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GEOPHYSICAL (GRADIOMETER) SURVEY

HALL GARDENS, BRIERLEY, SOUTH YORKSHIRE

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ON BEHALF OF PCAS ARCHAEOLOGY LTD & SAUL HOMES

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Non-technical summary

- *A fluxgate survey gradiometer at Hall Gardens, Brierley, South Yorkshire has identified potential ditches that appear to indicate land divisions; conceivably predating the modern agricultural landscape.*

- *Other linear anomalies are considered more likely to reflect cultivation; this probably pre-dates the construction of former Brierley Hall, with the site potentially once being incorporated into its grounds.*

- *The majority of discrete responses probably relate to modern/recent occupation, though a number have been highlighted as exhibiting greater archaeological potential as indicators of buried pits and/or sites containing burnt materials.*

- *Partial indications of a former tennis court were registered in the southern part of the site.*

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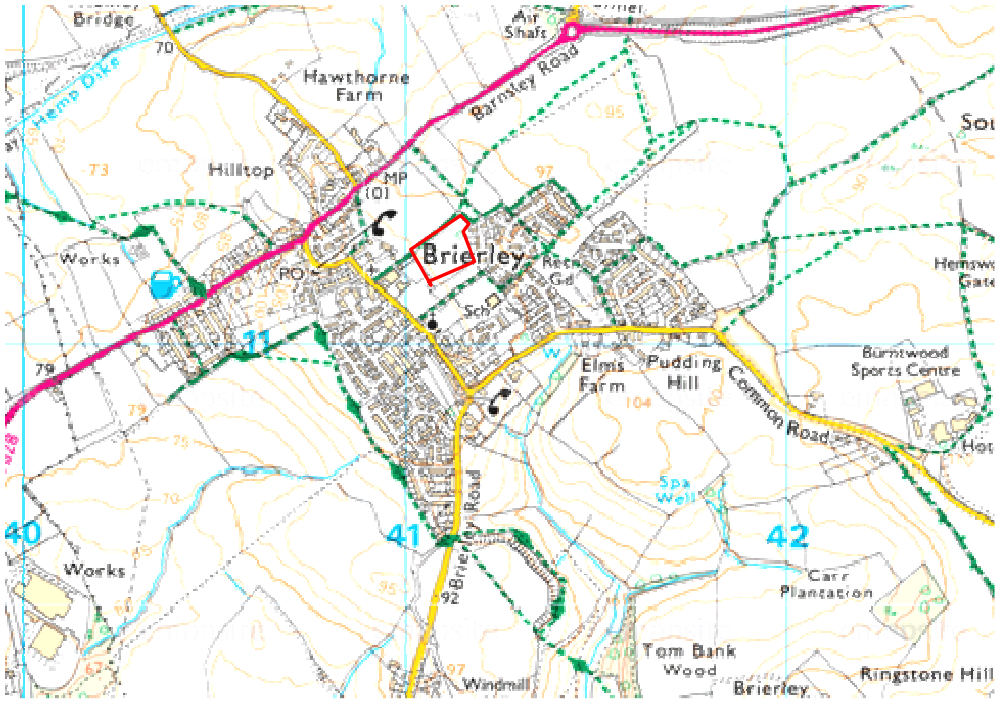


Fig. 1: Location of site

1.0 Introduction

Acting for Saul Homes, PCAS Archaeology Ltd commissioned a fluxgate gradiometer survey of land at Hall Gardens, Brierley, South Yorkshire. The site is proposed for residential development, comprising 38 dwellings and associated infrastructure.

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

2.0 Site Description

The site encompasses c.1.5ha of grassland, interspersed with mature trees and 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 and north-west by undeveloped land. The modern development to the west largely encompasses the former sites of Brierley Hall and a later council depot.

3.0 Geology and topography

The solid geology of the area comprises of 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 c.103m – 105m AOD.

4.0 Archaeological Context

The South Yorkshire online database[1] identifies the cropmark of a small rectangular enclosure within c.150m to the north, 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)'.

The above were also referenced in an aerial reconnaissance report by Dr David Knight that formed part of In Archaeological Desk-Based report of Brierley Hall (Sheppey, J. & Mora-Ottomano, A. (2010):

'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.

Two further curvilinear enclosures are located towards the Eastern limit of the Brierley area approximately 1km from Brierley Hall (centred 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 was prepared with reference to 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). A written Scheme of Investigation was prepared by PCG in advance of the fieldwork (Bunn, 2020).

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

Gradiometry should help to establish the presence/absence of buried magnetic anomalies, which may indicate sub-surface archaeological features, and may therefore form a basis for subsequent archaeological trenching, where required.

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 greenfield sites. The detection of anomalies requires the use of highly sensitive instruments; in this instance the Bartington 601 Dual Fluxgate Gradiometer, calibrated to the mean magnetic value of the survey area. Sensors mounted vertically and separated by 1m, measure slight, localised distortions of the earth's magnetic field, which are recorded by a data logger.

5.2 The fieldwork was undertaken on 12th of March 2020. The zigzag traverse method was used, with readings taken at 0.25m intervals along 1.0m wide traverses.

The survey grid was established by Global Positioning Satellite to an accuracy of +/- 0.1m using a Leica CS15 RTK with Leica SmartWorx Viva software.

The data were processed by *Terrasurveyor V3*.

The greyscale of the unprocessed data is presented on Fig. 2 (clipped to +/-10 nT to enhance resolution). A 'Despike' function was applied to reduce the effect of extreme readings induced by metal objects, and 'Destripe' to eliminate striping introduced by zigzag traversing. The processed data were clipped +/-3nT and presented as a greyscale image on Fig. 3.

Anomalies in excess of +/-10nT are highlighted pink and blue on the interpretive image (Fig. 4). These are characterised magnetically as dipolar 'iron spikes', often displaying strong positive and/or negative responses, which reflect ferrous-rich objects (particularly apparent on stacked trace plots). Examples include those forming/deposited along current or former boundaries (e.g. wire fencing), services and random scatters of horseshoes, ploughshares etc across open areas. Fired (ferro-enhanced) material, such as brick/tile fragments (often where the latter are introduced during manuring or land drain construction) usually induce a similar though predominately weaker response, closer to c+/-5nT (highlighted in pink/blue on interpretive images). Collectively, concentrations of such anomalies indicate probable rubble spreads, such as backfilled ponds/ditches and demolished buildings. On a cautionary note, fired clay associated with early activity has the same magnetic characteristics as modern brick/tile rubble. As such, the interpretation of such variation must consider the context in

which it occurs. It should also be noted that this technique only records magnetic variation (relative to natural background levels). As such, the magnetic response of archaeological remains will vary according to geology/pedology. Additionally, remains may be buried beyond the effective 1 - 2m range of the instrumentation.

The interpretation of geophysical survey results should only be regarded as an aid to establishing the nature and origin of buried features. This can only be fully achieved by intrusive investigation.

6.0 Results and discussion (Figs. 2 - 4)

The survey recorded a pattern of linear anomalies. Some of these are considered to reflect cultivation (dotted orange lines) but others appear to indicate ditches (red lines). No such features are depicted on historic O.S. maps[2], therefore it is conjectured these might represent land divisions associated with an early agricultural landscape. This hypothesis also references cropmark evidence of potential Romano-British or prehistoric enclosure in proximity to the site, the nearest within c.150 (HER No. 6733, see Section 4).

Generally, the site is magnetically 'busy' and it seems likely the majority of stronger discrete responses are of recent origin; indicative of miscellaneous ferrous-rich materials that have accumulated on land that might have formed part of Brierley Hall grounds and, presumably, has not been cultivated in recent times (strongest examples: pink and/or blue).

It has not been possible categorise with confidence the majority of weaker anomalies as either potential archaeological remains (e.g. pits) or natural features, such as tree throws, or other soil-filled depressions in the pedological and/or upper geological horizons.. However, a number of weaker and moderately strong anomalies are identified as potential pits/sites containing burnt materials (red).

Strong variation was recorded along sections of the site perimeter.

Magnetically depleted linear anomalies in the southern part of the site correspond to the western and, less well-defined, northern edges of a former tennis court that is depicted on late 19th to mid-20th century O.S Maps, where the ground is noticeably level across its footprint (dotted yellow lines, see also Fig. 3: inset).

7.0 Conclusions

The survey has identified ditch-like anomalies that appear to indicate land divisions of uncertain origin, though conceivably predating the modern agricultural landscape.

Other linear anomalies are considered most likely to reflect cultivation hat probably pre-dates the construction of the former Brierley Hall, with the site potentially once being incorporated into its grounds.

The majority of discrete responses most likely relate to modern/recent occupation, though a number have been highlighted as exhibiting greater archaeological potential - as indicators of buried pits and/or sites containing burnt materials.

Partial indications of a former tennis court were registered in the southern part of the site.

8.0 References

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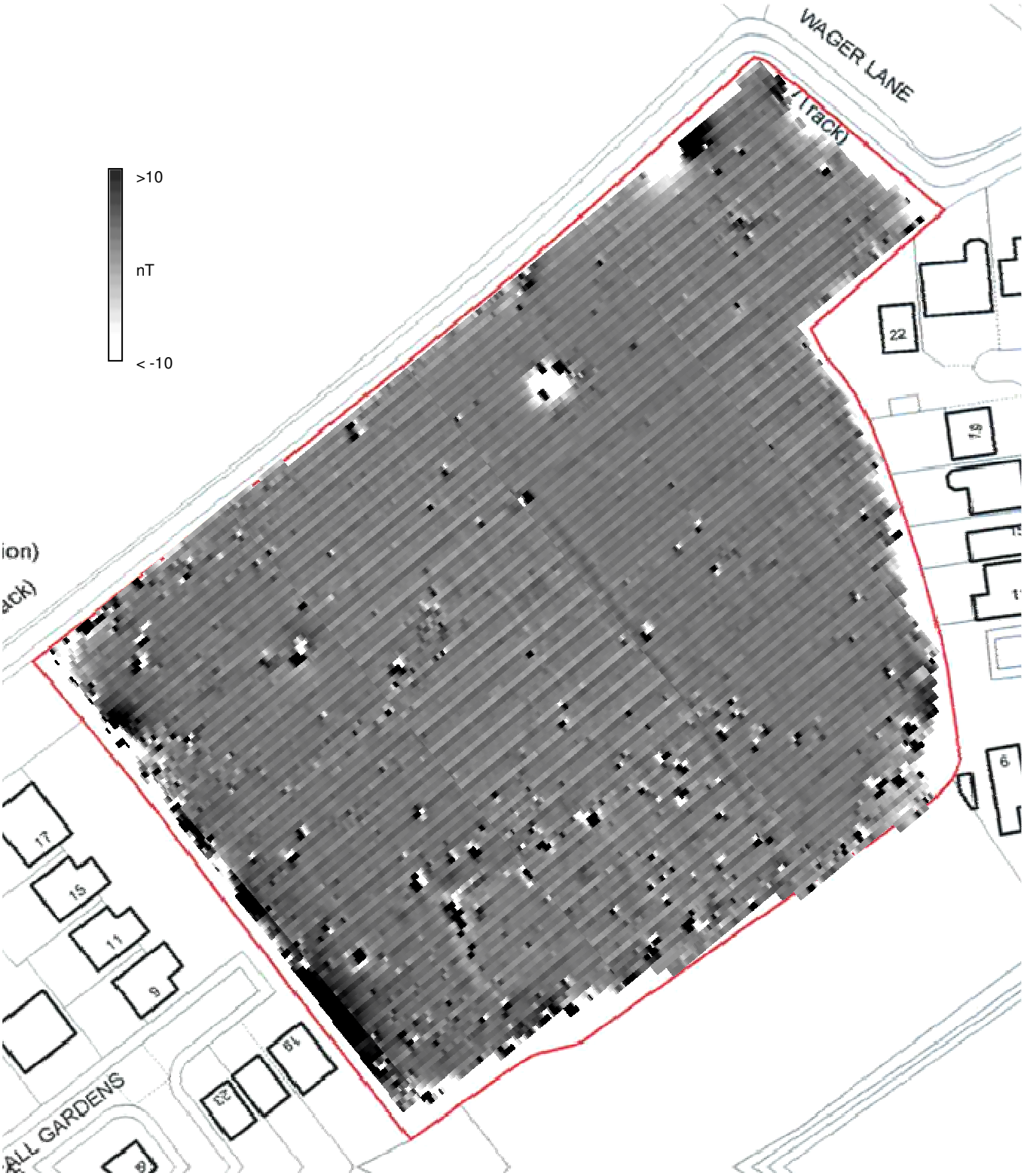
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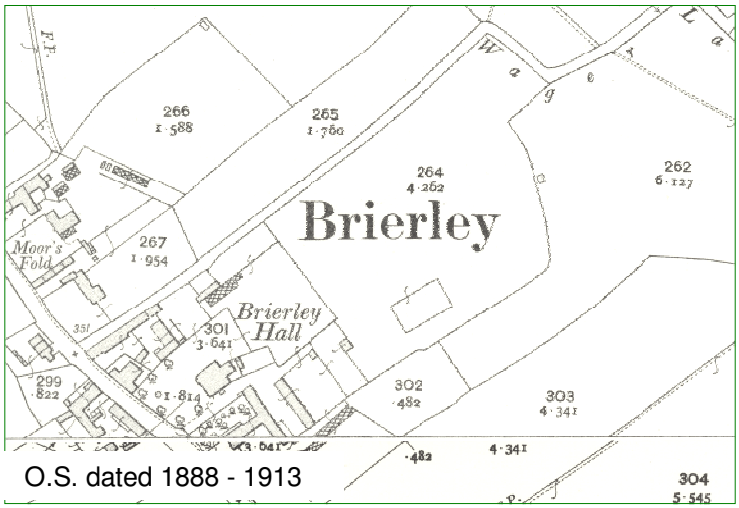
[1]http://www.heritagegateway.org.uk
[2]http://www.old-maps.co.uk/maps.html



100m

Fig. 2: Greyscale image of unprocessed data





100m

Fig. 3: Greyscale image of processed data



>Predominantly modern (rubble, metal objects/fencing etc)

Predominately natural, although archaeological remains typically produce weak magnetic anomalies within this range (e.g. ditches/pits). Exceptions include fired material (e.g. tile/pottery, kilns, hearths and other sites subject to intense heat).

< Predominantly modern (rubble, metal objects/fencing etc)

Potential archaeology

Cultivation

Edge of former tennis court

100m

Fig. 4: Interpretation