GEOPHYSICAL SURVEY REPORT

STRATASCAN™

SUMO Survey Services
SUMO Group Member

Project name:

Winter Woods Farm, Bedfordshire

Client:

Orion Heritage

November 2015

Job ref:

J8959

Report author:

Rebecca Davies BSc (Hons)

GEOPHYSICAL SURVEY REPORT

Project name:
Winter Woods Farm, Bedfordshire
Client:
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J8959

Techniques:
Detailed magnetic survey – Gradiometry

Survey date:
19th-30th October & 2nd November 2015

Site centred at:
SP 952 382

Post code:
MK17 8BS

Field team:
Richard Collins BA (Hons), **Thomas Hynd** BSc (Hons), **Sonia Kostrzewska** MA

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Checked by:
David Elks MSc ACIfA

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1 SUMMARY OF RESULTS

A detailed gradiometry survey was conducted over approximately 50 hectares of agricultural land. Areas of settlement activity have been identified through a series of linear anomalies and former pits, with further linear anomalies and discrete anomalies being of possible archaeological origin. Former field boundaries and areas of ridge and furrow cultivation indicate that the site has been used for agricultural purposes since the medieval period, supporting information from the desk-based assessment. The remaining features are natural or modern in origin and include areas of natural magnetic variation, land drains, scattered magnetic debris, a track-way, and magnetic disturbance from nearby ferrous objects.

2 INTRODUCTION

2.1 *Background synopsis*

Stratascan were commissioned to undertake a geophysical survey of an area outlined for development. This survey forms part of an archaeological investigation being undertaken by Orion Heritage.

2.2 *Site location*

The site is located to the east of Milton Keynes, Bedfordshire and is centred at OS ref. SP 952 382. The site lies to the north of the M1 and west of the A421 and is bound by agricultural land on all sides.

2.3 *Description of site*

The survey area is approximately 52 hectares of agricultural land, sloping gently downwards from the north-east to the south. The site is largely unobstructed, aside from Field 5 which could not be surveyed due to overgrown vegetation, and an area of Field 4 which could not be surveyed as a result of farm buildings and machinery. This has reduced the total area surveyed to 50 hectares.

2.4 *Geology and soils*

The underlying geology across the majority of the site comprises mudstone of Weymouth Member, with the geology across the southern edge of the site comprising mudstone of Oxford Clay Formation (British Geological Survey website). Drift geology comprising Glaciofluvial Deposits of sand and gravel is recorded across the north of the site (Fields 1 & 2) with an area of Oadby Member Diamicton recorded in the west of Field 3. Deposits of Head – clay, silt, sand and gravel are also recorded along the western edge of Field 3 (British Geological Survey website).

The overlying soils across the north, west, and east of the site are known as Hanslope which are typical calcareous pelosols. The soils across the south of the site are known as Bishampton

2, which are typical stagnogleyic argillic brown earths. The Hanslope soils consist of slowly permeable calcareous clayey soils, while the Bishampton 2 soils consist of deep, fine, loamy and fine loamy over clayey soils (Soil Survey of England and Wales, Sheet 6 South East England).

2.5 Site history and archaeological potential

Extract(s) from "Land at Winter Woods, Salford Road, Brogborough – Archaeological Desk-Based Assessment" (CgMs Consulting, 2015):

"Archaeological investigation ahead of the construction of the A421 to the east and south east of the site have revealed a late Iron Age settlement and field system c. 200m to the east of the study site (9599, 12938 & 12939). A second possible late Iron Age farmstead/activity site has been recorded c. 700m to the south east of the study site (19550). There is a general lack of recorded prehistoric remains within the study area. However, the A421 archaeological excavations have revealed that the area was occupied in the late Iron Age. There has been a lack of archaeological investigation within the rest of the study area so the lack of prehistoric remains may not be a true representation of the potential for prehistoric remains within the area. However, there is no evidence that specifically indicates that the study site contains prehistoric remains. Consequently, it is considered to have a low/moderate potential for prehistoric remains.

The only Roman remains recorded within the study area is the finding of c. 200 sherds of Roman pottery and iron and lead fragments c. 700m to the east of the study site. The lack of Roman remains recorded within the study area, despite the large scale archaeological investigations along the line of the A421, indicate that the lack of Roman remains may be a real pattern. Therefore, it would appear that there is a genuine lack of Roman remains within the study area. Consequently, the study site is considered to have low potential for Roman remains.

The earthworks of a possible occupation site have been recorded toward the north western corner of the site (15059). While these earthworks were visible on aerial photographs into the 1970s and early 1980s, the area has been subject to ploughing in recent years and traces of these earthworks are hard to see on the ground. Other medieval remains recorded within the site are two rings (18582 & 18607) and a brooch (18593).The site lies to the east and south east of Hulcote deserted medieval village (DMV) (774), its church (St Nicholas) (1077) and churchyard (8910), Hulcote Manor (28) and associated fishpond complex (3423).

Due to the presence of the earthworks in the north western part of the site, this area of the site is considered to have high potential for medieval remains. There is no evidence for further such domestic remains elsewhere within the site. Consequently, the majority of the site is considered to have low potential for medieval remains although agricultural remains could be present."

2.6 *Survey objectives*

The objective of the survey was to locate any features of possible archaeological origin in order that they may be assessed prior to development.

2.7 *Survey methods*

This report and all fieldwork have been conducted in accordance with both the English Heritage guidelines outlined in the document: *Geophysical Survey in Archaeological Field Evaluation, 2008* and with the Chartered Institute for Archaeologists document *Standard and Guidance for Archaeological Geophysical Survey.*

Due to the moderate potential for prehistoric and medieval remains, detailed magnetic survey (gradiometry) was used as an efficient and effective method of locating archaeological anomalies. More information regarding this technique is included in Appendix A.

2.8 *Processing, presentation and interpretation of results*

2.8.1 *Processing*

Processing is performed using specialist software. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following schedule shows the basic processing carried out on all minimally processed gradiometer data used in this report:

1. *Destripe* (Removes striping effects caused by zero-point discrepancies between different sensors and walking directions)
2. *Destagger* (Removes zigzag effects caused by inconsistent walking speeds on sloping, uneven or overgrown terrain)

2.8.2 *Presentation of results and interpretation*

The presentation of the data for each site involves a print-out of the minimally processed data both as a greyscale plot and a colour plot showing extreme magnetic values. Magnetic anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing for the site.

3 RESULTS

The detailed magnetic gradiometer survey conducted at Winter Woods Farm has identified a number of anomalies that have been characterised as being either of a *probable* or *possible* archaeological origin.

The difference between *probable* and *possible* archaeological origin is a confidence rating. Features identified within the dataset that form recognisable archaeological patterns or seem to be related to a deliberate historical act have been interpreted as being of a probable archaeological origin.

Features of possible archaeological origin tend to be more amorphous anomalies which may have similar magnetic attributes in terms of strength or polarity but are difficult to classify as being archaeological or natural.

The following list of numbered anomalies refers to numerical labels on the interpretation plots.

3.1 Probable Archaeology

1-2 A number of positive linear anomalies in the north-west and east of the site (Fields 1 and 4). These are indicative of former cut features, such as ditches, of archaeological origin. These are likely representative of areas of settlement activity and are associated with Anomalies 3, 4 & 5.

3-4 A small number of discrete positive anomalies in the north-west and east of the site (Fields 1 & 4). These are indicative of former cut features of archaeological origin, such as backfilled pits that are likely related to settlement activity associated with Anomalies 1, 2 and 5.

5 A positive area anomaly in the north-west of the site (Field 1). This is likely to be of archaeological origin and is associated with the settlement activity of Anomalies 1 & 3.

3.2 Possible Archaeology

6 A number of positive linear anomalies across the site (Fields 1 & 4). These are indicative of former cut features of possible archaeological origin, however they may also be related to agricultural activity on the site.

Anomaly 6a is associated with the negative linear feature (Anomaly 7) and may be indicative of a banked ditch of possible archaeological origin.

7 A negative linear anomaly and associated positive anomaly (Anomaly 6a) in the north-west of the site (Field 1). This is indicative of a banked ditch of possible archaeological origin, though its exact origin is unknown.

8 A number of small discrete positive anomalies across the site (Fields 1 & 4). These are indicative of small former cut features, such as backfilled pits, and may be of archaeological or natural origin.

9 Areas of magnetic disturbance in the north of the site (Fields 1 & 2). These may be associated with medieval earthworks that are recorded in this area (HER No. 15059), though their exact origin is unknown.

3.3 Medieval/Post-Medieval Agriculture

10 A number of widely spaced, slightly curved, parallel linear anomalies across the site. These are related to ridge and furrow cultivation.

11 A number of closely spaced parallel linear anomalies across the site. These are related to modern agricultural activity, such as ploughing.

12-22 A number of linear anomalies across the site (Fields 1, 3 & 4). These are related to former field boundaries present on available OS mapping. Anomalies 12-21 are visible from 1883-1995 and Anomaly 22 is visible from 1901-1995.

23 Areas of weak scattered magnetic debris across the site (Fields 1, 3 & 4). These are likely to be associated with the former field boundaries that are present on available OS mapping (Anomalies 11-20).

24-29 A small number of positive linear anomalies in the south and east of the site (Fields 2, 3 & 4). These are likely to be related to former field boundaries that are not present on available mapping.

3.4 Other Anomalies

30 Parallel positive linear anomalies in the north-west of the site (Field 1). These are related to a former trackway that is present on available OS mapping from 1883-1995.

31 A number of weak bipolar linear anomalies across the site (Fields 1, 2 & 4). These are likely to be related to land drains.

32 Areas of amorphous magnetic variation across the site. These are likely to be natural, i.e. geological, in origin

33 Areas of scattered magnetic debris in the north-west and centre of the site (Fields 1 & 4). These are likely to be modern in origin.

34 Areas of magnetic disturbance are the result of substantial nearby ferrous metal objects such as fences and underground services. These effects can mask weaker archaeological anomalies, but on this site have not affected a significant proportion of the area.

35 A number of magnetic 'spikes' (strong focussed values with associated antipolar response) indicate ferrous metal objects. These are likely to be modern rubbish.

4 DATA APPRAISAL & CONFIDENCE ASSESSMENT

Mudstone geologies, such as Oxford Clay Formation and Weymouth Member can give variable results for gradiometer survey, however superficial deposits of sand and gravel, and Oadby Member diamicton provide good results for magnetic survey. The data across the north of the site displays a higher contrast between magnetic anomalies when compared to the data across the south of the site. Despite this, archaeological anomalies have been identified across the whole site, along with field boundaries and evidence of medieval agricultural activity, suggesting that the survey has been effective.

5 CONCLUSION

The survey at Winter Woods Farm, Bedfordshire has identified a number of anomalies of probable and possible archaeological origin. Linear anomalies and former pits have been identified and are indicative of areas of former settlement activity. This supports information from the desk-based assessment of the site having a low/moderate potential for prehistoric remains, and a high potential for medieval remains. Further linear anomalies and small discrete anomalies have been identified and may be of archaeological origin, though their exact origin cannot be determined with confidence. Large areas of ridge and furrow cultivation and numerous former field boundaries indicate that the site has been used for agricultural purposes since the medieval period, again supporting information from the desk-based assessment which indicates that medieval agricultural remains may be present on the site.

The remaining features are natural or modern in origin and include large areas of natural magnetic variation, a track-way, land drains, evidence of ploughing, areas of scattered magnetic debris, and magnetic disturbance from nearby ferrous metal objects such as fencing.

6 REFERENCES

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APPENDIX A – METHODOLOGY & SURVEY EQUIPMENT

Grid locations

The location of the survey grids has been plotted together with the referencing information. Grids were set out using a Leica 705auto Total Station and referenced to suitable topographic features around the perimeter of the site or a Leica Smart Rover RTK GPS.

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. A SmartNet RTK GPS uses Ordnance Survey's network of over 100 fixed base stations to give an accuracy of around 0.01m.

Survey equipment and gradiometer configuration

Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTeslas (nT) in an overall field strength of 48,000nT, can be accurately detected using an appropriate instrument.

The mapping of the anomaly in a systematic manner will allow an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies such as pits and ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil.

To illustrate this point, the cutting and subsequent silting or backfilling of a ditch may result in a larger volume of weakly magnetic material being accumulated in the trench compared to the undisturbed subsoil. A weak magnetic anomaly should therefore appear in plan along the line of the ditch.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. The instrument consists of two fluxgates 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. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame. Each gradiometer has a 1m separation between the sensing elements so enhancing the response to weak anomalies.

Sampling interval

Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid.

Depth of scan and resolution

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m, though strongly magnetic objects may be visible at greater depths. The collection of data at 0.25m centres provides an optimum methodology for the task balancing cost and time with resolution.

Data capture

The readings are logged consecutively into the data logger which in turn is daily down- loaded into a portable computer whilst on site. At the end of each site survey, data is transferred to the office for processing and presentation.

APPENDIX B – BASIC PRINCIPLES OF MAGNETIC SURVEY

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.

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 and material such as brick and tile may be magnetised through the same process.

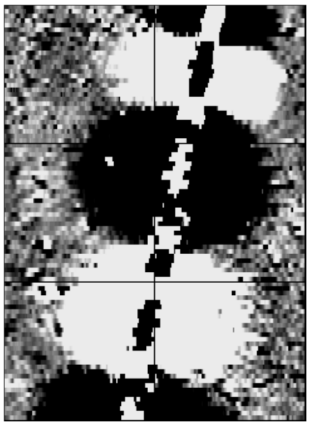
Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement 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 field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried 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, disturbance from modern services etc.

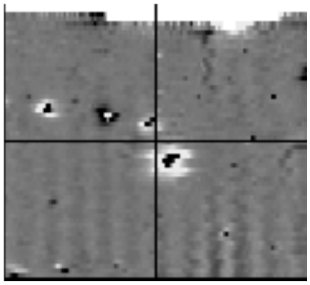
APPENDIX C – GLOSSARY OF MAGNETIC ANOMALIES

Bipolar



A bipolar anomaly is one that is composed of both a positive response and a negative response. It can be made up of any number of positive responses and negative responses. For example a pipeline consisting of alternating positive and negative anomalies is said to be bipolar. See also dipolar which has only one area of each polarity. The interpretation of the anomaly will depend on the magnitude of the magnetic field strength. A weak response may be caused by a clay field drain while a strong response will probably be caused by a metallic service.

Dipolar

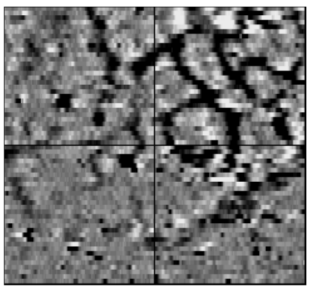


This consists of a single positive anomaly with an associated negative response. There should be no separation between the two polarities of response. These responses will be created by a single feature. The interpretation of the anomaly will depend on the magnitude of the magnetic measurements. A very strong anomaly is likely to be caused by a ferrous object.

Positive anomaly with associated negative response

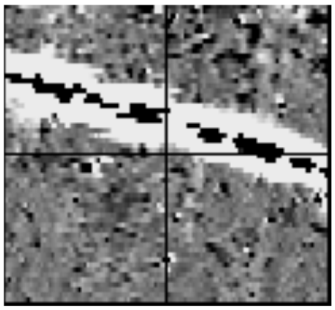
See bipolar and dipolar.

Positive linear



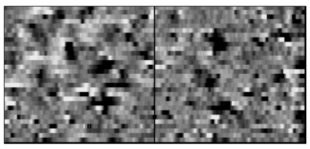
A linear response which is entirely positive in polarity. These are usually related to in-filled cut features where the fill material is magnetically enhanced compared to the surrounding matrix. They can be caused by ditches of an archaeological origin, but also former field boundaries, ploughing activity and some may even have a natural origin.

Positive linear anomaly with associated negative response



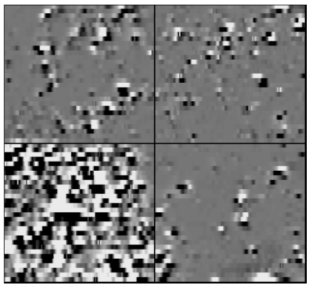
A positive linear anomaly which has a negative anomaly located adjacently. This will be caused by a single feature. In the example shown this is likely to be a single length of wire/cable probably relating to a modern service. Magnetically weaker responses may relate to earthwork style features and field boundaries.

Positive point/area



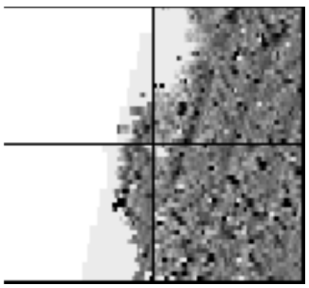
These are generally spatially small responses, perhaps covering just 3 or 4 reading nodes. They are entirely positive in polarity. Similar to positive linear anomalies they are generally caused by in-filled cut features. These include pits of an archaeological origin, possible tree bowls or other naturally occurring depressions in the ground.

Magnetic debris



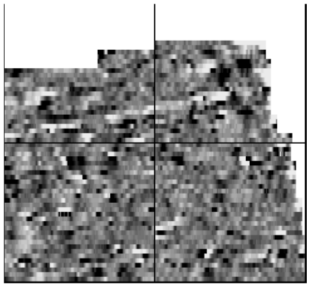
Magnetic debris consists of numerous dipolar responses spread over an area. If the amplitude of response is low (+/-3nT) then the origin is likely to represent general ground disturbance with no clear cause, it may be related to something as simple as an area of dug or mixed earth. A stronger anomaly (+/-250nT) is more indicative of a spread of ferrous debris. Moderately strong anomalies may be the result of a spread of thermoremanent material such as bricks or ash.

Magnetic disturbance



Magnetic disturbance is high amplitude and can be composed of either a bipolar anomaly, or a single polarity response. It is essentially associated with magnetic interference from modern ferrous structures such as fencing, vehicles or buildings, and as a result is commonly found around the perimeter of a site near to boundary fences.

Negative linear

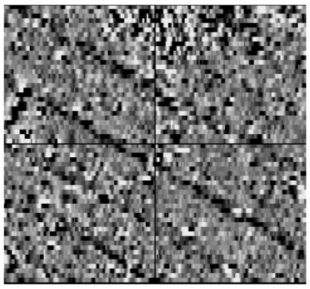


A linear response which is entirely negative in polarity. These are generally caused by earthen banks where material with a lower magnetic magnitude relative to the background top soil is built up. See also ploughing activity.

Negative point/area

Opposite to positive point anomalies these responses may be caused by raised areas or earthen banks. These could be of an archaeological origin or may have a natural origin.

Ploughing activity



Ploughing activity can often be visualised by a series of parallel linear anomalies. These can be of either positive polarity or negative polarity depending on site specifics. It can be difficult to distinguish between ancient ploughing and more modern ploughing. Clues such as the separation of each linear, straightness, strength of response and cross cutting relationships can be used to aid this, although none of these can be guaranteed to differentiate between different phases of activity.

Polarity

Term used to describe the measurement of the magnetic response. An anomaly can have a positive polarity (values above 0nT) and/or a negative polarity (values below 0nT).

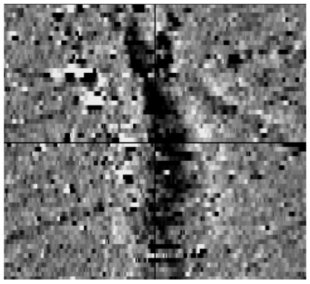
Strength of response

The amplitude of a magnetic response is an important factor in assigning an interpretation to a particular anomaly. For example a positive anomaly covering a 10m^2 area may have values up to around 3000nT, in which case it is likely to be caused by modern magnetic interference. However, the same size and shaped anomaly but with values up to only 4nT may have a natural origin. Colour plots are used to show the amplitude of response.

Thermoremanent response

A feature which has been subject to heat may result in it acquiring a magnetic field. This can be anything up to approximately +/-100 nT in value. These features include clay fired drains, brick, bonfires, kilns, hearths and even pottery. If the heat application has occurred in situ (e.g. a kiln) then the response is likely to be bipolar compared to if the heated objects have been disturbed and moved relative to each other, in which case they are more likely to take an irregular form and may display a debris style response (e.g. ash).

Weak background variations



Weakly magnetic wide scale variations within the data can sometimes be seen within sites. These usually have no specific structure but can often appear curvy and sinuous in form. They are likely to be the result of natural features, such as soil creep, dried up (or seasonal) streams. They can also be caused by changes in the underlying geology or soil type which may contain unpredictable distributions of magnetic minerals, and are usually apparent in several locations across a site.

VIEWPORT 1

VIEWPORT 2

VIEWPORT 3

VIEWPORT 4

1

2

3

4

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A

B

C

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E

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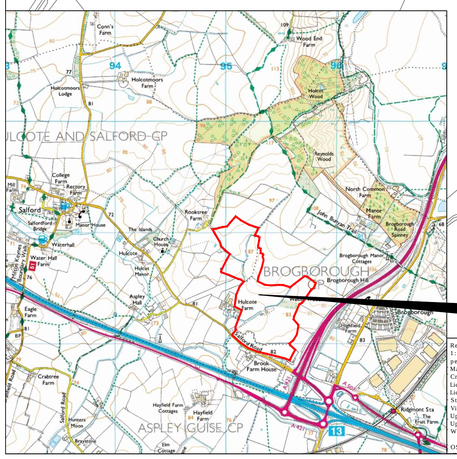
G

H



Amendments

Issue No.	Date	Description
-	-	-
-	-	-

Site centred on NGR SP 952 382

Area unsurveyable due to overgrown vegetation and farm buildings/machinery

OS REFERENCING INFORMATION

A	495077.44, 239022.66
B	495077.44, 238662.66
C	495257.44, 238842.66
D	495257.44, 238632.66
E	495137.44, 238422.66
F	495437.44, 238422.66
G	495167.44, 238122.66
H	495587.44, 238122.66

Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

SITE LOCATION, SURVEY AREA & REFERENCING

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
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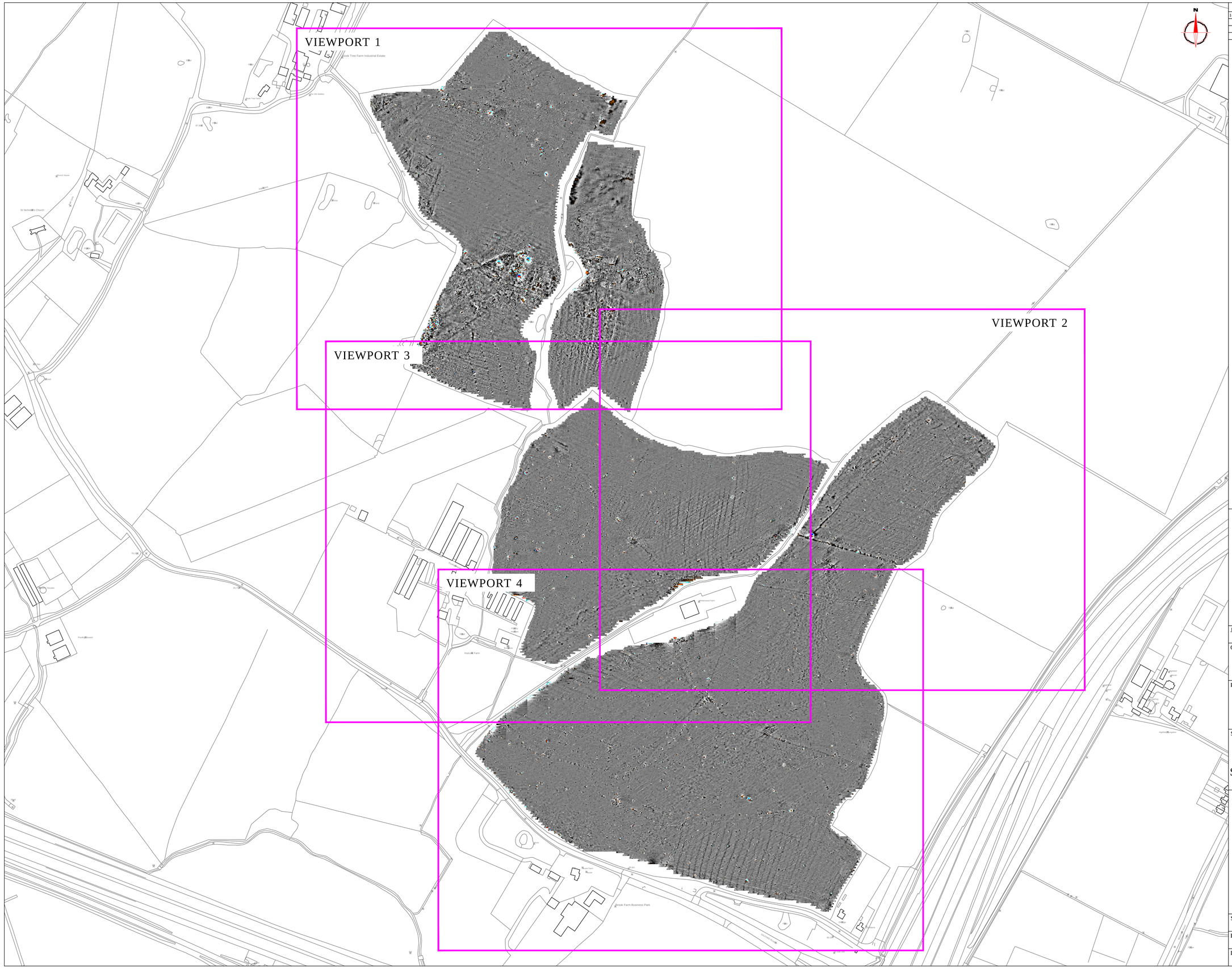
E: info@stratascan.co.uk
www.stratascan.co.uk

EUROPEAN GPR ASSOCIATION

SUMO GROUP MEMBER

Scale 1:2500 (0m 50 100 150m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
NOV 15	RD	01



Amendments

Issue No.	Date	Description
-	-	-
-	-	-

Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES - OVERVIEW

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
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WR8 0SA
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E: info@stratascan.co.uk
www.stratascan.co.uk

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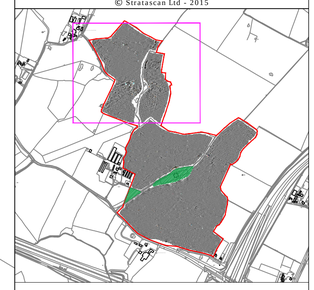
Scale 1:2500 (0m 50 100 150m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	Drawn by	Figure No.
NOV 15	RD	02

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES - VIEWPORT 1

STRATASCAN™
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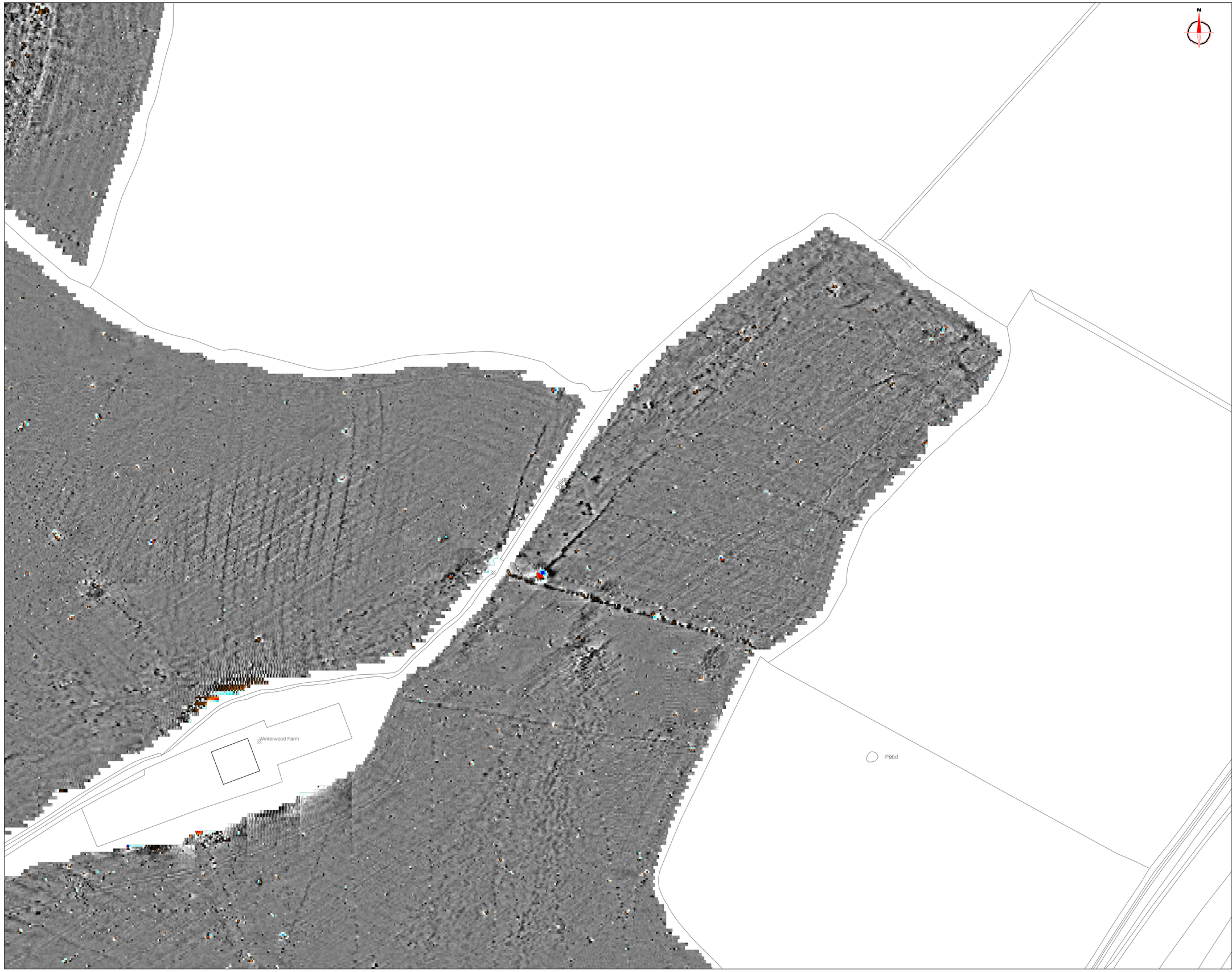
www.stratascan.co.uk

SUMO GROUP MEMBER

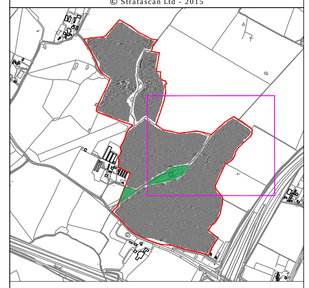
Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	Drawn by	Figure No.
NOV 15	RD	03



Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES - VIEWPORT 2

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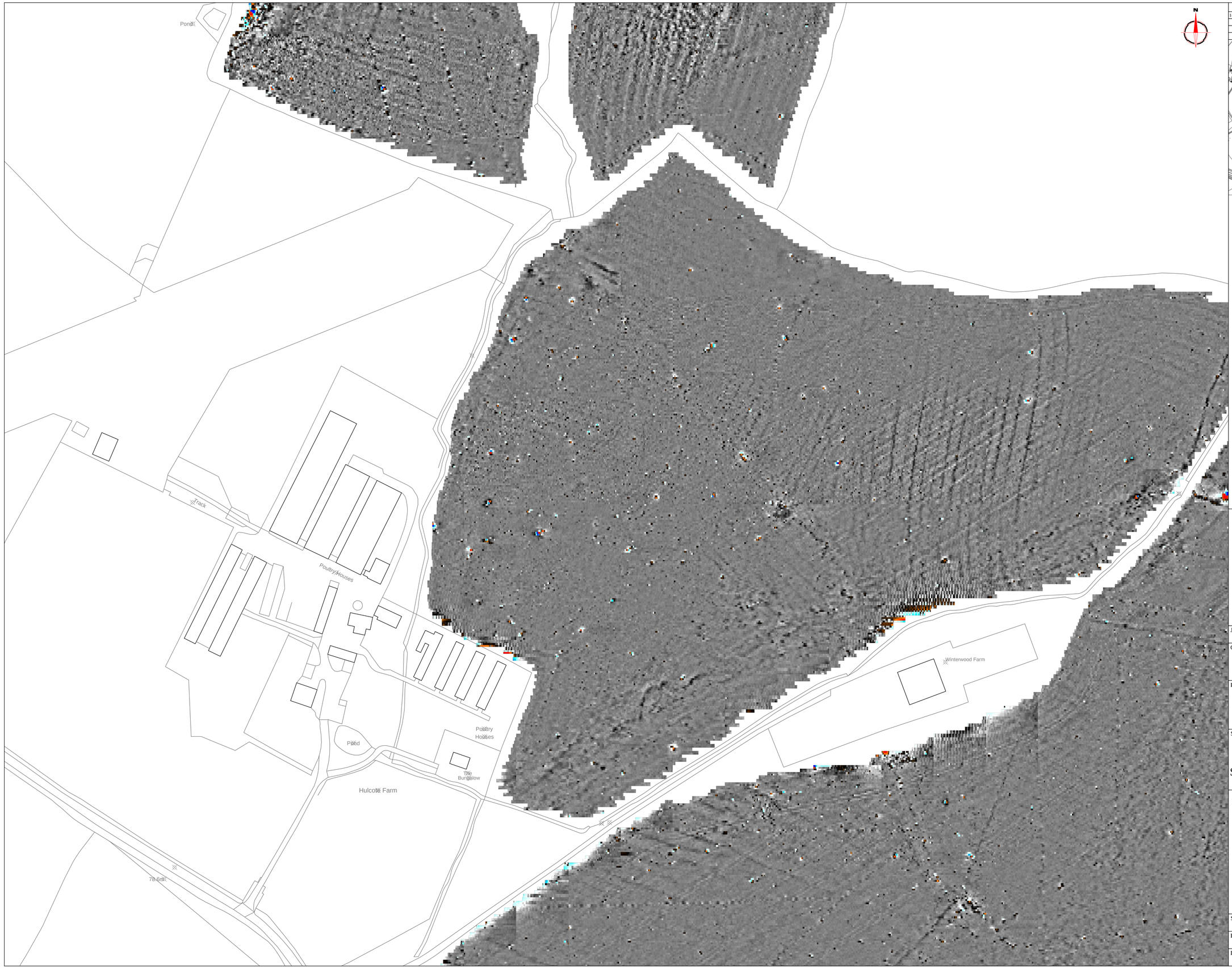
SUMO GROUP MEMBER

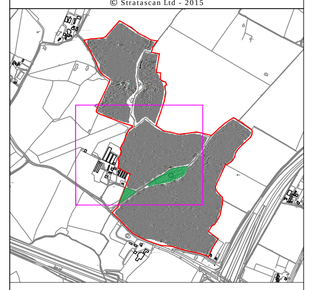
Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	Drawn by	Figure No.
NOV 15	RD	04



Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES - VIEWPORT 3

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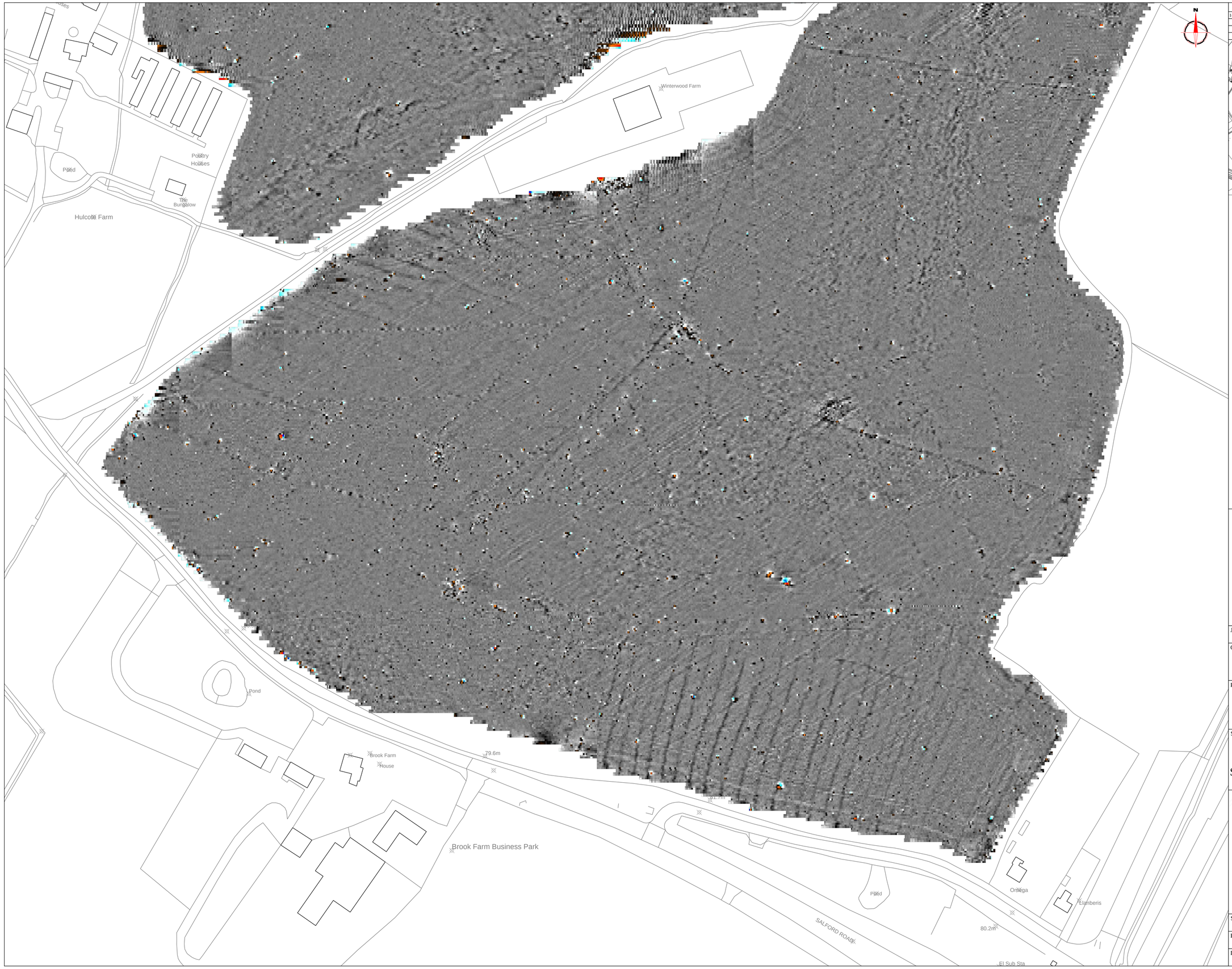
SUMO GROUP MEMBER

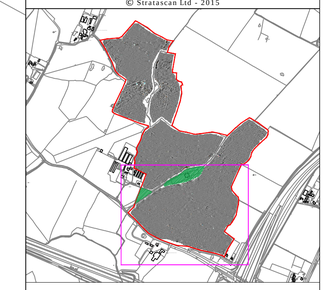
Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	Drawn by	Figure No.
NOV 15	RD	05



Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
8959	OCT 15

Client: ORION HERITAGE

Project Title: GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject: COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES - VIEWPORT 4

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SUMO GROUP MEMBER

Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	Drawn by	Figure No.
NOV 15	RD	06

Amendments

Issue No.	Date	Description
-	-	-
-	-	-

Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)

Zero Mean

-2nT +2nT

+2nT

-2nT

Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA - OVERVIEW

STRATASCAN™
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SUMO GROUP MEMBER

Scale 1:2500 (0m 50 100 150m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	Drawn by	Figure No.
NOV 15	RD	07

Rook Tree Farm Industrial Estate

The Old Stables

Track

Track

Pond

Pond

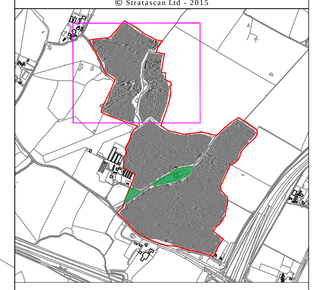
Pond

Pond

N

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)

Zero Mean

-2nT +2nT

+2nT

-2nT

Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA - VIEWPORT 1

STRATASCAN™
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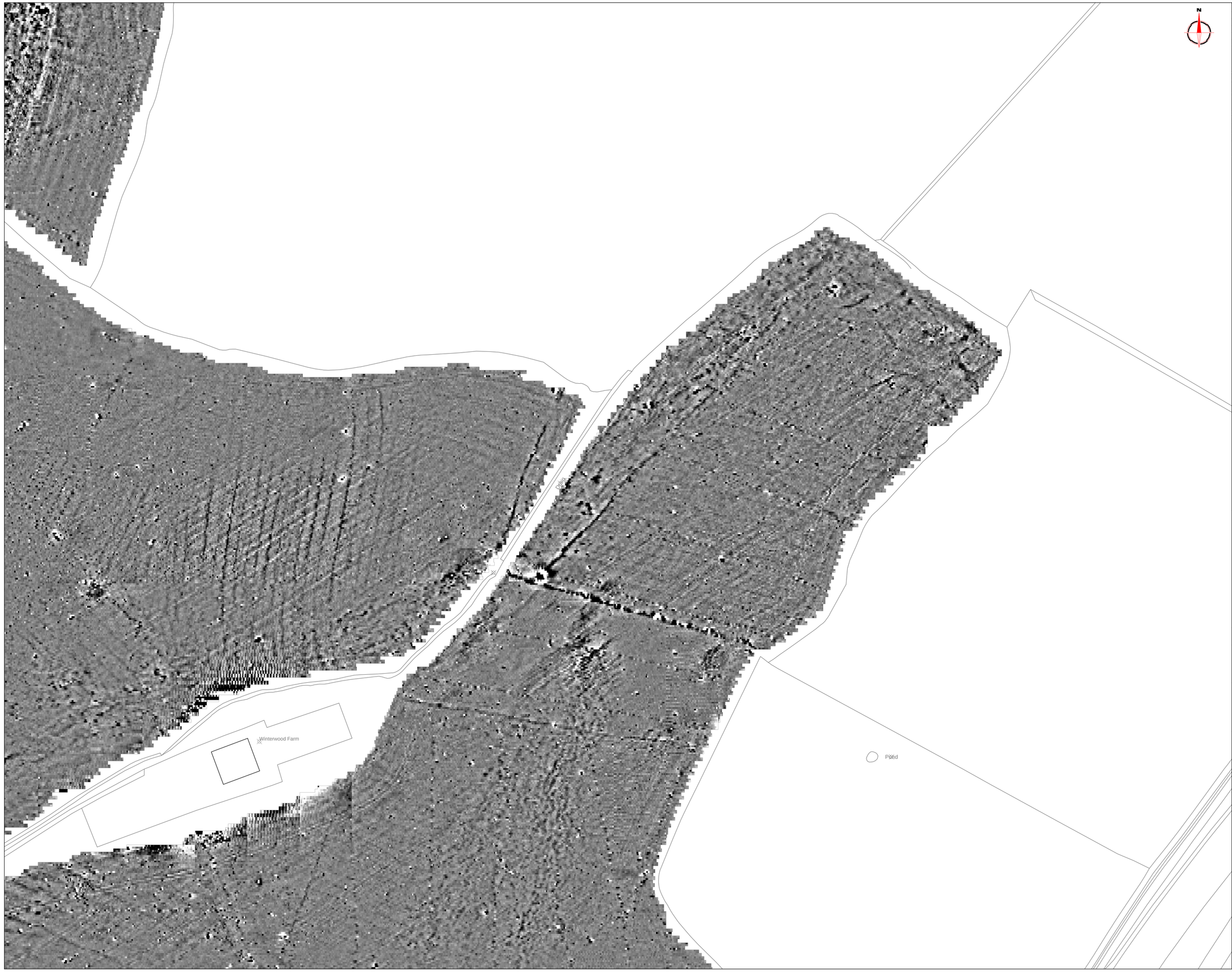
SUMO GROUP MEMBER

Scale 1:1000

0m 10 20 30 40 50 60m

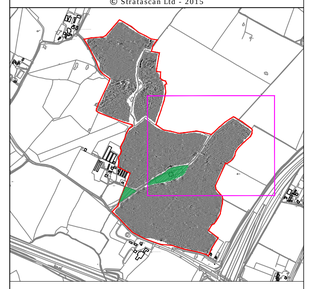
Plot	Checked by	Issue No.
A1	DGE	01
Date	Drawn by	Figure No.
NOV 15	RD	08



N

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)

Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA - VIEWPORT 2

STRATASCAN™
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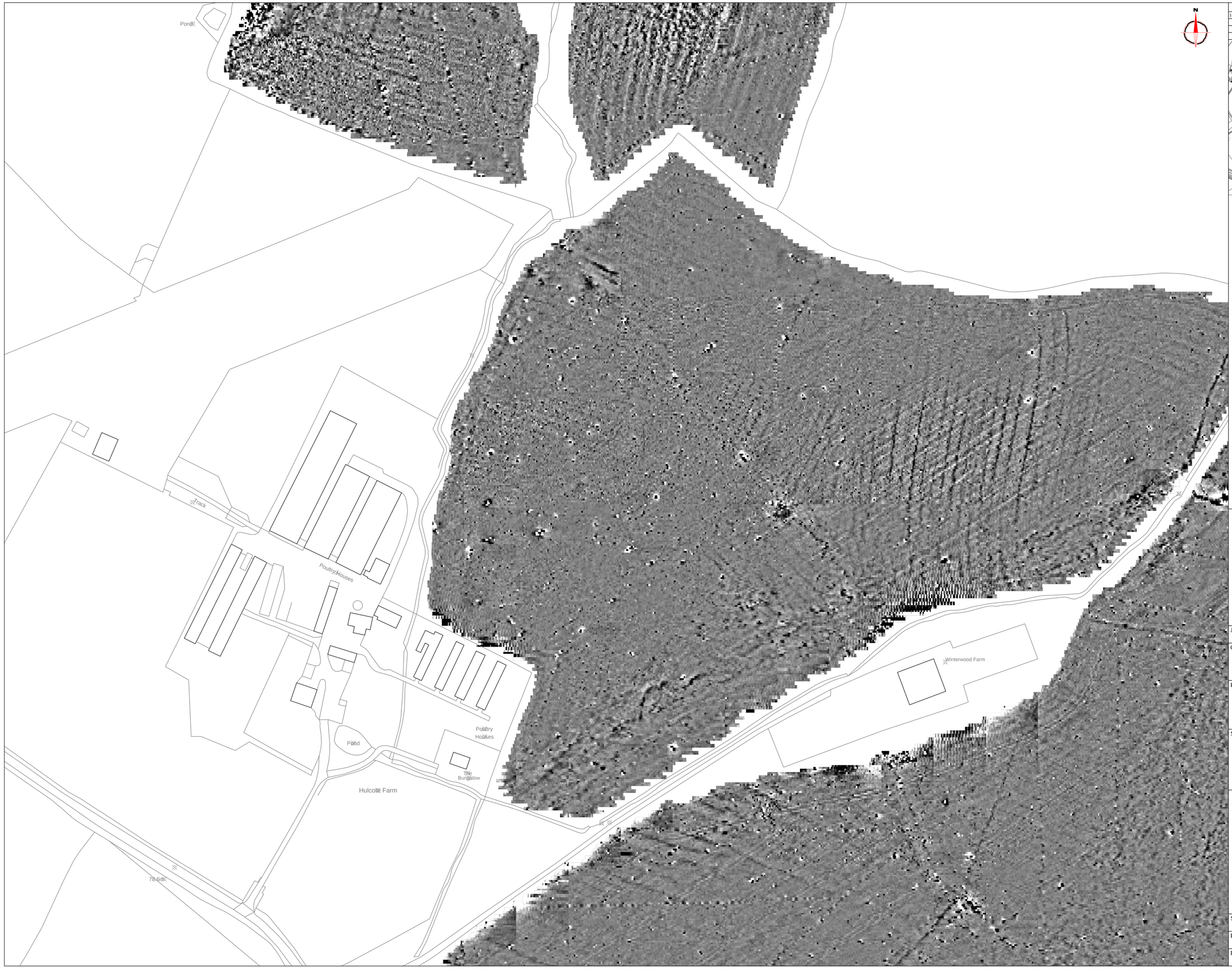
SUMO GROUP MEMBER

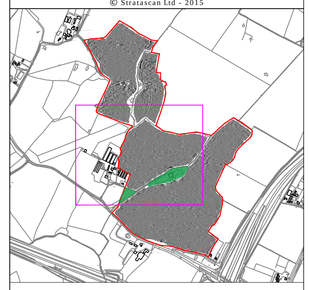
Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	Drawn by	Figure No.
NOV 15	RD	09



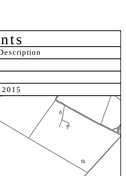
Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)



Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA - VIEWPORT 3

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SUMO GROUP MEMBER

Scale 1:1000 (0m 10 20 30 40 50 60m)

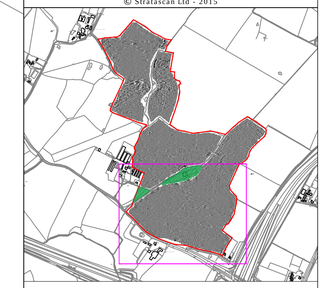
Plot	Checked by	Issue No.
A1	DGE	01
Date	Drawn by	Figure No.
NOV 15	RD	10

Poultry Houses
Pond
The Bungalow
Hulcote Farm
Winterwood Farm
Pond
Brook Farm House
79.6m
Brook Farm Business Park
Pond
Omega
Llanberis
80.2m
SALFORD ROAD
El Sub Sta

N

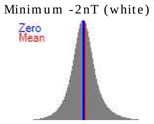
Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)



Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA - VIEWPORT 4

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SUMO GROUP MEMBER

Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	Drawn by	Figure No.
NOV 15	RD	11

VIEWPORT 1

VIEWPORT 2

VIEWPORT 3

VIEWPORT 4

Amendments

Issue No.	Date	Description
-	-	-
-	-	-

PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin

MEDIEVAL/POST-MEDIEVAL AGRICULTURE

- Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow
- Closely spaced parallel linear anomalies - probably related to agricultural activity such as ploughing
- Linear anomaly - probably related to a former field boundary not present on available mapping
- Linear anomaly - related to a former field boundary present on available mapping
- Scattered magnetic debris - related to a former field boundary present on available mapping

OTHER ANOMALIES

- Linear anomaly - probably related to pipe, cable or other modern service
- Linear anomaly - related to former track-way present on available mapping
- Linear anomaly - possibly related to land drain
- Magnetic disturbance associated with nearby metal object such as service or field boundary
- Strong magnetic debris - possible disturbed or made ground
- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES - OVERVIEW

STRATASCAN™
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SUMO GROUP MEMBER

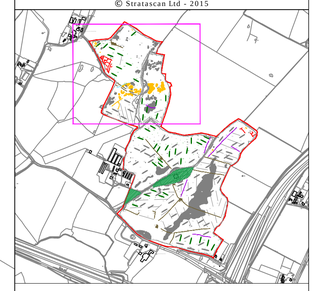
Scale 1:2500 (0m 50 100 150m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
NOV 15	RD	12

Rook Tree Farm Industrial Estate
The Old Stables
Track
Rook
Pond
Pond
Pond
Pond
Pond

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY

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- Magnetic spike - probable ferrous object

Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES - VIEWPORT 1

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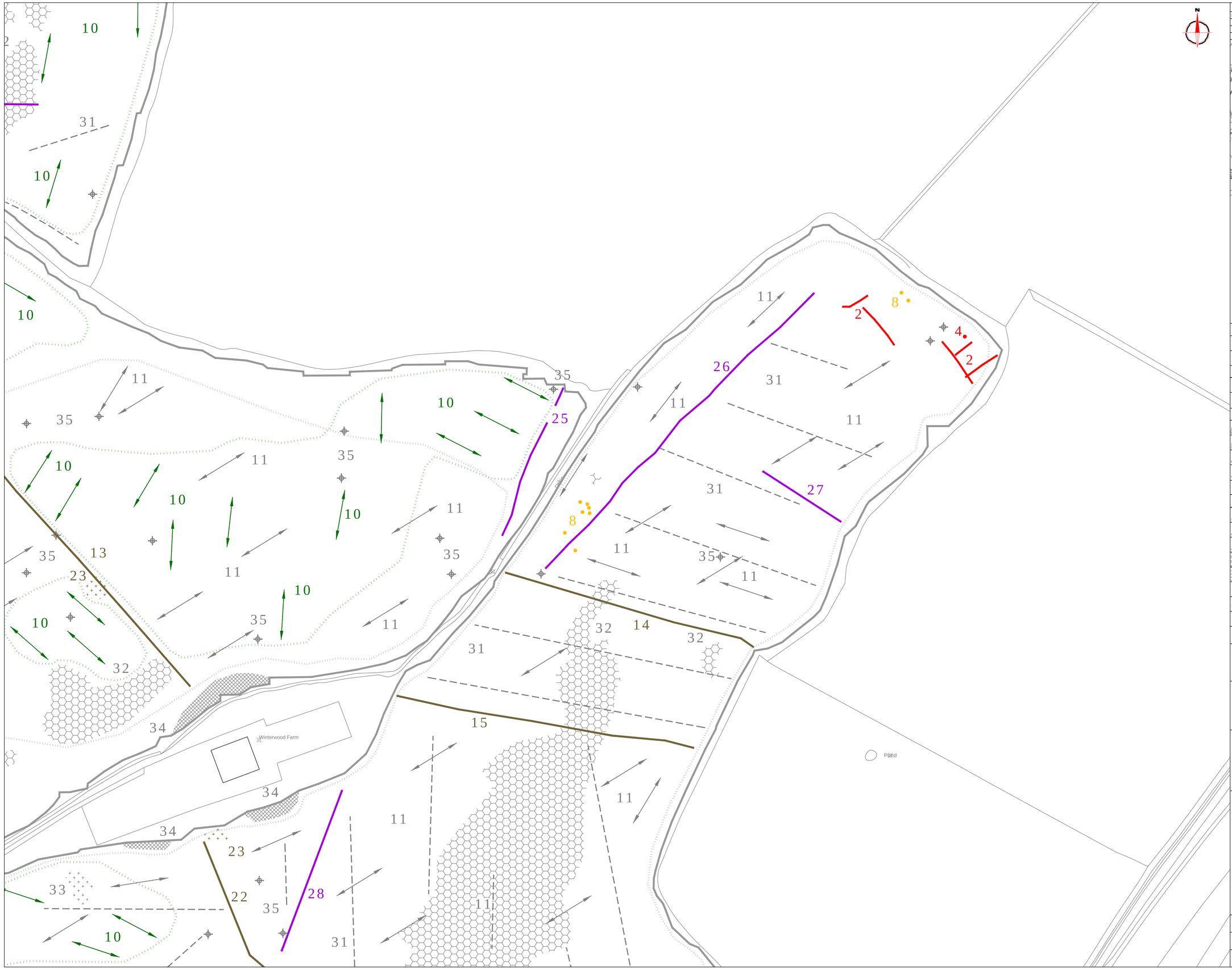
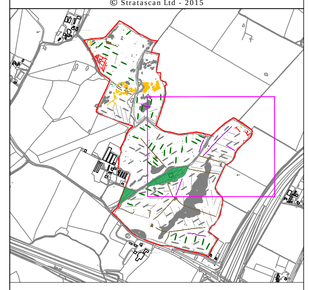
SUMO GROUP MEMBER

Scale	Plot	Checked by	Issue No.
1:1000 (0m 10 20 30 40 50 60m)	A1	DGE	01
Date	Drawn by	Figure No.	
NOV 15	RD	13	



Amendments

Issue No.	Date	Description
-	-	-
-	-	-



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- Magnetic spike - probable ferrous object

Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES - VIEWPORT 2

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SUMO GROUP MEMBER

Scale		
1:1000	0m 10 20 30 40 50 60m	
Plot	Checked by	Issue No.
A1	DGE	01
Date	Drawn by	Figure No.
NOV 15	RD	14

Pond

Track

Poultry Houses

Pond

Poultry Houses

The Bungalow

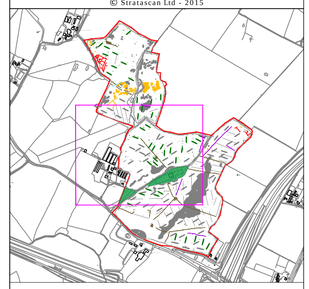
Hulcote Farm

78.6m

Winterwood Farm

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



PROBABLE ARCHAEOLOGY

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Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES - VIEWPORT 3

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SUMO GROUP MEMBER

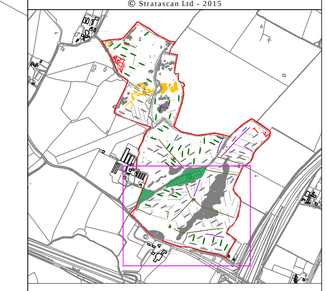
Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
NOV 15	RD	15

Poultry Houses
Pond
The Bungalow
Hulcote Farm
Winterwood Farm
Pond
Brook Farm House
Brook Farm Business Park
Pond
Omega
Llanberis
SALFORD ROAD
El Sub Sta
80.5m
79.6m
81.7m
80.2m

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



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- Closely spaced parallel linear anomalies - probably related to agricultural activity such as ploughing
- Linear anomaly - probably related to a former field boundary not present on available mapping
- Linear anomaly - related to a former field boundary present on available mapping
- Scattered magnetic debris - related to a former field boundary present on available mapping

OTHER ANOMALIES

- Linear anomaly - probably related to pipe, cable or other modern service
- Linear anomaly - related to former track-way present on available mapping
- Linear anomaly - possibly related to land drain
- Magnetic disturbance associated with nearby metal object such as service or field boundary
- Strong magnetic debris - possible disturbed or made ground
- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No.	Survey Date
8959	OCT 15

Client

ORION HERITAGE

Project Title

GEOPHYSICAL SURVEY - WINTER WOODS FARM, BEDFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES - VIEWPORT 4

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Scale							
1:1000	0m	10	20	30	40	50	60m

Plot	Checked by	Issue No.
A1	DGE	01
Date	Drawn by	Figure No.
NOV 15	RD	16

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