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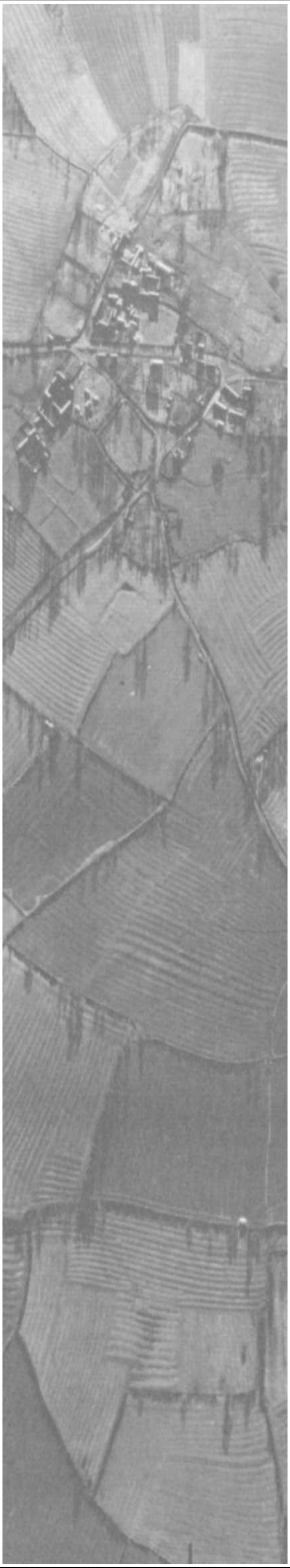

St Frideswide Farm
Oxford

MAGNETOMETER SURVEY REPORT

for

WYG Group Limited

Kerry Donaldson & David Sabin

October 2020

Ref. no. J831

ARCHAEOLOGICAL SURVEYS LTD

St Frideswide Farm
Oxford

MAGNETOMETER SURVEY REPORT

for

WYG Group Limited

Fieldwork by David Sabin BSc (Hons) MCIfA
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Primary archive location - Archaeological Surveys Ltd, Yatesbury, Wiltshire

Survey date – 25th September 2020
Ordnance Survey Grid Reference – **SP 50500 10900**

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SUMMARY

A detailed magnetometry survey was undertaken by Archaeological Surveys Ltd on 3.6ha of land at St Frideswide Farm to the north of Oxford. The results demonstrate the presence of a weak, fragmented, positive linear anomaly that could relate to a cut, ditch-like feature which has been truncated by ridge and furrow. Other short, positive linear and discrete positive responses have also been located, but they generally lack a coherent morphology. The site also contains a zone of strongly magnetic debris which is surrounded by weakly positive amorphous responses which could relate to former clay pits.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by WYG Group Limited, on behalf of Croudace Homes, to undertake a magnetometer survey of an area of land at St Frideswide Farm to the north of Oxford. The site has been outlined for a proposed residential development and the survey forms part of an archaeological assessment.

1.1.2 The geophysical survey was carried out in accordance with a Written Scheme of Investigation (WSI) produced by Archaeological Surveys (2020) and approved by David Radford, Archaeologist for Oxford City Council, prior to commencing the fieldwork.

1.2 Survey objectives and techniques

1.2.1 The objective of the survey was to use magnetometry to locate geophysical anomalies that may be archaeological in origin so that they may be assessed prior to development of the site. The methodology is considered an efficient and effective approach to archaeological prospection.

1.2.2 Geophysical survey can provide useful information on the archaeological potential of a site; however, the outcome of any survey relies on a number of factors and as a consequence results can vary. The success in meeting the aims and objectives of a survey is, therefore, often impossible to predetermine.

1.3 Standards, guidance and recommendations for the use of this report

1.3.1 The survey and report follow the recommendations set out by: European Archaeological Council (2015) *Guidelines for the Use of Geophysics in Archaeology;* Institute for Archaeologists (2002) *The use of Geophysical Techniques in Archaeological Evaluations.* The work has been carried out to the Chartered Institute for Archaeologists (2014) *Standard and Guidance for Archaeological Geophysical Survey.* Note: currently Historic England (2018) no longer support the guidelines set out in English Heritage (2008) *Geophysical survey in archaeological field evaluation* and there are currently no plans to update the document. As a consequence other sources of written guidance referring to this document may be out of date and/or contain unsupported information (e.g. Chartered Institute for Archaeologists, 2014).

1.3.2 Archaeological Surveys Ltd provide a detailed geophysical survey report and it is recommended that where possible the contents should be considered in full. The Summary provides a brief overview of the results with more detail available in the Discussion and/or Conclusion. The *List of anomalies* within the Results provides a detailed assessment of the anomalies within separate categories which can be useful in inferring a level of confidence to the interpretation. Quality and factors influencing the interpretation of anomalies is also set out within the results.

1.3.3 It is recommended that the full report should always be considered when using data and interpretation plots; where this is not possible, in the field for example, the abstraction and interpretation plots should retain their colour coding and be used with a corresponding legend.

1.3.4 Where targeting of anomalies by excavation is to be carried out, care should be taken to place trenches over solid lines or features visible on the abstraction and interpretation plots. Archaeological Surveys abstraction and interpretation avoids the use of dashed or dotted line formats, and broken or fragmented lines used in interpretive plots may well correspond closely with truncation of archaeological features.

1.4 Site location, description and survey conditions

1.4.1 The site is located at St Frideswide Farm, near Cutteslowe, north of Oxford. It is centred on Ordnance Survey National Grid Reference (OS NGR) SP 50500 10900, see Figs 01 and 02.

1.4.2 The geophysical survey covers approximately 3.6ha within the western part of an irregularly shaped field. The eastern part of this field has been subject to previous geophysical survey for a different scheme (ASWYAS, 2020).

1.4.3 Ground cover consisted of stubble with some short regrowth of wild plants and grass. The land is generally flat although the area contained a small number of low soil mounds relating to infilled geotechnical investigation pits. To the south of the site, tall steel fencing and lights, associated with a sports facility, were considered possible sources of magnetic disturbance, as well as houses and a pill box close to the south western part of the area.

1.4.4 The ground conditions across the site were generally considered to be favourable for the collection of magnetometry data. Weather conditions during the survey were mainly fine.

Plate 1: Survey area looking south west

1.5 Site history and archaeological potential

1.5.1 An Archaeological & Heritage Desk-Based Assessment has been prepared by WYG (2020), which outlines that a geophysical survey has been conducted within the surrounding area and that a number of previously unrecorded ring ditches and a linear ditch were located immediately to the east (ASWYAS, 2020). The Oxford/Oxfordshire Historic Environment Records indicate that a fragment of Neolithic flint adze-blade was located approximately 100m to the south and that two Bronze Age barrows are located approximately 280m to the north. The site of a possible Roman villa, recorded from cropmarks, is located 600m to the north east and two enclosures and a trackway further west. Cutteslowe Deserted Medieval Settlement is situated approximately 250m to the north east and has early medieval origins, with the site of a medieval moat also recorded to the north of the farmhouse. A World War Two Pill Box is located close to the south western corner of the site.

1.6 Geology and soils

1.6.1 The underlying solid geology across the site is mudstone from the Oxford Clay and West Walton Formation with overlying deposits from the Wolvercote Sand and Gravel Member along the southern edge (BGS, 2017).

1.6.2 The overlying soil across the survey area is from the Wickham 2 association and is a typical stagnogley. It consists of a slowly permeable, seasonally waterlogged, fine loamy over clayey soil (Soil Survey of England and Wales, 1983).

1.6.3 Magnetometry survey carried out across similar soils has produced variable results as mudstone geologies and stagnogley soils can be associated with low level magnetic susceptibility. However, where there has been long term occupation and/or industrial activity, the soils can become magnetically enhanced with good magnetic contrast between cut features and the material into which they are cut. The underlying geology and soils are, therefore, considered acceptable for magnetic survey.

2 METHODOLOGY

2.1 Technical synopsis

2.1.1 Magnetometry survey records localised magnetic fields that can be associated with features formed by human activity. Magnetic susceptibility and magnetic thermoremnance (also known as thermoremanence) are factors associated with the formation of localised fields.

2.1.2 Iron minerals within the soil may become altered by burning and the break down of biological material; effectively the magnetic susceptibility of the soil is increased, and the iron minerals become magnetic in the presence of the Earth's magnetic field. Accumulations of magnetically enhanced soils within features, such as pits and ditches, may produce magnetic anomalies that can be mapped by magnetic prospection.

2.1.3 Magnetic thermoremnance can occur when ferrous minerals have been heated to high temperatures such as in a kiln, hearth, oven etc. On cooling, a permanent magnetisation may be acquired due to the presence of the Earth's magnetic field. Certain natural processes associated with the formation of some igneous and metamorphic rock may also result in magnetic thermoremnance.

2.1.4 The localised variations in magnetism are measured as sub-units of the Tesla, which is a SI unit of magnetic flux density. These sub-units are nano Teslas (nT), which are equivalent to 10^{-9} Tesla (T). Additional details are set out in 2.2 below and within Appendix A.

2.2 Equipment configuration, data collection and survey detail

2.2.1 The detailed magnetic survey was carried out using a SENSYS MAGNETO®MXPDA 5 channel cart-based system. The instrument has 5 fluxgate gradiometers (FGM650) spaced 0.5m apart with readings recorded at 20Hz. The cart is pushed at walking speed and not towed. Each sensor is not zeroed in the field as the vertical axis alignment is precisely fixed leaving sensor offsets that are removed during data processing. The fixing of the vertical alignment ensures the sensors are not unduly influenced by localised magnetic fields and that the vertical component of a magnetic anomaly is measured. The gradiometers have a measurement range of ±8000nT, although the recorded range is ±3000nT, and resolution is around 0.1nT. They are linked to a Leica GS10 RTK GNSS with data recorded by SENSYS MAGNETO®MXPDA software on a rugged PDA computer system.

2.2.2 Due to the fixed offsets within the fluxgate sensors, as a result of the manufacturing and tensioning process, the survey data do not provide a visually useful dataset until a zero median traverse algorithm is applied. It is recognised that this has the potential to affect some anomalies detrimentally by removing linear features orientated parallel to survey transects. However, this has not been noted as a particular problem with the system due to the high resolution data collection, generally long length of traverses and variability within the magnetic characteristics of a linear anomaly.

2.2.3 Data are collected along a series of parallel survey transects to achieve 100% coverage of the surveyable land. The length of each transect is variable and relates to the size of the survey area and other factors including ground conditions. A visual display allows accurate placing of transects and helps maintain the correct separation between adjacent traverses. Data are not collected within fixed grids and data points are considered to be random even though the data are collected in a systematic manner covering all accessible areas (Aspinall, Gaffney and Schmidt, 2009).

2.2.4 Fluxgate sensors are highly sensitive to temperature change and this manifests as drift during the course of a survey. This can be particularly noticeable during the morning as temperatures rise and the equipment warms or cools. Sensor drift within the course of a traverse will appear as a line trending from negative to positive after processing with a zero median traverse algorithm. To remove the potential for temperature drift, data were collected after a 20 minute stabilisation period and traverses were limited to a time of generally <100s.

2.3 Data processing and presentation

2.3.1 Magnetic data collected by the MAGNETO®MXPDA cart-based system are initially prepared using SENSYS MAGNETO®DLMGPS software. The software effectively allocates a geographic position for each data point and can compensate for fixed offsets present within the FGM650 sensors. The offsets are positive or negative values present on all fluxgate gradiometer sensors. Some systems use manual or electronic balancing to effectively zero the sensors; however, this is a short term measure that is prone to drift through temperature changes and vibration and can easily be incorrectly set due to localised magnetic fields. The FGM650 sensors are very accurately aligned to the vertical magnetic gradient and are highly stable showing negligible drift on long traverses. The offset values are removed using TerraSurveyor software.

2.3.2 Survey tracks are analysed and georeferenced raw data (UTM Z30N) are then exported in ASCII format for further analysis and display within TerraSurveyor. The removal of the offset values (compensation) of the sensors is also carried out in TerraSurveyor using a zero median traverse function. Data are then considered to be minimally processed. Note: without the zero median traverse function it is not possible to create a meaningful data plot as all sensors have a different offset value. Although a zero median traverse algorithm can remove anomalies aligned with the survey tracks, in practice this rarely occurs due to the use of long traverses, high resolution measurement and variability within the magnetic susceptibility of long linear features.

2.3.3 The minimally processed data are collected between limits of ±3000nT and clipped for display at ±3nT. Data are interpolated to a resolution of effectively 0.5m between tracks and 0.15m along each survey track.

2.3.4 Additional data processing has been carried out in the form of high pass filtering. This effectively removes low frequency variation along a traverse that has been caused by large magnetic bodies, cultivation or rapid temperature change. Data treated to additional processing have been compared to unprocessed data to ensure that no significant anomalies have been removed.

2.3.5 Appendix C contains metadata concerning the survey and data attributes and is derived directly from TerraSurveyor. Reference should be made to Appendix B for further information on processing.

2.3.6 A TIF file is produced by TerraSurveyor software along with an associated world file (.TFW) that allows automatic georeferencing (OSGB36 datum) when using GIS or CAD software. The main form of data display used in the report is the minimally processed greyscale plot. With regard to the Sensys MXPDA, minimally processed data are considered by the manufacturer to be data that are compensated by SENSYS MAGNETO DLMGPS software, see 2.3.1 and 2.3.2. Note: traceplots are not considered to be appropriate as they do not provide an accurate or useful assessment of the magnetic anomalies due to the very high density of data collection. In addition, traceplots cannot be meaningfully plotted against base mapping and in areas of complexity traces may be lost or highly confused.

2.3.7 The raster images are combined with base mapping using ProgeCAD Professional 2016, creating DWG (2010) file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. The CAD plots are effectively georeferenced facilitating relocation of features using GNSS, resection method, etc.

2.3.8 An abstraction and interpretation is drawn and plotted for all geophysical anomalies located by the survey. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing. Appendix E sets out CAD layer names with colour and graphic content for each interpretation category, see 3.3.

2.3.9 A brief summary of each anomaly, with an appropriate reference number, is set out in list form within the results (Section 3) to allow a rapid and objective assessment of features within the survey area.

2.3.10 A digital archive is produced with this report, see Appendix D below. The main archive is held at the offices of Archaeological Surveys Ltd.

3 RESULTS

3.1 General assessment of survey results

3.1.1 The detailed magnetic survey was carried out over approximately 3.6ha within the western part of a single agricultural field.

3.1.2 Magnetic anomalies located can be generally classified as positive and negative anomalies of an uncertain origin, linear anomalies of an agricultural origin, areas of magnetic debris and disturbance and strong discrete dipolar anomalies relating to ferrous objects. Anomalies located within the survey area have been numbered and are described in 3.4 below.

3.2 Statement of data quality and factors influencing the interpretation of anomalies

3.2.1 Data are considered representative of the magnetic anomalies present within the site. There are no significant defects within the dataset.

3.2.2 Zones of magnetic disturbance are localised and considered unlikely to obscure weaker features with the exception of a very small area close to houses near the south western corner of the site. A large patch of magnetic debris was encountered in the western part of the field, and the high magnitude response may obscure weak features; however, the debris may relate to an infilled depression such as a pond or extraction pit.

3.2.3 The soil and underlying geology appear to support useful magnetic contrast as former ridge and furrow cultivation was located by the survey which may indicate that former cut features are capable of forming magnetic anomalies.

3.3 Data interpretation

3.3.1 The list of sub-headings below attempts to define a number of separate categories that reflect the range and type of features located during the survey. A general explanation of the characteristics of the magnetic anomalies is set out for each category in order to justify interpretation, see Table 1.

Interpretation category	Description and origin of anomalies
Anomalies with an uncertain origin	The category applies to a range of anomalies where there is not enough evidence to confidently suggest an origin. Anomalies in this category may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered. Morphology may be unclear or uncharacteristic and there may be a lack of additional supporting information. Positive anomalies are indicative of magnetically enhanced soils that may form the fill of 'cut' features or may be produced by accumulation within layers or 'earthwork' features; soils subject to burning may also produce positive anomalies. Negative anomalies are produced by material of comparatively low magnetic susceptibility such as stone and subsoil.

Anomalies relating to land management	Land drains can appear in a classic herringbone pattern of interconnected multiple dipolar linear anomalies, or as parallel linear anomalies. The multiple dipolar response indicates ceramic land drains.
Anomalies with an agricultural origin	The anomalies are often linear and form a series of parallel responses or are parallel to extant land boundaries. Where the response is broad, former ridge and furrow is likely; narrow response is often related to modern ploughing. This category does not include agricultural features of early date or considered to be of archaeological potential (e.g. animal stockades, enclosures, farmsteads, etc).
Anomalies associated with magnetic debris	Magnetic debris often appears as areas containing many small dipolar anomalies that may range from weak to very strong in magnitude. They often occur where there has been dumping or ground make-up and are related to magnetically thermoremnant materials such as brick or tile or other small fragments of ferrous material. This type of response is occasionally associated with kilns, furnace structures, hearths and nail spreads from former wooden structures or rooves and may, therefore, be archaeologically significant. It is also possible that the response may be caused by natural material such as certain gravels and fragments of igneous or metamorphic rock. Strong discrete dipolar anomalies are responses to ferrous objects within the topsoil.
Anomalies with a modern origin	The magnetic response is often strong and dipolar indicative of ferrous material and may be associated with extant above surface features such as wire fencing, cables, pylons etc. Often a significant area around these features has a strong magnetic flux which may create magnetic disturbance; such disturbance can effectively obscure low magnitude anomalies if they are present. Fluxgate sensors may respond erratically adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.

Table 1: List and description of interpretation categories

3.4 List of anomalies

Area centred on OS NGR 450500 210900, see Figs 03 – 05.

Anomalies with an uncertain origin

(1) – A weakly positive linear anomaly is located in the southern part of the survey area. It appears to have been truncated by ridge and furrow and could relate to a cut, linear ditch with archaeological potential. A negative linear anomaly is located close to and parallel with it.

(2) – The survey area contains a number of short, weakly positive linear anomalies which could relate to ditch-like features. However, they generally lack a coherent morphology preventing confident interpretation.

(3) – The survey area contains a number of discrete positive responses, with a large example in the north west. The anomalies indicate the presence of pit-like features, and although some are clustered in groups, there is a lack of pattern or layout to assist interpretation. Such pit-like features can relate to naturally formed soil-filled features within the underlying geology, or tree throw pits; however, an anthropogenic or archaeological origin is possible despite the lack of clearly defined associated archaeological features.

(4) – Several amorphous positive responses can be seen within the survey area, with two surrounding the large patch of magnetic debris (7) and another in the north eastern corner. It is not clear if these relate to naturally formed features, or if they are associated with clay extraction.

Anomalies associated with land management

(5) – A number of land drains are evident within the site with several appearing to lead away from the patch of magnetic debris (7) to the lower ground to the north.

Anomalies with an agricultural origin

(6) – The site contains former ridge and furrow on different orientations.

Anomalies associated with magnetic debris

(7) – A large patch of magnetic debris is located in the western part of the site. It corresponds to a shallow depression within the field. The response is to ferrous and other strongly magnetic material likely to have been dumped within a possible former clay pit or pond, although none have been mapped, the patch is visible on aerial photographs.

(8) – Strong, discrete, dipolar anomalies are responses to ferrous and other magnetically thermoremnant objects within the topsoil.

Anomalies with a modern origin

(9) – Magnetic disturbance from adjacent ferrous fencing and houses.

4 CONCLUSION

4.1.1 The geophysical survey located a weakly positive linear anomaly within the southern part of the site that could relate to a cut, ditch-like feature. There are a number of other linear anomalies within the site, but they generally lack a coherent morphology. Pit-like features are also evident, and although they can relate to naturally formed features, it is possible that they could relate to former cut features. Amorphous positive responses and a large patch of highly magnetic debris could be associated with an infilled pond or clay pits, although none have been mapped.

5 REFERENCES

ASWYAS, 2020. *The North Oxford Site (East), Cutteslowe, Oxfordshire, Geophysical Survey.* Report no. 3153. Unpublished typescript document.

Archaeological Surveys, 2020. *St Frideswide Farm, Oxford, Geophysical Survey Written Scheme of Investigation.* Unpublished typescript document.

Aspinall, A., Gaffney, C. and Schmidt, A. 2009. *Magnetometry for Archaeologists*. Lanham (US), AltaMira Press.

British Geological Survey, 2017. *Geology of Britain 3D (Beta version), 1:50 000 scale [online]* available from http://mapapps.bgs.ac.uk/geologyofbritain3d/index.html? [accessed 17/9/2020].

Chartered Institute for Archaeologists, 2014. *Standard and Guidance for archaeological geophysical survey*. CIfA, University of Reading.

European Archaeological Council, 2015. *EAC Guidelines for the Use of Geophysics in Archaeology: Questions to Ask and Points to Consider.* Europae Archaeologia Consilium and Association Internationale sans But Lucratif, Belgium.

Historic England, 2018. Geophysical Survey Advice [online] available from https://historicengland.org.uk/advice/technical-advice/archaeological-science/geophysics/ [accessed July 2018].

Institute for Archaeologists, 2002. *The use of Geophysical Techniques in Archaeological Evaluations*. IfA Paper No. 6. IfA, University of Reading.

Schmidt, A., 2013. *Geophysical Data in Archaeology: A Guide to Good Practice.* Oxbow Books.

Soil Survey of England and Wales, 1983. *Soils of England and Wales, Sheet 6 South East England.*

WYG, 2020. *St Frideswide Farm, Oxford, Archaeological & Heritage Desk-Based Assessment.* Report no. A105211-4. Unpublished typescript document.

Appendix A – basic principles of magnetic survey

Iron minerals are always present to some degree within the topsoil and enhancement associated with human activity is related to increases in the level of magnetic susceptibility and thermoremnant material. Magnetic susceptibility is an induced magnetism within a material when it is in the presence of a magnetic field. This can be thought of as effectively permanent due to the presence of the Earth's magnetic field. Thermoremnant magnetism occurs when ferrous material is heated beyond a specific temperature known as the Curie Point. Demagnetisation occurs at this temperature with re-magnetisation by the Earth's magnetic field upon cooling.

Enhancement of magnetic susceptibility can occur in areas subject to burning and complex fermentation processes on biological material; these are frequently associated with human settlement. Thermoremnant features include ovens, hearths, and kilns. In addition thermoremnant material such as tile and brick may also be associated with human activity and settlement.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil can create an area of enhancement compared with surrounding soils and subsoils into which the feature is cut. Mapping enhanced areas will produce linear and discrete anomalies allowing an assessment and characterisation of hidden subsurface features.

It should be noted that areas of negative enhancement can be produced from material having lower magnetic properties compared to the topsoil. This is common for many sedimentary bedrocks and subsoils which were often used in the construction of banks and walls etc. Mapping these 'negative' anomalies may also reveal archaeological features.

Magnetic survey or magnetometry can be carried out using a fluxgate gradiometer and may be referred to as gradiometry. The SENSYS gradiometer is a passive instrument consisting of two fluxgate sensors mounted vertically 65cm apart. The instrument is carried about 10-20cm above the ground surface and the upper sensor measures the Earth's magnetic field as does the lower sensor but this is influenced to a greater degree by any localised buried magnetic field. The difference between the two sensors will relate to the strength of the magnetic field created by the buried feature.

There are a number of factors that may affect the magnetic survey and these include soil type, local geology and previous human activity. Situations arise where magnetic disturbance associated with modern services, metal fencing, dumped waste material etc., obscures low magnitude fields associated with archaeological features.

Appendix B – data processing notes

Clipping

Minimum and maximum values are set and replace data outside of the range with those values. Extreme values are removed improving colour or greyscale contrast associated with data values that may be archaeologically significant. Different ranges are applied to data in order to determine the most suitable for anomaly abstraction and display.

Despike

Removal of data points that exceed the mean/median/threshold by selecting a window size of data points and replace by mean/median/threshold. Magnetic spikes can be caused iron objects on the surface or within the topsoil. Despike can improve the appearance of data and remove extreme readings that may affect further processing.

High Pass Filter

Removes low frequency anomalies within the data that are not considered to be archaeologically significant and may be natural in origin. A window passes over the data, the mean of all the data within the window is subtracted from the centre value. The size of the window is adjusted as is the weighting which may be uniform or Gaussian. The process is used to improve the visibility of anomalies of interest.

Low Pass Filter

Removes high frequency anomalies or 'noise' within datasets and provides a smoother output. A window passes over the data, the mean of all the data within the window is used to replace the centre value. The size of the window is adjusted as is the weighting. The process is used to improve the visibility of anomalies of interest.

Zero Median/Mean Traverse

The median (or mean) of data from each traverse is calculated ignoring data outside a threshold value, the median (or mean) is then subtracted from the traverse. The process is used to equalise differences between the offset values of the gradiometer sensors. The process can remove archaeological features that run along a traverse but with the high resolution datasets created by the Sensys FGM650 sensors and the method of data collection this has not been a notable problem. In fact, the removal of offsets using software avoids carrying out a balancing procedure on site, which inevitably can never be done in magnetically clean conditions and results in improperly aligned fluxgate sensors and/or electronic adjustment values.

Appendix C – survey and data information

Minimally processed data

Filename: J831-mag-proc.xcp
Description: Imported as Composite from: J831-mag.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 450368.73, 211028.41 m
Southeast corner: 450608.58, 210792.91 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702
Source GPS Points: 1057000
Dimensions
Composite Size (readings): 1599 x 1570
Survey Size (meters): 240 m x 236 m
Grid Size: 240 m x 236 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.10
Mean: 0.00
Median: 0.00
Composite Area: 5.6485 ha
Surveyed Area: 3.6134 ha
PROGRAM
Name: TerraSurveyor
Version: 3.0.23.0
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT

Filtered data

Filename: J831-mag-proc-hpf.xcp
Stats
Max: 2.32
Min: -2.30
Std Dev: 0.5
Mean: 0.01
Median: 0.00
GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 High pass Uniform (median) filter: Window dia: 250
5 Clip from -2.00 to 2.00 nT

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at their offices in Wiltshire. Data are backed-up onto an on-site data storage drive and at the earliest opportunity data are copied to CD ROM for storage on-site and off-site.

A PDF copy will be supplied to the Oxford Historic Environment Record with greyscale images and abstraction layers made available on request. The report will also be uploaded to the Online AccesS to the Index of archaeological investigationS (OASIS).

Archive contents:

File type	Naming scheme	Description
Data	J831-mag..asc J831-mag.xcp J831-mag-proc.xcp J831-mag-proc-hpf.xcp	Raw data as ASCII CSV TerraSurveyor raw data TerraSurveyor minimally processed data TerraSurveyor filtered data
Graphics	J831-mag-proc.tif J831-mag-proc-hpf.tif	Image in TIF format
Drawing	J831-**[version number]**.dwg	CAD file in 2010 dwg format
Report	J831 report.odt	Report text in Open Office odt format

Table 2: Archive metadata

Appendix E – CAD layers for abstraction and interpretation plots

The table below sets out Archaeological Surveys Ltd CAD layer names with associated colours and graphical content. Where CAD files are available layers may be extracted for further CAD/GIS use. Note: hatched polygon boundaries are contained within layers with the RGB colour code 254, 255, 255 (near white) in order to prevent their visibility.

Report sub-heading and associated CAD layer names	Colour with RGB index		Layer content
Anomalies with an uncertain origin			
AS-ABST MAG POS LINEAR UNCERTAIN		255,127,0	Line, polyline or polygon (solid)
AS-ABST MAG NEG LINEAR UNCERTAIN		Blue 0,0,255	Line, polyline or polygon (solid)
AS-ABST MAG POS DISCRETE UNCERTAIN		255,127,0	Solid donut, point or polygon (solid)
Anomalies relating to land management			
AS-ABST MAG LAND DRAIN		Cyan 0,255,255	Line or polyline
Anomalies with an agricultural origin			
AS-ABST MAG RIDGE AND FURROW		0,127,63	Line, polyline or polygon (cross hatched ANSI37)
Anomalies associated with magnetic debris			
AS-ABST MAG DEBRIS		132, 132, 132	Polygon (cross hatched ANSI37)
AS-ABST MAG STRONG DIPOLAR		132, 132, 132	Solid donut, point or polygon (solid)
Anomalies with a modern origin			
AS-ABST MAG DISTURBANCE		132, 132, 132	Polygon (hatched ANSI31)
AS-ABST MAG SERVICE		132, 132, 132	Line or polyline

Table 3: CAD layering

Appendix F – copyright and intellectual property

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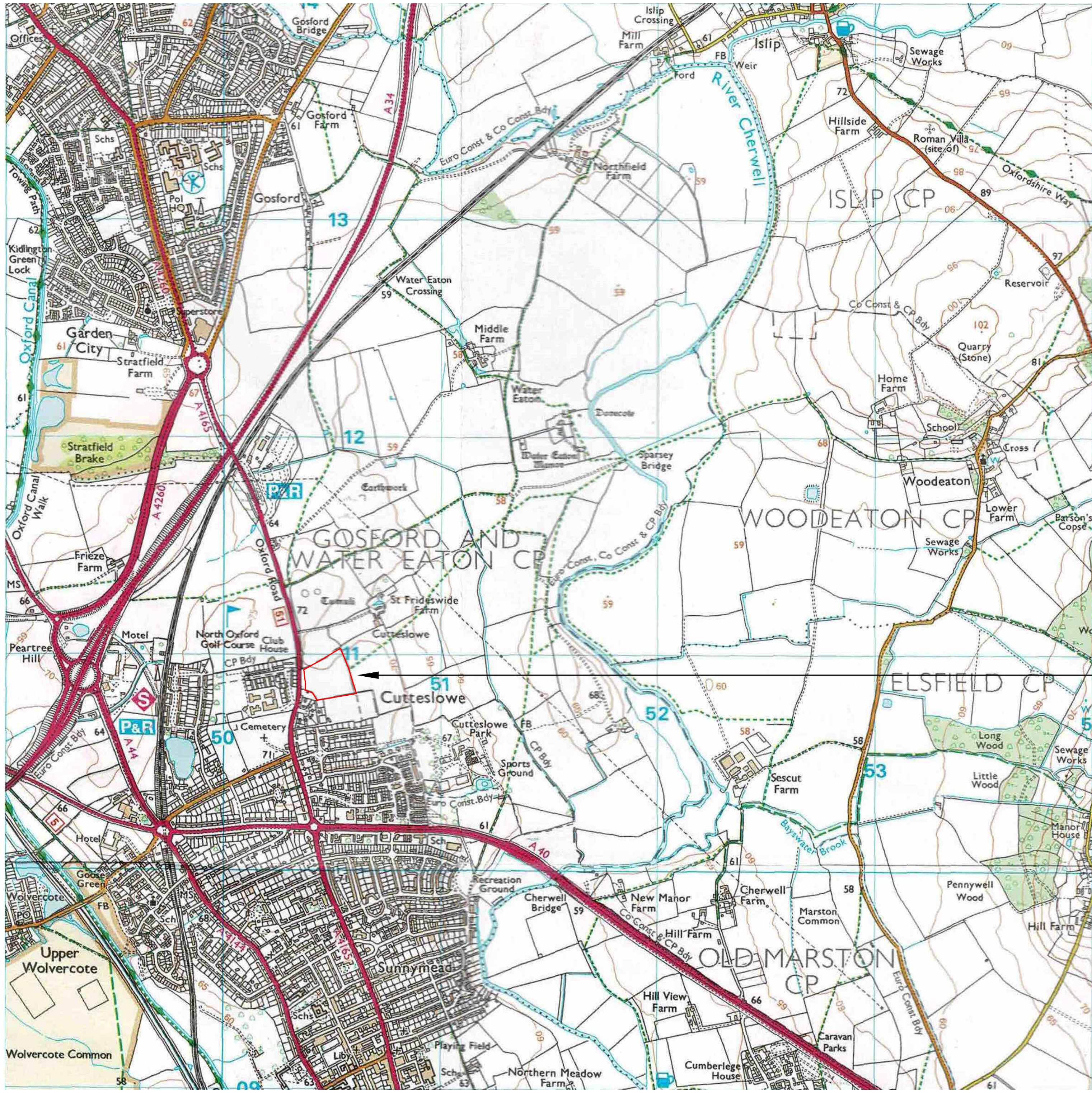
Map of survey area

N



Survey location

Survey location

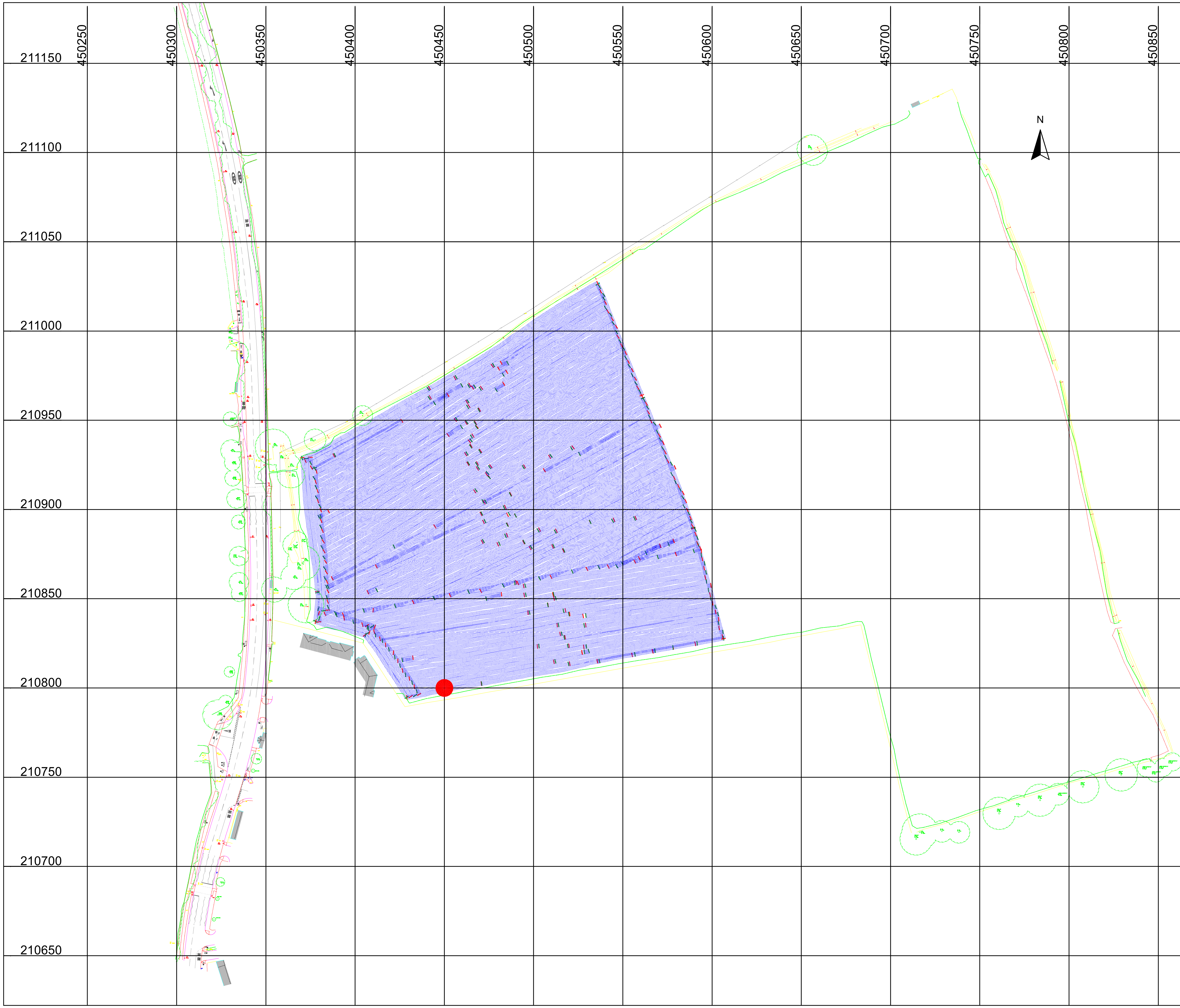
Site centred on OS NGR
SP 50500 10900

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 01



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Referencing information

Referencing grid to OSGB36 datum at 50m intervals

● 450450 210800

Survey tracks

Survey track start

Survey track stop

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SCALE TRUE AT A3

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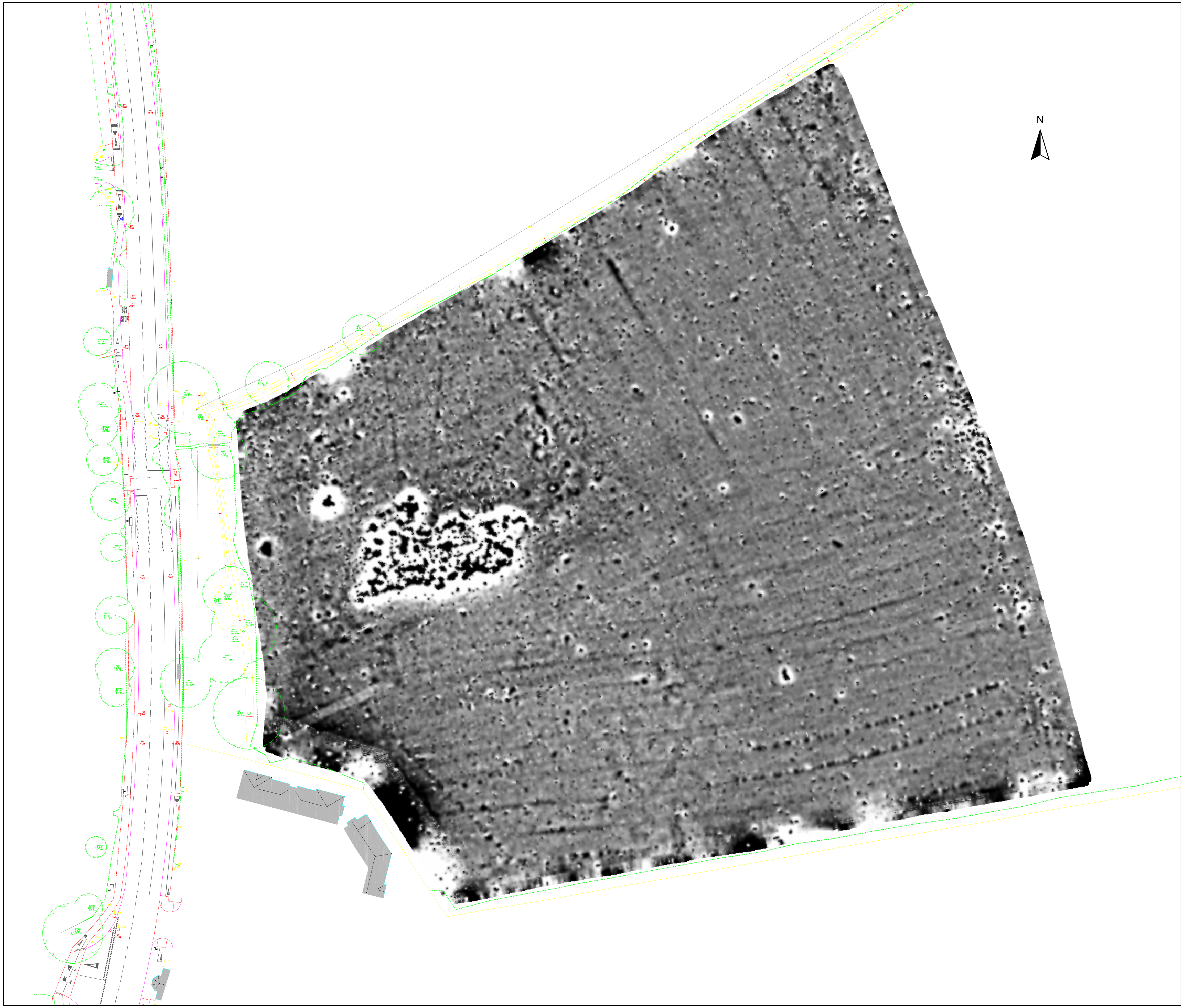
KTD	DJS	FIG 02



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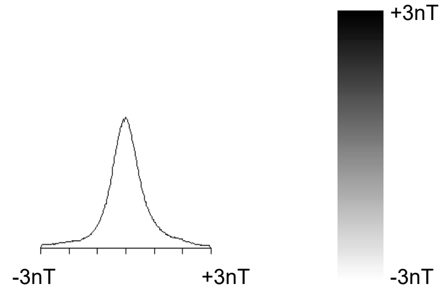
Greyscale plot of minimally processed magnetometer data



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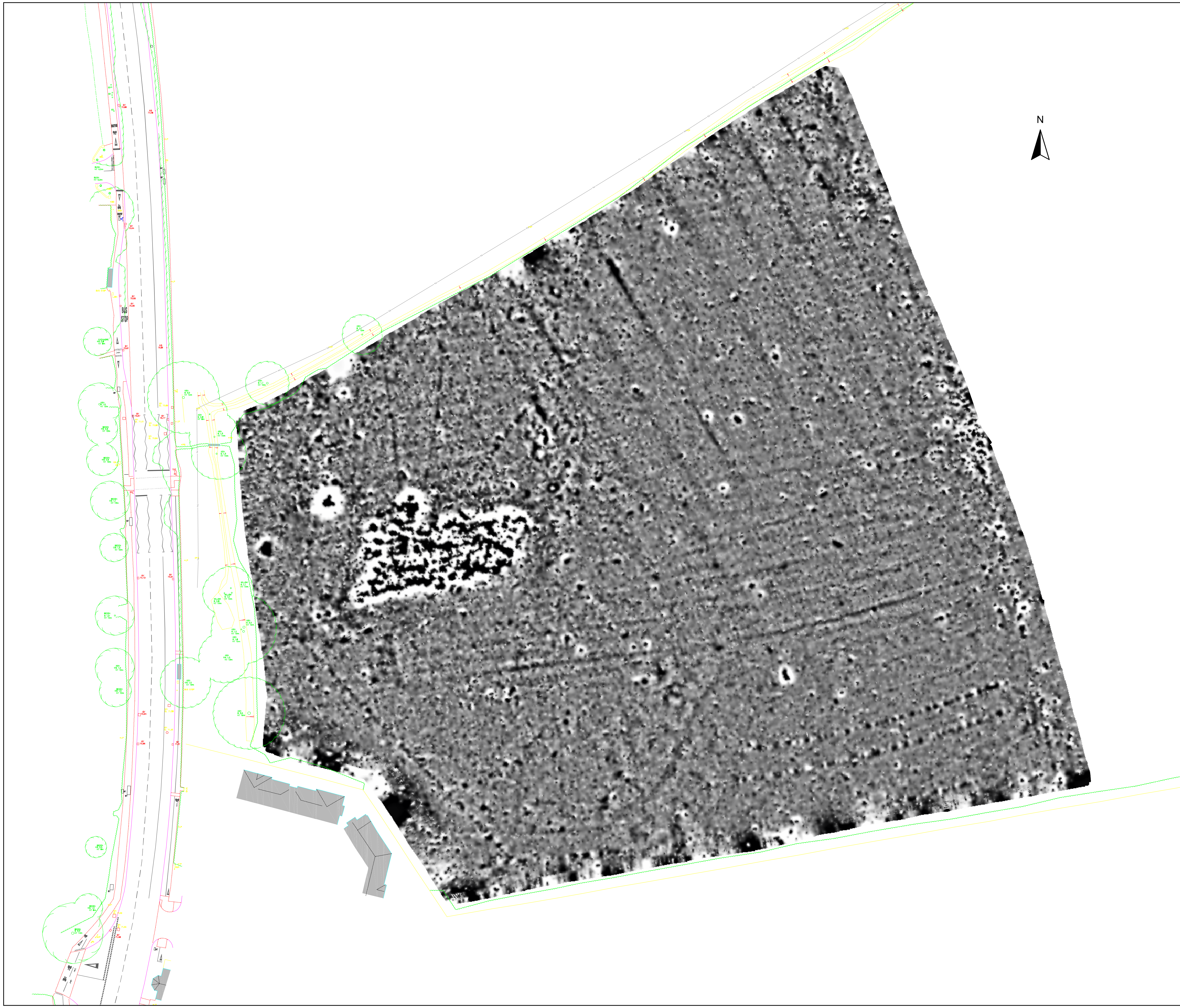

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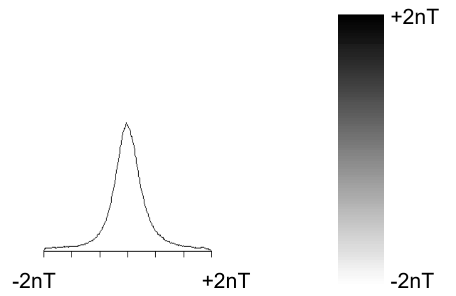
Greyscale plot of filtered magnetometer data



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SCALE TRUE AT A3

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KTD	DJS	FIG 04

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Abstraction and interpretation of magnetic anomalies

- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - ridge and furrow
- Positive/weak multiple dipolar linear anomaly - possible land drain
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

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KTD	DJS	FIG 05