GEOPHYSICAL SURVEY REPORT G14113

Land East of Bell Lane, Kesgrave

Client:

Suffolk County Council

On Behalf Of:

PERSIMMON

GSB PROSPECTION Ltd

Celebrating over 25 years at the forefront of Archaeological Geophysics

sumo Survey Services

GSB Survey Report No. G14113

Land East of Bell Lane, Kesgrave

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Survey Personnel

Field Co-ordinator:	James Lawton BSc MSc
Report Author:	James Lawton BSc MSc
Project Assistants:	Adrian Dillon BSc, Rachel Brown

Dates

Fieldwork:	8 - 11 December 2014
Report:	22 December 2014

Report Approved: Dr John Gater MIfA FSA

Background Project Details

NGR	TM 221 445
Location	The site is located on Foxhall Heath, just to the south of the small town of Kesgrave located approximately 4.5 miles east of Ipswich.
HER/SMR	Suffolk County Council HER
District	Suffolk Coastal
Parish	Kesgrave CP
Topography	Flat
Current Land Use	Arable
Soils	Newport 4 (551g): deep well drained sandy soils. Some very acid soils with bleached subsurface horizon especially under heath or woodland. (SSEW 1983).
Geology	The bedrock geology consists of Red Crag formation – sand, while the superficial deposits are Lowestoft formation – sand and gravel (BGS 2014).
Archaeology	Although prehistoric archaeology is present across the former heathland, it seems to be absent from the study area. A former wireless station was built to the south of the site in the early 20th century which is the only known activity in the study area (Sommers, M. 2014).
Survey Methods	Detailed magnetometer survey (fluxgate gradiometer)
Study Area	15.18 ha
OASIS Ref.	gsbprosp1-200001

Aims

To locate and characterise any anomalies of possible archaeological interest within the study area. The work forms part of a wider archaeological assessment being carried out by **Suffolk County Council** on behalf of **Persimmon Homes**.

Summary of Results

The survey indicated a number of ferrous anomalies across the site, two of which are considered to be trends related to either pipes of ferrous cables. The majority would seem to be associated with the former wireless station which stands to the south of the survey area.

Method

All survey grid positioning was carried out using Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS equipment. The geophysical survey areas are georeferenced relative to the Ordnance Survey National Grid by tying in to local detail and corrected to the mapping provided by the client. These tie-ins are presented in Figure T1. Please refer to this diagram when re-establishing the grid or positioning trenches.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1m	0.25m

All survey work is carried out in accordance with the current English Heritage guidelines (EH 2008).

Data Processing

Data processing was performed as appropriate using in-house and software package (GeoSuB) as outlined below.

Magnetic Data
Zero Mean Traverse, Step Correction (De-stagger) and Interpolation (on the Y axis).

Interpretation

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*). The more generic categories are also assigned a confidence level, for example: *Archaeology – ?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 *?Archaeology*. Details of the data plot formats and interpretation categories used are given in the Appendix: Technical Information at the end of the report.

General Considerations

The site was flat throughout with an established cereal crop growing. The ground was soft and wet at the time of survey, although this made walking difficult it did not unduly affect the results.

1.0 Survey Results - Magnetometer Survey

1.1 The survey located no anomalies of an archaeological nature. The results have revealed a number of anomalies which may relate to the former Cold War wireless station which stands to the south, just outside the survey area.

1.2 Two linear ferrous anomalies run into the eastern half of the site. These anomalies could be drains but given the proximity of the wireless station they may be associated pipes or armoured cable.

1.3 A track has been detected in the south east of the survey, in line with the western boundary of the wireless station. It survives as an upstanding feature in the field with a packed rubble surface.

1.4 A pipe has also been detected on the extreme western edge of the survey area, running parallel to the road.

1.5 A natural trend runs through the centre of the site and looks like the result of groundwater movement.

1.6 Zones of magnetic disturbance are likely to be material which has either been spread on the field or relates to previous features associated with the wireless station which have now been removed. Ferrous anomalies along the survey boundaries are due to metal fencing and are strongest adjacent to the southern boundary due to larger fences surrounding the former wireless station. A number of large ferrous responses are seen within the southern part of survey area the origins of which are uncertain. Possible bomb craters were noted on aerial photography of 1940 and during a walkover survey which may account for these larger ferrous anomalies (Sommers, 2014). Alternatively, they may be evidence of outlying features of the wireless station. Small scale ferrous anomalies are seen throughout; these can be best seen in the XY trace plots (see Archive CD) as sharp spikes and are due to iron debris within the topsoil or on the surface and are deemed modern in origin.

2.0 Conclusions

2.1 No archaeological features have been located within the survey area. All geophysical anomalies which have been identified are thought to be either associated with the former wireless station or are natural and likely to be of a pedological origin.

References

BGS 2014	British Geological Survey, Geology of Britain Viewer http://mapapps.bgs.ac.uk/geologyofbritain/home.html 1:50,000 scale geology, centred on 622243, 244504. Accessed 19/12/2014
EH 2008	*Geophysical Survey in Archaeological Field Evaluation.* English Heritage, Portsmouth.
OS 2014	http://www.old-maps.co.uk 1881 to present, 1:2,500, OS County Series Suffolk, centred on TM 221 445. Accessed 22/12/2014
SSEW 1983	*Soils of England and Wales. Sheet 4, Eastern England*. Soil Survey of England and Wales, Harpenden.
Sommers 2014	Desk-based Assessment Land East of Bell Lane, Kesgrave, November 2014 Suffolk County Council Archaeological Service, Unpublished Report.

Site Location

Project: G14113 Land East of Bell Lane, Kesgrave

Title: Site Location

Drawn by: GSA

Figure 1

GSB PROSPECTION Ltd
GSB Prospection Ltd
Cowburn Farm, 21 Market Street
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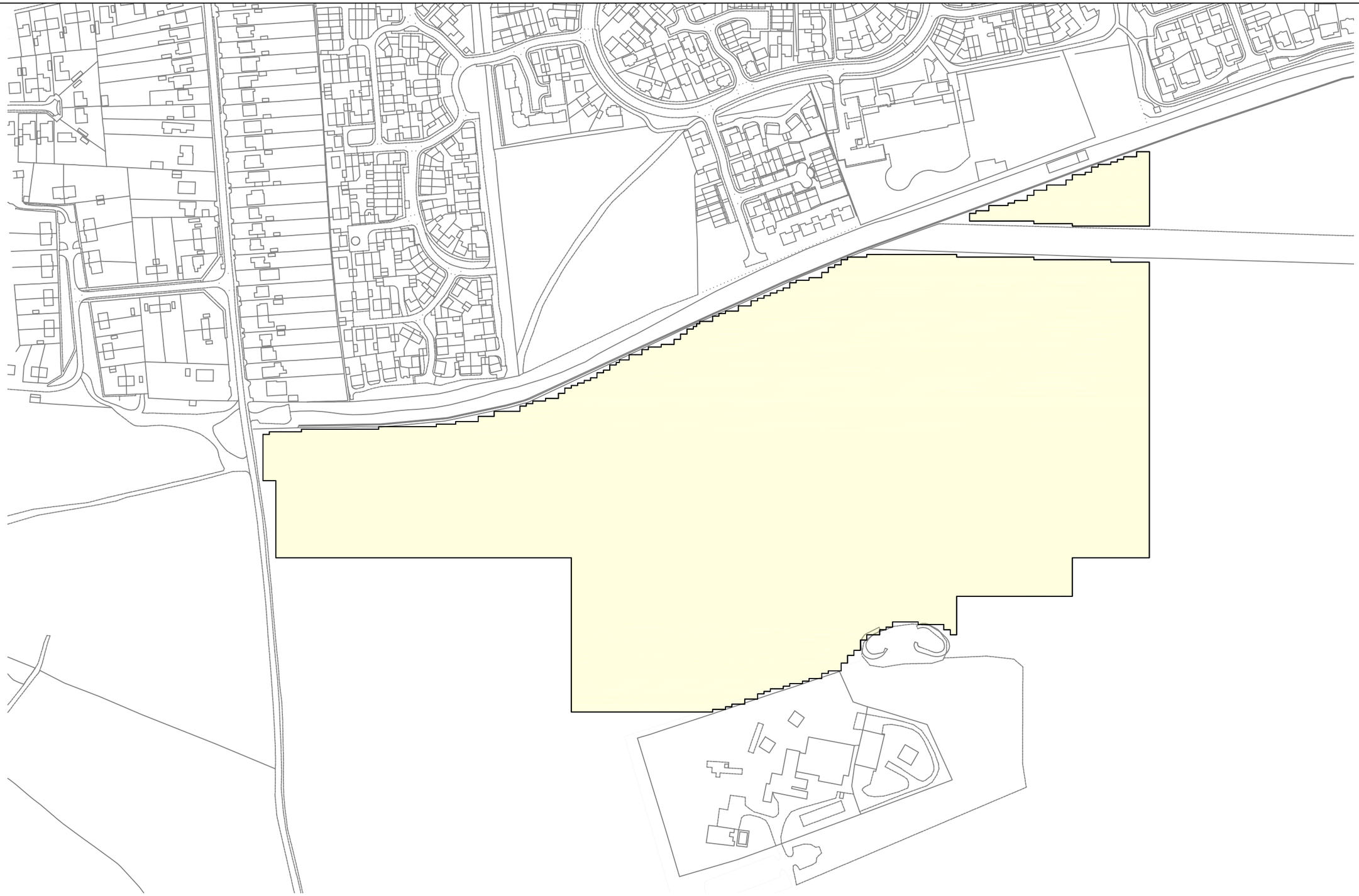
+44 (0)1274 835016



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sumo

N

0 metres 120

1:3000 @ A3

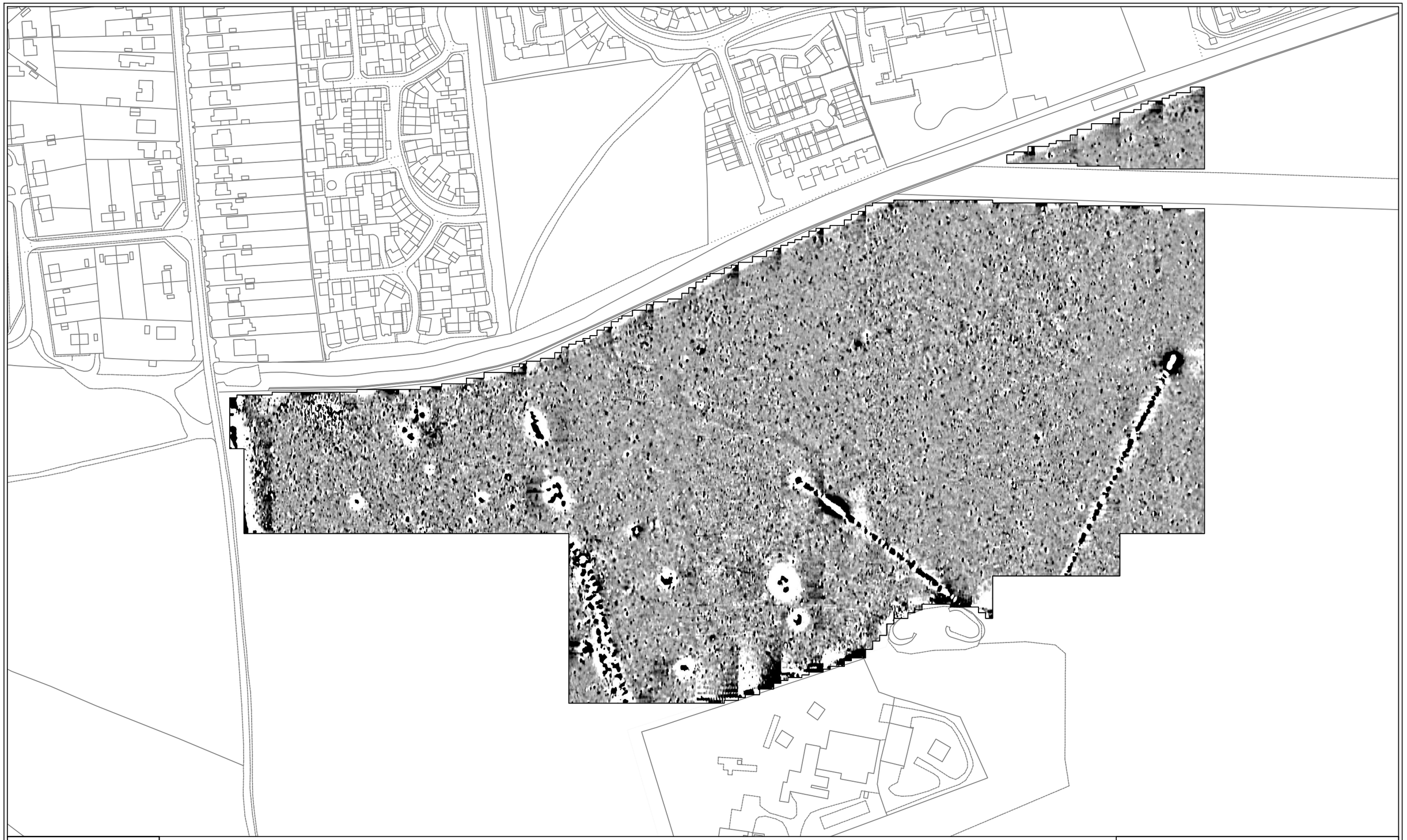
Area of Detailed Magnetometer Survey

Project: G14113 Land East of Bell Lane, Kesgrave

Title: Location of Survey Area

Drawn by: GSA

Figure 2



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N

0 metres 100

1:2500 @ A3

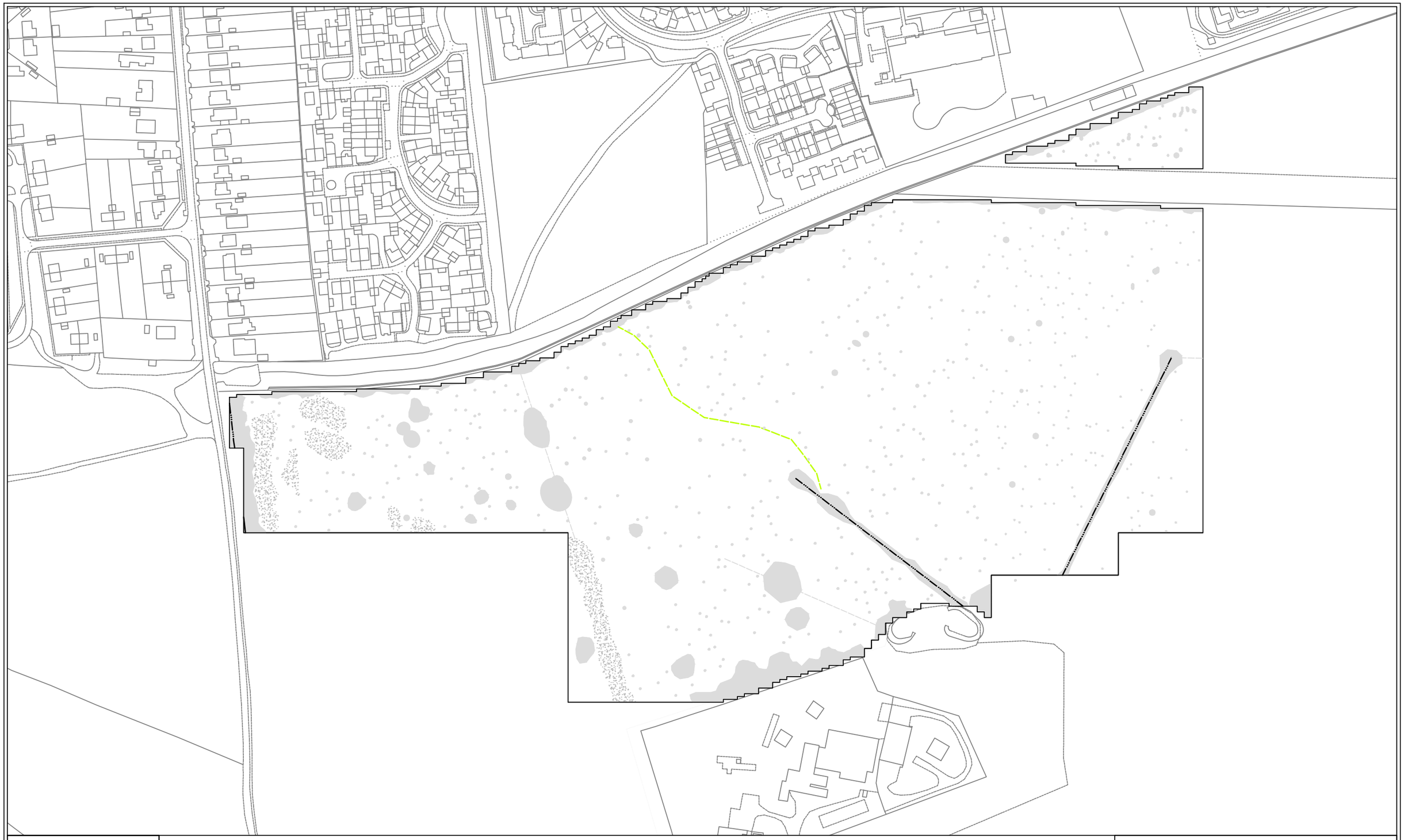
2
nT
-1

Project: G14113 Land East of Bell Lane, Kesgrave

Title: Magnetometer Survey - Greyscale Plot

Drawn by: JMT

Figure 3



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N

0 metres 100

1:2500 @ A3

Ferrous
(discrete anomaly / pipe / trend)

Natural

Area of Magnetic Disturbance

Project: G14113 Land East of Bell Lane, Kesgrave

Title: Magnetometer Survey - Interpretation

Drawn by: JMT

Figure 4

Appendix - Technical Information: Magnetometer Survey

Instrumentation: Bartington *Grad*601-2 / GSB CARTEASY^{N} Cart system

Both the Bartington and CARTEASY^{N} 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. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m. The CARTEASY^{N} system has four gradiometer units mounted at 0.75m intervals across its frame – rather than working in grids, the cart uses an on-board survey grade GNSS for positioning. The cart system allows for the collection of topographic data in addition to the magnetic field measurements.

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 (Destagger)	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.
Interpolation	When geophysical data are presented as a greyscale, each data point is represented as a small square. The resulting plot can sometimes have a 'blocky' appearance. The interpolation process calculates and inserts additional values between existing data points. The process can be carried out with points along a traverse (the x axis) and/or between traverses (the y axis) and results in a smoother greyscale image.

Display

XY Trace Plot	This involves a line representation of the data. Each successive row of data is equally incremented in the Y axis, to produce a stacked profile effect. This display may incorporate a hidden-line removal algorithm, which blocks out lines behind the major peaks and can aid interpretation. The advantages of this type of display are that it allows the full range of the data to be viewed and shows the shape of the individual anomalies. The display may also be changed by altering the horizontal viewing angle and the angle above the plane.
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.
3D Surface Plot	This is similar to the XY trace, but in 3 dimensions. Each data point of a survey is represented in its relative position on the x and y axes and the data value is represented in the z axis. This gives a digital terrain, or topographic effect.

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	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.
?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.
Increased Magnetic Response	An area where increased fluctuations attest to greater magnetic enhancement of the soils, but no specific patterns can be discerned in the data and no visual indications on the ground surface hint at a cause. They may have some archaeological potential, suggesting damaged archaeological deposits.
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.
Old Field Boundary	Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions.
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.
Ploughing	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
Natural	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions. Smaller, isolated responses which do not form such obviously 'natural' patterns but which are, nonetheless, likely to be natural in origin may be classified as *?Natural*.
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 *?Archaeology* and *?Natural* or (in the case of linear responses) *?Archaeology* and *?Ploughing*; occasionally they are simply of an unusual form.
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.
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.

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).

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