

ARCHAEOLOGICAL
SERVICES
DURHAM UNIVERSITY

on behalf of
Duchy Homes Ltd

Land at Mount Vernon
Worsbrough
Barnsley
South Yorkshire

geophysical survey

report 5434
December 2020

Contents

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

Figures

Figure 1:	Site location
Figure 2:	Magnetometer survey
Figure 3:	Geophysical interpretation
Figure 4:	Archaeological interpretation

1. Summary

The project

- 1.1 This report presents the results of a geophysical survey conducted in advance of proposed development at Mount Vernon, Worsbrough, Barnsley, South Yorkshire. The works comprised approximately 1.4ha of magnetometer survey.
- 1.2 The works were commissioned by Duchy Homes Ltd and conducted by Archaeological Services Durham University.

Results

- 1.3 Traces of probable former ridge and furrow cultivation were identified across much of the survey area.
- 1.4 The only other feature of possible archaeological interest was a curvilinear soil-filled feature detected in the east of the survey. This is probably a ditch or drain, of uncertain origin but possibly associated with one of the adjacent properties to the north.
- 1.5 The high concentration of ferrous/fired debris in the topsoil across the survey area has not hindered the detection or identification of anomalies of potential archaeological significance.

2. Project background

Location (Figure 1)

- 2.1 The proposed development area (PDA) was located to the south of Mount Vernon Crescent in Worsbrough, 1.6km south of Barnsley town centre, South Yorkshire (NGR centre: SE 3520 0484). To the east and south was farmland and to the west was Mount Vernon Road, with housing beyond.
- 2.2 One survey of approximately 1.4ha was conducted in one land parcel.

Development proposal

- 2.3 A residential development with associated services, greenspace and access is proposed.

Objective

- 2.4 The 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 development.
- 2.5 The regional research framework *Yorkshire Archaeological Research Framework: research agenda* (Roskams & Whyman 2007) contains an agenda for archaeological research in the region, which is incorporated into regional planning policy implementation. In this instance, the scheme of works was designed to address the following period priorities for research: Iron Age, early and high medieval.

Methods statement

- 2.6 The surveys have been undertaken in accordance with instructions from the client, proposals provided by Archaeological Services Durham University and national standards and guidance (see para. 5.1 below).

Dates

- 2.7 Fieldwork was undertaken on 23rd November 2020. This report was prepared for December 2020.

Personnel

- 2.8 Fieldwork, geophysical data processing and reporting were conducted by Duncan Hale, with illustrations by Janine Watson.

Archive/OASIS

- 2.9 The site code is **BMV20**, for **Barnsley Mount Vernon 2020**. 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 **Online Access to the Index of archaeological investigations project (OASIS)**. The OASIS ID number for this project is **archaeol3-409548**.

Acknowledgements

- 2.10 Archaeological Services Durham University is grateful for the assistance of the farmer in facilitating this scheme of works.

3. Historical and archaeological background

- 3.1 A detailed archaeological desk-based assessment has been conducted for the proposed development (Archaeological Services 2020); the results of that assessment are summarised here.
- 3.2 While there is no direct evidence for prehistoric or Roman activity within the PDA, the presence of settlements and artefacts in the wider landscape indicates that there is some potential for evidence from these periods to be present.
- 3.3 The proposed development area was probably farmland associated with the Elmhirst estate during the medieval period. LiDAR data record slight earthwork ridge and furrow across the site, perhaps medieval or early post-medieval in date.
- 3.4 The PDA was probably enclosed in the post-medieval period when the field walls and stone gateposts were added to the site for use as pasture.

4. Landuse, topography and geology

- 4.1 At the time of survey the PDA comprised one field of pasture for cattle. The field was bounded by stone walls to the west and north; a collapsed stone wall formed the western part of the southern boundary, while the eastern part of the southern boundary and the east boundary were fenced. Additional fences were present above the northern wall at some locations.
- 4.2 Telegraph poles and street lights were present along the western boundary; several sheds and outbuildings were present in the gardens backing onto the northern boundary. Four small, recently backfilled, excavations noted during survey were almost certainly associated with geotechnical investigations, such as trial pits and/or soakaway pits.
- 4.3 The PDA occupied a very gentle east-north-east-facing slope, with elevations between 151m OD at the south-west corner and 137m OD at the north-eastern corner. Many slight undulations were noted in the field; some of these are probably associated with former ridge and furrow cultivation.
- 4.4 The underlying solid geology of the area comprises sandstone of Mid-Pennsylvanian Woolley Edge Rock; no superficial deposits are recorded.

5. Geophysical survey Standards

- 5.1 The surveys and reporting were conducted in accordance with the Chartered Institute for Archaeologists (CIfA) *Standard and Guidance for archaeological geophysical survey* (2014, updated 2020); the *EAC Guidelines for the Use of Geophysics in Archaeology* (Schmidt *et al.* 2015); 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 previous work, it was considered possible 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 anticipated nature and depth of targets, and the non-igneous geological environment of the study area, a magnetic technique, fluxgate gradiometry, was considered appropriate for detecting the types of feature mentioned above. This technique involves the use of 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 (OS) National Grid using a Leica GS15 global navigation satellite system (GNSS) with real-time kinematic (RTK) corrections typically providing 10mm accuracy.
- 5.6 Magnetic gradient measurements were determined using a Bartington Grad601-2 dual fluxgate gradiometer. A zig-zag traverse scheme was employed and data were logged in 30m grid units. The instrument sensitivity was effectively 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.4 software was used to process the geophysical data and to produce a continuous tone greyscale image of the raw (minimally processed) data. Trace plots of the data were also prepared and examined but are not presented in this report. The greyscale image is presented in Figure 2; geophysical and archaeological interpretations are presented in Figures 3-4. 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 magnetometer data:

<i>clip</i>	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
<i>zero mean traverse</i>	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
<i>de-stagger</i>	corrects for displacement of geomagnetic anomalies caused by alternate zig-zag traverses
<i>interpolate</i>	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. Three types of magnetic anomaly have been distinguished in the data:

<i>positive magnetic</i>	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
<i>negative magnetic</i>	regions of anomalously low or negative magnetic field gradient, which may correspond to features of low magnetic susceptibility such as wall footings and other concentrations of sedimentary rock or voids
<i>dipolar magnetic</i>	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 plan is provided.
- 5.12 A relatively high concentration of small, discrete, dipolar magnetic anomalies has been detected across the survey area. These anomalies almost certainly reflect near-surface items of ferrous and/or fired debris, such as horseshoes and brick fragments, for example, and in most cases have little or no archaeological significance. Concentrations of such anomalies can sometimes indicate the presence of made ground or the application of so-called 'green manure'; in this instance the latter is more likely. A sample of these anomalies is shown on the geophysical interpretation plan, however, they have been omitted from the archaeological interpretation plan.
- 5.13 A series of parallel, weak, positive and negative magnetic anomalies has been detected across much of the survey area, aligned broadly east-north-east/west-south-west. These anomalies almost certainly reflect traces of former ridge and furrow cultivation.
- 5.14 A curvilinear positive magnetic anomaly has been detected in the east of the field, heading south-east from the northern boundary, then turning east. The anomaly is

slightly diffuse and irregular in shape, and gradually heads downslope from its highest point by the northern wall. This probably reflects a soil-filled feature such as an infilled channel or drain, perhaps associated with one of the properties to the north, or possibly an older ditch.

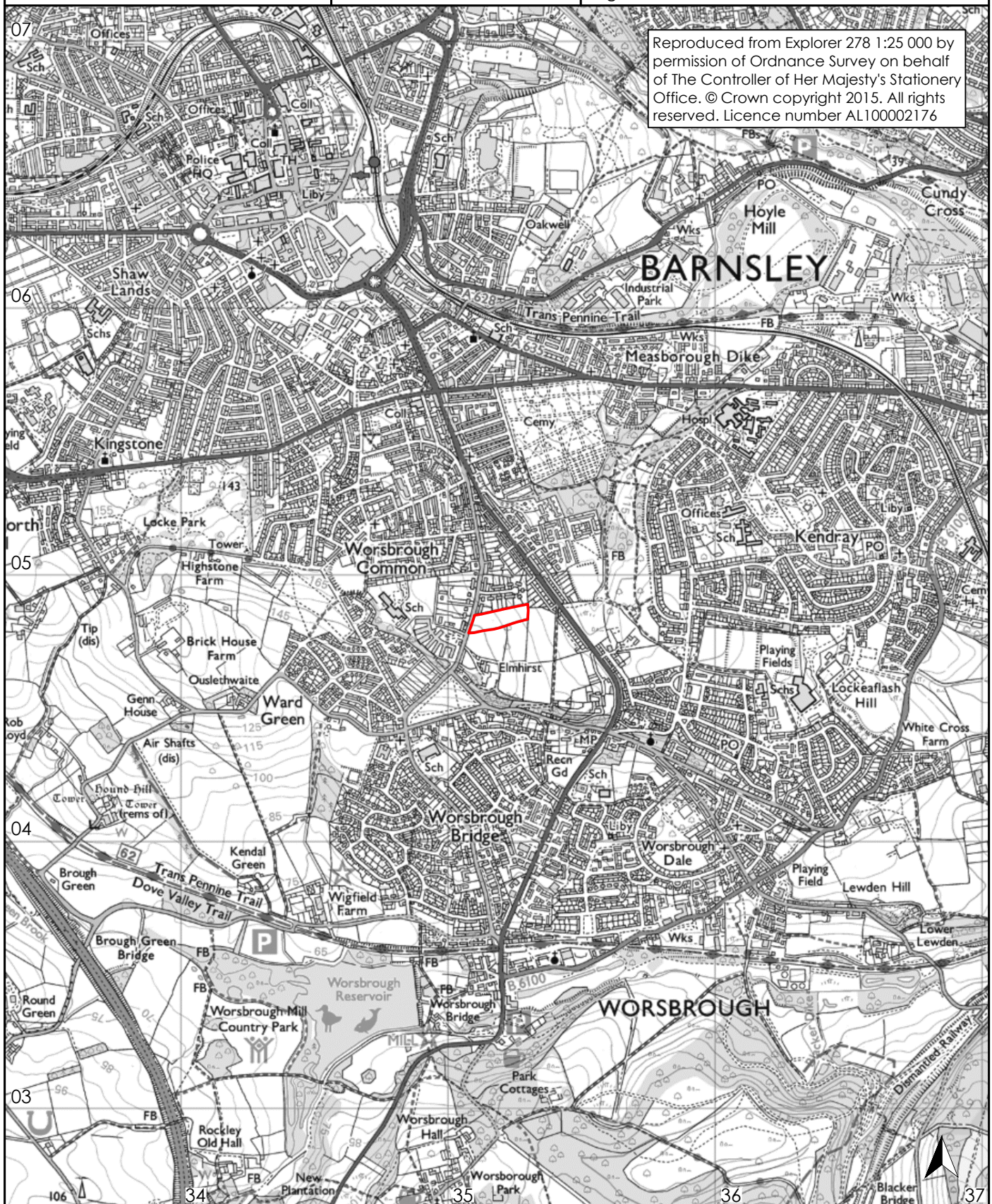
- 5.15 The only other anomalies detected here comprise intense dipolar magnetic anomalies detected around the edges of the survey. These reflect adjacent fences along the east and south-east site boundaries, and adjacent services along the western boundary. The large anomalies along the northern edge variously reflect brick buildings and tin roofs on structures abutting the boundary wall, as well as fences on top of the wall in places.

6. Conclusions

- 6.1 A magnetometer survey was undertaken on land off Mount Vernon Crescent, Worsbrough, Barnsley, prior to a proposed housing development.
- 6.2 Traces of probable former ridge and furrow cultivation were identified across much of the survey area.
- 6.3 The only other feature of possible archaeological interest was a curvilinear soil-filled feature detected in the east of the survey. This is probably a ditch or drain, of uncertain origin but possibly associated with one of the adjacent properties to the north.
- 6.4 The high concentration of ferrous/fired debris in the topsoil across the survey area has not hindered the detection or identification of anomalies of potential archaeological significance.

7. Sources

- Archaeological Services 2020 *Land at Mount Vernon, Worsbrough, Barnsley, South Yorkshire: archaeological desk-based assessment*. Report **5412**, Archaeological Services Durham University
- CIfA 2014 (updated 2020) *Standard and Guidance for archaeological geophysical survey*. Chartered Institute for Archaeologists
- Roskams, S, & Whyman, M, 2007 *Yorkshire Archaeological Research Framework: research agenda*. RFRA 2936
- Schmidt, A, 2013 *Geophysical Data in Archaeology: A Guide to Good Practice*. Archaeology Data Service & Digital Antiquity, Oxbow
- Schmidt, A, Linford, P, Linford, N, David, A, Gaffney, C, Sarris, A & Fassbinder, J, 2015 *EAC Guidelines for the Use of Geophysics in Archaeology: Questions to Ask and Points to Consider*. EAC Guidelines **2**, Namur

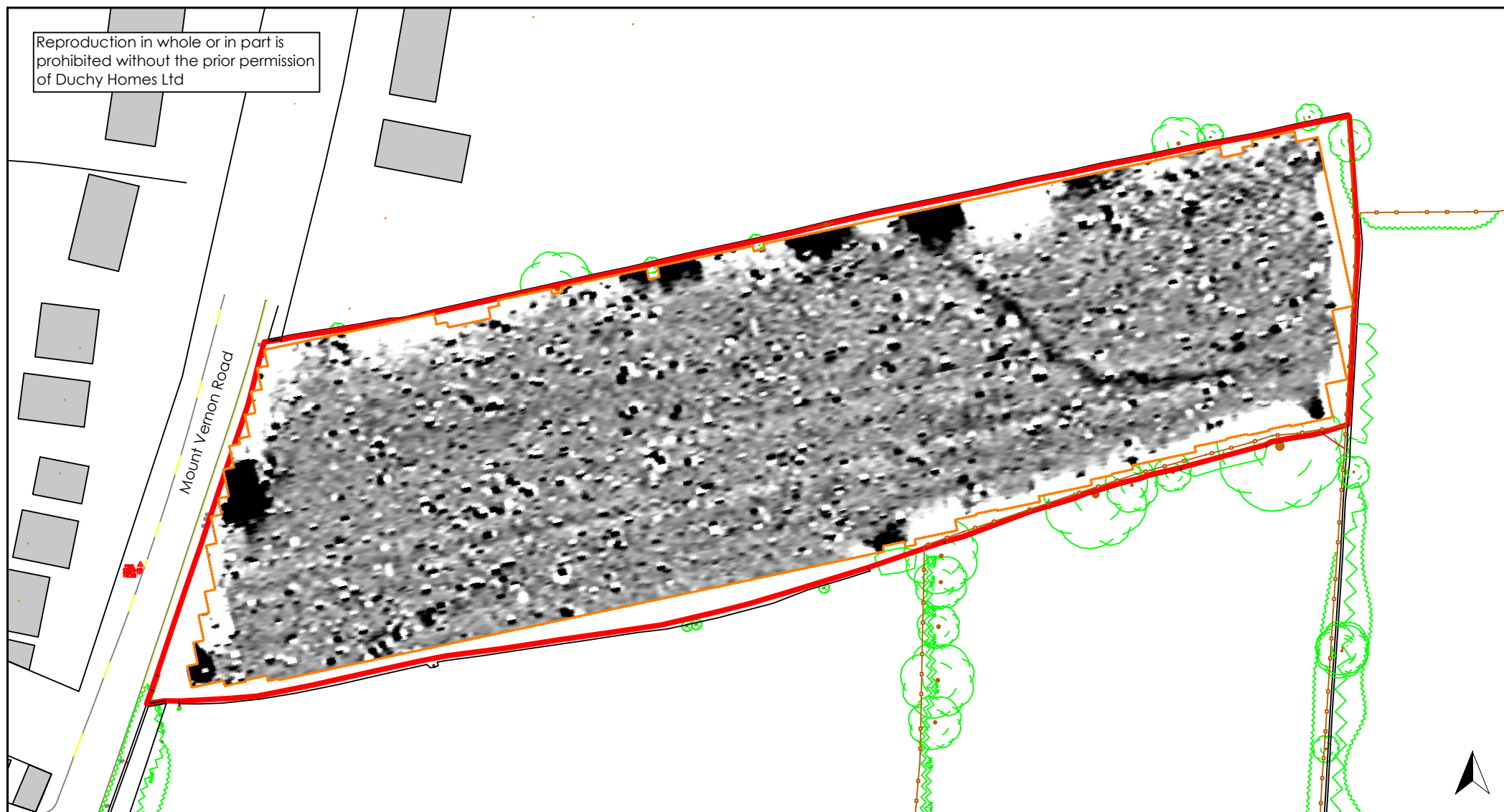


site boundary

0 1km

scale 1:20 000 for A4 plot

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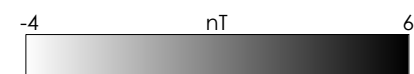
Figure 2: Magnetometer survey



site boundary



magnetometer survey



0 50m

scale 1:1000 for A4 plot

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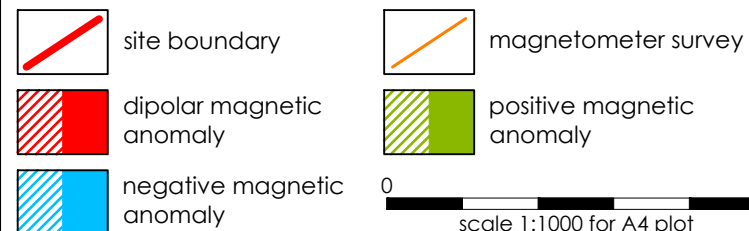
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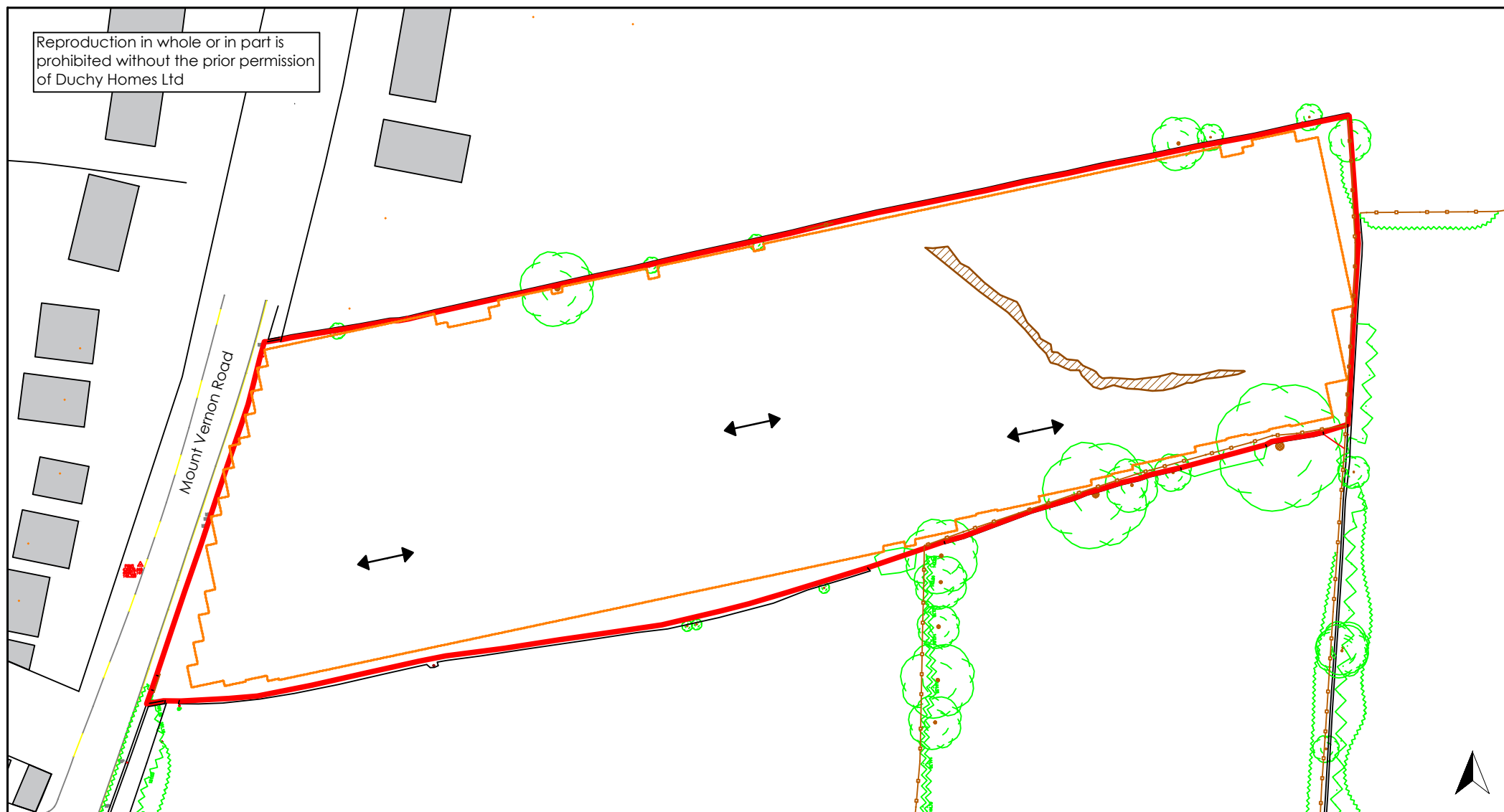
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Figure 3: Geophysical interpretation



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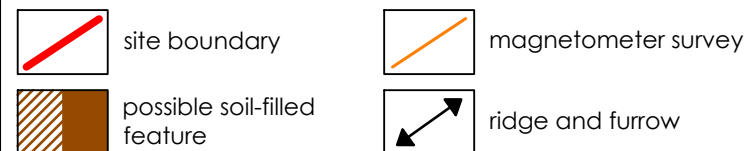
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Figure 4: Archaeological interpretation



0 50m
scale 1:1000 for A4 plot