pre-construct geophysics

archaeological surveys

WRITTEN SCHEME OF INVESTIGATION

GEOPHYSICAL (GRADIOMETER) SURVEY

HALL GARDENS BRIERLEY, SOUTH YORKSHIRE

CENTRAL NGR 441100 411250

PLANNING APPLICATION REF: 2019/1530/INVALID

PREPARED BY DAVID BUNN

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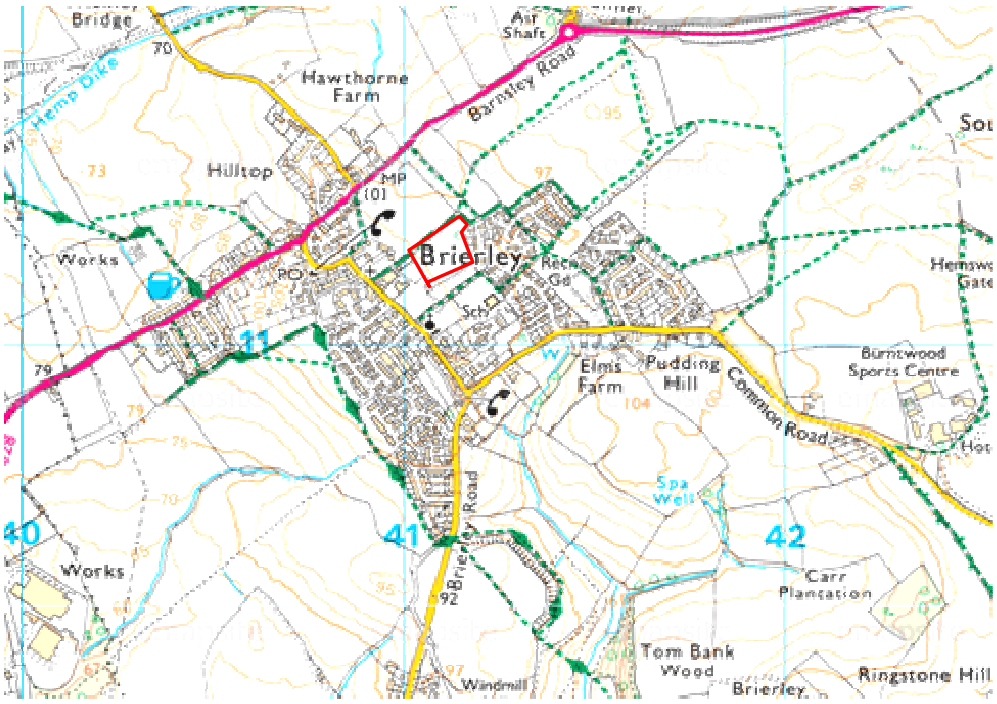


Fig. 1: Location of site

1.0 Introduction

This document sets out details of a written scheme of investigation for a geophysical survey of land at Hall Gardens, Brierley, South Yorkshire (Fig.1). The survey has been requested by Pre-Construct Archaeology Ltd, acting on behalf of Saul Homes. The site is proposed for residential development comprising 38 dwelling and associated infrastructure.

In December 2019 a response to a planning application submitted to Barnsley Metropolitan Borough Council was determined to be invalid for a number of reasons, including the provision for an archaeological evaluation (Planning Ref. 2019/1530/INVALID). The results of geophysical survey will fulfil part of a scheme of archaeological investigation.

2.0 Site Description

The site encompasses c.1.5 ha of grass land interspersed with mature trees that is situated at the mid-northern edge of the modern settlement and to the east of its historic core (Centred at NGR 441100 411250).

It is bordered to the south-west and east by residential developments and to the north, north-east, north-west by undeveloped land. The modern development to the east largely encompasses the former site of Brierley Hall and a council depot.

3.0 Geology and topography

The solid geology comprises sandstone (Brierley Rock) - sedimentary Bedrock formed approximately 310 to 315 million years ago during the Carboniferous Period in a local environment previously dominated by swamps, estuaries and deltas (BGS, 2020). There are no recorded superficial deposits.

The site occupies generally level ground at a height of c.103m – 105m AOD.

4.0 Archaeological Context

The South Yorkshire online database[1] lists a cropmark of a small rectangular enclosure within c.300m to the north-east, described as:

*'two sides of a possible small rectangular enclosure with a gap at the corner formed by these two sides shown on aerial photographs taken on 03/08/1996 (Monument Number: 6733). The site is located just over the border in South Yorkshire, and is bisected by Barnsley Road. Two more irregular/curvilinear ditches lie c.100 m. to the south west (BY, 1997)', t*he latter clearly closer to the current proposed development site.

The above were also referenced in an aerial reconnaissance report (by David Knight0 that formed part of In Archaeological Desk-Based report of Brierley Hall (Sheppey, J. & Mora-Ottomano, A. (201):

'The whole region was covered with Post-Medieval ridge and furrow and steam ploughed narrow ridge and furrow, visible as extensive earthworks, and in places as cropmarks (NMR UID 1394251 and 1394254). The majority of these fields appear to have been heavily cultivated since the date of the mapped photography (predominantly 1950's) and most of the ridge and furrow was found to be no longer visible on the latest 1984 photography.

Approximately 0.3km North of the development site (centred at SE 4115 1148) are two curvilinear ditched enclosures of probable Prehistoric or Roman date. The southernmost consists of an intermittently visible ditch with a maximum internal diameter of 72m. Abutting this enclosure is a linear ditch which extends to the south-west for a distance of 122m. Immediately to the north of these is a more irregular broken enclosure with an internal diameter of 69m. A possible associated "L"-shaped ditch is visible to the south.

[1] https://www.heritagegateway.org.uk/Gateway/

Two further curvilinear enclosures are located towards the Eastern limit of the Brierley area approximately 1km from Brierley Hall (centreed at SE 4207 1103). Both are intermittently visible, with the westernmost having a diameter of 39m (SE 4182 1111). This feature displays a possible entrance along its eastern length. The larger of the two enclosures, at SE 4213 1102, is more irregular in plan with a maximum visible internal diameter of over 70m. Two parallel linear ditches, approximately 42m apart from one-another, are visible lying between the two enclosures, measuring between 133m and 164m in length. The latter may be remnant associated field boundaries. All these features are considered to be prehistoric or Roman in date.

A possible enclosure and an irregular ditch are visible as cropmarks approximately 0.8km from the development site (SE 4174 1053 51). The enclosure appears to be rectilinear in plan (SE 4166 1064), although only partly visible, and has a diameter of over 43m. The ditch lies nearly 300m to the south-east and extends east to west for a length of 113m. The date for both these features is uncertain.'

5.0 Methodology

The survey methodology has been prepared in accordance with all relevant heritage industry guidance and best practice advice, including the *EAC Guidelines for the use of Geophysics in Archaeology* (Schmidt et al. 2016) and the '*Standard and Guidance for Archaeological Geophysical Survey'* (Chartered Institute for Archaeologists, 2014).

5.1 Principles

Fluxgate Gradiometry is a non-intrusive scientific prospecting tool, used to establish the presence/absence of some classes of sub-surface archaeological features (e.g. pits, ditches, kilns, and occasionally stone walls).

The use of gradiometry should help to establish the presence/absence of buried magnetic anomalies, which may reflect sub-surface archaeological features.

The use of magnetic surveys to locate sub-surface ceramic materials and areas of burning, as well as magnetically weaker features is well established, particularly on large green field sites. The detection of anomalies requires the use of highly sensitive instruments; in this instance the Bartington 601 Dual Fluxgate Gradiometer. Two sensors mounted vertically and separated by 1m, measure slight localised distortions of the earth's magnetic field, which are recorded by a data logger.

The technique records variation that is referenced to natural background soil magnetism; where instrument sensors are calibrated to 0nT. As such, the magnetic response of archaeological remains will vary according to geology/pedology, with a possibility that buried features could remain undetected should their magnetic susceptibility closely match that of the surrounding soils. Additionally, some remains may be buried beyond the effective 1m - 2m range of the instrumentation; for example beneath alluvial deposits. Back-filled shallow pits or ditches might also exhibit minimal variation. It should also be noted that the magnetic characteristics (and morphology) of natural features are potentially indistinguishable from weakly magnetic anthropogenic remains (e.g. shared magnetic properties of natural soil filled depressions and pits or palaeochannels with cultivation 'scores' and buried ditches). The interpretation of geophysical survey results should only be regarded as an aid to establishing the nature and origin of buried features.

5.2 Fieldwork and data processing

The survey grid will be located to an accuracy of +/- 2cm by GPS (Leica GS08 RTK).

The instruments will be accurately calibrated to the mean magnetic value of each survey area (following a period of c.30 minutes in order to adjust to air temperature). Further calibration will be undertaken at least once a day - more if and when sensor imbalances are noted on the data logger.

The survey will be undertaken at 4 readings per metre (a sample interval of 0.25m). The zigzag traverse method of survey will be used along 1m wide traverses. The sensitivity of the instrument(s) will be set to record magnetic variation in the order of 0.1 nanoTesla.

Data will be downloaded onto a laptop computer, and subsequently analysed and processed using Terrasurveyor V3. Processing minimally involves 'Despiking' (to reduce the effect of extreme readings induced by metal objects), 'Destriping' to eliminate striping introduced by zigzag traversing and 'clipping' to enhance the graphical presentation of the processed data. These, and any additional process functions (including parameters), will be listed within the report.

5.3 Reporting

A written report will include:

- A summary of the survey results
- Introduction
- Description of site and geology
- Archaeological context
- Methodology, including non technical summary and list of processing functions
- Written results referenced to geo-referenced figures of greyscale images of raw and processed data (clipped to within +/-10nT & +/-2nT, respectively) and interpretive images at a scale of 1:000 (scale bar included on all figures). The interpretative figure(s) will include a key to differentiate between recorded features.
- Conclusions
- Acknowledgements

A PDF version of the report will be produced (plus hard copies if requested). A DWX/DFX drawing (AutoCAD 2010) with images (JPEG format) externally referenced to the CAD illustration an OS base map will also be provided (mapping supplied by client).

A digital archive of the geophysical data and report will be retained by PCG.

6.0 Health and Safety

All work would be carried out in a way that complies with the Health and Safety at Work Act 1974 and its related regulations and codes of practice. Pre-Construct Geophysics staff would perform their duties in accordance with company safety policy, with senior staff responsible for monitoring compliance with health and safety requirements and legislation.

7.0 Insurance

PCG holds Public Liability Insurance to a limit of £5,000,000, Employers Liability Insurance to a limit of £10,000,000 and Professional Indemnity Insurance to a limit of £1,000,000.

8.0 References

British Geological Survey. 2020. Geology of Britain viewer, 1:50,000 geological mapping, bedrock and superficial - http://mapapps.bgs.ac.uk/geologyofbritain/home.html

CIFA 2014 *Standard and Guidance for Archaeological Geophysical Survey.* Chartered Institute for Archaeologists

Schmidt, A; Linford, Linford, P; N; David, A; Gaffney, C; Sarris, A; & Fassbinder, J; 2016. EAC *Guidelines for the use of Geophysics in Archaeology: Questions to Ask and Points to Consider. EAC Guidelines 2.* Euopae Archaeologiae Consilium

Sheppey, J. & Mora-Ottomano, A. (2010) *An Archaeological Desk-Based Assessment of Brierley Hall, Brierley, Barnsley. Archaeological Research Services Ltd Report No. 2010/12*