Archaeological Services
University of Durham

Land near New Barns Farm, Warkworth, Northumberland

geophysical surveys

on behalf of
The Northumberland Estates

Report 1672
July 2007

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Estate Office, Alnwick Castle, Alnwick, Northumberland NE66 1NQ

Contents

1. Summary

The project

1.1 This report presents the results of geophysical surveys conducted in advance of a proposed development at New Barns Farm, Warkworth, Northumberland. The works comprised geomagnetic surveys of three fields.

1.2 The works were commissioned by The Northumberland Estates and conducted by Archaeological Services in accordance a written scheme of investigation (WSI) provided by Archaeological Services and approved by the Assistant County Archaeologist.

Results

1.3 The former ridge and furrow cultivation evident on the surface of Area 1 was recorded, along with possible additional traces in Area 3.

1.4 Small soil-filled pit-like features, possibly of archaeological origin were detected in Areas 2 and 3.

1.5 Two linear anomalies in Area 1 probably reflect former field boundaries.

2. Project background

Location (Figure 1)

2.1 The study area is located at New Barns Farm, Warkworth, Northumberland, (NGR centre: NU 2465 0465) and is bounded by the farm buildings to the west, farmland to the north and south, and Guilden Road and Guilder's Burn to the east. The survey area comprised three fields measuring approximately six hectares (Figure 2).

Development proposal

2.2 The proposed development is for the provision of holiday accommodation. The proposals are at the pre-application stage, planning reference number A40/2; 6802.

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 advance of development.

Methods statement

2.4 The surveys have been undertaken in accordance with a written scheme of investigation (WSI) provided by Archaeological Services and approved by the Assistant County Archaeologist at Northumberland County Council.

Dates

2.5 Fieldwork was undertaken on 29th May and 5th July 2007. This report was prepared between 6th and 16th July 2007.

Personnel

2.6 Fieldwork was conducted by Aidan Bell, Ed Davies, Louise Robinson, Richie Villis and Lorne Elliott (Supervisor). This report was prepared by Lorne Elliott with illustrations by David Graham. The Project Manager was Duncan Hale.

Archive/OASIS

2.7 The site code is **NBW07**, for **N**ew **B**arns Farm, **W**arkworth 20**07**. The survey archive will be supplied on CD to Alnwick Castle. Archaeological Services 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 **archaeol3-28461**.

3. Archaeological and historical background

3.1 A desk-based assessment undertaken for this project in April (Archaeological Services 2007) indicates there is no known prehistoric activity in the proposed development area, however, there is evidence in the surrounding environment

including a Neolithic cup and ring marked stone and Bronze Age incised rocks to the west of the study area (SMR 5558 and SAM 24598). Guilder's Burn flows along the southeastern boundary of the application site. This watercourse may have been a favourable resource from the early prehistoric period onwards.

3.2 Cropmarks have been identified from aerial photographs to the northwest and west of the study area (SMR 5453, 5569, 5583 and 5585). A double-ditched circular enclosure with a hut circle inside lies to the northwest, close to the River Coquet. Two circular earthworks and a boundary bank visible as a parch-mark also lie to the west; the specific period is unknown.

3.3 Cropmarks thought to represent Roman features have been recorded to the east of the study area (SMR 5598 and 5615) and a fragment of Roman altar was found west of Gloster Hill in 1856 (SMR 5599). To the north of the study area a Roman statuette of Bacchus was found in Heather Leazes (SMR 5441).

3.4 A World War II pillbox lies close to the western edge of the study area (SMR 19939). This pillbox, along with another three nearby, formed part of the WWII defences for the Warkworth area (SMR 20001, 20063 and 5616).

3.5 An aerial photograph from the 1960s shows ridge and furrow in the southern field of the site and in several other fields nearby. The land was drained in the late 1800s but has otherwise remained unchanged since the medieval period.

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised three fields; the southern field was pasture, the remaining two were set-aside. Ridge and furrow was evident on the surface of survey Area 1, the southernmost field. Survey Areas 2 and 3 to the north were fields of set-aside containing oilseed rape, spearwort and dock. The northern field contained several small haystacks in the central part of the survey area (Figure 2).

4.2 The elevation of the site ranges between *c*.7m and *c*.24m OD. All three fields slope eastwards down to Guilder's Burn.

4.3 The underlying solid geology of the area comprises Westphalian Coal Measures and Namurian Millstone Grit Series, which is overlain by alluvium and boulder clay with morainic drift.

5. Geophysical survey

Standards

5.1 The surveys and reporting were conducted in accordance with English Heritage Research and Professional Services Guideline No.1, *Geophysical survey in archaeological field evaluation* (David 1995); the Institute of Field Archaeologists Technical Paper No.6, *The use of geophysical techniques in*

archaeological evaluations (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2001).

Technique selection

5.2 Geophysical surveying enables the relatively rapid and non-invasive identification of potential archaeological features within landscapes and can involve a variety of complementary techniques such as magnetometry, electrical resistance, ground-penetrating radar and electromagnetic survey. Some techniques are more suitable than others in particular situations, depending on a variety of 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 desktop evidence (Archaeological Services 2007), 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) 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 each of the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record minute 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 The study area comprised three land parcels containing three separate survey areas totalling *c*.6ha. Survey Area 1, the southernmost field, was undertaken on the first visit on 29th May. Areas 2 and 3 were surveyed on 5th July, following rolling of the set-aside vegetation, which may have affected the quality of the data recorded. Up to one hectare along the northwestern side of the proposed development area was still unavailable for survey due to the height of the vegetation.

5.6 A 30m grid was established across each survey area and tied-in to known, mapped Ordnance Survey points using a Trimble Pathfiner Pro XRS global positioning system (GPS) with real-time correction.

5.7 Measurements of vertical geomagnetic field gradient were determined using two 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 set to 0.1nT, the sample interval to 0.25m and the traverse interval to 1.0m, thus providing 3600 sample measurements per 30m grid unit.

5.8 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

5.9 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 (unfiltered) data. The greyscale images and interpretations are presented in Figures 3-5; the trace plots are provided in Appendix I. 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.

5.10 The following basic processing functions have been applied to each dataset:

Clip	clips, or limits 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 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 gradiometer data have been interpolated to 0.25 x 0.25m intervals.

Interpretation: anomaly types

5.11 Colour-coded geophysical interpretation plans are provided in Figure 4. 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

5.12 Colour-coded archaeological interpretation plans are provided in Figure 5.

5.13 Small, discrete dipolar magnetic anomalies have been detected in all three 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.

Area 1

5.14 Ridge and furrow cultivation was evident on the surface throughout this survey area. This was recorded as a series of parallel, slightly curving, alternate positive and negative magnetic anomalies spaced at approximately 7m intervals. These anomalies have a broadly north-south alignment in the western half of the area and an east-west orientation in the eastern half of the survey.

5.15 Two weak linear positive magnetic anomalies were detected in the central part of the survey aligned approximately north-south. The western anomaly corresponds to a visible ridge or embankment in the field which may be contemporary with the ridge and furrow. The eastern anomaly appears to cut the ridge and furrow, suggesting a later date. These anomalies probably reflect former field boundaries.

5.16 A strong dipolar magnetic anomaly at the southern edge of the survey reflects an adjacent metal gate. Further dipolar magnetic anomalies to the west of this along the southern boundary correspond to a wire fence.

Area 2

5.17 Several small curvilinear and discrete positive magnetic anomalies have been detected throughout this survey. These may reflect soil-filled features such as pits, possibly of archaeological origin.

5.18 Three weak curvilinear negative magnetic anomalies were detected near the western edge of the survey. These may represent small furrows or wheel ruts though due to the rolling of the vegetation it was not possible to identify any features on the surface.

5.19 A group of dipolar magnetic anomalies was detected in the northern part of this survey, highlighted on the trace plot (Appendix I). These most likely represent near surface litter although an archaeological origin is also possible.

Area 3

5.20 Several small, very weak linear and curvilinear positive magnetic anomalies were detected in this survey, with a broadly east-west orientation. These anomalies, possibly reflecting traces of ridge and furrow cultivation, are also evident on the trace plots.

5.21 Small discrete positive and dipolar magnetic anomalies detected in the southwest corner of the survey could reflect soil-filled pits, possibly of archaeological origin. This is a continuation of the cluster of anomalies detected in the northern part of Area 2.

5.22 A chain of intense dipolar magnetic anomalies recorded in the northern part of this survey area, aligned approximately east-west, almost certainly reflects a ferrous service pipe.

5.23 Dummy readings in the central part of this survey correspond to several small haystacks.

6. Conclusions

6.1 Fluxgate gradiometer surveys have been undertaken on land near New Barns Farm, Warkworth, Northumberland, in advance of a proposed development for holiday accommodation.

6.2 The former ridge and furrow cultivation evident on the surface of Area 1 was recorded along with possible additional traces in Area 3.

6.3 Small soil-filled pit-like features, possibly of archaeological origin, were detected in Areas 2 and 3.

6.4 Two linear anomalies in Area 1 probably reflect former field boundaries.

7. Sources

Archaeological Services 2007 *Land near New Barns Farm, Warkworth, Northumberland; archaeological desk-based assessment,* unpublished report **1641** for The Northumberland Estates, Archaeological Services Durham University

David, A, 1995 *Geophysical survey in archaeological field evaluation,* Research and Professional Services Guideline **1**, English Heritage

Gaffney, C, Gater, J, & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*, Technical Paper **6**, Institute of Field Archaeologists

Schmidt, A, 2001 *Geophysical Data in Archaeology: A Guide to Good Practice,* Archaeology Data Service, Arts and Humanities Data Service

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Figure 1
Location of proposed development area

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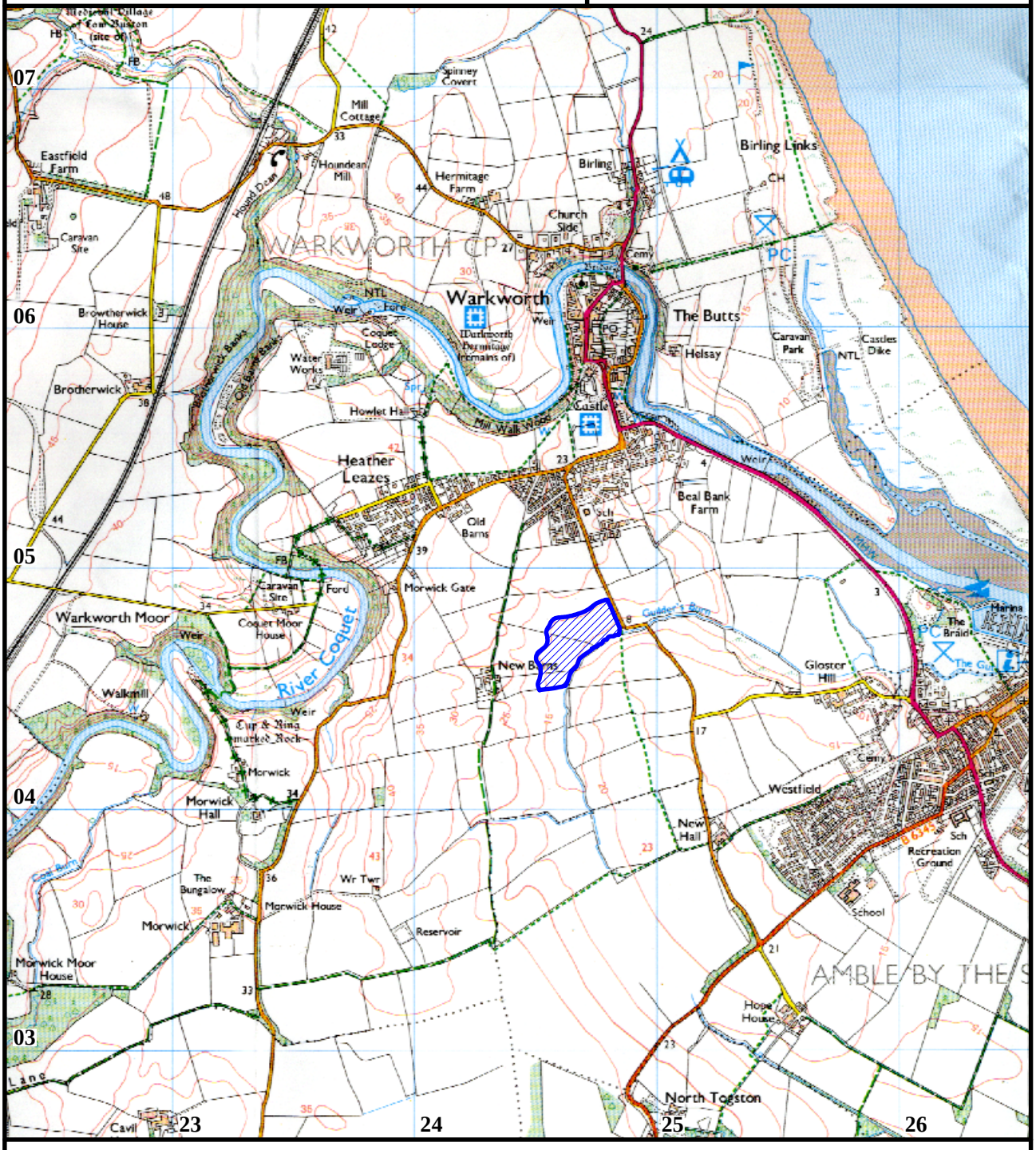

proposed development area

0 1km

scale 1:25 000 - for A4 plot

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Figure 2
Location of the geophysical survey areas

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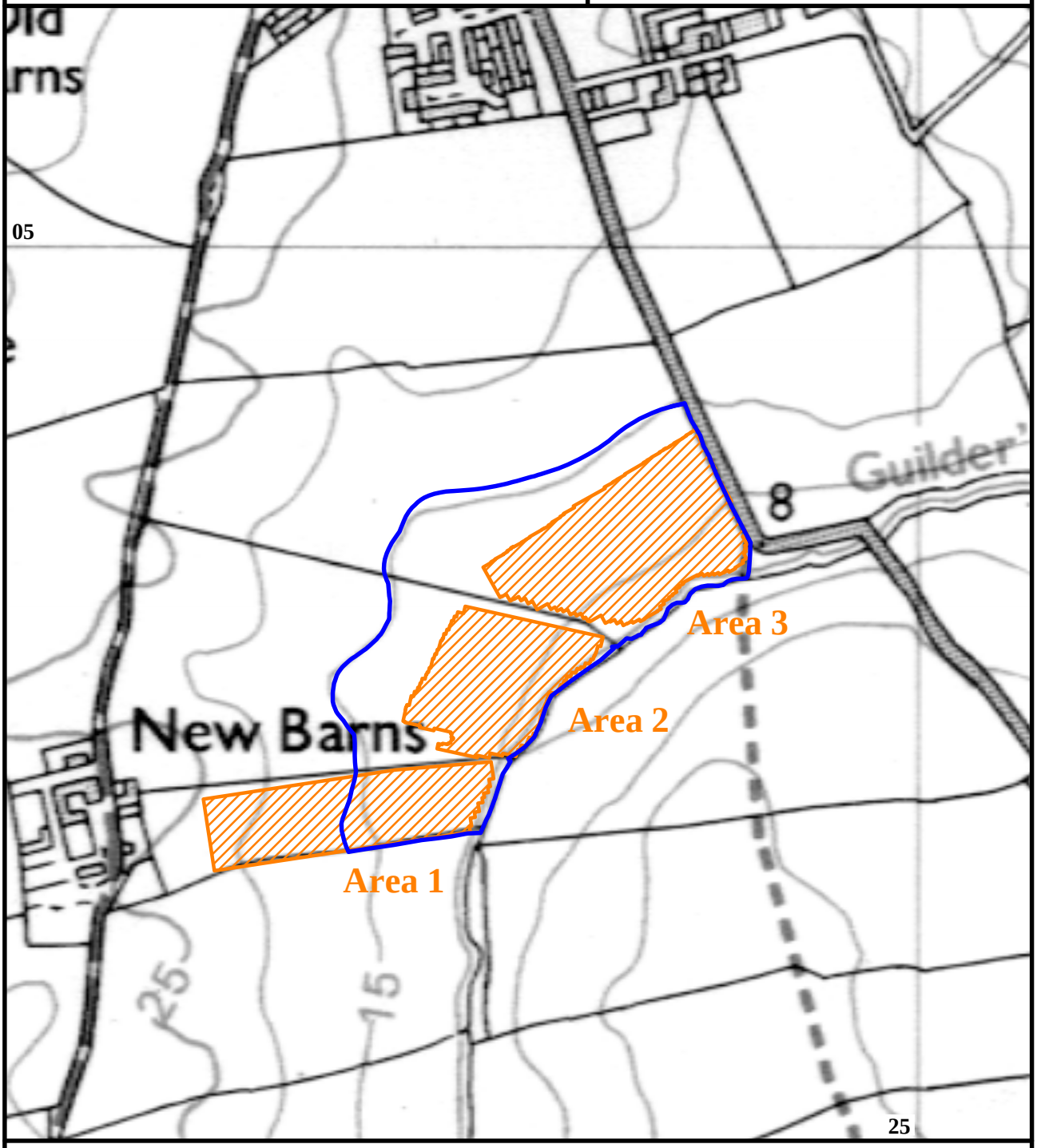

Area 3

Area 2

Area 1

Guilden Road

Guilder's Burn

048

047

046

045

244

245

246

247

248

proposed development area

outline of survey area

5.00
4.17
3.33
2.50
1.67
0.83
0.00
-0.83
-1.67
-2.50
-3.33
-4.17
-5.00 nT

0 50m

scale 1:1000 - for A2 plot

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Figure 3

Areas 1-3, geophysical surveys

Area 3

Area 2

Area 1

Guilden Road

Guilder's Burn

048

047

046

045

244

245

246

247

248

proposed development area

outline of survey area

positive magnetic anomalies

negative magnetic anomalies

dipolar magnetic anomalies

0 50m

scale 1:1000 - for A2 plot

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Figure 4

Areas 1-3, geophysical interpretation

Area 3

Area 2

Area 1

Guilden Road

Guilder's Burn

048

047

046

045

244

245

246

247

248

proposed development area

outline of survey area

soil-filled features

service pipes

orientation of ridge and furrow

haystacks

0 50m

scale 1:1000 - for A2 plot

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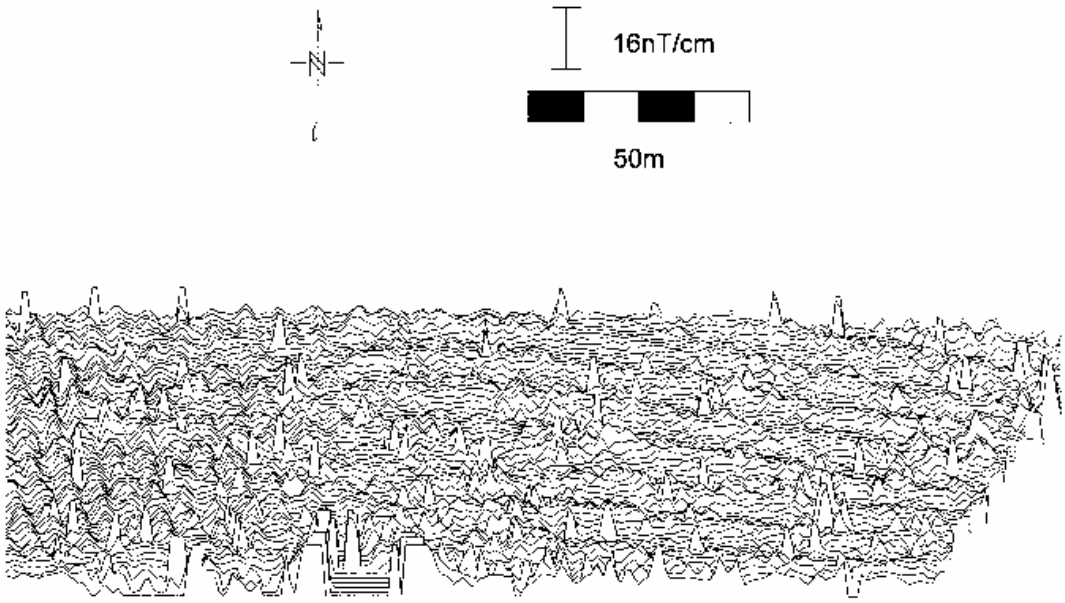
Figure 5

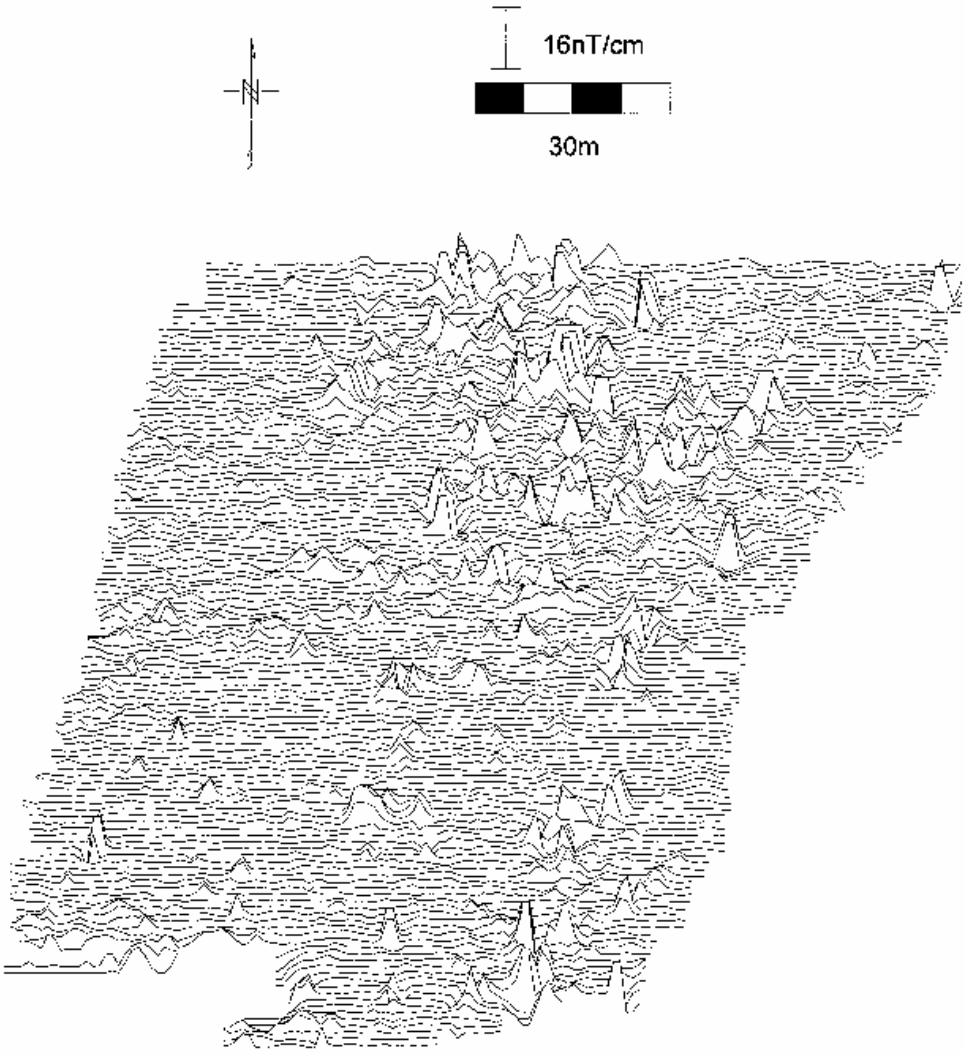
Areas 1-3, archaeological interpretation

Appendix I: Trace plots of geophysical data

Area 1, Magnetic data



Area 2, Magnetic data



Area 3, Magnetic data