



Cefn Road, Wrexham

Written Scheme of Investigation
for an Archaeological Geophysical Survey

Document Ref.: 247430.02
October 2021



© Wessex Archaeology Ltd 2021, all rights reserved

Portway House
Old Sarum Park
Salisbury
Wiltshire
SP4 6EB

www.wessexarch.co.uk

Wessex Archaeology Ltd is a company limited by guarantee registered in England, company number 1712772. It is also a Charity registered in England and Wales number 287786, and in Scotland, Scottish Charity number SC042630. Our registered office is at Portway House, Old Sarum Park, Salisbury, Wiltshire, SP4 6EB

Disclaimer

The material contained in this document was designed for an individual client and was prepared solely for the benefit of that client. The material contained in this document does not necessarily stand on its own and is not intended to nor should it be relied upon by any third party. To the fullest extent permitted by law Wessex Archaeology will not be liable by reason of breach of contract negligence or otherwise for any loss or damage (whether direct indirect or consequential) occasioned to any person acting or omitting to act or refraining from acting in reliance upon the material contained in this document arising from or connected with any error or omission in the material contained in the document. Loss or damage as referred to above shall be deemed to include, but is not limited to, any loss of profits or anticipated profits damage to reputation or goodwill loss of business or anticipated business damages costs expenses incurred or payable to any third party (in all cases whether direct indirect or consequential) or any other direct indirect or consequential loss or damage

Document Information

Document title:

Document subtitle: Written Scheme of Investigation for an Archaeological Geophysical Survey

Document reference: 247430.02

Client name: Corylus Planning & Environmental Ltd

Address: Unit 3
The Old Dairy
Yanworth
Cheltenham
GL54 3LQ

Site location: Cefn Road, Abenbury, Pentre Maelor, LL13 0PX,

County: Wrexham, Wales.

National grid reference 336779, 348623 (SJ 36779 48623)

WA project code 247430


Date of fieldwork 14th & 15th October 2021

Project management by Mark Turner

Document compiled by Nicholas Crabb

Graphics by Nicholas Crabb

Quality Assurance

Issue	Date	Author	Approved by
1 Draft	01/10/2021	NLC	 CB



Contents

1	INTRODUCTION	1
1.1	Project background.....	1
1.2	Scope of document.....	1
1.3	Location, topography, and geology	1
2	ARCHAEOLOGICAL AND HISTORICAL BACKGROUND.....	2
2.1	Introduction.....	2
2.2	Archaeological and historical context.....	2
3	AIMS AND OBJECTIVES.....	3
3.1	Project aims.....	3
3.2	Project objectives.....	3
4	SURVEY METHODS	4
4.1	Introduction.....	4
4.2	Access.....	4
4.3	Service location and other constraints	4
4.4	Survey specification.....	4
4.5	Instrument specification	4
4.6	Gradiometer survey specification.....	4
5	REPORTING	5
5.1	General.....	5
5.2	OASIS	5
6	ARCHIVE STORAGE AND CURATION.....	6
6.1	Preparation of archive.....	6
7	COPYRIGHT	6
7.1	Archive and report copyright	6
7.2	Third party data copyright	6
8	WESSEX ARCHAEOLOGY PROCEDURES.....	6
8.1	External quality standards.....	6
8.2	Personnel	7
8.3	Internal quality standards.....	7
8.4	Health and Safety	8
8.5	Insurance.....	8
	REFERENCES	9
	APPENDICES	10
	Appendix 1: Survey equipment and data processing.....	10
	Appendix 2: Geophysical interpretation.....	12
	Appendix 3: Data Management Plan.....	13
	Appendix 4: Selection Strategy	14



List of Figures

Figure 1 Site location



Crynodeb Technegol

Comisiynwyd Wessex Archaeology gan Corylus Planning & Environmental Ltd ('y cleient'), i gynnal arolwg geoffisegol archeolegol o dri ardal, yn mesur cyfanswm o 14.6 ha ar dir i'r gogledd o Cefn Road, Wrecsam, Cymru, wedi ei ganoli ar NGR 336779, 348623.

Mae'r arolwg geoffisegol yn cefnogi datblygiad arfaethedig i adeiladu fferm solar gyda seilwaith cysylltiedig, gan gynnwys ffensys palis; a phlanhigion llystyfol gan gynnwys gwrychoedd, coetir a phrysgwydd.

Bydd yr arolwg geoffisegol yn cynnwys arolwg graddiomedr manwl, a fydd yn ffurfio rhan o ddull fesul cam i bennu potensial archeolegol y safle. Mae hyn yn dilyn gwaith archeolegol di-ymwthiol arall, gan gynnwys Asesiad Desg Amgylchedd Hanesyddol (Wessex Archaeology 2021).

Bydd yr arolwg graddiomedr manwl yn cael ei gynnal gan ddefnyddio naill ai graddiometrau Bartington Grad-01-1000L, neu raddiometrau Sensys FGM-650/3, wedi eu gosod ar gyfnodau 1 m ar ffrâm cart anfagnetig. Gyda sensitifrwydd effeithiol o 0.03 nT, cesglir data bob 0.25 m ar hyd trawsluniau rhwng 1 m oddi wrth ei gilydd, yn unol ag argymhellion Consilium Archaeologiae Ewropeaidd (Schmidt et al. 2015).

Mae'r system graddiomedr yn defnyddio offeryn Leica Captivate RTK GNSS, sydd yn derbyn cywiriadau gan rwydwaith o orsafoedd cyfeirio a weithredir gan yr Arolwg Ordnans (OS) a Leica Geosystems. Mae offerynnau o'r fath yn caniatáu i swyddi gael eu pennu gyda manwl gywirdeb o 0.02 m mewn amser gwir ac felly maent yn rhagori ar argymhellion Consilium Archaeologiae Ewropeaidd (Schmidt et al. 2015).

Ar ôl cwblhau y gwaith maes a phrosesu ac asesu y data, cyflwynir adroddiad drafft i'w gymeradwyo i'r cleient, i gael sylwadau arno. Ar ôl ei gymeradwyo, bydd fersiwn derfynol ddigidol (.pdf) yn cael ei gyflwyno.



Cefn Road, Wrexham

Written Scheme of Investigation for an Archaeological Geophysical Survey

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology has been commissioned by Corylus Planning & Environmental Ltd ('the client'), to produce a written scheme of investigation (WSI) for a proposed archaeological geophysical survey of three areas measuring a total of a 14.6 ha at land north of Cefn Road, Wrexham, Wales. The evaluation area is centred on NGR 336779, 348623 (**Figure 1**).

1.1.2 The proposed development comprises the construction of a solar farm with associated infrastructure, including palisade fencing; and vegetative plantings including hedgerows, woodland and scrub.

1.1.3 The geophysical survey will comprise a detailed gradiometer survey over the 14.6 ha of land. This forms part of staged approach in determining the archaeological potential of the site, and follows other non-intrusive archaeological work, including a Historic Environment Desk-Based Assessment (Wessex Archaeology 2021)

1.2 Scope of document

1.2.1 This WSI sets out the aims of the geophysical survey, and the methods and standards that will be employed. In format and content, it conforms to current best practice, as well as to the guidance outlined in *Management of Research Projects in the Historic Environment* (MoRPHE, Historic England 2015), the Chartered Institute for Archaeologists' (CIfA) *Standards and guidance for archaeological geophysical survey* (CIfA 2014a), European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015) and Historic England *Thesauri* (English Heritage 2014).

1.2.2 This document will be submitted to County Archaeologist for Wrexham County Borough Council for approval, prior to the start of the geophysical survey.

1.3 Location, topography, and geology

1.3.1 The proposed geophysical survey area is located across two agricultural fields to the north of Cefn Road, adjacent to the Wrexham Industrial Estate, with a further (substation) area adjacent to the water treatment works to the south of Cefn Road (**Figure 1**). It is approximately 3.5 km south-east of the centre of Wrexham, 1.2 km north-west of the village of Marchwiell in the county of Wrexham, Wales.

1.3.1 The two agricultural fields to the north of Cefn Road both comprise agricultural land currently used for arable cultivation. The eastern field to the north of Cefn Road measures 6.8 ha and the western field approximately 6 hectares. The narrower area to the south of the road measures approximately 1.8 hectares.



- 1.3.2 The two northern fields cover a roughly triangular area, divided by a central field boundary. These are bounded to the south by Cefn Road and to the east of the site are buildings from the Wrexham industrial estate. The northern extent is bounded by a wooded field boundary, leading to open pasture. The southern area is adjacent to a road leading to the water treatment works, and intersected by the River Clywedog, which traverses the area on an east-west orientation, close to Cefn Road.
- 1.3.3 The site slopes gradually towards the River Clywedog, from the north-west to south-east within the fields to the north of Cefn Road, ranging from 38 m above Ordnance Datum (aOD) to 32 m aOD. The smaller land parcel to the south of Cefn Road is relatively flat at approximately 38 m aOD.
- 1.3.4 3.1.3 The underlying geology of the Site comprises Salop Formation – Mudstone, Sandstone and Conglomerate with superficial deposits of River Terrace Deposits (Sand and Gravel) and Alluvium (Clay, Silt, Sand and Gravel) (British Geological Survey 2021).
- 1.3.5 The soils underlying the site are likely to consist of Typical Stagnogley soils of the 711h (Salop) association (SSEW SE Sheet 2 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.

2 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

2.1 Introduction

- 2.1.1 The archaeological and historical background was assessed in a prior Historic Environment Desk-Based assessment (HEDBA) (Wessex Archaeology 2021), which considered the recorded historic environment resource within a 1 km study area of the proposed development. The DBA used information from the Clwyd-Powys Archaeological Trust Historic Environment Record (CPATHER), and the National Monuments Record of Wales (NMRW). Additional sources of information are referenced, as appropriate. The findings of the DBA are summarised below.

2.2 Archaeological and historical context

- 2.2.1 There are a small number of designated heritage assets within the study area, which are primarily comprised of listed buildings. This includes the Grade II listed 17th century farmhouse with Georgian remodelling at Pum-Rhyd (18058), which is located 575 m to the south-east of the site. In addition, the Grade II listed Llwyn Onn Hall Hotel (15530, and associated Ice-house (17275) are located approximately 970 m to the north-west of the site and has origins in the late 17th and 18th century.
- 2.2.2 Whilst there are limited records pertaining to periods prior to the early medieval period, the site has geoarchaeological potential for preserving early prehistoric remains. The River Clywedog runs through the substation area of the Site, which would likely indicate that this landscape would have been an attractive settlement location to prehistoric populations for its accessibility to natural resources. The River Terrace deposits adjacent to this have the broad potential to contain reworked Lower and early Middle Palaeolithic artefacts, as well as contemporary late Middle and Upper Palaeolithic archaeology. Moreover, where layers of peat are preserved in alluvium, organic material may be present, preserving a wide range of paleoenvironmental evidence (Howard et al. 2011). Such deposits are commonly located within palaeochannels and Historic aerial photography has indicated that there is potential for palaeochannels to exist within the northern part of the site.



- 2.2.3 A cropmark of a square enclosure, as well as other linear features, has been identified from aerial photography. These are thought to be prehistoric in date suggesting that there is potential for as yet unidentified archaeological remains within the areas of the site to the north of Cefn Road.
- 2.2.4 Aside from a singular Romano-British coin findspot approximately 405 m to the north-west of the site, there are no records dating to the Romano-British period. There is also no evidence for early medieval activity within this landscape, although Eyton, Sutton Green and Farnham were all identified as settlements within the Domesday Book. Wrexham and Marchwiell were part of the Kingdom of Powys, which would have been on the western side of Offa's Dyke and therefore has always been within Wales. There have been deer parks and enclosures identified within the Domesday Book for these settlements, and placename evidence for other local settlements (e.g. Holt, which means 'copse') indicate that the landscape was likely heavily wooded during this period.
- 2.2.5 Extensive areas of ridge and furrow have been identified on historic aerial photography, including within the southern area of the Site, where the proposed substation will be located. However, LiDAR analysis and historic Google Earth imagery has not identified evidence for ridge and furrow within the Site. However, there is one feature on the aerial photography that runs north to south within the western field, which may be a former field boundary.
- 2.2.6 The site of Five Fords Farm would have been adjacent to the substation area of the site and was constructed in the late 17th/early 18th century and demolished in 1973. This would have served during the early post-medieval period to help support the agricultural practices within this landscape.
- 2.2.7 The 1873 OS map shows that the Site comprised of irregularly shaped agricultural fields, with a historic hedgerow that divides the two that is still in place. Within the land parcel to the south of Cefn Road, a ford and an orchard can be seen to the south of the River Clywedog and Five Fords Manor House is visible to the west of the orchard. Aside from the addition of a small pond within the southern extent of the Site (to the north-east of the orchard/south of the River Clywedog), no further changes within the Site are noted on the 1899 OS map

3 AIMS AND OBJECTIVES

3.1 Project aims

- 3.1.1 The aims (or purpose) of the geophysical survey, in compliance with the ClfA' *Standards and guidance for archaeological geophysical survey* (ClfA 2014a), are:
- To determine, as far as is reasonably possible, the nature of the detectable archaeological resource within a specified area using appropriate methods and practices; and
 - To inform either the scope and nature of any further archaeological work that may be required; or the formation of a mitigation strategy (to offset the impact of the development on the archaeological resource); or a management strategy.

3.2 Project objectives

- 3.2.1 In order to achieve the above aims, the objectives of the geophysical survey are:
- To conduct a geophysical survey covering as much of the specified area as possible, allowing for on-site obstructions;



- To clarify the presence/absence of anomalies of archaeological potential; and
- Where possible, to determine the general nature of any anomalies of archaeological potential.

4 SURVEY METHODS

4.1 Introduction

- 4.1.1 All works will be undertaken in accordance with the detailed methods set out within this WSI. Any significant variations to these methods will be agreed in writing with the County Archaeologist and the client, prior to being implemented.

4.2 Access

- 4.2.1 The client will make all access arrangements for the geophysical survey works, Wessex Archaeology will not deal directly with any landowners etc. unless instructed to do so by the client.
- 4.2.2 Any areas which are not accessible during the survey, or which are deemed by Wessex Archaeology staff to be unsafe to access, will not form a part of this survey work. Any such areas will be documented for future reference.

4.3 Service location and other constraints

- 4.3.1 The client will provide information regarding the presence of any below/above-ground services, and any ecological, environmental, or other constraints.

4.4 Survey specification

- 4.4.1 The navigation display on cart-based system provides real time positioning enabling full site coverage without the need to set up individual grid nodes across the site. However, to ensure survey accuracy, the boundaries of the survey extent will be established using a Leica Viva RTK GNSS instrument.
- 4.4.2 All survey data will be recorded in OS National Grid coordinates and heights above OD (Newlyn), as defined by OSGM15 and OSTN15, with a horizontal precision of at least 50 mm.
- 4.4.3 Digital mapping and archaeological information gathered during any previous work by Wessex Archaeology on the site will be used to support the interpretation of the geophysical data.
- 4.4.4 An interpretation of the geophysical anomalies will be presented identifying likely and possible archaeological features, along with linear trends and areas of increased magnetic response.
- 4.4.5 Further details of the geophysical and survey equipment, methods, processing, and interpretation are described in **Appendix 1** and **2**.

4.5 Instrument specification

4.6 Gradiometer survey specification

- 4.6.1 The detailed gradiometer survey will be conducted using Bartington Grad-01-1000L gradiometers mounted at 1 m intervals on either a non-magnetic cart frame with an effective sensitivity of 0.03 nT.



4.6.2 Data will be collected at 0.25 m intervals along transects spaced 1 m apart, in accordance with European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015). Data will be collected in the zigzag method.

4.6.3 Where necessary, data from the survey will be subject to minimal correction processes. The precise steps required will be determined after data collection but would typically comprise a zero-mean traverse function (± 5 nT thresholds) to correct for variations in the calibration between the Bartington sensors used and a de-step function to account for variations in traverse position due to varying ground cover and topography. The data will be processed using commercially available and in-house software which allows greyscale and trace plots to be produced. All efforts will be made during data collection to limit required processing and no further filtering will be applied.

5 REPORTING

5.1 General

5.1.1 Following completion of the fieldwork and the processing and assessment of the data, a draft report will be submitted for approval to the client, for comment. Once approved, a digital (.pdf) final version will be submitted.

5.1.2 The report will include the following elements:

- A non-technical summary;
- Introductory statements including location and NGR of surveyed area, background to the project (and any references/event numbers as supplied by the client), site description with geology, and summarised archaeological background;
- Aims and objectives;
- Methods;
- Results;
- Conclusions in relation to the project aims and objectives;
- Archive preparation and deposition arrangements;
- Appendices;
- Plans and plots (including location plan); and
- References

5.1.3 The report will be prepared within three weeks of completion of all fieldwork, and submitted to the client for approval. If required interim reporting can be completed following fieldwork, subject to variation.

5.1.4 Digital copies of the raw data, report text, figures and electronic drawings will be made available upon request (subject to copyright).

5.2 OASIS

5.2.1 An OASIS online record (<http://oasis.ac.uk/pages/wiki/Main>) will be created, with key fields completed, and a .pdf version of the final report submitted. Subject to any contractual requirements on confidentiality, copies of the OASIS record will be integrated into the relevant local and national records and published through the Archaeology Data Service (ADS) ArchSearch catalogue.



6 ARCHIVE STORAGE AND CURATION

6.1 Preparation of archive

- 6.1.1 If provision is made in the contract, the complete project archive will be prepared in accordance with *A Guide to Good Practice: Geophysical Data in Archaeology* (Schmidt *et al.* 2001) and ADS guidelines (ADS 2015), and any requirements of the relevant Historic Environment Record (HER).
- 6.1.2 A high quality geo-rectified TIFF will be produced from the processed data, with the raw data stored as Geoplot compatible pre-processed composite files. The archive will usually be deposited within 6–12 months of the project's completion.
- 6.1.3 The digital archive will be provided to the Clwyd-Powys Archaeological Trust Historic Environment Record (CPATHER), and the National Monuments Record of Wales (NMRW).

7 COPYRIGHT

7.1 Archive and report copyright

- 7.1.1 The full copyright of the written/illustrative/digital archive relating to the project will be retained by Wessex Archaeology under the *Copyright, Designs and Patents Act 1988* with all rights reserved. The client will be licenced to use each report for the purposes that it was produced in relation to the project as described in the specification. The museum, however, will be granted an exclusive licence for the use of the archive for educational purposes, including academic research, providing that such use conforms to the *Copyright and Related Rights Regulations 2003*. In some instances, certain regional museums may require absolute transfer of copyright, rather than a licence; this should be dealt with on a case-by-case basis.
- 7.1.2 Information relating to the project will be deposited with the Historic Environment Record (HER) where it can be freely copied without reference to Wessex Archaeology for the purposes of archaeological research, or development control within the planning process.

7.2 Third party data copyright

- 7.2.1 This document, the evaluation report and the project archive may contain material that is non-Wessex Archaeology copyright (e.g., Ordnance Survey, British Geological Survey, Crown Copyright), or the intellectual property of third parties, which Wessex Archaeology are able to provide for limited reproduction under the terms of our own copyright licences, but for which copyright itself is non-transferable by Wessex Archaeology. Users remain bound by the conditions of the *Copyright, Designs and Patents Act 1988* with regard to multiple copying and electronic dissemination of such material.

8 WESSEX ARCHAEOLOGY PROCEDURES

8.1 External quality standards

- 8.1.1 Wessex Archaeology is registered as an archaeological organisation with the Chartered Institute for Archaeologists (CIfA) and fully endorses its *Code of conduct* (CIfA 2014b) and *Regulations for professional conduct* (CIfA 2014c). All staff directly employed or subcontracted by Wessex Archaeology will be of a standard approved by Wessex Archaeology, and archaeological staff will be employed in line with the CIfA codes of practice, and will normally be members of the CIfA.



8.2 Personnel

Project specific

8.2.1 The fieldwork will be directed and supervised by an experienced member of Wessex Archaeology's geophysics team. This will likely comprise geophysicists from our Sheffield Office, who will be on site at all times for the length of archaeological fieldwork as required. The overall responsibility for the conduct and management of the project will be held by one of Wessex Archaeology's project managers, who will visit the fieldwork as appropriate to monitor progress and to ensure that the scope of works is adhered to. Where required, monitoring visits may also be undertaken by Wessex Archaeology's Health and Safety manager. The appointed project manager and fieldwork director will be involved in all phases of the investigation through to its completion.

8.2.2 The following key staff are proposed:

- Tom Richardson
- Andres Perez Arana

8.2.3 Wessex Archaeology reserves the right, due to unforeseen circumstances (e.g., annual leave, sick leave, maternity, retirement etc) to replace nominated personnel with alternative members of staff of comparable expertise and experience.

Wessex Archaeology's geophysical capabilities

8.2.4 Wessex Archaeology has a unique track record in undertaking archaeological geophysics investigations in land, coastal and marine environments. Both in the UK and abroad, Wessex Archaeology delivers professional archaeological geophysical services. A practical and pragmatic approach to carrying out investigations is matched by a proven ability to place the results within their proper archaeological context.

8.2.5 Wessex Archaeology's expertise in geophysical surveys is fully integrated with its archaeological services, ensuring a seamless, professional approach with direct access to in-house computing, illustration, finds and environmental analysis, and scholarly and popular publication.

8.2.6 Wessex Archaeology's geophysics team comprises specialist staff at all grades from Geophysicist to Technical Manager, and is overseen by the Director of Geoservices. This team is supplemented by archaeologists with geomatics and geoarchaeological experience from Wessex Archaeology's wider staff and further experienced staff can be brought in on contract to meet project requirements.

8.2.7 In addition to its in-house expertise, Wessex Archaeology routinely employs the services of a range of eminent geoarchaeological, palaeoenvironmental, and finds specialists. The contribution of these specialists to specific projects is managed through a relevant technical manager. Further details of external specialists employed by Wessex Archaeology can be provided on request.

8.3 Internal quality standards

8.3.1 Wessex Archaeology is an ISO 9001 accredited organisation (certificate number FS 606559), confirming the operation of a Quality Management System which complies with the requirements of ISO 9001:2015 – covering professional archaeological and heritage advice and services. The award of the ISO 9001 certificate, independently audited by the British Standards Institution (BSI), demonstrates Wessex Archaeology's commitment to providing quality heritage services to our clients. ISO (the International Organisation for



Standardisation) is the most recognised standards body in the world, helping to drive excellence and continuous improvement within businesses.

- 8.3.2 Wessex Archaeology operates a computer-assisted project management system. Projects are assigned to individual project managers who are responsible for the successful completion of all aspects of the project. This includes monitoring project progress and quality; controlling the project budget from inception to completion; and all aspects of Health and Safety for the project. At all stages, the project manager will carefully assess and monitor performance of staff and adherence to objectives, timetables, and budgets, while the manager's performance is monitored in turn by the team leader or regional director.
- 8.3.3 All work is monitored and checked whilst in progress on a regular basis by the project manager, and all reports and other documents are checked (where applicable) by the team leader/technical manager, or regional director, before being issued. A series of guideline documents or manuals form the basis for all work. The technical managers in the Graphics, Finds & Analysis, GeoServices and IT sections provide additional assistance and advice.
- 8.3.4 All staff are responsible for following Wessex Archaeology's quality standards but the overall adherence to and setting of these standards is the responsibility of the senior management team in consultation with the team leaders/regional directors who also ensure projects are adequately programmed and resourced within Wessex Archaeology's portfolio of project commitments.

8.4 Health and Safety

- 8.4.1 Health and Safety considerations will be of paramount importance in conducting all fieldwork. Safe working practices will override archaeological considerations at all times. Wessex Archaeology will supply trained, competent, and suitably qualified staff to perform the tasks and operate the equipment used on site. All work will be carried out in accordance with the *Health and Safety at Work Act 1974* and the *Management of Health and Safety at Work Regulations 1999*, and all other applicable Health and Safety legislation, regulations, and codes of practice in force at the time.
- 8.4.2 Wessex Archaeology will supply a copy of the company's Health and Safety Policy and a Risk Assessment to the client before the commencement of the evaluation. The Risk Assessment will have been read, understood, and signed by all staff attending the site before any fieldwork commences. Wessex Archaeology staff will comply with the Personal Protective Equipment (PPE) requirements for working on the site, and any other specific additional requirements of the principal contractor.

8.5 Insurance

- 8.5.1 Wessex Archaeology has both Public Liability (£10,000,000) and Professional Indemnity Insurance (£5,000,000).



REFERENCES

- ADS 2015 Guidelines for Depositors,
[http://archaeologydataservice.ac.uk/advice/FilelevelMetadata.xhtml#Geophysics and Remote Sensing](http://archaeologydataservice.ac.uk/advice/FilelevelMetadata.xhtml#Geophysics_and_Remote_Sensing) (01/10/2021)
- British Geological Survey online viewer <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>
(01/10/2021)
- Chartered Institute for Archaeologists [ClfA] 2014a *Standards and guidance for archaeological geophysical survey*. Reading, ClfA
- ClfA 2014b *Code of Conduct*. Reading, ClfA
- ClfA 2014c *Regulations for Professional Conduct*. Reading, ClfA
- English Heritage 2013 *English Heritage Thesauri*,
http://thesaurus.historicengland.org.uk/thes_splash.htm (01/10/2021)
- Historic England 2015 *Management of Research Projects in the Historic Environment: The MoRPHE Project Manager's Guide. Version 1.0*
- Schmidt, A and Ernenwein, E 2001 *Guide to Good Practice: Geophysical Data in Archaeology*
http://guides.archaeologydataservice.ac.uk/g2gp.pdf?page=Geophysics_Toc&xsl=test.xml&ext=.pdf
- Schmidt, A, Linford, P, Linford, N, David, A, Gaffney, C, Sarris, A and Fassbinder, J. 2015 *Guidelines for the use of geophysics in archaeology: questions to ask and points to consider*. EAC Guidelines 2, Belgium: European Archaeological Council.
- Soil Survey of England and Wales 1983 *Sheet 2, Soils of Wales*. Ordnance Survey, Southampton
- Wessex Archaeology 2021 *Cefn Road, Wrexham, Historic Environment Desk-based Assessment*. Document Ref.: 247430.01.

APPENDICES

Appendix 1: Survey equipment and data processing

CART-BASED GRADIOMETER SURVEY

The magnetic data for this project will be acquired using a non-magnetic cart-based system. This instrument has several Bartington Grad-01-1000L sensors fixed horizontally 1 m apart allowing multiple traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1m separation, and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of 0.03 nT over a ± 100 nT range, and measurements from each sensor are logged at intervals of 0.25 m. All of the data are then relayed to a Leica Viva CS35 tablet, running the MLgrad601 program, which is used to record the survey data from the array of Grad601 probes at a rate of 6 Hz. The program also receives measurements from a GPS system, which is fixed to the cart at a measured distance from the sensors, providing real time locational data for each data point.

The cart-based system relies upon accurate GPS location data which is collected using a Leica Viva system with rover and base station. This receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02 m in real-time and therefore exceed the level of accuracy recommended by European Archaeologiae Consilium (Schmidt *et al.* 2015).

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.125 m intervals along traverses spaced up to 0.25 m apart exceeding recommendation by European Archaeologiae Consilium (Schmidt *et al.* 2015) for characterisation surveys.

Post-processing

The magnetic data collected during the detail survey are downloaded from the Bartington cart system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

The cart-based system generally requires a lesser amount of post-processing than the handheld Bartington Grad 601-2 fluxgate gradiometer instrument. This is largely because mounting the gradiometers on the cart reduces the occurrence of operator error, caused by inconsistent walking speeds and deviation in traverse position due to varying ground cover and topography.

Typical data and image processing steps may include:

- Destripe – Applying a smooth function to remove differences caused by directional effects inherent in the magnetometer;
- Despiking – Filtering isolated data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings (generally only used for earth resistance data).



Typical displays of the data used during processing and analysis:

- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies.
- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.



Appendix 2: Geophysical interpretation

GRADIOMETER

The interpretation methodology used by Wessex Archaeology separates the anomalies into four main categories: archaeological, modern, agricultural, and uncertain or geological origin.

The archaeological category is used for features when the form, nature, and pattern of the anomaly are indicative of archaeological remains. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into two groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Possible archaeology – used for features which give a response but which form no discernible pattern or trend.

The modern category is used for anomalies that are presumed to be relatively modern in date:

- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be observed.

The agricultural category is used for the following:

- Former field boundaries – used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Agricultural ditches – used for ditch sections that are aligned parallel to existing boundaries and former field boundaries that are not considered to be of archaeological significance.
- Ridge and furrow – used for broad and diffuse linear anomalies that are considered to indicate areas of former ridge and furrow.
- Ploughing – used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage – used to define the course of ceramic field drains that are visible in the data as a series of repeating bipolar (black and white) responses.

The uncertain origin/geological category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Superficial geology – used for diffuse edged spreads considered to relate to shallow geological deposits. They can be distinguished as areas of positive, negative, or broad bipolar (positive and negative) anomalies.



Appendix 3: Data Management Plan



Data Management Plan Terrestrial Geophysics

October 2021, v0.1



Data Management Plan

1 WESSEX ARCHAEOLOGY STANDARDS AND PROCEDURES

Standard Wessex Archaeology procedures include pro-forma digital and paper recording, fieldwork/survey manuals, context/finds database guidance and archive procedure manual. company quality management protocols and implementation of a competence management system in line with ISO 10018, data management guidelines and data protection and security policy.

2 NATIONAL STANDARDS AND GUIDANCE

2.1 Formal standards for data management

ADS 2013 *Caring for Digital Data in Archaeology: a guide to good practice*. Archaeology Data Service & Digital Antiquity Guides to Good Practice

Brown, D H 2011 *Archaeological Archives: A guide to best practice in creation, compilation, transfer, and curation* (2nd edition). Reading, Institute of Field Archaeologists/Archaeological Archives Forum

ClfA 2014 *Standard and guidance for the collection, documentation, conservation, and research of archaeological materials* (revised edition June 2020). Reading, Chartered Institute for Archaeologists

English Heritage 2012 *MIDAS: the UK Historic Environment Data Standard Version 1.1. Best practice guidelines. Forum on Information Standards in Heritage* (FISH)

Forster, M 2019 *Work Digital / Think Archive. A Guide to managing Digital data generated from archaeological investigations*. Dig Ventures

Historic England 2015 *Digital Image Capture and File Storage*. Swindon, Historic England

3 SCOPE OF DIGITAL DATA CREATION AND FILE TYPES

3.1 Digital data creation and standardised Open Source/Archival format file types to be used will include

Survey data in its raw format, depending on the survey technique used.

Interpreted geophysical survey data in .tif, .tiff, .png, .pgw or shapefiles and .xyz, .dat, .asc, .csv data files

Project reports and figures produced in Microsoft Word .docx or .pdf format stored in Union Square (US) a proprietary project management system (PMS) used by Wessex Archaeology. Upon completion of the work, these will be incorporated into the relevant report.

3.2 Wessex Archaeology procedures

All data types are industry standard and can be accessed by most data-specific software. If this is not the case, data can be converted to other common formats. As advised by ADS, all PDF files selected for archive will be converted to archival standard PDF/A on deposition.



Standardised file naming conventions to include project number, and land parcel for example: 12345_LP01.asc.

Standardised project folder structure is used to organise and compartmentalise various project elements from set up to archiving.

Project reporting document management system (DMS) with versioning and version control handled automatically.

3.3 Guidance

Chartered Institute for Archaeologists [ClfA] 2014, Standards and Guidance, Codes of Conduct and Regulations. ClfA, Reading

Chartered Institute for Archaeologists [ClfA] 2014, Standards and guidance for archaeological geophysical survey. ClfA, Reading

Schmidt, A, Linford, P, Linford, N, David, A, Gaffney, C, Sarris, A and Fassbinder, J. 2015 Guidelines for the use of geophysics in archaeology: questions to ask and points to consider. EAC Guidelines 2, Belgium: European Archaeological Council.

4 SCOPE OF DIGITAL DATA COLLECTION

The exact scope of digital data collection will be dependent upon the geophysical technique used for the survey. Digital data will be used, in conjunction with other data, in interpretation and reporting of the site.

4.1 Digital data collection methods

All Geophysical Survey Techniques

All recorded raw data is being regularly backed up onto company servers to ensure data security. All geophysical data is recorded with GPS location data which is collected using a Leica Captivate system. This receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by European Archaeologiae Consilium recommendations (Schmidt et al. 2015) for geophysical surveys.

Magnetic Gradiometer

The magnetic data for this project is acquired using a non-magnetic cart fitted with gradiometers. The instrument has up to sixteen sensors assemblies fixed horizontally between 0.25 m and 1 m apart allowing several traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically and measures the difference between the vertical components of the total magnetic field within each sensor. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

All of the data is relayed to a CS35 tablet, running the surveying software, which is used to record the survey data at a rate of 10 - 200 Hz. The program also receives measurements from a GPS system, which is fixed to the cart at a measured distance from the sensors, providing real time locational data for each data point.

Ground penetrating radar

The ground penetrating radar (GPR) data is collected using a cart-mounted shielded antenna with central frequency suitable for the types of targets being investigated. Lower

frequency antennae are able to acquire data from deeper below the surface, whereas higher frequencies allow high resolution imaging of near-surface targets at the expense of deep penetration. The exact make and model of equipment varies.

GPR data is collected along traverses of varying lengths. The data sampling resolution is governed by the data logger and a minimum separation of 0.01 m between traces is collected for all surveys, in accordance with European Archaeologiae Consilium recommendations (Schmidt et al. 2015).

Electromagnetic survey

The electromagnetic data is acquired using a low frequency electromagnetic instrument. It consists of a transmitter coil and at least two receiver coils, depending on the survey equipment. The Low Frequency Electromagnetic (LFEM or EM) instruments operate under 300kHz.

It measures apparent conductivity and magnetic susceptibility. The data is collected along parallel traverses with at least two readings per metre. The survey relies on a GPS system to accurately locate each reading taken by the instrument. The sampling interval is in accordance with the 'Evaluation' strategy recommended by European Archaeologiae Consilium (Schmidt et al. 2015) and is consistent with their 'Characterization' survey strategy.

Electrical Resistivity Tomography

ERT data is collected using an industry standard instrument. The system uses four electrodes at a time to measure each reading. By varying the position and separation of the four electrodes used, the position along each transect and the depth of the reading can be controlled. This then runs through the sequence(s), automatically switching between probes used. Readings are logged automatically on the system and then downloaded to a computer for processing.

Typical ERT surveys consist of the collection of a series of linear transects with electrodes spaced at regular intervals along the line. The type of array, the number of electrodes used and the separation between them dictate the maximum depth of investigation of the survey. The array used is determined by the application and requirements of the site. If transects are collected on a regular grid the individual 2D transects can be combined and processed to give a 3D output.

Each probe is recorded with the GNSS system, the array is stored as a .dxf and implemented in processing steps.

Electric resistivity survey

The data is acquired using an earth resistance meter with an appropriate array system. The instrument has two electrodes spaced 0.5m apart fixed horizontally to the portable frame and two electrodes anchored 15-50m away. The probes work in pairs (one mobile, one remote) to measure the current and potential resistivity. This arrangement of electrodes suppresses any double peaking effects.

Data may be collected with a high sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 16 readings per metre, exceeding that recommended by European Archaeologiae Consilium (Schmidt et al. 2015) for characterisation surveys.

4.2 General notes

It is not expected that other digital data collection methods will be employed for recording the site, however, should the need arise for other digital techniques to be used, these will be undertaken according to national standards and Wessex Archaeology's procedures.

Existing data that may be used to contribute to the project could include desk-based assessment, geophysical data, prior and relevant archaeological results and reporting, HER, NRHE and other archival data. Data volumes will be dependent on the size, number of sites and nature of investigation undertaken, and techniques used.

4.3 Wessex Archaeology procedures

Data collection and product realisation procedures. Preparation to work, data collection and recording, data processing and digital archiving following guidance and good practice outlined below.

Quality Management System (QMS) policy and procedures including quality assurance and control procedures. Quality assurance for the digital data will be provided by Wessex Archaeology's Quality Management System, including data quality monitoring and logging during survey, and quality control assessments during processing and interpretation. This will be conducted by the project supervisory.

Guidance

ADS 2013 *Caring for Digital Data in Archaeology: a guide to good practice*. Archaeology Data Service & Digital Antiquity Guides to Good Practice

Chartered Institute for Archaeologists [CIfA] 2014 Standards and Guidance, Codes of Conduct and Regulations. Reading, CIfA

Chartered Institute for Archaeologists [CIfA] 2014, Standards and guidance for archaeological geophysical survey. CIfA, Reading

Schmidt, A, Linford, P, Linford, N, David, A, Gaffney, C, Sarris, A and Fassbinder, J. 2015 Guidelines for the use of geophysics in archaeology: questions to ask and points to consider. EAC Guidelines 2, Belgium: European Archaeological Council.

4.4 General notes

Data volumes are dependent on the size of site and specific equipment used.

All data types are industry standard and can be accessed by most data specific software. If this is not the case, data can be converted to other common formats.

5 SCOPE OF DIGITAL DATA PROCESSING

5.1 Wessex Archaeology procedures

Wessex Archaeology uses data processing, product realisation procedures and digital archiving. QMS policy and procedures as summarised below.

Magnetic Gradiometer

The magnetic data collected during the survey is downloaded from the system for processing and analysis. Data will be processed using both commercial and in-house



software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies. Typical data and image processing steps may include:

- *Destripe* – Applying a zero-mean traverse in order to remove differences caused by directional effects inherent in the magnetometer;
- *Remove overlap* – Applying a proximity defined buffer, that rejects readings that are located closer than a defined threshold to the original data and correct for the data points collected too close to one another.

Ground penetrating radar

The radar data collected during the detail survey are downloaded from the GPR system for processing and analysis using commercial software (GPR Slice). This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies. Typical data and image processing steps may include:

- *Wobble correction* – applies a 0-mean filter on the trace that corrects for the trace drift that can occur at the lower depths.
- *Time 0 correction* – performs a correction along each profile to correct for the position of the “first response”
- *Gain* – Amplifies GPR data based upon its position in the profile, which boosts the contrast between anomalies and background. A wobble correction is also applied during this step
- *Background removal filter* - is used to remove banding noises that are seen across the radargrams
- *Bandpass filter* – Removes GPR data lying outside a specified range, which removes high- and low-frequency noise.

Electromagnetic survey

5.1.1 The electromagnetic data collected during the survey is downloaded from the data logger for processing using commercial software while analysis is done in ESRI ArcGIS Desktop. This allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies. Typical data and image processing steps may include:

- *Destripe* – Applying a smooth function in order to remove differences caused by directional effects inherent in the magnetometer;
- *Despike* – Filtering isolated data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings (generally only used for earth resistance data)

Electrical Resistivity Tomography

The ERT data collected during the survey is downloaded from the ERT system, processed and analysed using commercial software. This software allows for the inversion of the collected 2D transects in isolation and the inversion of several 2D transects collected in a

regular grid at the same time. The inversion process creates a model and calculates the resistivity values that would have been recorded over it from this model. By comparing the model data with the field data, an error value can be calculated and the software goes through a number of iterations to minimise this error by altering the modelled values. Typical inversion parameters that may be altered include:

- *Robust inversion* – This option is typically used where sharp boundaries exist between subsurface bodies that would be smeared by the standard least-squares inversion method. The robust model constrain inversion method minimises the absolute changes in the resistivity values producing models with sharp interfaces;
- *Smoothing of model resistivity values* – This is used for particularly noisy data sets where the smoothness constraint used in the standard least-squares inversion method is not sufficient on its own.

Electric resistivity survey

The data collected during the detailed resistivity survey are downloaded from the instrument for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies. Typical data and image processing steps may include:

- *Destripe* – Applying a zero-mean traverse in order to remove differences caused by directional effects inherent in the magnetometer;
- *Destagger* – Shifting each traverse longitudinally by a number of readings. This corrects for operator errors and is used to enhance linear features;
- *Despike* – Filtering isolated data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings.

5.2 Guidance

ADS 2013 *Caring for Digital Data in Archaeology: a guide to good practice*. Archaeology Data Service & Digital Antiquity Guides to Good Practice

Chartered Institute for Archaeologists [ClfA] 2014 Standards and Guidance, Codes of Conduct and Regulations. Reading, ClfA

Forster, M 2019 *Work Digital / Think Archive. A Guide to managing Digital data generated from archaeological investigations*. Dig Ventures

Historic England 2017 *Photogrammetric Applications for Cultural Heritage*. Swindon, Historic England

Chartered Institute for Archaeologists [ClfA] 2014, Standards and guidance for archaeological geophysical survey. ClfA, Reading

Schmidt, A, Linford, P, Linford, N, David, A, Gaffney, C, Sarris, A and Fassbinder, J. 2015 Guidelines for the use of geophysics in archaeology: questions to ask and points to consider. EAC Guidelines 2, Belgium: European Archaeological Council.



6 QUALITY MANAGEMENT

6.1 Wessex Archaeology procedures

Standardised naming conventions and folder structures alongside (US) document version control will be used for consistent and clear data recording and management. Consistency and quality of data collection will be controlled and documented via on site supervision/QA, data processing/reporting QA and digital archiving/QA. This may include processes such as calibration, peer review of data or representation with controlled vocabularies.

Wessex Archaeology is an ISO 9001 accredited organisation (certificate number FS 606559) independently audited by the British Standard Institution (BSI), confirming the operation of a Quality Management System which complies with the requirements of ISO 9001:2008 – covering professional archaeological and heritage advice and services.

Wessex Archaeology is registered as an archaeological organisation with the Chartered Institute for Archaeologists (CIfA) and fully endorses its Code of Conduct and Regulations for Professional Conduct.

7 MANAGING ACCESS AND DATA SECURITY

7.1 Wessex Archaeology procedures

Risks to data security will be managed in accordance with Wessex Archaeology's data security policy and procedures. Access will be controlled by secure user accounts and the implementation of document and folder level security.

All Wessex Archaeology office networks are secured behind managed firewalls which are upgraded, updated, and reviewed on a regular basis. All internal core systems are Microsoft licensed products (Windows 10, Windows Server 2016, Windows Server 2019) and we implement Active Directory to manage all user accounts, security, services and access to systems data and resources.

External access to Wessex Archaeology's systems and network is controlled via secured Virtual Private Network connections (encrypted and security controlled). Access is granted to Wessex Archaeology staff only.

Collaboration will be enabled via data access and sharing protocols that do not jeopardise data security. When creating the primary archive or collecting data in the field, data will be backed up daily onto Wessex Archaeology's main secured systems.

Wessex Archaeology's IT department has a backup strategy and policies that involve daily, weekly, monthly, and annual backups of data. Data will be stored on secured servers and within offsite storage locations.

7.2 Data protection

Wessex Archaeology has a privacy policy and procedures for dealing with personal information which meets the requirements of the *Data Protection Act 2018*. These detail what information Wessex Archaeology collects, the purpose for collecting this data, how it will be processed, stored, transferred, and disposed of. These documents are available on request.



Wessex Archaeology takes appropriate technical and organisational steps to ensure the security of relevant personal data. We have implemented security measures to protect the personal data that we have under our control from:

- Unauthorised access;
- Improper use or disclosure; and
- Unauthorised modification.

The Company ensures that all staff are aware of their responsibilities under GDPR and the *Data Protection Act 2018*, and provides them with the necessary advice, guidance, and awareness training in handling personal data.

Wessex Archaeology is committed to complying with the *General Data Protection Regulation* (GDPR) and the *Data Protection Act 2018* in fulfilling its duty to the rights of individuals and in the collection, processing, and transfer of personal information to ensure that personal data is:

- Processed lawfully, fairly and in a transparent manner;
- Collected for specific, explicit, and legitimate purposes only;
- Adequate, relevant, and limited to what is necessary in relation to the purposes for which it is collected;
- Accurate and, where necessary, kept up to date. We will take every reasonable step to erase or rectify inaccurate personal data;
- Not kept in a form which allows identification of the subject for longer than is necessary for the specified purpose(s);
- Processed in an appropriately secure manner including protection against unauthorised use, accidental loss, destruction, or damage; and
- Where required, personal data will be redacted prior to the exchange of project documents or data with external organisations and individuals.

All relevant data collected as part of the project will be curated in line with these principles.

8 DATA RETENTION, SHARING AND PRESERVATION

8.1 Storage and preservation

All data will be retained forming the digital element of the overall working project archive. Digital data will be securely stored by Wessex Archaeology, with consideration of client confidentiality, GDPR restrictions and technological developments. Data will be stored in a logical, manageable way using Wessex Archaeology's methodology and storage systems. This will allow easy access throughout the duration of the project and for archive collation and consolidation once the project has ended.

For long-term storage preservation and accessibility, files will be converted to an open-source format, e.g., .dat, .csv and .dxf, where necessary or required. Data for all sites investigated as part of the project should be retained for as long as it is deemed to have

potential for archaeological reuse. At a minimum, project reports that do not contain confidential information should be made available. It is recommended that data supporting these reports be made publicly accessible.

8.2 Selection and retention

The digital archive may include reports (including Written Scheme of Investigation (WSI)), raw geophysical data, GNSS survey data and completed survey drawings.

All data will be subject to this selection and retention process, as defined by the project-specific Selection Strategy, and as agreed with all project stakeholders during the course of the project.

Data will be kept in line with obligations to retain certain data, the potential reuse value, what is economically sustainable, and any additional effort required to prepare the data for data sharing and preservation. Data will be reused to validate research findings, conduct new studies, and for teaching. File formats will be stable cross-industry standard formats and deposited following good practice guidance.

Deselected digital files, those not being archived will be held on backed-up Wessex Archaeology servers for an appropriate and sustainable period of not less than a year following project completion, submission, and archive deposition.

8.3 Specific data type selection

Survey

Survey data in shapefiles and site plans in a CAD .dwg or .dxf format will be deposited in final file versions representing the data collection and data processing stages of work respectively. Interpreted survey data in .tif, .tiff or shapefiles will be subject to the same selection procedure.

Reporting

All final client reports produced will be archived as final file versions in .pdf or Microsoft Word .docx format. Early versions, drafts will not be selected for archive but will be held on Wessex Archaeology servers. Project reporting is subject to a document management system (DMS) with versioning and version control handled automatically.

Data types

All data types used for archiving are industry standard and can be accessed by most data specific software. If this is not the case, data can be converted to other common formats. As advised by ADS all .pdf files selected for archive will be converted to archival standard PDF/A on deposition.

8.4 Guidance

ADS 2019 *Guidance on the Selection of Material for Deposit and Archive* Online guidance <https://archaeologydataservice.ac.uk/advice/selectionGuidance.xhtml> (accessed 31/08/21)

Brown, D H 2011 *Archaeological Archives: a guide to best practice in creation, compilation, transfer, and curation* (revised edition). Archaeological Archives Forum

Forster, M 2019 *Work Digital / Think Archive. A Guide to managing Digital data generated from archaeological investigations*. Dig Ventures

Whyte, A and Wilson, A 2010 *How to Appraise & Select Research Data for Curation* (revised 15/08/16, v.1.1), Digital Curation Centre, <https://www.dcc.ac.uk/guidance/how-guides/appraise-select-data> (accessed 31/08/21)

9 DATA SHARING

Data will be shared via a range of accessible media and portals as broadly as possible and via a Core Seal trusted repository. Data will be shared in accordance with project stakeholder requirements and any restrictions, if imposed and shared with consideration of client confidentiality and GDPR restrictions.

An OASIS form will be completed for each phase of archaeological work associated with the project. For some projects with negative archaeological results, this, alongside selected images deposited with OASIS, would form the archaeological archive as agreed with project stakeholders.

A final version of the project reporting will be supplied to the Historic Environment Record directly and/or via OASIS, and any data which they request can also be provided directly if they are manageable and sustainable. Data will be made available as soon after collection as possible, provided it is in accordance with stakeholder agreed requirements and any restrictions. Data archived with the ADS will have a persistent Digital Object Identifier (DOI) after deposition.

In agreement with project stakeholders, the digital archaeological archive and required metadata will be deposited with a Core Trust Seal trusted repository at a level commensurate with its potential for archaeological reuse, value for future research and public benefit. This will follow national and repository guidelines and CIFA standards, as outlined in this DMP.

Wessex Archaeology will attempt to minimise data restrictions as far as practicable. Exclusive use of the data may be required for limited periods where client approval is required, or longer term where sensitivities exist in discussion with project stakeholders. A data sharing agreement (or equivalent) will be adhered to via a deposition licence.

Data for deposition will be shared digitally via downloads accessible by the general public via the specific repository's data sharing guidelines and deposition licence with acknowledged long-term value. The methods used to share data will be dependent on several factors such as the type, size, complexity, and sensitivity of data. Open source and standard formats will form the basis of files comprising the archaeological archive to best enable future data sharing and ease of reuse.

If deposition is not possible at the time of project completion, the archive will be retained by Wessex Archaeology, until a suitable repository is agreed between project stakeholders.



Appendix 4: Selection Strategy

Cefn Road, Wrexham Geophysical Survey 11/10/2021 V.1 SELECTION STRATEGY

Project Manager:	Chris Breeden	
Archaeological Archive Manager:	Lorraine Mephram	
Organization:	Wessex Archaeology	
STAKEHOLDERS		Date Contacted
Collecting Institution(s):	Clwyd-Powys Archaeological Trust Historic Environment Record (CPATHER), and the National Monuments Record of Wales (NMRW)	
Project Lead / Project Assurance:	Project Manager: Chris Breeden	
Landowner/Developer:	Corylus Planning & Environmental Ltd	
Other:	Development Control Archaeologist	
RESOURCES REQUIRED	WA Geophysical Survey Specialists	
Context		
<p>This selection strategy relates to the magnetic gradiometer survey being undertaken in October 2021 and will be amended for future works as defined in further project WSI/UPDs. For full details of the project's aims and objectives, methodology and work program please refer to the WSI/Project Design (attached). Only the aims and objectives relevant to this selection strategy are listed here;</p> <p>The relevant aims of a survey are:</p>		

- To determine, as far as is reasonably possible, the nature of the detectable archaeological resource within a specified area using appropriate methods and practices; and
- To inform either the scope and nature of any further archaeological work that may be required; or the formation of a mitigation strategy (to offset the impact of the development on the archaeological resource); or a management strategy.

The relevant objectives of the survey are:

- To conduct a geophysical survey covering as much of the specified area as possible, allowing for on-site obstructions;
- To clarify the presence/absence of anomalies of archaeological potential; and
- Where possible, to determine the general nature of any anomalies of archaeological potential.

1. DIGITAL DATA

STAKEHOLDERS

Archaeological Archive Manager, Project Manager,
HER Officer at CPAT

SELECTION

Location of Data Management Plan (DMP):

Appendix to WSI

Digital data will be selected for inclusion in the preserved archive by the Project Manager and Project Archives Officer, as agreed with the identified project stakeholders. This process will enable digital data considered to have valuable potential for future study and reuse, to be preserved and accessible.

Text: Digital copies of various Word/PDFA Documents; including Written Scheme of Investigation and Client Reports, data supporting documentation and a Digital Archive Index document. Born digital text files in accessible formats; in-house text in Word (.docx), .txt or PDFA.

Survey Data: Survey data in shapefiles and site plans in a CAD .dwg or .dxf format will be deposited in final file versions representing the data collection and data processing stages of work respectively. Interpreted survey data in .tif, .tiff or shapefiles will be subject to the same selection procedure.

Selection strategy reviews will be undertaken at Review Points R2 and R3 (MoRPHE guidance, HE 2015), as stated. Additional reviews will also take place, if necessary, at further project stages, to be defined in the Updated Project Design.

Copyright: See section 8 of the attached WSI for copyright statements regarding selected archive data copyright and third-party data copyright. Users remain bound by the conditions of the Copyright, Designs and Patents Act 1988 regarding multiple copying and electronic dissemination of such material.

DE-SELECTED DIGITAL DATA

Deselected data is stored on secured servers and within offsite storage locations. The WA IT department has a backup strategy and policies that involves daily, weekly, and monthly and annual backups of data as stated in the Wessex Archaeology Data Management Policy/Plan.

This strategy is non-migratory, and original files will be held at Wessex Archaeology under their

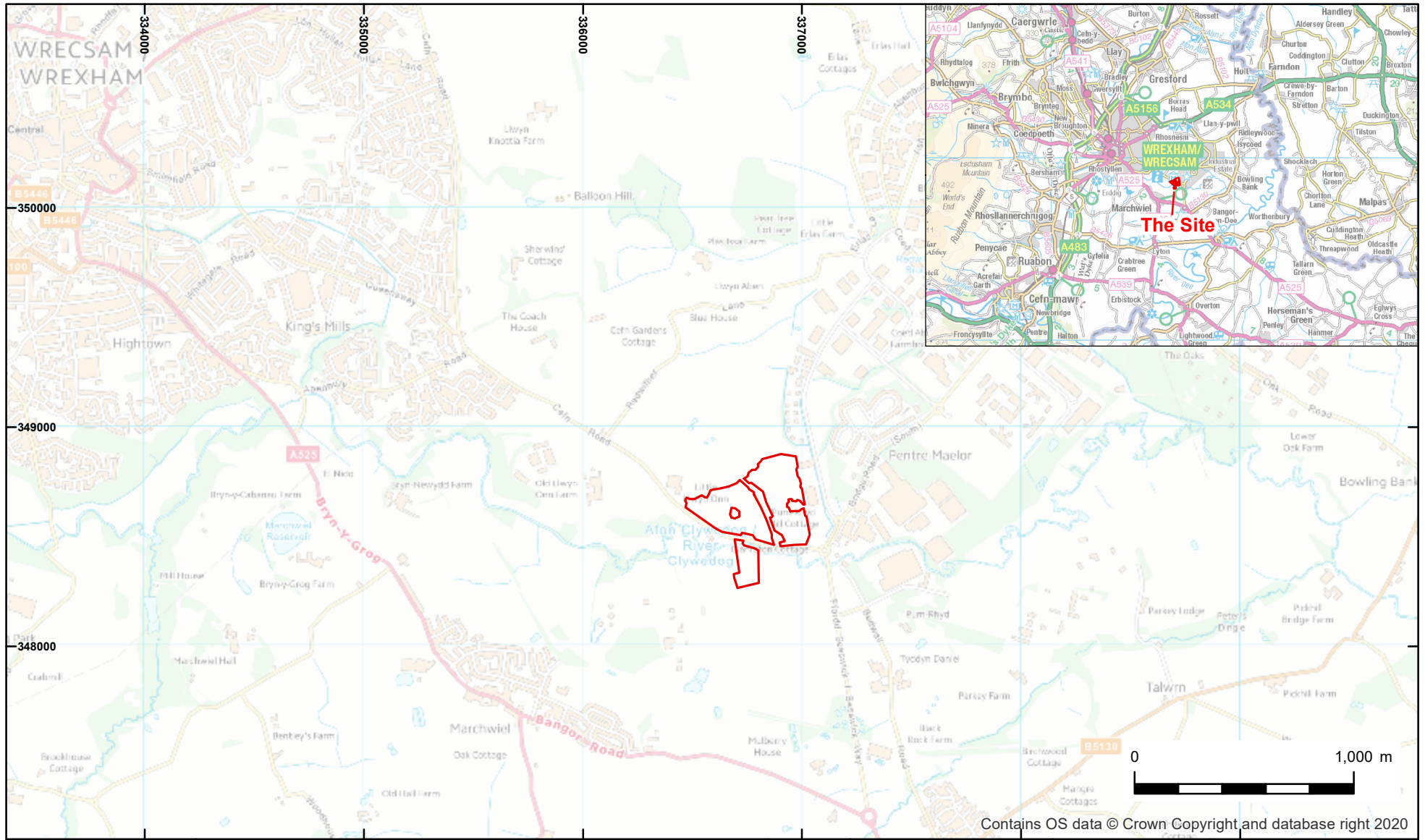
unique project identifier, as long as they remain useful and usable in their final version format.



Deselected digital data (using the stated criteria), only relevant but not intrinsic to project understanding, will be included in the paper archive as printed copies and deposited with the stakeholder Museum as identified and agreed

This data may be used for teaching or reference collections by the museum, or by Wessex Archaeology unless otherwise required by contractual or copyright obligations.

AMENDMENTS

Date	Amendment	Rationale	Stakeholders Involved



	 The Site	Coordinate system: OSGB36 (OSTN15/OSGM15)		Date: 01/10/2021	Revision Number: 0
		Scale: 1:25,000 and 1:300,000 at A4	Illustrator: NLC		
		Path: S:\PROJECTS\247430\GIS\FigsMXD\Geophysics\WSI			

Site location

Figure 1



Wessex Archaeology Ltd registered office Portway House, Old Sarum Park, Salisbury, Wiltshire SP4 6EB
Tel: 01722 326867 Fax: 01722 337562 info@wessexarch.co.uk www.wessexarch.co.uk



FS 606559