ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
URS

Laverock Hall Road
Blyth
Northumberland

geophysical survey

report 3405
April 2014

Durham University

Contents

Figures

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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 Laverock Hall Road, Blyth. The works comprised the geomagnetic survey of 8.4ha of arable land.

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

Results

1.3 An anomaly which may reflect a soil-filled ditch / post-medieval boundary feature were detected in Area 1.

1.4 Anomalies reflecting former ridge and furrow cultivation were identified across both areas surveyed. The ridge and furrow signature is likely to be insufficient to mask underlying features.

1.5 A concentration of modern rubble / land fill was detected in Area 1.

1.6 Anomalies reflecting land drains were detected in both areas surveyed. A modern service was detected along the north edge of the field.

2. Project background

Location (Figure 1)

2.1 The proposed development area was located south of Laverock Hall Road, Blyth Northumberland (NGR centre: NZ 2972 7898). Two surveys were conducted in one land parcel totalling 8.4ha. To the north and west is open farmland; to the north-east is residential housing. The site is bounded by the A1061 to the south and Laverock Hall Road to the north.

Development proposal

2.2 The proposed development is residential.

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 development.

Methods statement

2.4 The surveys have been undertaken in accordance with a Written Scheme of Investigation provided by URS and approved by the Assistant County Archaeologist for Northumberland County Council and in line with national standards and guidance (below, para. 5.1).

Dates

2.5 Fieldwork was undertaken between 27th and 31st March 2014. This report was prepared for April 2014.

Personnel

2.6 Fieldwork was conducted by Natalie Swann (supervisor) and Rebekah Watson. The geophysical data were processed by Duncan Hale. This report was prepared by Natalie Swann with illustrations by David Graham and edited by Peter Carne.

Archive/OASIS

2.7 The site code is **LHB14**, for **L**averock **H**all **B**lyth 20**14**. 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 **archaeol3-176259**.

3. Historical and archaeological background

3.1 A detailed examination of the historical and archaeological background of the site has been undertaken (URS 2014); the results of that report are summarised below.

Previous archaeological works

3.2 No previous archaeological work has been conducted within the proposed development area, although a number of assessments have been conducted in the surrounding area. Geophysical survey at South Newsham Road revealed a series of furrows. Geophysical survey followed by trial trenching adjacent to the east of the

site revealed a prehistoric water channel and prehistoric flints, and furrows of presumed medieval origin.

The prehistoric and Roman periods (up to 5th century)

3.3 The site of a possible rectilinear enclosure was identified immediately east of the proposed development area (PDA). However, an archaeological evaluation did not detect the enclosure, although one flint core was recovered. There are no known Roman sites within or near the PDA.

The medieval period (5th century to 1540)

3.4 The PDA was situated within an area of three medieval farmsteads known as the village of Newsham. It is likely the PDA was in use as agricultural land during the medieval period.

The post-medieval and modern periods (1541 to present)

3.5 The former Plessey waggonway closed in 1812 and lies 500m north of the PDA. The line of the former Morpeth to Bedlington railway lies immediately to the west of the PDA.

3.6 The PDA has remained undeveloped through the post-medieval and modern periods.

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised a single field of arable land. A series of geotechnical test pits had been excavated across the field. An area of disturbed ground was noted in the northeast part of the survey area which contained a concentration of brick and concrete rubble. Further rubble in a lower concentration was visible on the ground spread across the northern part of the field. It was not possible to collect data in two small areas due to flooding.

4.2 The field was gently undulating with an elevation ranging from approximately 18.5m OD to 21m OD. There was a notable rise in the south-east corner of the field.

4.3 The underlying solid geology of the area comprises Pennine middle coal measures overlain by a drift geology of 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 & 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 in the area, 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 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 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:

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 0.25m intervals

Interpretation: anomaly types

5.10 A colour -coded geophysical interpretation plans 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

Interpretation: features

Area 1

5.11 One linear positive magnetic anomaly was detected in the north-west part of the survey area aligned north-west/south-east, which could reflect a soil-filled feature such as a ditch. This continues the line of a field boundary in the field to the north visible on the 1st edition Ordnance Survey map and subsequent editions.

5.12 Two series of slightly curving but broadly linear positive magnetic anomalies have been detected in this area, one series aligned north-east/south-west and the other aligned north-west/south-east. These anomalies are likely to reflect soil-filled features; the slightly curving nature of the anomalies indicates that they reflect former ridge and furrow cultivation.

5.13 Further linear positive magnetic anomalies have been detected in the south-east part of this survey area aligned north-east/south-west; these anomalies are more diffuse and are likely to reflect land drains.

5.14 A concentration of dipolar magnetic anomalies has been recorded in the north of the survey area. These anomalies correspond to a spread of brick rubble noted on the ground. The defined edges to this feature suggest it may reflect an enclosure where land fill has taken place or other disturbance including the spreading of rubble.

5.15 Further small, discrete dipolar magnetic anomalies have been detected across 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.

5.16 A chain of dipolar magnetic anomalies was detected along the north edge of the survey area which is likely to reflect a modern service.

Area 2

5.17 A series of linear positive magnetic anomalies was detected aligned north-west/south-east. These anomalies reflect a continuation of the former ridge and furrow cultivation detected in Area 1. Two linear positive magnetic anomalies were detected aligned north-east/south-west either side of a gap in the furrows; these anomalies are likely to reflect headlands from the ploughing. This is reflected in a field boundary visible on the 1st edition Ordnance Survey map and subsequent editions.

5.18 Further linear positive magnetic anomalies have been detected in this area, aligned north-east/south-west; these anomalies are more diffuse and are likely to reflect land drains.

5.19 Small, discrete dipolar magnetic anomalies have also been detected across the survey area. 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.

6. Conclusions

6.1 8.4ha of geomagnetic survey was undertaken at land south of Laverock Hall Drive, Blyth prior to proposed development.

6.2 An anomaly which may reflect a soil-filled ditch / post-medieval boundary feature were detected in Area 1.

6.3 Anomalies reflecting former ridge and furrow cultivation were identified across both areas surveyed. The ridge and furrow signature is likely to be insufficient to mask underlying features.

6.4 A concentration of modern rubble / land fill was detected in Area 1.

6.5 Anomalies reflecting land drains were detected in both areas surveyed. A modern service was detected along the north edge of the field.

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

URS 2014 *WSI for Archaeological Geophysical Survey; Laverock Hall Drive.* URS Infrastructure and Environment UK ltd

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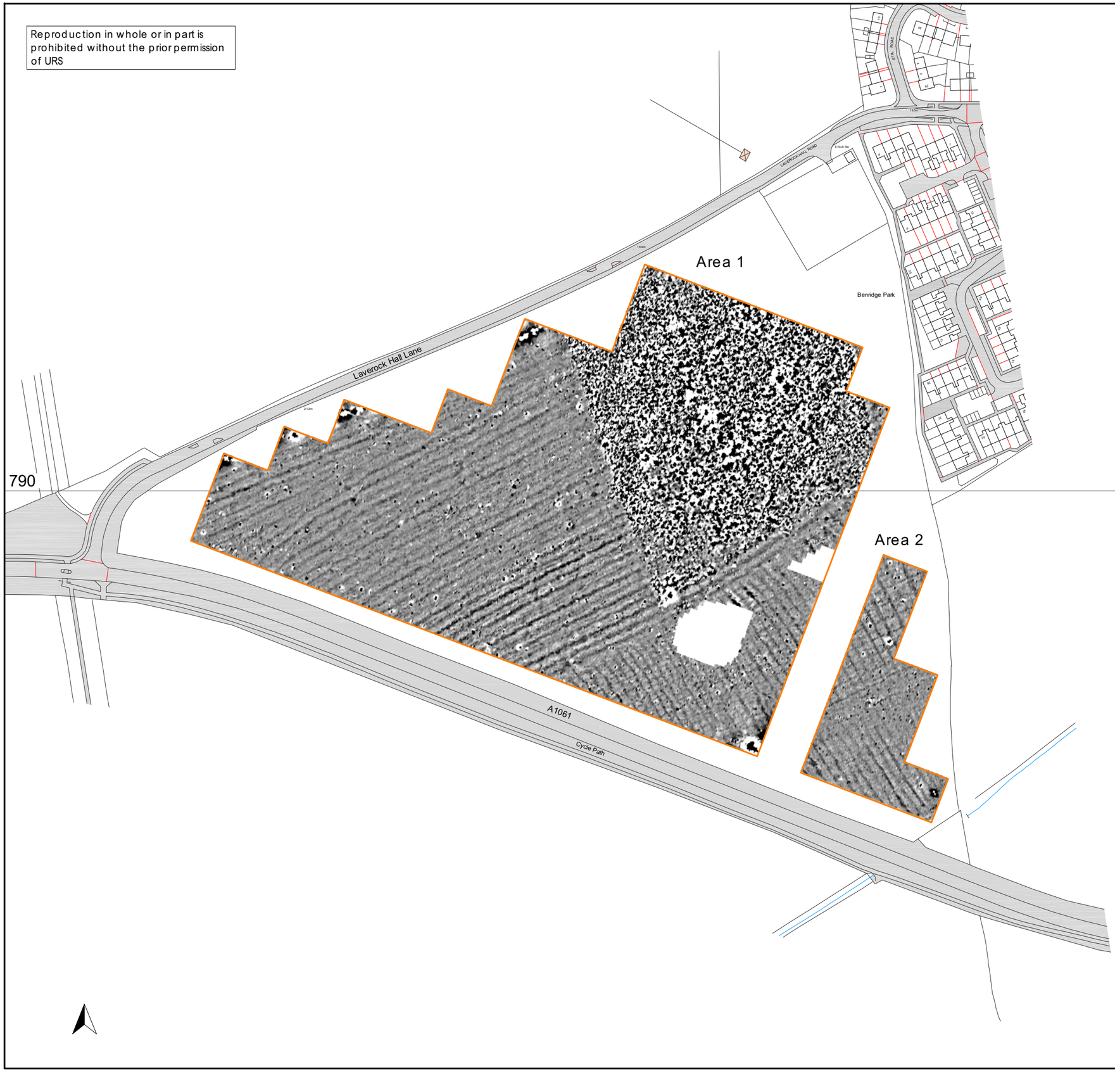
Figure 1: Site location

site location

0 1km
scale 1:25 000 for A4 plot



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report 3405

Figure 2: Geophysical survey overview

0 100m
scale 1:2500 for A3 plot

magnetic survey

-3 nT 4

Area 1

Area 2

Benridge Park

Laverock Hall Lane

A1061

Cycle Path

18.9m

21.3m

791

790

789

788

294

295

296

297

298

magnetic survey

-3 nT 4

0 50m

scale 1:1000 for A2 plot

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DURHAM UNIVERSITY

on behalf of
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Laverock Hall Road
Blyth
Northumberland

geophysical survey
report 3405

Figure 3: Geophysical survey

Area 1

Area 2

Benridge Park

Laverock Hall Lane

A1061

Cycle Path

18.9m

21.3m

791

790

789

788

294

295

296

297

298

magnetic survey

dipolar magnetic anomaly

positive magnetic anomaly

negative magnetic anomaly

0 50m

scale 1:1000 for A2 plot

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Blyth
Northumberland

geophysical survey
report 3405

Figure 4: Geophysical interpretation

Area 1

Area 2

Benridge Park

Laverock Hall Lane

18.9m

21.3m

A1061

Cycle Path

791

790

789

788

294

295

296

297

298

magnetic survey

soil-filled feature

disturbed area/ rubble

service pipes

ridge and furrow

land drain

0 50m

scale 1:1000 for A2 plot

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Laverock Hall Road
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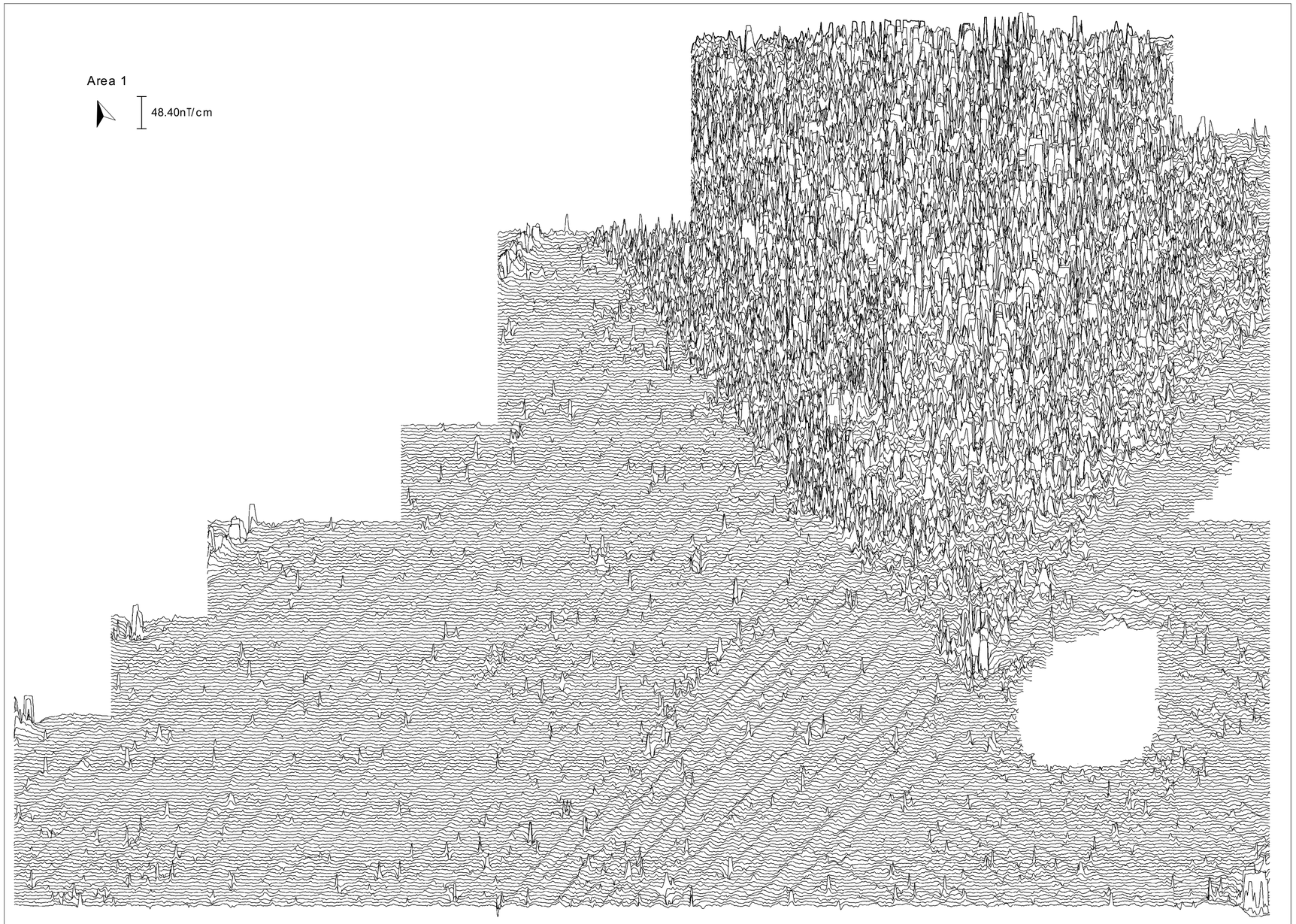
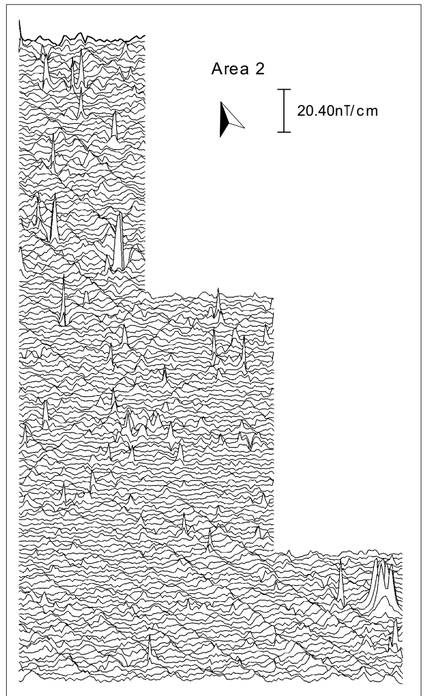
Northumberland

geophysical survey
report 3405

Figure 5: Archaeological interpretation





0 50m
scale 1:1000 for A2 plot

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Northumberland

geophysical survey
report 3405

Figure 6: Trace plots of geomagnetic data