

**Yarm Preparatory School, Yarm School,
Yarm, Stockton-on-Tees, Teesside**

geophysical survey

on behalf of

Yarm School

Report 2175

April 2009

Archaeological Services

Durham University

South Road

Durham DH1 3LE

Tel: 0191 334 1121

Fax: 0191 334 1126

archaeological.services@durham.ac.uk

www.durham.ac.uk/archaeological.services

Yarm Preparatory School, Yarm School, Yarm, Stockton-on-Tees, Teesside

geophysical survey

Report 2175

April 2009

Archaeological Services Durham University

on behalf of

Yarm School

The Friarage, Yarm TS15 9EJ

Contents

1. Summary	1
2. Project background	2
3. Archaeological and historical background	2
4. Landuse, topography and geology	3
5. Geophysical survey	3
6. Conclusions	5
7. Sources	5

Appendix: Project brief

Figures (inside back cover)

Figure 1: Site location

Figure 2: Geophysical survey results

Figure 3: Geophysical interpretation

Figure 4: Archaeological interpretation

Figure 5: Trace plot of geomagnetic data

1. Summary

The project

- 1.1 This report presents the results of geophysical surveys conducted in advance of proposed development on the playing fields at Yarm Preparatory School (part of Yarm School), Yarm, Stockton-on-Tees. The works comprised the geomagnetic survey of one area measuring approximately 0.5ha.
- 1.2 The works were commissioned by Yarm School and conducted by Archaeological Services Durham University.

Results

- 1.3 Several probable soil-filled features were detected in the east of the area. These could be of archaeological interest.
- 1.4 Land drains were also detected across the survey area.

2. Project background

Location (Figure 1)

- 2.1 The study area was located at Yarm Preparatory School, which is part of Yarm School, Yarm, Stockton-on-Tees (NGR centre: NZ 419 121). Approximately 0.5ha was surveyed on the playing field to the west of the preparatory school buildings.

Development proposal

- 2.2 The development proposal is for a Multi-use Games Area, including artificial surfaces.

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 brief provided by the Tees Archaeology Officer (Appendix).

Dates

- 2.5 Fieldwork was undertaken on 6th April 2009. This report was prepared on 6th and 7th April 2009.

Personnel

- 2.6 Fieldwork was conducted by Natalie Swann (Supervisor) and Richie Villis. This report was prepared by Richie Villis with illustrations by Edward Davies and Janine Watson, and edited by Duncan Hale, the Project Manager.

Archive/OASIS

- 2.7 The site code is **YPS09**, for **Yarm Preparatory School 2009**. The survey archive will be supplied on CD to the client for deposition with the project archive in due course. Archaeological Services is registered with the **Online Access to the Index of archaeological investigationS project (OASIS)**. The OASIS ID number for this project is **archaeol3-57889**.

3. Archaeological and historical background

- 3.1 The present school dates from 1913, but has occupied the site since 1884. In the medieval period the site was open fields. Prehistoric or medieval archaeological features could be found in association with “Maiden Castle Hill”, which was quarried away by 19th-century brickworks.

4. Landuse, topography and geology

- 4.1 At the time of survey the proposed development area was the preparatory school playing field. The survey area was bordered to the north by a concrete play ground, to the east by the school building and to the south and west by a metal fence.
- 4.2 The survey area was level with a mean elevation of 30m OD.
- 4.3 The underlying solid geology of the area comprises undifferentiated Permian and Triassic sandstones, including “Bunter and Keuper”, which are overlain by boulder clay and morainic drift.

5. Geophysical survey

Standards

- 5.1 The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in archaeological field evaluation 2nd edition* (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 variety of complementary techniques such as magnetometry, earth 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 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 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 tied-in to known, mapped Ordnance Survey points using a Trimble Pathfinder Pro XRS global positioning system with real-time correction providing sub-metre 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 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.
- 5.7 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 (unfiltered) data. The greyscale image and interpretations are presented in Figures 2-4; the trace plot is provided in Figure 5. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. Palette bars relates the greyscale intensities to anomaly values in nanoTesla.
- 5.9 The following basic processing functions have been applied to each dataset:
- | | |
|---------------------------|--|
| <i>clip</i> | clips, or limits data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic. |
| <i>zero mean traverse</i> | 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. |
| <i>destagger</i> | corrects for displacement of anomalies caused by alternate zig-zag traverses. |
| <i>interpolate</i> | increases the number of data points in a survey to match sample and traverse intervals. In this instance the data have been interpolated to 0.25x 0.25m intervals. |

Interpretation: anomaly types

- 5.10 Colour-coded geophysical interpretation plans are provided. Two types of geomagnetic anomaly have been distinguished in the data:
- | | |
|--------------------------|---|
| <i>positive magnetic</i> | 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. |
| <i>dipolar magnetic</i> | 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 Several weak linear and curvilinear positive magnetic anomalies have been detected in the east of the survey area. These anomalies could reflect soil-filled cut features such as gullies, ditches and pits.
- 5.13 Several very straight positive magnetic lineations have been detected across the survey area aligned north-south. These anomalies almost certainly reflect land drains.
- 5.14 The large dipolar magnetic anomalies detected around the edges of the survey area reflect adjacent metal fences, school buildings and the school playground.
- 5.15 Four pairs of intense dipolar magnetic anomalies detected opposite each other on the east and west edges of the survey area reflect metal goalposts.

6. C onclusions

- 6.1 Geomagnetic survey was undertaken on the playing field west of Yarm Preparatory School, Yarm, Stockton-on-Tees.
- 6.2 Several probable soil-filled features were detected in the east of the area. These could be of archaeological origin and may warrant further investigation by means of trial trenching.
- 6.3 Land drains were also detected across the survey area.

7. S ources

David, A, Linford, N, & Linford, P, 2008 *Geophysical survey in archaeological field evaluation, 2nd edition*, 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.

Appendix: Project brief

Brief for Geophysical Survey: Yarm School, Preparatory School Playing Fields, Yarm

1 Backg round

- 1.1 The site centered on NZ 419 121 comprises the playing fields of Yarm School, Preparatory School.
- 1.2 It is proposed to install Multi Use Games Areas on the playing fields with artificial surfaces.
- 1.3 Yarm School Preparatory School occupies the site of the former Yarm Grammar School which moved from the town centre to this location in 1884. The present buildings date from 1913 onwards. A desktop assessment of the site 'Archaeological Desk Top Survey at Yarm School's Grammar School Lane Site, Yarm' was carried out by Brigantia Archaeological Practice in 2005. This indicated that the site was part of the medieval open fields in the area, however it drew attention to the field name 'Maiden Castle Hill' to the immediate north of the playing fields. This hill has been quarried away by 19th century brick works, however any archaeological remains which may have been associated with this feature could extend into the playing fields.

2 Aims of Geophysical Survey

- 2.1 The geophysical survey will cover the whole of the playing fields, an area of c.0.6ha. It will particularly look for:-
- evidence of remains of early medieval or prehistoric date which may be associated with the 'Maiden Castle Hill' field name.
 - evidence of the layout of the medieval fields.
- 2.2 The purpose of the survey is to determine if further investigation in the form of trial trenching is required in order to provide sufficient information to provide advice to the local planning authority on a planning application to develop the fields as a MUGA. It should also identify the possible location of any trenches.

3 Methodology

- 3.1 Geophysical Survey
- 3.1.1 The most likely remains to be encountered in this situation are cut features such as ditches, pits and postholes.
- 3.1.2 It is recommended that Magnetometer Survey should be deployed.
- 3.1.3 A strategy for the Geophysical Survey should be provided and agreed with the Tees Archaeology Officer or his representative.
- 3.1.4 The geophysical survey should be conducted according to the standards set out in 'English Heritage. 1995. *Geophysical survey in Archaeological Field Evaluation*. Research and Professional Services Guideline No. 1. English Heritage'.

4 Method Statement

- 4.1 The current brief should not be considered sufficient to enable the execution of the project. A method statement will be required to provide the basis for a measurable standard for monitoring. The method statement should be prepared in response to this brief in the format set out in Appendix 2 of English Heritage. 1991. *Management of Archaeological Projects*.
- 4.2 The method statement should particularly:-
- demonstrate the techniques, materials and recording systems to be employed
 - provide a provisional programme for undertaking the fieldwork, processing of the data, report preparation and the deposition of the project archive
 - identify the staff involved, their qualifications, and those who will be carrying out specialist assessments
 - demonstrate that the work will be undertaken in accordance with all relevant health and safety legislation.
 - define a programme of post-survey work, to allow the delivery of a report.

5 Monitoring

- 5.1 The proposal for the work should identify the staff involved. The Tees Archaeology Officer or his representative should be notified in writing at least two weeks in advance of the work taking place and should be allowed on site to inspect and monitor the work at any reasonable time.

5.2 The monitoring will be in the form of a series of visits by a member of Tees Archaeology and the completion of monitoring forms on site (Appendix 1). The archaeological contractor will be notified if standards contained in the brief and method statement are not being met. The report for the work and deposition of archive will be monitored and standards enforced where required.

6 Report and Recommendations

6.1 The information from the fieldwork should be brought together in a report. This should identify the necessity or otherwise of further works such as trial trenching and identify possible locations of such trenches. The report should present the information together with local, regional and national parallels. Reference and comparisons should be made to previous work on similar sites, material held by the HER, historic maps and aerial photographs.

6.2 The report should be written with the intention that it will be submitted to a regional or national journal for publication. Provision for a publication level report should be fully detailed in the method statement.

6.3 Three copies of the report should be forwarded to the Tees Archaeology Historic Environment Record.

7 A rchive

7.1 An appendix (Appendix 2) is attached detailing the archival requirements. A copy of the documentary and photographic archive should be deposited with Tees Archaeology at Sir William Gray House, Clarence Road, Hartlepool. TS24 8BT

8 Health and Safety

8.1 Contractors are expected to abide by the 1974 Health and Safety Act and its subsequent amendments. Safe working practice should be adopted as described in the Standing Conference of Archaeological Unit Managers manual on archaeological health and safety. It is recommended that a risk assessment for the site is completed prior to the start of works.

*Brief prepared by Robin Daniels, Archaeology Officer.
20th March 2009.*



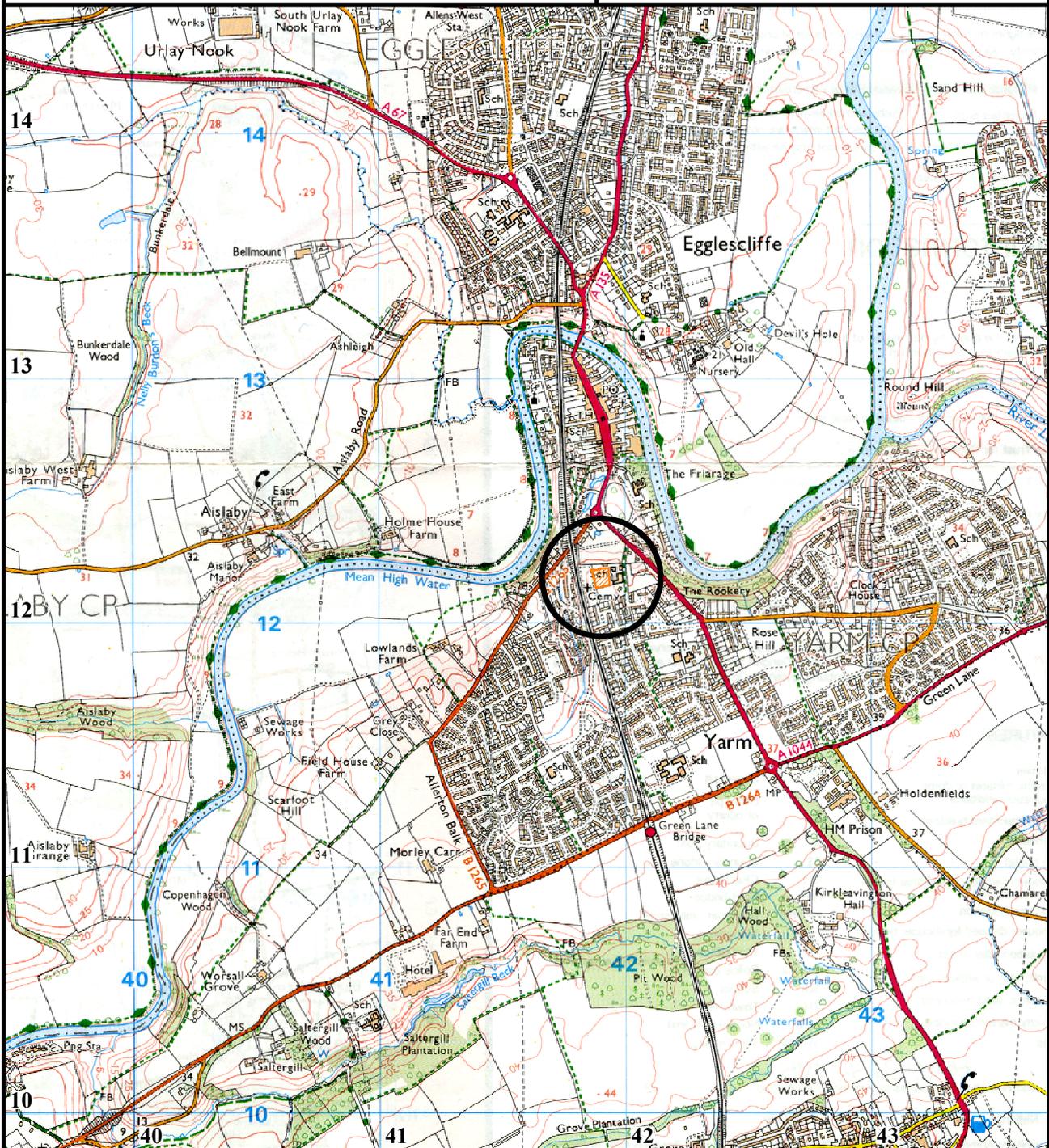
Archaeological Services
University of Durham

Yarm Preparatory School, Yarm School, Yarm,
Stockton-on-Tees, Teesside
geophysical survey

Report 2175
Figure 1
Site location

on behalf of
Yarm School

Reproduced from Explorer 304 1:25 000 by
permission of Ordnance Survey on behalf of
The Controller of Her Majesty's Stationery
Office. © Crown copyright 1995. All rights
reserved. Licence number AL100002176



location of geophysical survey



scale 1:25 000 - for A4 plot





Archaeological Services
University of Durham

Yarm Preparatory School, Yarm School, Yarm,
Stockton-on-Tees, Teesside
geophysical survey

Report 2175
Figure 2
Geophysical survey

on behalf of
Yarm School

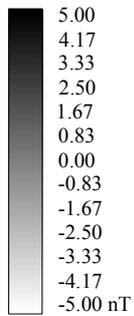


scale 1:1000 - for A4 plot



Reproduction in whole or in part is
prohibited without the prior permission
of Yarm School

122



419

THE OLD RECTORY

420



outline of survey area



Archaeological Services
University of Durham

Yarm Preparatory School, Yarm School, Yarm,
Stockton-on-Tees, Teesside
geophysical survey

Report 2175

Figure 3

Geophysical interpretation

on behalf of
Yarm School



scale 1:1000 - for A4 plot



Reproduction in whole or in part is
prohibited without the prior permission
of Yarm School

122



419

420



outline of survey area



positive magnetic anomalies



dipolar magnetic anomalies



Archaeological Services
University of Durham

Yarm Preparatory School, Yarm School, Yarm,
Stockton-on-Tees, Teesside
geophysical survey

Report 2175

Figure 4

Archaeological interpretation

on behalf of
Yarm School



scale 1:1000 - for A4 plot



Reproduction in whole or in part is
prohibited without the prior permission
of Yarm School

122



419

420



outline of survey area



soil-filled features



land drains



goal posts

Figure 5: Trace plot of geomagnetic data

Area 1

