Archaeological Services
University of Durham

Broadhelm Park, Pocklington, East Riding of Yorkshire

geophysical surveys

on behalf of

On-Site Archaeology

Report 1798
January 2008

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Contents

1. Summary

The project

1.1 This report presents the results of geophysical surveys conducted in advance of proposed development at Broadhelm Park, Pocklington. The works comprised geomagnetic surveys totalling some 14ha.

1.2 The works were commissioned by On-site Archaeology and conducted by Archaeological Services in accordance with instructions provided by On-Site Archaeology.

Results

1.3 Several probable former ditch features have been detected, particularly in Area 1, though with a low concentration of similar features in other areas also. These include parts of possible enclosures and ring-ditches and could indicate the presence of former small-scale occupation of the area.

1.4 The surveys have detected probable evidence for former ridge and furrow cultivation in Areas 2 and 3.

1.5 Survey of Area 1 has detected a relatively large area of either imported material or disturbed ground.

2. Project background

Location (Figure 1)

2.1 The study area is located at Broadhelm Park, Pocklington, East Riding of Yorkshire (NGR: SE 4796 7922). The main survey covered approximately 12ha of the airfield and was bounded by the A1079 and B1246 Hodsow Lane to the south, the former runway to the north and east and an industrial estate to the west. The survey to the east side of Hodsow Lane measured 2ha, comprising a pipe corridor across land parcels. The first of these was bounded by the farm complex to the north and Hodsow Lane to the west, while the second was bounded by the farm to the north and a sewage works to the south.

Objective

2.2 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

2.3 The surveys have been undertaken in accordance with instructions provided by On-Site Archaeology.

Dates

2.4 Fieldwork was undertaken between 10th and 18th December 2007. This report was prepared between 18th December 2007 and 7th January 2008.

Personnel

2.5 Fieldwork was conducted by Natalie Swann (Supervisor), Graeme Attwood (Supervisor), Edward Davies and Andy Platell. This report was prepared by Graeme Attwood, with illustrations by Janine Wilson, and edited by Duncan Hale, the Project Manager.

Archive/OASIS

2.6 The site code is **PBP07**, for **P**ocklington **B**roadhelm **P**ark, 20**07**. The survey archive will be supplied on CD to On-Site Archaeology for deposition with the project archive. 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 **archaeol3-36084**.

3. Archaeological and historical background

3.1 The site lies within an area of high archaeological potential with a number of known prehistoric, Romano-British and medieval sites in the surrounding landscape.

3.2 In August 1940 the construction of Pocklington airfield was begun; this was initially planned to have three runways but was quickly scaled down to two. In

September 1946 the airfield was closed and the land reverted back to its former agricultural use. Much of the airfield's associated structures have since been removed though some are still in use in the neighboring industrial estate and by a gliding club.

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised a Second World War airfield, currently used by a gliding club, and two arable fields.

4.2 The survey area was predominantly level at a mean elevation of *c*.25m OD.

4.3 The underlying solid geology of the area comprises Triassic mudstones, which are overlain by clay-with-flints.

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 2008 forthcoming, second edition); 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, 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 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 A 30m grid was established across the study area to the west of the B1246 Hodsow Lane, while a 20m grid was employed to the east of the lane. All survey areas were tied-in to known, mapped Ordnance Survey points using a Trimble Pathfinder Pro XRS global positioning system (GPS) with real-time correction providing sub-metre accuracy.

5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 fluxgate gradiometers. A zig-zag traverse scheme was employed and data were logged in 30m and 20m 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 or 1600 sample measurements per 30m or 20m grid unit respectively.

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 (unfiltered) data. The greyscale images and interpretations are presented in Figures 3-5; the trace plots are provided in Figure 6. It has not been practicable to provide a trace plot for Area 1 due to its size. 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, 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.
despike	locates and suppresses random iron spikes in gradiometer data.
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

5.10 A colour-coded geophysical interpretation plan is 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

General comments

5.11 A colour-coded archaeological interpretation plan is provided in Figure 5.

5.12 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 furrows, ditches or pits) whose magnetic susceptibility has been enhanced by decomposed organic matter or by burning.

5.13 Series of parallel weak positive magnetic anomalies, which almost certainly reflect former ridge and furrow cultivation, have been detected across Areas 2 and 3.

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

Area 1

5.15 Several linear and curvilinear positive magnetic anomalies have been detected in this area, particularly just north of centre. These probably reflect soil-filled ditch features, some of which may have been associated with former occupation.

5.16 A large, well-defined area of strong magnetic anomalies has been detected across the central part of the area; this almost certainly reflects disturbed ground, possibly backfill in a former quarry or other excavation, or otherwise imported material. Our surveyors noted a difference on the ground here, in particular a higher concentration of flint nodules in this area, perhaps supporting the notion of material brought in from elsewhere, or of relatively deep *in situ* disturbance.

5.17 Series of parallel positive magnetic anomalies detected across much of Area 1 almost certainly reflect land drainage systems. Modern services and cables have also been detected across the survey area as both negative and dipolar magnetic anomalies.

Area 2

5.18 This survey area is very noisy magnetically, which has made it difficult to identify possible archaeological features with any certainty, but there are very faint traces of probable ridge and furrow (aligned north-east/south-west) and a few other, small, possible soil-filled features in the eastern part of the area.

Area 3

5.19 Parallel positive magnetic anomalies have been detected on a similar alignment to those in Area 2, almost certainly reflecting a continuation of the ridge and furrow that was identified in that area.

5.20 A ferrous pipe probably lies immediately beyond the south-eastern limit of this survey, parallel to the field boundary.

Area 4

5.21 A group of strong positive magnetic anomalies has been detected at the eastern part of the survey area. These could reflect soil-filled features, possibly pits.

Area 5

5.22 Three positive magnetic anomalies at the northern end of this survey area, could reflect the remains of ditch features.

5.23 A chain of dipolar magnetic anomalies along the north-western edge of the survey area probably represents an adjacent ferrous pipe along the back boundary of the farm complex.

6. Conclusions

6.1 Five geomagnetic surveys have been conducted on land at Broadhelm Park, Pocklington, East Riding of Yorkshire, in order to identify possible areas of archaeological potential in advance of proposed development and pipe-laying.

6.2 Several probable former ditch features have been detected, particularly in Area 1, though with a low concentration of similar features in other areas also. These could indicate the presence of former small-scale occupation of the area.

6.3 The surveys have detected probable evidence for former ridge and furrow cultivation in Areas 2 and 3.

6.4 Survey of Area 1 has detected a relatively large area of either imported material or disturbed ground.

7. Sources

David, A, 2008 forthcoming, *Geophysical survey in archaeological field evaluation*, 2nd edition. 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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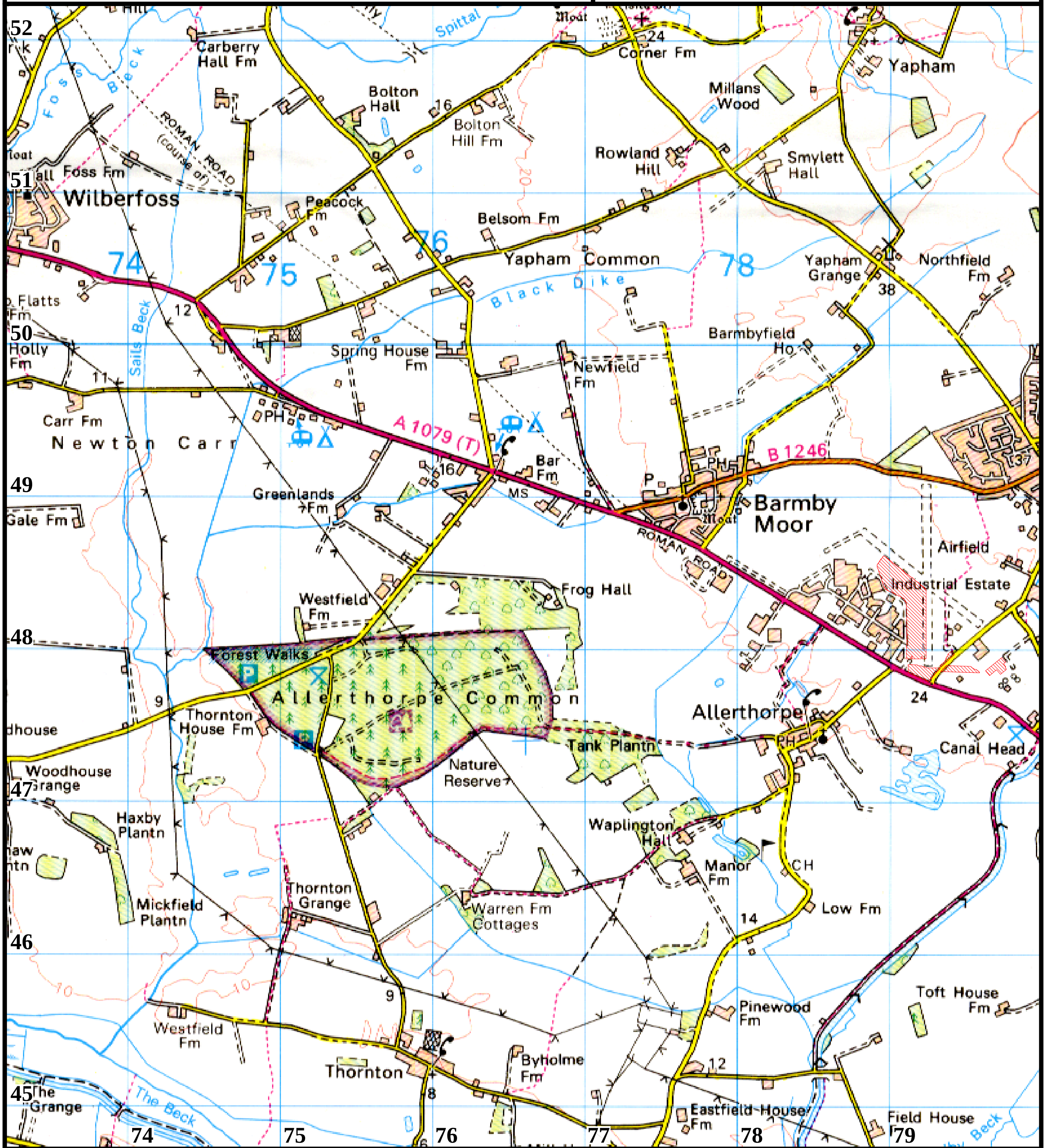
Figure 1

Location of geophysical surveys



geophysical survey areas

0 2km

scale 1:40 000 - for A4 plot

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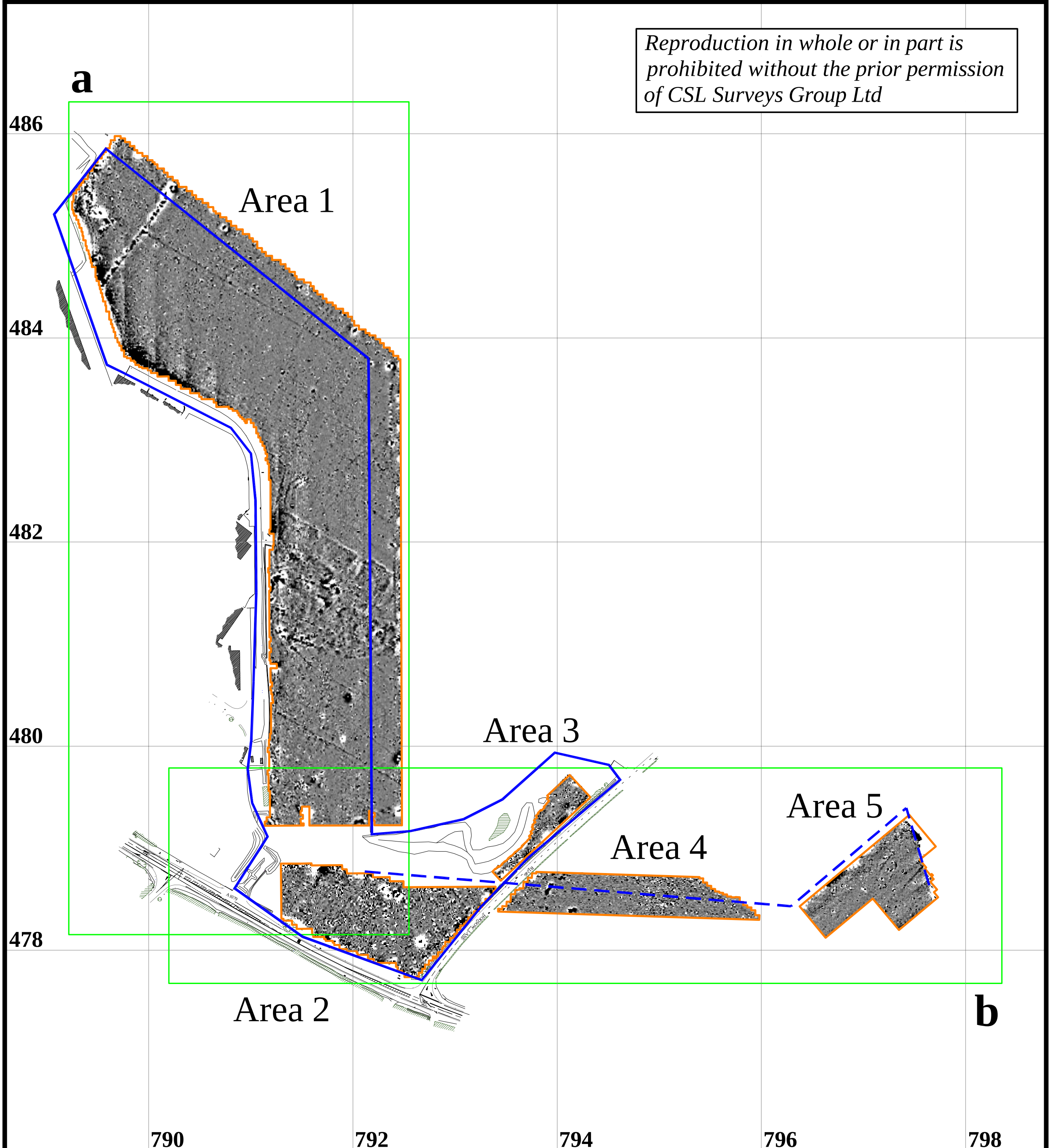
Figure 2
Geophysical surveys and figure layout

0 300m
scale 1:6000 - for A4 plot



orientation of surveys in following figures
survey outline
site boundary
proposed pipeline route

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Figure 3

Geophysical surveys


a
b
790
791
792
481
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795
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791
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478
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Area 1
Area 2
Area 3
Area 4
Area 5
B1246
HODSOW LANE
A1079
outline of survey area
site boundary
proposed pipeline route
positive magnetic anomalies
negative magnetic anomalies
dipolar magnetic anomalies
0
50m
scale 1:1000 - for A1 plot
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Figure 4
Geophysical interpretations

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Figure 5

Archaeological interpretations

Figure 6: Trace plots of geophysical data