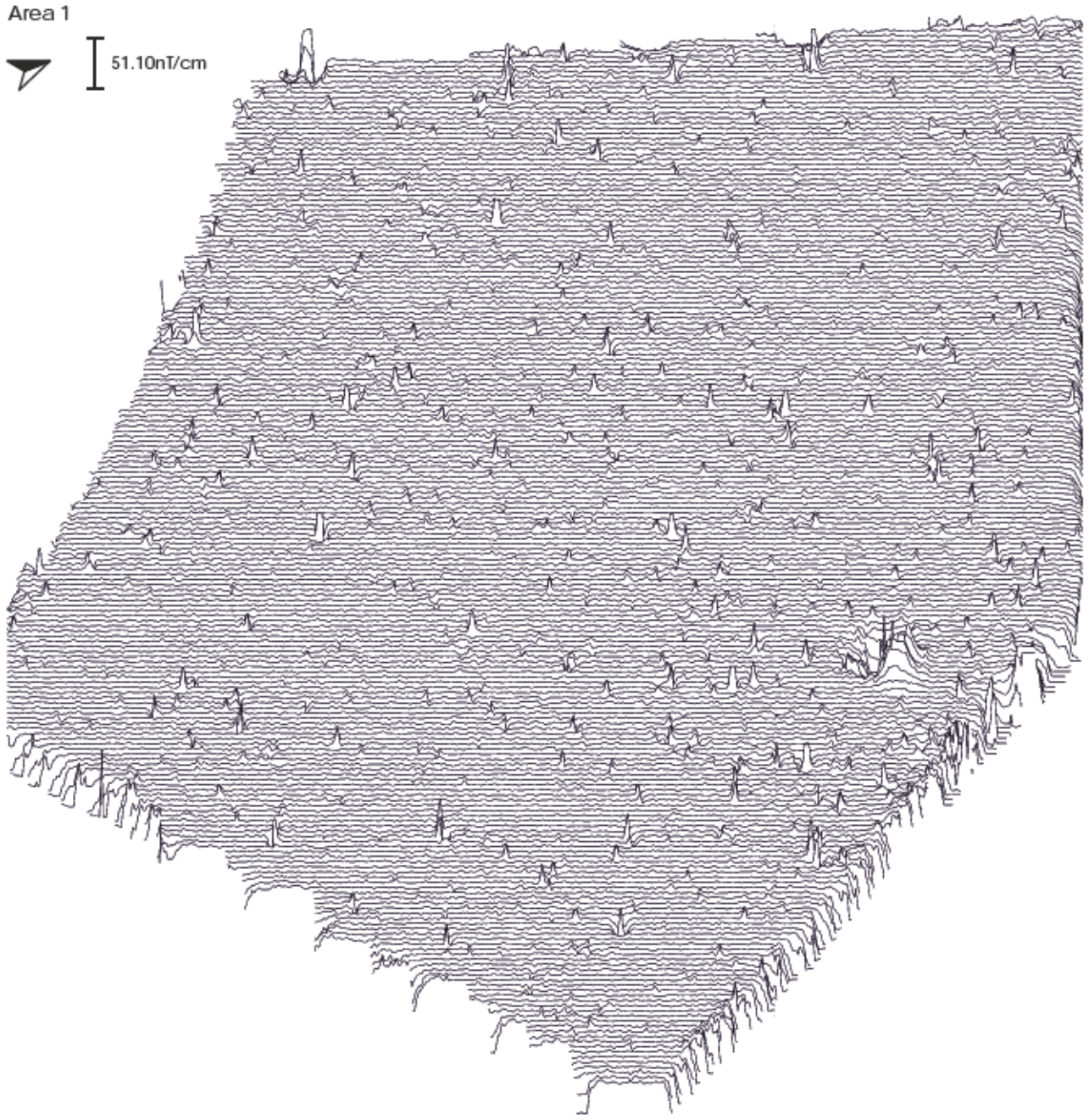
Figure 4: Archaeological interpretation

Area 1

51.10nT/cm

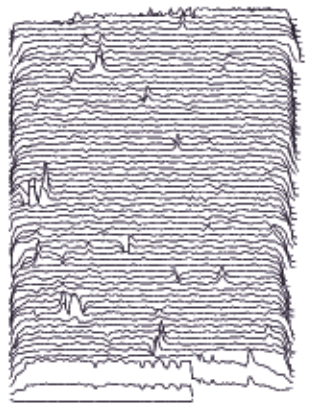


Area 2

248.00nT/cm

Area 4

68.10nT/cm

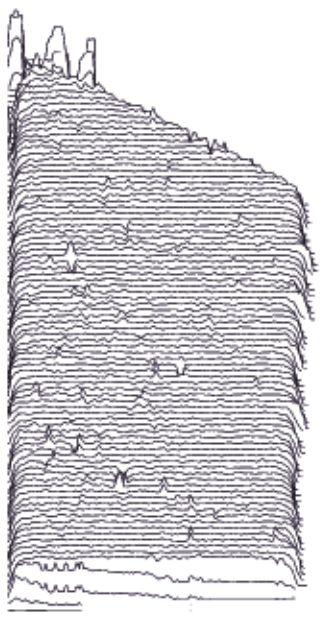


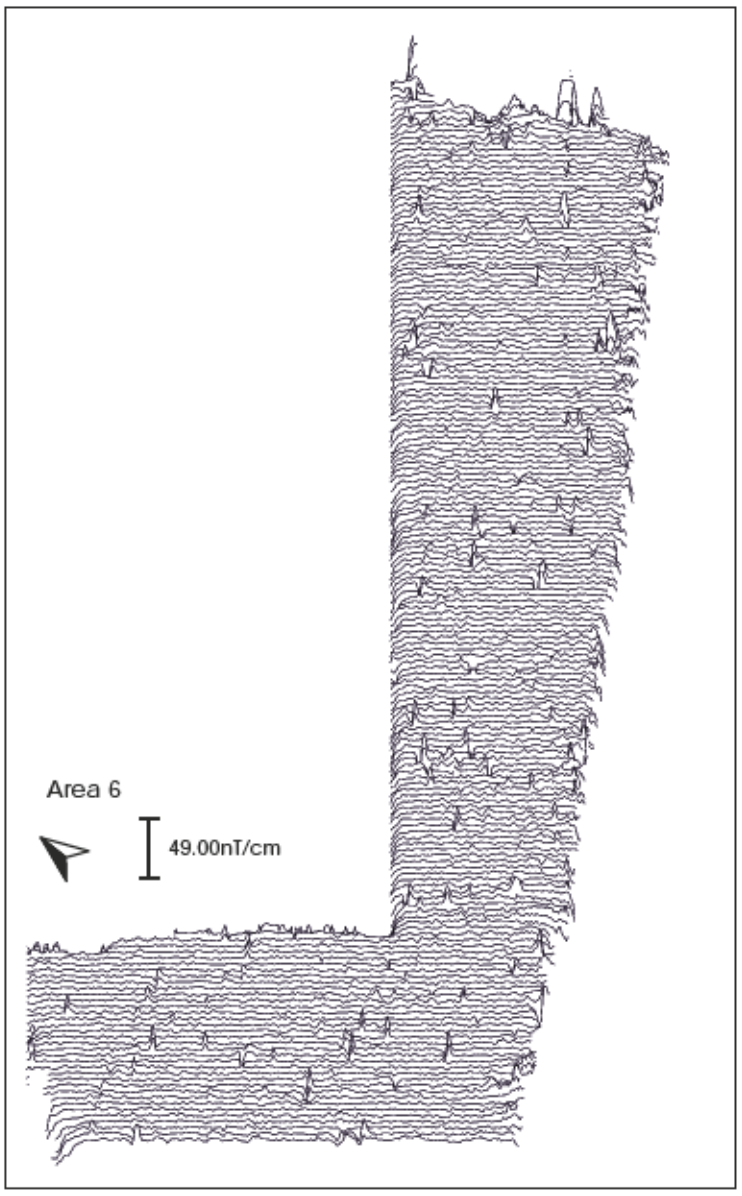
Area 3

222.50nT/cm

Area 5

65.60nT/cm





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0 50m
scale 1:1250 for A3 plot

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Figure 5: Trace plots of geomagnetic data