# Green Hill Solar Farm
## EN010170

# Environmental Statement
# Appendix 12.4: Archaeological Geophysical Survey Reports
# Revision A
# (Part 10 of 10)

Prepared by: Lanpro

Date: November 2025

Document Reference: EX1/GH6.3.12.4_A

APFP Regulation 5(2)(a)

## Schedule of Changes

| Revision | Section Reference | Description of Changes | Reason for Revision |
|---|---|---|---|
| A | [cover] | Updated document reference to Revision A | Updated survey results. |
| | pp.2-11 | Changes to overall plans due to insertion of survey area CR1a.12. Updates to figure schedules and numbering of figures from fig. 27-116 | Updated survey results based on survey of CR1a.12 inserted at fig. 24-26. |

Blue highlights show additional text and annotations. Yellow highlights show amendments to text and annotations.

N

CR9a.1

CR9a.2

CR9a.3

CR9a.4

2568 00

2566 00

2564 00

2562 00

489 00

489 200

489 400


Archaeological Services W Y A S,
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Tel: 0113 535 3007 Email: archaeology@wyjs.org.uk www.aswyas.com

Project ID: XK77_EXG23 Cable

Processed greyscale magnetometer data; Sector 33



Fig. 108

Title

SECTOR BOUNDARY

nT -1.0 2.0

0 50m

1:1500 @ A2

N

CR9a.1

CR9a.2

CR9a.3

CR9a.4

2568 00

2566 00

2564 00

2562 00

489 00

489 200

489 400


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XY trace plot of minimally processed magnetometer data; Sector 33



Fig. 109

Title

SECTOR BOUNDARY

15.0 nT/cm

0 50m

1:1500 @ A2

N

CR9a.1

CR9a.2

CR9a.3

CR9a.4

2568 00

2566 00

2564 00

2562 00

489 00

492 00

494 00


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Interpretation of magnetometer data; Sector 33



Fig. 110

Title

Interpretation

- SECTOR BOUNDARY
- FERROUS
- SERVICE PIPE
- MAGNETIC DISTURBANCE
- RIDGE & FURROW
- AGRICULTURAL
- GEOLOGY
- UNCERTAIN

0 50m

1:1500 @ A2

N

CR9a.5

CR9a.6

2562 00

2560 00

2558 00

2556 00

4892 00

4894 00

4896 00


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Project ID: XK77_EXG23 Cable

Processed greyscale magnetometer data; Sector 34



Fig. 111

Title

SECTOR BOUNDARY

nT -1.0 2.0

0 50m

1:1500 @ A2

N

CR9a.5

CR9a.6

2562 00

2560 00

2558 00

2556 00

4892 00

4894 00

4896 00


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XY trace plot of minimally processed magnetometer data; Sector 34



Fig. 112

Title

SECTOR BOUNDARY

15.0 nT/cm

0 50m

1:1500 @ A2

N

CR9a.5

CR9a.6

FB9

P12

FB10

U15

2562 00

2560 00

2558 00

2556 00

4892 00

4894 00

4896 00


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Project ID: XK77_EXG23 Cable

Interpretation of magnetometer data; Sector 34



Fig. 113

Title

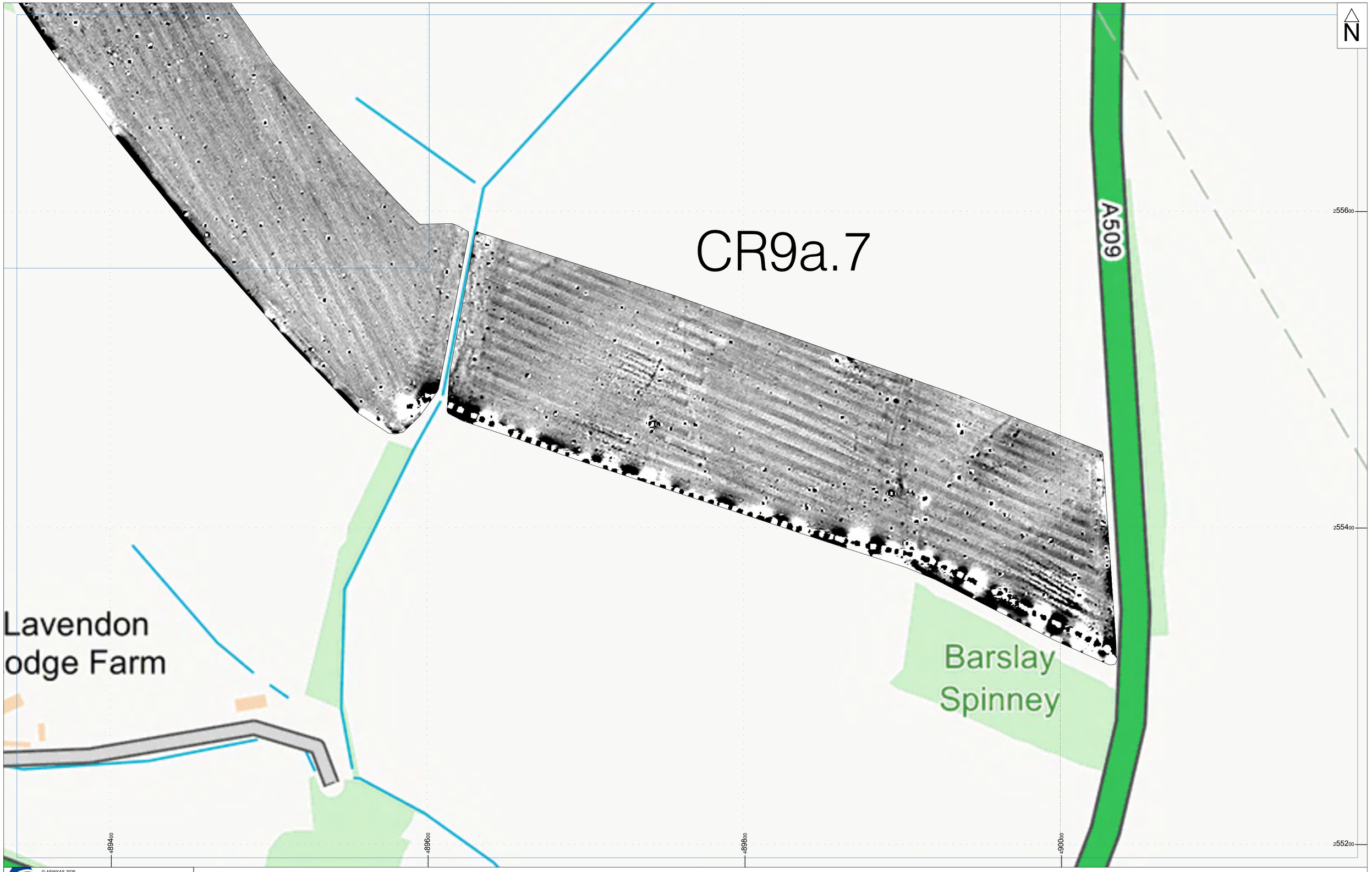
- SECTOR BOUNDARY

Interpretation

- FERROUS
- MAGNETIC DISTURBANCE
- RIDGE & FURROW
- AGRICULTURAL
- FORMER FIELD BOUNDARY
- GEOLOGY
- UNCERTAIN
- ARCHAEOLOGY?

0 50m

1:1500 @ A2





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Processed greyscale magnetometer data; Sector 35



Fig. 114

Title

SECTOR BOUNDARY

nT -1.0 2.0

0 50m

1:1500 @ A2

CR9a.7

A509

Barslay Spinney

Lavendon
odge Farm

N

2556 00

2554 00

2552 00

4894 00

4896 00

4898 00

4900 00


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Project ID: XK77_EXG23 Cable

XY trace plot of minimally processed magnetometer data; Sector 35



Fig. 115

Title

SECTOR BOUNDARY

15.0 nT/cm

0 50m

1:1500 @ A2

# CR9a.7

U15

U16

U17

A509

Barslay Spinney

Lavendon odge Farm

N

2556$_{00}$

2554$_{00}$

2552$_{00}$

894$_{00}$

896$_{00}$

898$_{00}$

900$_{00}$


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Project ID: XK77_EXG23 Cable

Interpretation of magnetometer data; Sector 35



Fig. 116

Title

- SECTOR BOUNDARY

Interpretation

- FERROUS
- SERVICE PIPE
- MAGNETIC DISTURBANCE
- AGRICULTURAL
- GEOLOGY
- UNCERTAIN

0 50m

1:1500 @ A2

# Appendix 1: Magnetic survey - technical information

## Magnetic Susceptibility and Soil Magnetism

Iron makes up about 6% of the Earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haemetite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms. Areas of human occupation or settlement can then be identified by measuring the magnetic susceptibility of the topsoil because of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected. The magnetic susceptibility of a soil can also be enhanced by the application of heat and the fermentation and bacterial effects associated with rubbish decomposition. The area of enhancement is usually quite large, mainly due to the tendency of discard areas to extend beyond the limit of the occupation site itself, and spreading by the plough.

## Types of Magnetic Anomaly

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

*Isolated dipolar anomalies (iron spikes)*

These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

*Areas of magnetic disturbance*

These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

*Linear trend*

This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

*Areas of magnetic enhancement/positive isolated anomalies*

Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

*Linear and curvilinear anomalies*

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

**Methodology: Gradiometer Survey**

The main method of using the fluxgate gradiometer for commercial evaluations is referred to as ***detailed survey*** and requires the surveyor to walk at an even pace carrying the instrument within a grid system. A sample trigger automatically takes readings at predetermined points,

typically at 0.25m intervals, on traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation.

During this survey an eight channel Sensys MX V3 system containing eight FGM650 sensors was also used which was towed across the area using an ATV. Readings were taken every 20MHz (between 0.05 and 0.1m). Data was be recorded onto a device, using a Carlson GNSS Smart antenna, for centimetre accuracy. These readings were stored in the memory of the instrument and downloaded for processing and interpretation.

Fields CR1a.12, CR5a.4 to CR5a.7, CR5a.12 to CR5a.14, CR5a.26 to CR5a.29, and the paddocks of CR7.7 were carried out using hand-held equipment. An initial survey station was established using a Trimble VRS differential Global Positioning System (Trimble R6 model). The data was geo-referenced using the geo-referenced survey station with a Trimble RTK differential Global Positioning System (Trimble R6 model). The accuracy of this equipment is better than 0.01m. The survey grids were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if co-ordinates are measured off hard copies of the mapping rather than using the digital co-ordinates.

## Appendix 2: Survey location information

Data was recorded onto a device, using a Carlson GNSS BRx7 Smart antenna, for centimetre accuracy. These readings were stored in the memory of the instrument and downloaded for processing and interpretation. The accuracy of the BRx7 is between 0.15cm – 0.8cm. The BRx7 has a built-in tilt sensor to correct collected point coordinates to within 2cm.

The survey data were then super-imposed onto a base map provided by the client to produce the displayed locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if co-ordinates are measured off hard copies of the mapping rather than using the digital co-ordinates.

***Archaeological Services WYAS cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.***

## Appendix 3: Geophysical archive

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2003), and graphics files (Adobe Illustrator CS6 and AutoCAD 2017) files; and
- a full copy of the report.

At present the archive is held by Archaeological Services WYAS although it is anticipated that it may eventually be lodged with the Archaeology Data Service (ADS). Brief details may also be forwarded for inclusion on the English Heritage Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the Northamptonshire Historic Environment Record).

# Appendix 4: Oasis form

# OASIS Summary for archaeol11-533893

| | |
|---|---|
| OASIS ID (UID) | archaeol11-533893 |
| Project Name | Geophysical Survey at Green Hill Solar Project - Cable Route |
| Sitename | Green Hill Solar Project - Cable Route |
| Sitecode | EXG23 |
| Project Identifier(s) | |
| Activity type | Geophysical Survey, MAGNETOMETRY SURVEY |
| Planning Id | |
| Reason For Investigation | Planning: Pre application |
| Organisation Responsible for work | Archaeological Services WYAS |
| Project Dates | 02-Sep-2024 - 15-Apr-2025 |
| Location | Green Hill Solar Project - Cable Route<br>NGR : SP 85464 64553<br>LL : 52.272502629546224, -0.748903492753614<br>12 Fig : 485464,264553 |
| Administrative Areas | Country : England<br>County/Local Authority : Milton Keynes<br>County/Local Authority : North Northamptonshire<br>County/Local Authority : Bedford<br>County/Local Authority : West Northamptonshire<br>Area : Maritime |
| Project Methodology | The cart-based survey was undertaken using an eight channel SenSYS MX V3 system containing eight FGM650 sensors. Readings are taken every 20MHz (between 0.05 and 0.1m). Data were recorded onto a device, using a Carlson GNSS Smart antenna, for centimetre accuracy. These readings were stored in the memory of the instrument and downloaded for processing and interpretation. DLMGPS and MAGNETO software, alongside bespoke in-house software was used to process and present the data.<br><br>Fields CR5a.4 - CR5a.7, CR5a.26 - CR5a.29 and the compound area of CR7 was surveyed using a hand-held approach. The Site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble R8 model). The survey was undertaken using Bartington Grad601 magnetic gradiometers. These were employed taking readings at 0.25m intervals on zig-zag traverses 1.0m apart within 30m by 30m grids, so that 3600 readings were recorded in each grid. These readings were stored in the memory of the instrument and later downloaded to computer for processing and interpretation. Bespoke in-house software was used to process and present the data. |

| | |
|---|---|
| Project Results | A geophysical (gradiometer) survey was undertaken on approximately 271.2 hectares of land within the cable route and compound areas of the Green Hill Solar Project, Northamptonshire and the Milton Keynes City unitary authority area in Buckinghamshire. Archaeological and possible archaeological responses have been recorded. These comprise ring ditches, linear ditches, pits and rectilinear enclosures, indicative of settlement activity over a probable prehistoric to medieval timeframe. Uncertain anomalies recorded within the data generally appear to be agricultural or geological in origin. Former field boundaries have been recorded along with medieval/post-medieval ridge and furrow cultivation, modern ploughing and land drains. Magnetic disturbance within the dataset can be attributed to adjacent tracks, metal fencing within field boundaries, electricity pylons, overhead cables, and service pipes. Geological responses seen within the dataset reflect either the topography of the site, discrete pockets of natural variations, possible quarrying, or former watercourses. Based on the geophysical survey, the archaeological potential of this Site is deemed to be high where there are areas of activity and low elsewhere. |
| Keywords | Ring Ditch - LATER PREHISTORIC - FISH Thesaurus of Monument Types<br>Hut Circle Settlement - LATER PREHISTORIC - FISH Thesaurus of Monument Types<br>Rectangular Enclosure - LATER PREHISTORIC - FISH Thesaurus of Monument Types |
| Funder | Private or public corporation Green Hill Solar Project |
| HER | Northamptonshire SMR - unRev - STANDARD |
| Person Responsible for work | Emma Brunning |
| HER Identifiers | |
| Archives | |

**Report generated on: 15 May 2025, 10:23**

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