

GEOPHYSICAL SURVEY REPORT

STRATASCAN™



Project name:
Edgwarebury Lane, Edgwarebury, London

Client:
Albion Archaeology

Job ref:
J9692

May 2016

GEOPHYSICAL SURVEY REPORT

Project name: Edgwarebury Lane, Edgwarebury, London Client: Albion Archaeology	Job ref: J9692
Survey date: 14th April 2016	Report date: May 2016
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Version number and issue date: V1 03/05/2016	Amendments:



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1 SUMMARY OF RESULTS

A detailed gradiometry survey was conducted over approximately 3.5 hectares of grassland. The survey has not identified any anomalies of archaeological origin. All of the anomalies detected relate to modern features, including land drains, areas of concrete and made ground, ferrous objects, and fencing.

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 Albion Archaeology.

2.2 Site Details

NGR / Postcode	TQ 192 936 HA8 8QP
Location	The site lies to the east of Edgwarebury Lane, Edgwarebury, London. Edgwarebury Cemetery lies to the immediate north of the site.
HER	Greater London
District	Barnet
Parish	Edgware
Topography	Mostly flat
Current Land Use	Disused grassland
Weather Conditions	Dry and overcast
Soils	The overlying soils are known as Windsor, which are typical pelostagnogley soils. These consist of clayey soils mostly with brown subsoils, some fine loamy over clayey and fine silty over clayey soils (Soil Survey of England and Wales, Sheet 6 South East England)
Geology	The underlying geology is London Clay Formation – clay, silt, and stone. There is no recorded drift geology (British Geological Survey website).
Archaeology	A desk-based assessment (ELO8409) and historic environment assessment (ELO13127) are recorded in close proximity to the survey area on the Archaeological Data Services (2016) Archsearch. These suggest that there is limited archaeological activity in close proximity to the site, however there is some potential for prehistoric and Roman activity.

Survey Methods	Gradiometry
Study Area	4.5ha, however c.1ha was not surveyable due to overgrown vegetation

2.3 Aims and objectives

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

3 METHODS, PROCESSING & PRESENTATION

3.1 Standards & Guidance

This report and all fieldwork have been conducted in accordance with the latest guidance documents issued by Historic England (2008) and the Chartered Institute for Archaeologists (2002 & 2014).

Stratascan Ltd are a Registered Organisation with the CIfA and are committed to upholding its policies and standards.

3.2 Survey methods

Given the potential for prehistoric and Roman activity, detailed magnetic survey was used as an efficient and effective method of locating archaeological anomalies.

More information regarding this technique is included in Appendix A.

3.3 Processing

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

1. *Destripe*
2. *Destagger*

3.4 Presentation of results and interpretation

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

When interpreting the results several factors are taken into consideration, including the nature of archaeological features being investigated and the local conditions at the site (geology, pedology, topography etc.). Anomalies are categorised by their potential origin. Where responses can be related to very specific known features documented in other sources, this is done (for example: Abbey Wall, Roman Road). For the generic categories levels of confidence are indicated, for example: probable, or possible archaeology. The former is used for a confident interpretation, based on anomaly definition and/or other corroborative data such as cropmarks. Poor anomaly definition, a lack of clear patterns to the responses and an absence of other supporting data reduces confidence, hence the classification "possible".

4 RESULTS

The detailed magnetic gradiometer survey conducted at Edgwarebury Lane has not identified any anomalies that have been characterised as being either of a *probable* or *possible* archaeological origin. The following list of numbered anomalies refers to numerical labels on the interpretation plots.

4.1 *Probable Archaeology*

No probable archaeology has been identified within the survey area.

4.2 *Possible Archaeology*

No possible archaeology has been identified within the survey area.

4.3 *Medieval/Post-Medieval Agriculture*

No medieval or post-medieval agriculture has been identified within the survey area.

4.4 *Other Anomalies*

- 1 Linear anomalies in the north-east and south-west of the site. These form a herring bone pattern indicative of land drains.
- 2 A square area of strong magnetic disturbance in the centre of the western field. The square shape of this anomaly suggests it is likely related to a buried concrete pad, however it could also relate to an area of made ground.
- 3 Areas of strong magnetic disturbance in the north-west and south-west of the site. These are related to areas of concrete and disturbed ground caused by the removal of woodland and vegetation.
- 4 An area of strong magnetic disturbance in the centre of the site. This is indicative of made ground, and is related to an extension of the existing pond present on available mapping 1873-1964.
- 5 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.

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

5 DATA APPRAISAL & CONFIDENCE ASSESSMENT

London Clay Formation geologies, such as those at Edgwarebury Lane, can give variable responses to magnetic survey. Whilst no archaeological remains have been detected, this is in keeping with the known history of the site. The land drains that have been identified are weak in places, suggesting that the survey has not been completely effective. It is possible that small weak archaeological anomalies may not be seen, however any large significant features would likely be detected were they present.

6 CONCLUSION

The survey at Edgwarebury Lane has not identified any anomalies of archaeological origin. This is in keeping with the limited amount of activity recorded in the surrounding area. All of the anomalies detected relate to modern features. These include land drains, areas of concrete and made ground, ferrous objects, and fencing.

7 REFERENCES

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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	1m	0.25m

Instrumentation: Bartington *Grad601-2*

Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted vertically, 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. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m.

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.

Data Processing

Zero Mean Traverse Step Correction (Destagger) 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. 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.

Archaeology/Probable Archaeology This term is used when the form, nature and pattern of the response are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.

Possible Archaeology 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.

Industrial / Burnt-Fired 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.

Former Field Boundary (probable & possible) 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.

Ridge & Furrow 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.

Agriculture (ploughing) Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.

Land Drain Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains will often lead and empty into larger diameter pipes and which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.

Natural These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.

Magnetic Disturbance Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present. They are presumed to be modern.

Service Magnetically strong anomalies usually forming linear features indicative of ferrous pipes/cables. Sometimes other materials (e.g. pvc) cause weaker magnetic responses and can be identified from their uniform linearity crossing large expanses.

Ferrous 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* and *Possible Natural* or (in the case of linear responses) *Possible Archaeology* and *Possible 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 0.2 nanoTeslas (nT) in an overall field strength of 48,000nT, 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 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.

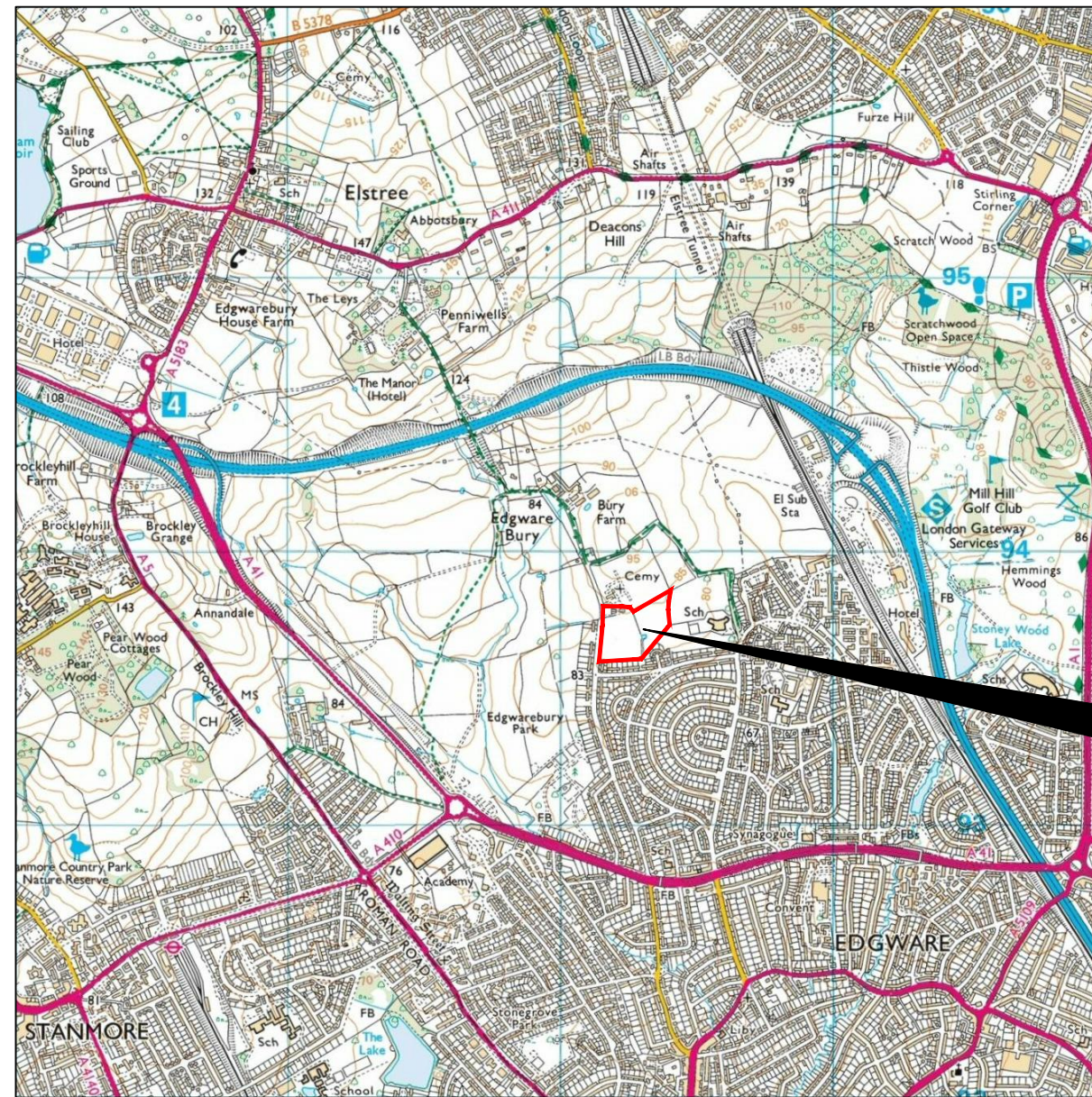
Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same 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.

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96
 95
 94
 93
 92



Survey Area

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Issue No.	Date	Description
-	-	-
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Site centred on NGR TQ 192 936

Client
ALBION ARCHAEOLOGY

Project Title Job No. J9692
**EDGWAREBURY LANE,
 EDGWAREBURY, LONDON**

Subject
LOCATION PLAN OF SURVEY AREA

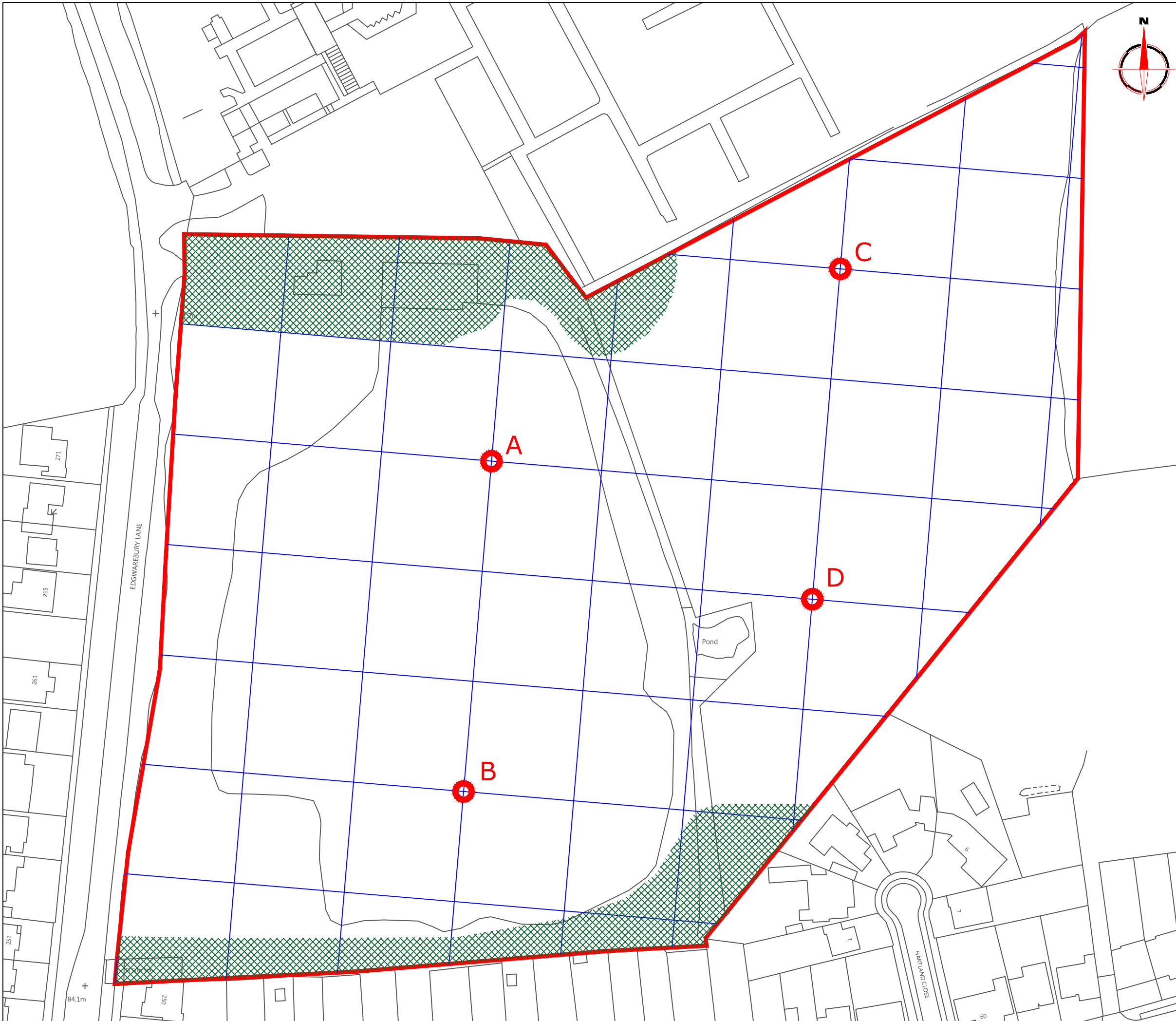
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Scale 1:25000 0m 500m 1000m

Plot A3	Checked by DGE	Issue No. 01
Survey date MAR 16	Drawn by TR	Figure No. 01

17 18 19 20 21



Amendments

Issue No.	Date	Description
-	-	-
-	-	-

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KEY

	Area unsurveyable - overgrown
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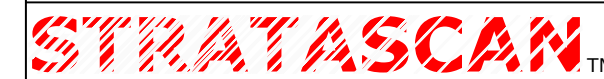
OS GRID REFERENCES

A	519243.48, 193739.87
B	519235.89, 193650.19
C	519338.22, 193792.07
D	519330.63, 193702.39

Client
ALBION ARCHAEOLOGY

Project Title Job No. J9692
**EDGWAREBURY LANE,
EDGWAREBURY, LONDON**

Subject
**LOCATION OF SURVEY GRIDS AND
REFERENCING**



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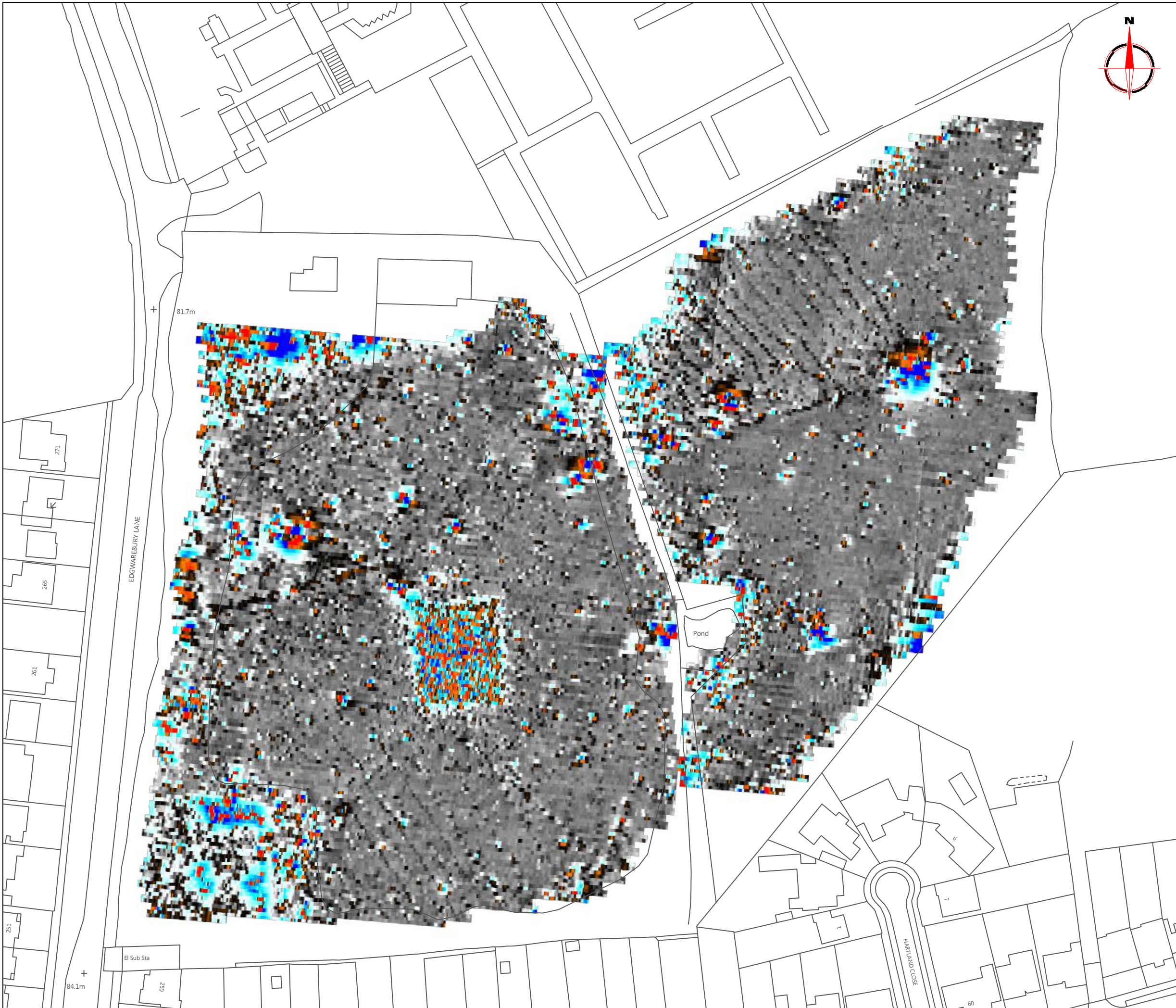


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Scale **1:1000**

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Survey date MAR 16	Drawn by TR	Figure No. 02



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Issue No.	Date	Description
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-	-	-

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Plotting parameters

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

Client
ALBION ARCHAEOLOGY

Project Title **EDGWAREBURY LANE,
EDGWAREBURY, LONDON** Job No. J9692

Subject
**COLOUR PLOT OF GRADIOMETER
DATA SHOWING EXTREME VALUES**

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

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Issue No.	Date	Description
-	-	-
-	-	-

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Plotting parameters

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

Client
ALBION ARCHAEOLOGY

Project Title **EDGWAREBURY LANE,
EDGWAREBURY, LONDON** Job No. **J9692**

Subject
**PLOT OF MINIMALLY PROCESSED
GRADIOMETER DATA**

**GEOPHYSICS FOR ARCHAEOLOGY
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Survey date MAR 16	Drawn by TR	Figure No. 04



Amendments

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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

OTHER ANOMALIES

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

Client
ALBION ARCHAEOLOGY

Project Title Job No. J9692
**EDGWAREBURY LANE,
EDGWAREBURY, LONDON**

Subject
**ABSTRACTION AND INTERPRETATION
OF GRADIOMETER ANOMALIES**

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