

ARCHAEOLOGICAL
SERVICES
DURHAM UNIVERSITY

on behalf of
The Northumberland Estates

Land south of New Barns Court
Warkworth
Northumberland
geophysical survey

report 2981
September 2012

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1. Summary

The project

- 1.1 This report presents the results of a geophysical survey conducted in advance of proposed development at land south of New Barns Court, Warkworth, Northumberland. The works comprised the geomagnetic survey of a single field measuring approximately 1ha.
- 1.2 The works were commissioned by The Northumberland Estates and conducted by Archaeological Services Durham University.

Results

- 1.3 Evidence for ridge and furrow cultivation was detected across the area; this was also evident in the field as upstanding earthworks.
- 1.4 A modern service was detected along the southern boundary of the site.

2. Project background

Location (Figure 1)

- 2.1 The survey area was located south of New Barns Court, Warkworth, Northumberland (NGR centre: NZ 2450 0512). One survey covering approximately 1ha was conducted in a single land parcel. To the north and east is housing, to the south and west is open farmland.

Development proposal

- 2.2 A residential development is proposed for the site.

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 instructions from the client and in line with national standards and guidance (5.1 below).

Dates

- 2.5 Fieldwork was undertaken on 30th August 2012. This report was prepared for 25th September 2012.

Personnel

- 2.6 Fieldwork was conducted by Natalie Swann. Geophysical data processing and report preparation were also by Natalie Swann, with illustrations by Janine Watson. This report has been edited by Duncan Hale, the Project Manager.

Archive/OASIS

- 2.7 The site code is **WNB12**, for **Warkworth New Barns 2012**. 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 **archaeol3-133228**.

3. Historical and archaeological background

Previous archaeological works

- 3.1 An archaeological desk-based assessment was undertaken for the site (Archaeological Services 2012); the results of that assessment are summarised here.
- 3.2 No previous archaeological works have been undertaken within the proposed development area (PDA) but a number have been undertaken nearby. Directly to the west of the of the proposed development area at Old Barns Farm, a desk-based assessment (Archaeological Services 2011a) and geophysical survey (Archaeological Services 2011b) were carried out. The assessment noted the archaeological potential of the site and the subsequent geophysical survey detected possible soil-filled ditches and pits and ridge and furrow cultivation. 500m south of the proposed

development area at New Barns Farm, a desk-based assessment, geophysical survey and trial trenching were undertaken. The assessment outlined the archaeological potential of the area and the subsequent works revealed ridge and furrow and a post-medieval culvert.

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

- 3.3 There is no direct evidence for prehistoric or Roman activity within the study area; the evidence for occupation of this date in the surrounding area indicates that an as yet unidentified resource has the potential to exist.

The medieval and post-medieval periods (5th century to 1899)

- 3.4 The proposed development area lies beyond the edge of the medieval town of Warkworth and formed part of the town's demesne lands. It is probable that the area was agricultural land in the medieval and post-medieval periods. Evidence relating to this, in the form of ridge and furrow cultivation, survives as upstanding earthworks.

The modern period (1900 to present)

- 3.5 Modern Ordnance Survey maps show that the proposed development area has remained undeveloped.

4. Landuse, topography and geology

- 4.1 At the time of survey the proposed development area comprised a single field of overgrown pasture.
- 4.2 The field was predominantly level with a mean elevation of 28mOD. The field contains earthwork remains of ridge and furrow cultivation, aligned approximately east to west. The ridges survive to a height of approximately 0.3m, with the ridges being between 3-5m apart.
- 4.3 The survey area lies on the boundary between Carboniferous Namurian Millstone Grit and the Westphalian Coal Measures. The solid geology is overlain by boulder clay and morainic drift, with alluvium along the river terraces.

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, based on 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 30m grid was established across the survey area and related to known, mapped Ordnance Survey points and the 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 a continuous tone greyscale image and a trace plot of the raw (minimally processed) data. The greyscale image and interpretations are presented in Figures 2-4; the trace plot is provided in Figure 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:

<i>clip</i>	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
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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

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 A series of alternate, parallel, positive and negative magnetic anomalies was detected across the survey area aligned approximately east/west. These anomalies correspond to upstanding ridge and furrow earthworks visible in the field.

5.13 A chain of intense dipolar magnetic anomalies detected along the southern edge of the survey area almost certainly reflects a service pipe.

5.14 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 1ha of geomagnetic survey was undertaken on land south of New Barns Court prior to proposed development.

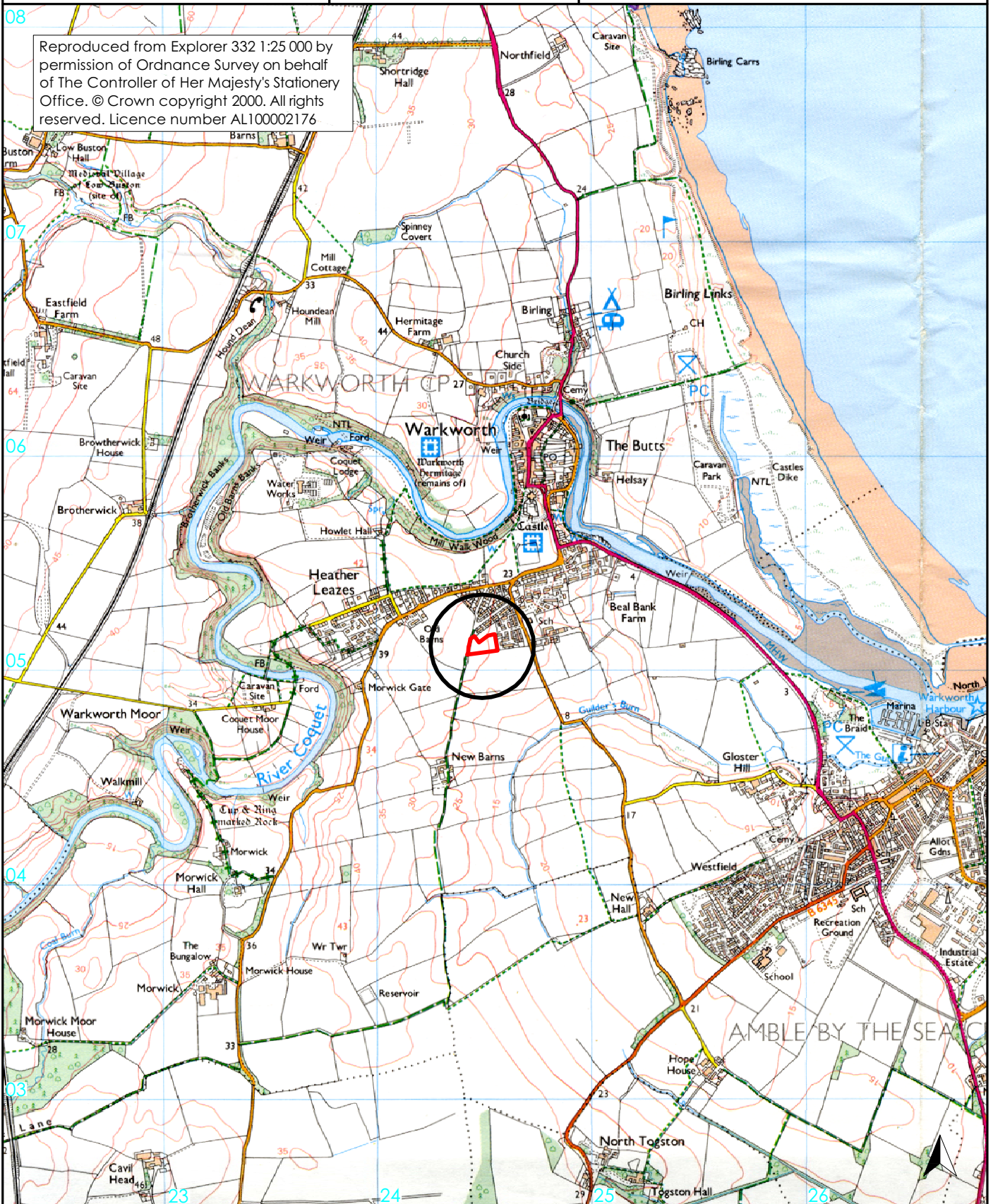
6.2 Evidence for ridge and furrow cultivation was detected across the area; this is also evident in the field as upstanding earthworks.

6.3 A service was detected along the southern boundary of the site.

7. Sources

- Archaeological Services 2011a *Old Barns, Morwick Road, Warkworth , Northumberland: Geophysical Survey*. Unpublished report **2773**, Archaeological Services University of Durham
- Archaeological Services 2011b *Old Barns, Morwick Road, Warkworth , Northumberland: Archaeological Desk-based Assessment*. Unpublished report **2736**, Archaeological Services University of Durham
- Archaeological Services 2012 *Land off New Barns Court, Warkworth, Northumberland: archaeological desk-based assessment*. Unpublished report **2952**, Archaeological Services Durham University
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- 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
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proposed development area

0 1km
scale 1:25 000 for A4 plot

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052

New Barns House

New Barns Court
1 to 21

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Figure 2: Geophysical survey

0 50m
scale 1:1000 for A4 plot

 proposed development area
 magnetic survey

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Figure 3: Geophysical interpretation

0 50m
scale 1:1000 for A4 plot

-  proposed development area
-  magnetic survey
-  dipolar magnetic anomaly
-  positive magnetic anomaly
-  negative magnetic anomaly



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
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Figure 4: Archaeological
interpretation

0 50m
scale 1:1000 for A4 plot

-  proposed development area
-  magnetic survey
-  service pipe
-  ridge and furrow



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Figure 5: Trace plot of geomagnetic data

0 50m
scale 1:1000 for A4 plot

