ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
Environment Agency

West Coldside
Morpeth Flood Alleviation Scheme
Northumberland

geophysical survey

report 3030
November 2012

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 a proposed borrow pit development at West Coldside, to the south-east of Molesden, near Morpeth, Northumberland. The works comprised geomagnetic survey of approximately 20ha.

1.2 The works were commissioned by the Environment Agency and conducted by Archaeological Services Durham University.

Results

1.3 A few possible soil-filled features have been identified, some of which may be anthropogenic.

1.4 Former field boundaries and ground disturbance, probably associated with woodland clearance, have been identified.

1.5 Traces of recent agricultural practices have been detected.

2. Project background

Location (Figure 1)

2.1 The proposed development area was located south of West Coldside, to south-east of the village of Molesden, near Morpeth, Northumberland (NGR centre: NZ 1538 8349). One survey of approximately 20ha was conducted in arable land. To the north was the now dismantled Wansbeck section of the North British Railway; to the south-west stood Foxcovert Plantation and Eddington Fox Covert; Harestone Beck runs along the east edge of the area. Open farmland surrounded the survey in all directions.

Development proposal

2.2 The proposed development is a flood alleviation scheme for Morpeth, sited on the River Wansbeck. The proposals include the creation of an upstream storage area at Lightwater Cottage, where an earth dam will be built. The areas that will be affected by this scheme are a level field on the floodplain, together with a small bluff on the south side of the valley; a construction access route in a field on the north side of the river; construction and maintenance access on the south bank; and two large borrow pits between the valley and the Mitford-Meldon lane. This report concerns the area for Borrow Pit B. The area for Borrow Pit A has previously been surveyed (Archaeological Services 2012a).

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 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 development.

Methods statement

2.4 The geophysical surveys were undertaken in accordance with instructions from the client and national standards and guidance (below, para. 5.1).

Dates

2.5 Fieldwork was undertaken between 5th and 12th November 2012. This report was prepared for 27th November 2012.

Personnel

2.6 Fieldwork was conducted by Jamie Armstrong, Matthew Claydon and Richie Villis (Supervisor). The geophysical data were processed by Richie Villis. This report was prepared by Richie Villis with illustrations by Janine Watson and edited by Duncan Hale, the Project Manager.

Archive/OASIS

2.7 The site code is **MWC12**, for **M**orpeth **W**est **C**oldside 20**12**. The survey archive will be 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 **archaeol3-137770**.

Acknowledgements

2.8 Archaeological Services Durham University is grateful for the assistance of landowners, agents and tenants in facilitating this scheme of works.

3. Historical and archaeological background

3.1 An Environmental Impact Assessment (EIA) is being prepared which will contain a detailed cultural heritage assessment of the site. The following briefly summarises information from the forthcoming EIA.

3.2 None of the affected areas contains any known historic assets, but in the surrounding area there are a number of cropmark and earthwork sites of the Iron Age and Romano-British periods. The site of a deserted medieval village lies about 1.6km upstream at Rivergreen, and ridge and furrow is visible at numerous locations around the proposed dam site. The dam site is close to an old ford across the Wansbeck. There is still a river crossing there, with concrete stepping stones. Tithe maps of the 1840s mark a path between the Mitford-Meldon road and Newton Underwood; this ran between the proposed Borrow Pit A fields and crossed the river at the ford. This route is still a byway today.

3.3 A previous phase of geophysical survey conducted in summer 2012 (Archaeological Services 2012a) and archaeological evaluation works (Archaeological Services 2012b) have been undertaken at the dam site, access tracks and Borrow Pit A locations.

3.4 The results of the geophysical survey are summarised below:

3.5 Possible soil-filled features have been identified, some of which may be anthropogenic (such as enclosure ditches and ring-ditches); these are largely concentrated in Areas 8, 9 and 10 in the south.

3.6 Former ridge and furrow cultivation has been identified in Areas 2 and 7.

3.7 Former field boundaries and tracks, as shown by Ordnance Survey maps, have been identified.

3.8 A palaeochannel has almost certainly been detected in the north end of Area 2.

3.9 Traces of modern agricultural practices have been detected.

3.10 The results of the archaeological evaluation works are briefly summarised below:

3.11 Natural subsoil was variable across the site, being a mixture of yellow and brown clays and sands. It was identified in all the trenches at a depth of between 0.2m and 1.0m. A number of natural geological features and palaeochannels were identified in several of the trenches.

3.12 Archaeological evidence in the Borrow Pit A area comprised a number of ditches and gullies in Trenches 24, 25, 26, as well as ditches, pits and postholes in Trench 7, and a spread and a possible ditch in Trench 6. Evidence for ridge and furrow was recorded in the following Trenches: 2, 3, 7, 8, 16, 18, 20, 24, 25, 31, 32 and 33; furrows 2-3m wide survived cut into the natural subsoil at intervals of approximately 5m; these were up to 0.2m in depth and had been truncated by modern ploughing.

3.13 Archaeological evidence in the South Access Road was limited to a trackway in Trench 46.

3.14 Archaeological evidence in the Dam Site was limited to a gully in Trench 52. Evidence of an old field boundary was also present in the form of a strong concentration of tree or hedge roots towards the centre of the trench.

3.15 Archaeological evidence in the North Access Road was limited to a single medieval or post-medieval furrow in in Trench 56. This was 0.3m wide and 0.1m in depth, and had been truncated by modern ploughing.

3.16 Over all the trenches was a grey-brown sandy silt topsoil, up to 0.3m deep.

3.17 Finds recovered include one unstratified iron object from Trench 24 and medieval pottery from Trenches 24 and 25.

3.18 A total of 16 test pits were monitored. These comprised 11 pits excavated at Borrow Pit A and five at Borrow Pit B. Each pit was excavated to a depth of more than 4m, and recorded natural clay subsoil overlain by a red-brown subsoil and a grey-brown topsoil. No features of archaeological significance were identified and no finds recovered.

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised a single field of harvested arable land.

4.2 The land undulated gently with elevations of between 90m and 95m OD.

4.3 The underlying solid geology of the area comprises Namurian mudstone, sandstone and limestone of the Stainmore Formation, which are overlain by Devensian till.

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 Institute for Archaeologists (IfA) *Standard and Guidance for archaeological geophysical survey* (2011); the IfA Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service *Guide to Good Practice: Geophysical Data in Archaeology* (Schmidt & Ernenwein 2011).

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 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) could also be present.

5.4 Given the anticipated shallowness of targets and 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 known, mapped Ordnance Survey (OS) points 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 a continuous tone greyscale image. The greyscale image and interpretations are presented in Figures 2–5. 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:

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
destagger	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 0.5m intervals

Interpretation: anomaly types

5.10 A colour-coded geophysical interpretation plan is provided. Three 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
negative magnetic	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
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 plan is provided.

5.12 Three weak linear positive magnetic anomalies have been detected, which broadly correspond to the locations of former field boundaries as shown by OS editions from the 1850s to the 1970s. The area is also shown as being woodland on several of the OS map editions. This may account for the magnetic 'noise' detected across the survey area.

5.13 A series of weak positive magnetic striations have been detected across the survey area. This almost certainly reflects a former ploughing regime.

5.14 A number of other weak and ephemeral positive magnetic anomalies have been detected. These could reflect the truncated remains of soil-filled features. Although possibly anthropogenic, the origin of these potential features is undetermined.

5.15 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.

6. Conclusions

6.1 Approximately 20ha of geomagnetic survey was undertaken at West Coldside, near Morpeth, Northumberland, at the proposed site of a borrow pit for the Morpeth flood alleviation scheme.

6.2 A few possible soil-filled features have been identified, some of which could be anthropogenic.

6.3 Former field boundaries and ground disturbance, probably associated with woodland clearance, have been identified.

6.4 Traces of recent agricultural practices have been detected.

7. Sources

Archaeological Services 2012a *Morpeth Flood Alleviation Scheme, Morpeth, Northumberland: geophysical survey*. Unpublished report **2919**, Archaeological Services Durham University

Archaeological Services 2012b *Morpeth Flood Alleviation Scheme, Molesden, Northumberland: scheme of archaeological works*. Unpublished interim report **3036**, Archaeological Services Durham University

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*. Technical Paper **6**, Institute of Field Archaeologists

IfA 2011 *Standard and Guidance for archaeological geophysical survey*. Institute for Archaeologists

Schmidt, A, & Ernenwein, E, 2011 *Guide to Good Practice: Geophysical Data in Archaeology*. Archaeology Data Service

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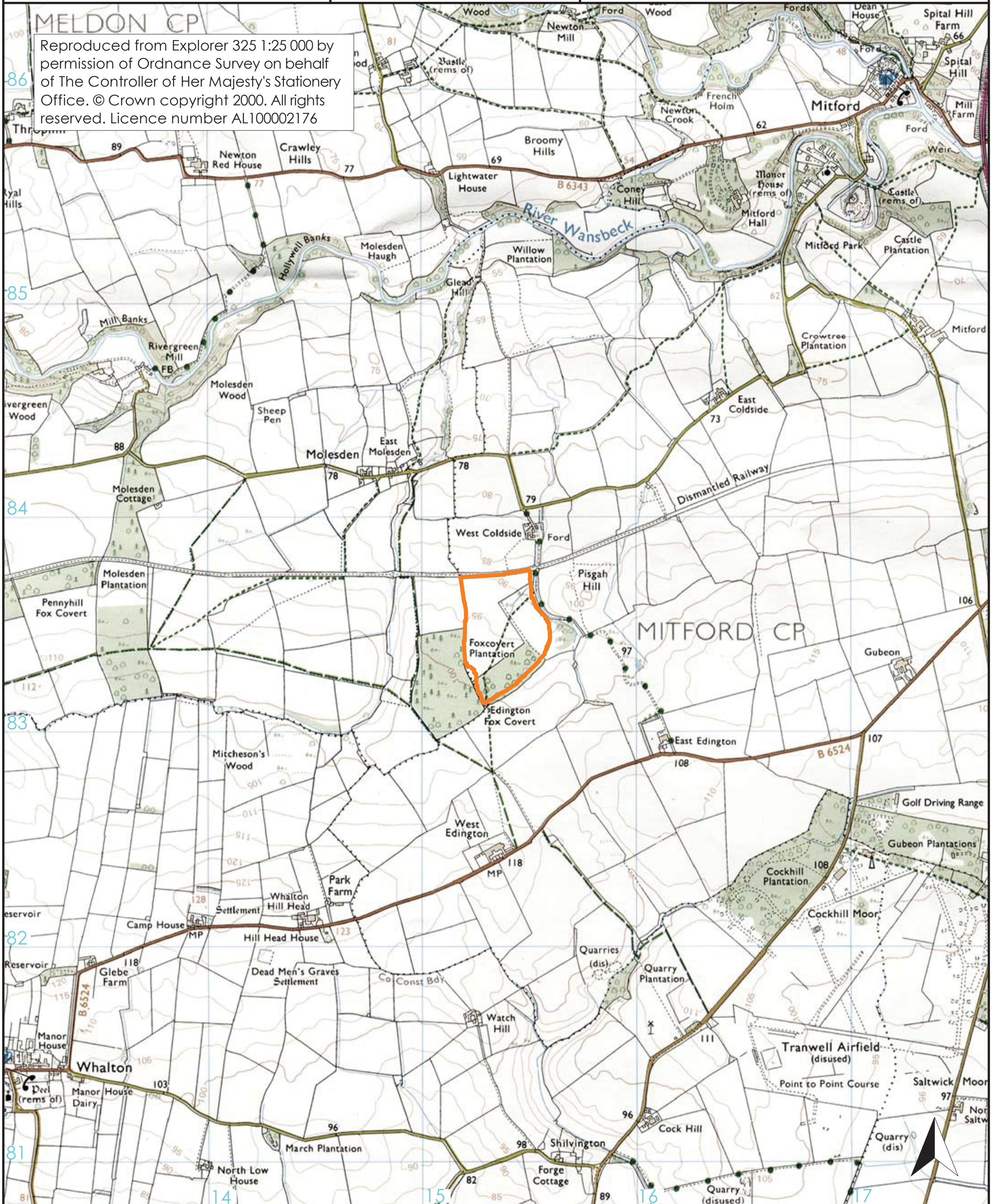
Figure 1: Site location



survey location

0 1km
scale 1:25 000 for A4 plot

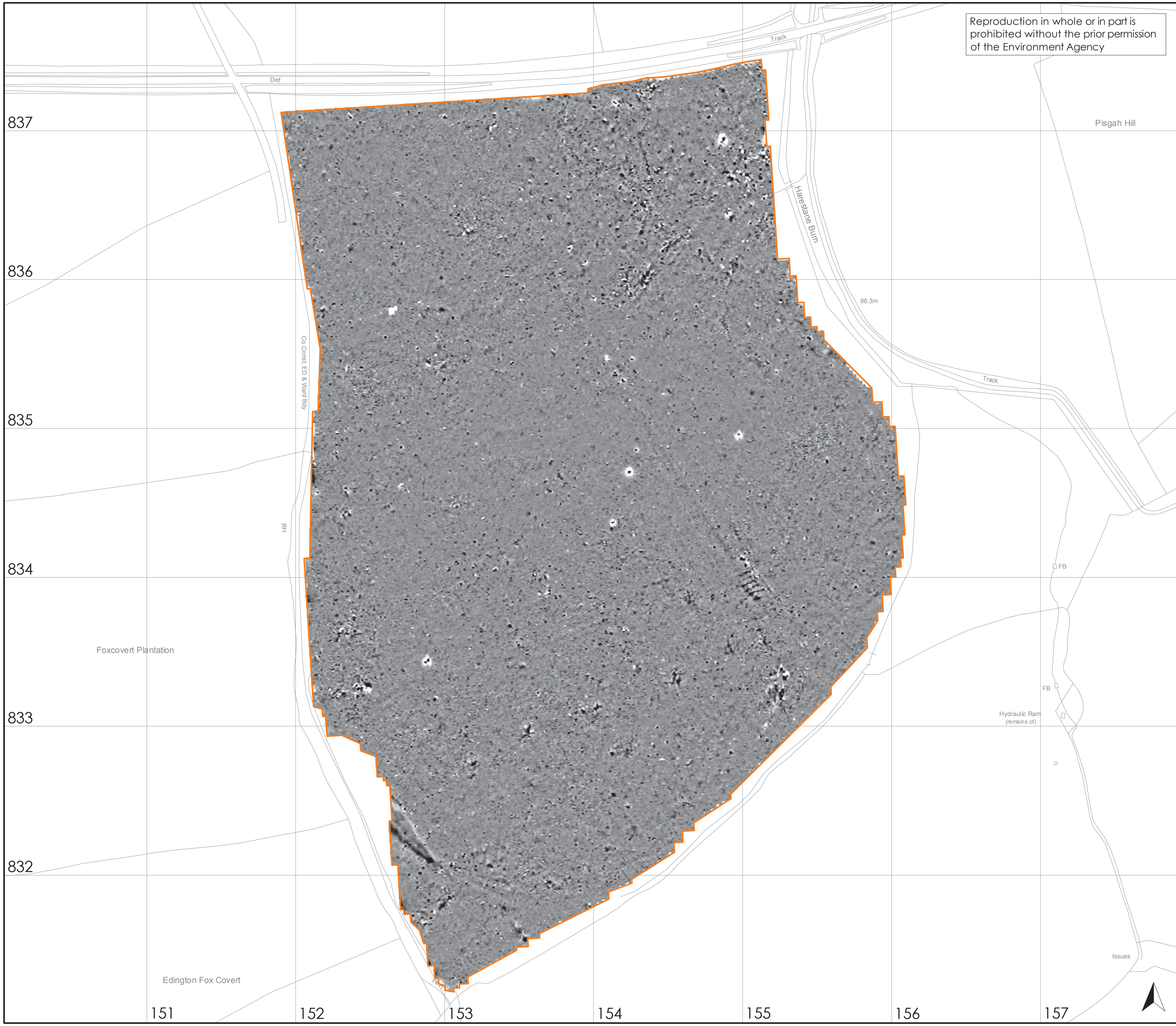


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Figure 2: Geophysical survey (1:2500)

0 100m
scale 1:2500 for A3 plot

magnetic survey

-5 nT 5

magnetic survey

-6 nT 8

0 50m
scale 1:1000 for A1 plot

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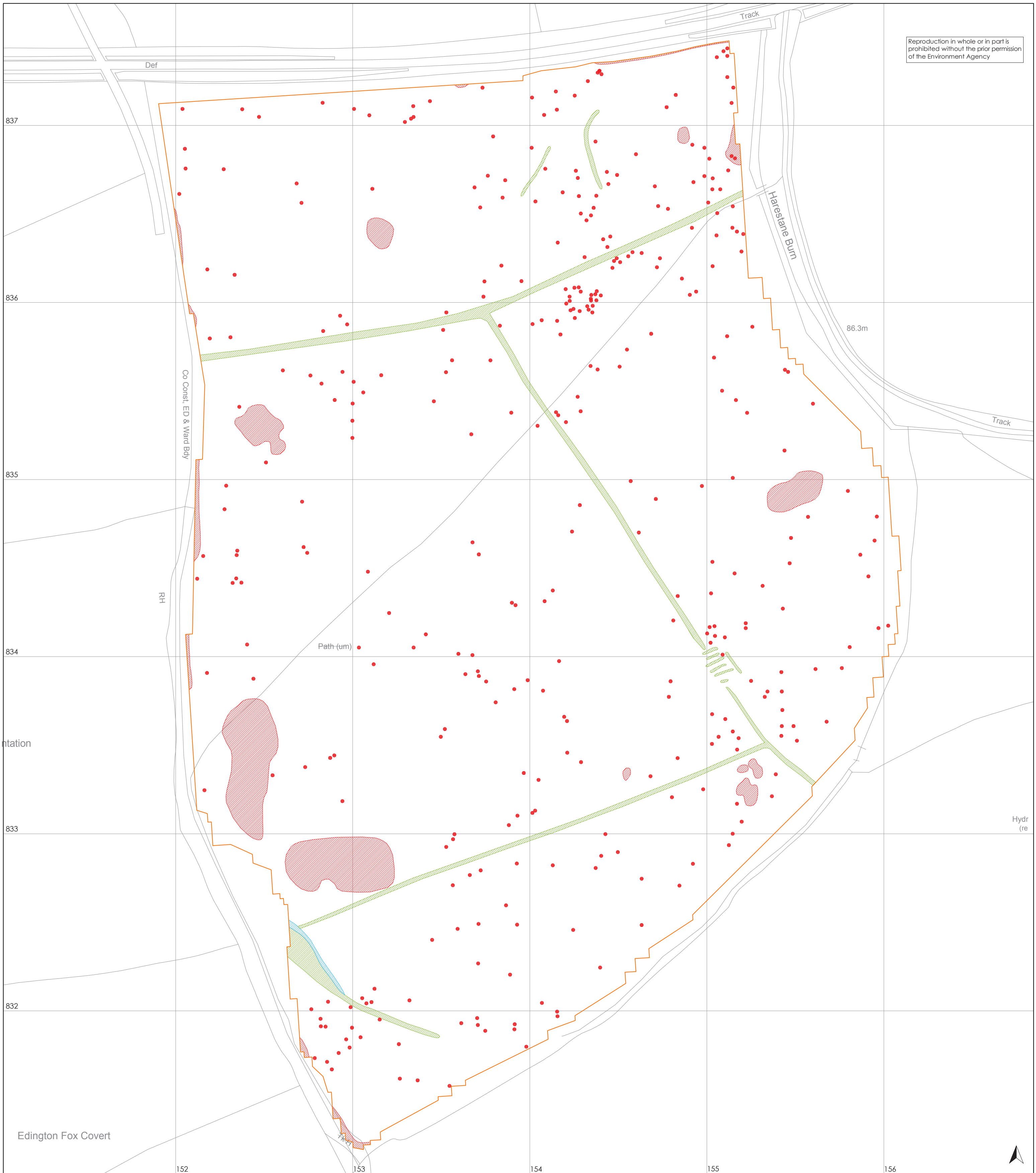
Figure 3: Geophysical survey
(1:1000)



- magnetic survey
- dipolar magnetic anomaly
- positive magnetic anomaly
- negative magnetic anomaly

0 50m
scale 1:1000 for A1 plot

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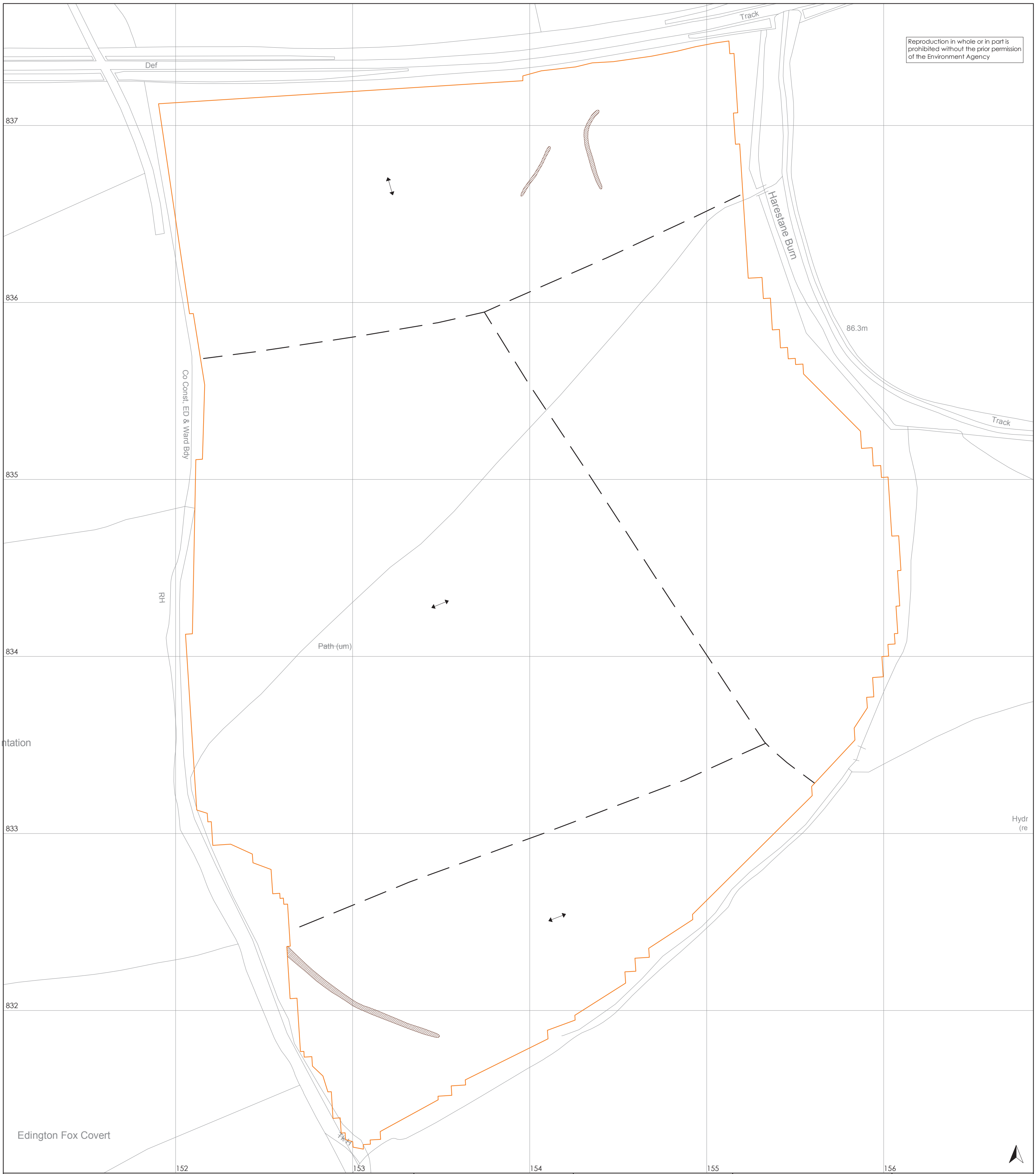
Figure 4: Geophysical interpretation



magnetic survey
soil-filled feature
former plough
former field boundary

0 50m
scale 1:1000 for A1 plot

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Figure 5: Archaeological interpretation