ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
Faithful+Gould

Queen Elizabeth High School
Hexham
Northumberland

geophysical survey

report 4911
November 2018

Durham University

Contents

Figures

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1. Summary

The project

1.1 This report presents the results of geophysical surveys conducted in advance of proposed development at Queen Elizabeth High School, in Hexham, Northumberland. The works comprised 2.5ha of magnetometer survey.

1.2 The works were commissioned by Faithful+Gould and conducted by Archaeological Services Durham University.

Results

1.3 No features of likely archaeological significance have been identified in the geophysical survey, partly due to landscaping the presence of more recent features.

1.4 Made-ground and evidence of other landscaping works have been detected across many of the survey areas.

1.5 Existing features relating to the sports pitches have been detected in Area 6, including land drains, rugby goal-posts and a cricket wicket.

1.6 Several services have also been detected.

2. Project background

Location (Figure 1)

2.1 The proposed development area (PDA) was located at Queen Elizabeth High School, Hexham, Northumberland (NGR centre: NY 9240 6399). The PDA comprised two school building complexes and the school grounds, including footpaths, access roads, sports pitches and lawns. The school is on the western edge of Hexham, on the north side of Allendale Road, the B6305.

2.2 Six surveys totalling approximately 2.5ha were conducted, across all practicable areas of the school grounds.

Development proposal

2.3 The site is proposed for development.

Objective

2.4 The aim of the surveys was to assess the nature and extent of any sub-surface features of potential archaeological significance within the survey areas, 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.

2.5 The regional research framework *Shared Visions: The North-East Regional Research Framework for the Historic Environment* (Petts & Gerrard 2006) contains an agenda for archaeological research in the region, which is incorporated into regional planning policy implementation. In this instance, the scheme of works was designed to address the following research priorities: Early Medieval EMi. Landscape, EMii. Settlement; Later Medieval MDi. Settlement, MDii. Landscape.

Methods statement

2.6 The surveys have been undertaken in accordance with instructions from the client and national standards and guidance (see para. 5.1 below).

Dates

2.7 Fieldwork was undertaken on 29th and 30th October 2018. This report was prepared for November 2018.

Personnel

2.8 Fieldwork was conducted by Duncan Hale, Richie Villis and Mark Woolston-Houshold. Geophysical data processing and report preparation was by Richie Villis, with illustrations by Dr Helen Drinkall. This report was edited by Duncan Hale, the Project Manager.

Archive/OASIS

2.9 The site code is **HQE18**, for **H**exham **Q**ueen **E**lizabeth 20**18**. The survey archive will be retained at Archaeological Services Durham University and a copy 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 **archaeol3-333723**.

Acknowledgements

2.10 Archaeological Services Durham University is grateful for the assistance of personnel of the Queen Elizabeth High School in facilitating this scheme of works.

3. Historical and archaeological background

3.1 An extensive urban survey of Hexham has been produced (NCC & EH 2009). The PDA is covered in the survey's study area but falls outside of the conservation area; the following is a summary of relevant information from the urban survey report.

3.2 There is one Grade II listed building within the PDA, the former 'Hydropathic Mansion' (below, para. 4.8). There are no Scheduled Ancient Monuments on or in the vicinity of the site.

3.3 There is no direct evidence of prehistoric or Roman activity in the PDA, although there is evidence of prehistoric activity in the wider area.

3.4 Hexham developed at a crossing place of the Tyne from the Saxon period and has been variously known as Hutoldesham, Hestaldesham, Hextoldesham and Halgustad (Lewis 1848). The settlement at this date was concentrated to the south of the river; there is no indication that it would have extended as far as the PDA.

3.5 The Benedictine abbey and church built by Wilfred, Bishop of York, in 674 were destroyed during Viking raids in 876. The abbey was re-founded in 1113 as a monastery for Augustine canons and the Church of St Andrew was also rebuilt in the 12th century. The eastern boundary of Hexham Abbey was marked by a cross. The position today is marked by a later cross base.

3.6 The town grew as a market centre for the surrounding area. The Moot Hall, Old Gaol and claustral buildings associated with the Priory Church are all of medieval date. Throughout the medieval period the area was subject to raids by the Scots and many of the buildings in the town were damaged or destroyed during these incursions.

3.7 The PDA is located well away from the focus of early medieval settlement.

3.8 Hexham Free Grammar School, later the Queen Elizabeth Grammar School, was founded by Royal Charter in 1599. A schoolmaster's house was built at the town's expense in 1694 at Bankhead, approximately 1km east of the present school site. In 1878 a 'Hydropathic Mansion' was constructed on the Allendale Road, which is a Grade II listed building. Originally this was a health spa using water from the Ladel Well Springs, it now forms part of the current school.

4. Landuse, topography and geology

4.1 At the time of survey the PDA comprised school buildings and grounds. Geophysical survey was conducted across all practicable areas, comprising six individual survey areas detailed in the table below.

Area	Size (ha)	Location and notes	NGR
1	0.03	Flat mown grass to east of main school building; landscaped terraces to west and east; bushes and trees to north and east; path and steps to south	NY 92449 64009
2	0.04	Flat mown grass to east of main school building; landscaped terraces to west; bushes and trees to east and south; path and steps to north	NY 92455 63970
3	0.13	Mown grass area to south of astro-turf; metal fence and wall to north; path and trees to west and south; trees, bushes and fence to east; lamp posts along path to west and south	NY 92455 63970
4	0.25	Mown grass area surrounded by approach roads, paths and trees; landscaped and sunken 'bowling-green' in north	NY 92456 63888
5	0.17	Mown grass area with pre-fab building in east; trees and bushes to east; access road and trees to north, south and west	NY 92384 63896
6	1.91	Playing fields; metal rugby posts, cricket nets, scrum machine and concrete games areas; pavilion and sheds in east; trees to north and west, steep landscaped bank down to school grounds in east and house in west; overgrown scrub and bushes to south-east	NY 92248 63927

4.2 The survey areas were predominantly level, with evidence of landscaping, and occupied elevations between approximately 90-100m OD.

4.3 The underlying solid geology of the area comprises Carboniferous sandstone, mudstone and limestone of the Stainmore Formation; no superficial deposits are recorded.

5. Geophysical survey

Standards

5.1 The surveys and reporting were conducted in accordance with Historic England guidelines, *Geophysical survey in archaeological field evaluation* (David, Linford & Linford 2008); the Chartered Institute for Archaeologists (CIfA) *Standard and Guidance for archaeological geophysical survey* (2014); the CIfA Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service & Digital Antiquity *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2013).

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 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 non-igneous geological environment of the study area a magnetic technique, fluxgate gradiometry, was considered appropriate for detecting the types of feature mentioned above. This technique involves the use of 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 In Areas 1-5, magnetic gradiometer measurements were determined using hand-held Bartington Grad601-2 dual fluxgate gradiometers. A zig-zag traverse scheme was employed and data were logged in 20m grid units. The instrument sensitivity was effectively 0.03nT, the sample interval was 0.25m and the traverse interval was 1m, thus providing 1,600 sample measurements per 20m grid unit.

5.6 In Area 6, magnetic gradiometer measurements were determined using a Sensys Magneto MX V3 multi-sensor magnetometer survey system towed by a quad-bike. Eight FGM650/3 fluxgate gradiometer sensors were mounted at 0.5m intervals, logging data at less than 0.08m intervals along traverses, providing high density data collection.

5.7 In each case, data collection point locations were recorded in relation to the Ordnance Survey (OS) National Grid using a global navigation satellite system (GNSS) with real-time kinematic (RTK) correction typically providing 10mm accuracy.

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 For Areas 1-5, Geoplot v.4 software was used to process the geophysical data and to produce continuous tone greyscale images and trace plots of the raw (minimally processed) data.

5.10 For Area 6, Sensys MonMX, DLMGPS and MagnetoARCH software were used to record and display gradient and positional data and to create a greyscale image of gridded values at 0.2m by 0.2m intervals. TerraSurveyor software was used to further process the data and produce a trace plot.

5.11 The greyscale images, trace plots and interpretations are presented in Figures 2-5. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. Palette bars relate the greyscale intensities to anomaly values in nanoTesla.

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

clip	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
de-spike	locates and suppresses iron spikes in gradiometer data

zero mean traverse	(Areas 1-5) 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
de-stagger	(Areas 1-5) 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 0.1m x 0.1m intervals

Interpretation: anomaly types

5.13 A colour-coded geophysical interpretation plan is provided. Three types of magnetic 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

5.14 A colour-coded archaeological interpretation plan is provided.

5.15 No features of likely archaeological significance have been identified in the geophysical survey. Anomalies associated with such features, if present, could have been obscured by stronger anomalies associated with landscaping and existing structures and infrastructure on the site, as below.

5.16 Concentrations of dipolar magnetic anomalies have been detected in the majority of the survey areas. These almost certainly reflect spreads of ferrous and/or fired material and probably relate to made-ground or other landscaping works across the school grounds. The sunken 'bowling-green' area in the north of Area 4 is a prime example of these types of anomalies; the southern half of Area 4 is much less magnetically disturbed than the sunken feature and does not appear to have been landscaped.

5.17 A broadly east/west aligned series of very closely spaced positive and negative magnetic anomalies has been detected across the southern half of Area 6. This also almost certainly reflects former landscaping works, possibly very shallow ploughing or harrowing to improve the playing surface.

5.18 Series of linear positive magnetic anomalies have been detected across Area 6, in distinctive 'herring-bone' patterns. These anomalies reflect land drains.

5.19 Chains of intense dipolar magnetic anomalies have been detected in several of the survey areas (e.g. across the south-western corner of Area 4). These almost certainly reflect services.

5.20 Other intense magnetic anomalies are associated with existing features such as adjacent buildings (e.g. in the north-east of Area 5 and the east of Area 6) and adjacent metal fences (e.g. in the north of Area 3).

5.21 Four large and intense magnetic anomalies detected in Area 6 correspond to rugby goal-posts; a rectangular anomaly in the centre of the same area reflects the rubble and/or clinker base for the cricket wicket and further strong anomalies in the north-west and east of Area 6 correspond to concrete sports features.

6. Conclusions

6.1 Approximately 2.5ha of magnetometer survey was undertaken at Queen Elizabeth High School, Hexham, Northumberland, prior to proposed development.

6.2 No features of likely archaeological significance have been identified in the geophysical survey, partly due to landscaping the presence of more recent features.

6.3 Made-ground and evidence of other landscaping works have been detected across many of the survey areas.

6.4 Existing features relating to the sports pitches have been detected in Area 6, including land drains, rugby goal-posts and a cricket wicket.

6.5 Several services have also been detected.

7. Sources

CIfA 2014 *Standard and Guidance for archaeological geophysical survey*. Chartered Institute for Archaeologists

David, A, Linford, N, & Linford, P, 2008 *Geophysical Survey in Archaeological Field Evaluation*. Historic England

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Schmidt, A, 2013 *Geophysical Data in Archaeology: A Guide to Good Practice*. Archaeology Data Service & Digital Antiquity, Oxbow

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Figure 1: Site location

proposed development area

0 1km
scale 1:25 000 for A4 plot

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proposed development area

magnetic survey

-4 nT 6

0 50m
scale 1:1000 for A3 plot

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Figure 2: Magnetometer survey

Area 1

Area 2

Area 3

Area 4

Area 5

Area 6

Existing Hydro Area
2.89 ha

Existing Area
6.66

640

639

922

923

924

925

Sub Sta

Playing Field

Tank

Queen Elizabeth High Sch

Hydro Bungalow

Briorwood

Willow House

Hydro Lodge

LB

88.1m

Corrie

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40.00nT/cm

0 50m
scale 1:1000 for A3 plot

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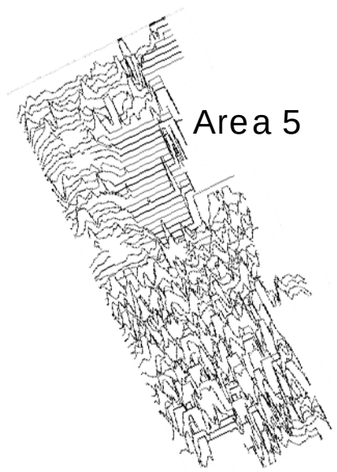
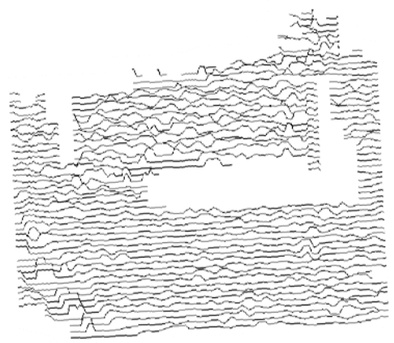
Figure 3: Trace plots of magnetometer data





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proposed development area

magnetic survey

dipolar magnetic anomaly

positive magnetic anomaly

0 50m
scale 1:1000 for A3 plot

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Figure 4: Geophysical interpretation

Area 1

Area 2

Area 3

Area 4

Area 5

Area 6

Hydro Area
2.89 Ha

Existing Site Area
6.66 Ha

640

639

922

923

924

925

Sub Sta

Playing Field

Tank

Queen Elizabeth High School

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Briorwood

Willow House

Hydro Lodge

LB

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proposed development area
magnetic survey
concrete P.E. feature
made ground
cricket wicket
land drain
service
rugby posts

0 50m
scale 1:1000 for A3 plot

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Figure 5: Archaeological interpretation

Area 1
Area 2
Area 3
Area 4
Area 5
Area 6

Hydro Area
2.89 Ha

Existing Site Area
6.66 Ha

640
639
922
923
924
925

Playing Field
Playing Field
Sub Sta
Tank
Queen Elizabeth High School
Hydro Bungalow
Briorwood
Willow House
Hydro Lodge
LB
Corrie
88.1m