ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
Environment Agency

Oakwood Burn
Wylam
Northumberland

geophysical survey

report 2451
July 2010

Durham University

Contents

Figures

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1. Summary

The project

1.1 This report presents the results of a geophysical survey conducted in advance of proposed flood alleviation works along Oakwood Burn, Wylam, Northumberland. The works comprised geomagnetic survey of two areas.

1.2 The works were commissioned by the Environment Agency and conducted by Archaeological Services Durham University.

Results

1.3 Possible soil-filled pits and ditch remains were detected in Area 1.

1.4 Traces of former ridge and furrow cultivation were identified in both survey areas.

2. Project background

Location (Figure 1)

2.1 The study area flanked the eastern and southern banks of Oakwood Burn, near Wylam, in Northumberland (NGR centre: NZ 1122 6574). Two areas were surveyed in two fields to the east of Holeynhall Road, between Oakwood House to the north and Acomb Drive, Wylam village, to the south. It was not possible to collect data in a third, southern, area.

Development proposal

2.2 The development proposal is for the construction of flood banks along the eastern and southern banks of Oakwood Burn just north of Wylam village. In addition, there is an area for the proposed storage of imported clay adjacent to the northern proposed flood bank.

Objective

2.3 The principal aim of the survey 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 provided by the Environment Agency, following recommendations by their National Environmental Assessment Service (NEAS).

Dates

2.5 Fieldwork was undertaken on 7th July 2010. This report was prepared for 28th July 2010.

Personnel

2.6 Fieldwork, data processing and report preparation was conducted by Duncan Hale (the Project Manager), with illustrations by Janine Watson.

Archive/OASIS

2.7 The site code is **WOB10**, for **W**ylam **O**akwood **B**urn 20**10**. 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 **archaeol3-79512**.

Acknowledgements

2.8 Archaeological Services Durham University is grateful for the assistance of the Environment Agency in facilitating this scheme of works.

3. Historical and archaeological background

3.1 Although Wylam is a small parish it has two river crossings and a wealth of significant post-medieval remains. The following information is taken from 'Keys to

the Past', a historic environment website provided by Durham County Council and Northumberland County Council.

Previous archaeological works

3.2 There are no records of any previous schemes of archaeological work having been conducted within the current study area or within a 500m radius.

The prehistoric period (up to AD 70)

3.3 Although the Tyne valley was probably attractive land for early prehistoric hunter-gatherers and settlers no traces have yet been discovered here. Similarly, no Iron Age settlement is known here, but a nearby hillfort in Horsley Wood would have overlooked part of the parish.

The Roman period (AD 70 to 5th century)

3.4 Wylam lies south of Hadrian's Wall but no Roman remains have been found in the parish. A cropmark of a rectangular ditched enclosure with rounded corners and an east-facing entrance has been recorded on aerial photographs approximately 600m east of the development area; this could possibly be the remains of a Roman period settlement.

The medieval period (5th century to 1540)

3.5 Similarly, no early medieval presence is known, despite the numerous Anglo-Saxon sites along the Tyne valley at Ovingham, Bywell and within Tyne and Wear at Newburn. Later, in the medieval period, Wylam was an estate of Tynemouth Priory (Tyne and Wear). The priory owned land and the services of tenants around the area through monastic granges. Wylam Hall was the base of this small estate and, like Tynemouth Priory, was fortified against Scottish raiders.

The post-medieval period (1541 to 1899)

3.6 Wylam was a focus for innovation in the post-medieval period. There used to be many remains associated with the coal industry, including many collieries, fire clay works and waggonways. Such operations needed many workers, which included the family of the great engineer George Stephenson, who lived in one room of the house now known as George Stephenson's Cottage. As part of the Industrial Revolution others made huge sums of money on Tyneside, including Charles Parson, inventor of the turbine, who lived at Holeyn Hall. Another inventor, who lived at Wylam Hall, was William Hedley, who experimented with steam engines and built Puffing Billy and Wylam Dilly at Wylam Forge with Timothy Hackworth and John Foster. Transport links were developed from the purely industrial enterprises of waggonways through the Newcastle and Carlisle Railway. Wylam station is one of the oldest stations in the world still in passenger use.

3.7 Two bridges cross the River Tyne at Wylam: one a road bridge that was originally a combined road and rail bridge connecting the village with its collieries on the south bank; and the other, the West Wylam Railway Bridge, a precursor of the famous Tyne Bridge in Newcastle.

The modern period (1900 to present)

3.8 In modern times, the importance of river crossings so close to Newcastle resulted in the construction of a pillbox outside the village during World War II.

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised parts of three fields. The northern field was in use as sheep pasture, with thistles typically up to 1m in height and nettles up to 1.5m in height in the northernmost part (Area 1). The central field was pasture for sheep and cattle (Area 2). A telegraph pole and steel guy were present within the surveyed part of this field. The southern field was arable, with a mature oilseed rape crop. Despite some vegetation clearance along the southern side of the stream here it was not possible to collect useful data along this narrow bank between the stream and the adjacent mature rape crop. It was also noted on site that this bank has been enhanced by the stacking of sandbags during previous flood alleviation schemes, further reducing the potential for detecting features of possible archaeological significance here.

4.2 The land in both surveyed areas was predominantly level at approximately 60m OD, with very slight ridge and furrow earthworks visible in places.

4.3 The underlying solid geology of the area comprises Carboniferous sandstone of the Pennine Lower Coal Measures Formation, which is overlain by 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 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 2002).

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, 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) could also be present.

5.4 Given the anticipated nature and depth of potential 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 both survey areas 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 a Bartington Grad601-2 dual fluxgate gradiometer. 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 0.25m and the traverse interval 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 Figure 3; the trace plots are provided in Figure 4. 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 the geomagnetic data:

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 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 Sets of weak, parallel magnetic anomalies have been detected in each area. Two sets have been detected in Area 1, one aligned north-south and another, weaker, group aligned north-east/south-west. Those in Area 2 are aligned north-south. These anomalies almost certainly reflect former ridge and furrow cultivation, slight evidence for which was noted on the ground in Area 2. This type of cultivation was common in the medieval and post-medieval periods.

5.13 Several small, discrete positive magnetic anomalies have been detected in the north-western part of this Area 1. These anomalies reflect relative increases in 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. In this instance they could represent the remains of soil-filled pits.

5.14 Many other anomalies have been detected which are of a similar shape and size, however, they are more intense and almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments. Such anomalies typically have little or no archaeological significance. A sample of them is shown on the geophysical interpretation plan, however, they have been omitted from the archaeological interpretation plan. Some of this material could have been associated with nearby coal workings.

5.15 Two further positive magnetic anomalies have been identified in Area 1 as possibly reflecting archaeological features, one curvilinear and one L-shaped. Although both are very weak they could possibly reflect the remains of ditches.

5.16 A large dipolar magnetic anomaly in the southern part of Area 2 corresponds to the location of a steel guy and associated telegraph pole.

6. Conclusions

6.1 Geomagnetic survey was undertaken adjacent to Oakwood Burn, near Wylam in Northumberland, prior to proposed flood alleviation works.

6.2 Possible soil-filled pits and ditch remains were detected in Area 1.

6.3 Traces of former ridge and furrow cultivation were identified in both survey areas.

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

Schmidt, A, 2002 *Geophysical Data in Archaeology: A Guide to Good Practice.* Archaeology Data Service, Arts and Humanities Data Service

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Figure 1: Site location

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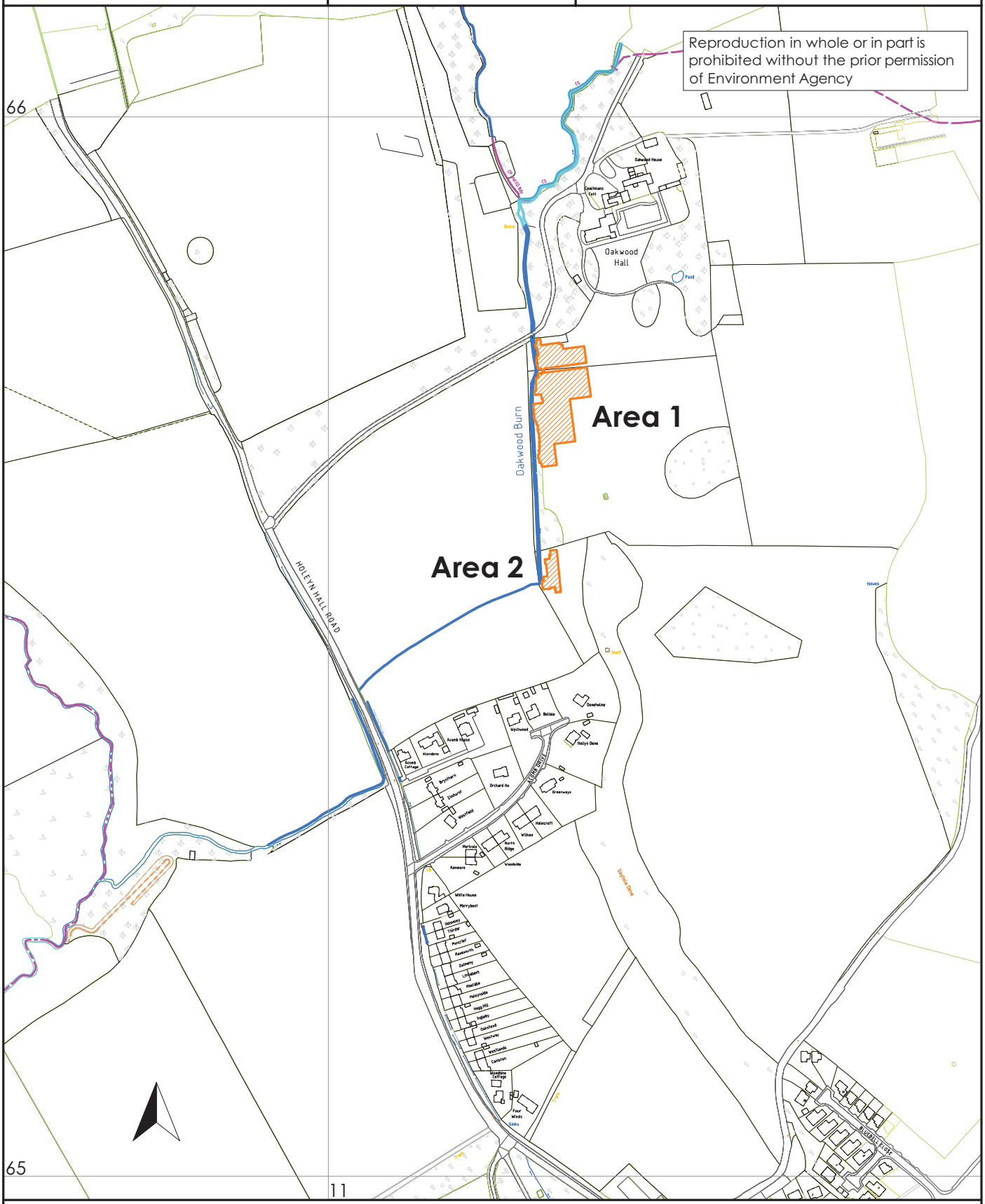
Figure 2: Location of geophysical surveys



geophysical survey

0 250m

scale 1:5000 for A4 plot