

ARCHAEOLOGICAL
SERVICES
DURHAM UNIVERSITY

on behalf of
Earthmill Ltd

Hunmanby Grange Farm
Hunmanby
North Yorkshire

geophysical surveys

report 2575
January 2011

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1. Summary

The project

- 1.1 This report presents the results of geophysical surveys conducted in advance of proposed development at Hunmanby Grange Farm, Hunmanby, North Yorkshire. The works comprised c. 2.25ha of geomagnetic survey conducted over two land parcels.
- 1.2 The works were commissioned by Earthmill Ltd and conducted by Archaeological Services Durham University.

Results

- 1.3 Several possible soil-filled features have been identified. The origin of the features is unknown, but if they are associated with cut archaeological features they are likely to be truncated. The anomalies could simply reflect natural solution features in the chalk rockhead.
- 1.4 Former ploughing regimes, such as ridge and furrow, have been identified across the survey.

2. Project background

Location (Figure 1)

- 2.1 The survey area was located at Hunmanby Grange Farm, Hunmanby, North Yorkshire (NGR centre: TA 0705 7549). Two surveys totalling c. 2.25ha were conducted in two land parcels. To the north-east are the farm buildings and yard of Grange Farm with open, arable fields on all other sides.

Development proposal

- 2.2 The proposal comprises a row of three wind turbines and an associated cable run leading to the farm buildings (Figure 2).

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 survey 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 surveys have been undertaken in accordance with a Written Scheme of Investigation provided by Archaeological Services Durham University and approved by the client.

Dates

- 2.5 Fieldwork was undertaken on 20th December 2010. This report was prepared for 10th January 2011.

Personnel

- 2.6 Fieldwork was conducted by Natalie Swann and Richie Villis (Supervisor). The geophysical data were processed by Richie Villis. This report was prepared by Richie Villis, with illustrations by Edward Davies, and edited by Duncan Hale, the Project Manager.

Archive/OASIS

- 2.7 The site code is **HGF10**, for **Hunmanby Grange Farm 2010**. 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 **Online Access** to the Index of archaeological investigationS project (**OASIS**). The OASIS ID number for this project is **archaeol3-90195**.

Acknowledgements

- 2.8 Archaeological Services Durham University is grateful for the assistance of Tom Mellor and personnel of Wold Top Brewery in facilitating this scheme of works.

3. Historical and archaeological background

- 3.1 An archaeological desk-based assessment has been undertaken for the proposed development area (Archaeological Services 2010). The following summarises the assessment's conclusions.

- 3.2 No archaeological resource has been identified which requires preservation *in situ*. There are no historic or statutorily protected buildings in the vicinity of the site. There are no Scheduled Ancient Monuments on or in the vicinity of the site.
- 3.3 There is aerial photographic evidence of a dyke that may be of later prehistoric date passing through the proposed development area (HERs 7806 and 2807). There is further evidence from aerial photographs that the surrounding area was extensively exploited in prehistory, and this evidence could extend into the site.
- 3.4 The area lies to the south-west of the medieval village of Hunmanby, and was most likely exploited as agricultural land during the medieval and post-medieval periods, and it is unlikely that a significant archaeological resource from these periods is present on the site.

4. Landuse, topography and geology

- 4.1 At the time of survey the proposed development area comprised a field of ploughed arable land and a field planted with small trees to be used by free-range poultry. The area was covered in snow at the time of survey.
- 4.2 The area was predominantly level with a mean elevation of approximately 112m OD. Grange Farm is on a promontory with the land sloping away steeply to the west, to a dry valley known as Green Cliff, and more gradually to the south and east. The ground to the north is almost level.
- 4.3 The underlying solid geology of the area comprises Cretaceous chalk of the Welton Formation and Burnham Formation, which are overlain by a shallow topsoil with a high proportion of chalk rubble.

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) *Draft Standard and Guidance for archaeological geophysical survey* (2010); 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* (draft 2nd edition, Schmidt & Ernenwein 2010).

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 the evidence in the desk-based assessment, it was considered likely 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 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 20m grid was established across each survey area and tied-in to known, mapped Ordnance Survey points using a Trimble Pathfinder Pro XRS global positioning system with real-time correction.
- 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 20m grid units. The instrument sensitivity was nominally 0.03nT, the sample interval was 0.25m and the traverse interval was 1m, thus providing 1,600 sample measurements per 20m 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 3-5; the trace plots are provided in Figure 6. In the greyscale images, 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 each dataset:

<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>destagger</i>	corrects for displacement of geomagnetic anomalies caused by alternate zig-zag traverses
<i>despike</i>	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. 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 Series of parallel, weak, positive and negative magnetic anomalies have been detected aligned broadly north-west/south-east across both areas. These almost certainly reflect a former ploughing regime, such as ridge and furrow.

5.13 One positive magnetic anomaly in Area 2, and several very weak anomalies in Area 1, could reflect soil-filled features. These could possibly have archaeological origins, but are likely to be truncated. It is also possible that the anomalies reflect natural solution features in the chalk rockhead.

5.14 The large number of very small unsurveyed areas in Area 2 correspond to the positions of some of the larger and more established trees in this area.

5.15 The large and strong dipolar magnetic anomalies detected at the edges of the survey areas reflect the adjacent metal field boundaries. The boundary at the south-west edge of Area 2 also had a row of bushes planted in front of the field boundary.

5.16 The large and strong dipolar magnetic anomalies detected in the north-east corner of Area 2 almost certainly reflect an area of hardstanding and two hen houses.

5.17 The only other anomalies detected in both surveys 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.

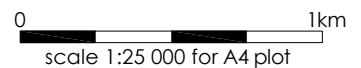
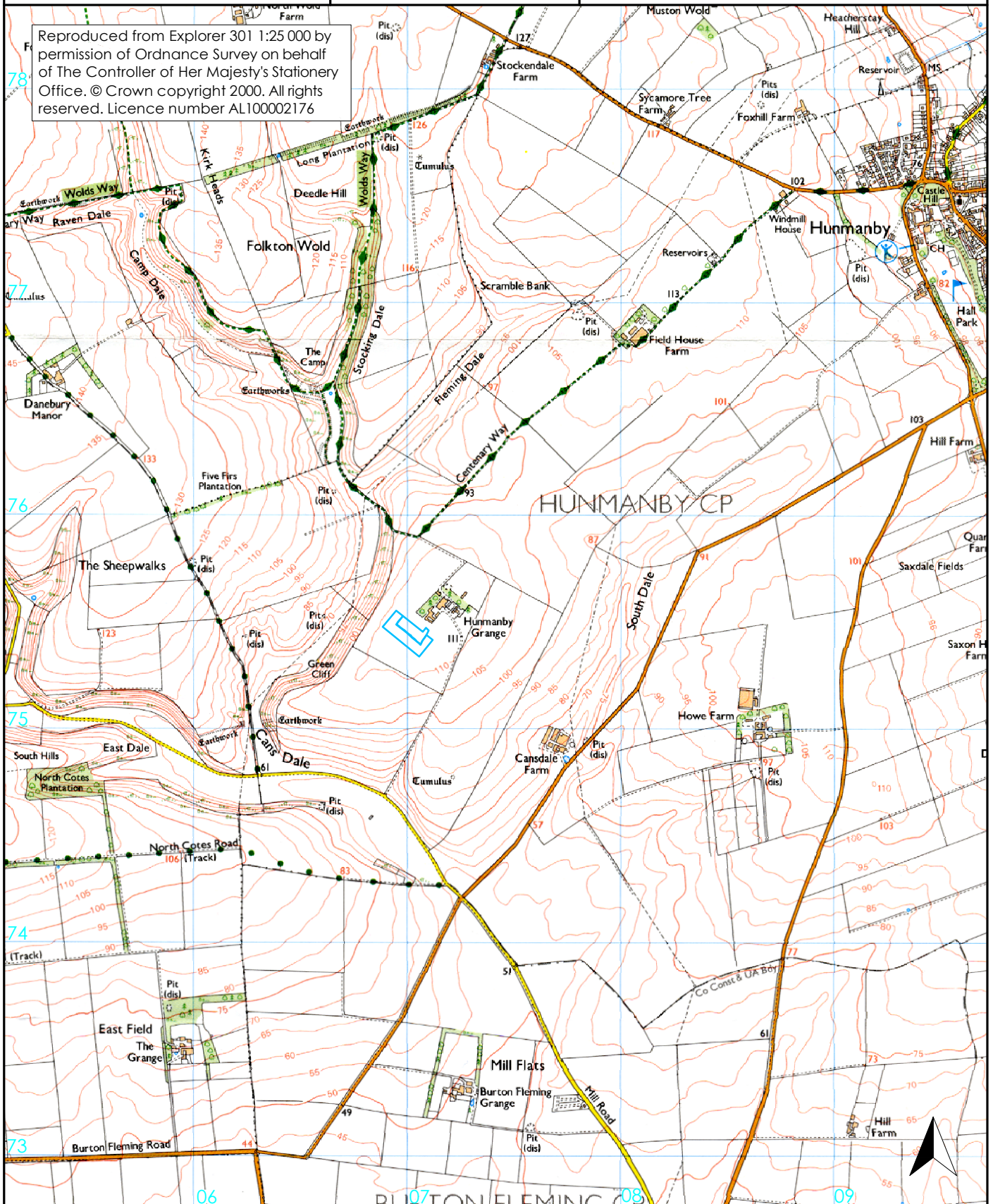
6. Conclusions

- 6.1 Approximately 2.25ha of geomagnetic survey was undertaken at Hunmanby Grange Farm, Hunmanby, North Yorkshire prior to the proposed development of three wind turbines and associated cabling.
- 6.2 Several possible soil-filled features have been identified. The origin of the features is unknown, but if they are associated with cut archaeological features they are likely to be truncated. The anomalies could simply reflect natural solution features in the chalk rockhead.
- 6.3 Former ploughing regimes, such as ridge and furrow, have been identified across the survey.

7. Sources

- Archaeological Services 2010 *Hunmanby Grange Farm, Hunmanby, Yorkshire: archaeological desk-based assessment*. Unpublished report **2469**, 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 2010 *Draft Standard and Guidance for archaeological geophysical survey*. Institute for Archaeologists
- Schmidt, A, & Ernenwein, E, 2010 (draft) *Guide to Good Practice: Geophysical Data in Archaeology*. Archaeology Data Service

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Figure 2: Survey area

0  75m
scale 1:1500 for A4 plot

 proposed development

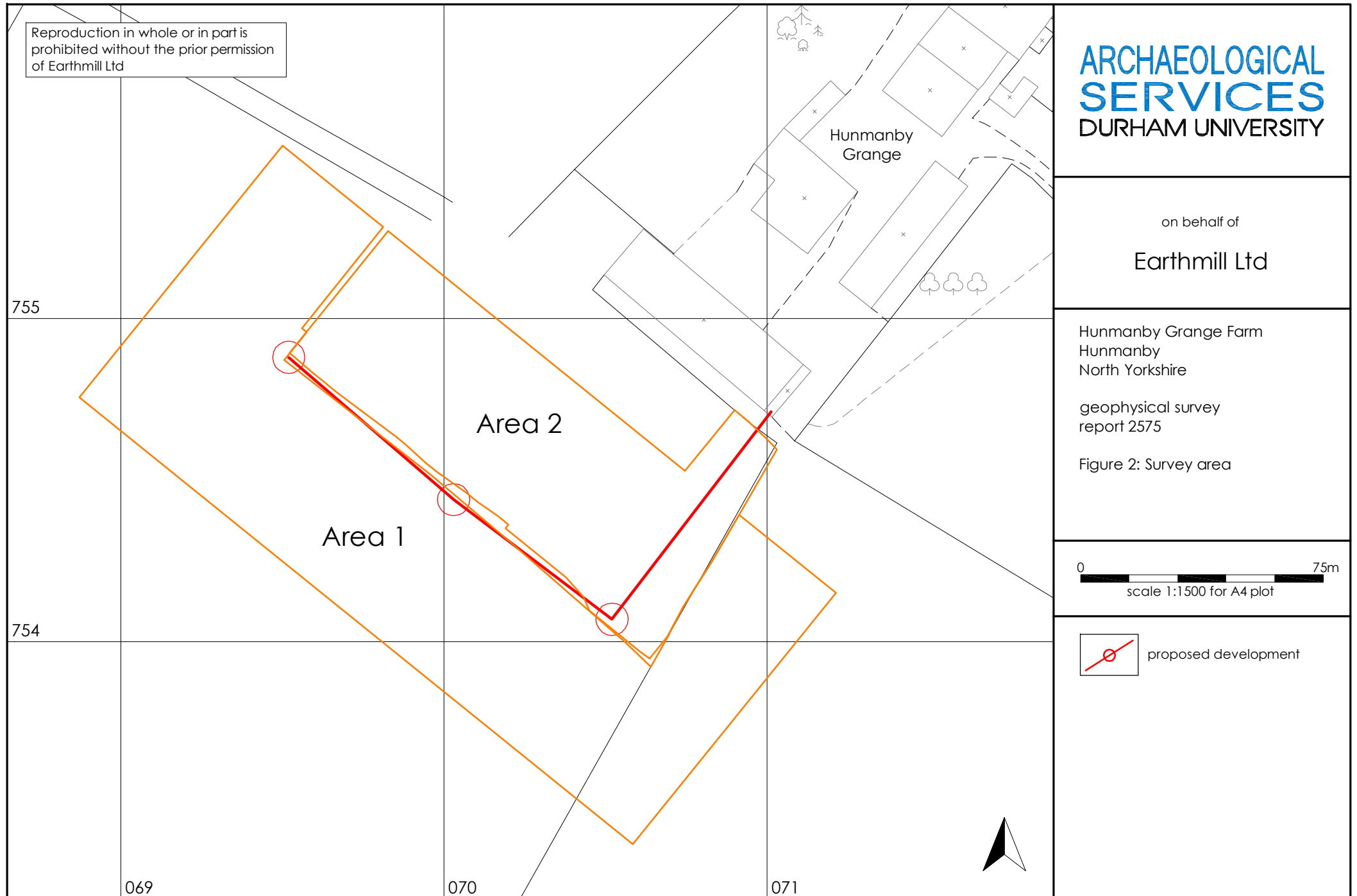
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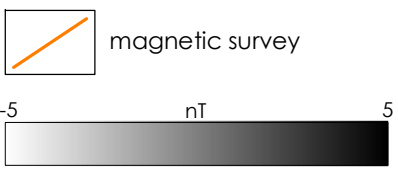
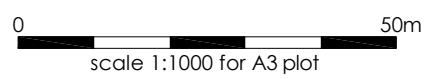
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Figure 3: Geophysical survey



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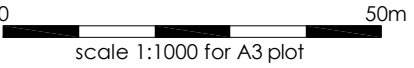
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Figure 4: Geophysical interpretation



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

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Area 2

Area 1

Hunmanby
Grange

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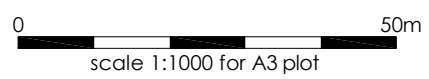
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
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Figure 5: Archaeological interpretation



-  proposed development
-  soil-filled feature
-  chicken huts
-  former ploughing

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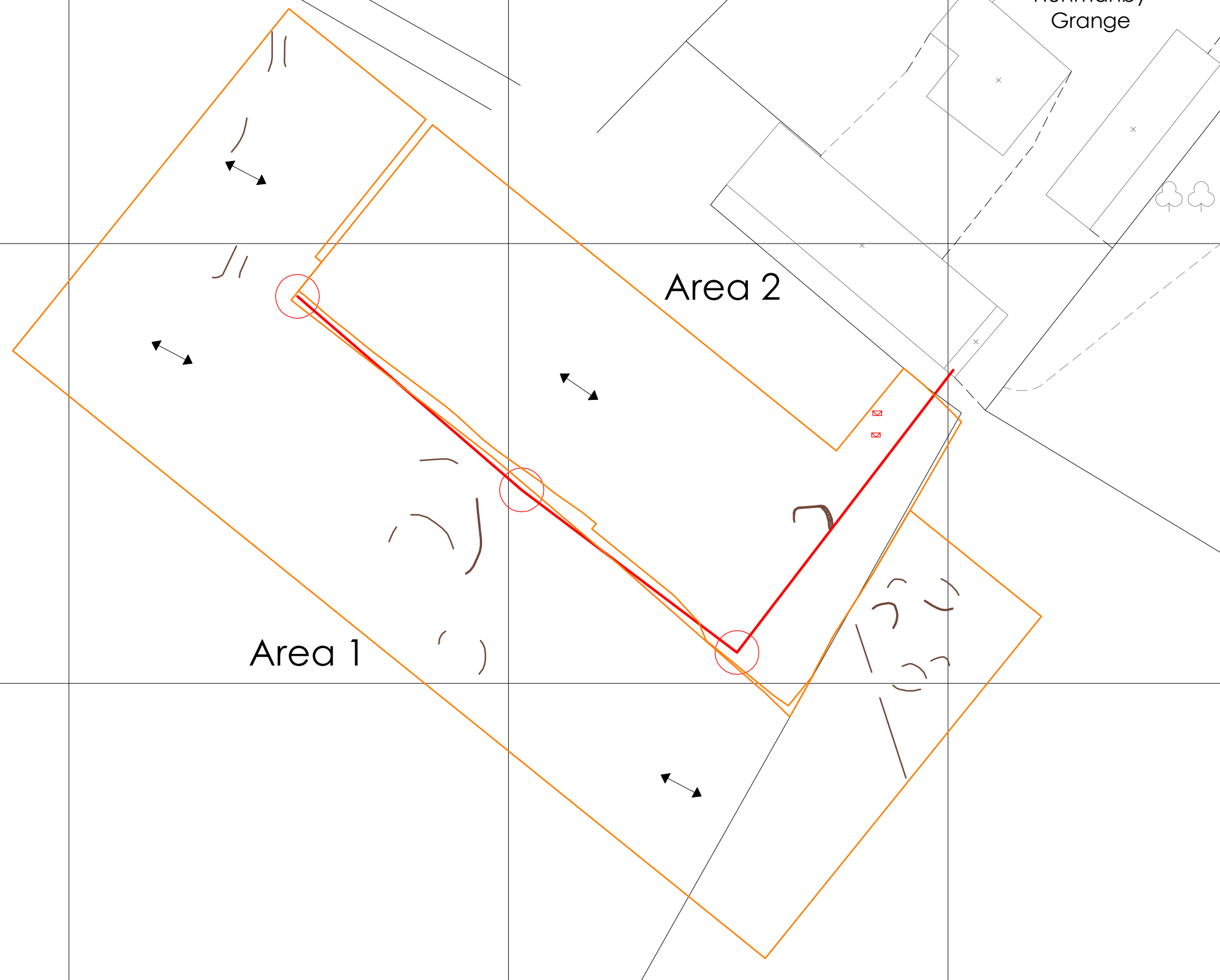


Figure 6:
Trace plots of geomagnetic data

