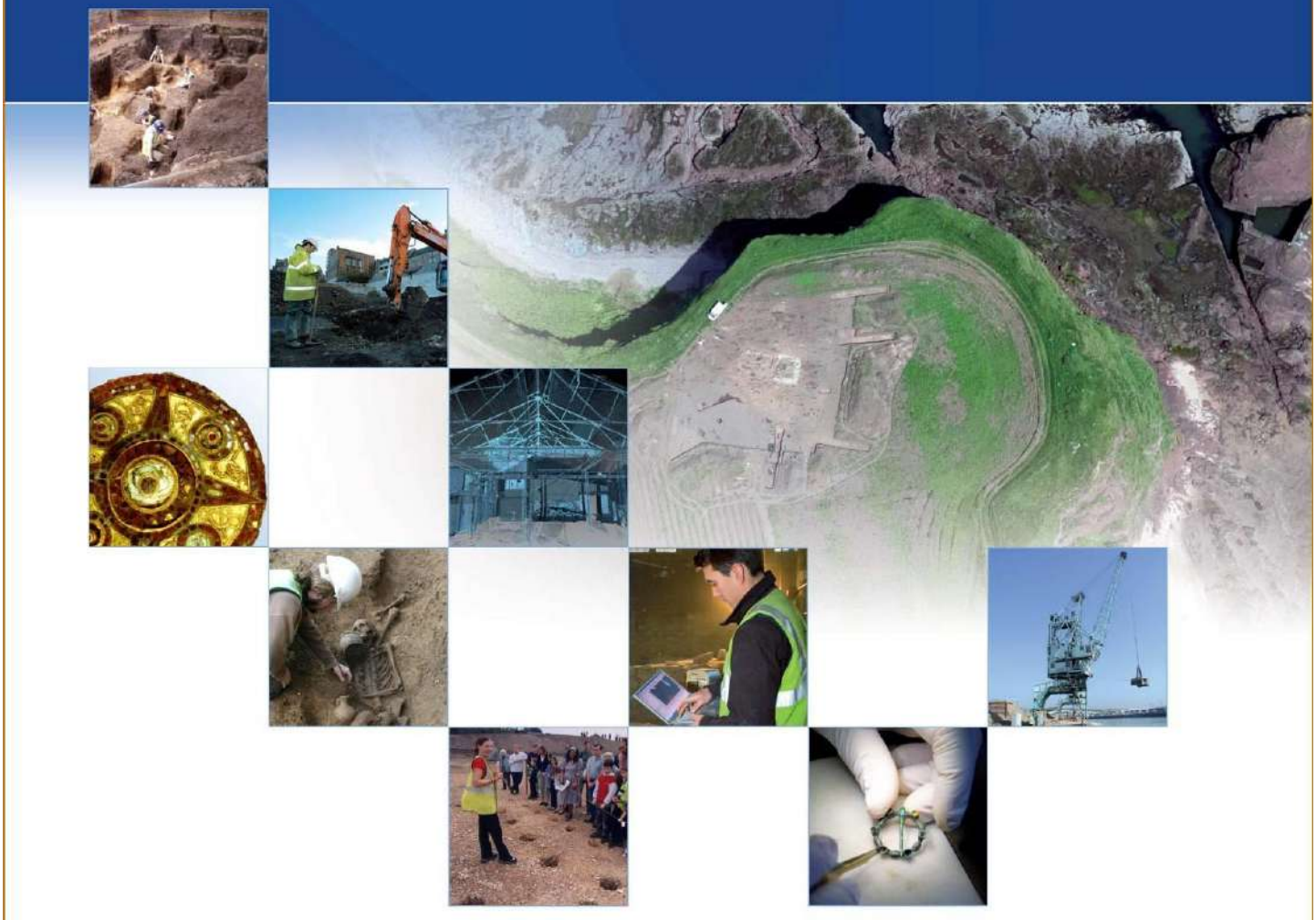
Stokes Lane Solar Farm

Archaeological Geophysical Survey

National Grid Reference: SU 60379 55522
AOC Project No: 40716
Date: 20 June 2025



AOC Archaeology Group

ARCHAEOLOGY | HERITAGE | CONSERVATION

Stokes Lane Solar Farm

Archaeological Geophysical Survey

On Behalf of:	**Harry Whittaker. Stokes Lane Solar Farm Limited 22 Grosvenor Gardens London SW1W 0DG**
National Grid Reference (NGR):	**SU 60379 55522**
AOC Project No:	**40716**
OASIS IC	**aocarcha1-523651**
Prepared by:	**Alistair Galt**
Illustrations by:	**Alistair Galt**
Date of survey:	**14th-21st February, 13th-14th March 2024**
Surveyors:	**Victoria Huggett, Marguerite Hall, Kinnie Wade, Reed Haywood**

This document has been prepared in accordance with AOC standard operating procedures.

Author: Alistair Galt	**Date: 20 June 2025**
Quality Checked by: Susan Ovenden	**Date: 20 June 2025**
Report Stage: Initial Draft	**Date: 20 June 2025**

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Contents

List of Plates

List of Figures

Non-Technical Summary

AOC Archaeology Group was commissioned by Solar 2 on behalf of Stokes Lane Solar Farm Limited to undertake an archaeological geophysical survey using magnetic gradiometry of an area of land North and South of Rookery Farm Lane, Monk Sherbourne, centred at NGR SU 60379 55522.

The survey area is composed of a single arable field of 16ha, roughly 1km south of Sherbourne St John. The survey area is sloped in both the southeast and the southwest, forming a valley that bottoms out into the centre of the survey area. It is underlain by a Chalk bedrock with a loamy soil across the survey area.

Some anomalies have been identified that might have an archaeological provenance, although it is difficult without further ground truthing to assess their character. The chalk geology in places produces strongly enhanced anomalies which likely reflect variations in the weathering of the surface of the chalk.

Modern disturbance is also present to the west and north of the survey area.. The anomalies have overall responded well to this technique.

Discrete positive anomalies are present over the majority of the survey area. These anomalies have a response that is characteristic of a burning activity, although some of the anomalies are obscured by natural disturbance. Some of the anomalies are possibly responses to chalk extraction. Due to proximity of known archaeological features from a previous geophysical survey, it may be that these features are linked, but it is impossible to ascertain this without ground truthing or further non-invasive investigations. A holloway might also be recorded in the east of the survey area, roughly parallel to the recorded former field boundary.

A few negatively enhanced linear trends in the north of the dataset could have an archaeological or natural provenance, and are aligned with the slope of the hill.

A single historic field boundary has been located in the east of the dataset, and some linear trends around this feature may be related to it.

Geological features are present across the dataset as broad trends. Modern ploughing activity has been identified running in two directions in the dataset. Modern disturbance is present along the eastern and southern edge of the dataset, with an area of enhanced disturbance in the centre of the dataset that may be related to modern agricultural practices.

Overall there appear to be some small anomalies that might have an archaeological potential, however they are difficult to ascertain their character more confidently.

1 Introduction

1.1 AOC Archaeology Group was commissioned by Solar 2 on behalf of Stokes Lane Solar Farm Limited to undertake an archaeological geophysical survey using magnetic gradiometry of an area of land at Sherbourne St John The survey was commenced on 14th February and completed on 14th March as part of a wider scheme of archaeological assessment in advance of the proposed development of the site. The planned survey area was 16.22ha, of which 16ha was completed. Approximately 0.5ha in the southwest was unsurveyable due to the ground conditions at the time of survey.

1.2 Archaeological geophysical survey uses non-intrusive and non-destructive techniques to determine the presence or absence of anomalies likely to be caused by archaeological features, structures or deposits, as far as is reasonably possible (CIfA 2014, updated 2020). It is therefore a common component of the process of evaluating the impact of development on the historic environment. It is also a key tool in archaeological research as it is non-destructive and able to cover large areas, to allow below ground interventions to be appropriately targeted.

1.3 This survey was carried out to provide information on the presence, character and extent of potential buried archaeological remains within the proposed development site.The significance of any such remains can only be determied with reference to further information; as such this report may form part of an assessment of significance, but cannot stand alone as such.

2 Survey Area Location and Description

2.1 The proposed development site (hereafter 'the survey area') is located North and South of Rookery Farm Lane, Monk Sherbourne SU 60379 55522. The survey area is situated on arable land (see Figure 1).

2.2 The survey area covers 16ha across a single arable field (Figure 2). The area is on land sharply sloping down to the southwest and northeast, forming a valley in the centre of the dataset, with a much more gently sloping southeast slope across the whole survey area, situated between 100 metres above Ordnance Datum (aOD) in the east and 124 metres aOD to the west of the survey area.

2.3 The recorded solid geology underlying the survey area consists of The Seaford Chalk Formation. The superficial deposits are not recorded (BGS, 2024). The soils within the survey area consist of shallow loamy lime rich soil (Soilscapes, 2024).

2.4 Chalk geologies typically provide good results for gradiometry surveys (David *et al.* 2008: 15). In this instance, the soil and geological environment of the survey area do not appear to have adversely impacted on the overall clarity of the dataset.

3 Archaeological Background

3.1 This archaeological background is a summary of information contained in a previous geophysical survey report (ARS, 2023). Any references to HER numbers should refer to this document.

Prehistoric (500,000 BC – AD 43)

3.2 There is substantial evidence of prehistoric activity in the vicinity of the previous geophysical survey. This includes a perforated mace head found in 1953 b Hugh Oliver-Bellasis to the north of Crooked Row Copse, Monk Sherbounre. Three circular enclosures are reported as being visible on LiDAR and as crop marks on aerial photography in the north of the survey area to the west of Sherbourne St. John. The enclosures measure between 29m and 34m in diameter (HER ID 36035). The investigation surggests the features may be associated with a potential later pre-historic co-axial field system to the west (HER ID 36035). An irregular/sub-oval enclosure was also identified on aerial photographs south of Rookery Farm Lane (HER ID 36031).

3.3 Two Bronze Age ring ditches, identified through aerial survey in 1996, have been recorded in fields to the south-east of Manor Farm in the local Historic Environmental Record. An air photograph survey in 1996 also yielded images of an irregular series of cropmarks south of Rookery Farm Lane. These cropmarks are interpreted as a probable Iron Age settlement (HER ID 36064).

Romano-British (AD 43 – AD 410)

3.4 Evidence of possible Roman presence is indicated by a number of finds including fragments of glass vessels, window glass, tile finds, building material finds and pottery were obtained south of Rookery Farm Lane (HER ID 19499). These finds have been used to support the proposal that a Roman villa is present in the proximity of the survey area. The presence of hypocaust tiles and iron slag (HER ID 19498) go someway to supporting this hypothesis. Further observations in 1957 indicated the presence of two ditches and associated finds to the east side of a chalk pit (HER ID 20718). Roman pottery was also obtained in 1986 to the north of the site, north of Rookery Farm. Lane (HER ID 20660). In 1993 the potential villa was included in a survey of Romano-British villas in Hampshire ('A Survey of Romano-British Villas'; HER ID 20655).

Medieval (AD 410 – AD 1540)

3.5 In 1996 a holloway was recorded east of the boundary of All Saints church/Manor farm. The sunken lane was an estimated date range of 1066AD-1539AD (HER ID 36853). A LiDAR survey identified medieval/post-medieval ridge and furrow (HER ID 69631). The Pamber Priory was founded in c.1120-30 by Henry de Por and inhabited by a prior and 12 monks until it was suppressed in 1414. Excavations have revealed and an earlier church beneath the extant nave, the east wall of a chantry chapel, footings of the South transept and a North chapel. The Priory is also recorded as having to have utilised Roman and medieval floor tiles, but no medieval priory (HOB UID: 240330).

Post-medieval – Modern (AD 1540 – present)

3.6 No major historical changes have been recorded from the post-medieval period to the present day within the survey area.

Previous Archaeological Invesitgations

3.7 A geophysical survey by ARS identified a probable braided Holloway and possible linear features relating to agricultural field boundaries and ferrous anomalies, alongside probable circular ring ditches and potential D-shaped enclosure, extraction site, former trackway and field systems, with possible braided Holloways (ARS 2023: 3-5), all located to the south and east of the survey area.

4 Aims

4.1 The aim of the geophysical survey was to identify anomalies that suggest the presence of archaeological remains, in order to enhance the current understanding of the historical environment within the survey area.

4.2 Specifically, the aims of the gradiometer survey were:

- To locate, record and characterise any potential surviving sub-surface archaeological remains within the survey area, as part of a broader archaeological evaluation,
- To help determine the next stage of works as per the client's instruction,
- To produce a comprehensive site archive (Appendix 1) and report.

5 Methodology

5.1 The geophysical survey was undertaken between 14/02/2024 and 14/03/2024.

5.2 All geophysical survey work was carried out in accordance with current good practice specified in the EAC guidelines document (Schmidt *et al.* 2015), as recommended by Historic England, and in the Chartered Institute for Archaeologists' *Standard and Guidance for Archaeological Geophysical Survey* (2014, updated 2020).

5.3 Parameters and survey methods were selected that were suitable for the prospective aims of the survey and in accordance with recommended professional good practice (Schmidt *et al*. 2015).

5.4 Digital photographs of every survey parcel were taken before, during and after geophysical survey to show any changes to field conditions following the programme of works. The photos were downloaded and stored off site, and relevant examples are included as Plates 1 to 3 in this report.

5.5 The gradiometer survey was carried out using a Bartington Non-Magnetic Cart. The cart system utilises six Grad-01 fluxgate gradiometer sensors mounted upon a carbon fibre frame, along with data logging equipment and batteries (see Appendix 2). Before each session of use, the cart system was balanced around a single set up point within the Site specifically chosen for being magnetically quiet. Balancing the machine around this point produces a more uniform dataset throughout and allows all data to be plotted with ease on the same palette.

5.6 Data was collected using zig-zag traverses alongside a constant stream of GPS data collected through a Trimble R10 GPS, enabling the collected data to be spatially georeferenced without the need for a pre-determined grid system. The data was logged on a laptop mounted to the cart using Geomar MLGrad601 software.

5.7 A total of 16ha were surveyed using the Bartington cart.

5.8 Care was also taken to attempt to avoid metal obstacles present within the survey area, such as metal objects within and adjacent to the survey area as gradiometer survey is affected by 'above-ground ferrous disturbance' and avoiding these improves the overall data quality and results obtained.

5.9 The data was downloaded from MLGrad601 and converted into a .xyz file in Geomar MultiGrad601 before being processed along with the GPS data in TerraSurveyor v3.0.34.10. The details of these processes can be found in Appendices 2 and 3.

5.10 Interpretations of the data were created in ArcGIS Pro and the technical terminology used to describe the identified features can be found in Appendix 4.

6 Results and Interpretation

6.1 The gradiometer survey results have been visualised as greyscale plots, with the processed data plotted at -1 to 2nT as seen in Figure 3. An interpretation of the data can be seen in Figure 4 and an individual characterisation of the numbered identified anomalies of interest is given below. Figure 5 shows minimally processed data plotted as XY traces at 40nT/cm at A3.

6.2 Appendix 4 contains a guide to the interpretation categories employed and the logic used to assign anomalies to specific classes, as well as a short discussion of how past human activity results in these anomalies, however, some important points are noted below:

6.3 The classes have three sub-types (generally): anomalies (typically indicated by a solid colour polygon), spreads (a stippled polygon) and trends (a line with a colour matching the polygon colour). *Anomalies* refer to distinct changes in the survey data which suggest an abrupt boundary between materials below ground, such as a cut feature with a magnetically contrasting fill. *Spreads* of enhanced material refer to diffuse areas of altered magnetic contrast which suggest a localised spread of material with a magnetic contrast within the topsoil or ploughzone. Linear *trends* are less distinct and are typically visible as linear patterning in the overall texture of the data. A common example of these is the striping effect caused by recent ploughing.

6.4 Anomalies placed in the '*Uncertain'* class may have an archaeological origin, but other explanations are equally likely. Where any particular interpretation is *more* likely than others, the anomaly is assigned to that class.

6.5 The definite '*Archaeology'* class is only used for anomalies with no other possible explanation, either due to their diagnostic characteristics or because they are corroborated by other sources such as previous interventions within the survey area. Anomalies with magnetic characteristics or morphologies that suggest an archaeological origin will generally be assigned to the '*Possible Archaeology'* class.

6.6 The anomaly type '*Ferrous Spike'* is assigned to strong dipolar anomalies which cover a small spatial area and have a characteristic appearance in the XY traces of the survey data. These are strongly likely to be of recent origin in the form of magnetic or ferrous debris within the topsoil; 'spikes' of other origin will be assigned to their appropriate classification.

6.7 A distinction is made between modern *disturbance* from strongly ferrous materials within or adjacent to the survey area, such as the strong dipolar 'halos' produced by services like gas mains, and spreads of material within the topsoil causing noise that is assumed to have a recent origin. Generally speaking, '*Modern Disturbance'* occurs at a distance from a magnetic source, whereas *modern magnetic spreads/debris* are related to material directly at that location.

6.8 Generally, only anomalies (or groups thereof) of a likely archaeological or historical origin have been assigned an anomaly number on the interpretation figures. However, anomalies interpreted as resulting from other processes that are integral to the discussion of the results have also been assigned anomaly numbers.

6.9 The overall background levels are heightened as the chalk geology has variability in enhancement across the survey area, reflecting thinner soils and variably weathered chalk on the higher ground, and accumulation of soils (and protection of the soil/chalk interface) in the valley areas. The area in the east of the survey area marked by the former boundary seems to have been under different past land use which has been less erosive. Nonetheless this heightened background response has not overly affected the overall clarity of the anomalies.

Archaeology

6.10 Though no anomalies of definite archaeological interest have been identified in the survey results, a series of anomalies that are of potential archaeological interest have been identified, and are discussed below:

Possible Archaeology

6.11 Several discrete and roughly oblong positively enhanced anomalies, measuring approximately 5 – 30 metres wide in diameter, are present over the west and the south of the survey area [**1A,1B,1C**]. These particular anomalies have a magnetic character that contains a distinct twin-peak response, suggesting a usage that is distinct from the other anomalies listed in paragraph 6.12 below. These features 1A-1C are more likely to contain archaeological deposits. However as similar features are not recorded in the local area, either from historical mapping or in other surveys such as in the ARS geophysical survey mentioned in paragraph 3.7, a more definitive archaeological interpretation cannot be ascribed to these features. Nonetheless they could be related to the other settlement patterns recorded in the ARS survey, given the relative proximity of the enclosed settlements and Holloway.

6.12 Similarly shaped features to features 1A, 1B and 1C are recorded over a wider area but are characterised by a slightly different magnetic response [**2A-2AC**]. These responses are different as their magnetic characteristic is more indicative of infilling. Given the known chalk extraction in the local vicinity correlates well with the size of many of these anomalies and many of these anomalies appear to be situated directly on top of enhanced responses to the local chalk geology this seems to be a likely explanation for their provenance. A small spread close to the western margin of the survey area may be associated with this activity as well [**2AD**].

6.13 A spread of approximately 60 metres wide is located to the east of the survey area, running roughly parallel to the historic field boundary, and may also be represented by part of a linear trend [**3A – 3B**]. This feature may be associated with a Holloway noted in the ARS survey in paragraph 3.7. This interpretation is based on extrapolating a straight line from the surviving Holloway that is incomplete in form, and the response in this dataset differs substantially from the ARS survey, so it is a tentative interpretation that could have an alternative provenance.

6.14 Two negatively enhanced trends originate from the northern margin and snake their way to the field drain, approximately 105 and 95 metres long respectively [**4A** and **4B**]. These might have an archaeological interpretation, such as a small lynchet, although this is tempered by the fact that 4B is curved, and doesn't respect the localised topography series of faint linear trends are present in the south of the survey area could also have a similar interpretation [**4C**, **4D**, **4E**].

Unclear Origins

6.15 A faint positive linear trend is visible on the western margins of the survey area [**2AE**]. It is both weak in magnitude and its association with 2AD means that it is difficult to interpret with any confidence, although it cannot be ruled out as having an archaeological provenance.

6.16 A series of enhanced spreads aligned west-east and widely spaced apart are located in the north of the survey area [**2AF-2AH**].

6.17 Smaller positive anomalies have been identified in the vicinity of anomalies **6A** and **12A** [**17A** and **18A**]. These are approximately 5 – 7 metres long and 1.5 – 2 metres wide, so they are relatively homogenous in size as well as response, which is overall weaker than anomalies **1A**-**16A**. These are likely to be responses to modern ploughing regimes, although an alternative response cannot be completely ruled out.

6.18 Two weakly enhanced linear trends in the east of the dataset are set at different angles to the historic field boundary and have a stronger response [**3C – 3E**]. It is difficult to interpret these linear features, and they could have an archaeological or anthropological provenance.

6.19 A very faint positively enhanced linear trend that forms a roughly rectangular shape is located in the centre of the survey area [**4G**]. It is very difficult to ascertain the provenance of this anomaly. Two positively enhanced curved trends are also present in the centre of the survey area [**4H** and **4I**]. As they are so faint and obscured by the enhanced background disturbance in the vicinity of the anomalies, it is unclear as to their interpretation.

6.20 Several small positively enhanced anomalies are closely aligned to each other in two areas in the south and west of the survey area [**4J** and **4K**]. These are likely to be related to ploughing trends, however an alternative archaeological or natural interpretation cannot be entirely ruled out.

Historical Features

6.21 An historic field boundary is located in the east of the survey area, which closely matches a field boundary seen on 19th century OS mapping. A similar linear anomaly that extends from a right angle to the east of this anomaly is likely to be an unrecorded historic field boundary.

Agricultural

6.22 Plough marks in the dataset that correlate with the orientation of the present-day plough lines are noted throughout the dataset (see Plates 1 and 3). The present day plough is more visible, more packed in together aligned roughly west - east orientation, while a second series of fainter plough lines that are more widely spaced apart and only visible in the north of the survey area which could be modern but may also be more historic in origin, is aligned more southwest-northeast

Non – Archaeology

6.23 The dataset is largely overlain with responses of broad sweeping tends of positively and negatively enhanced anomalies that roughly correspond to the slope of the valley.

6.24 There is a broad patch of enhanced magnetic disturbance in the centre of the dataset, which appears to have a modern origin, although it is not as magnetically enhanced as green waste.

6.25 The eastern and western margins of the survey area are dominated by magnetic disturbance caused by wire fencing and farm gates.

7 Conclusion

7.1 Positively enhanced anomalies in the dataset could have an archaeological origin, including some areas of in-situ burning activity. Similarly sized features in the survey area are likely to be associated with infill from chalk extraction. A Holloway might also be present in the east of the survey area, although this is based on extrapolating from incomplete surviving evidence. A single historic field boundary has been located in the east of the dataset. Overall, in spite of the enhanced magnetic background, the anomalies are reasonably well defined and do not appear to obscure the anomalies substantially.

7.2 The possible archaeology in the survey area could be the remains of either chalk pit mining and/or other industrial activity. This might be complemented by burials in the vicinity, although it is difficult to interpret these anomalies due to the issues outlined above.

7.3 In respect to the known background information, this survey has helped to demonstrate the extent of any additional activity that may be related to the enclosure to the south of the survey area. However given the difference in plotting ranges between this survey and the ARS survey, it may be that there are additional features in the ARS geophysical survey that may have been found with the plotting range or the equipment setup used here. The paucity of geological anomalies is to be noted as an example of the difference in the plotting ranges; however a feature in Field 4 of the previous survey may continue from the south of this survey into the present dataset. Extrapolating this feature it may

correlate with the location of the historic field boundary, possibly anomalies A19, albeit with a substantially reduced magnetic response in this survey.

7.4 In assessing the results of the geophysical survey against the specific aims set out in Section 4:

- The survey has succeeded in locating, recording and characterising surviving sub-surface remains within the Site, though more remains may be present that are not suitable for detection using gradiometry;
- The survey will help in determining the next stage of works as it has provided evidence that remains of an uncertain origin are most likely present on site, and has provided a number of targets for further investigation;
- The survey has resulted in a comprehensive report and archive.

8 8Statement of Indemnity

8.1 Although the results and interpretation detailed in this report have been produced as accurately as possible, it should be noted that the conclusions offered are a subjective assessment of collected datasets.

8.2 The success of a geophysical survey in identifying archaeological remains can be heavily influenced by several factors, including geology, seasonality, field conditions and the properties of the features being detected. Therefore, the geophysical interpretation may only reveal certain archaeological features and not produce a complete plan of all the archaeological remains within a survey area.

9 Archive Deposition

9.1 In accordance with professional standard practice an online OASIS database record will be completed for submission to the HER and Archaeological Data Service (ADS) (Appendix 2).

9.2 One digital and hard copy of the report and data will be submitted to the relevant Historic Environment Record (HER) at the Client's discretion.

9.3 A digital copy of the report and data will also be submitted to the ADS at the Client's discretion.

10 Bibliography

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*denotes a reference that occurs in Appendix 2 rather than the main body of this report.

11 Plates

Plate 1: East facing Southwest.

Plate 2: East facing North.

Plate 3: East facing West.

12 Figures

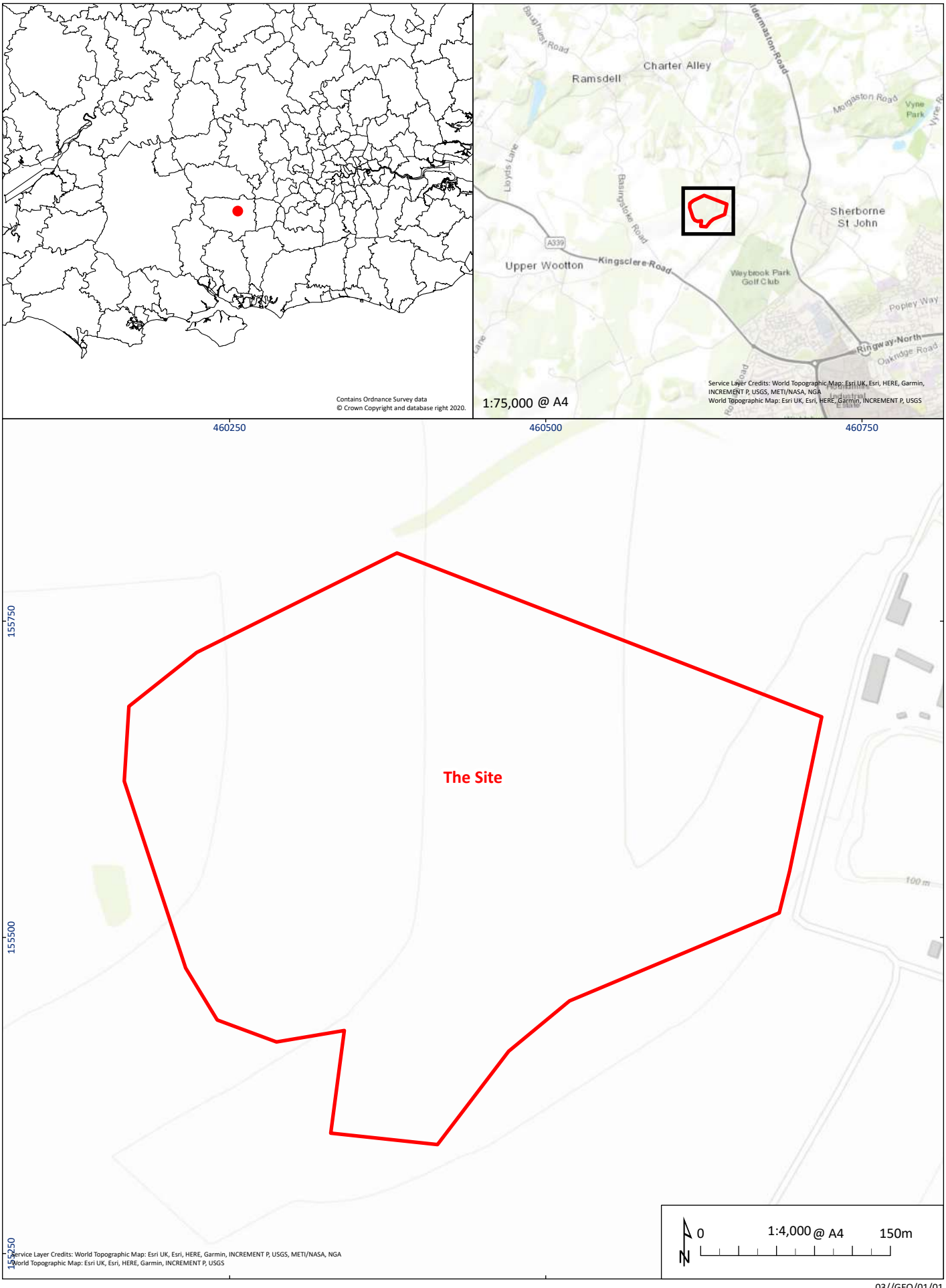
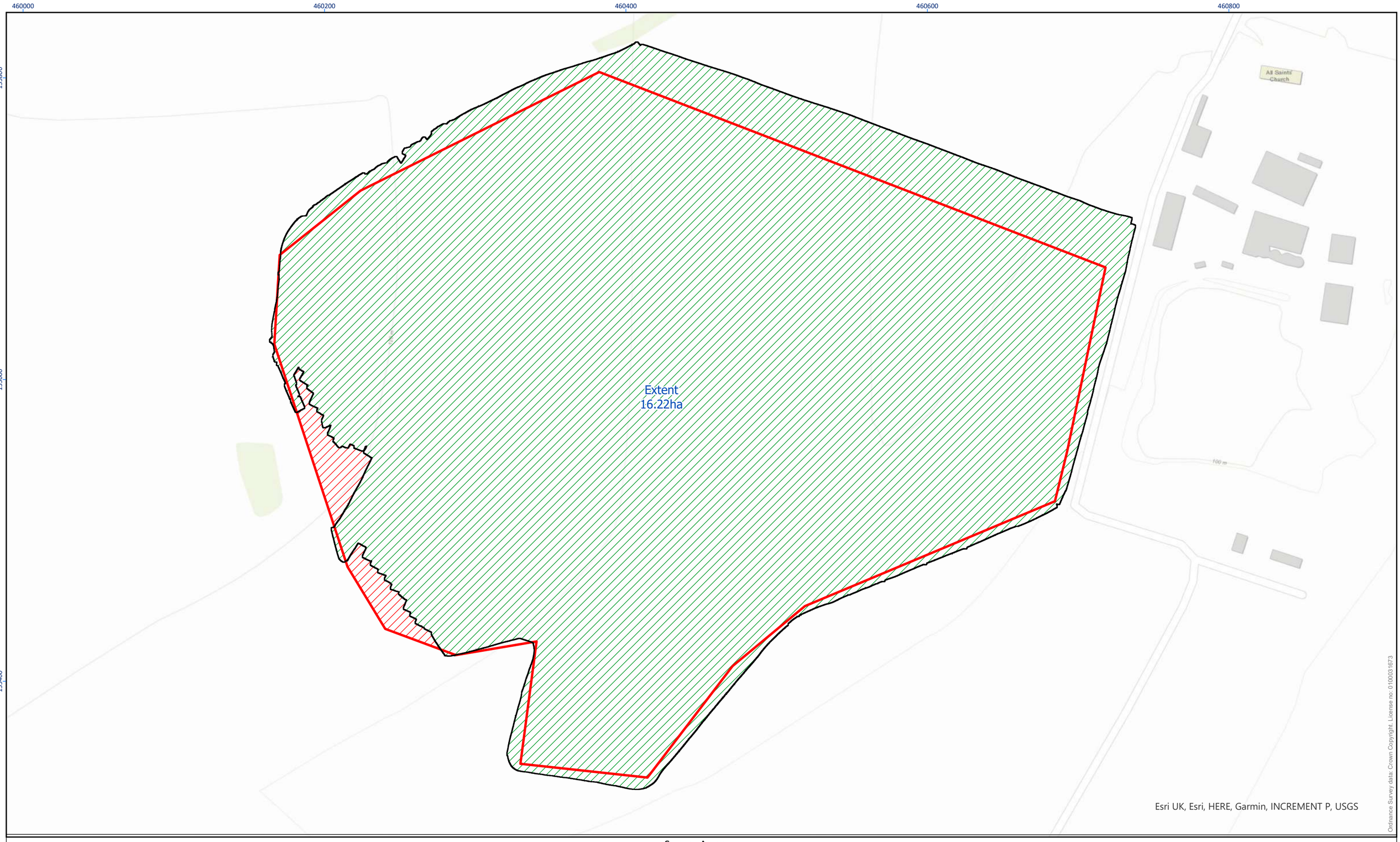


Figure 1: Site Location

03//GEO/01/01

STOKES LANE SOLAR FARM: ARCHAEOLOGICAL GEOPHYSICAL SURVEY (40716)



Survey Areas

Figure 2

- Red Line Boundary
- Surveyed
- Unsuitable

N

0 60m

Scale: 1:2,250 @ A3

Drawing Number: 05/40716/GEO/02/01	
Created by: AG	Date: 25/03/2024
Checked by: CS	Date: 25/03/2024
Approved by: JL	Date: 25/03/2024

AOC Archaeology Group

460000 460200 460400 460600 460800

155800 155600 155400

All Saints' Church

100 m

Esri UK, Esri, HERE, Garmin, INCREMENT P, USGS

Gradiometer Survey Results - Greyscale Plot

Figure 3

2nT

-1nT

Red Line Boundary

N

0 60m

Scale: 1:2,250 @ A3

Drawing Number: 05/40716/GEO/03/01	
Created by: AG	Date: 25/03/2024
Checked by: JL	Date: 25/03/2024
Approved by: JL	Date: 25/03/2024

AOC Archaeology Group

460000 460200 460400 460600 460800

155800 155600 155400

All Saints' Church

1A 2A 3A 4A 5A 6A 7A 8A 9A 10A 11A 12A 13A 14A 15A 16A 17A 18A 19A 20A 21A 22A 23A 24A 25A

Esri UK, Esri, HERE, Garmin, INCREMENT P, USGS

Gradiometer Survey Results - Interpretation

Figure 4

- Linear Trend (Possible Archaeology)
- Linear Trend (Unclear Origin)
- Linear Trend (Agricultural, Ploughing)
- Linear Trend (Geology/Natural)
- Linear Trend (Service)
- Anomaly (Possible Archaeology)
- Spread (Historic Feature)
- Spread (Geology/Natural)
- Spread (Magnetic Disturbance)
- Anomaly (Ferrous/Iron Spike)
- Spread (Ferrous/Iron Spike)

N

0 60m

Scale: 1:2,250 @ A3

Drawing Number:	05/40716/GEO/04/01
Created by: AG	Date: 25/03/2024
Checked by: CS	Date: 25/03/2024
Approved by: JL	Date: 25/03/2024

AOC Archaeology Group

460000 460200 460400 460600 460800

155800 155600 155400

All Saints' Church

100 m

Esri UK, Esri, HERE, Garmin, INCREMENT P, USGS

Magnetometer survey - XY Trace Plot

Figure 5

40nT
-40nT

N

0 60m

Scale: 1:2,250 @ A3

Drawing Number: 05/40716/GEO/5/01	
Created by: AG	Date: 25/03/2024
Checked by: SO	Date: 25/03/2024
Approved by: JL	Date: 25/03/2024

AOC Archaeology Group

Appendix 1: Survey Metadata

Oasis ID: aocarcha1-523651

Field	Description
Surveying company	AOC Archaeology Group
Data collection staff	Victoria Huggett, Marguerite Hall, Kinnie Wade, Reed Haywood
Client	Solar2 on behalf of Stokes Lane Solar Farm Limited
Site name	Stokes
County	Hampshire
NGR	SU 60379 55522
Land use/field condition	Arable
Duration	7 days
Weather	14th - 21st February: Cloudy, sunny. 13th-14th March - Sunny
Survey type	Gradiometer Survey
Instrumentation	Bartington cart survey: Bartington Non-Magnetic Cart, two Bartington Grad 601-2, Trimble R10 GNSS System
Area covered	16.22ha
Download software	MLGrad601
Processing software	Geomar, MultiGrad601 and TerraSurveyor
Visualisation software	ArcGIS Pro
Geology	Seaford Chalk Formation (BGS, 2025)
Soils	Shallow loamy lime rich soil (Soilscapes/Scotland's Soils, 2025)
Scheduled Monuments	No
Known archaeology within survey area	None
Historical documentation/ mapping of survey area	None
Report title	Stokes Lane Solar Farm: Archaeological Geophysical Survey
Project number	40716
Report author	Alistair Galt
Quality Checked by	Chris Sykes

Appendix 2: Archaeological Prospection Techniques, Instrumentation and Software Utilised

Gradiometer Survey

Gradiometer surveys measure small changes in the earth's magnetic field. Archaeological materials and activity can be detected by identifying changes to the magnetic values caused by the presence of weakly magnetised iron oxides in the soil (Aspinall *et al*. 2008: 23; Sharma 1997: 105). Human habitation often causes alterations to the magnetic properties of the soils and sediments present in the area (Aspinall *et al*. 2008: 21). There are two physical transformations that produce a significant contrast between the magnetic properties of archaeological features and the surrounding soil: the enhancement of magnetic susceptibility and thermoremanent magnetization (Aspinall *et al*. 2008: 21; Heron and Gaffney 1987: 72).

Ditches and pits can often be detected through gradiometer survey as the topsoil within and around settlements typically has a greater magnetisation than the subsoil, due to human activity. This enhanced material accumulates in cut features such as ditches and pits. Areas of burning or materials which have been subjected to heat commonly also have high magnetic signatures, such as hearths, kilns, fired clay and mudbricks (Clark 1996: 65; Lowe and Fogel 2010: 24).

It should be noted that negative anomalies can also be useful for characterising archaeological features. If the buried remains are composed of a material with a lower magnetisation compared to the surrounding soil, the feature in question will display a negative signature. For example, stone-built structures composed of sedimentary rocks that are less magnetic than the surrounding soils can appear as negative features within the dataset if the local soils and sediments are at all magnetised.

Ferrous objects – i.e. iron and its alloys - are strongly magnetic and are typically detected as high-value peaks in gradiometer survey data; small (in spatial terms) spikes are generally assumed to derive from ferrous material of recent origin (e.g. stray bits of farm equipment) in the topsoil, though archaeological sources cannot be ruled out. Broader dipolar anomalies and those with diagnostic characteristics of form will be assigned to other classifications based on their character, which might include archaeology, burning, modern ferrous or uncertain.

Although gradiometer surveys have been successfully carried out in all areas of the United Kingdom, the effectiveness of the technique is lessened in areas with complex geology, particularly where igneous and metamorphic bedrock is present or there are layers of alluvium or till between the surface and the layers of interest. All magnetic geophysical surveys must therefore take the effects of background geological and geomorphological conditions into account.

Bartington Non-Magnetic Cart Instrumentation and Software

AOC Archaeology's cart-based surveys are carried out using a Bartington Non-Magnetic Cart. The cart enables multiple traverses of data to be collected at the same time, increasing the speed at which surveys may be carried out and offers the benefits of reduced random measurement noise and rapid area coverage (Schmidt *et al.* 2015, 60-62; David *et al*. 2008, 21).

The cart uses a configuration of six Grad-01-1000L sensors mounted upon a carbon fibre frame along with three DL601 dataloggers and three BC601 battery cassettes. The sensors are normally positioned at 1m intervals on a horizontal bar, with the datalogger taking readings at 10Hz frequency, which generally takes readings between 10-20cm depending on the pace of the user along each traverse, though this can be altered to increase / reduce resolution if required. The data is georeferenced via a Trimble R10 Real Time Kinematic (RTK) VRS Now GNSS GPS which streams data throughout survey and allows the data to be recorded relative to a WGS1984 UTM coordinate system.

The gradiometer data is collected through Geomar MLGrad601 software on a laptop in real-time during the survey. The data is downloaded and converted into a .txt and a .xyz file in Geomar MultiGrad601 before being processed along with the GPS data in TerraSurveyor v3.0.34.10 (see Appendix 3 for a summary of the processes used in Geoplot to create final data plots).

Appendix 3: Summary of Data Processing

Process	Effect
Clip	Limits data values to within a specified range
De-spike	Removes small spatial scale exceptionally high readings in the data. In resistivity survey, these can be caused by poor contact of the mobile probes with the ground. In gradiometer survey, these can be caused by highly magnetic items such as buried modern ferrous objects.
Discard Overlap	Removes datapoints which occur too closely together and can cause digital artefacts in the data which are caused by the overlapping of parallel traverses.
Interpolate	Increases the resolution of a survey by interpolating new values between surveyed data points, creating a smoother overall effect.
Low Pass filter	Uses a Gaussian filter to remove high-frequency, small spatial scale variance, typically for smoothing the data.
Zero Mean Traverse	Resets the mean value of each traverse to zero, in order to address the effect of striping in the data and counteract edge effects.

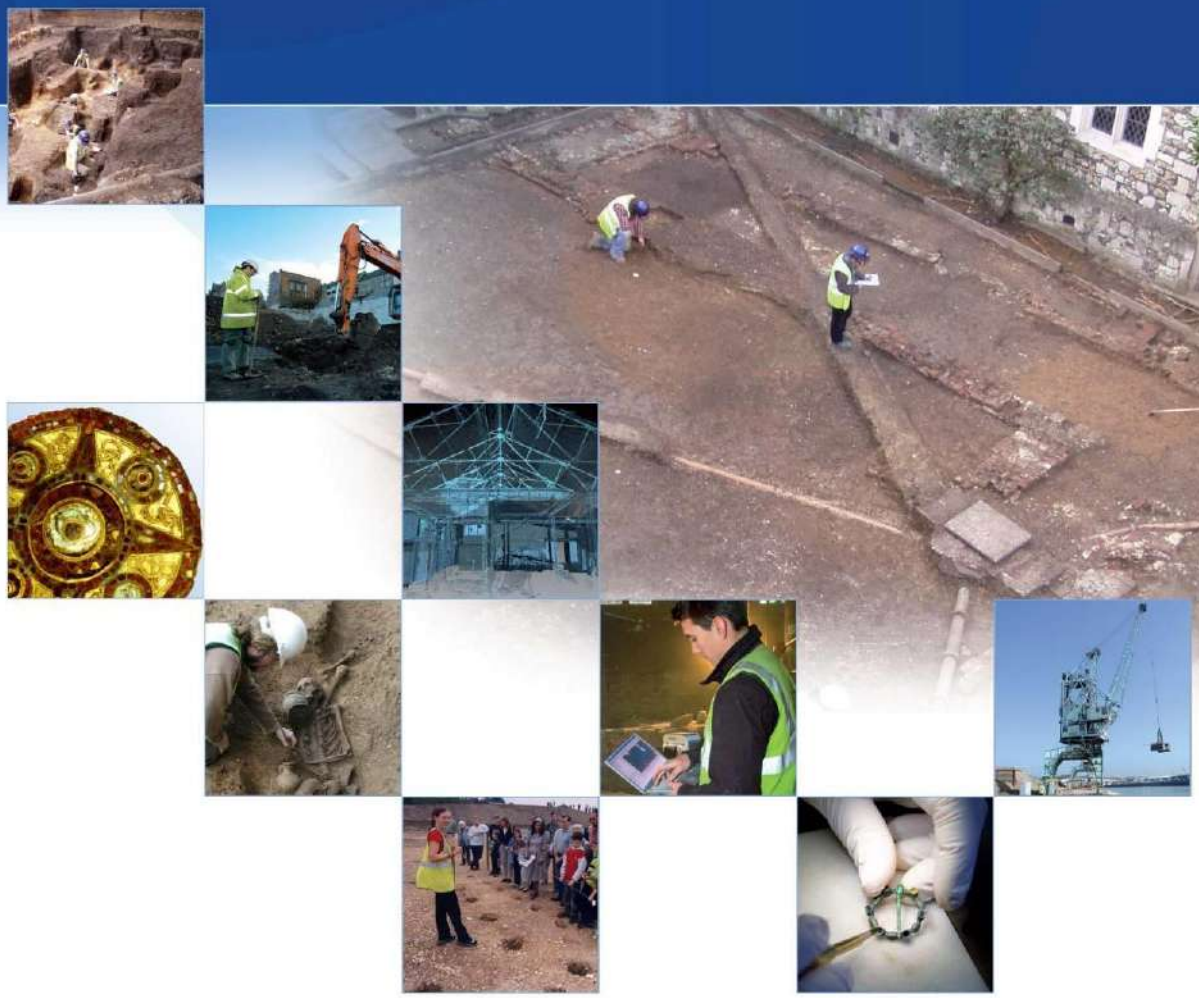
Processing Steps

Bartington Cart survey	
Process	**Extent**
Base Settings	Interval 0.121m, Track Radius 1.06m
Discard Overlap	Threshold Distance 0.4m, Minimum Track 5, Newest
Destripe	Mean Traverse no limit set
Clip	-30/30

Appendix 4: Technical Terminology

Type of Anomaly	Description of Type/Class and rationale for interpretation
Anomaly	Usually linear / curvilinear / rectilinear / discrete anomalies characterised by a sharp-edged increase or decrease in values compared to the magnetic background. Some interpretation classes may have more gradual transitions in magnetic character- this is used as part of the classification process.
Spread	Spreads of enhanced material refer to diffuse areas of altered magnetic character, which suggest a localised spread of material with a magnetic contrast within the topsoil or ploughzone or a generalised enhancement of the magnetic properties over a specific area. These anomalies do not have the high dipolar response characteristic of ferrous material anomaly unless specifically classified as a spread of ferrous debris.
Linear Trend	Linear trends are less distinct and are typically visible as linear patterning in the overall texture of the data. A common example of these is the striping effect caused by recent ploughing.

Class of Anomaly	Description
Probable Archaeology	Interpretation is supported by the presence of known archaeological remains or by other forms of evidence such as HER records, LiDAR data or cropmarks identified through aerial photography. OR the data contains diagnostic anomalies in terms of character or morphology which allow a secure interpretation. Anomalies typically have well defined edges with abrupt transitions indicative of cut features with magnetically enhanced fills, such as ditches. Discrete anomalies will be checked on XY traces for their magnetic character; discrete anomalies in this class likely to be cut features such as pits; anomalies indicating high temperature processes will alternatively classified as 'burned area' - see below. Ferrous material creates distinct 'spikes' and is classified as such.
Possible Archaeology	Anomalies are interpreted as likely to have an archaeological origin, though other explanations are also possible, but less likely. Anomalies typically have well defined edges with abrupt transitions indicative of cut features with magnetically enhanced fills, such as ditches. Discrete anomalies checked on XY traces; discrete anomalies in this class likely to be cut features such as pits; anomalies indicating high temperature processes classified as 'burned area' - see below.
Burned Area	An anomaly with a form on the XY trace plot that is characteristic of high temperature activity such as a kiln or hearth. Should be considered as possible archaeology and should be assigned an anomaly number if a more specific interpretation is possible based on the anomaly characteristics (for example, a clear kiln) so that this can be discussed in text.
Historical Features	Features observed on historical mapping that correspond with anomalies in the data. Linear anomalies caused by removed field boundaries often exhibit distinct characteristics related to the removal process. Areas of enhanced magnetism in this class could relate to former buildings, trackways, quarries or ponds and their nature should be clarified with the use of anomaly numbers and discussion in the results section.
Unclear Origin	These anomalies are (often) magnetically weak and discontinuous or isolated making their context difficult to ascertain. OR they are indistinct for other reasons such as magnetic disturbance in their vicinity. Anomalies in this category have no more likely explanation than another, so whilst an archaeological origin is possible, an agricultural, geological, or modern origin is also equally likely.
Agricultural	Anomalies associated with agricultural activity, either historical (unless shown on a map, then classed as a historical feature) or modern. Usually, this interpretation is arrived at due to on the ground observations of (for example) ploughing, access tracks and the like, or from observation of recent aerial images of the survey area. Recent ploughing is shown as a dashed line and Ridge and Furrow ploughing is shown as a solid line.
Ridge and Furrow / Rig and Furrow	A series of regular linear or slightly curvilinear anomalies which are broad and usually have diffuse edges, either composed of an increased or decreased magnetic response compared to background values. Wide regular spacing between the anomalies is consistent with that of a ridge and furrow / rig and furrow ploughing regime, and the regime may also have a degree of sinuosity characteristic of certain types of ridge and furrow cultivation. Often, multiple directions will be present, with distinct headlands in between. The pattern might follow the general landscape organisation, or it may radically differ from it, depending on the local sequence of inclosure. The anomalies often present as a positive 'ridge' anomaly adjacent to a negative 'furrow' anomaly.
Ploughing Trends	A series of regular linear anomalies or changes in the texture of the survey data, either composed of an increased or decreased magnetic response compared to background values. Anomalies seen parallel to field edges are representative of headlands caused by ploughing.
Drains	A series of magnetic linear anomalies (often with a characteristic alternating positive-negative pattern, which indicates a ceramic drain) of an indeterminate date, usually with a regular dendritic or herringbone patterning which reflects the topography of the survey area.
Geology / Natural	An area of enhanced magnetism that is composed of irregular (usually) weak increases or decreases in magnetic values, frequently with gradual transitions in character, compared with background readings. These are likely to indicate natural variations in soil composition or reflect variations in the bedrock or superficial geology. In areas where former water courses were present, paleochannels may present as distinct curving and banded or braided linear anomalies.
Service	Strong linear anomalies often composed of contrasting high positive and negative dipolar values, with a halo of magnetic disturbance extending from the causative body. Such anomalies are characteristic of below-ground services.
Magnetic Disturbance	A zone of strong magnetic response (usually alternating between positive and negative with abrupt transitions) that has been caused by modern infrastructure or ferrous material within or adjacent to the survey area, such as metallic boundary fencing, gateways. The magnetic haloes around services and changes in the background texture of the data resulting from overhead power lines also fall into this class. These haloes are strong enough to obscure other anomalies (including those of possible archaeological interest) in the area they affect.
Ferrous Anomalies / Ferrous (iron spikes) and ferrous or debris spreads	A response caused by ferrous materials on the ground surface or within the subsoil, which causes a strong but localised dipolar response in the data. These generally represent modern material often re-deposited during manuring, rubbish at field edges and spreads of debris or building material used to surface tracks or left behind following demolition. Distinct from magnetic disturbance, these anomalies relate to material at their spatial location, rather than an effect occurring at a distance from the material responsible.
Free Category for custom use	A category which may be employed to denote specifically identified anomalies related to known past activity within the area, for example those definitely associated with a former airfield, or mapped former mineral extraction.



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