

ARCHAEOLOGICAL
SERVICES
DURHAM UNIVERSITY

on behalf of
Swaledale and Arkengarthdale
Archaeology Group

Grinton Mound East and Cogden Hall
Swaledale
North Yorkshire

geophysical surveys

report 2814
February 2012

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1. Summary

The project

- 1.1 This report presents the results of geophysical surveys conducted at two archaeological sites in Swaledale, North Yorkshire. The works comprised the geomagnetic survey of two areas, totalling 2.6ha, at Cogden Hall and a single 1ha area at Grinton Mound East undertaken as part of ongoing research by the Swaledale and Arkengarthdale Archaeology Group (SWAAG).
- 1.2 The works were commissioned by Swaledale and Arkengarthdale Archaeology Group (SWAAG) and conducted by Archaeological Services Durham University and SWAAG members.

Results

- 1.3 The surveys combined training with members of SWAAG and continued research into the historic landscape of Swaledale.
- 1.4 A series of defensive ditches and stone banks have been identified at Grinton Mound East. Within this enclosure a number of possible structures have been identified. External features, such as possible trackways and ditches, have also been identified. It is considered likely that the surviving earthworks and geophysical anomalies detected at Grinton Mound East reflect the remains of a significant fortified settlement. Sub-surface archaeology outside the earthworks, especially to the south, may have been impacted upon by later landscaping activity, specifically in the use of this area as a golf course.
- 1.5 Several features have been detected at Cogden Hall, where a number of anomalies complimented previously recorded earthworks. Series of enclosures and concentrations of fired or ferrous debris, possibly reflecting occupation or small-scale industrial activity, have been identified. A modern service has been detected.
- 1.6 Targeted earth electrical resistance and ground penetrating radar (GPR) survey followed by targeted trial trenching of some of the features identified at both sites would enhance our understanding of the surviving archaeological deposits, and would provide evidence to increase the understanding of the archaeological landscape of Swaledale.

2. Project background

Location (Figure 1)

- 2.1 Geophysical surveys were conducted at two sites in Swaledale, North Yorkshire. The first was at Grinton Mound East which is situated south-west of Low Fremington, south of the River Swale (NGR: SE 05032 98465); the second was at Cogden Hall situated south of the B6270, east of Grinton (NGR centre: SE 05640 97905).

Objective

- 2.2 The principal aim of the surveys was to record and assess the nature and extent of any sub-surface features of potential archaeological significance at each site, as part of ongoing research by the Swaledale and Arkengarthdale Archaeology Group (SWAAG). A secondary aim was to provide geophysical survey training to SWAAG members; this was carried out at the Cogden Hall site.

Methods statement

- 2.3 The geophysical surveys were undertaken in accordance with a project design prepared by Archaeological Services Durham University, and to national standards and guidance (below, para. 5.1).

Dates

- 2.4 Fieldwork at Grinton Mound East was undertaken on the 12th October 2011; fieldwork at Cogden Hall was undertaken on the 6th December 2011. This report was prepared for February 2012.

Personnel

- 2.5 Fieldwork at Grinton Mound East was conducted by Andy Platell and Richie Villis (Supervisor); fieldwork at Cogden Hall was conducted by Catrin Jenkins, Natalie Swann and Richie Villis with members of SWAAG. The geophysical data were processed by Natalie Swann and Richie Villis. This report was prepared by Natalie Swann and Richie Villis, with illustrations by Tony Liddell, and edited by Duncan Hale, the Project Manager.

Archive/OASIS

- 2.6 The site codes are **SGM11** for Swaledale Grinton Mound East 2011 and **SCH11** for Swaledale Cogden Hall 2011. 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 **archaeol3-117329**.

Acknowledgements

- 2.7 Archaeological Services is grateful for the assistance of SWAAG, the Yorkshire Dales National Park Authority (YDNPA) and the landowners in facilitating this scheme of works.

3. Historical and archaeological background

- 3.1 Grinton Mounds sit on the floodplain on the south side of the River Swale and consist of two glacial terminal moraine mounds that have been modified by man. The mounds have been known by various names including Ox Hill, Grinton How, and

Grinton Fort. The mounds appear to have been fortified but no archaeological investigations have been conducted to define the date of these features and they have been interpreted as everything from prehistoric to medieval.

- 3.2 The western mound is the site of a 'Cold War' Royal Observer Corps bunker used from 1965 to 1991. Although most of the exterior of the mound appears to be intact the presence of the bunker would have an adverse effect on a geomagnetic survey and its construction may have impacted on any archaeological remains; this mound was therefore excluded from the present study.
- 3.3 No previous archaeological work has been conducted at the site of Cogden Hall. An earthwork survey conducted by SWAAG identified a number of earthworks of possible archaeological origin suggesting multiple phases of occupation. Cogden Hall itself is a Grade II listed building.

4. Landuse, topography and geology

- 4.1 At the time of the survey both sites were sheep-grazed pasture.
- 4.2 Grinton Mounds sit on the floodplain south of the River Swale at a mean elevation of approximately 185m OD. The Grinton Mounds consist of two terminal moraine mounds that appear to have been modified by man as defensive structures. Survey was conducted over the east mound, which is made up of a flat rectangular area enclosed by an earth bank. Beyond the bank there is a step down and a further earth bank. The mound is bounded by very steep slopes on the north and west sides. The earthworks are most visible on the north, west and south sides of the mound, on the eastern side there is more of a gradual slope down towards ground level.
- 4.3 The site at Cogden Hall is situated on a north-facing hillside, which slopes from 280m OD at the Hall down to approximately 185m OD at the B6270 road in the north.
- 4.4 The underlying solid geology of both sites comprises limestone and subordinate sandstone of the Alston Formation overlain by glaciofluvial deposits of sand and gravel. In the north-west corner of the Cogden Hall site the drift geology is comprised of alluvial fan 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 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 At both sites it was considered likely that cut features such as ditches and pits would be present, 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 laptop computers 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. Plots of filtered data and shaded relief plots are also provided. The greyscale images and interpretations are presented in Figures 2-8; the trace plots are provided in Figure 9. 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. Palette bars with the filtered images relate the greyscale intensities to standard deviations rather than absolute values.

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>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

5.10 The following filter has been applied to the geomagnetic data (Figures 3, 5 & 6):

<i>low pass filter</i>	(applied with Gaussian weighting) to remove high frequency, small-scale spatial detail, such as some near-surface ferrous debris; for enhancing larger weak features;
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Interpretation: anomaly types

5.11 Colour-coded geophysical interpretation plans are provided. Three types of geomagnetic 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

General comments

5.12 Colour-coded archaeological interpretation plans are provided.

5.13 Except where stated otherwise in the text below, positive magnetic anomalies are taken to reflect relatively high magnetic susceptibility materials, typically sediments in cut archaeological features (such as ditches or pits) whose magnetic susceptibility has been enhanced by decomposed organic matter or by burning.

5.14 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 plans, however, they have been omitted from the archaeological interpretation plans and the following discussion.

Grinton Mound East

- 5.15 A series of concentric, roughly 60m square, positive magnetic anomalies have been detected. These reflect relative increases in high magnetic susceptibility soils and sediments, often in cut features such as ditches, but also upcast as banks or to create terraces. These anomalies broadly correspond with the upstanding earthworks and are likely to reflect a series of defensive ditches and embankments constructed to enclose the top of the mound. Weak linear negative magnetic anomalies have been detected in between these ditches, which may reflect the presence of stonework within the embankments. A break in these features occurs in the centre of the eastern edge of the mound, which may represent an entrance into the enclosure.
- 5.16 Within the enclosure created by the earth banks and ditches a number of discrete positive magnetic anomalies have been detected, which may reflect soil-filled postholes or pits. Towards the north-east corner of the enclosure these anomalies appear to form a ring-ditch, possibly associated with a roundhouse, approximately 10m in diameter. Two smaller circular features, c.6m in diameter, could also be formed by similar anomalies. Concentrations of dipolar magnetic anomalies have been detected within the enclosure, which may reflect occupation debris.
- 5.17 A linear positive magnetic anomaly was detected aligned north-east/south-west which correlates with an earthwork on the ground and may reflect a former land boundary. A break in this feature appears to be aligned with the entrance on the mound, suggesting these features may be contemporary.
- 5.18 At the south end of this feature, a parallel, weak, negative magnetic anomaly has been detected, and the positive anomaly appears much weaker than elsewhere along the feature. This could reflect stonework within the earthen bank. The earthwork itself is more defined at this end than further north. It is possible that this feature has been enhanced relatively recently as the south end of this area is recorded as a golf course on early Ordnance Survey maps.
- 5.19 East of the linear earthwork two broad diffuse positive magnetic anomalies were detected, which cross from the south and east towards the entrance within the linear bank and then towards the mound proper. These anomalies may reflect the remains of trackways and do not correspond to any recorded earthworks.
- 5.20 A number of other linear positive magnetic anomalies were detected across the survey area, which are likely to reflect soil-filled ditches. The extreme south-east corner of the survey area encompassed an east-west aligned earthwork, which has been detected in the geophysical data as a strong positive magnetic anomaly.
- 5.21 Ditch features detected in the south of the survey area may reflect features associated with the former golf course. If these features are contemporary with the earthworks and mound then it is likely they are severely truncated.

- 5.22 Upstanding earthworks relating to former ridge and furrow cultivation exist to the east of the survey area. These may be reflected in the geophysical data as weak positive magnetic anomalies.
- 5.23 It is considered likely that Grinton Mound East is a defended settlement. Relatively few features have been identified within the defensive compound itself. The possible location of a roundhouse within the compound would be consistent with an interpretation as a Romano-British settlement rather than a Roman military marching camp. It is possible that Grinton Mounds represents a defended centre for the nearby Romano-British farming settlements, such as West Hagg.

Cogden Hall

Area 1

- 5.24 A number of linear and curvilinear positive magnetic anomalies have been detected across this area, which broadly correspond to upstanding earthworks. These anomalies probably reflect soil-filled ditches. These ditches appear to form a series of enclosures. The easternmost linear anomaly, aligned approximately north-south, has a gap in it which could reflect an entrance into the enclosures.
- 5.25 A smaller sub-circular positive magnetic anomaly detected in the south-west corner of the survey area could possibly reflect a soil-filled ring-ditch, such as those associated with roundhouses. A second oval positive magnetic anomaly on the north edge of the survey could similarly reflect another ring-ditch.
- 5.26 A number of discreet dipolar magnetic anomalies have been detected across the survey area with a heavy concentration within the centre of the enclosures. These anomalies almost certainly reflect near-surface ferrous or fired debris and may be the result of occupational debris or small-scale industrial/quarry waste. The intense, large and strong dipolar magnetic anomaly reflects a sheep feeder.
- 5.27 Linear positive magnetic anomalies have been detected aligned approximately north-south and east-west which may reflect former plough regimes, such as ridge and furrow.

Area 2

- 5.28 A sub-rectangular positive magnetic anomaly has been detected in the north-east corner of this area. This corresponds with an upstanding earthwork which consists of a slightly raised platform surrounded by earth banks. The positive magnetic anomaly is likely to reflect the higher magnetic susceptibility sediments of either soil-filled ditches or upcast against the earthwork banks.
- 5.29 Upstanding earthworks in the south of this area correlate to positive magnetic and dipolar magnetic anomalies.
- 5.30 A sub-circular positive magnetic anomaly has been detected in the south-east corner of the survey area. This could possibly reflect a soil-filled ring-ditch, possibly associated with a roundhouse.
- 5.31 Positive magnetic anomalies in this region are likely to reflect soil-filled ditch features and upcast against the banks of possible housing platforms. Concentrations of dipolar magnetic anomalies are likely to reflect fired and ferrous waste. The

concentration of these anomalies within the enclosed areas and potential housing platforms may reflect occupational debris, or possibly quarrying waste.

- 5.32 Other linear and curvilinear positive magnetic anomalies, which almost certainly reflect soil-filled ditch features, have been detected across this survey area.
- 5.33 The east-west aligned chain of strong dipolar magnetic anomalies detected across the central part of the survey area almost certainly reflects a service. An intense dipolar magnetic anomaly has been detected in the extreme south corner of the survey area. This corresponds to a large and steep mound in the corner of the field, and possibly reflects quarrying waste.

6. Conclusions

- 6.1 Geophysical survey was undertaken at two sites of potential archaeological significance in Swaledale, North Yorkshire. Two surveys totalling 2.6ha were undertaken at Cogden Hall, a potential early settlement. A single 1ha survey was undertaken at Grinton Mound East, a possible Romano-British defended enclosure.
- 6.2 The surveys combined training with members of the Swaledale and Arkengarthdale Archaeology Group (SWAAG) with continued research into the historic landscape of Swaledale.
- 6.3 A series of defensive ditches and stone banks have been identified at Grinton Mound East. Within this enclosure a number of possible structures have been identified. External features, such as possible trackways and ditches, have also been identified. It is considered likely that the surviving earthworks and geophysical anomalies detected at Grinton Mound East reflect the remains of a significant fortified settlement. Sub-surface archaeology outside the earthworks, especially to the south, may have been impacted upon by later landscaping activity, specifically in the use of this area as a golf course.
- 6.4 Several features have been detected at Cogden Hall, where a number of anomalies complimented previously recorded earthworks. Series of enclosures and concentrations of fired or ferrous debris, possibly reflecting occupation or small-scale industrial activity have been identified. A modern service has been detected.
- 6.5 Targeted earth electrical resistance and ground penetrating radar (GPR) survey followed by targeted trial trenching of some of the features identified at both sites would enhance our understanding of the surviving archaeological deposits, and would provide evidence to increase the understanding of the archaeological landscape of Swaledale.

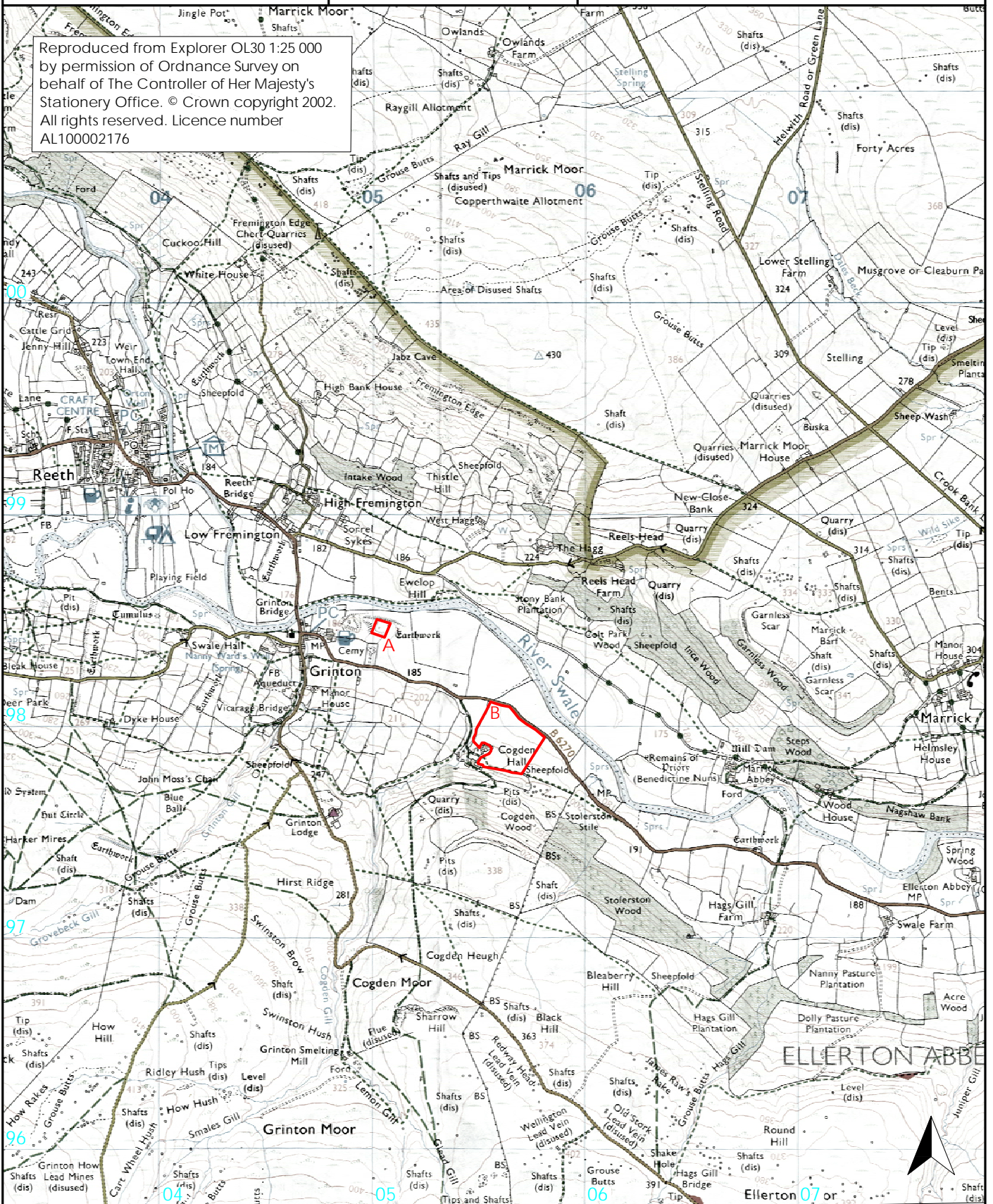
7. Sources

- 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

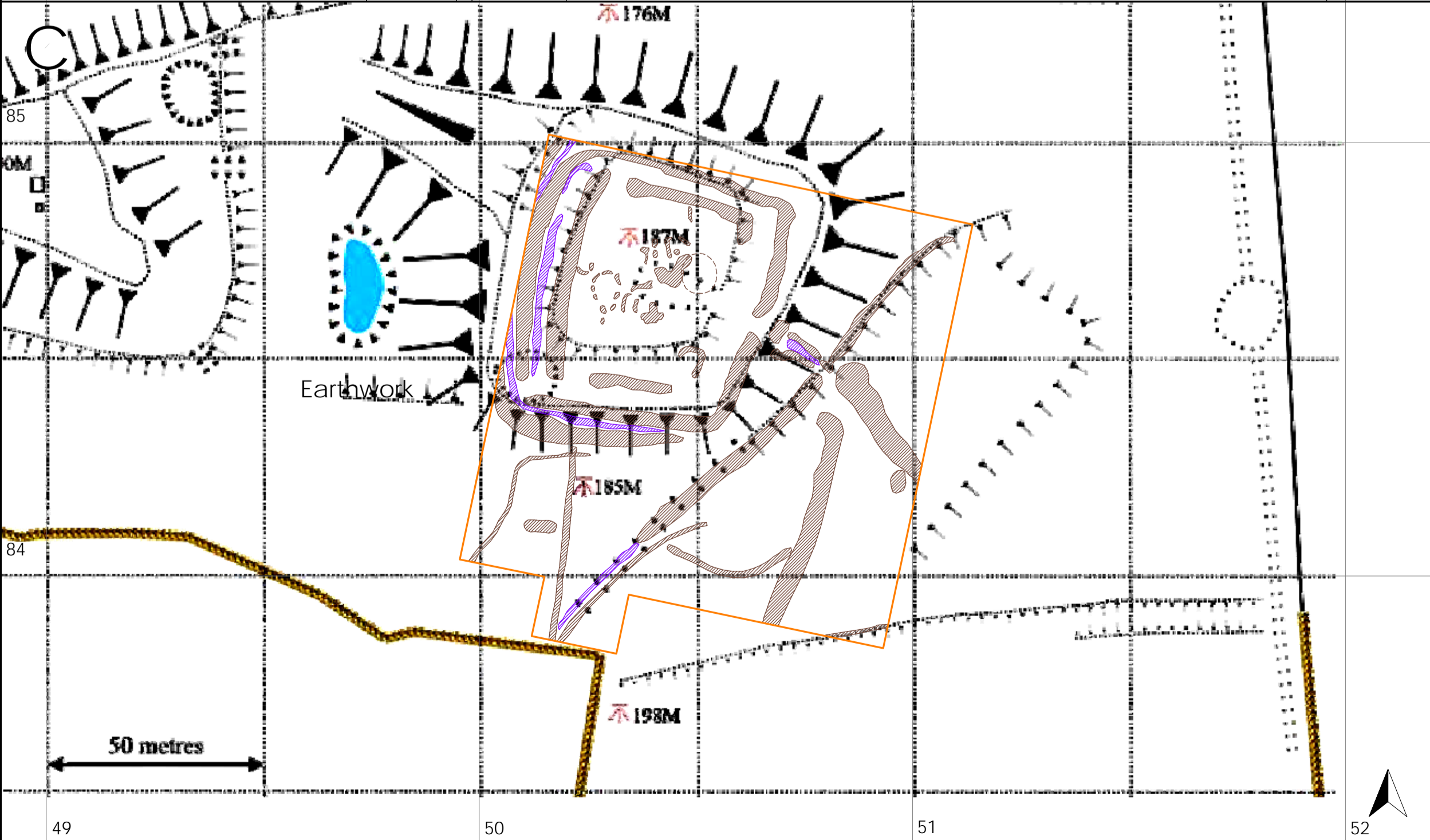
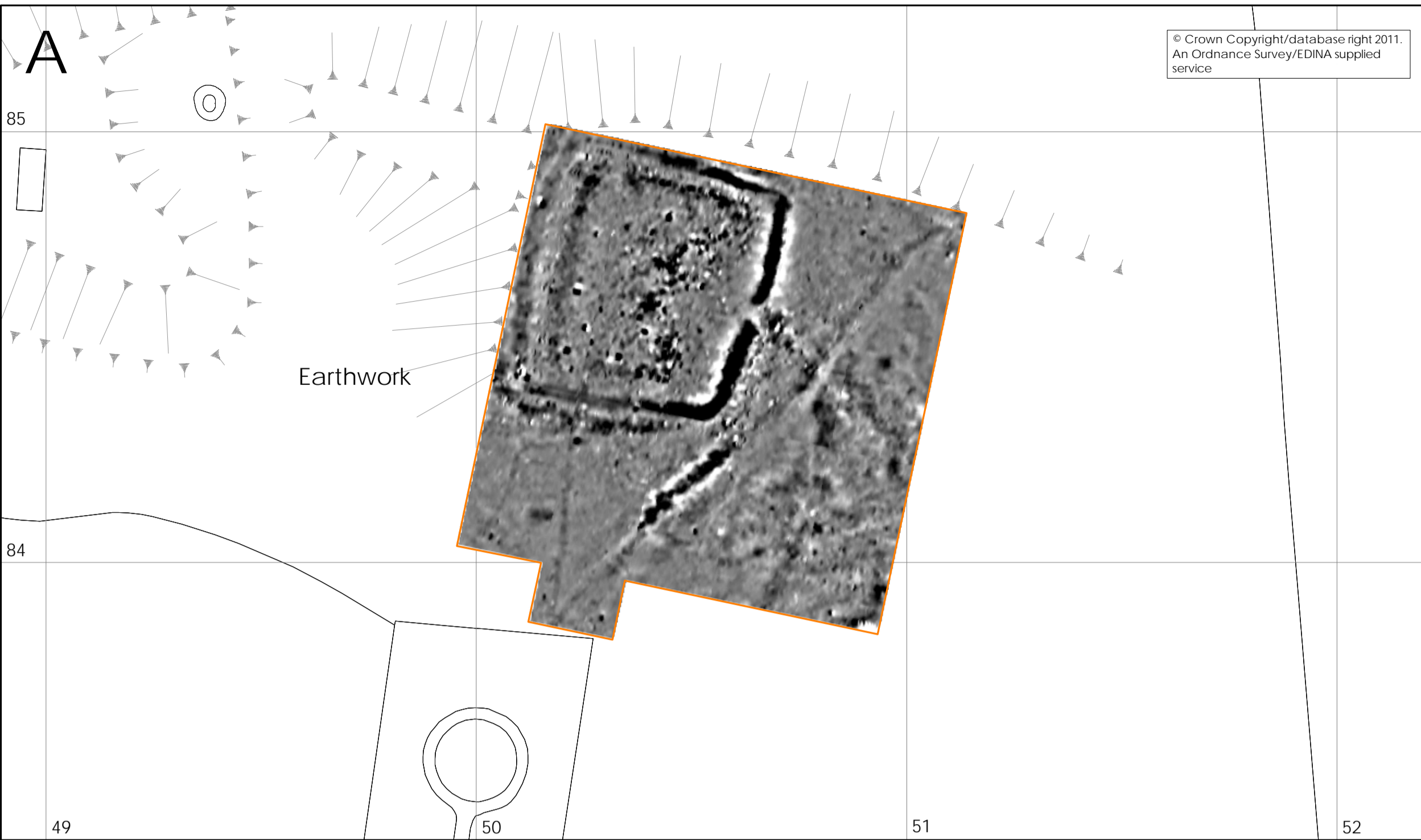
Figure 1: Site locations

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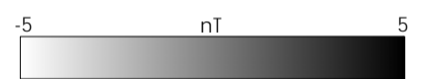
A: Grinton Mound East B: Cogden Hall





A - geophysical survey

magnetic survey



B - geophysical interpretation

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

C - archaeological interpretation
with SWAAG topographic survey
underlay

- soil-filled feature
- stone / rubble



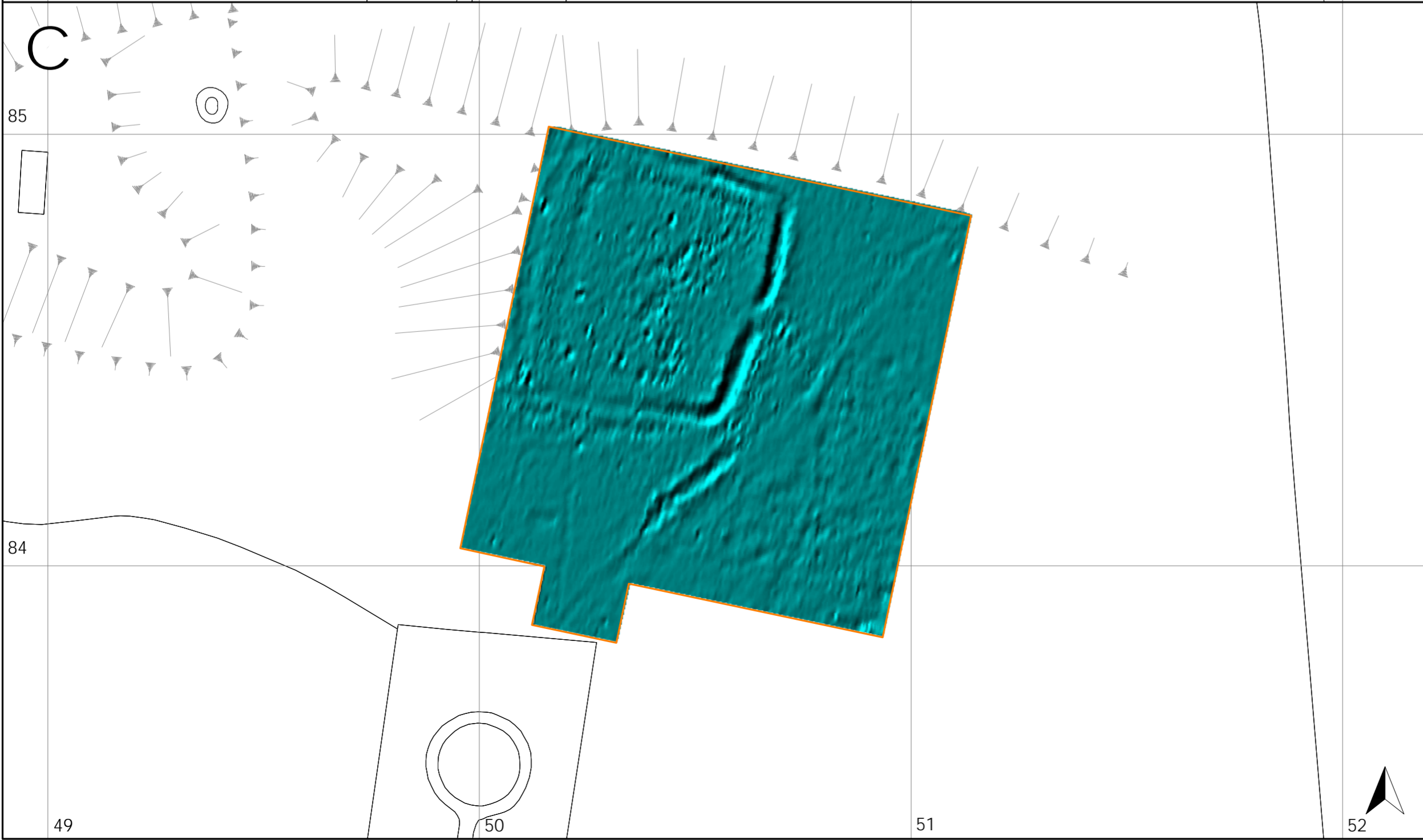
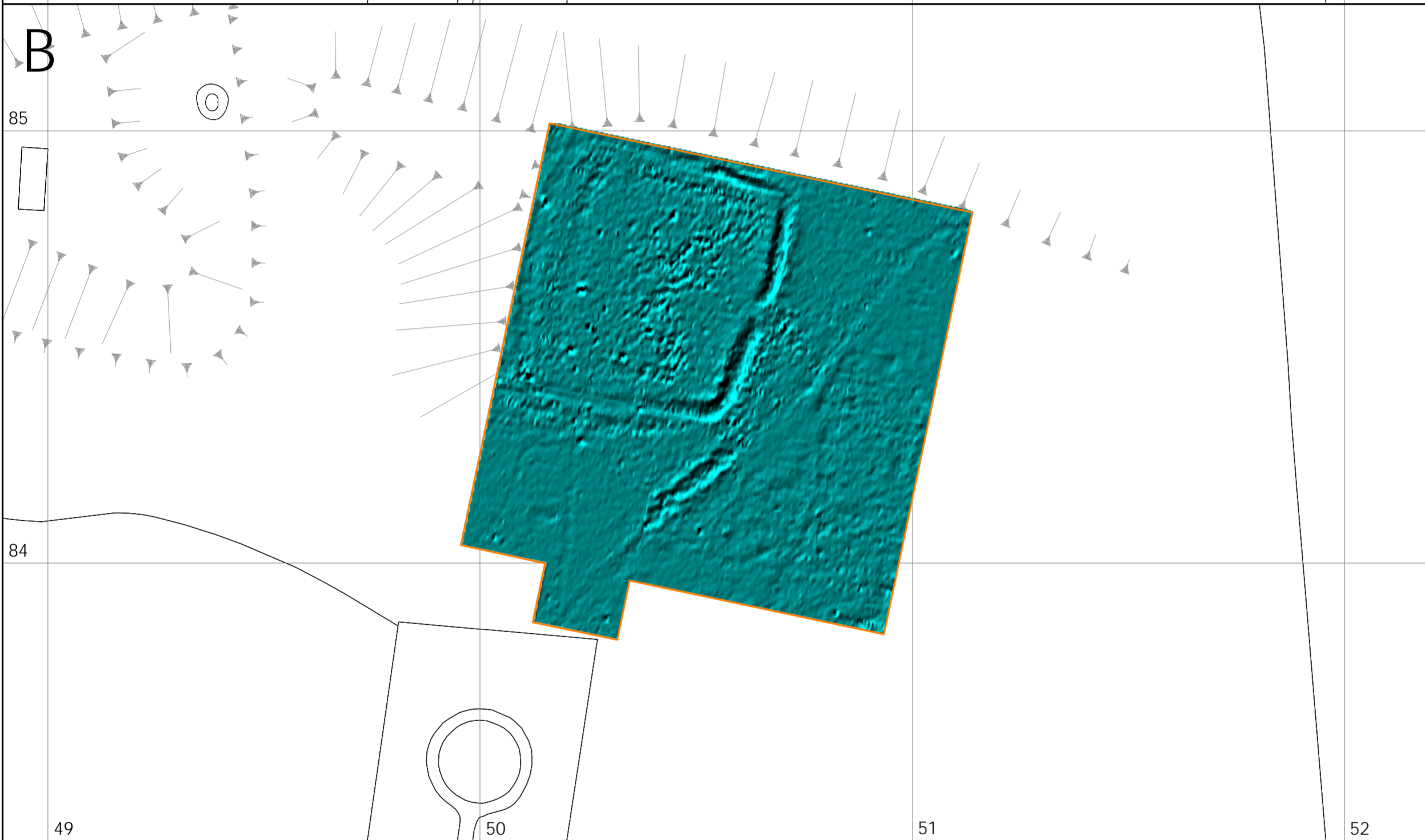
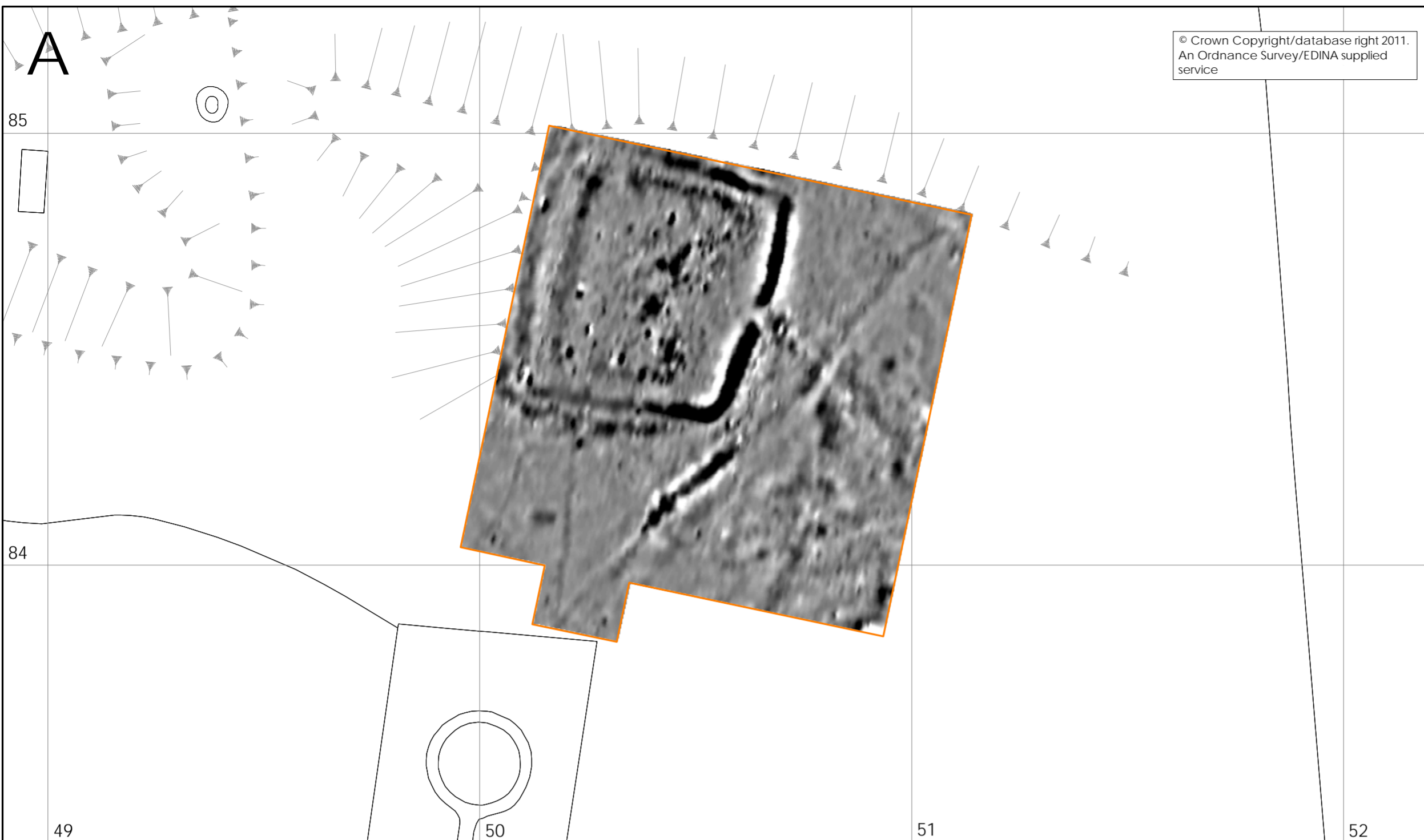
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Figure 2: Grinton Mound East
geophysical survey and interpretations



A - geophysical survey (filtered)

 magnetic survey

B - relief plot

C - relief plot (filtered)

0 50m
scale 1:1000 for A2 plot

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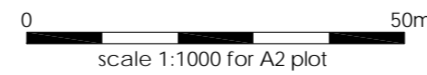
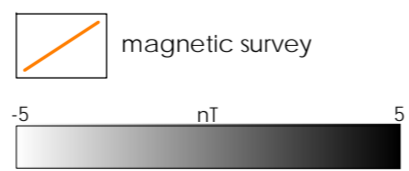
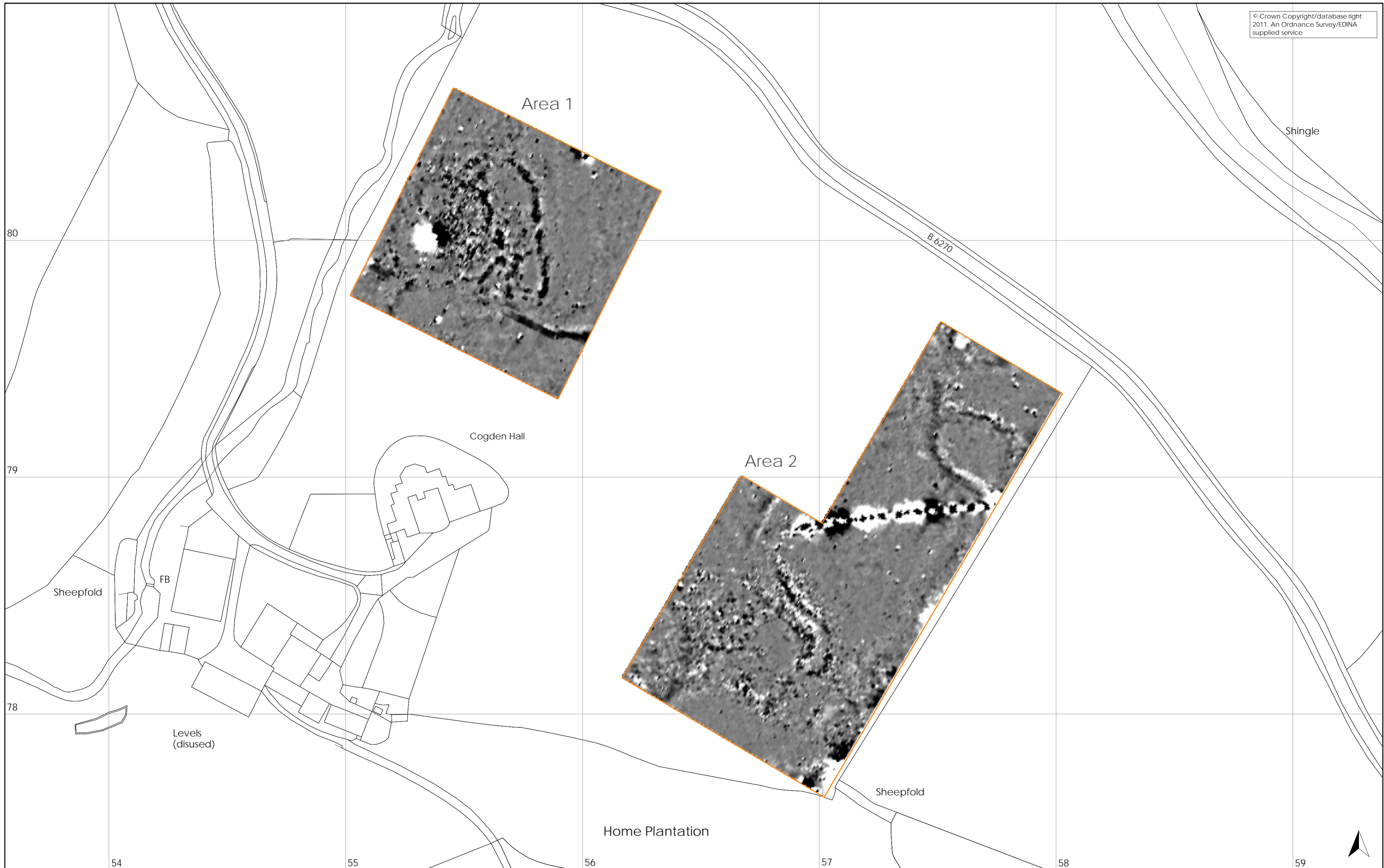
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Figure 3: Grinton Mound East
geophysical survey (filtered data and
relief plots)





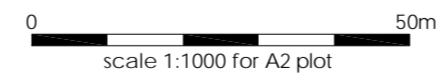
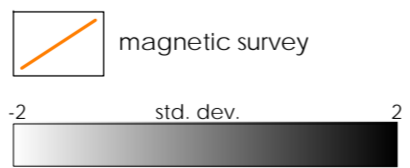
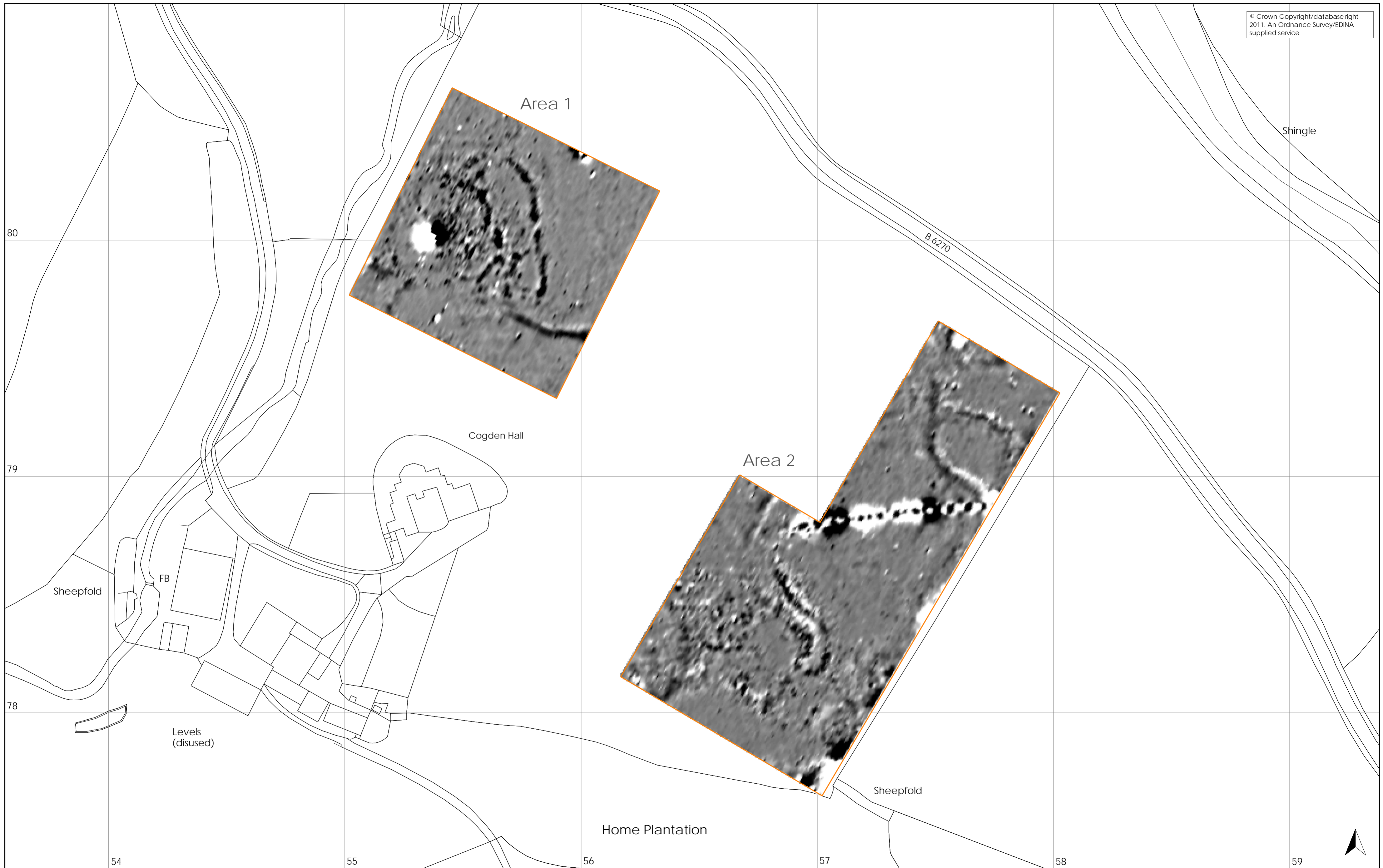
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Figure 4: Cogden Hall geophysical survey



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Figure 5: Cogden Hall geophysical survey
(filtered data)





 magnetic survey

0 50m
scale 1:1000 for A2 plot

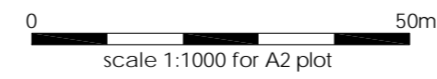
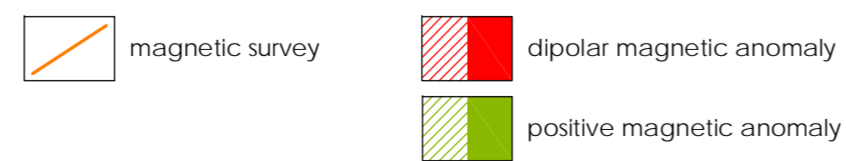
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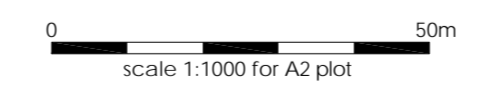
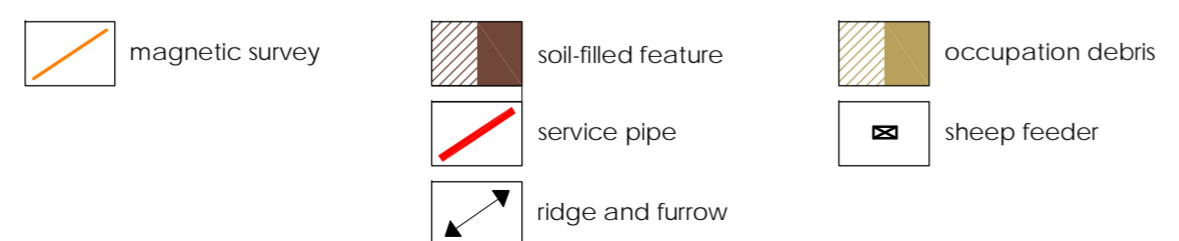
Figure 6: Cogden Hall geophysical survey (relief
plots of filtered data)



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Figure 7: Cogden Hall geophysical
interpretation

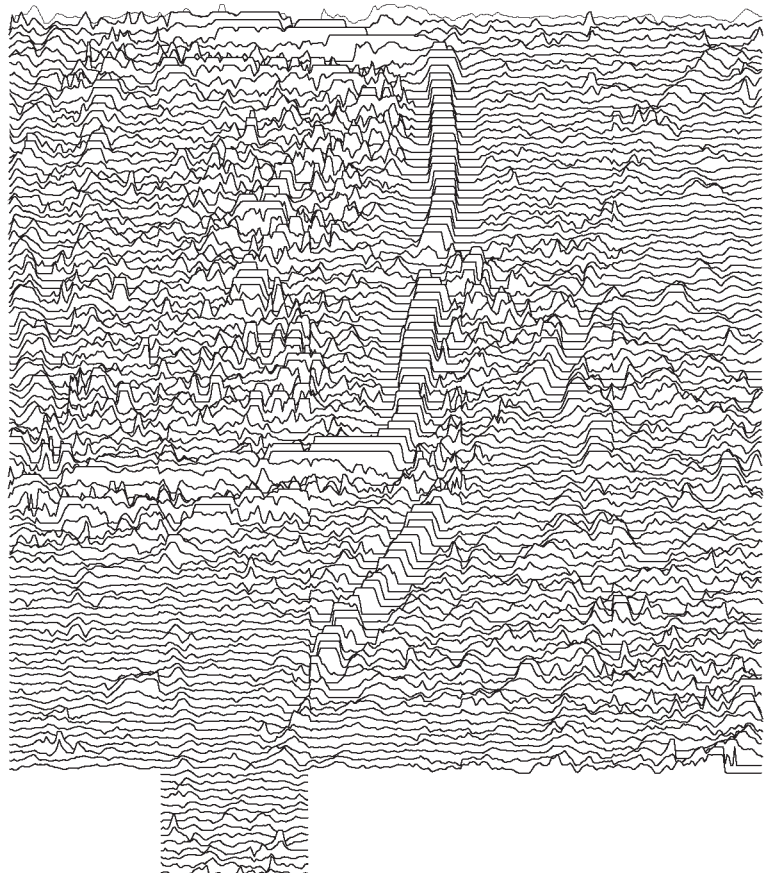


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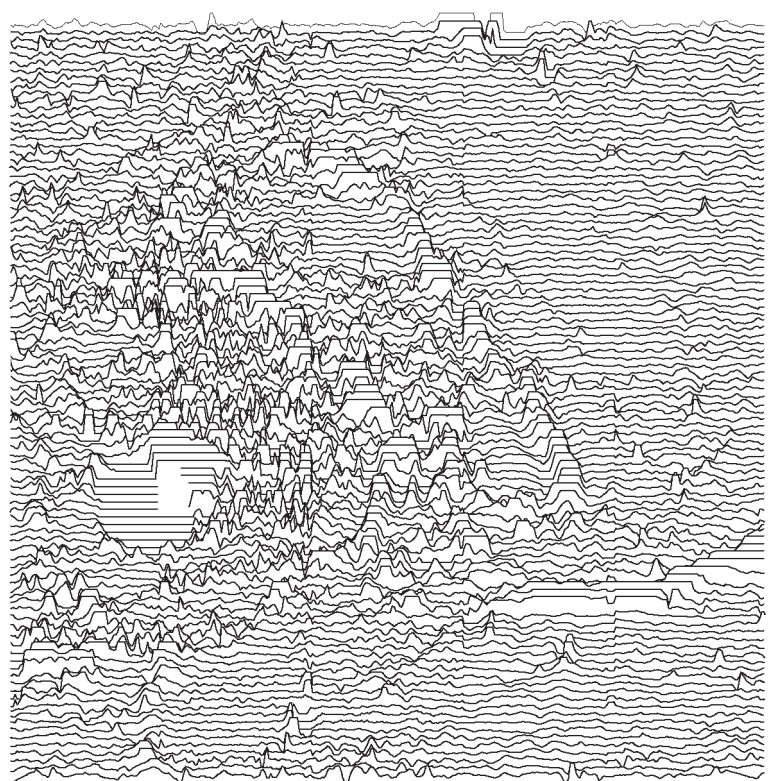


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Figure 8: Cogden Hall archaeological
interpretation

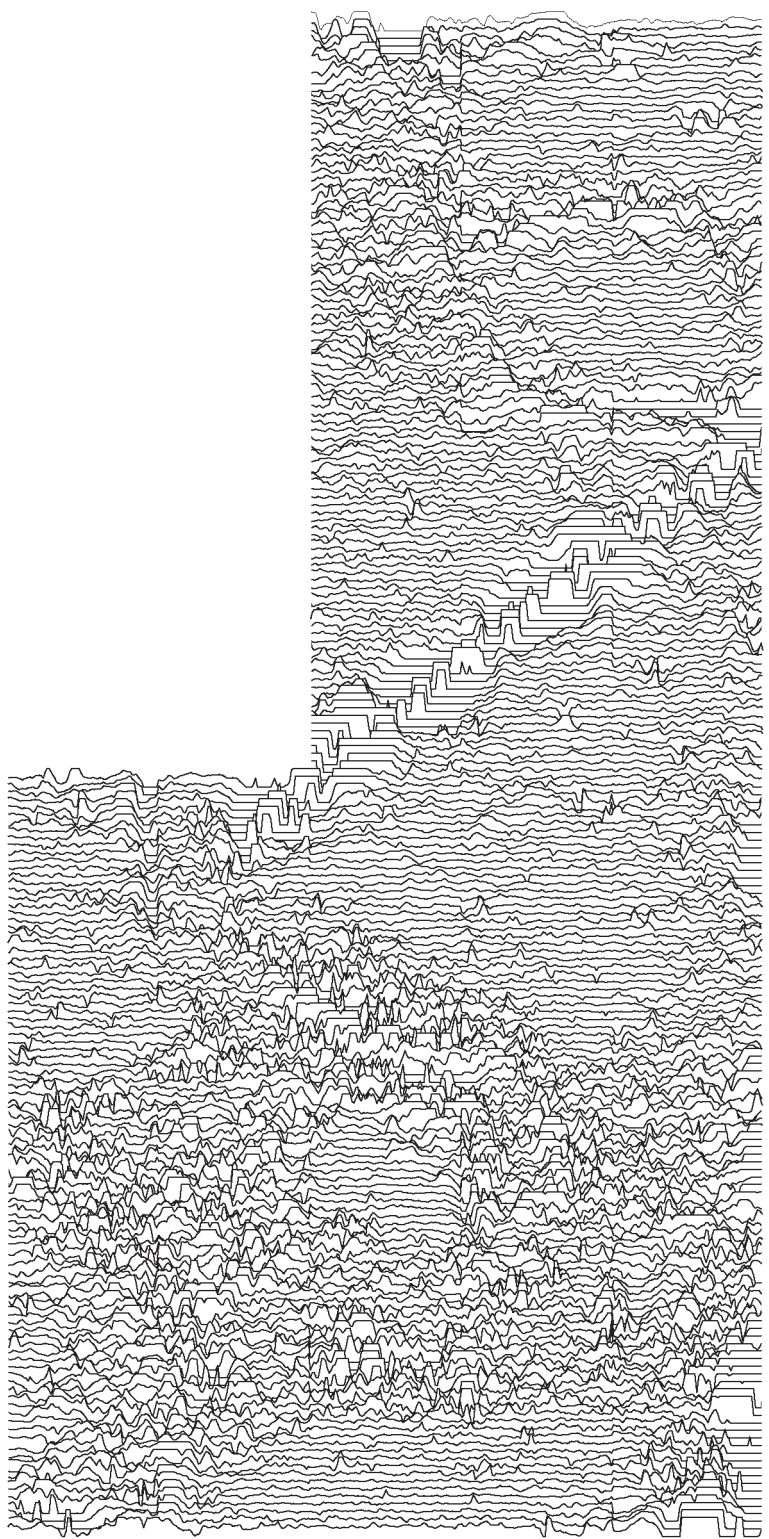
Figure 9:
Trace plots of geomagnetic data



Grinton Mound East
0.2=20.10nT/cm
0 50m
scale 1:1000



Cogden Hall Area 1
0.2=22.50nT/cm
0 50m
scale 1:1000



Cogden Hall Area 2
0.2=19.60nT/cm
0 50m
scale 1:1000