

# Light Valley Solar

Environmental Statement Volume 3

## Appendix 8.3: Geophysical Survey Results Part Aii

Document Reference: EN0110012/APP/LVS/06.03.08.03ii

March 2026

Planning Inspectorate Reference: EN0110012  
APFP Regulation: 5(2)(a)



Light Valley  
Solar

# Infrastructure Planning

## Planning Act 2008

### The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

## Light Valley Solar

## Development Consent Order 2025

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## Appendix 8.3: Geophysical Survey Results Part Aii

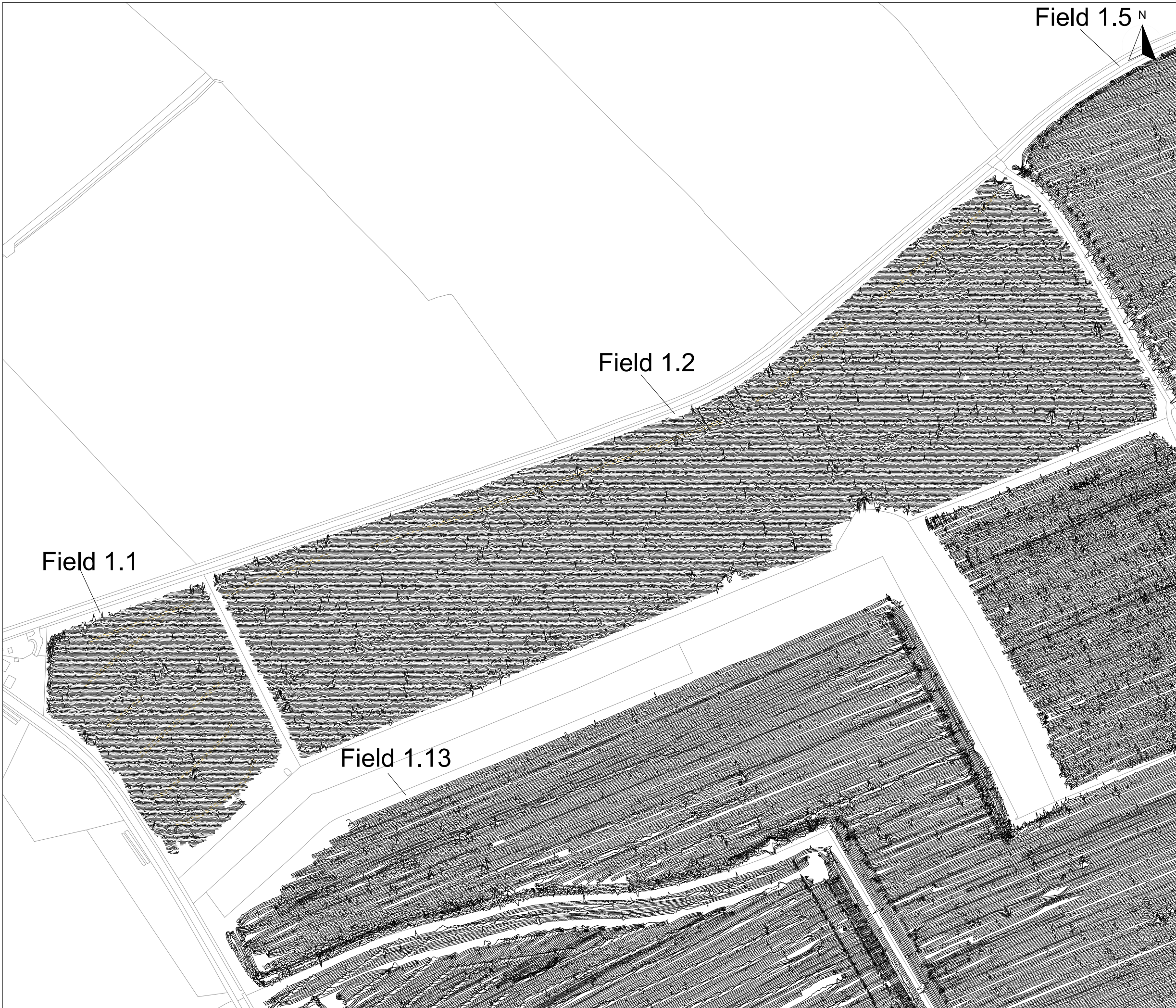
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<b>Regulation Reference</b>	APFP Regulation 5(2)(a)
<b>Planning Inspectorate Case Reference</b>	EN0110012
<b>Application Document Reference</b>	EN0110012/APP/LVS/06.03.08.03ii
<b>Author</b>	Light Valley Solar Limited

Version	Date	Status of Version
1.0	March 2026	DCO Submission

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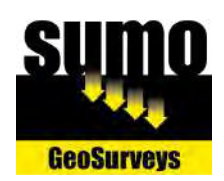


Field 1.1

Field 1.2

Field 1.13

Field 1.5 N



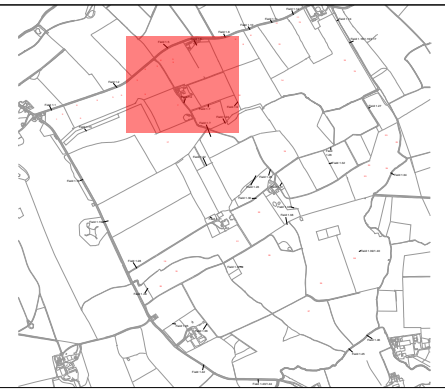
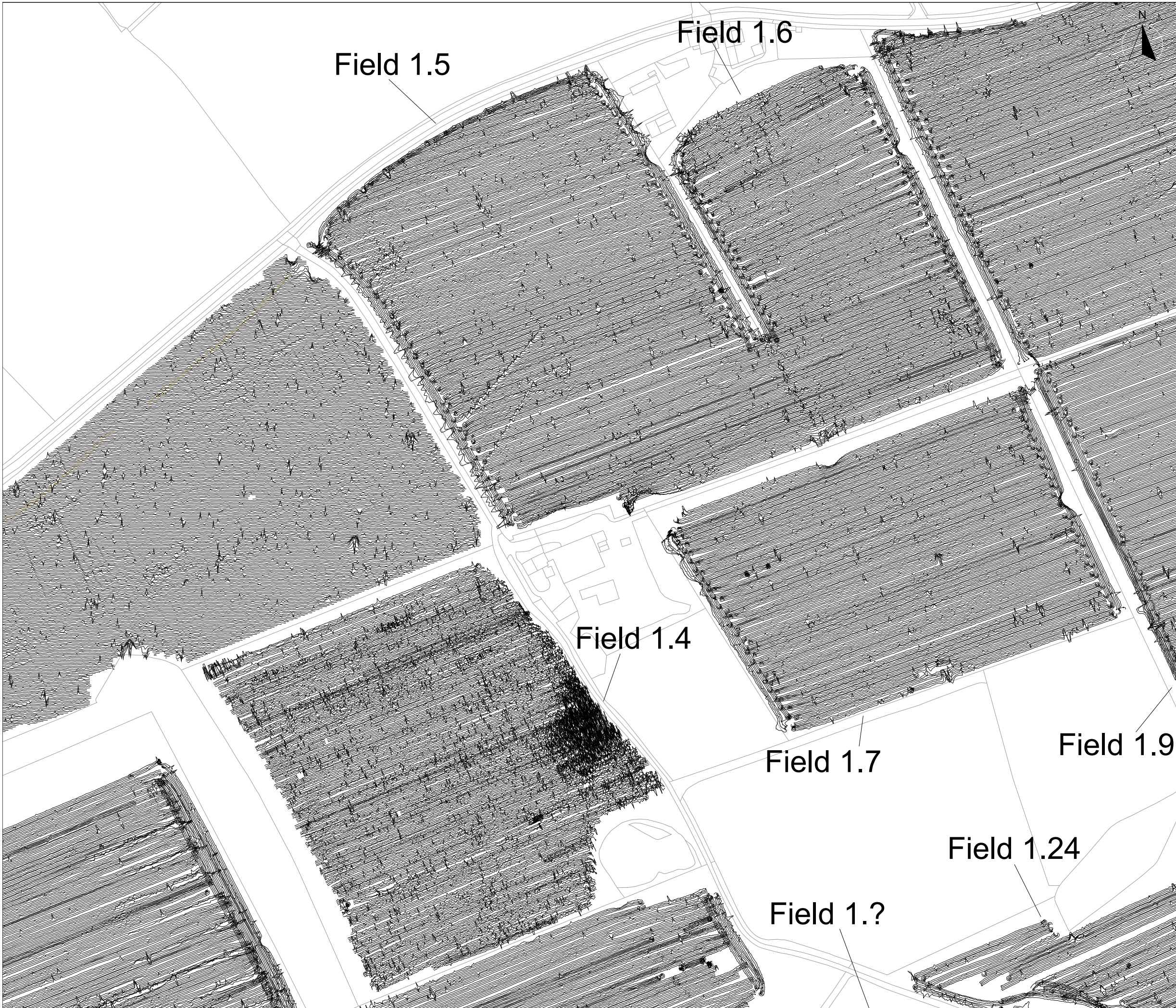
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Client: Island Green Power UK Limited

Project: 16614-1 - Light Valley Solar Project: Site 1

Scale: 0 metres 150  
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Fig No: 69



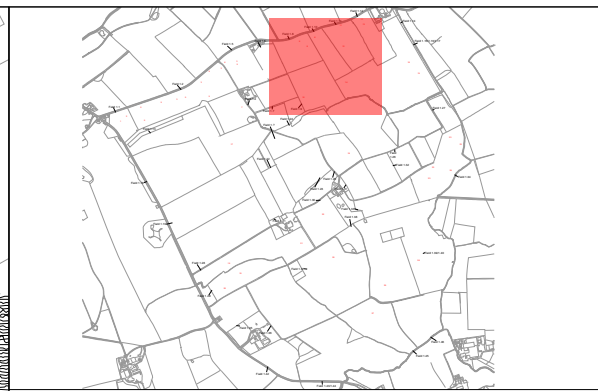
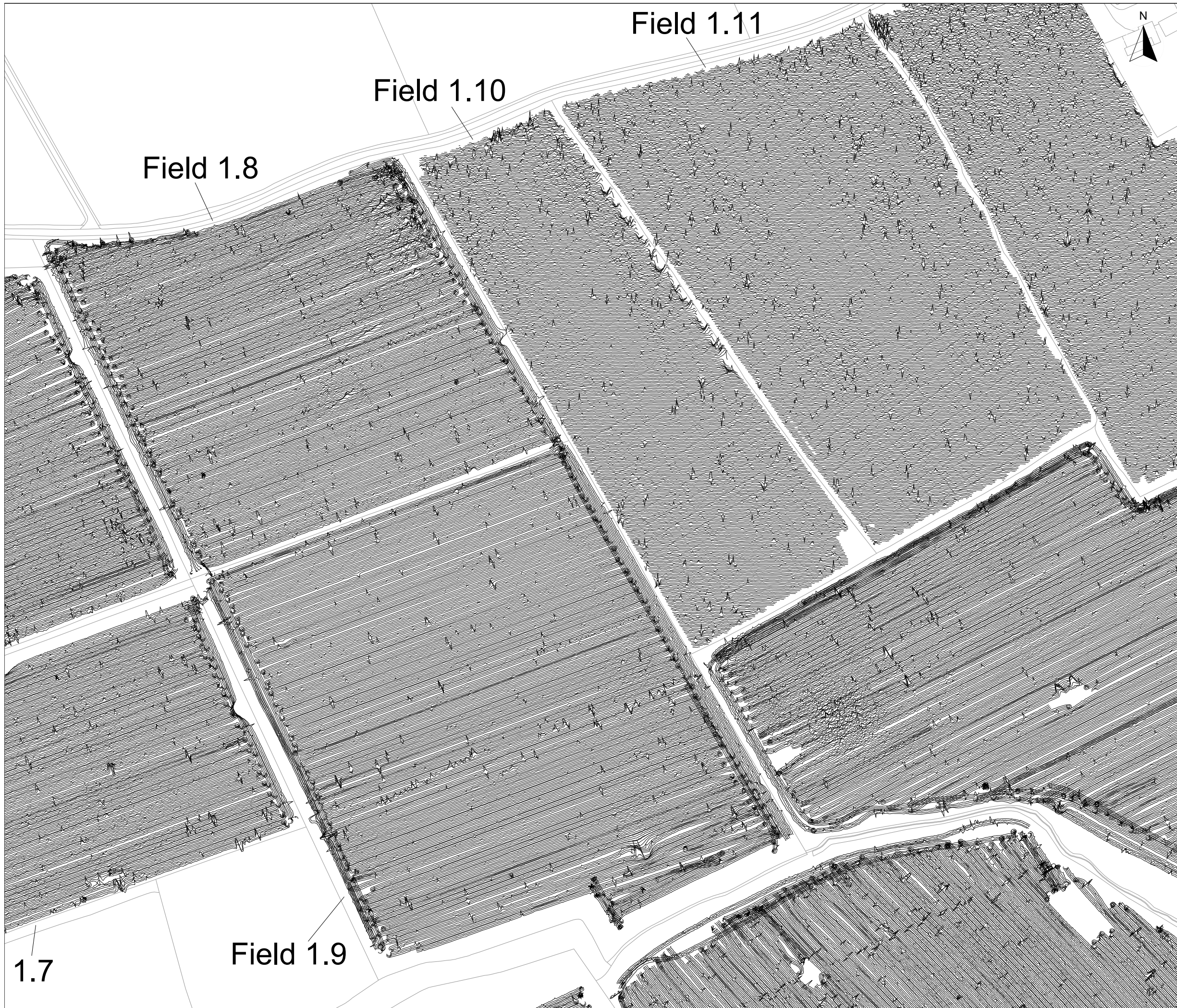
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Client: Island Green Power UK Limited

Project: 16614-1 - Light Valley Solar Project: Site 1

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Fig No: 70



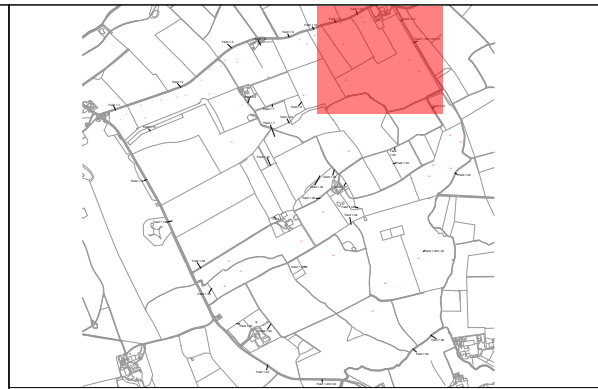
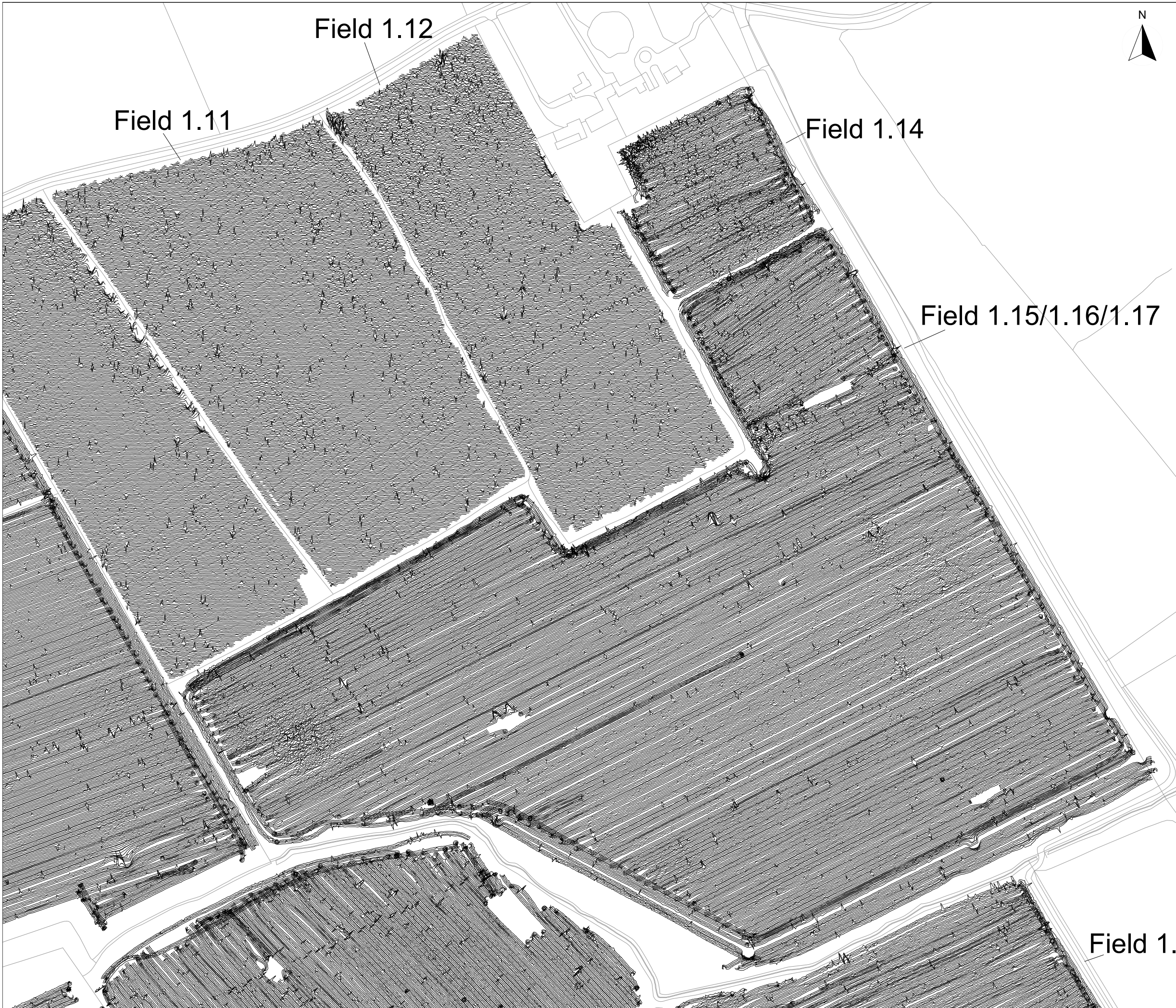
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Client: Island Green Power UK Limited

Project: 16614-1 - Light Valley Solar Project: Site 1

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Fig No: 71



**sumo**  
GeoSurveys

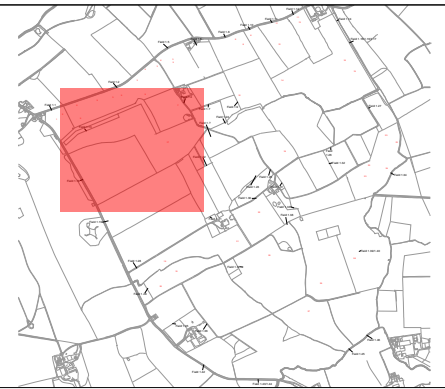
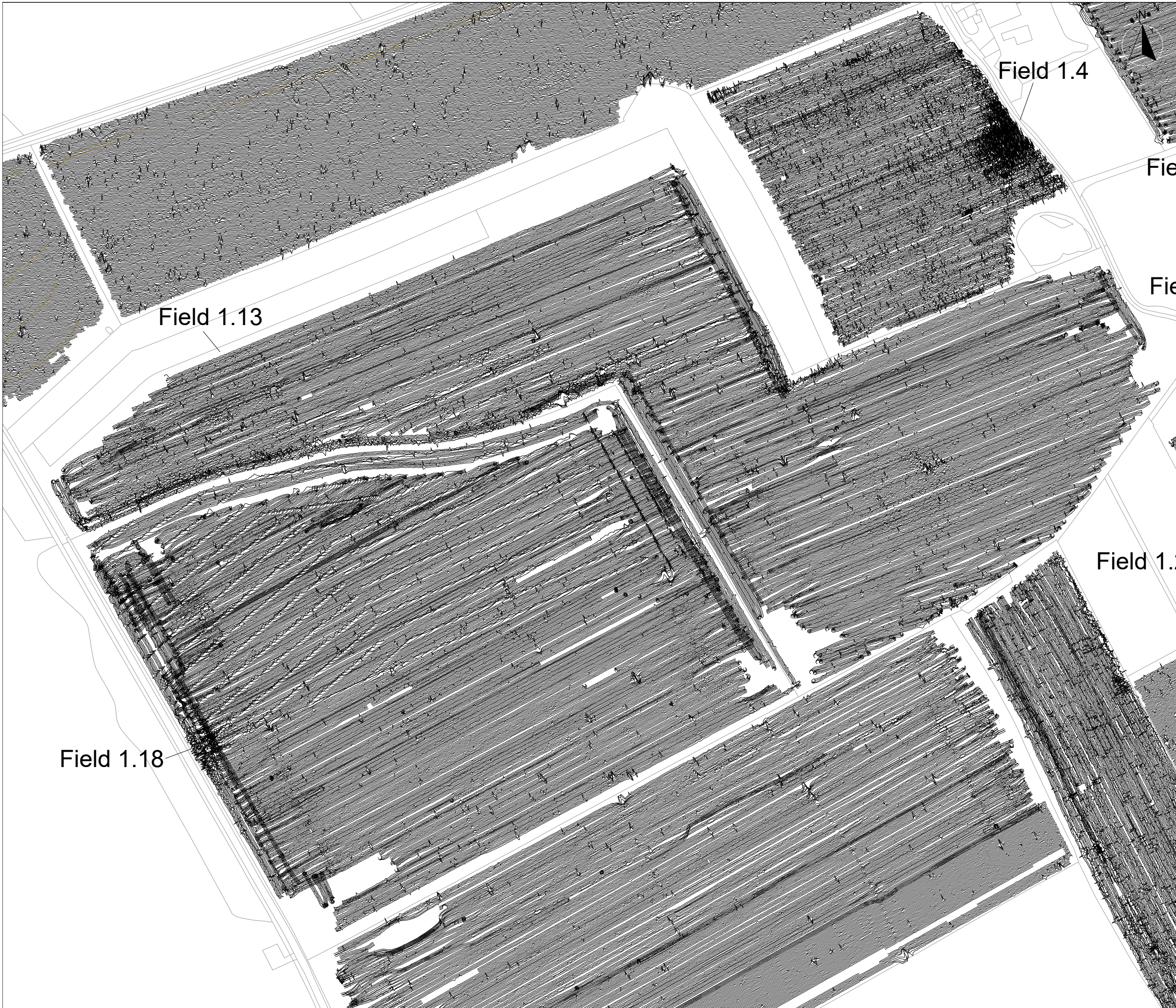
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Client:  
Island Green Power UK Limited

Project:  
16614-1 - Light Valley Solar Project: Site 1

Scale:  
0 metres 140  
1:2800 @ A3

Fig No:  
72



Field 1.4  
Field 1.2

Field 1.13

Field 1.18

Field 1.2



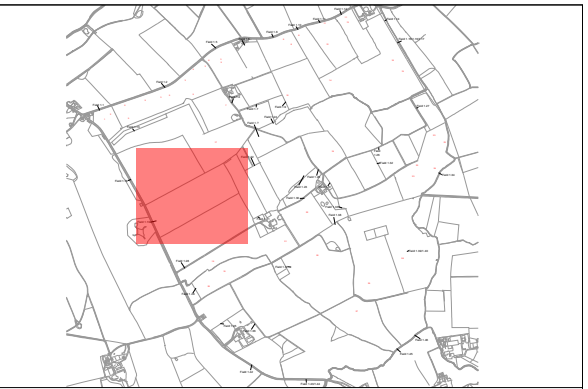
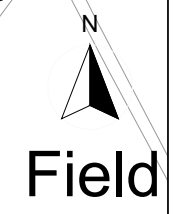
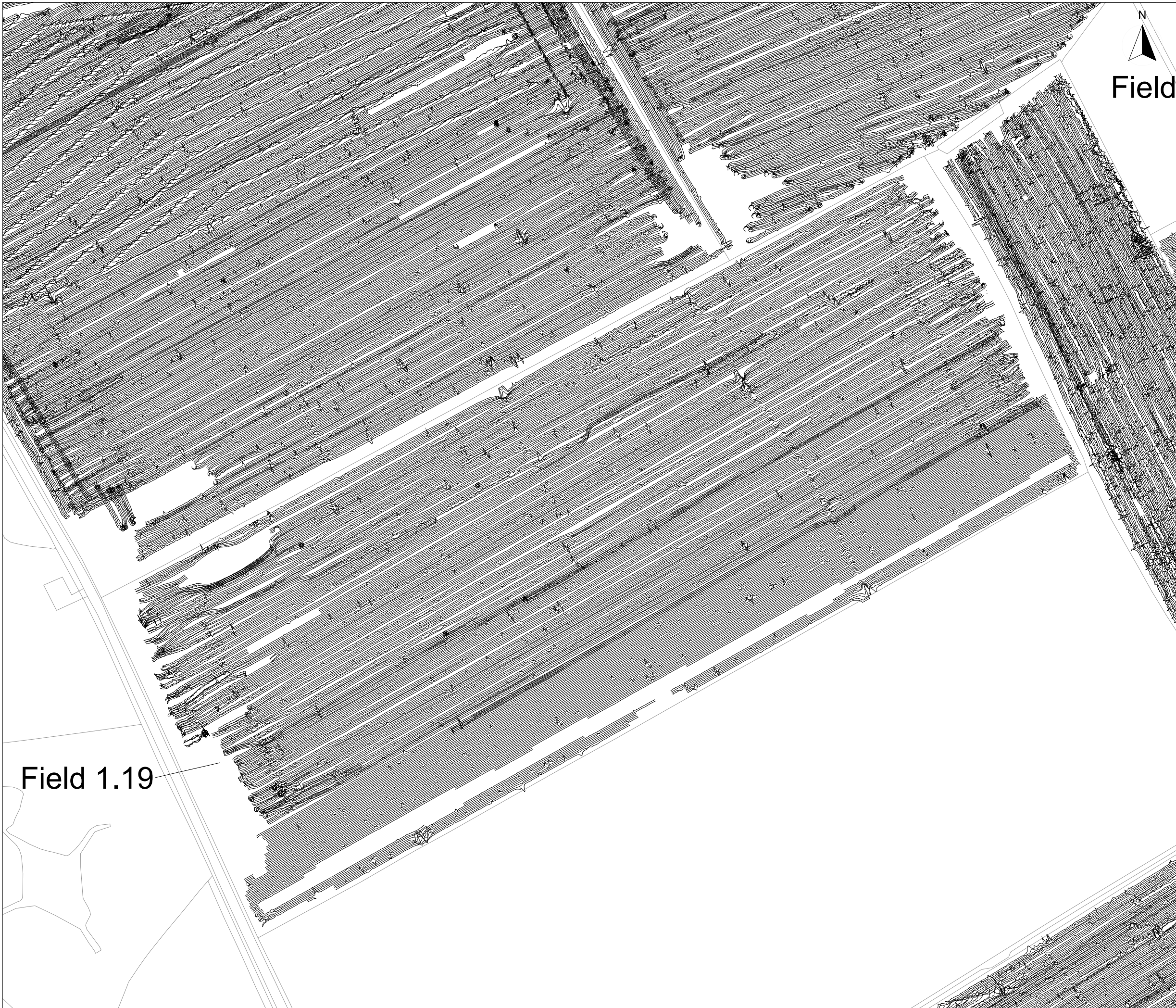
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Client: Island Green Power UK Limited

Project: 16614-1 - Light Valley Solar Project: Site 1

Scale: 0 metres 160  
1:3200 @ A3

Fig No: 73



Title:  
XY Trace Plots (Field 1.19 clipped at +/-15nT)

Client:  
Island Green Power UK Limited

Project:  
16614-1 - Light Valley Solar Project: Site 1

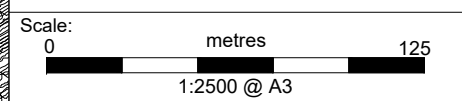
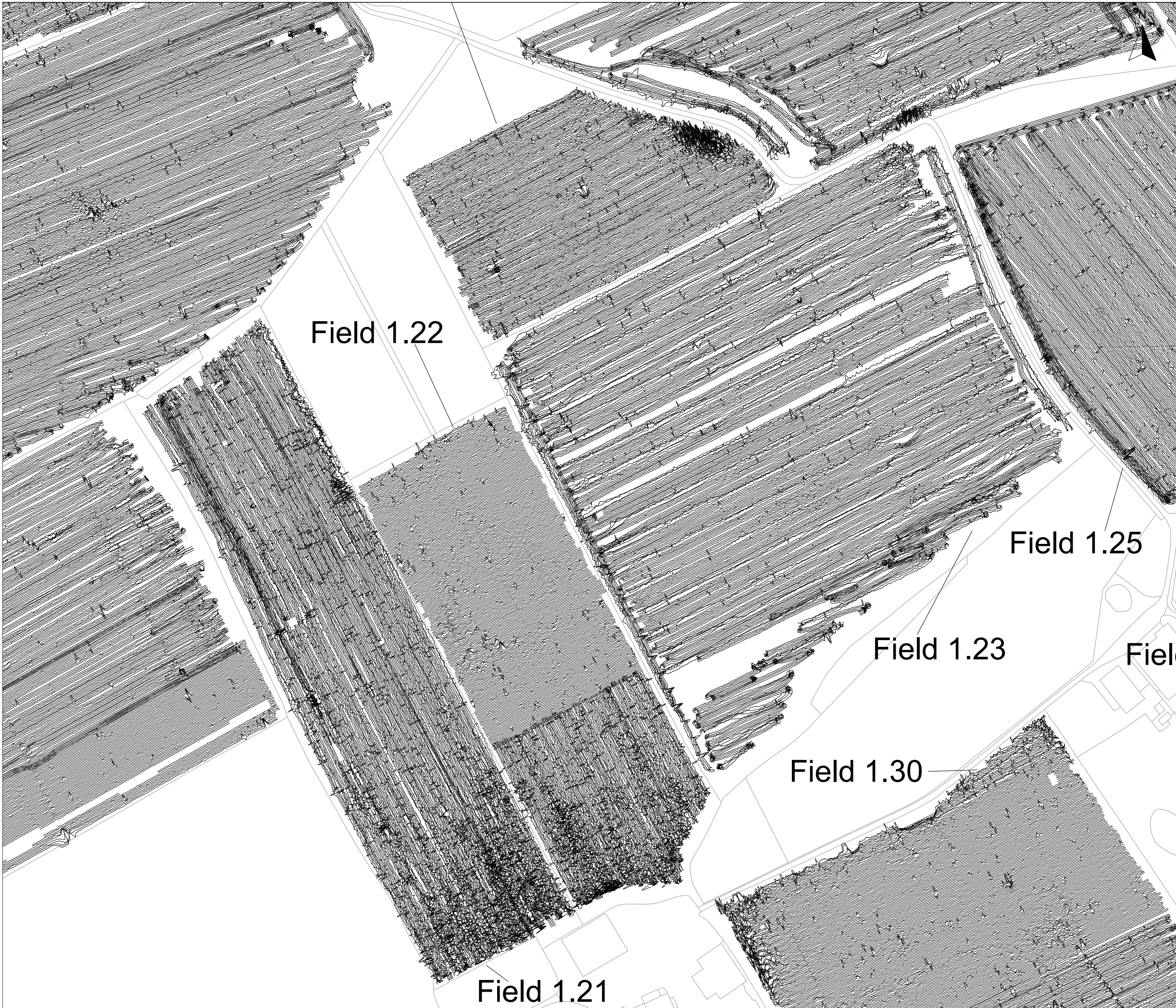


Fig No:  
74



Field 1.22

Field 1.25

Field 1.23

Field

Field 1.30

Field 1.21



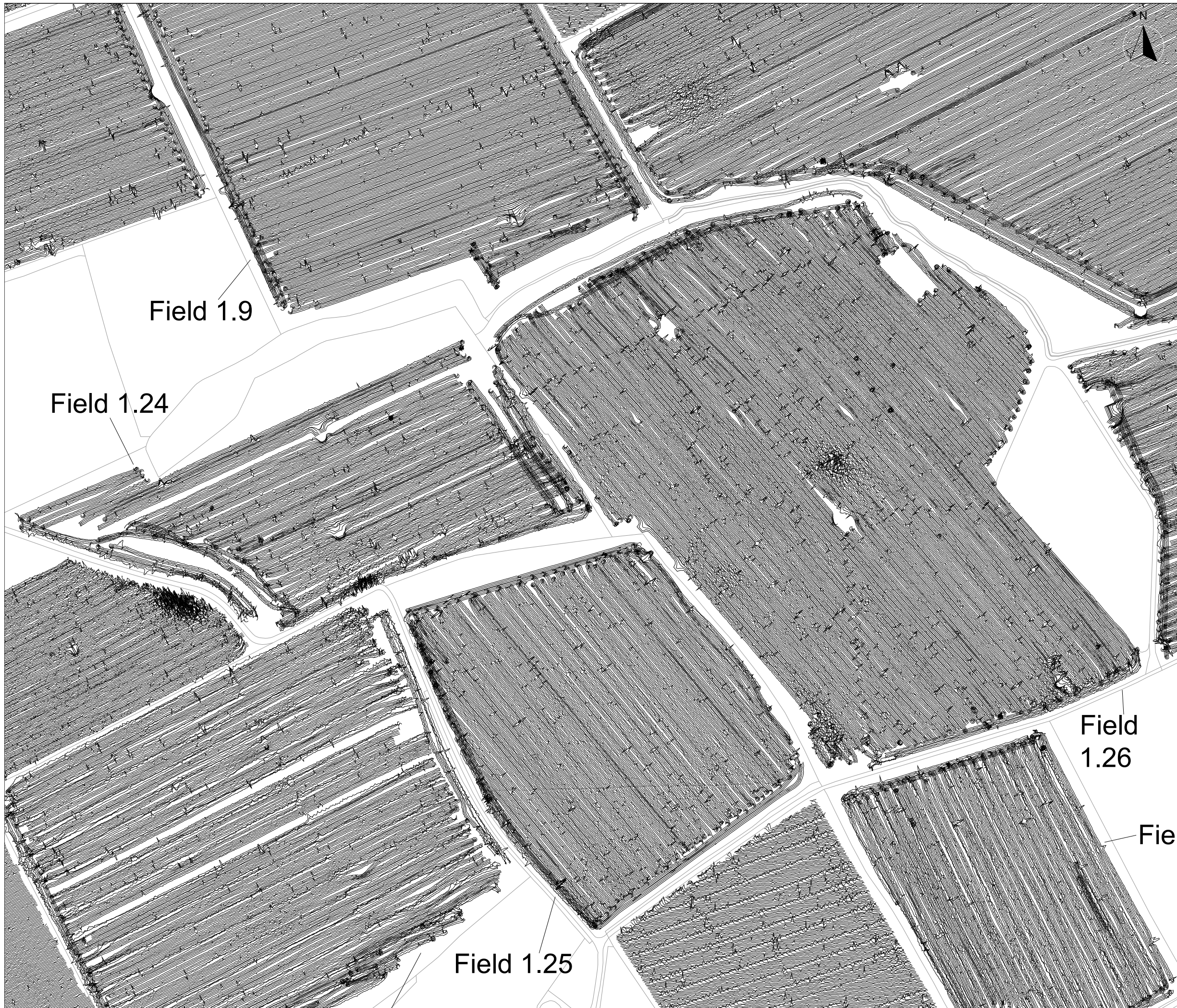
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Scale: 0 metres 125  
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Fig No: 75



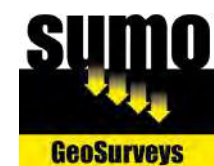
Field 1.9

Field 1.24

Field 1.26

Field 1.25

Field 1.27



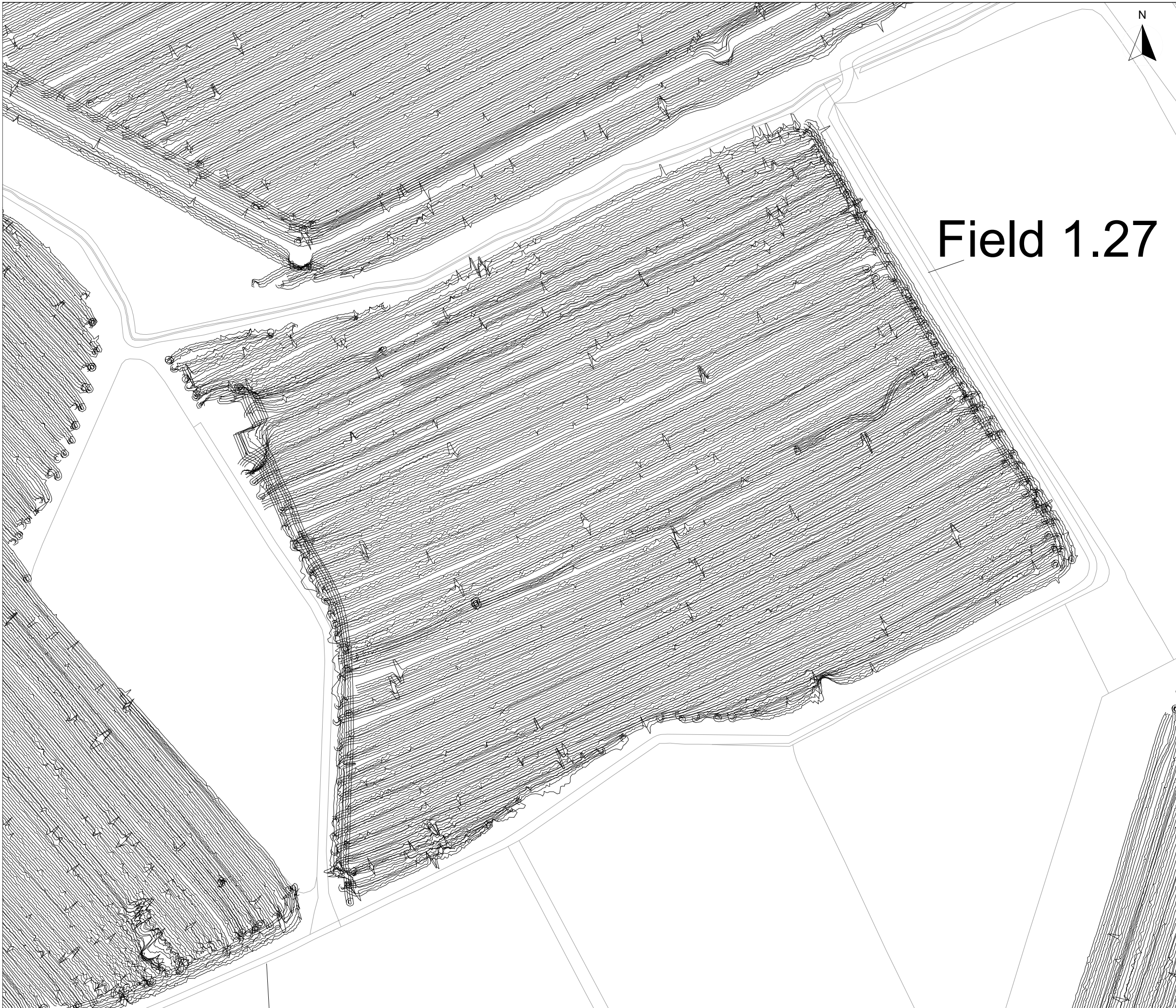
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Client: Island Green Power UK Limited

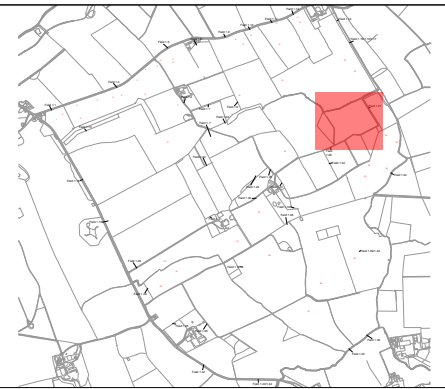
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Scale: 0 metres 140  
1:2800 @ A3

Fig No: 76



Field 1.27



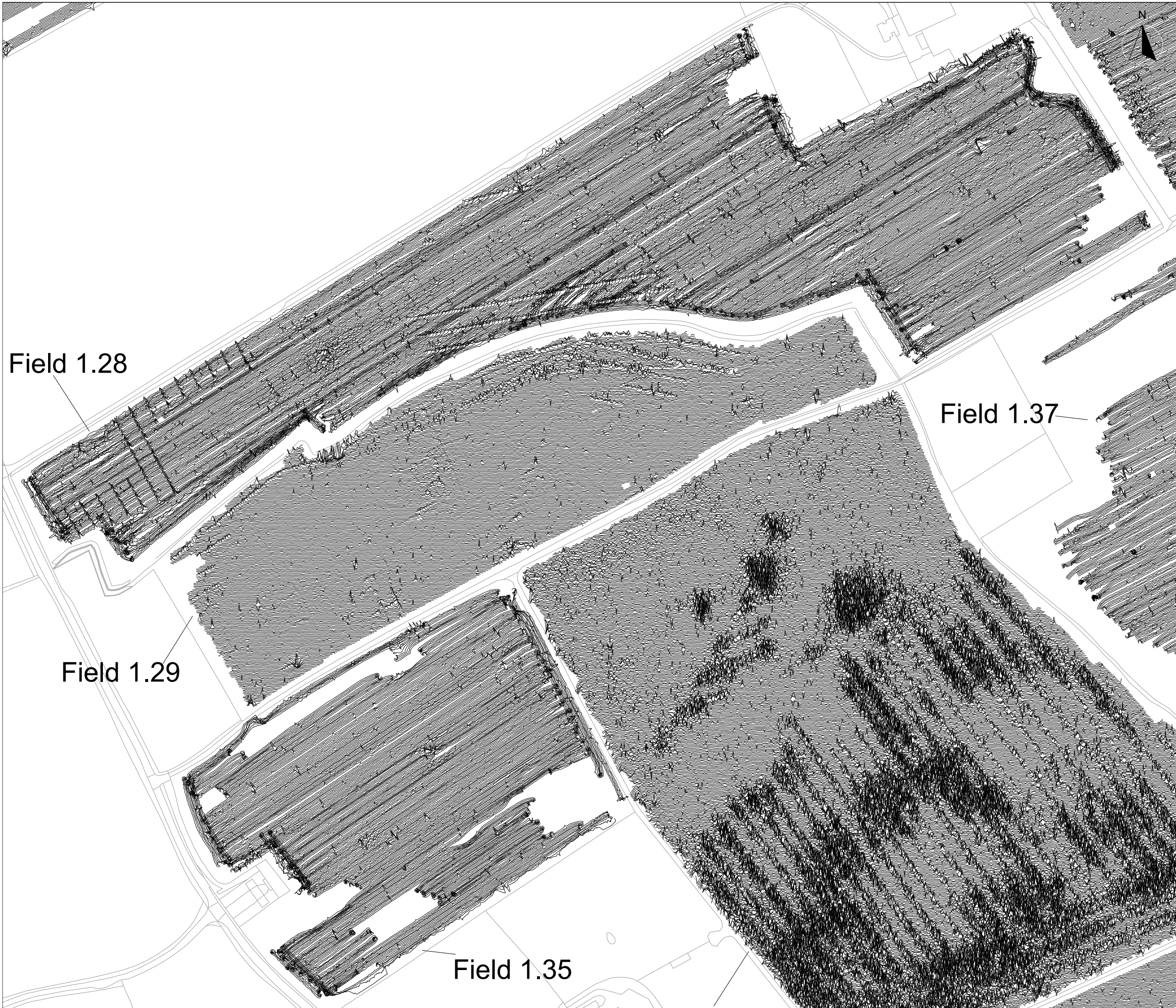
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XY Trace Plots (Field 1.27 clipped at +/-15nT)

Client:  
Island Green Power UK Limited

Project:  
16614-1 - Light Valley Solar Project: Site 1

Scale:  
0 metres 75  
1:1500 @ A3

Fig No:  
77

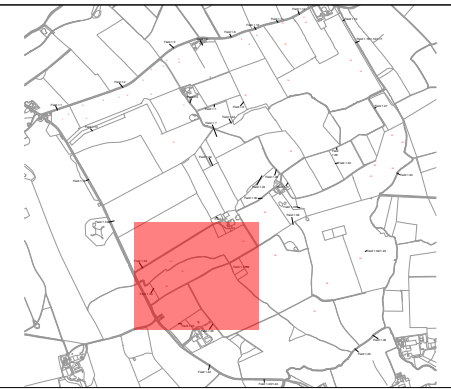


Field 1.28

Field 1.29

Field 1.35

Field 1.37



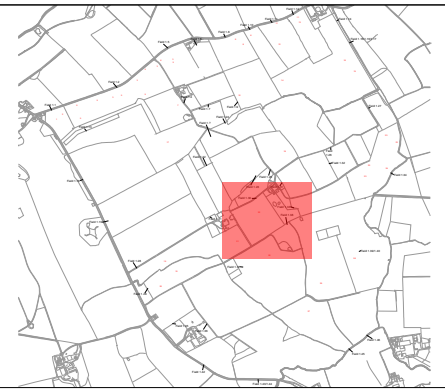
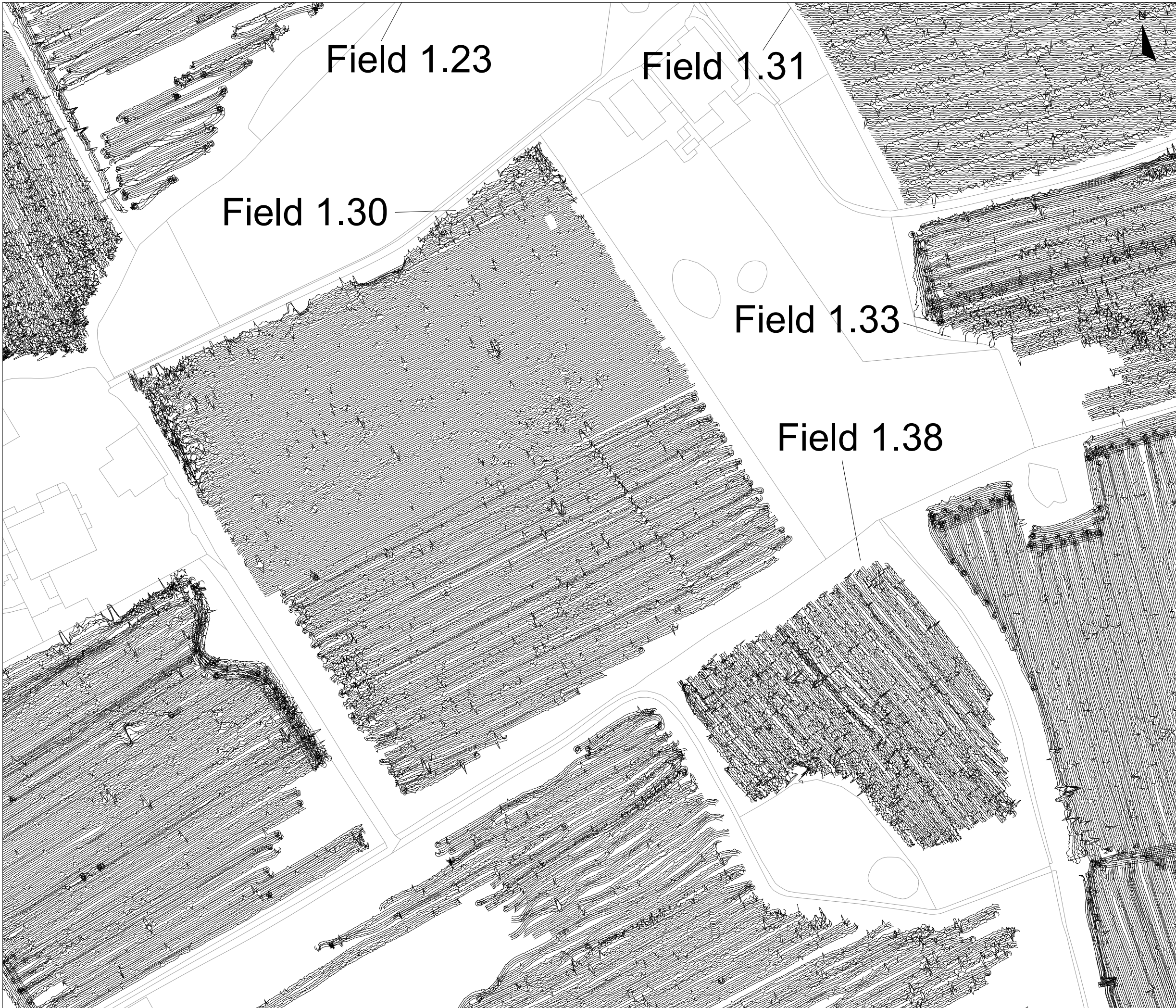
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Client: Island Green Power UK Limited

Project: 16614-1 - Light Valley Solar Project: Site 1

Scale: 0 metres 140  
1:2800 @ A3

Fig No: 78



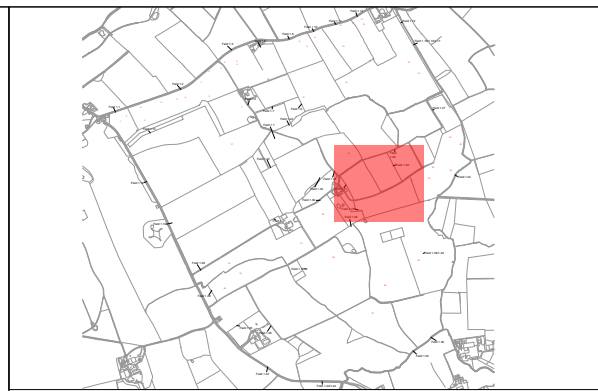
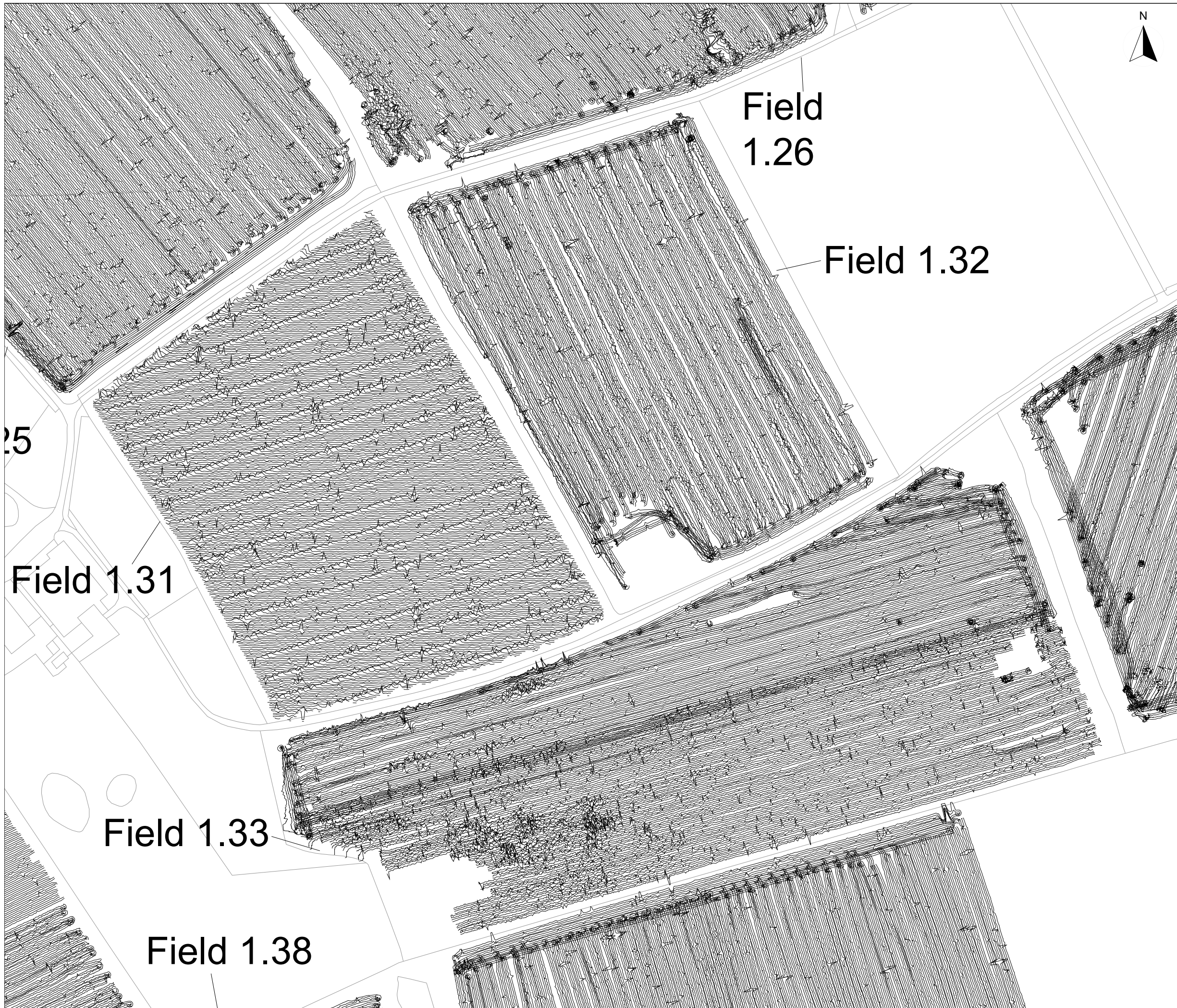
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Client: Island Green Power UK Limited

Project: 16614-1 - Light Valley Solar Project: Site 1

Scale: 0 metres 100  
1:2000 @ A3

Fig No: 79



25

Field 1.26

Field 1.32

Field 1.31

Field 1.33

Field 1.38



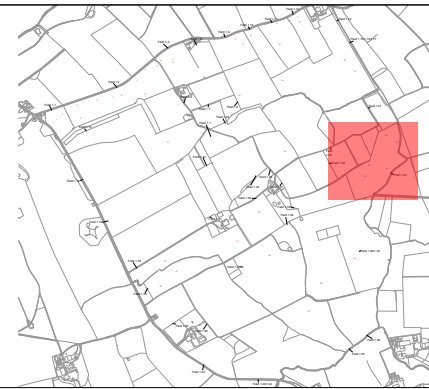
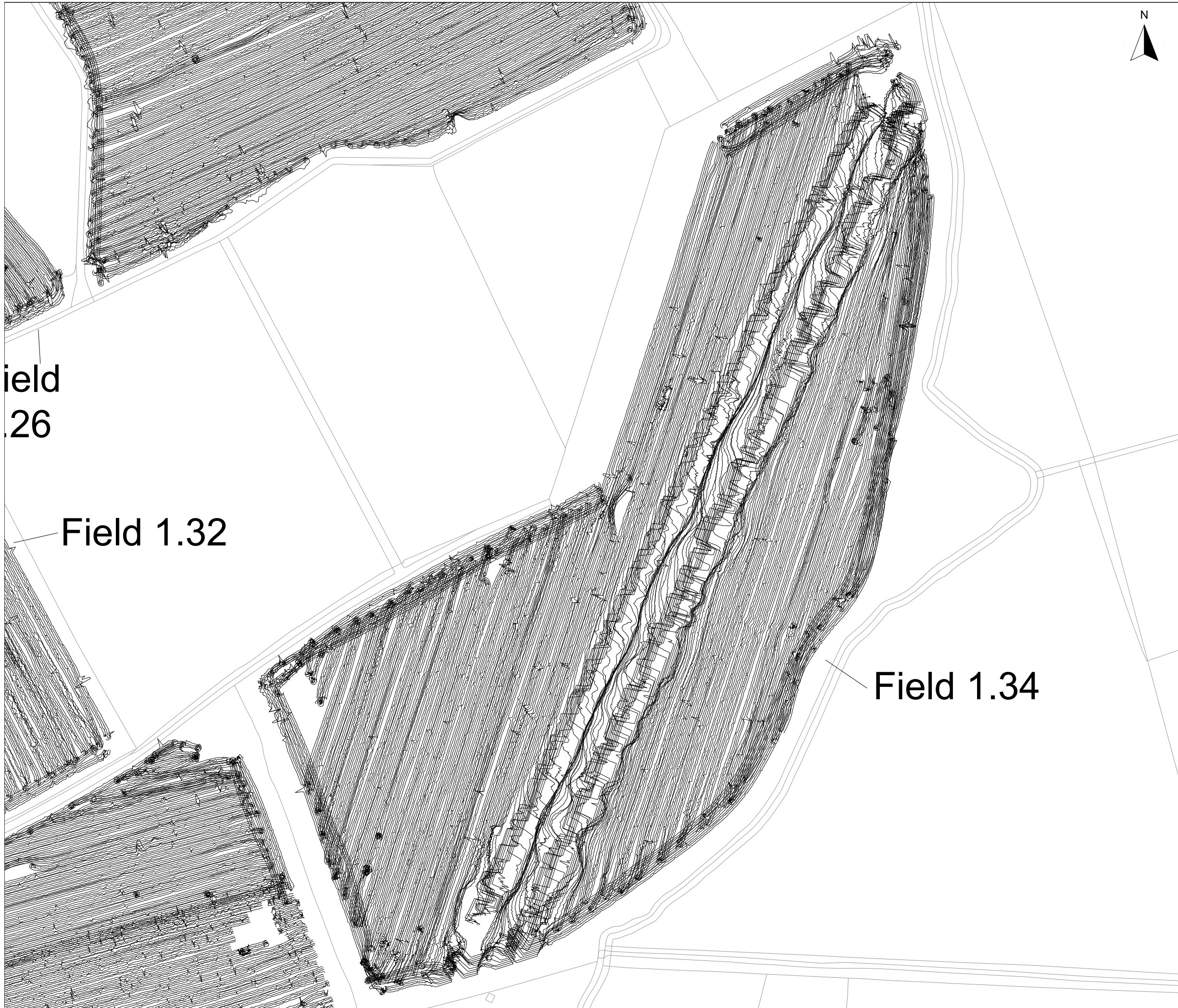
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Project: 16614-1 - Light Valley Solar Project: Site 1

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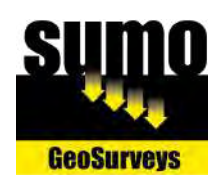
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Field  
26

Field 1.32

Field 1.34



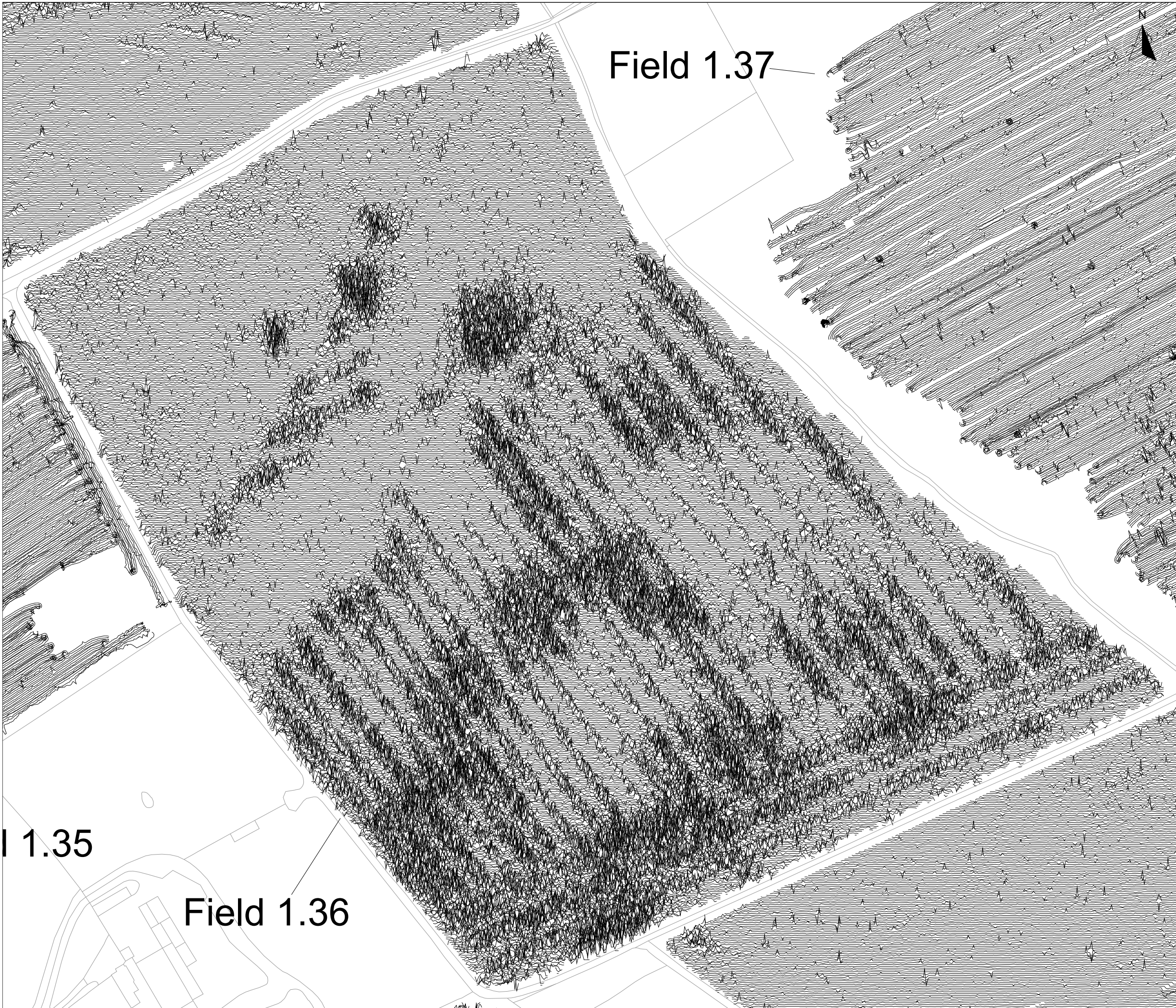
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Client:  
Island Green Power UK Limited

Project:  
16614-1 - Light Valley Solar Project: Site 1

Scale:  
0 metres 100  
1:2000 @ A3

Fig No:  
81



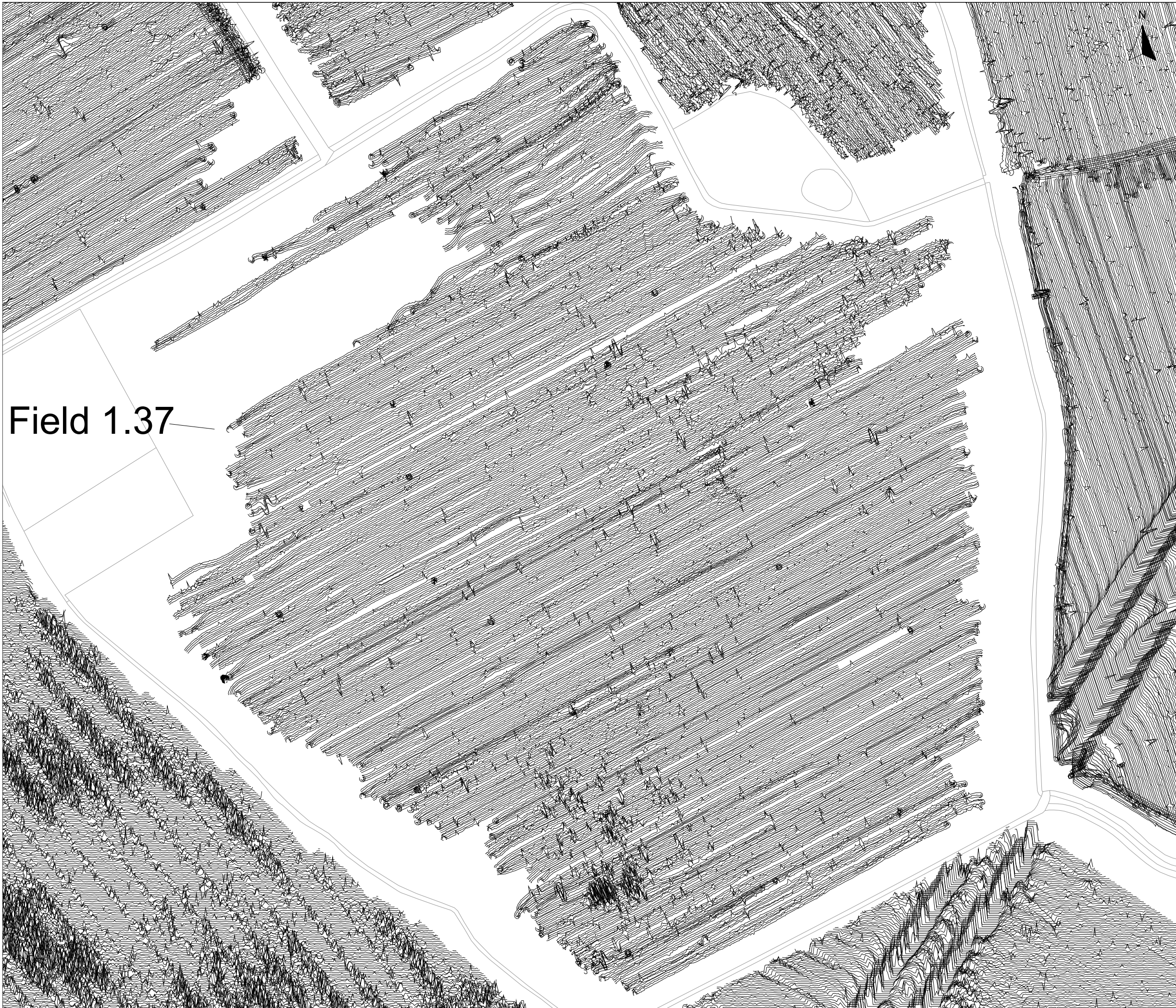
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Client:  
Island Green Power UK Limited

Project:  
16614-1 - Light Valley Solar Project: Site 1

Scale:  
0 metres 100  
1:2000 @ A3

Fig No:  
82



Field 1.37

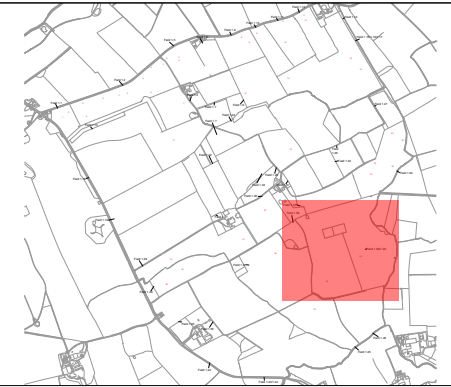


Title:	XY Trace Plots (Field 1.37 clipped at +/-15nT)	
Client:	Island Green Power UK Limited	
Project:	16614-1 - Light Valley Solar Project: Site 1	
Scale:	0 metres 100	Fig No: 83
	1:2000 @ A3	

Field 1.33

Field 1.38

Field 1.39/1.40



Title: XY Trace Plots  
(Field 1.39/1.40 clipped at +/-15nT)

Client: Island Green Power UK Limited

Project: 16614-1 - Light Valley Solar Project: Site 1

Scale: 0 metres 130  
1:2600 @ A3

Fig No: 84

Field 1.36

Field 1.42



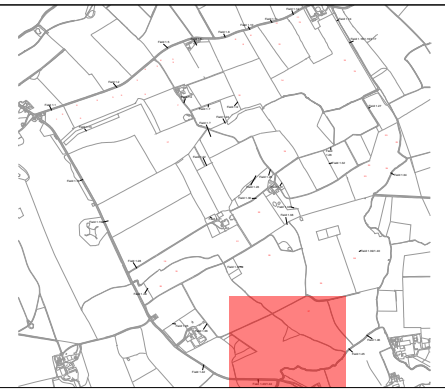
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Client:  
Island Green Power UK Limited

Project:  
16614-1 - Light Valley Solar Project: Site 1

Scale:  
0 metres 75  
1:1500 @ A3

Fig No:  
85



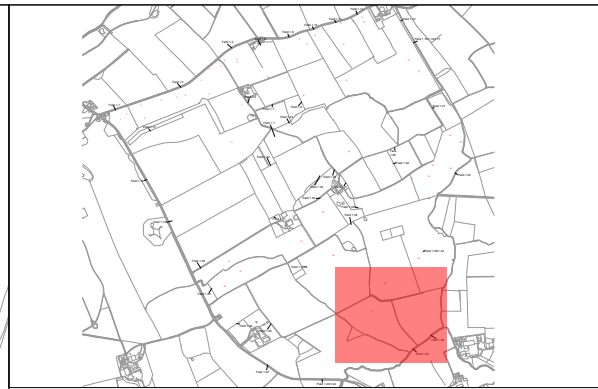
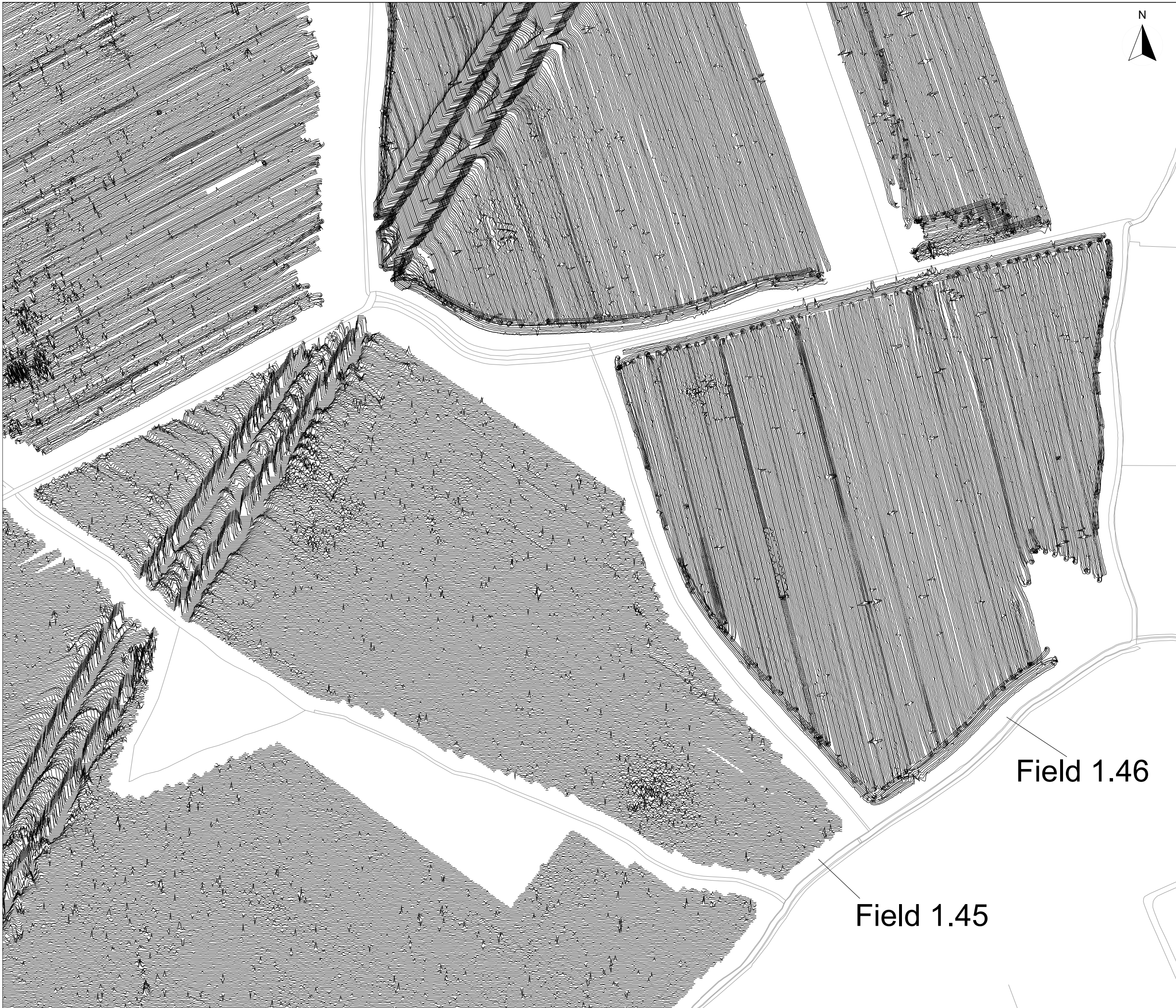
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(Field 1.43/144 clipped at +/-15nT)

Client: Island Green Power UK Limited

Project: 16614-1 - Light Valley Solar Project: Site 1

Scale: 0 metres 130  
1:2600 @ A3

Fig No: 86



Field 1.46

Field 1.45



Title: XY Trace Plots  
(Field 1.43/144 clipped at +/-15nT)

Client: Island Green Power UK Limited

Project: 16614-1 - Light Valley Solar Project: Site 1

Scale: 0 metres 125  
1:2500 @ A3

Fig No: 87

## Appendix A - Technical Information: Magnetometer Survey Method

### Grid Positioning

For hand held gradiometers the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS GPS system.

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. This results in an accuracy of around 0.01m.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1.0m	0.25m
Magnetometer	Bartington Cart System	1.0m	0.125m
Magnetometer	MACS Cart System (Foerster)	1.0m	0.125m

### Instrumentation:

Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted horizontally, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method, though strongly magnetic objects may be visible at greater depths.

### Bartington Grad 601-2

Hand-Held: Data will be collected using a Bartington Grad 601-2. The instrument consists of two paired sensors and readings are logged at 0.25m centres along traverses 1.0m apart across 30m grids. The collection of data at 0.25m centres provides an appropriate methodology balancing cost and time with resolution as per Historic England guidelines

### Bartington Cart System

Data will be collected using a cart carrying four paired Bartington magnetic sensors. Each data point is geographically referenced using an on-board Trimble RTK survey grade GPS system. Readings will be taken at 0.125m centres along traverses 1.0m apart.

### MACS Cart System (Foerster)

A multi-sensor array cart system (MACS) utilising 4 Foerster 4.032 Ferex CON 650 gradiometers, spaced at 1m intervals, with a control unit and data logger was used for the magnetic survey. Each data point is geographically referenced using an on-board RTK GNSS system. Readings will be taken at 0.125m centres along traverses 1.0m apart.

### Data Processing

Zero Mean	This process sets the background mean of each traverse within each grid to zero.
Traverse	The operation removes striping effects and edge discontinuities over the whole of the data set.
Step Correction (De-stagger)	When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.

## Display

Greyscale/  
Colourscale Plot

This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly, all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.

## Interpretation Categories

In certain circumstances (usually when there is corroborative evidence from desk-based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, *Roman Road, Wall, etc.*) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the results.

<i>Archaeology / Probable Archaeology</i>	This term is used when the form, nature and pattern of the responses are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.
<i>Possible Archaeology</i>	These anomalies exhibit either weak signal strength and / or poor definition, or form incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.
<i>Industrial / Burnt-Fired</i>	Strong magnetic anomalies that, due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metal-working areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.
<i>Former Field Boundary (probable &amp; possible)</i>	Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions. Possible denotes less confidence where the anomaly may not be shown on historic mapping but nevertheless the anomaly displays all the characteristics of a field boundary.
<i>Ridge &amp; Furrow</i>	Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases, the response may be the result of more recent agricultural activity.
<i>Agriculture (ploughing)</i>	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
<i>Land Drain</i>	Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains may lead and empty into larger diameter pipes, which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.
<i>Natural</i>	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.
<i>Magnetic Disturbance</i>	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present.
<i>Service</i>	Magnetically strong anomalies, usually forming linear features are indicative of ferrous pipes/cables. Sometimes other materials (e.g. pvc) or the fill of the trench can cause weaker magnetic responses which can be identified from their uniform linearity.
<i>Ferrous</i>	This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern.

Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.

*Uncertain Origin*

Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of *Possible Archaeology / Natural* or (in the case of linear responses) *Possible Archaeology / Agriculture*; occasionally they are simply of an unusual form.

Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

## Appendix B - Technical Information: Magnetic Theory

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.1 nanoTeslas (nT) in an overall field strength of 48,000 (nT), can be accurately detected.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns; material such as brick and tile may be magnetised through the same process.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried feature. The difference between the two sensors will relate to the strength of a magnetic field created by this feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity and disturbance from modern services.

## Appendix C - OASIS Summary

<b>OASIS ID (UID)</b>	sumogeop1-523845
<b>Project Name</b>	Magnetometry Survey, Geophysical Survey at Light Valley Solar Project: Site 1
<b>Sitename</b>	Light Valley Solar Project: Site 1
<b>Sitecode</b>	16614-1
<b>Project Identifier(s)</b>	SUMO-16614 Monk Fryston
<b>Activity type</b>	Magnetometry Survey, Geophysical Survey, MAGNETOMETRY SURVEY
<b>Planning Id</b>	
<b>Reason For Investigation</b>	Planning requirement
<b>Organisation Responsible for work</b>	SUMO Geophysics Ltd.
<b>Project Dates</b>	08-Apr-2024 - 27-Sep-2024
<b>Location</b>	<p><b>Light Valley Solar Project: Site 1</b></p> <p>NGR: SE 65133 41963  LL: 53.869798509912926, -1.010934662777584  12 Fig: 465133,441963  NGR: SE 65817 41759  LL: 53.867882170289924, -1.000584213074114  12 Fig: 465817,441759  NGR: SE 64887 42314  LL: 53.872979391582106, -1.014611335328968  12 Fig: 464887,442314  NGR: SE 65011 42670  LL: 53.87616977549879, -1.012653728266969  12 Fig: 465011,442670  NGR: SE 65395 41049  LL: 53.86155193506129, -1.00715371585938  12 Fig: 465395,441049  NGR: SE 64790 42657  LL: 53.87607901976973, -1.016007828011558  12 Fig: 464790,442657  NGR: SE 65545 41025  LL: 53.86131283660176, -1.00487040539967  12 Fig: 465545,441025  NGR: SE 65419 41966  LL: 53.869785276272914, -1.006595586295792  12 Fig: 465419,441966  NGR: SE 66149 42294  LL: 53.872639842523455, -0.995429268337722  12 Fig: 466149,442294  NGR: SE 65122 41500  LL: 53.86563794703103, -1.011208131706272</p>

	<p>12 Fig: 465122,441500  NGR: SE 65137 41870  LL: 53.86895875415546, -1.010896244879487  12 Fig: 465137,441870</p>
<b>Administrative Areas</b>	<p>Country: England  County/Local Authority: North Yorkshire  Local Authority District: North Yorkshire  Parish: Escrick  Parish: Thorganby  Parish: Skipwith</p>
<b>Project Methodology</b>	<p>A temporary grid system was established over the site and marked out using canes. The location of the grid will was set out using an RTK GPS system theoretically accurate to some 0.01m and referenced to OS co-ordinates. Hand Held: Data was collected using a Bartington Grad 601-2. The instrument consists of two paired sensors (see below) and readings are logged at 0.25m centres along traverses 1.0m apart across 30m grids. Two sensors mounted 1m horizontally apart and very accurately aligned to nullify the effects of the earth's magnetic field. Cart: Data was also collected using a cart carrying four paired Bartington magnetic sensors. Four sensors mounted 1m horizontally apart and very accurately aligned to nullify the effects of the earth's magnetic field. Each data point is geographically referenced using an on-board Trimble RTK survey grade GPS system. Readings will be taken at 0.125m centres along traverses 1.0m apart. The collection of data provides an appropriate methodology balancing cost and time with resolution as per Historic England guidelines. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background.</p>
<b>Project Results</b>	<p>The magnetometer survey has recorded numerous magnetic responses which have been interpreted as being of archaeological interest. In the north of the site a ditched trackway has been plotted which appears to span the width of the survey area; it has been intermittently recorded for a distance of 1.8 km. Extending either side of this track are enclosures and ditches, some of which have ring-ditches and pits within them. In the north-west of Field 1.5 the location of a possible post-pit building has been marked. Several clusters of archaeological responses have also been recorded in Fields 1.13, 1.15/1.16/1.17, 1.28, 1.29, 1.30, 1.37, 1.39/1.40 and 1.45 which represent small farmsteads, enclosures and field systems. In the east of Field 1.4 the foundations of a relatively modern building and spreads of demolition debris have been plotted. Historic ridge and furrow cultivation have been marked in many of the survey areas. Numerous responses of uncertain origin have been marked throughout the data which is to be expected on a survey of this size. The majority of these have probably been caused by variations in the underlying geology or agricultural processes. However, archaeological origins for some of these responses cannot be entirely discounted. Corroborated and conjectural former field boundaries have been plotted throughout the survey and modern ploughing effects are visible in Field 1.43/1.44. Land drains have also been detected in many of the fields along with agricultural tractor tramlines in Fields 1.2 and 1.3. Amorphous zones of natural response are visible in Fields 1.28, 1.30, 1.33, 1.46 and 1.46. Two strong dipolar ferrous anomalies have been recorded in Fields 1.34, 1.39/1.40, 1.43/1.44 and 1.45</p>

	which mark the routes of two underground aqueducts. While two smaller pipes have also been detected in Field 1.5.
<b>Keywords</b>	Multiple Ditch System - UNCERTAIN - FISH Thesaurus of Monument Types Ditched Enclosure - UNCERTAIN - FISH Thesaurus of Monument Types Ditch - UNCERTAIN - FISH Thesaurus of Monument Types Ring Ditch - UNCERTAIN - FISH Thesaurus of Monument Types Pit - UNCERTAIN - FISH Thesaurus of Monument Types Field System - UNCERTAIN - FISH Thesaurus of Monument Types Trackway - UNCERTAIN - FISH Thesaurus of Monument Types Coaxial Field System - UNCERTAIN - FISH Thesaurus of Monument Types Rectangular Enclosure - UNCERTAIN - FISH Thesaurus of Monument Types Rectangular Enclosure - UNCERTAIN - FISH Thesaurus of Monument Types Rectilinear Enclosure - UNCERTAIN - FISH Thesaurus of Monument Types Oval Enclosure - UNCERTAIN - FISH Thesaurus of Monument Types Circular Enclosure - UNCERTAIN - FISH Thesaurus of Monument Types Sub Circular Enclosure - UNCERTAIN - FISH Thesaurus of Monument Types Building - UNCERTAIN - FISH Thesaurus of Monument Types Enclosed Settlement - UNCERTAIN - FISH Thesaurus of Monument Types Farmstead - UNCERTAIN - FISH Thesaurus of Monument Types Ridge And Furrow - MEDIEVAL - FISH Thesaurus of Monument Types Field Boundary - POST MEDIEVAL - FISH Thesaurus of Monument Types Plough Marks - 20TH CENTURY - FISH Thesaurus of Monument Types Pipeline - 20TH CENTURY - FISH Thesaurus of Monument Types
<b>Funder</b>	Private or public corporation Island Green Power UK Limited
<b>HER</b>	North Yorkshire HER - unRev - STANDARD
<b>Person Responsible for work</b>	Thomas Cockcroft
<b>HER Identifiers</b>	
<b>Archives</b>	

Report generated on: 23-12-2024:1328

## Appendix D – Data Management Plan & Archive Selection Strategy

### Data Management Plan

Project ID / OASIS ID

SUMO-16614-1 / sumogeop1-523845

Project Name

Light Valley Solar Project: Site 1

Project Description

Detailed magnetic survey over approx. 420ha at Site 1

Client

Island Green Power UK Limited

Project Manager

Thomas Cockcroft

Field Leader

Jelmer Wubs / Robert Knight / Simon Lobel / Liam Brice-Bateman

Date DMP created

26.03.2024

Date DMP last updated

23.12.2024

Version

2

Technique - data

Detailed magnetic survey.

Manual – cart - other

ATV/Cart magnetometers.

Documentation and metadata

All documentation and data produced are stored on SUMO servers in a specific job file.

Data storage, access and back-up

- SUMO Secure server during the project life set up in a RAID configuration (a RAID configuration incorporates a level of data redundancy meaning if a single hard drive in fails data can still be restored).

- Snap shots of the data will be made at several intervals during the day to allow data to be restored for up to 30 days if changed / deleted.
- Once the final report has been completed data will be moved onto NAS drive set up in a RAID configuration.
- All data is backed up to an off-site location (Cloud storage).

## **Archive Selection Strategy**

### **Digital Data**

#### Selection

It is proposed that only the final version of all born digital documents (reports, images and CAD files) will be selected for inclusion in the Preserved Archive. All raw and processed survey data will be included in the preserved archive. Below is what will constitute the selected archive:

- Raw data in XYZ format .csv and .png plus .pgw world file
- Processed data as .png plus .pgw world file
- Final survey report .pdf
- CAD and Vector graphics (interpretations) in .dwg format

#### De-selected digital data

The de-selected material will be retained on the SUMO Secure server and Cloud storage.

### **Documents**

Not applicable – no archive

### **Materials**

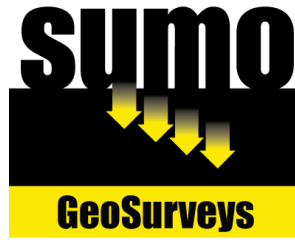
Not applicable – no archive



- Archaeological Geophysics
- Engineering Geophysics
- Measured Building Services
- Utility and Topographic Services
- Aerial Surveys
- Rail Surveys

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SUMO Services Ltd, incorporated under the laws of England and Wales,  
Company Registration No.4275993.  
Registered Office Unit 8 Hayward Business Centre, New Lane, Havant, Hampshire, PO9 2NL

# **Annex B Light Valley Site 2 Geophysical Survey Report**



# GEOPHYSICAL SURVEY REPORT

## Light Valley Solar Project: Site 2

Client

**Island Green Power UK Limited**

Survey Report

**16614-2**

OASIS Ref. No.

**sumogeop1-529783**

Date

**27 November 2024**



## Survey Report 16614-2: Light Valley Solar Project: Site 2

<b>Survey dates</b>	29-31 July 2024 1 August 2024 11&12 September 2024
<b>Field co-ordinator</b>	Simon Lobel BSc Liam Brice-Bateman BA
<b>Field Team</b>	Craig Wakefield MSc William Vernon BA (Hons)
<b>Report Date</b>	27 November 2024
<b>CAD Illustrations</b>	Thomas Cockcroft MSc MCIfA
<b>Report Author</b>	Thomas Cockcroft MSc MCIfA
<b>Project Manager</b>	Thomas Cockcroft MSc MCIfA
<b>Report approved</b>	Dr John Gater BSc DSc(Hon) MCIfA FSA

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## 2 LIST OF APPENDICES

Appendix A	Technical Information: Magnetometer Survey Methods, Processing and Presentation
Appendix B	Technical Information: Magnetic Theory
Appendix C	OASIS Data Collection Sheet

## Appendix D Data Management Plan & Archive Selection Strategy

### 3 SURVEY TECHNIQUE

- 3.1 Detailed magnetic survey (magnetometry) was chosen as the most efficient and effective method of locating the type of archaeological anomalies which might be expected at this site. All survey techniques followed the guidance set out by ClfA (2020) and the European Archaeology Council (EAC) (2016).

Bartington Cart System      Traverse Interval 1.0m      Sample Interval 0.125m

The only processes performed on data are the following unless specifically stated otherwise:

Zero Mean Traverse      This process sets the background mean of each traverse within each grid to zero. The operation removes instrument striping effects and edge discontinuities over the whole of the data set.

### 4 EXECUTIVE SUMMARY OF RESULTS

- 4.1 A magnetometer survey of 83 hectares of land at Site 2 of the Light Valley Solar Project has recorded magnetic responses that have been interpreted as being of archaeological interest. In Area 4 numerous anomalies are visible which mark the locations of enclosures, pits, a trackway, a probable ring-ditch and spreads of habitation type features. These anomalies are likely to represent small farmsteads and wider scale landscape divisions. Ridge and furrow cultivation has also been plotted in Areas 3, 4, 5 and 6. Uncertain responses have been detected throughout the survey data and while archaeological origins cannot be discounted for all of them, the majority have probably been caused by natural and agricultural processes. Former field boundaries, land drains and two service pipes have also been marked. Ferrous responses in the north-east of Area 3 have been caused by the foundations of a former building.

### 5 INTRODUCTION

- 5.1 **SUMO GeoSurveys** was commissioned to undertake a geophysical survey of an area outlined for development. This survey forms part of an archaeological investigation being undertaken by **Island Green Power UK Limited**.
- 5.2 This survey is part of the Light Valley Solar Project which is composed of a five separate magnetometer survey reports.
- 5.3 Site Details

NGR / Postcode	SE 52791 30311 / LS25 5EW
Location	The site is located 4km south-east of Sherburn in Elmet and 1.2km east of Monk Fryston. The survey area surrounds Siddle Farmhouse, and is bounded to the south by the A63, while Fryston Common Lane passes between Areas 1/2 and Area 3.
HER	North Yorkshire HER
OASIS Ref. No.	sumogeop1-529783
District	N/A
Parish	Monk Fryston Civil Parish
Topography	Flat
Land Use	Arable
Geology (BGS 2024)	Bedrock:      Roxby Formation - Mudstone, calcareous Sherwood Sandstone Group – Sandstone Superficial:   Alluvium - Clay, silt, sand and gravel

Hemingbrough Glaciolacustrine Formation - Clay, silty.  
Brighton Sand Formation - Sand

Soils (CU 2024) Soilscape 22: Loamy soils with naturally high groundwater  
Survey Methods Magnetometer survey (fluxgate gradiometer)  
Study Area 83ha

#### 5.4 **Archaeological Background**

5.4.1 A search of the HER has revealed that no designated or non-designated heritage assets are recorded within the survey area. A geophysical survey was conducted across land at Hillam Farm 300m south-west of the site (ENY9910). The survey identified several previous field boundaries, areas of former ridge and furrow ploughing, and modern cultivation trends. On the northeastern boundary of the surveyed area, a series of anomalies were interpreted as potentially showing a trackway and enclosures, although it was noted that they might also show a geological feature such as a paleochannel. 300m east of the site the HER records fragmentary remains of rectilinear enclosures that are visible as cropmarks (MNY10363). They HER records numerous cropmarks 600-900 m north of the site, these include enclosures, ring ditches, ditches and a drove way (MNY39992, MNY17139, MNY17140, MNY10350, MNY39993, MNY17141 & MNY17159).

#### 5.5 **Aims and Objectives**

5.5.1 To locate and characterise any anomalies of possible archaeological interest within the study area.

## 6 **RESULTS**

6.1 *The survey has been divided into six survey areas (Areas 1-6).*

#### 6.2 **Probable / Possible Archaeology**

6.2.1 In Area 4 ditch-like anomalies, pits, trends and zones of increased response are visible across the survey which have been assigned to the categories of *Probable / Possible Archaeology* in accordance with their magnetic strengths. These anomalies mark the locations of several enclosures, a ditched trackway, a ring-ditch and probable refuse pits; while the zones of increased response could indicate spreads of habitation features. These anomalies could mark the locations of small farmsteads or nucleated small settlements plus wider landscape divisions or field systems.

#### 6.3 **Ridge and Furrow**

6.3.1 In Areas 3, 4, 5 and 6 broad and widely spaced parallel linear anomalies have been detected have been caused by historic ridge and furrow cultivation. In places, it has been difficult to distinguish between the ridge and furrow cultivation and the land drains which have been detected across the site (6.6.1).

#### 6.4 **Uncertain**

6.4.1 Linear and curvilinear trends, discrete anomalies and zones of increased response are visible throughout the survey area which have been assigned to the category of *Uncertain*. The majority lack the defined morphologies of anomalies that would ordinarily warrant an archaeological interpretation. They have probably been caused by variations in the underlying geology or relatively modern agricultural processes. In places, it has been difficult to interpret

some of the responses with confidence due to the high density of anomalies that have been detected in parts of the survey.

#### 6.5 ***Former Field Boundary – Corroborated / Conjectural***

- 6.5.1 In Areas 3, 4, 5 and 6 numerous linear responses have been recorded which correspond with the routes of former field boundaries that are visible on several editions of historic mapping (see Figures 20 & 21).
- 6.5.2 Linear anomalies in Areas 3, 5 and 6 have been interpreted as conjectural boundaries. While they don't appear to available historic mapping, they have a similar magnetic signature to the corroborated field boundaries (see 6.5.1).

#### 6.6 ***Agricultural – Land Drains***

- 6.6.1 Across all six of the survey areas widely spaced linear responses of varying magnetic strengths have recorded which mark the routes of land drains.

#### 6.7 ***Service***

- 6.7.1 Magnetically strong linear anomalies have been plotted in Areas 3, 5 and 6 which have been caused by two underground service pipes.

#### 6.8 ***Ferrous / Magnetic Disturbance***

- 6.8.1 In the north-east of Area 2 eight ferrous responses forming two rows of evenly spaced anomalies have been detected within a zone of magnetic disturbance. They correspond with the location of a former building that is visible on 1888-1915 & 1937-1961 Ordnance Survey Mapping (see Figure 20 & 21). The strong ferrous responses are the result of the foundation of the former building, while the zone of magnetic disturbance has probably been caused by spreads of modern debris. Magnetic disturbance has also been recorded in the north of Area 1 and in the south of Areas 5 and 6. These are due to made ground or spreads of debris associated with the construction of the A63 to the south.
- 6.8.2 Ferrous responses close to boundaries are due to adjacent fences and gates. Smaller scale ferrous anomalies ("iron spikes") are present throughout the data and are characteristic of small pieces of ferrous debris (or brick / tile) in the topsoil; they are commonly assigned a modern origin. Only the most prominent of these are highlighted on the interpretation diagram.

### 7 **DATA APPRAISAL & CONFIDENCE ASSESSMENT**

- 7.1 Historic England Table 4 (EH 2008) states that the typical magnetic response on the local soils / geology is variable. The results from this survey indicate the presence of enclosures, pits and ditches; consequently, the survey is deemed to have worked well. However, in places, it has been difficult to confidently interpret some of the responses due to high density of anomalies that are present in parts of the site.

### 8 **CONCLUSION**

- 8.1 The magnetometer survey has recorded magnetic responses that have been interpreted as being of archaeological interest. In Area 4 a series of enclosures, pits, a trackway and a probable ring-ditch have been detected. They likely represent small farmsteads and wider scale landscape divisions. Ridge and furrow cultivation has also been plotted in Areas 3, 4, 5 and 6. Numerous responses of uncertain origin are visible across the data and while archaeological origins cannot be discounted for all these responses, the majority have probably been caused by natural and agricultural processes. Former field boundaries, land drains and two service pipes have also been marked in the survey. Ferrous responses in the north-east of Area 3 have

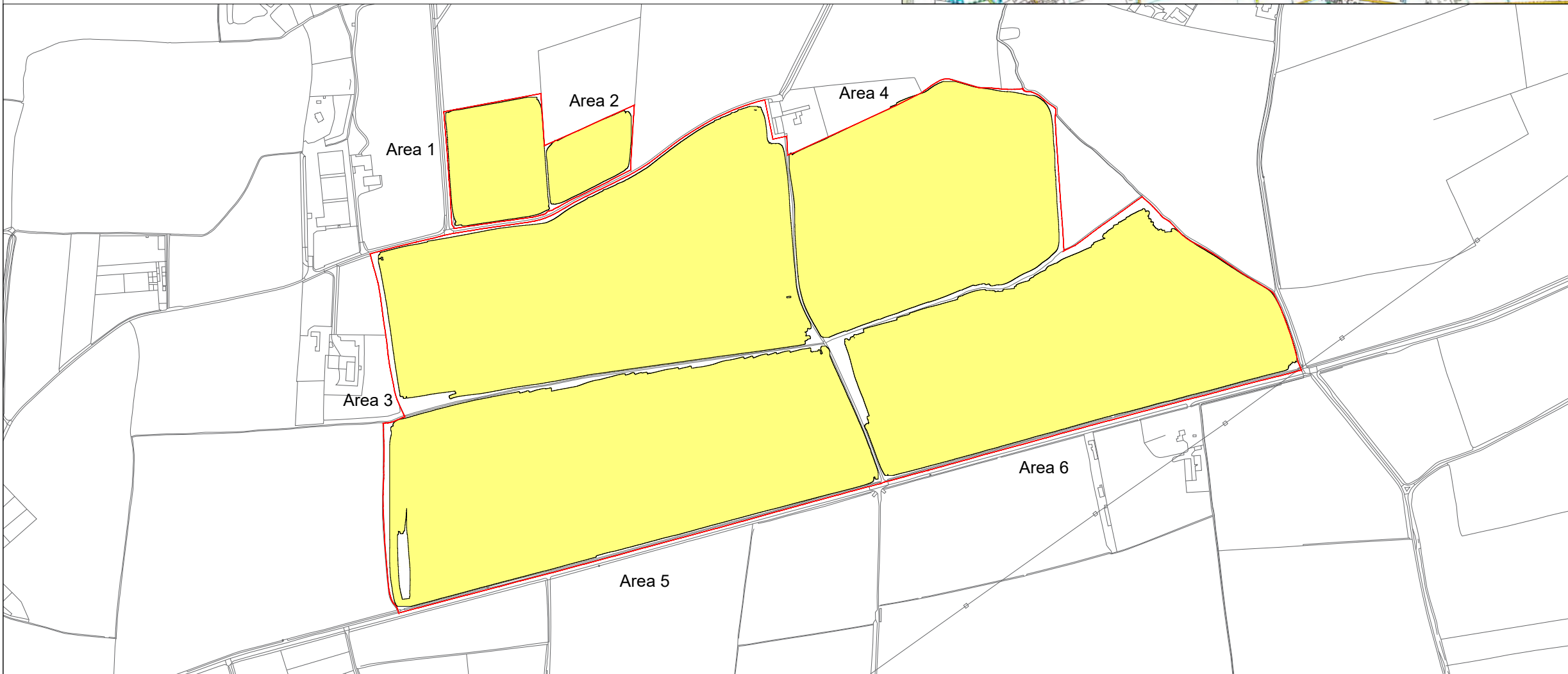
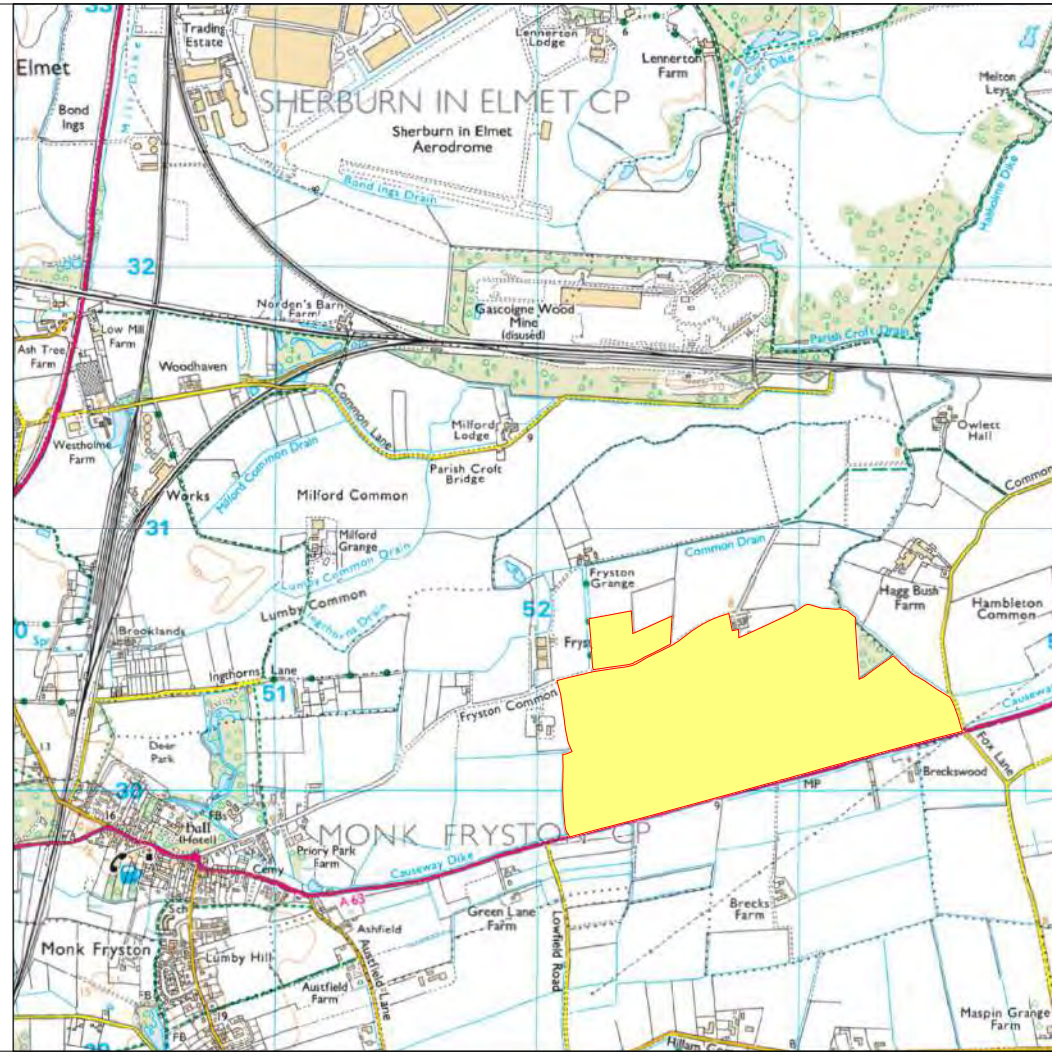
been caused by the foundations of a former building, while zones of magnetic disturbance are due to spreads of modern debris or made ground.

## 9 REFERENCES


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- CIfA 2020 *Standard and Guidance for Archaeological Geophysical Survey*. 2014 amended 2020. CIfA Guidance note. Chartered Institute for Archaeologists, Reading  
[REDACTED]
- CU 2024 *The Soils Guide*. www.landis.org.uk. Cranfield University, UK. website:  
[REDACTED]
- EAC 2016 *EAC Guidelines for the Use of Geophysics in Archaeology*, European Archaeological Council, Guidelines 2.
- EH 2008 *Geophysical Survey in Archaeological Field Evaluation*. English Heritage, Swindon (now withdrawn, but used for evaluating suitability of soil types)

## 10 ARCHIVE

- 10.1 The minimally processed data, data images, XY traces and a copy of this report are stored in **SUMO GeoSurveys'** digital archive, on an internal RAID configured NAS drive in the Midlands Office. These data are also backed up to the Cloud for off-site storage.
- 10.2 The Grey Literature will be archived with OASIS and the relevant HER within a period of 12 months.



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 Survey Areas



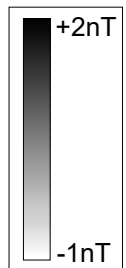
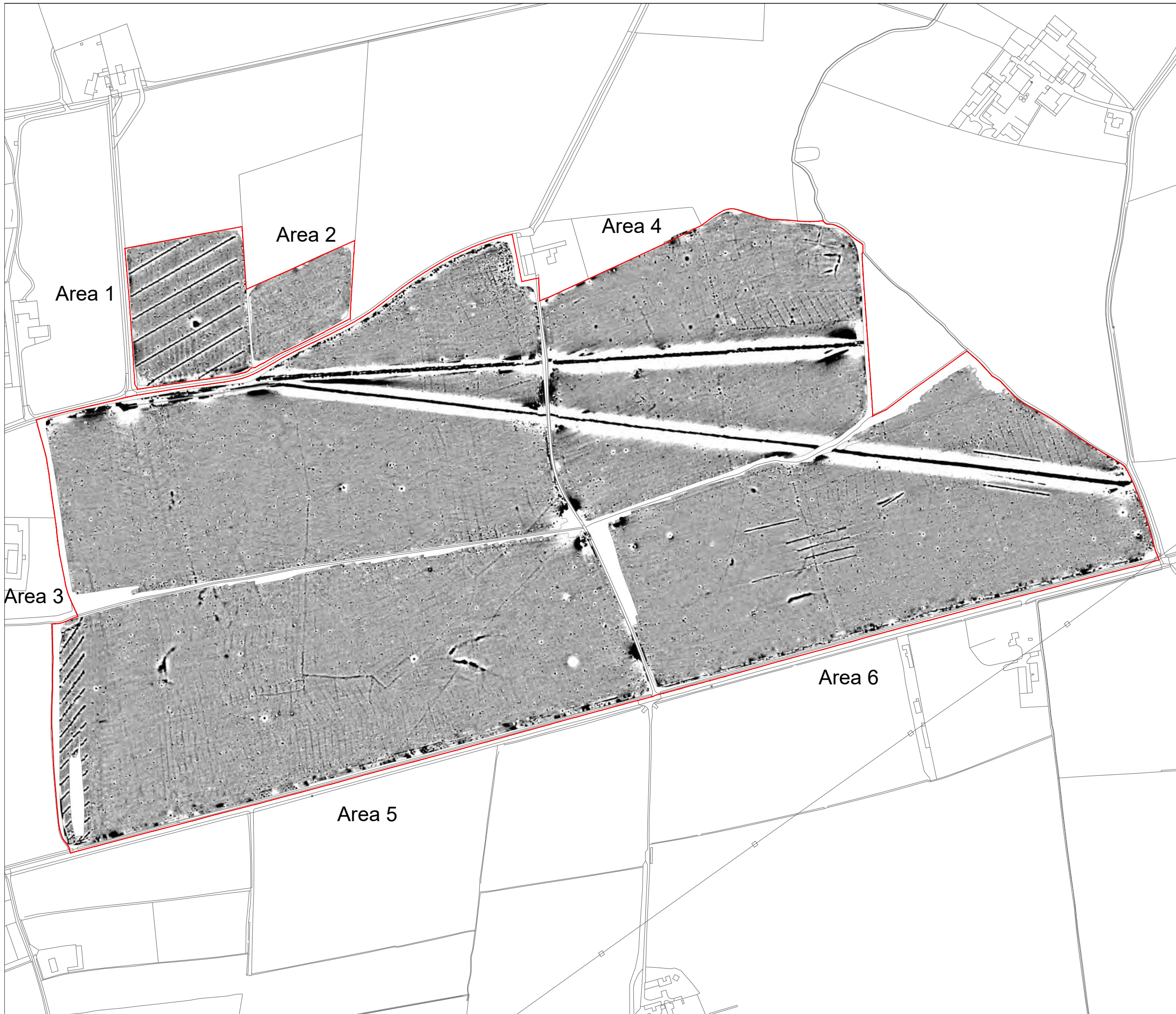
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Client: Island Green Power UK Limited

Project: 16614-2 - Light Valley Solar Project: Site 2

Scale: NOT TO SCALE

Fig No: 01



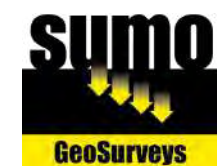
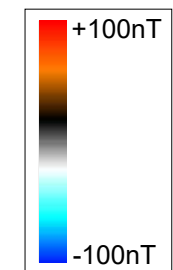
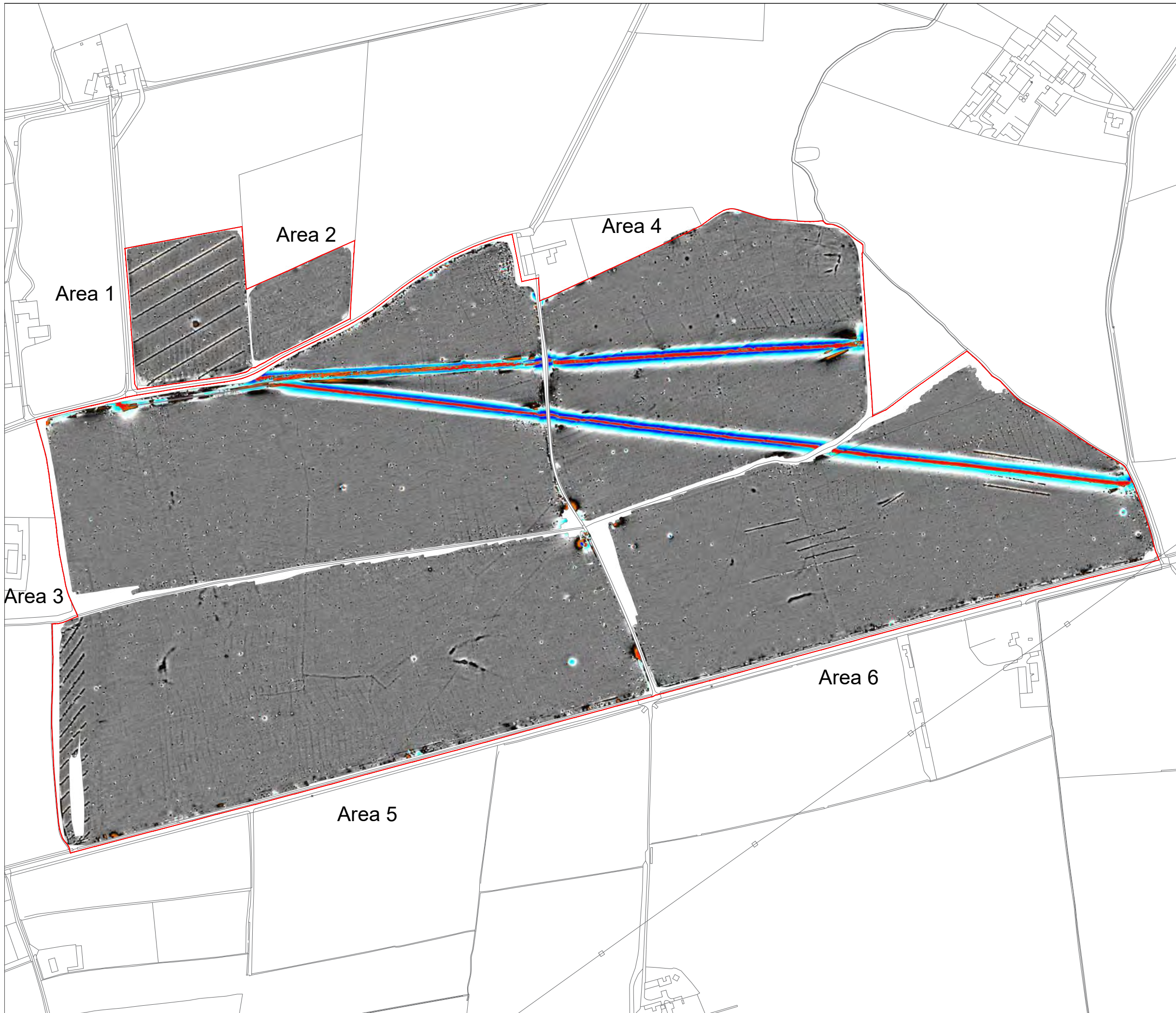
Title:  
Magnetometer Survey - Greyscale Plots

Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
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Fig No:  
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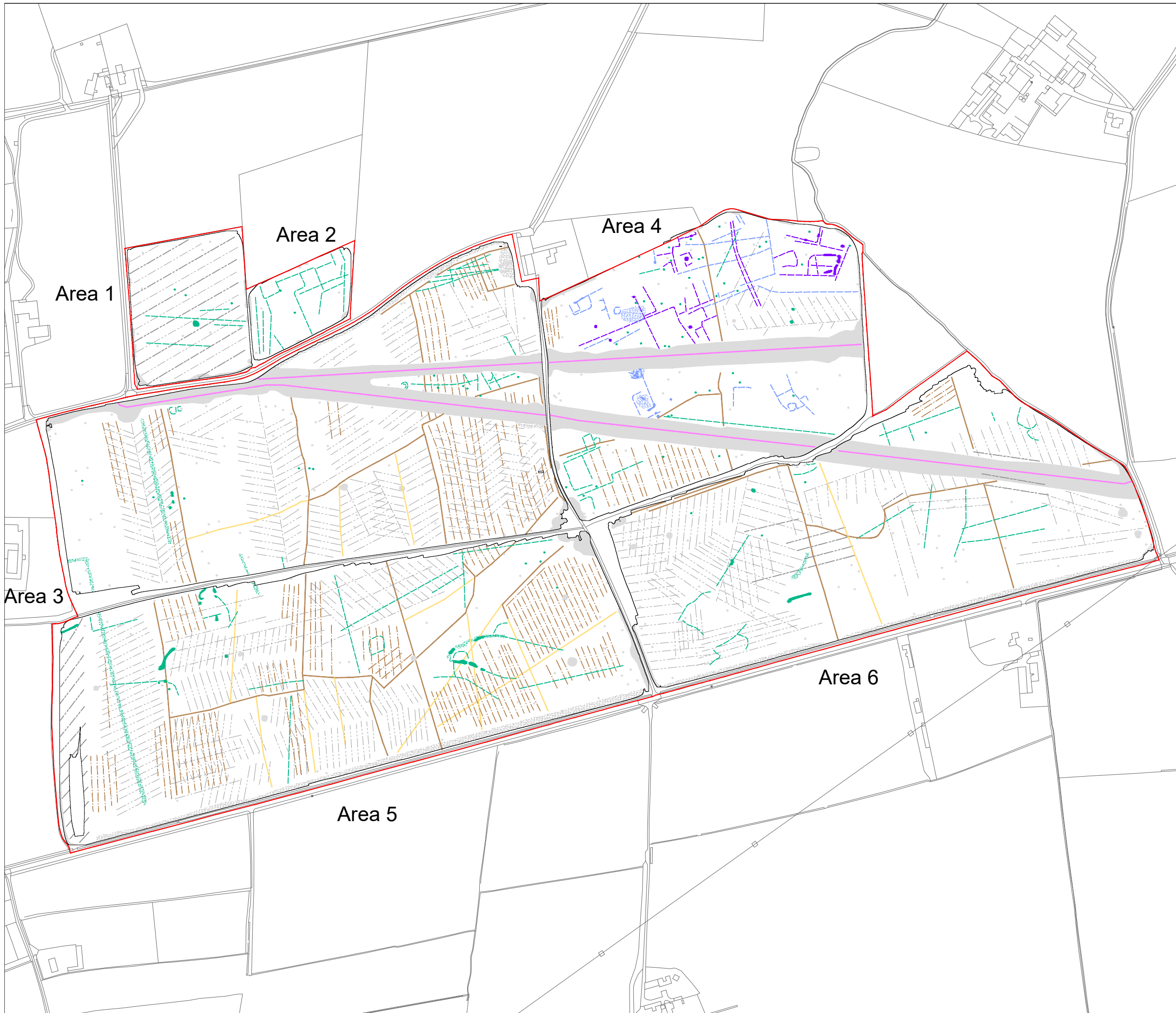
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Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
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Fig No:  
03



### KEY

	Probable archaeology (discrete anomaly / trend / increased response)
	Possible archaeology (discrete anomaly / trend / increased response)
	Ridge and furrow
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (land drain)
	Magnetic disturbance
	Service
	Ferrous



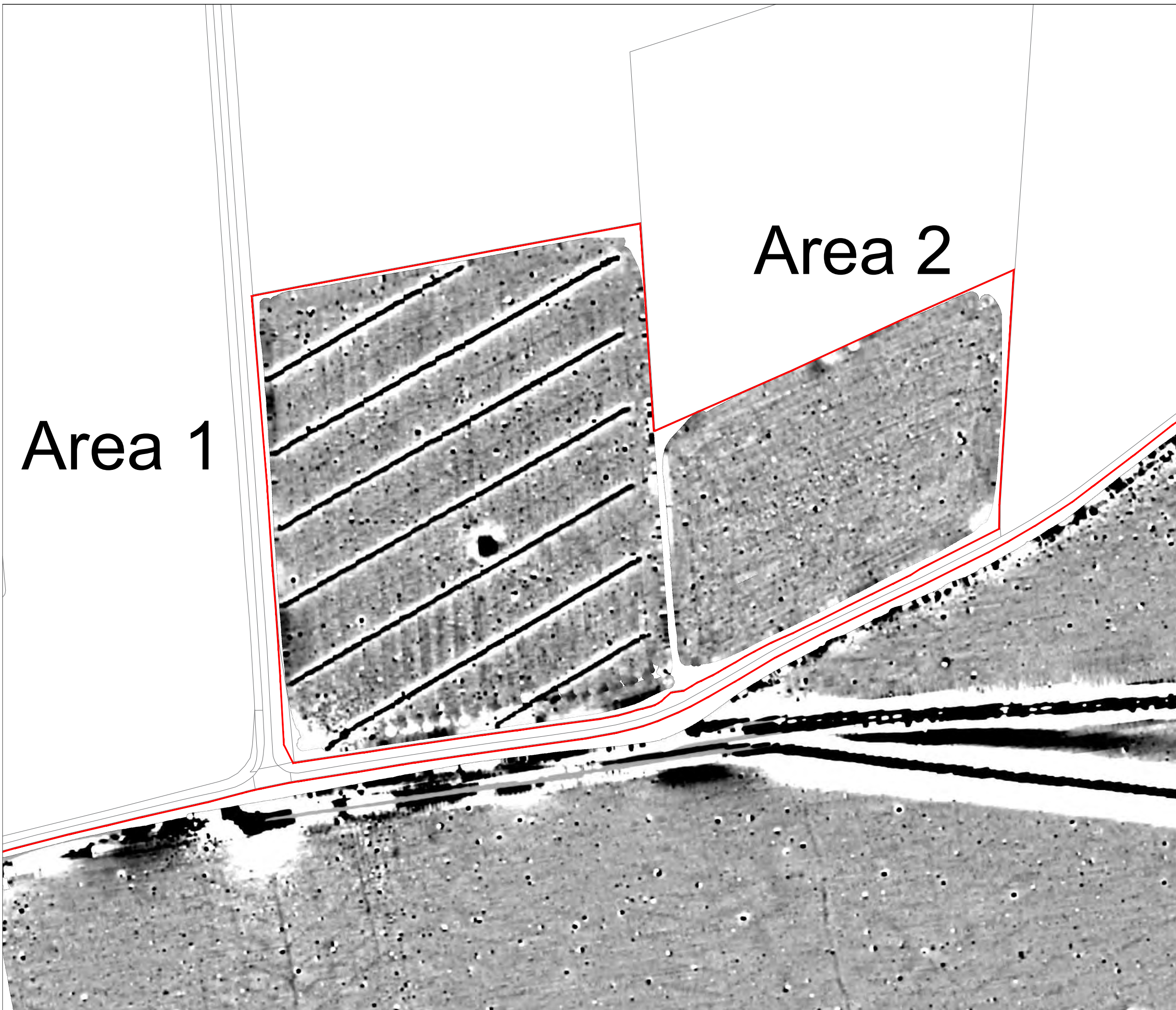
Title: Magnetometer Survey - Interpretation

Client: Island Green Power UK Limited

Project: 16614-2 - Light Valley Solar Project: Site 2

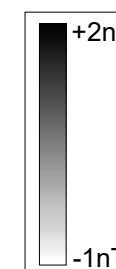
Scale: 0 metres 250  
1:5000 @ A3

Fig No: 04



Area 1

Area 2



Title: Magnetometer Survey - Greyscale Plots (Areas 1 & 2)

Client: Island Green Power UK Limited

Project: 16614-2 - Light Valley Solar Project: Site 2

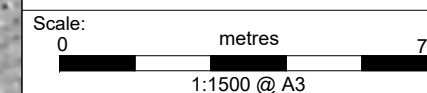
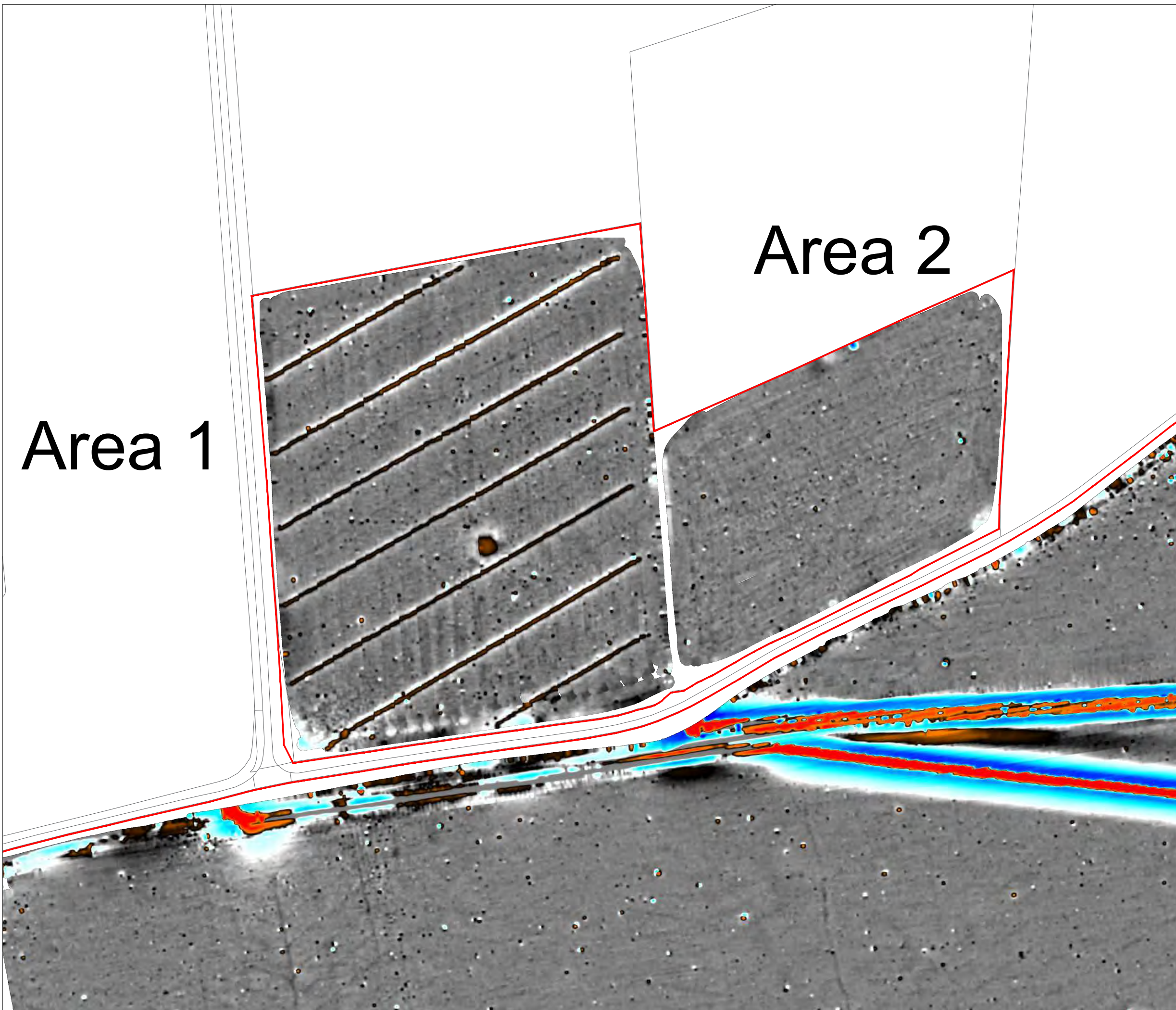
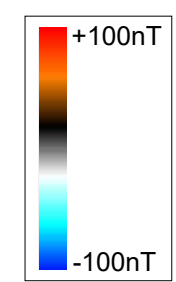


Fig No: 05



Area 1

Area 2



Title: Magnetometer Survey - Colour Plots (Areas 1 & 2)

Client: Island Green Power UK Limited

Project: 16614-2 - Light Valley Solar Project: Site 2

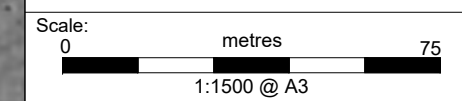
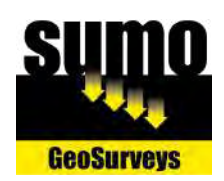


Fig No: 06



**KEY**

	Probable archaeology (discrete anomaly / trend / increased response)
	Possible archaeology (discrete anomaly / trend / increased response)
	Ridge and furrow
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (land drain)
	Magnetic disturbance
	Service
	Ferrous



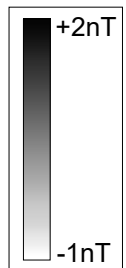
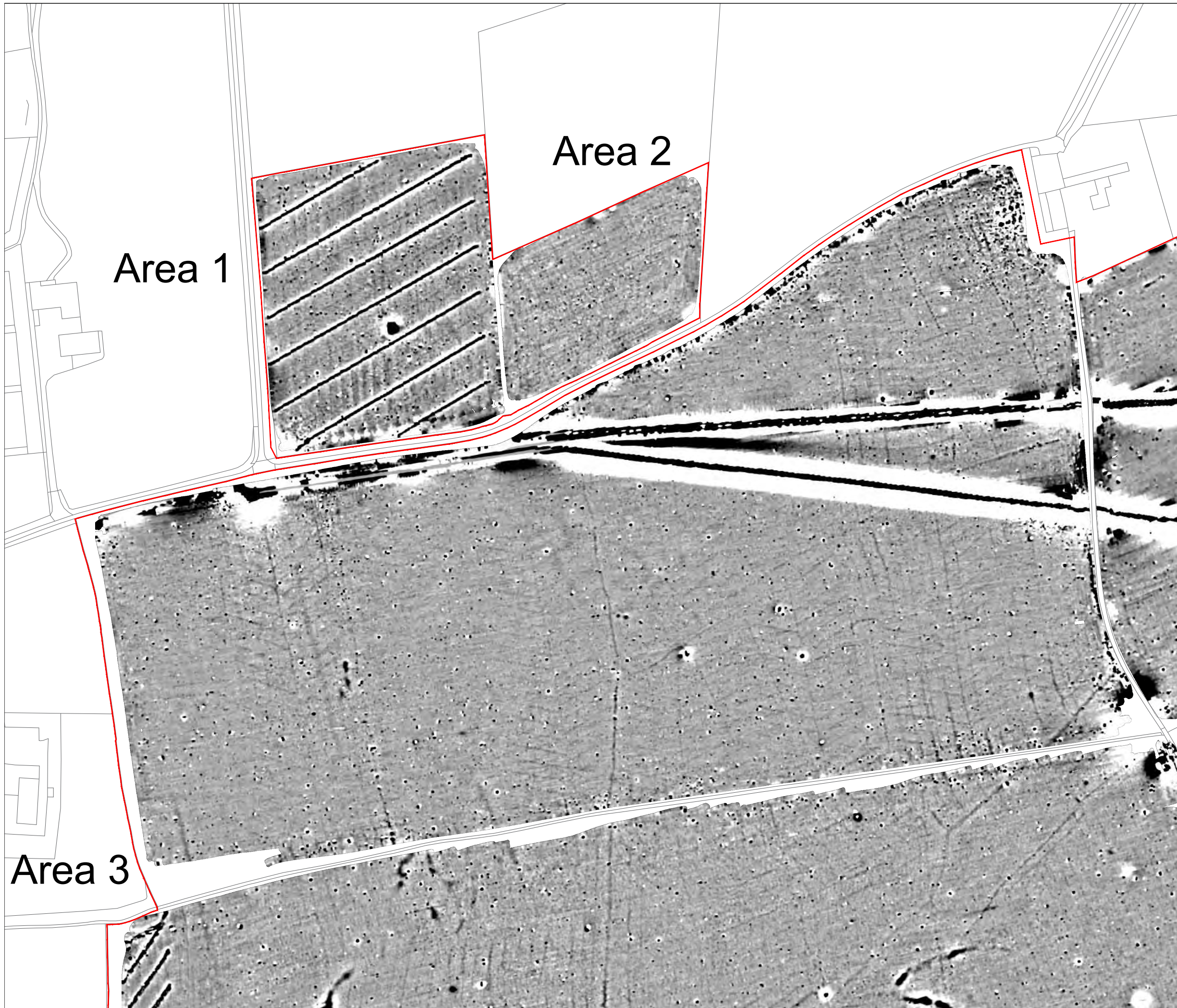
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Client: Island Green Power UK Limited

Project: 16614-2 - Light Valley Solar Project: Site 2

Scale: 0 metres 75  
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Fig No: 07



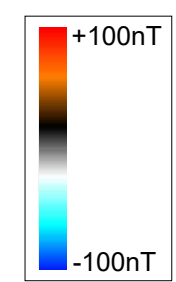
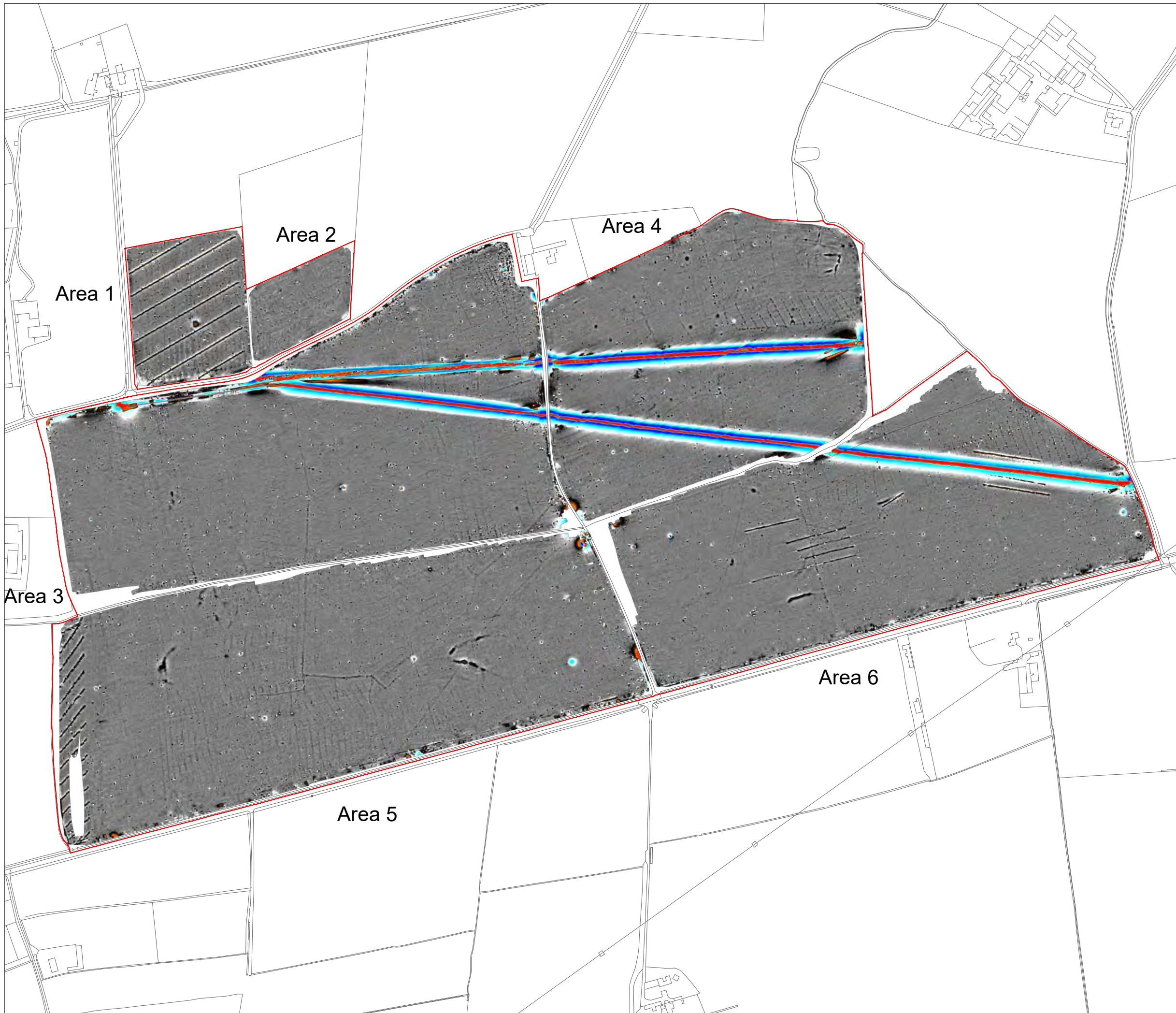
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Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
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1:2500 @ A3

Fig No:  
08



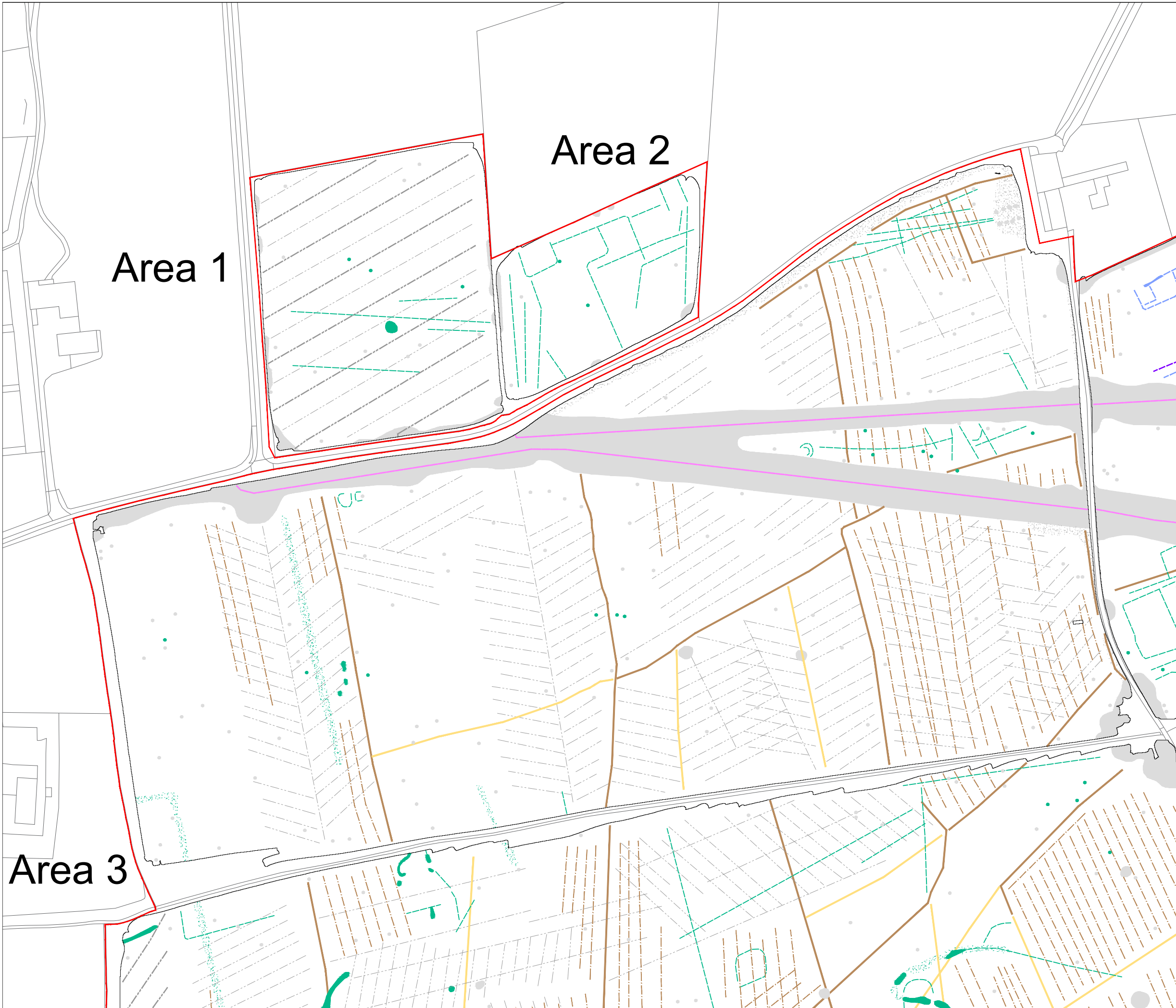
Title:  
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Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
0 metres 125  
1:2500 @ A3

Fig No:  
09



**KEY**

	Probable archaeology (discrete anomaly / trend / increased response)
	Possible archaeology (discrete anomaly / trend / increased response)
	Uncertain Origin (discrete anomaly / trend / increased response)
	Ridge and furrow
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (land drain)
	Magnetic disturbance
	Service
	Ferrous



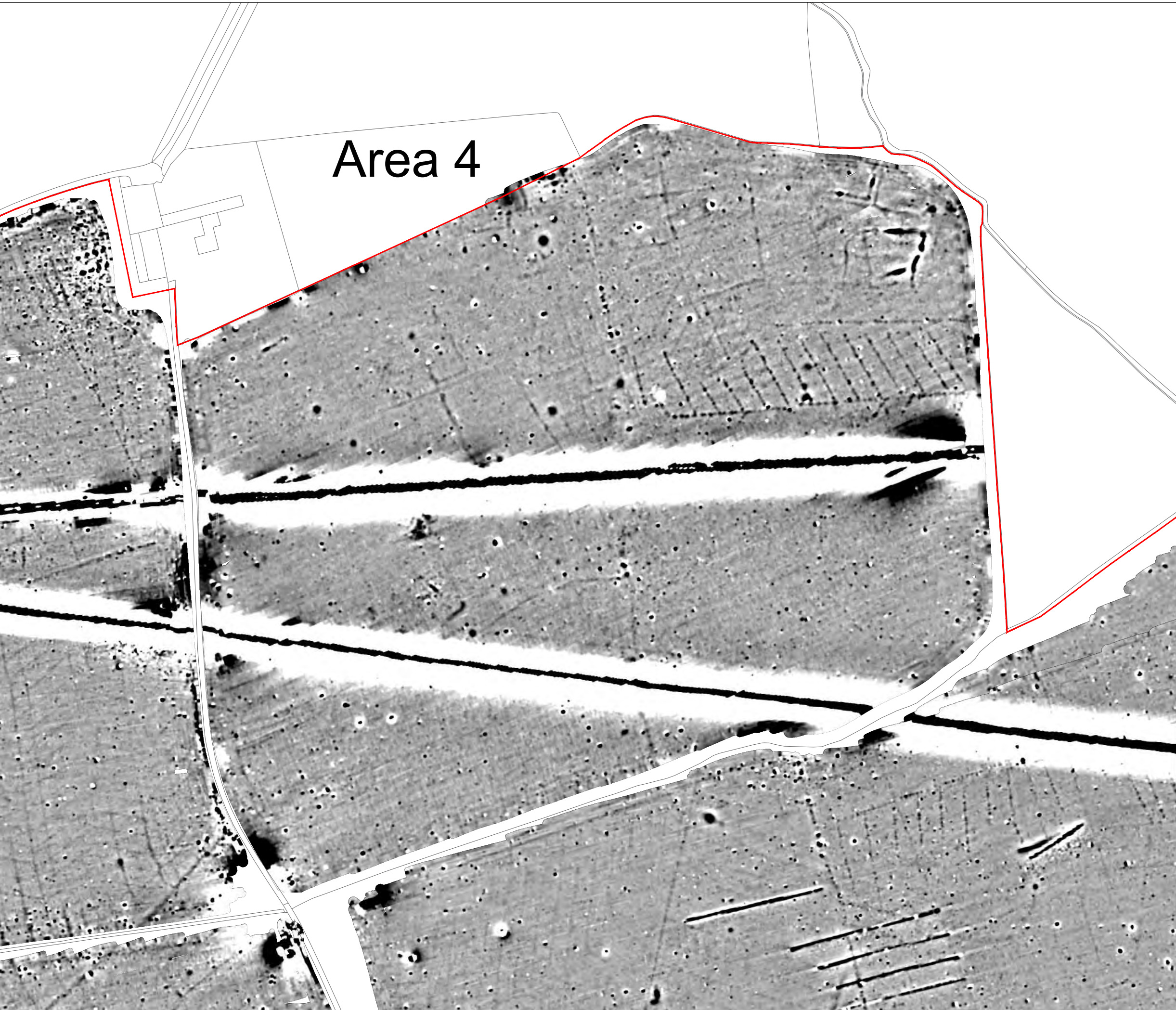
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Client: Island Green Power UK Limited

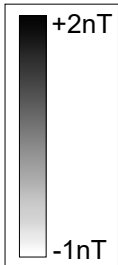
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Fig No: 10



Area 4



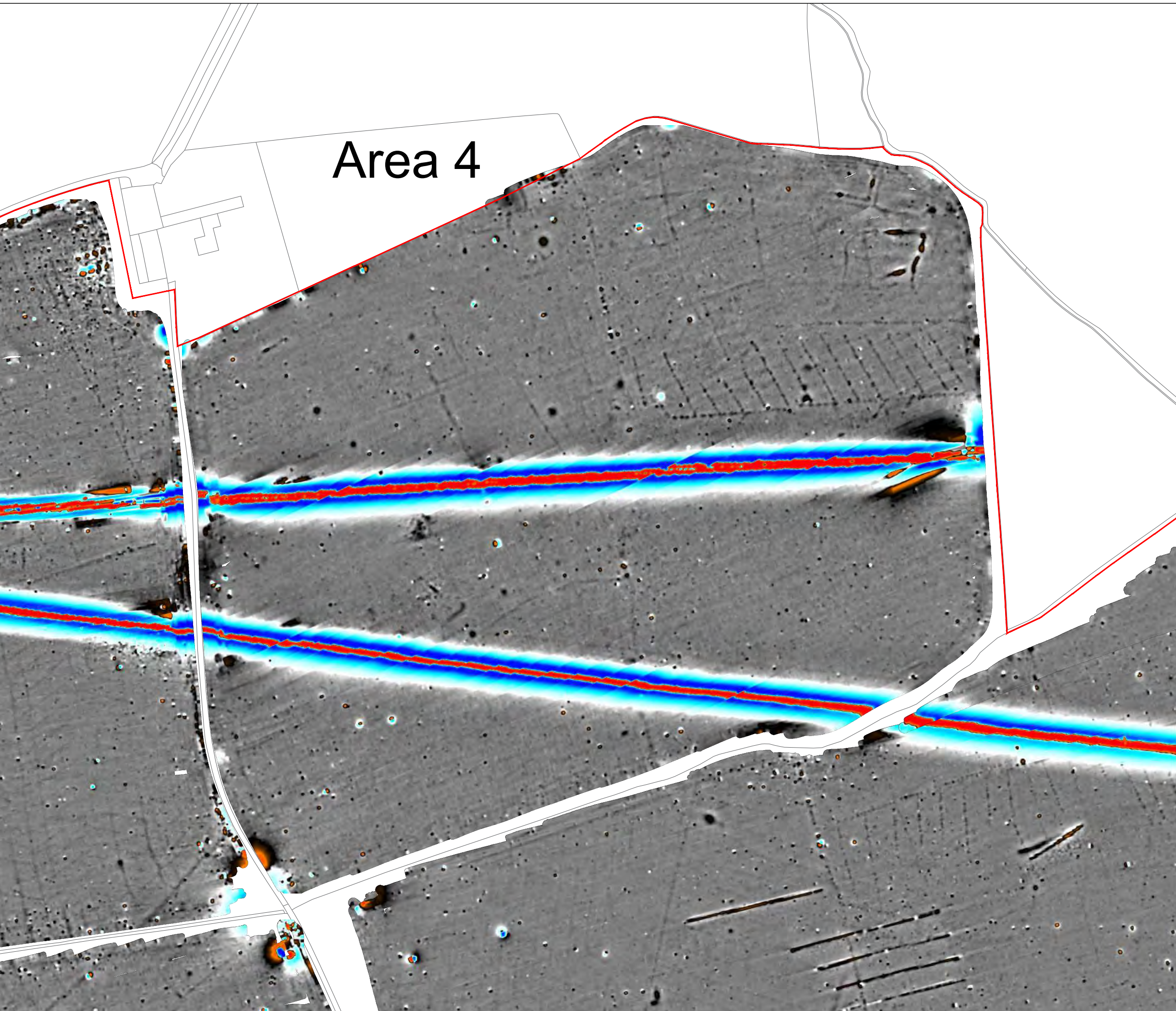
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Client:  
Island Green Power UK Limited

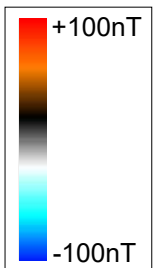
Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
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1:2000 @ A3

Fig No:  
11



Area 4



Title:  
Magnetometer Survey - Colour Plot (Area 4)

Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
0 metres 100  
1:2000 @ A3

Fig No:  
12

# Area 4



## KEY

	Probable archaeology (discrete anomaly / trend / increased response)
	Possible archaeology (discrete anomaly / trend / increased response)
	Ridge and furrow
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (land drain)
	Magnetic disturbance
	Service
	Ferrous



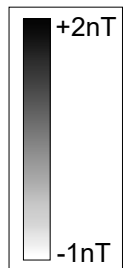
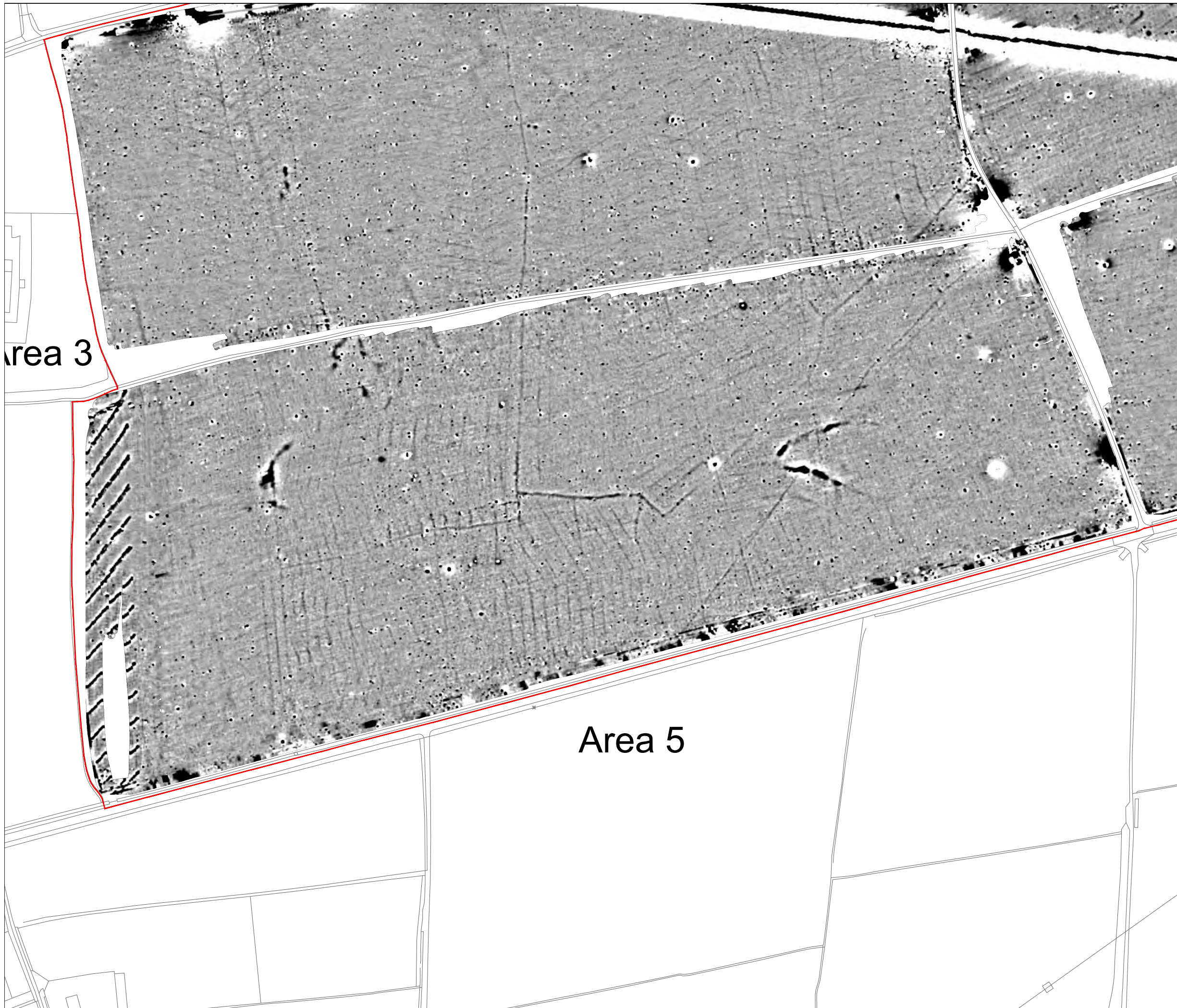
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Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

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Fig No: 13



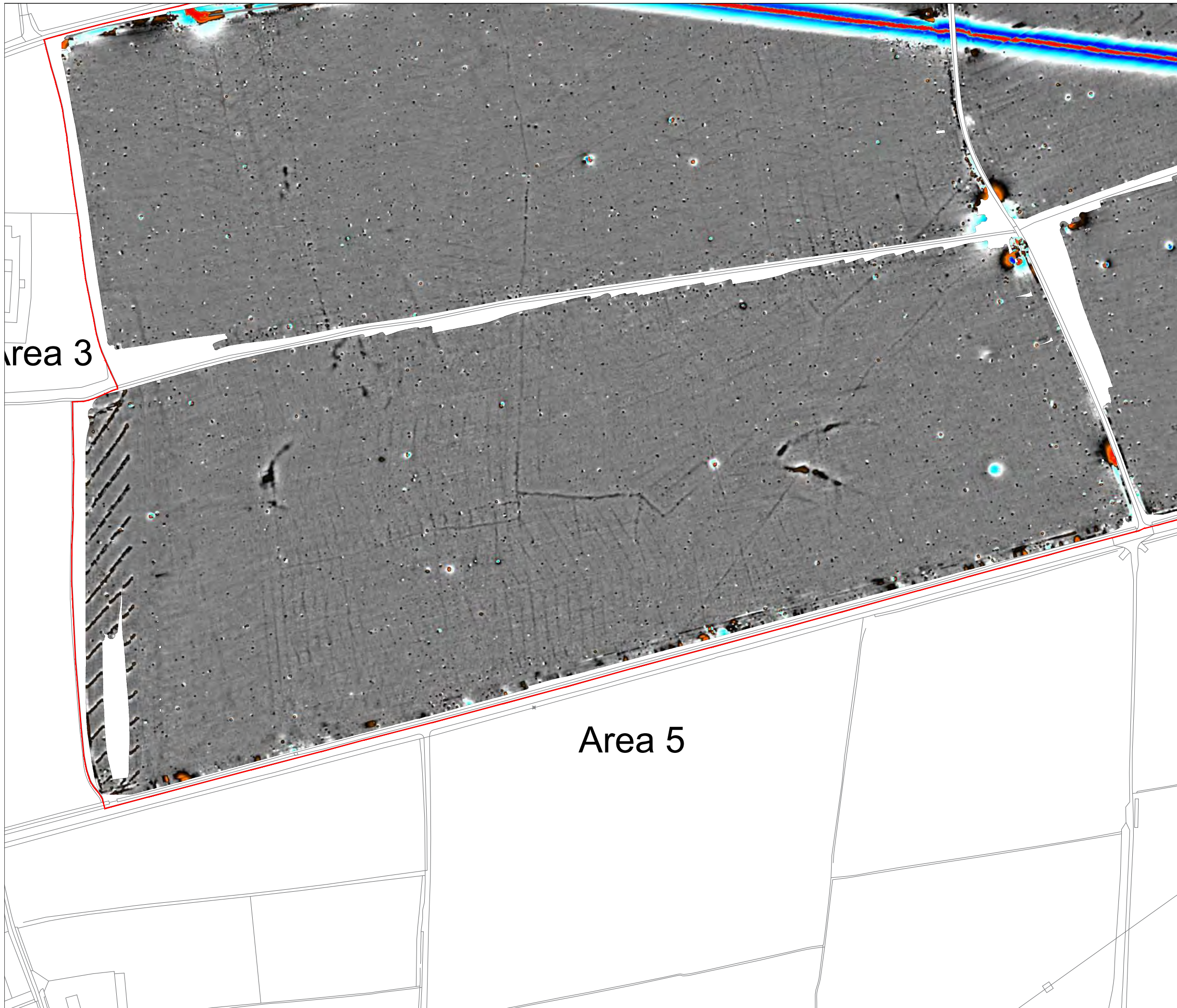
Title:  
Magnetometer Survey - Greyscale Plot (Area 5)

Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

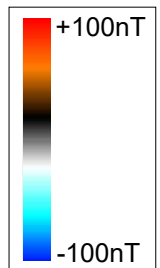
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Fig No:  
14



Area 3

Area 5



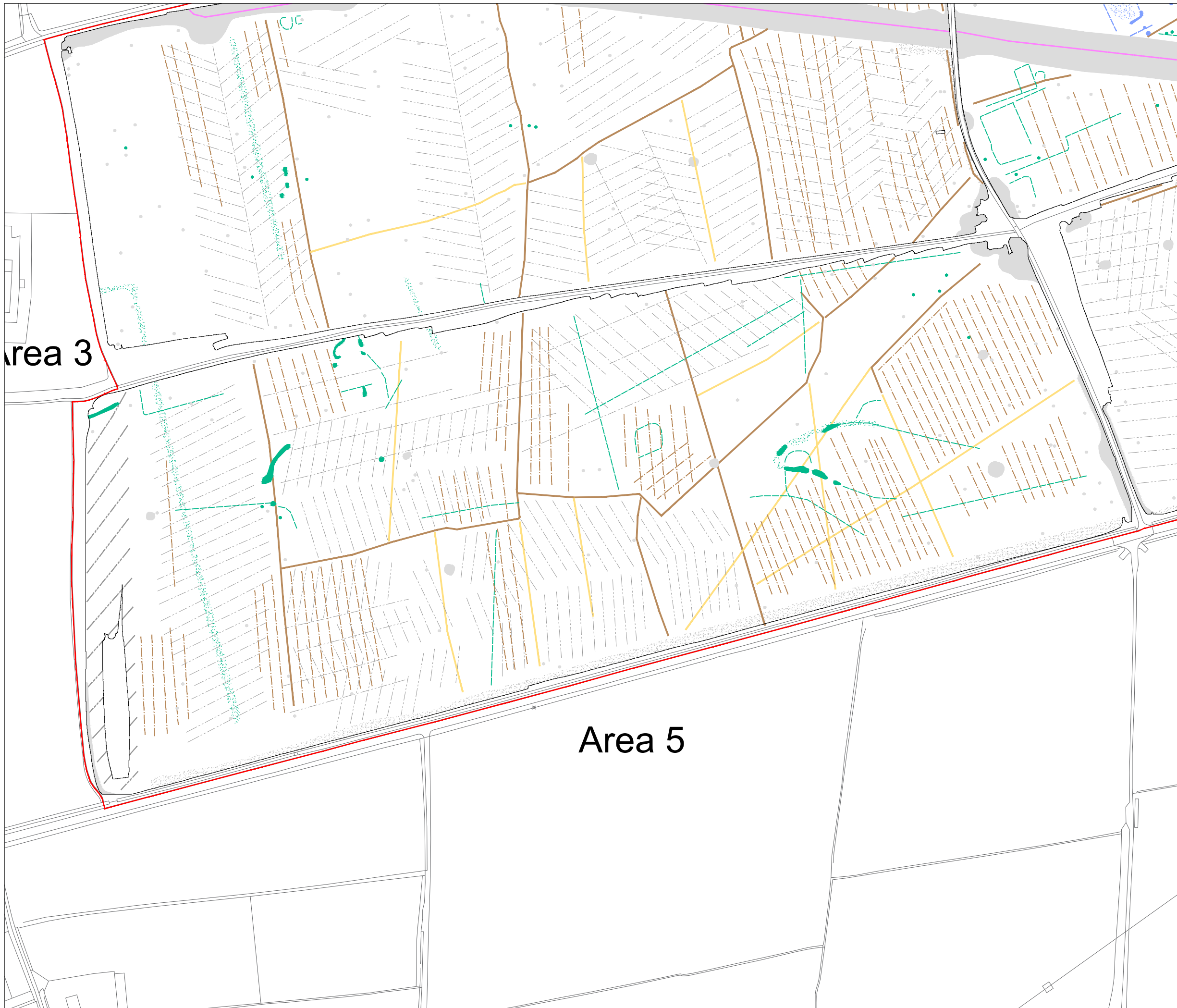
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Magnetometer Survey - Colour Plot (Area 5)

Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
0 metres 140  
1:2800 @ A3

Fig No:  
15



### KEY

	Probable archaeology (discrete anomaly / trend / increased response)
	Possible archaeology (discrete anomaly / trend / increased response)
	Ridge and furrow
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (land drain)
	Magnetic disturbance
	Service
	Ferrous



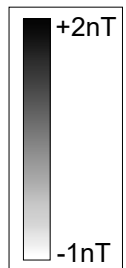
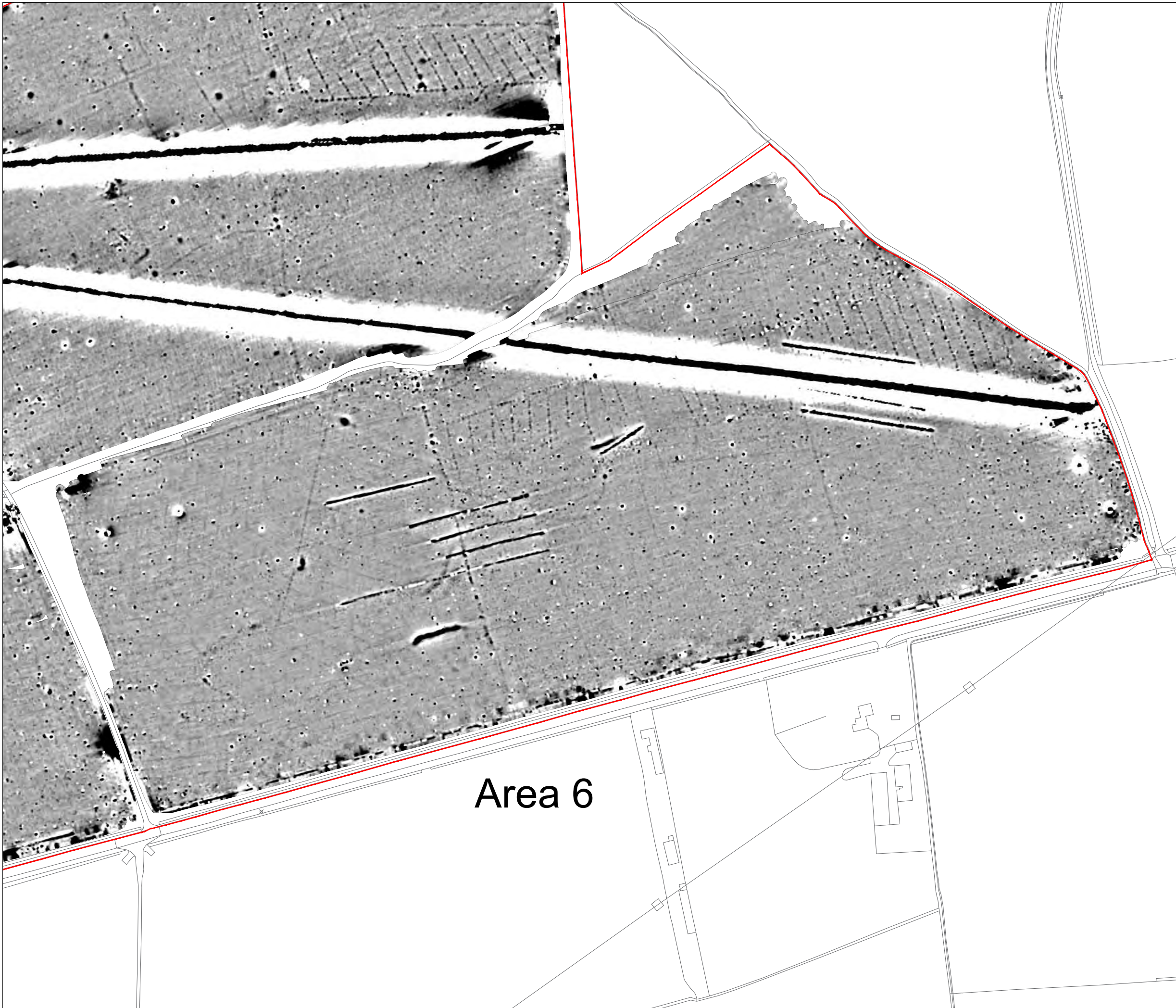
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Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
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1:2800 @ A3

Fig No:  
16



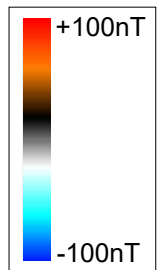
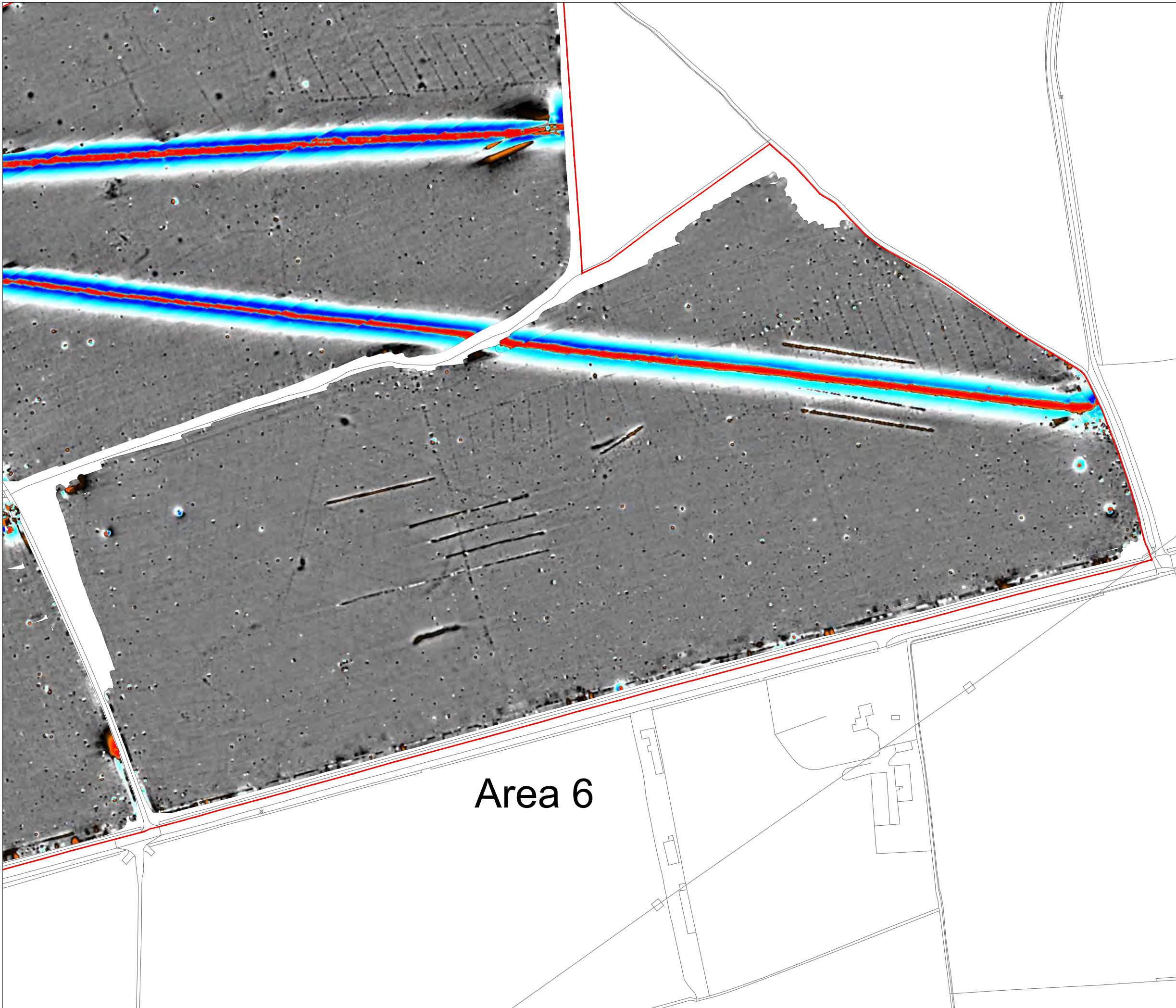
Title:  
Magnetometer Survey - Greyscale Plot (Area 6)

Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
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Fig No:  
17



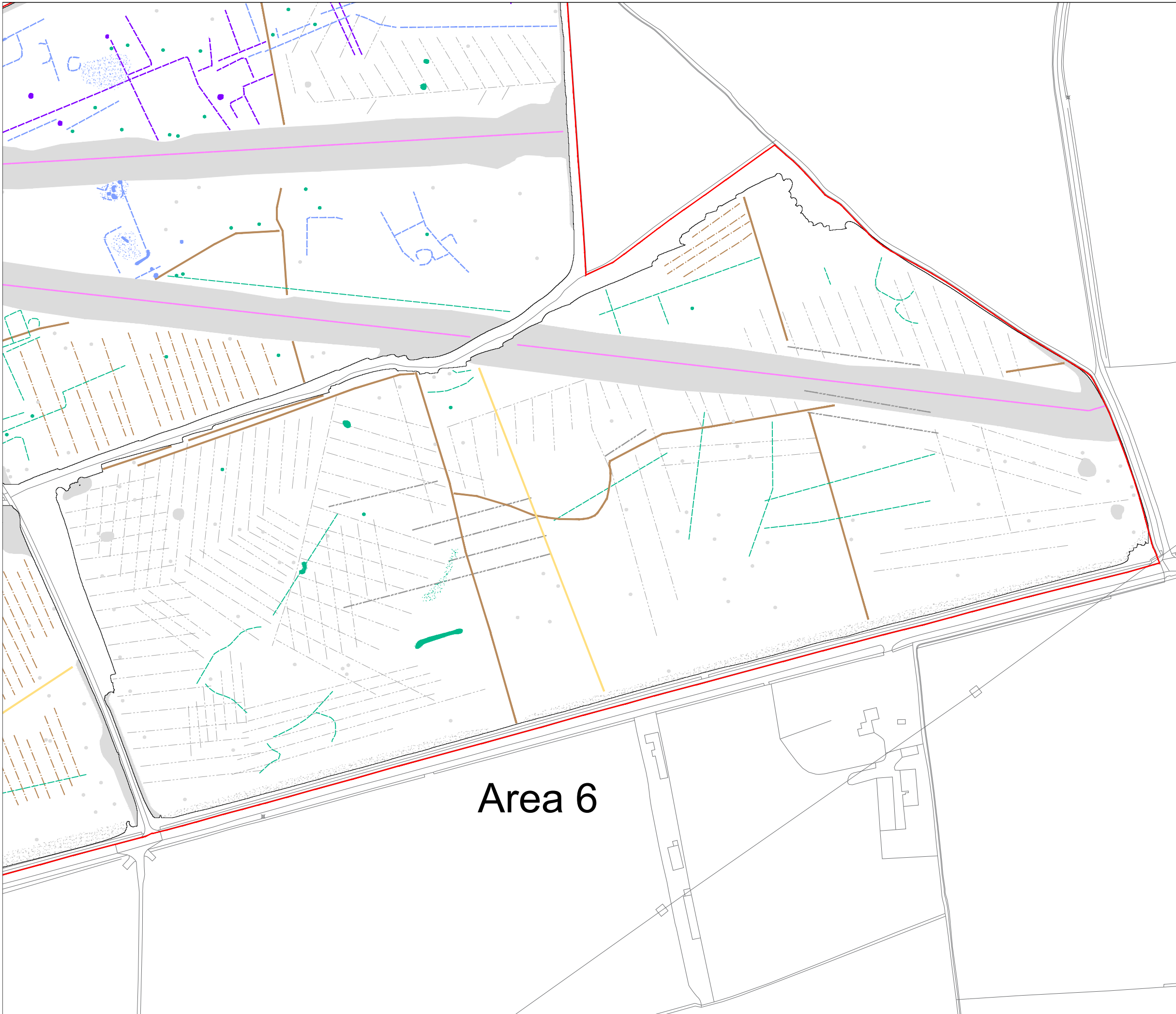
Title:  
Magnetometer Survey - Colour Plot (Area 6)

Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
0 metres 125  
1:2500 @ A3

Fig No:  
18



**KEY**

	Probable archaeology (discrete anomaly / trend / increased response)
	Possible archaeology (discrete anomaly / trend / increased response)
	Ridge and furrow
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (land drain)
	Magnetic disturbance
	Service
	Ferrous



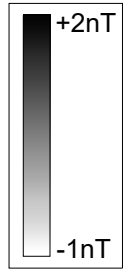
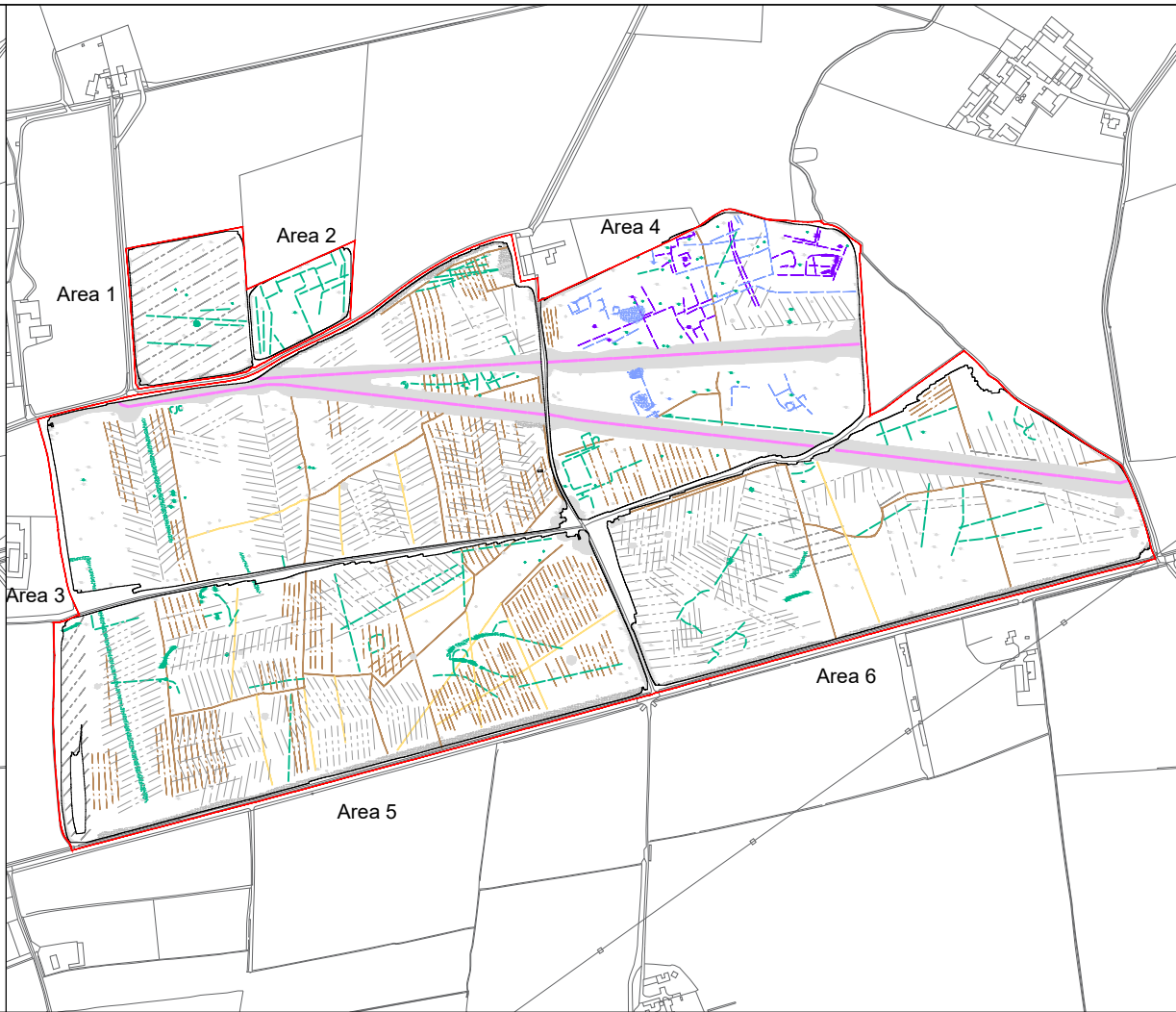
Title:  
Magnetometer Survey - Interpretation (Area 6)

Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
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1:2500 @ A3

Fig No:  
19



**KEY**

	Probable archaeology (discrete anomaly / trend / increased response)
	Possible archaeology (discrete anomaly / trend / increased response)
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Ridge and furrow
	Agriculture (land drain)
	Magnetic disturbance
	Service
	Ferrous

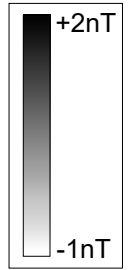
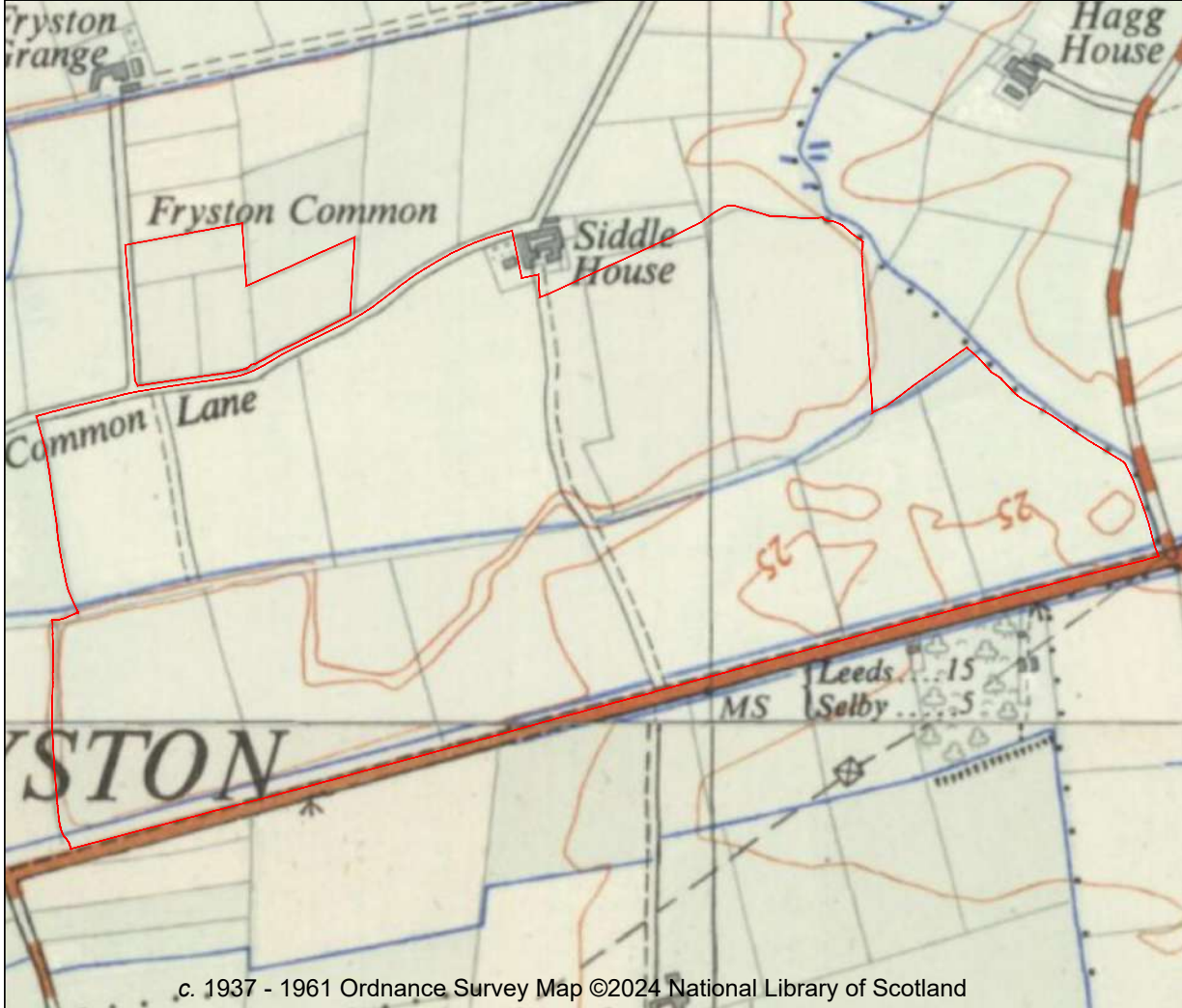
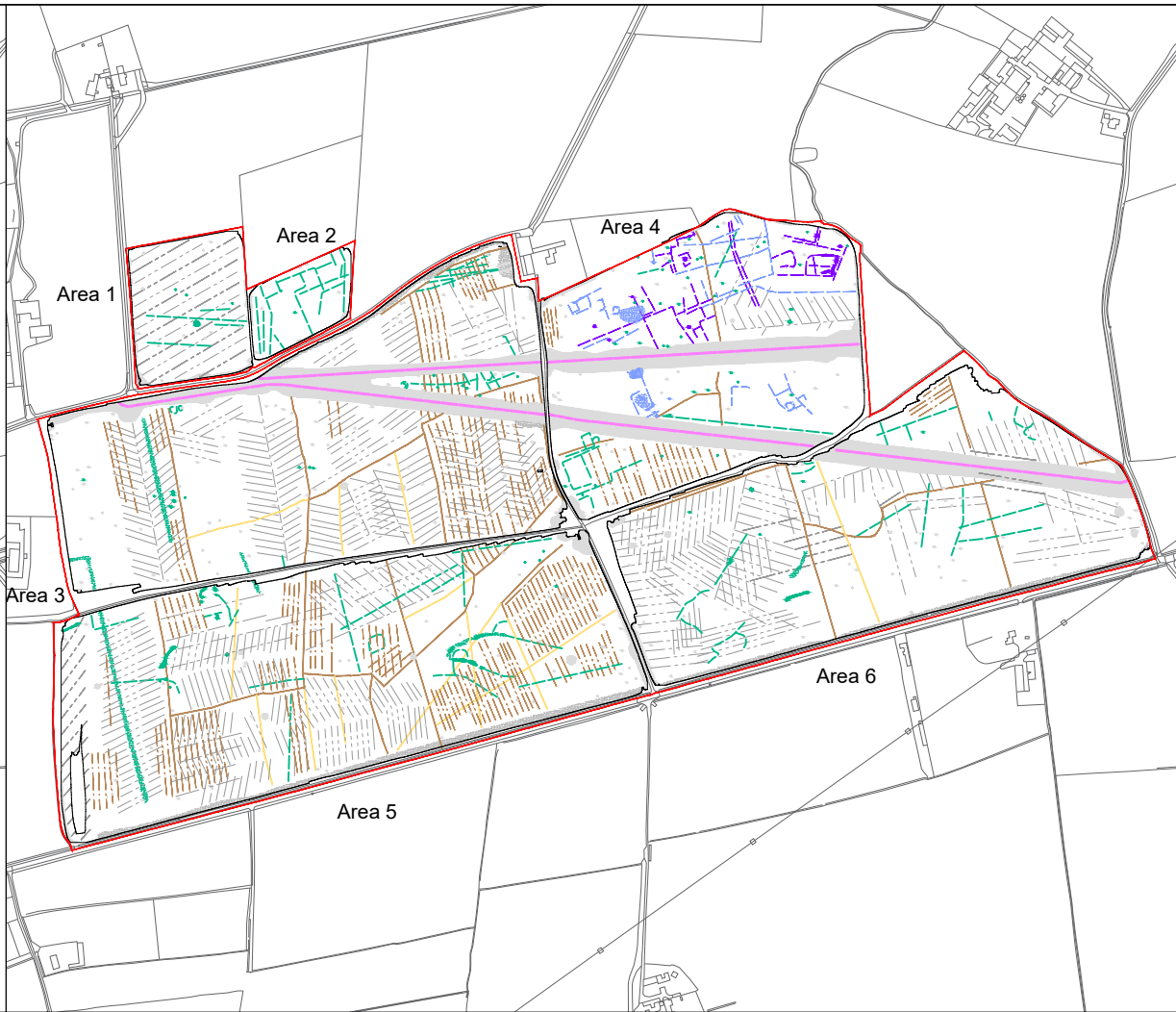


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Client: Island Green Power UK Limited

Project: 16614-2 - Light Valley Solar Project: Site 2

Scale: NOT TO SCALE Fig No: 20



**KEY**

	Probable archaeology (discrete anomaly / trend / increased response)
	Possible archaeology (discrete anomaly / trend / increased response)
	Ridge and furrow
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (land drain)
	Magnetic disturbance
	Service
	Ferrous

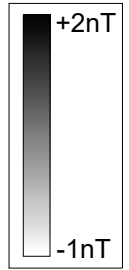
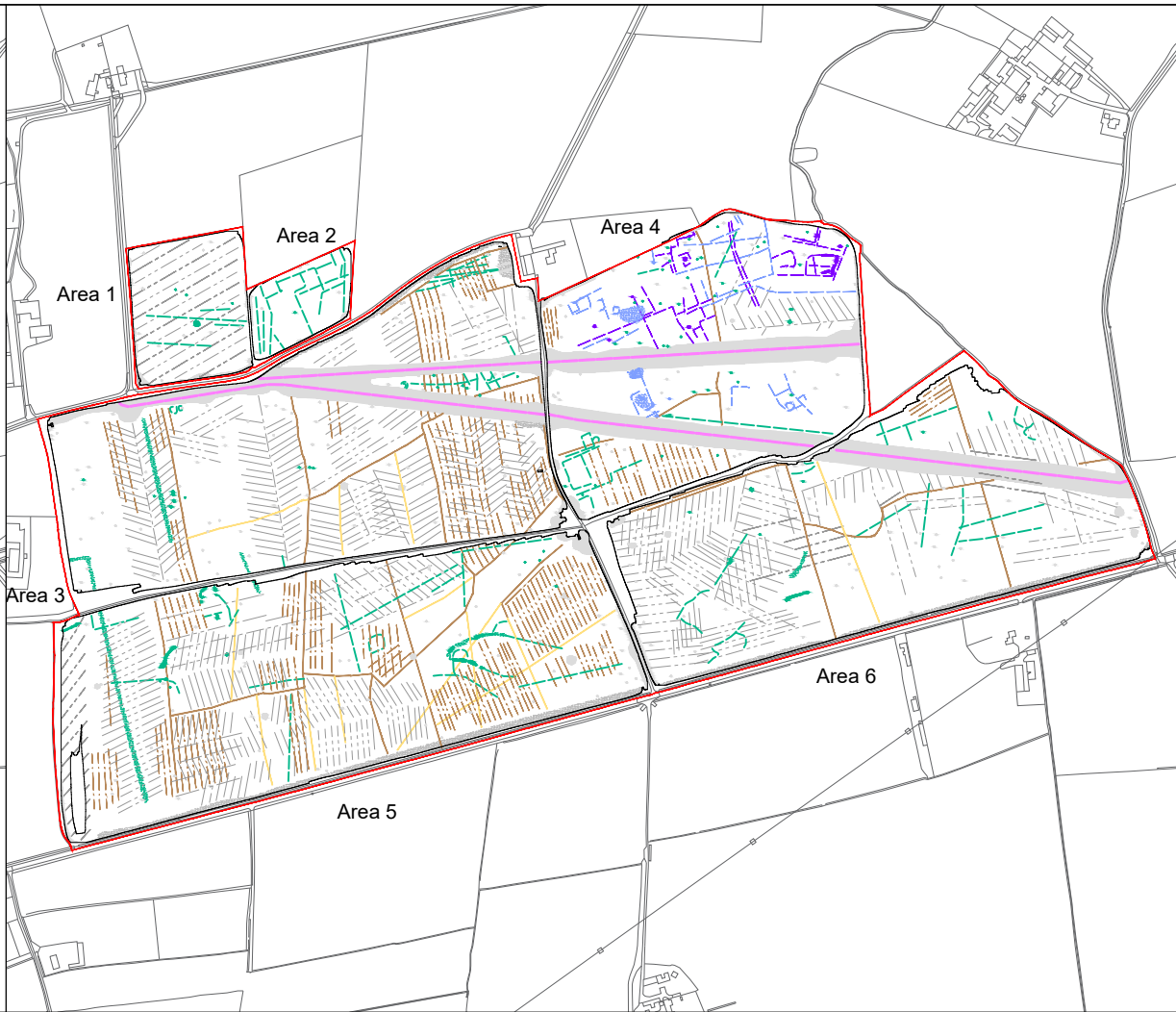


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Client: Island Green Power UK Limited

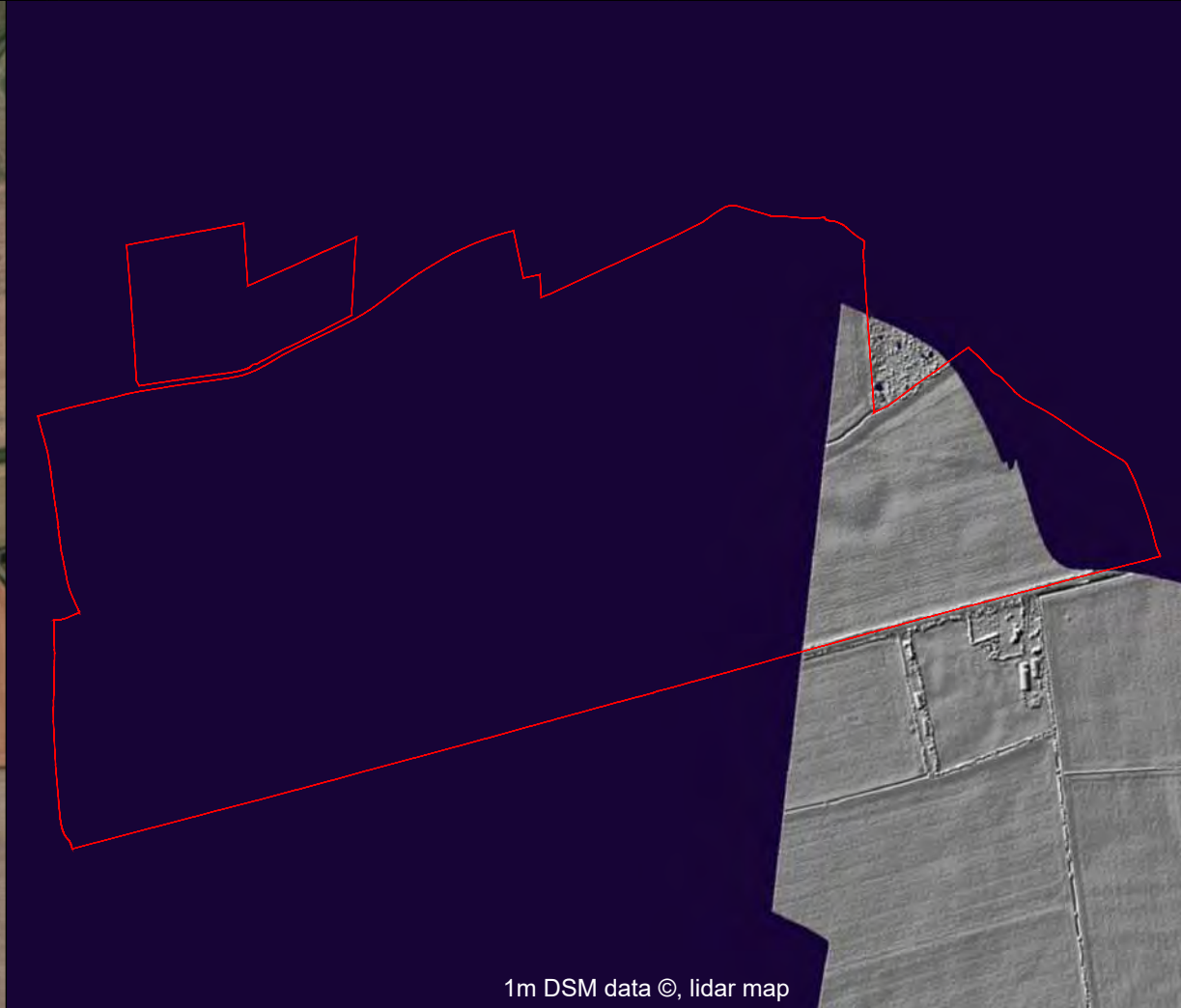
Project: 16614-2 - Light Valley Solar Project: Site 2

Scale: NOT TO SCALE Fig No: 21



**KEY**

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	Possible archaeology (discrete anomaly / trend / increased response)
	Ridge and furrow
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (land drain)
	Magnetic disturbance
	Service
	Ferrous



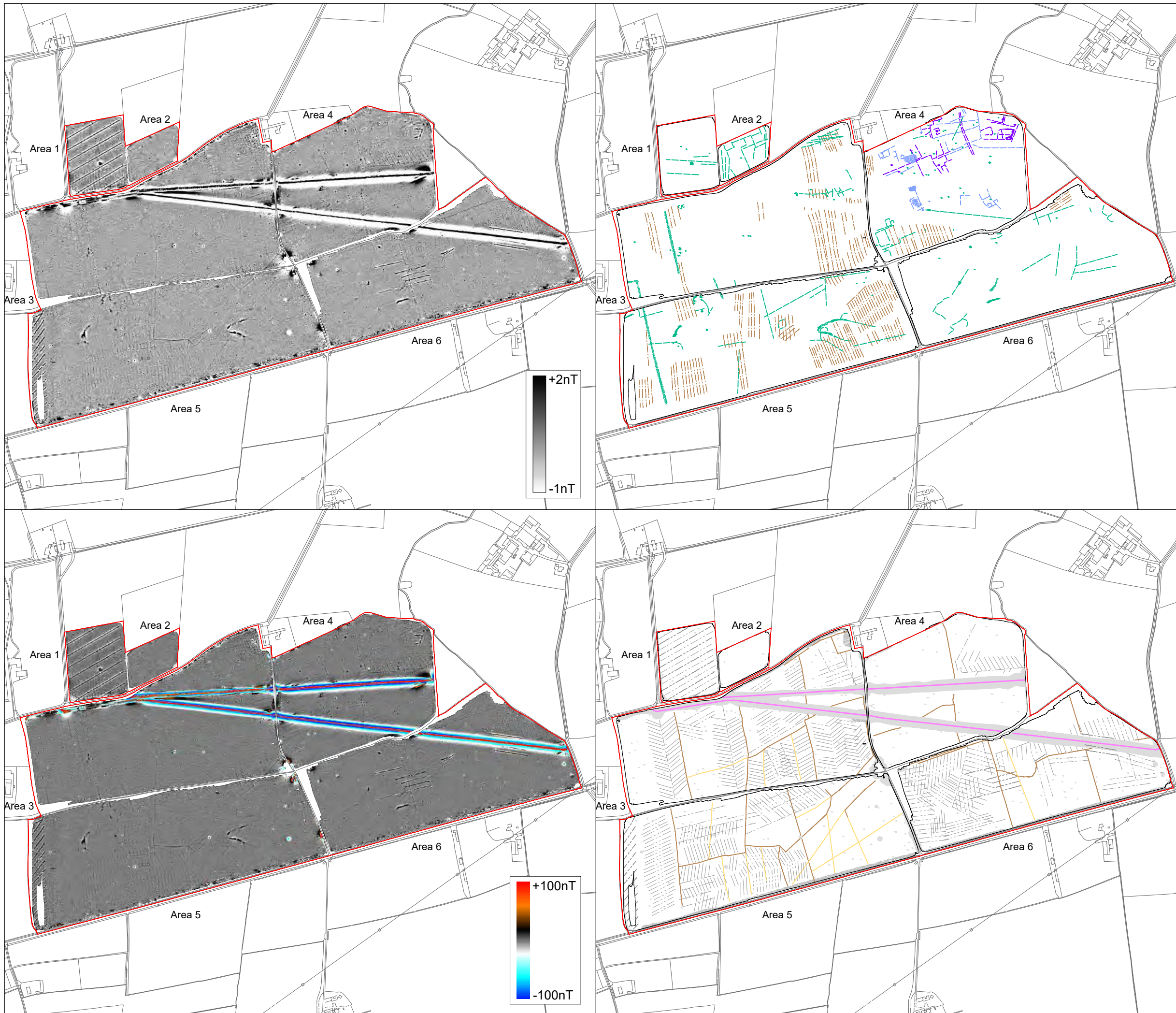
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Client: Island Green Power UK Limited

Project: 16614-2 - Light Valley Solar Project: Site 2

Scale: NOT TO SCALE

Fig No: 22

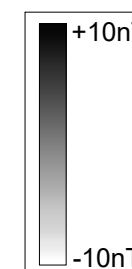
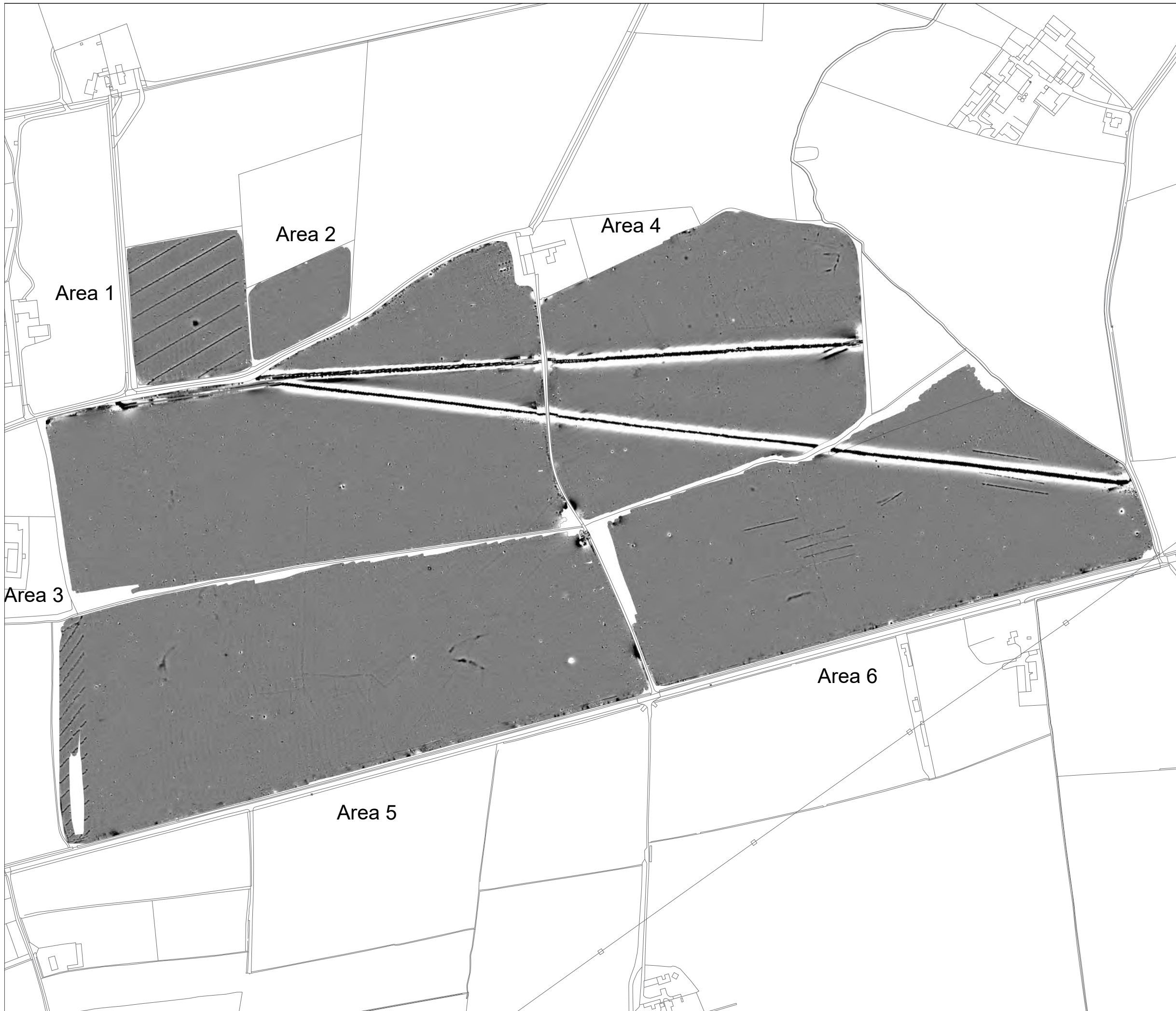


### KEY

	Probable archaeology (discrete anomaly / trend / increased response)
	Possible archaeology (discrete anomaly / trend / increased response)
	Ridge and furrow
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (land drain)
	Magnetic disturbance
	Service
	Ferrous



Title: Greyscale and Colour Plots / Interpretation	
Client: Island Green Power UK Limited	
Project: 16614-2 - Light Valley Solar Project: Site 2	
Scale: NOT TO SCALE	Fig No: 23



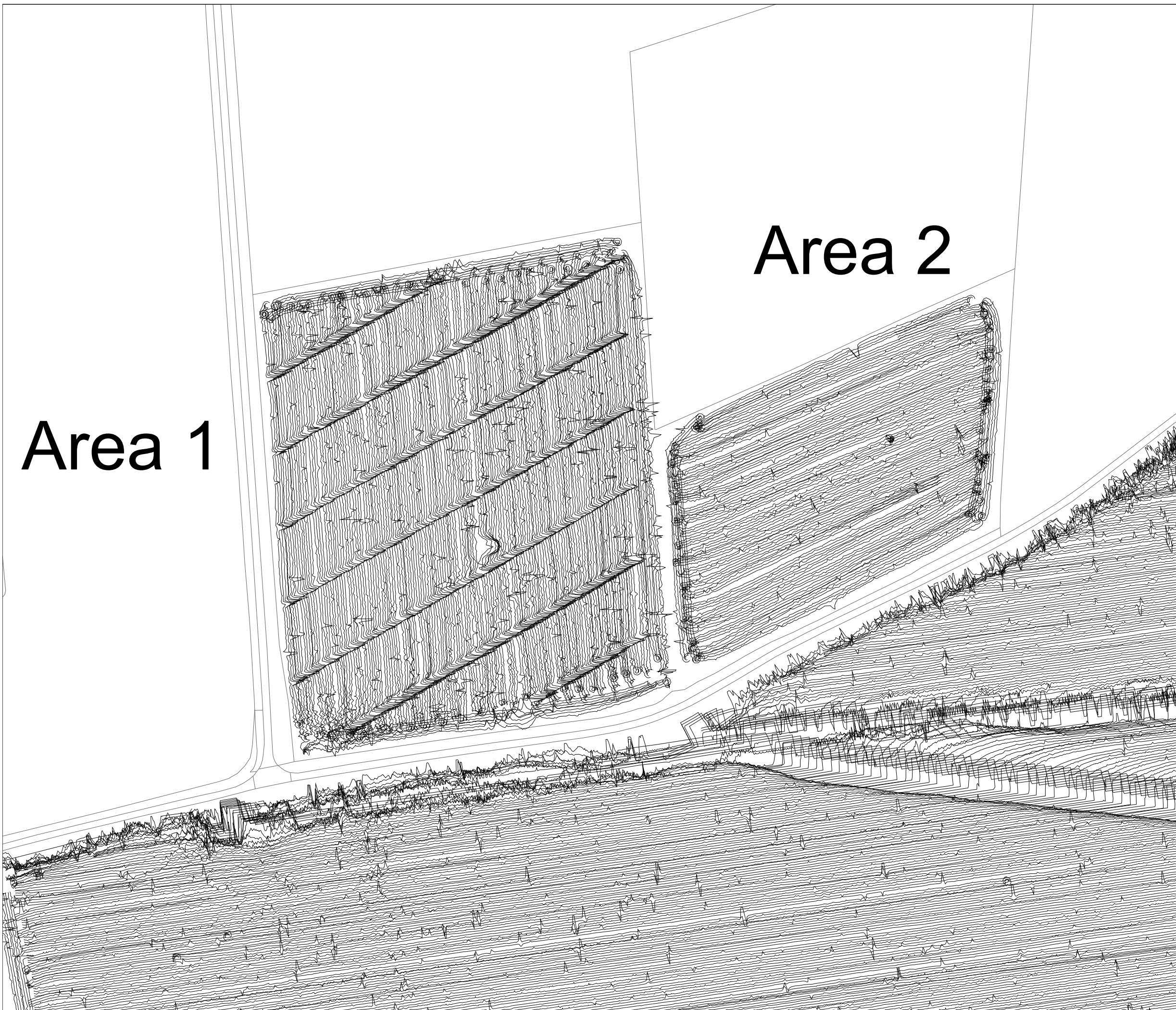
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Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
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Fig No:  
24



Area 1

Area 2



Title:  
XY Trace Plots (Areas 1 & 2 clipped at +/-15nT)

Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
0 metres 75  
1:1500 @ A3

Fig No:  
25



Area 1

Area 2

Area 3



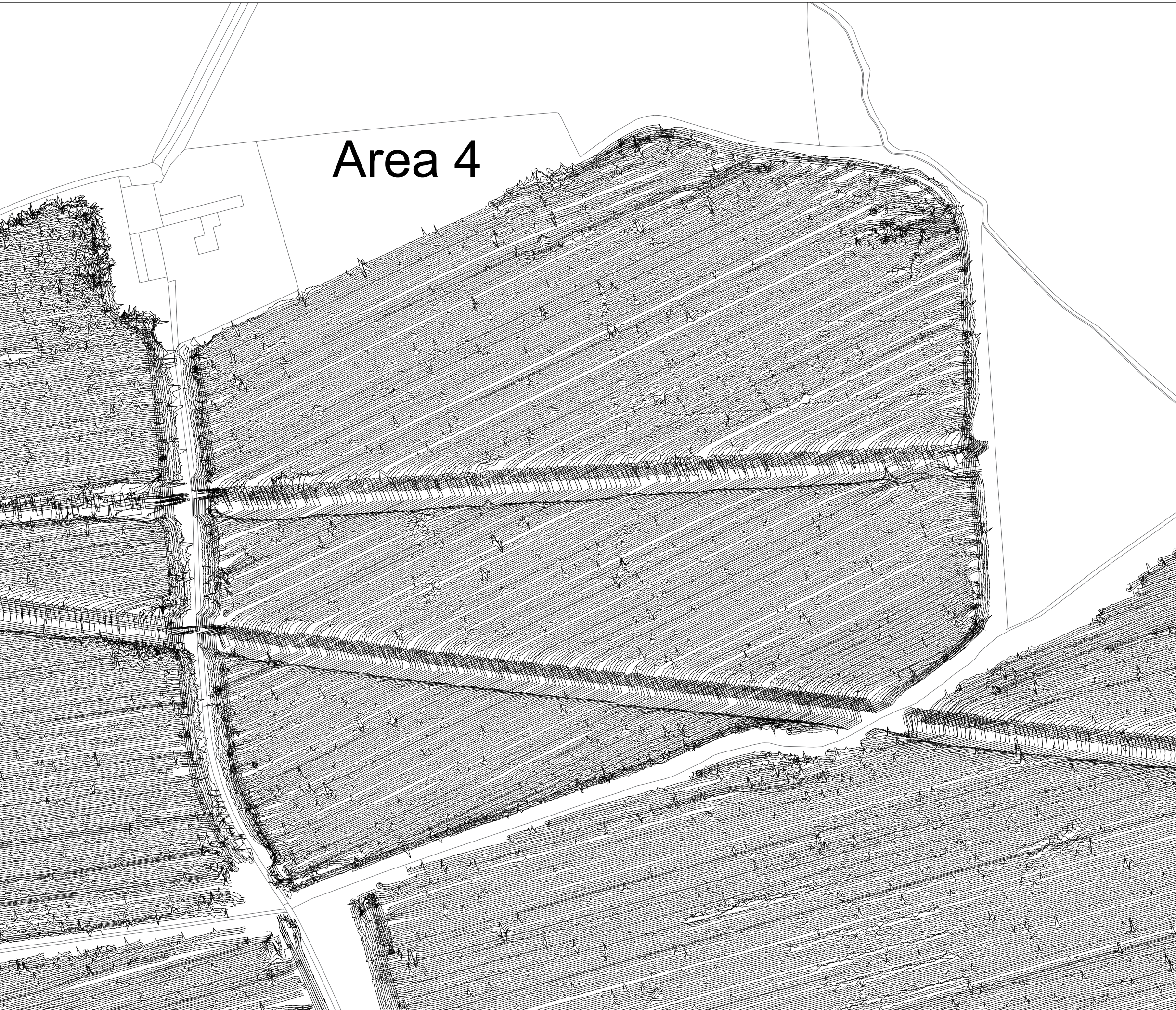
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XY Trace Plots (Area 3 clipped at +/-15nT)

Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
0 metres 125  
1:2500 @ A3

Fig No:  
26



# Area 4



Title:  
XY Trace Plots (Area 4 clipped at +/-15nT)

Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
0 metres 100  
1:2000 @ A3

Fig No:  
27



Area 3

Area 5



Title:  
XY Trace Plots (Area 5 clipped at +/-15nT)

Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale:  
0 metres 140  
1:2800 @ A3

Fig No:  
28



Area 6



Title:  
XY Trace Plots (Area 6 clipped at +/-15nT)

Client:  
Island Green Power UK Limited

Project:  
16614-2 - Light Valley Solar Project: Site 2

Scale: 0 metres 125  
1:2500 @ A3

Fig No:  
29

## Appendix A - Technical Information: Magnetometer Survey Method

### Grid Positioning

For hand held gradiometers the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS GPS system.

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. This results in an accuracy of around 0.01m.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1.0m	0.25m
Magnetometer	Bartington Cart System	1.0m	0.125m
Magnetometer	MACS Cart System (Foerster)	1.0m	0.125m

### Instrumentation:

Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted horizontally, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method, though strongly magnetic objects may be visible at greater depths.

### Bartington Grad 601-2

Hand-Held: Data will be collected using a Bartington Grad 601-2. The instrument consists of two paired sensors and readings are logged at 0.25m centres along traverses 1.0m apart across 30m grids. The collection of data at 0.25m centres provides an appropriate methodology balancing cost and time with resolution as per Historic England guidelines

### Bartington Cart System

Data will be collected using a cart carrying four paired Bartington magnetic sensors. Each data point is geographically referenced using an on-board Trimble RTK survey grade GPS system. Readings will be taken at 0.125m centres along traverses 1.0m apart.

### MACS Cart System (Foerster)

A multi-sensor array cart system (MACS) utilising 4 Foerster 4.032 Ferex CON 650 gradiometers, spaced at 1m intervals, with a control unit and data logger was used for the magnetic survey. Each data point is geographically referenced using an on-board RTK GNSS system. Readings will be taken at 0.125m centres along traverses 1.0m apart.

### Data Processing

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes striping effects and edge discontinuities over the whole of the data set.
Step Correction (De-stagger)	When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.

## Display

Greyscale/  
Colourscale Plot

This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly, all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.

## Interpretation Categories

In certain circumstances (usually when there is corroborative evidence from desk-based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, *Roman Road, Wall, etc.*) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the results.

<i>Archaeology / Probable Archaeology</i>	This term is used when the form, nature and pattern of the responses are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.
<i>Possible Archaeology</i>	These anomalies exhibit either weak signal strength and / or poor definition, or form incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.
<i>Industrial / Burnt-Fired</i>	Strong magnetic anomalies that, due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metal-working areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.
<i>Former Field Boundary (probable &amp; possible)</i>	Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions. Possible denotes less confidence where the anomaly may not be shown on historic mapping but nevertheless the anomaly displays all the characteristics of a field boundary.
<i>Ridge &amp; Furrow</i>	Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases, the response may be the result of more recent agricultural activity.
<i>Agriculture (ploughing)</i>	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
<i>Land Drain</i>	Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains may lead and empty into larger diameter pipes, which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.
<i>Natural</i>	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.
<i>Magnetic Disturbance</i>	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present.
<i>Service</i>	Magnetically strong anomalies, usually forming linear features are indicative of ferrous pipes/cables. Sometimes other materials (e.g. pvc) or the fill of the trench can cause weaker magnetic responses which can be identified from their uniform linearity.
<i>Ferrous</i>	This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern.

Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.

*Uncertain Origin*

Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of *Possible Archaeology / Natural* or (in the case of linear responses) *Possible Archaeology / Agriculture*; occasionally they are simply of an unusual form.

Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

## Appendix B - Technical Information: Magnetic Theory

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.1 nanoTeslas (nT) in an overall field strength of 48,000 (nT), can be accurately detected.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns; material such as brick and tile may be magnetised through the same process.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried feature. The difference between the two sensors will relate to the strength of a magnetic field created by this feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity and disturbance from modern services.

## Appendix C - OASIS Summary

<b>OASIS ID (UID)</b>	sumogeop1-529783
<b>Project Name</b>	Geophysical Survey, Magnetometry Survey at Light Valley Solar Project: Site 2
<b>Sitename</b>	Light Valley Solar Project: Site 2
<b>Sitecode</b>	16614-2
<b>Project Identifier(s)</b>	SUMO-16614-2 Light Valley Solar Project: Site 2
<b>Activity type</b>	Geophysical Survey, Magnetometry Survey, MAGNETOMETRY SURVEY
<b>Planning Id</b>	
<b>Reason For Investigation</b>	Planning requirement
<b>Organisation Responsible for work</b>	SUMO Geophysics Ltd.
<b>Project Dates</b>	29-Jul-2024 - 12-Sep-2024
<b>Location</b>	<p><b>Light Valley Solar Project: Site 2</b></p> <p>NGR: SE 52799 30285  LL: 53.76624942582038, -1.200501630895012  12 Fig: 452799,430285</p> <p>NGR: SE 52350 30579  LL: 53.76893225715847, -1.207255892684032  12 Fig: 452350,430579</p>
<b>Administrative Areas</b>	<p>Country: England</p> <p>County/Local Authority: North Yorkshire</p> <p>Local Authority District: North Yorkshire</p> <p>Parish: Hambleton</p> <p>Parish: Monk Fryston</p>
<b>Project Methodology</b>	A temporary grid system was established over the site and marked out using canes. The location of the grid was set out using an RTK GPS system theoretically accurate to some 0.01m and referenced to

	<p>OS co-ordinates. Data was collected using a cart carrying four paired Bartington magnetic sensors. Four sensors mounted 1m horizontally apart and very accurately aligned to nullify the effects of the earth's magnetic field. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background. Each data point is geographically referenced using an on-board Trimble RTK survey grade GPS system. Readings were taken at 0.125m centres along traverses 1.0m apart. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background.</p>
<b>Project Results</b>	<p>The magnetometer survey has recorded magnetic responses that have been interpreted as being of archaeological interest. In Area 4 a series of enclosures, pits, a trackway and a probable ring-ditch have been detected. They likely represent small farmsteads and wider scale landscape divisions. Ridge and furrow cultivation has also been plotted in Areas 3, 4, 5 and 6. Numerous responses of uncertain origin are visible across the data and while archaeological origins cannot be discounted for all these responses, the majority have probably been caused by natural and agricultural processes. Former field boundaries, land drains and two service pipes have also been marked in the survey. Ferrous responses in the north-east of Area 3 have been caused by the foundations of a former building, while zones of magnetic disturbance are due to spreads of modern debris or made ground.</p>
<b>Keywords</b>	<p>Ditched Enclosure - UNCERTAIN - FISH Thesaurus of Monument Types  Pit - UNCERTAIN - FISH Thesaurus of Monument Types  Ditch - UNCERTAIN - FISH Thesaurus of Monument Types  Ring Ditch - UNCERTAIN - FISH Thesaurus of Monument Types  Ridge And Furrow - MEDIEVAL - FISH Thesaurus of Monument Types  Field Boundary - POST MEDIEVAL - FISH Thesaurus of Monument Types  Drain - 20TH CENTURY - FISH Thesaurus of Monument Types  Pipeline - 20TH CENTURY - FISH Thesaurus of Monument Types</p>
<b>Funder</b>	<p>Private or public corporation Island Green Power UK Limited</p>
<b>HER</b>	<p>North Yorkshire HER - unRev - STANDARD</p>

<b>Person Responsible for work</b>	Thomas Cockcroft
<b>HER Identifiers</b>	
<b>Archives</b>	

Report generated on: 27-11-2024:1552

## Appendix D – Data Management Plan & Archive Selection Strategy

### Data Management Plan

Project ID / OASIS ID

16614-2 / sumogeop1-529783

Project Name

Light Valley Solar Project: Site 2

Project Description

A magnetometer survey of 83 hectares of land at Site 2 of the Light Valley Solar Project

Client

Island Green Power UK Limited

Project Manager

Thomas Cockcroft

Field Leader

Simon Lobel / Liam Brice-Bateman

Date DMP created

26.03.2024

Date DMP last updated

27.11.2024

Version

2

Technique - data

Detailed magnetic survey.

Manual – cart - other

ATV/Cart magnetometers

Documentation and metadata

All documentation and data produced are stored on SUMO servers in a specific job file.

Data storage, access and back-up

- SUMO Secure server during the project life set up in a RAID configuration (a RAID configuration incorporates a level of data redundancy meaning if a single hard drive in fails data can still be restored).

- Snap shots of the data will be made at several intervals during the day to allow data to be restored for up to 30 days if changed / deleted.
- Once the final report has been completed data will be moved onto NAS drive set up in a RAID configuration.
- All data is backed up to an off-site location (Cloud storage).

## **Archive Selection Strategy**

### **Digital Data**

#### Selection

It is proposed that only the final version of all born digital documents (reports, images and CAD files) will be selected for inclusion in the Preserved Archive. All raw and processed survey data will be included in the preserved archive. Below is what will constitute the selected archive:

- Raw data in XYZ format .csv and .png plus .pgw world file
- Processed data as .png plus .pgw world file
- Final survey report .pdf
- CAD and Vector graphics (interpretations) in .dwg format

#### De-selected digital data

The de-selected material will be retained on the SUMO Secure server and Cloud storage.

### **Documents**

Not applicable – no archive

### **Materials**

Not applicable – no archive



- Archaeological Geophysics
- Engineering Geophysics
- Measured Building Services
- Utility and Topographic Services
- Aerial Surveys
- Rail Surveys

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SUMO Services Ltd, incorporated under the laws of England and Wales,  
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**Solar**

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