Geophysical Survey of land at Bolton Hill Quarry, Pembrokeshire



View of the PDA looking east.

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EXECUTIVE SUMMARY

This report presents the results of a geophysical survey undertaken on land at Bolton Hill Quarry, Pembrokeshire in respect of the Written Scheme of Investigation dated July 2017 submitted in compliance with Condition 40 of planning consent reference 07/0705/MN (dated 24 April 2009) having been approved by Pembrokeshire County Council on 24 November 2017 under reference 17/0457/DC. A geophysical survey of 4.75 ha was carried out in January 2018 whilst the ground conditions were suitable for geophysical survey. The instrument chosen was a Bartington Grad 601 dual sensor fluxgate gradiometer.

The geophysical survey results have revealed a number of strong positive anomalies which are most likely to be a direct result of the granitic geology but an archaeological origin cannot be discounted. The results have also clearly revealed anomalies that are not a direct result of the geology, most notably a pair in the east of the DA that can be interpreted with some confidence as a double-ditched post-medieval field boundary based on the evidence of the 2010 evaluation (Johnson and Tinsley 2010). As this pair of anomalies has been detected with such clarity it is reasonable to assume that other cut features, should they survive as sub-surface remains, would have been detected by the geophysical survey unless there is a significant change in geology and pedology towards the east of the DA.

As such a large number of features of archaeological significance (113) were recorded during the previous archaeological investigations (Johnson and Tinsley 2010) and no definite evidence of significant archaeology has been recorded during the geophysical survey it is possible that thermoremnant effects are influencing the results and masking other remains. For this reason only a low confidence rating can be assigned to the geophysical survey results. The detected anomalies should be investigated during the subsequent archaeological watching brief to confirm their status and origin.

1.0 INTRODUCTION

1.1 Background

- 1.1.1 Archaeological Research Services Ltd (ARS Ltd) was commissioned by GD Harries and Sons Ltd to undertake a geophysical survey of land at Bolton Hill Quarry, Pembrokeshire. This is in respect of the Written Scheme of Investigation (Kendall 2017: Appendix 2) dated July 2017 submitted in compliance with Condition 40 of planning consent reference 07/0705/MN (dated 24 April 2009) having been approved by Pembrokeshire County Council on 24 November 2017 under reference 17/0457/DC. The development area (DA) is centred at SM 92177 10884 and originally covered an area of c.3.6 ha. During the course of the survey an instruction was received to extend the survey area to the east and west resulting in a combined survey area of c.4.75 ha. (Figure 1).
- 1.1.2 This report presents the results of the geophysical survey. The objective of the geophysical survey was to identify any anomalies of archaeological origin within the development area in order to identify and record the presence/absence, location, nature and extent of any surviving below-ground archaeological remains.

1.2 Location, Topography and Geology

- 1.2.1 The 'red line boundary' of the development area is depicted by a red polygon on Figure 1 and is *c*.4.75 ha in area. The DA comprises part of a pasture field to the south of the working quarry. The DA lies approximately 4.8km south-west of Haverfordwest and occupies a prominent hilltop position with unrestricted views along the northern scarp towards the Preseli Mountains. The DA is bounded on its north-western edge by a public bridleway, on its north-eastern edge by the working quarry and is unbounded on all other sides. The land falls gently from 90m above Ordnance Datum (aOD) in the north-west, to 80m aOD in the south-east, beyond which the land falls away more steeply towards the village of Johnston.
- 1.2.2 The underlying solid geology of the DA comprises a granitic outcrop within the wider South Wales Lower and Middle coal measures with overlying till deposits (BGS 2018).

2.0 ARCHAEOLOGICAL BACKGROUND

- 2.1. As part of the Phase 1 works Archaeological Research Services Ltd were commissioned in 2010 by F.H. Gilman and Co to undertake an archaeological strip, map and sample excavation. The following archaeological background was compiled and included in the accompanying Written Scheme of Investigation (Kendal 2017).
- 2.2 Previous chance finds in the area and on the site indicated the presence of archaeological deposits and features of probable prehistoric date. The presence of several possible burnt mounds had been mooted as being present on the site. The

site is also located close to the find spot of a Bronze Age hoard of gold. However, no further gold hoard nor any burnt mound was found during the excavation.

- 2.3 The excavations in advance of the Phase 1 works did, however, reveal evidence of six phases of activity (Johnson and Tinsley 2010), that date predominantly from the prehistoric period and include Mesolithic-Neolithic transition pit digging (Johnson and Tinsley 2010, 14-16), midden pits from the mid-Neolithic (*ibid*, 17-22), pits and postholes dating to the Chalcolithic (Beaker/early Bronze Age) possibly representing a building (*ibid*, 22-27), as well as isolated pits and a cluster of late Bronze Age pits and postholes, which may also represent the heavily truncated remains of a building (*Ibid*, 28-34).
- 2.4 An important assemblage of mid-Neolithic ceramics was also recovered from the site. This material comprised Impressed Ware, sometimes referred to as 'Peterborough Ware', which came from the fills of isolated 'midden' pits. Some Neolithic-derivative, Beaker and late Bronze Age ceramics were also recovered from the site, along with 38 worked flints.
- 2.5 A post-medieval enclosure was also excavated on the site, although the lack of any structural evidence or material culture associated with this feature makes ascribing a function to this feature speculative (Johnson and Tinsley 2010, 35-38).

3.0 METHODOLOGY

- 3.1 Magnetometry is a non-intrusive scientific prospecting technique that is the preferred geophysical technique used to determine the presence or absence of buried archaeological features when site and geological conditions are favourable. It is an efficient and effective method for locating anomalies corresponding with archaeological features. The instrument chosen for this survey was a Bartington Grad 601 dual sensor fluxgate gradiometer which can detect weak changes in the Earth's magnetic field caused by buried features.
- 3.2 All fieldwork and reporting was undertaken following Historic England and Chartered Institute for Archaeologists (CIfA) standards and guidance (Gaffney *et al.* 2008; CIfA 2014a; 2014b).
- 3.3 The 30m by 30m survey grids were located to cover the DA and aligned as shown in Figure 2. In total 58 survey grids (including partial grids) were set out and accurately positioned using a Leica Zeno 10 GNSS field controller with GS05 antenna cap which was connected to Leica Smartnet to receive corrections resulting in an accuracy of typically 0.6m or better. Each grid was then surveyed at 1m traverse intervals with the sampling at 0.25m (4 readings per metre) intervals. The survey was carried out in 'zigzag' mode with each alternate traverse walked in opposite directions. The range of the instrument was set at 100nT (0.01nT resolution).

- 3.4 The geophysical survey was conducted between 24th and 26th January in variable weather conditions with strong winds and frequent heavy showers. At the time of the survey the field was under short grass and was firm underfoot. In the north the DA encroaches and extends beyond a mature hedgerow and into the working quarry resulting in a strip approximately 40m wide that was inaccessible for survey. The remaining area was unobstructed and was suitable for geophysical survey.
- 3.5 Prior to commencing the survey the gradiometer was balanced and calibrated to the local conditions and this was repeated regularly throughout each day. At the end of each day the data was downloaded into a computer, checked and archived on the ARS Ltd server. The data was downloaded using Bartington Instruments' *Grad 601 Communication Application*.

4.0 GEOPHYSICAL SURVEY RESULTS

4.1 Introduction

- 4.1.1 The data was minimally processed using Geoplot software. The data was "clipped" (clipping parameters selected on the mean and standard deviation data values), "destaggered" and the striping that can often appear in gradiometer data was removed by utilising the "zero mean traverse" function with thresholds applied. Finally, the data was interpolated. To enhance the visibility of subtle features the data was viewed under a number of different clip plotting parameters.
- 4.1.2 Occasionally processing the data to compensate for directional sensitivity or to remove iron spikes caused by miscellaneous ferrous objects can also inadvertently disguise anomalies that may be of archaeological origin, particularly long linear features in the direction of the traverses. To take account of this the data has been analysed in a number of different formats and at each stage of processing.
- 4.1.3 The data analysis is presented graphically in Figures 3 to 5. A greyscale shade plot of the processed gradiometer data is presented in Figure 3 and an interpretative plan in Figure 4. A trace plot of the processed gradiometer data is presented in Figure 5.

4.2 Anomalies (Anomaly numbers refer to Fig. 4)

- 4.2.1 A number of strong positive anomalies with amorphous form are notable in the dataset. It is most likely that the anomalies are a result of the underlying granitic geology and are not considered to be archaeological at this stage. However, an archaeological origin cannot be discounted and the origin and status of the anomalies should be confirmed during the subsequent archaeological watching brief (see Written Scheme of Investigation: Appendix 2).
- 4.2.2 A water main crosses the northern part of the DA on a north-west/ south-east alignment and this has been clearly detected by the geophysical survey (anomaly 1). Just to the south of the pipe an ovular anomaly (2) was recorded. It is possible that

the anomaly is of archaeological origin and could be another, albeit smaller, example of a ditched enclosure similar to the one which discovered during the 2009 strip, map and sample excavation and dated within the late medieval to post-medieval period (Johnson and Tinsley, 2010, 35-38).

- 4.2.3 In the south-east of the DA two parallel positive linear anomalies (3) on a north-east/ south-west alignment were recorded. The anomalies are separated by a distance of approximately 3.5m and are most likely to represent the ditches associated with a double-ditched post-medieval field boundary contemporary with the ones identified during the 2009 strip, map and sample excavation (Johnson and Tinsley 2010). It is also possible that two weak and apparently discontinuous linear anomalies that bisect the DA on an east-north-east/ west-south-west alignment (4) also represent the remains of a double-ditched field boundary, albeit more heavily truncated, or, alternatively, they may be of more recent agricultural origin.
- 4.2.4 A weak linear anomaly (5) respects the alignment of the north-eastern field boundary and is therefore most likely to be agricultural. In the west, very weak parallel linear anomalies (group 6) are also most likely to be cultivation remains, possibly ridge and furrow, or even land drainage.

5.0 DISCUSSION AND CONCLUSIONS

- 5.1 The effects of the igneous granitic outcrop on the results of the geophysical survey are unknown. The Historic England guidance, Geophysical survey in Archaeological field Evaluation, states that "Thermoremanent effects can preclude survey over some igneous rock types (eg basalts); however, others (eg Cornish granites) seem to be relatively unaffected" (Gaffney *et al.* 2008).
- 5.2 The geophysical survey results have revealed a number of strong positive anomalies which are most likely to be a direct result of the granitic geology but an archaeological origin cannot be discounted. The results have also revealed anomalies that are not a direct result of the geology, most notably a pair in the east of the DA that can be interpreted with some confidence as a double-ditched post-medieval field boundary based on the evidence of the 2009 strip, map and sample excavation (Johnson and Tinsley 2010). As these anomalies have been detected with such clarity it is reasonable to assume that other cut features, should they survive as sub-surface remains, would have been detected by the geophysical survey unless there is a significant change in geology and pedology towards the east of the DA.
- 5.3 As such a large number of features of archaeological significance (113) were recorded during the previous archaeological investigations (Johnson and Tinsley 2010) and no definite evidence of significant archaeology has been recorded during the geophysical survey it is possible that thermoremnant effects are influencing the results and masking other remains. For this reason only a low confidence rating can be assigned to the geophysical survey results. The detected anomalies should be

investigated during the subsequent archaeological watching brief (see Written Scheme of Investigation: Appendix 2) to confirm their status and origin.

6.0 ARCHIVE DEPOSITION

- 6.1 One bound copy of the final report with an attached digital PDF/A copy on disc will be deposited with the relevant Historic Environment Record (HER). The disc will also include a digital archive, consisting of relevant ESRI shape files or CAD files, for use of updating the HER database.
- 6.2 Archaeological Research Services Ltd will retain the copyright of all documentary and photographic material under the Copyright, Designs and Patent Act (1988).

7.0 PUBLICITY, CONFIDENTIALITY AND COPYRIGHT

- 7.1 Any publicity will be handled by the client.
- 7.2 Archaeological Research Services Ltd will retain the copyright of all documentary and photographic material under the Copyright, Designs and Patent Act (1988).

8.0 STATEMENT OF INDEMNITY

8.1 All statements and opinions contained within this report arising from the works undertaken are offered in good faith and compiled according to professional standards. No responsibility can be accepted by the author/s of the report for any errors of fact or opinion resulting from data supplied by any third party, or for loss or other consequence arising from decisions or actions made upon the basis of facts or opinions expressed in any such report(s), howsoever such facts and opinions may have been derived.

9.0 ACKNOWLEDGEMENTS

9.1 Archaeological Research Services Ltd would like to thank all those involved in the project for their help and assistance. In particular we would like to thank GD Harries and Sons Ltd. for commissioning this work and the Quarry Management team for arranging access to carry out the survey and for their help and advice.

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Site Code: Bolton Hill Quarry Drawing Ref. Figure 2 Date: February 2018 Drawn: RD Scale: As Shown

Figure 2

Location of survey grids

Key:



1 30m x 30m survey grids

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10

Site Code: Bolton Hill Quarry Drawing Ref. Figure 3 Date: February 2018 Drawn: RD Scale: As Shown

Figure 3 Greyscale shade plot of processed gradiometer data



Proposed Development Area (PDA)

Plotting parameters



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Geophysical Survey of land at Bolton Hill Quarry, Pembrokeshire

Appendix 2: Written Scheme of Investigation

Bolton Hill Quarry, Pembrokeshire Phase 2

Written Scheme of Investigation for Geophysical Survey, Watching Brief and Strip, Map and Record.

July 2017



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Written Scheme of Investigation for Archaeological Excavations at Bolton Hill Quarry, Pembrokeshire



1 INTRODUCTION

1.1 Project and Planning Background

1.1.1 This Written Scheme of Investigation (WSI) has been prepared by Archaeological Research Services Ltd (ARS Ltd) on behalf of G D Harries & Sons Ltd. It details a scheme of works for geophysical survey and a scalable archaeological watching brief which has been designed to be scalable up to strip, map and record excavation, as appropriate to the nature of the archaeological remains encountered, in satisfaction of planning consent 07/0705/MN and with regard to Condition 40 of the consent for the extension of Bolton Hill Quarry granted 24th April 2009.

1.1.2 The aim of the programme of works is, in line with the National Planning Policy Framework (NPPF) paragraph 141 (DCLG 2012), to record and enhance understanding of the significance of any heritage assets to be lost during the proposed development in a manner proportionate to their importance, and to make this evidence (and any archived generated) publicly accessible.

1.1.3 Planning permission has been granted for development of the site subject to Condition 40, which requires archaeological work prior to development and states that:

Prior to the commencement of soil stripping operations at the site the applicant, or their agents or successors in title, shall secure the implementation of a programme of archaeological work in accordance with a written scheme of investigation which has been submitted by the applicant and approved in writing by the Local Planning Authority

Reason: to protect historic environment interests whilst enabling development

1.1.4 This WSI has been prepared following consultation with, and under the guidance of, Mike Ings, Senior Planning Archaeologist, Dyfed Archaeological Trust in his role as advisor to Pembrokeshire County Council.

1.1.5 This WSI describes the objectives and the methods to be employed during archaeological works which comprise geophysical survey as well as archaeological watching brief and, where necessary and appropriate, scalable strip, map and record excavations. In its final, issued, form this WSI has been recommended by Mike Ings, Senior Planning Archaeologist, Dyfed Archaeological Trust for approval by Pembrokeshire County Council.

1.2 Site Location

1.2.1 The site lies approximately 4.8km south-west of Haverfordwest and occupies a prominent hill top, the second highest in Pembrokeshire, with unrestricted views along the northern scarp towards the Preseli Mountains.



1.3 Site Description, Landform, Topography and Soils

1.3.1 The 'red line boundary' of the PDA (Proposed Development Area) is outlined in Figure 1. It encompasses an area of approximately 3.6ha.

1.3.2 The site comprises farmland, used for pasture, subdivided by hedgerows into irregularly shaped fields.

1.3.3 The land falls gently from 90m above Ordnance Datum (aOD) in the northwest, to 80m aOD in the south-east, beyond which the land falls away more steeply towards the village of Johnston.

1.3.4 Land use prior to quarrying consisted of open pasture, although cultivation of deep plough crops, such as potatoes, as well as other forms of agriculture had been practiced across the site in recent history.

1.3.5 The south-western area of the site is crossed by public footpath PF84/7, which links with bridleway 84/8 on its northern side, and then runs south-westwards, via footpath 33/10 to Johnston.

1.3.6 The underlying solid geology of the site comprises a granitic outcrop within the wider South Wales Lower and Middle coal measures with overlying till deposits (BGS 2017).

2 HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

2.1.1 As part of the Phase 1 works (Figure 1) Archaeological Research Services Ltd were commissioned in 2010 by F.H. Gilman and Co to undertake an archaeological strip, map and sample excavations.

2.1.2 Previous chance finds in the area and on the site indicated the presence of archaeological deposits and features of probable prehistoric date. The presence of several possible burnt mounds had been mooted as being present on the site. The site is also located close to the find spot of a Bronze Age hoard of gold. However, neither gold hoard nor burnt mound was found during the excavation.

2.1.3 The excavations in advance of the Phase 1 works however revealed evidence of six phases of activity (Johnson and Tinsley. 2010), that date predominantly from the prehistoric period and include Mesolithic-Neolithic transition pit digging (Johnson and Tinsley. 2010. 14-16), midden pits from the mid-Neolithic (Ibid 17-22), pits and postholes dating to the Chalcolithic (Beaker/early Bronze Age) possibly representing a building (ibid, 22-27), as well as isolated pits and a cluster of late Bronze Age pits and postholes, which may also represent the heavily truncated remains of a building (Ibid, 28-34).

2.1.4 An important assemblage of mid-Neolithic ceramics was also recovered from the site. This material comprised Impressed Ware, sometimes referred to as 'Peterborough Ware', which came from the fills of isolated 'midden' pits. Some Neolithic-derivative, Beaker and late Bronze Age ceramics were also recovered from the site, along with 38 worked flints.



2.1.6 A post-medieval enclosure was also excavated on the site, although the lack of any structural evidence or material culture associated with this feature makes ascribing a function to this feature impossible (Johnson and Tinsley. 2010, 35-38).

3 AIMS AND OBJECTIVES

3.1 Regional Research Aims and Objectives

3.1.1 The results of the Phase 1 excavations are significant to the research of the Neolithic and Bronze Age periods in Wales in particular, and in Britain more widely. This is especially true given the radiometric dating associated with the Impressed Ware ceramics, as well as the evidence for activity during the Mesolithic - Neolithic transition, and the possible buildings dating to the Chalcolithic (Beaker) and later Bronze Age (Johnson and Tinsley. 2010).

3.1.2 Potentially, the results of further archaeological works at the site will enable the further development of our understanding of Middle and Later Neolithic landscape occupation, as the tradition of burial of domestic midden material shown at Bolton Hill is in keeping with other sites in Wales.

- 3.1.3 The aims and objectives of the phase of work proposed here would be to:
 - Identify further phases of Prehistoric activity locally.
 - Add to the Regional understanding of Mesolithic/Neolithic Transition, Agriculture, Landscape Use and Material Culture within this area of Pembrokeshire.
 - Identify potential areas of burnt mounds.
 - Identify and quantify additional ceramic evidence within features revealed in Phase 2.

3.2 Project Objectives

3.2.1 The aims of the programme of work are to gather sufficient evidence to establish, supplement, improve and make available information about any archaeological remains existing within the area of investigation, and to provide an appropriate post-excavation assessment, analysis, reporting, archiving and dissemination.

- 3.2.2 The objectives are as follows.
 - To produce an appropriately scaled geophysical survey of potential features across the site.
 - To produce a photographic, drawn and descriptive record of any surviving below-ground archaeological remains.
 - To produce dating and phasing for archaeological deposits recorded on the site.
 - To establish the character and delimit the extent of archaeological deposits in order to define functional areas on the site, e.g. industrial and domestic.



• To produce information on the economy and local environment.

4 METHOD STATEMENTS

4.1 General Statement of Practice

4.1 An overarching methodology is set out for the scheme of archaeological mitigation for the site. This represents an integrated programme of works and comprises:

- Geophysical survey (Section 4.3 below)
- Scalable archaeological watching brief including strip, map and sample excavations, as required, appropriate to the scale and nature of any archaeological remains encountered (Section 4.4 below).

4.1.2 All works covered under this specification will be undertaken in accordance with best practice and will conform to the letter and in spirit with Chartered Institute for Archaeologists (CIfA) standards and guidance, to wit: Code of Conduct (2014a), Standards and Guidance for Geophysical Survey (2014b), Standards and Guidance for Archaeological Excavations (2014c), Standards and Guidance for Archaeological Watching Briefs (2014d).

4.1.3 All staff employed on the project will be suitably qualified for their respective project roles and have substantial experience of the work they are being asked to undertake.

4.1.4 All staff will be made aware of the archaeological importance of the area surrounding the site and will be fully briefed on the work required by this specification.

4.1.5 All ground works covered under this specification will be undertaken either by hand or by a suitable mechanical excavator fitted with a toothless ditching bucket working in plan and under archaeological supervision.

4.1.6 ARS Ltd will ensure that plant or machinery will not be operated in the immediate vicinity of any archaeological remains until they have been recorded.

4.1.7 Contractors and plant operators will be notified that any observations of archaeological remains must be reported immediately to the archaeologist on site.

4.1.8 Regular contact will be ensured between ARS Ltd and the site project manager to ensure that ARS Ltd is kept up to date with site works and given the change to respond appropriately and in line with Mike Ings, Senior Planning Archaeologist, Dyfed Archaeological Trust for Pembrokeshire County Council.

4.1.9 All site operations will be carried out in a safe manner in accordance with ARS Ltd's health and safety policy. A risk assessment will be prepared before commencement on site.



4.2 Coverage

4.2.1 The area subject to additional mineral extraction for Phase 2 is approximately 3.6 ha in size with 3.3ha reserved for extraction.

4.3 Geophysical Survey

4.3.1 Geomagnetic survey is considered to be an appropriate geophysical technique, given the non-igneous environment, and the expected presence of archaeological features at depths of no more than 1.5m.

4.3.2 This technique involves the use of hand-held gradiometers, which measure variations in the vertical component of the earth's magnetic field. These variations can be due to the presence of sub-surface archaeological features. Geomagnetic measurements will be determined using a Bartington Grad601-2 dual gradiometer system, with twin sensors set 1m apart.

4.3.3 A 30m grid will be established over the survey area, and tied-in to known Ordnance Survey points using a Trimble M3 total station with datalogger.

4.3.4 The survey will be undertaken using a zig-zag traverse scheme, with data being logged in 30m grid units. A sample interval of 0.25m will be used, with a traverse interval of 1m, providing 3,600 sample measurements per grid unit. The data will be downloaded onto a laptop computer for data processing and storage in the field using specialist software.

4.3.5 Geophysical survey data will be processed using Terra Surveyor software, to produce 'grey-scale' images of the raw data. Positive magnetic anomalies will be displayed as dark grey, and negative magnetic anomalies are displayed as light grey. A palette will show the relationship between the grey shades and geomagnetic values in nT.

4.3.6 Raw data will be processed in order to further define and highlight the archaeological features detected. The resulting grey-scale images will be combined with site survey data and Ordnance Survey data to produce geophysical survey plans.

4.3.7 Colour-coded geophysical interpretation diagrams will be provided, showing the locations and extent of positive, negative, dipolar, and diffuse magnetic anomalies.

4.3.8 Archaeological interpretation diagrams will also be provided, which will be based on the interpretation of the geophysical survey results, in light of the archaeological and historical background of the site.

4.3.9 A detailed report will be provided, and will include the following:

A location plan showing the location of the study area, related to the national grid, and an eight figure Ordnance Survey grid reference.

- The dates on which the project was undertaken
- A concise, non-technical summary of the results
- A summary of the historical and archaeological background of the site



- A description of the methodology employed, work undertaken and results obtained
- A description of any geophysical anomalies detected within the study area
- Greyscale plans at an appropriate scale showing the location and extent of any geophysical anomalies (raw and processed data)
- Interpretation of the geophysical survey results in light of the archaeological and historical background of the site
- Geophysical and archaeological interpretation diagrams
- Plots of raw data will be included in the Appendix

4.3.10 The geophysical report will inform the subsequent archaeological process by highlighting areas suitable for strip, map and record excavations and those areas where it is considered that a watching brief would be a more suitable method of evaluation. Such a judgement would be taken under the guidance and with the agreement of Mike Ings, Senior Planning Archaeologist, Dyfed Archaeological Trust for Pembrokeshire County Council.

4.4 Watching Brief

4.4.1 All elements of the archaeological watching brief will be carried out in accordance with the relevant CIFA Codes of Conduct (see Section 4.1 above).

4.4.2 The watching brief will be carried out during all groundworks.

4.4.3 All excavated spoil will be scanned visually to recover small finds. Finds so recovered will be recorded with their location of origin ascribed. Finds will be retained and recorded.

4.4.5 Where archaeological features and/or deposits are identified during the watching brief, then a sufficient quantity of the said features will be investigated by hand to allow their date, nature and degree of survival to be ascribed.

4.4.6 If significant archaeological features are identified during these works Dyfed Archaeological Trust: Development Management (DAT DM) will be notified and a decision made as how to proceed.

4.5 Strip, Map and Record

4.5.1 All elements of the archaeological strip, map and record exercise will be carried out in accordance with CIFA Codes of Conduct (see Section 4.1 above).

4.5.2 The strip, map and record will be carried out during the preliminary groundworks associated with topsoil stripping.

4.5.3 The topsoil will be removed mechanically by a suitable mechanical excavator fitted with a toothless ditching bucket, under continuous archaeological supervision. The topsoil or recent overburden will be removed down to the first significant archaeological horizon in successive level spits.



4.5.4 The stripped areas will be appropriately cleaned using hand tools in order to expose the full nature and extent of archaeological features and deposits.

4.5.5 Once the area has been stripped, cleaned and mapped as outlined above, consultation will take place with Mike Ings, Senior Planning Archaeologist, Dyfed Archaeological Trust for Pembrokeshire County Council.

4.5.6 All excavated spoil will be scanned visually to recover small finds. Finds so recovered will be recorded with their location of origin ascribed. Finds will be retained and recorded.

4.5.7 Isolated, discrete features such as pits not belonging to structures or industrial activities will be 50% sampled, although if they produce artefacts then provision is made for full excavation.

4.5.8 Limited representative samples of bricks from brick-built structures, and selective products of the brick working process will be retained for specialist analysis where appropriate.

4.6 Sampling, Faunal Remains and Treasure

4.6.1 This section outlines sampling methodologies to be utilised in all excavation types.

4.6.2 For sealed and stratigraphically secure deposits that have the potential to provide environmental evidence relating to diet and economy, dating evidence or land use regime, a minimum of 40 litres of sample will be taken, or 100% of the sample if smaller. This material will be floated and passed through graduated sieves, the smallest being a 500μ mesh.

4.6.3 In the case of waterlogged or anaerobic deposits, a minimum sample size of 20 litres will be taken.

4.6.4 Should a sequence of superimposed deposits of note be present column sampling may be considered.

4.6.5 In all instances, sampling strategies will be in accordance with guidelines issued by Historic England's Environmental Archaeology: A Guide to the Theory and Practice Methods, from sampling and recovery to post-excavation (Campbell et al. 2011) and will be targeted in order to explore the levels and types of preservation present.

4.6.6 Should other types of environmental deposits be encountered, appropriate specialist advice will be sought and appropriate sampling strategy devised. Samples will be assessed by a suitable specialist with provision for further analysis as required. Advice from the Historic England Scientific Advisor will be taken as appropriate.

4.6.7 Any human remains will initially be left in-situ and, if deemed necessary, removal will be undertaken following once a Coroners licence has been obtained in accordance with the relevant Ministry of Justice regulations and in discussion with the Dyfed Archaeological Trust: Development Management (DAT DM).



4.6.8 Finds of 'treasure' will be reported to the Coroner in accordance with the Treasure Act (DCMS 2008). The Portable Antiquities Liaison officer will also be notified.

4.7 Recording

4.7.1 Site recording will follow standard conventions outlined in the Site Recording Manual of Museum of London Archaeology Services (MoLAS) (2002).

4.7.2 The site will be accurately tied into the National Grid and located on a 1:2500 or 1:1250 map of the area. The site will be recorded using a single context planning system in accordance with the ARS Ltd field recording manual.

4.7.3 A full and proper record (written, graphic and photographic as appropriate) will be made for all work, using pro-forma record sheets and text descriptions appropriate to the work. Accurate measured scale plans and section/elevations will be drawn where required at the appropriate scale and in accordance with best practice. In addition to relevant illustrations, provision for rectified photographic recording shall be made, if deemed necessary.

4.7.4 A plan of the excavated areas will be maintained, features notes and section lines recorded. All drawings will be carried out at an appropriate scale and all contexts will be recorded using a single context recording system.

4.7.5 Sample representative levels will be taken to record the maximum depth of the archaeology or natural should no archaeological features be uncovered.

4.7.6 The stratigraphy of the site will be recorded even where no archaeological deposits have been identified.

4.7.7 All heights above sea level will be recorded for all deposits and features in metres above Ordnance Datum (aOD).

4.7.8 A full photographic record will be compiled using a digital camera, a Fuji XP90 with a 16.4 MP resolution, and a register of all photographs will be kept. The photographic record will encompass all encountered archaeological entities. In addition, key relationships between entities, where these help demonstrate sequence or form, will also be photographed. A clearly visible, graduated metric scale will be included in all record shots. A supplementary record of working images will be taken to demonstrate how the site was investigated and what the prevailing conditions were like during excavation.

4.7.9 A stratigraphic matrix will be compiled for all trenches where superimposed archaeological deposits, features or structures are encountered.

5 FINDS PROCESSING AND STORAGE

5.1.1 All finds processing, conservation work and storage of finds will be carried out in accordance with the CIFA (2014e) Standard and Guidance for the collection, documentation, conservation and research of archaeological materials and the UKIC (1990) Guidelines for the Preparation of Archives for Long-Term Storage.



5.1.2 Artefact collection and discard policies will be appropriate for the defined purpose.

5.1.3 Bulk finds which are not discarded will be washed and, with the exception of animal bone, marked. Marking and labelling will be indelible and irremovable by abrasion. Bulk finds will be appropriately bagged, boxed and recorded. This process will be carried out no later than two months after the end of the excavation.

5.1.4 All small finds will be recorded as individual items and appropriately packaged (e.g. lithics in self-sealing plastic bags and ceramic in acid-free tissue paper). Vulnerable objects will be specially packaged and textile, painted glass and coins stored in appropriate specialist systems. This process will be carried out within two days of the small find being excavated.

5.1.5 During and after the excavation all objects will be stored in appropriate materials and storage conditions to ensure minimal deterioration and loss of information (including controlled storage, correct packaging, and regular monitoring, immediate selection for conservation of vulnerable material). All storage will have appropriate security provision.

5.1.6 The deposition and disposal of artefacts will be agreed with the legal owner and Scolton Manor Museum prior to the work taking place. All finds except treasure trove are the property of the landowner.

5.1.7 All retained artefacts and ecofacts will be cleaned and packaged in accordance with the requirements of the recipient museum.

6 MONITORING ARRANGEMENTS

6.1.1 At least one week prior notice of the commencement of the ground works will be given to:

Senior Planning Archaeologist Mike Ings, Dyfed Archaeological Trust Corner House 6 Carmarthen Street, Llandeilo, Carmarthenshire, SA19 6AE Tel: 01558 825987 ext 210

6.1.2 ARS Ltd will liaise with Dyfed Archaeological Trust: Development Management (DAT DM) at regular intervals throughout the course of the work.

6.1.3 The client will afford reasonable access to the Development Control Archaeologist, or his / her representative, Dyfed Archaeological Trust, for the purposes of monitoring the archaeological mitigation.

7 STAFFING

7.1.1 The Project Manager for the archaeological fieldwork will be Reuben Thorpe, FSA, MCIfA, Projects Manager at ARS Ltd. The Fieldwork Project Officer will be Tom Parker Assistant Projects Officer at ARS Ltd.



7.1.2 Finds analysis will be carried out by appropriately qualified specialists as detailed subject to availability:

•	Flint and prehistoric pottery:	Dr Clive Waddington MCIfA / Robin Holgate MCIfA
٠	Romano-British pottery:	Dr Jeremy Evans
٠	Samian ware:	Gwladys Monteil
٠	Medieval and post-medieval pottery:	Dr Chris Cumberpatch
٠	Clay pipes:	Mike Wood MCIfA
٠	Industrial Remains:	Chris Scott MCIfA
٠	Plant macrofossils and charcoals:	Luke Parker
٠	Molluscs:	Dr Andy McWilliams
٠	Human and animal bone:	Milena Grzybowska
٠	Radiocarbon dating:	SUERC
٠	Finds conservation:	Dr Jenny Jones, Durham University

8 REPORT

8.1.1 Following completion of the work, Archaeological Research Services Ltd will produce a report which will include,

- Non-technical summary
- Introductory statement
- Aims and purpose of the project
- Methodology
- A location plan showing all excavated areas and any archaeological features with respect to nearby fixed structures and roads
- Illustrations of all archaeological features with appropriately scaled hachured plans and sections
- An objective summary statement of results
- Conclusions
- Supporting data tabulated or in appendices
- Index to archive and details of archive location
- References
- Statement of intent regarding publication



- Confirmation of archive transfer arrangements
- A copy of the OASIS form

8.1.2 One bound copy of the final report with a digital copy of the report in PDF/A format on disk will be deposited with the Dyfed Archaeological Trust Historic Environment Record (HER). A copy of the report should be uploaded as part of the OASIS record.

9 ARCHIVE DEPOSITION

9.1.1 Should the project produce no archaeologically significant finds, then it is not necessary to deposit an archive with the repository museum, which in this case is the Scolton Manor Museum, Spittal, Haverfordwest, Pembrokeshire, SA62 5QL.

9.1.2 If the project produces archaeologically significant finds, then the Development Control Archaeologist, or his representative, Dyfed Archaeological Trust and Museum Curator will be notified at the earliest opportunity, and an accession number will be produced for the site. In addition, a digital, paper and artefactual archive will be prepared by ARS Ltd, consisting of all primary written documents, plans, sections, photographs and electronic data (in a format to be agreed by the recipient Museum).

9.1.3 The archive will be deposited in line with the CIFA (2013f) Standard and Guidance for the creation, compilation, transfer and deposition of archaeological archives, Society of Museum Archaeologists (1993) Selection, Retention and Dispersal of Archaeological Collections and the National Standard and Guidance to Best Practice for Collecting and Depositing Archaeological Archives in Wales 2017 and will be deposited within two months of the completion of the report.

9.1.4 The Dyfed Archaeological Trust Development Control Archaeologist and Museum Curator will be notified in writing on completion of the fieldwork with projected dates for the completion of the report and deposition of the archive. The date for deposition of the archive will be confirmed in the report and the Development Control Archaeologist informed in writing on final deposition of the archive.

9.1.5 All artefacts and associated material will be cleaned, recorded, properly stored and deposited in the archive.

9.1.6 A full set of annotated, illustrative pictures of the site, excavation, features, layers and selected artefacts will be deposited with the archive as digital images on a CD ROM.

9.1.7 The final report should be submitted to the regional HER and the HER staff will create an event record to upload, together with a pdf of the report, to OASIS.

9.1.8 A summary of the work will be submitted to the editor of Archaeology in Wales for publication, dependant on the quality and quantity of the archaeology the Local Planning Authority (LPA) may become involved in the final scope of the article submitted



10 GENERAL ITEMS

10.1 Health and Safety

10.1.1 All work will be carried out in accordance with The Health and Safety at Work Act 1974. Specific health and safety policies exist for all out workplaces and all staff employed will be made aware of the policy and any relevant issues. The particular risks involved with this project will be assessed, recorded and relevant mitigation measures put in place as part of a full risk assessment, which will be compiled in advance of fieldwork. ARS Ltd retains Peninsula as its expert health and safety consultants.

10.2 Insurance Cover

10.2.1 ARS Ltd has full insurance cover for employee liability (£10 million) public liability (£5 million), professional indemnity (£2 million) and all-risks cover.

10.3 Changes to the Written Scheme of Investigation

10.3.1 Changes to the approved methodology or programme of works will only be made with prior written approval of Dyfed Archaeological Trust and Local Planning Authority.

10.4 Publication

10.4.1 If significant archaeological remains are recorded, a summary of the project with, if appropriate, selected drawings, illustrations and photographs will be submitted within 2 years of the completion of the project to the editor Archaeology Wales for publication. ARS Ltd has full insurance cover for employee liability public liability, professional indemnity.

10.5 Community Engagement and Outreach

10.5.1 Any opportunities for engaging the local community in any archaeological findings should be sought, for example a guided site tour and/or dissemination of information via ARS Ltd's website and local media.

10.6 Copyright

10.6.1 Any publicity will be handled by the client. ARS Ltd will retain the copyright of all documentary and photographic material under the Copyright, Designs and Patent Act (1988).



11 REFERENCES

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