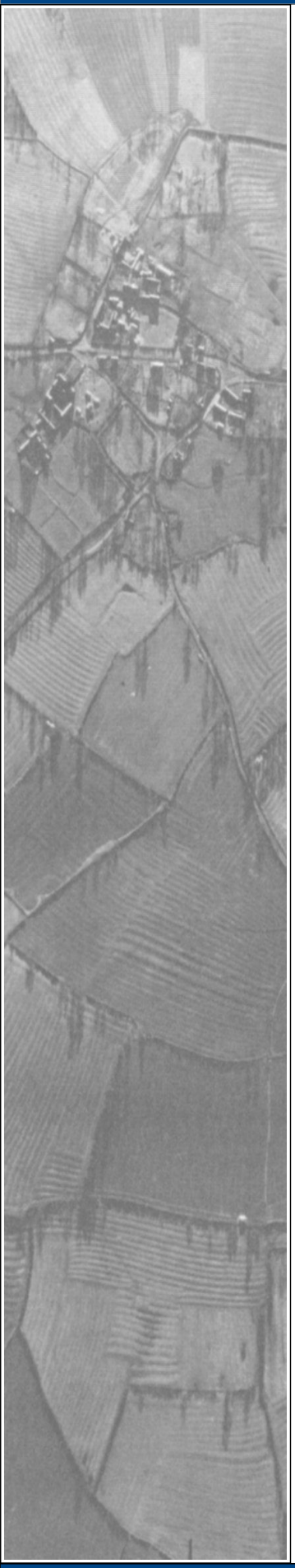


Sherecroft Farm
Botley
Hampshire

MAGNETOMETER SURVEY REPORT

for

The Swaythling Housing Society Ltd

Kerry Donaldson & David Sabin

January 2023

Ref. no. J944

ARCHAEOLOGICAL SURVEYS LTD

Sherecroft Farm
Botley
Hampshire

MAGNETOMETER SURVEY REPORT

for

The Swaythling Housing Society Ltd

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

Survey dates – 13th, 16th & 17th January 2023
Ordnance Survey Grid Reference – **SU 51830 13185**

Archaeological Surveys Ltd
1 West Nolands, Nolands Road, Yatesbury, Calne, Wiltshire, SN11 8YD
Tel: 01249 814231 Fax: 0871 661 8804
Email: info@archaeological-surveys.co.uk
Web: www.archaeological-surveys.co.uk

CONTENTS

LIST OF FIGURES

LIST OF PLATES

LIST OF TABLES

SUMMARY

Detailed magnetometry was carried out by Archaeological Surveys Ltd, ahead of a mixed use development at Sherecroft Farm, near Botley in Hampshire. The results indicate the presence of a rectilinear anomaly in the eastern part of the site with a number of other positive and negative anomalies in the vicinity. However, the origin of the anomalies cannot be confidently determined. Elsewhere the anomalies generally lack a coherent morphology, although a small group of positive anomalies in the central part of the site and another close to the western edge appear to relate to magnetically enhanced features that may be associated with anthropogenic features.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Tetra Tech, on behalf of The Swaythling Housing Society Ltd, to undertake a magnetometer survey of an area of land at Sherecroft Farm, near Botley in Hampshire. The site has been outlined for a proposed mixed use development (Winchester City Council hybrid planning application no: 20/00494/FUL).

1.1.2 The geophysical survey was carried out in accordance with a Written Scheme of Investigation (WSI) produced by Archaeological Surveys (2022). The WSI considers the requirements of a Brief for Archaeological Work (Tetra Tech, 2022) which outlines the need for a geophysical survey within the site as part of an archaeological investigation.

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 Archaeological Surveys Ltd is a Registered Organisation with the Chartered

Institute for Archaeologists and both company directors are Members of the Chartered Institute for Archaeologists (MCIfA) and have therefore been assessed for their technical competence and ethical suitability and abide by the CIfA Codes of Conduct. 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, updated 2020) *Standard and Guidance for Archaeological Geophysical Survey.*

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 Sherecroft Farm on the eastern edge of Botley, but within the parish of Curdridge in Hampshire. It is centred on Ordnance Survey National Grid Reference (OS NGR) SU 51830 13185, see Figs 01 and 02.

1.4.2 The geophysical survey covers approximately 9ha within three land parcels that were accessible and suitable for survey. The western strip of land outlined in the development boundary was too steep, overgrown and inaccessible for survey.

1.4.3 Area 1 is a triangular field forming the eastern part of the site. It is located immediately south of Bottings Industrial Estate with the A334 to the south and east and Area 2 to the west. Field boundaries are mainly hedgerows, at the time of survey temporary steel mesh fencing (Heras) was present along the western boundary. The surface conditions were poor due to deep vehicle,

waterlogged ground and areas of standing water. Ground cover was rough grass.

1.4.4 Area 2 is a field located to the west of Area 1 and Bottings Industrial Estate, Area 3 is located to the west of it with dilapidated agricultural buildings located to the south. At the northern end of the field there is a steel pylon, steel Heras fencing was located along the western, eastern and southern sides of the area. The ground cover consisted of rough grass and the land was waterlogged with some standing water in the south western corner.

1.4.5 Area 3 is a strip of land along the western side of the site. It is located west of Area 2 and is bounded along the western side by by a channel of the River Hamble. The land slopes down towards the river, steeply in places, and a number of springs or drainage channels emerge from the slope. The ground cover consisted of rough grass and wild vegetation, the extent of the survey was limited in places by both boggy ground and areas of thick vegetation.

1.4.6 The ground conditions across the site were generally considered to be suitable for the collection of magnetometry data. Survey avoided infilled geotechnical pits due to saturated clayey backfill that was potentially hazardous to walk on. Survey avoided the immediately vicinity of modern steel objects due to high magnitude magnetic disturbance. Weather conditions during the survey were mainly cold and fine.

Plate 1: Survey Area 2 looking north east

1.5 Site history and archaeological potential

1.5.1 An Archaeological Desk-Based Assessment has been prepared for the site by Tetra Tech (formerly WYG, 2020), which outlines that evidence for Bronze Age settlement has been identified both to the north west and south east of the site with the medieval settlement of Botley located immediately to the south west of the site. The western part of the site lies within the Botley Conservation Area. The Bishops Waltham Tithe map of 1839 shows the site subdivided into nine separate land parcels with gradual amalgamation into the four land parcels that it is today.

1.6 Geology and soils

1.6.1 The underlying solid geology across the site is sand, silt and clay from the Wittering Formation with overlying River Terrace Deposits in the central part of the site and alluvium along the western edge (BGS, 2022).

1.6.2 The overlying soil across the survey area is from the Wickham 4 association (711h) and is a typical stagnogley soil. It consists of a slowly permeable, seasonally waterlogged, fine, loamy over clayey soil. The soil overlying the alluvium along the western edge of the site is from the Fladbury 3 association (813d) which is a pelo-alluvial gley soil and consists of a stoneless, clayey, fine, silty soil affected by groundwater (Soil Survey of England and Wales, 1983).

1.6.3 The underlying geology and soils are considered less than optimum for magnetic survey as they can be associated with low magnetic susceptibility. If, however, the site contains evidence for long term occupation or industrial activity, the soils can become sufficiently enhanced for the creation of magnetic anomalies.

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 magnetic 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 positive magnetic anomalies that can be mapped by magnetic prospection. In addition, where soil is displaced by material of comparatively low magnetic susceptibility, such as

many types of sedimentary rock, anomalies of negative value may occur which could be indicative of structural remains.

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 and displayed at 0.15m. The cart is pushed at walking speed and not tEach 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 approximately 0.1nT. They are linked to a Leica GS10 RTK GNSS with data recorded by SENSYS MonMX software on a rugged notebook 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.

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 for Areas 1 and 2 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. 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. Traceplots may be used to demonstrate characteristic magnetic profiles across discrete features where it is considered beneficial.

2.3.7 The raster images are combined with base mapping using ProgeCAD Professional 2021, creating DWG (2018) 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 each 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 a total of three survey areas covering approximately 9ha.

3.1.2 Magnetic anomalies located can be generally classified as positive and negative anomalies of an uncertain origin, anomalies associated with land management, linear anomalies of an agricultural origin, anomalies with a natural origin, areas of magnetic debris and disturbance, strong discrete dipolar anomalies relating to ferrous objects and strong multiple dipolar linear anomalies relating to buried services or pipelines. Anomalies located within each survey area have been numbered and are described in 3.4 to 3.7 below.

3.2 Data quality and factors affecting the interpretation or formation of anomalies

3.2.1 Data are considered representative of the magnetic anomalies present within the site. Zones of high magnitude magnetic disturbance were located adjacent to Bottings Industrial Estate and crossing the central part of Area 1. These relate to underground services and above ground modern steel objects. The very high magnitude of the anomalies has the potential to obscure weak magnetic features should they occur within those zones.

3.2.2 Although the magnetic susceptibility of the soils across the site is typically low, several linear anomalies relating to former agricultural activity were located, along with other anomalies of uncertain origin, and these may infer that the soil is capable of producing useful magnetic contrast.

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	Anomalies are mainly linear and may be indicative of the magnetically enhanced fill of cut features (i.e. ditches). The anomalies may be long and/or form rectilinear elements and they may relate to topographic features or be visible on early mapping. Associated agricultural anomalies (e.g. headlands, plough marks and former ridge and furrow) may support the interpretation. 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.
Anomalies with a natural origin	Naturally formed magnetic anomalies are caused by localised variability in the magnetic susceptibility of soils, subsoils and other drift or solid geologies. Anomalies may be amorphous, linear or curvilinear and may appear 'fluvial' or discrete; the latter are almost impossible to distinguish from pit-like anomalies with an anthropogenic origin. Fluvial, glacial and periglacial processes may be responsible for their

	formation within drift material and subsoil. Igneous and metamorphic activity can lead to anomalies within more solid geology.

Table 1: List and description of interpretation categories

3.4 List of anomalies - Area 1

Area centred on OS NGR 451935 113095, see Figs 03 – 05.

Anomalies with an uncertain origin

(1) – A positive rectilinear anomaly is located in the north eastern part of Area 1. It appears to relate to a cut feature that has been truncated through later activity and could therefore have archaeological potential.

(2) – The survey area contains a number of weakly positive and some negative linear anomalies with a concentration towards the north eastern corner. They lack a coherent morphology and it is not clear if there is an association with cut features or vehicular activity.

Anomalies with an agricultural origin

(3) – A series of linear anomalies, parallel with the western field boundary, relate to agricultural activity.

Anomalies with a modern origin

(4) – A strong, multiple dipolar linear anomaly crosses the survey area from the north western corner towards the south east. It relates to a buried service. A second service extends along the northern edge of the area and both have caused widespread strongly magnetic disturbance.

3.5 List of anomalies - Area 2

Area centred on OS NGR 451770 113200, see Figs 03 – 05.

Anomalies with an uncertain origin

(5) – A group of positive linear and discrete anomalies are situated at the western edge of Area 2. The response may indicate and association with former cut features.

(6) – The southern half of Area 2 contains three discrete positive anomalies. They have a response of 10-20nT, which may suggest an association with burnt material.

(7) – A small number of weakly positive discrete anomalies are situated within the site. They have a response of c1.5nT and may relate to natural features.

Anomalies associated with land management

(8) – A positive linear anomaly relates to a formerly mapped field boundary extending through the centre of the survey area.

(9) – Two parallel positive linear anomalies and a linear zone of magnetic debris are associated with a formerly mapped boundary.

(10) – Two weak, multiple dipolar linear anomalies relate to land drains in the northern part of Area 2.

Anomalies with an agricultural origin

(11) – Linear anomalies parallel with the southern field boundary and former boundary (8) relate to agricultural activity.

Anomalies with a natural origin

(12) – Zones of magnetically variable responses in the south eastern part of Area 2 relate to naturally formed features. River terrace gravels are mapped in the vicinity and these are likely to be associated.

Anomalies associated with magnetic debris

(13) – Magnetic debris is evident along the southern edge of the survey area. Recent burning and other modern ferrous debris was visible at the time of survey.

Anomalies with a modern origin

(14) – Strong, multiple dipolar, linear anomalies relate to a buried service extending from the north eastern corner of the area towards the agricultural buildings.

(15) – Buried services seen associated with a wide zone of magnetic disturbance.

3.6 List of anomalies - Area 3

Area centred on OS NGR 451670 113285, see Figs 03 – 05.

Anomalies with an uncertain origin

(16) – A group of linear, rectilinear and discrete anomalies are located at the western edge of Area 3. Although their morphology is unclear, it is possible that they have some archaeological potential. Low linear earthworks are visible in the vicinity

although they may relate to naturally formed or agricultural features

(17) – Two weakly positive, sinuous linear anomalies can be seen in the centre of the survey area. It is not possible to determine their origin.

(18) – Area 3 contains a small number of weakly positive discrete anomalies. It is possible that they relate to natural features.

Anomalies associated with land management

(19) – Two parallel linear anomalies appear to relate to land drains.

Anomalies with a natural origin

(20) – Magnetically variable responses relate to natural formed features along the western edge of the site.

Anomalies associated with magnetic debris

(21) – Strong, discrete dipolar anomalies are a response to ferrous and other magnetically thermoremnant objects, such as brick/tile, within the topsoil.

4 CONCLUSION

4.1.1 The geophysical survey located a positive rectilinear anomaly in the eastern part of the site (Area 1) that may relate to a cut feature. Other positive and negative linear anomalies within the vicinity lack a coherent morphology and cannot be confidently interpreted. In the central part of the site (Area 2) there is a small group of positive responses, with other isolated discrete positive responses that appear to relate to magnetically enhanced features; however, the origin of these anomalies cannot be confidently interpreted. In the western part of the site (Area 3) there is a group of positive responses, that could relate to cut and magnetically enhanced features with an anthropogenic origin.

5 REFERENCES

Archaeological Surveys, 2022. *Sherecroft Farm, Botley, Hampshire, 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, 2022. *Geology Viewer, [online]* available from https://geologyviewer.bgs.ac.uk [accessed 15/12/2022].

Chartered Institute for Archaeologists, 2014 (updated 2020). *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.*

Tetra Tech, 2022. *Sherecroft Farm, Botley, Geophysical Survey Brief for Archaeological Works.*

WYG, 2020. *Sherecroft Farm, Botley, Archaeological Desk-Based Assessment.* Ref: A091339.

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.

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.

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

Area 1 minimally processed data
Filename: J944-mag-Area1-proc.xcp
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 451822.86, 113176.27 m
Southeast corner: 452077.41, 113008.27 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702
Dimensions
Survey Size (meters): 255 m x 168 m
X&Y Interval: 0.15 m
Source GPS Points: Active: 966832, Recorded: 966837
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.56
Mean: 0.00
Median: 0.02
Composite Area: 4.2764 ha
Surveyed Area: 2.6762 ha
PROGRAM
Name: TerraSurveyor
Version: 3.0.37.0
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (UTM to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT

Area 1 filtered data
Filename: J944-mag-Area1-proc-hpf.xcp
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.24
Mean: 0.01
Median: 0.00
GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (UTM to OSGB36).
3 DeStripe Median Traverse:
4 High pass Uniform (median) filter: Window dia: 200
5 Clip from -3.00 to 3.00 nT

Area 2 minimally processed data
Filename: J944-mag-Area2-proc.xcp
Northwest corner: 451666.55, 113366.92 m
Southeast corner: 451853.75, 113052.97 m
Dimensions
Survey Size (meters): 187 m x 314 m
X&Y Interval: 0.15 m
Source GPS Points: Active: 1114790, Recorded: 1114795
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.44
Mean: -0.04
Median: 0.04
Composite Area: 5.8771 ha
Surveyed Area: 3.6285 ha
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (UTM to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT

Filename: J944-mag-Area2-proc-hpf.xcp
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.33
Mean: -0.05
Median: 0.00
GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (UTM to OSGB36).
3 DeStripe Median Traverse:
4 High pass Uniform (median) filter: Window dia: 300
5 Clip from -3.00 to 3.00 nT

Filename: J944-mag-Area3-proc.xcp
Northwest corner: 451597.70, 113427.76m
Southeast corner: 451773.65, 113116.96m
Dimensions
Survey Size (meters): 176 m x 311 m
X&Y Interval: 0.15 m
Source GPS Points: Active: 442944, Recorded: 442949
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.08
Mean: 0.00
Median: 0.00
Composite Area: 5.4685 ha
Surveyed Area: 1.3073 ha
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (UTM to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 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 Winchester 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	J944-mag-**[area number/name]**.asc J944-mag-**[area number/name]**.xcp J944-mag-**[area number/name]**-proc.xcp	Raw data as ASCII CSV TerraSurveyor raw data TerraSurveyor minimally processed data
Graphics	J944-mag-**[area number/name]**-proc.tif	Image in TIF format
Drawing	J944-**[version number]**.dwg	CAD file in 2018 dwg format
Report	J944 report.odt	Report text in LibreOffice 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 BOUNDARY	127,0,0	Line, polyline or polygon (solid or cross hatched ANSI37)
AS-ABST MAG LAND DRAIN	Cyan 0,255,255	Line or polyline
Anomalies with an agricultural origin		
AS-ABST MAG AGRICULTURAL	Green 0,255,0	Line or polyline
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
Anomalies with a natural origin		
AS-ABST MAG NATURAL FEATURES	204,178,102	Polygon (cross hatched ANSI37)

Table 3: CAD layering

Appendix F – copyright and intellectual property

This report may contain material that is non-Archaeological Surveys Ltd copyright (eg Ordnance Survey, Crown Copyright) or the intellectual property of third parties, which we are able to provide for limited reproduction under the terms of our own copyright licences, but for which copyright itself is non-transferable by Archaeological Surveys Ltd. Users remain bound by the conditions of the Copyright, Design and Patents Act 1988 with regard to multiple copying and electronic dissemination of this report.

Archaeological Surveys Ltd shall retain intellectual property rights for the materials and records created as part of this project. A non-exclusive and royalty-free licence shall be granted to the client on full payment of works in order for them to use, reproduce and enhance the reports, documentation, graphics and illustrations produced as part of this project for the purpose for which they were commissioned.

A non-exclusive licence will also be granted to the local authority for planning use and within the Historic Environment Record for public dissemination upon payment by the client.

Please note that a non-exclusive licence does not transfer full copyright which remains with Archaeological Surveys Ltd. A non-exclusive licence also does not allow the licensee to pass on usage rights to third parties.

Any document produced to meet planning requirements may be freely copied for planning, development control, research and outreach purposes without recourse to the originator, subject to all due and appropriate acknowledgements being provided and to the terms of the original contract with the client. Archaeological Surveys Ltd shall retain the right to be identified as the author and originator of the material.

The report, data and any associated material produced by Archaeological Surveys Ltd cannot be freely used for any commercial activity other than those set out above. Any unauthorised use will be considered to be in breach of copyright including the use of graphic items by third parties unless an additional non-exclusive licence has been granted by Archaeological Surveys Ltd.

www.archaeological-surveys.co.uk
info@archaeological-surveys.co.uk
Tel: 01249 814 231

Archaeological Surveys
Specialist Geophysical Surveyors

Geophysical Survey
Sherecroft Farm
Botley
Hampshire

Map of survey area

● Survey location

Site centred on OS NGR
SU 51830 13185

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 01

Archaeological Surveys
Specialist Geophysical Surveyors

Geophysical Survey
Sherecroft Farm
Botley
Hampshire

Referencing information

451550 451600 451650 451700 451750 451800 451850 451900 451950 452000 452050 452100 452150

113450 113400 113350 113300 113250 113200 113150 113100 113050 113000 112950

N

Area 3

Area 2

Area 1

Unsurveyable

Referencing grid to OSGB36 datum at 50m intervals

451800 113200

Survey tracks

Survey track start

Survey track stop

Development boundary

SCALE 1:2000

0m 20 40 60 80 100m

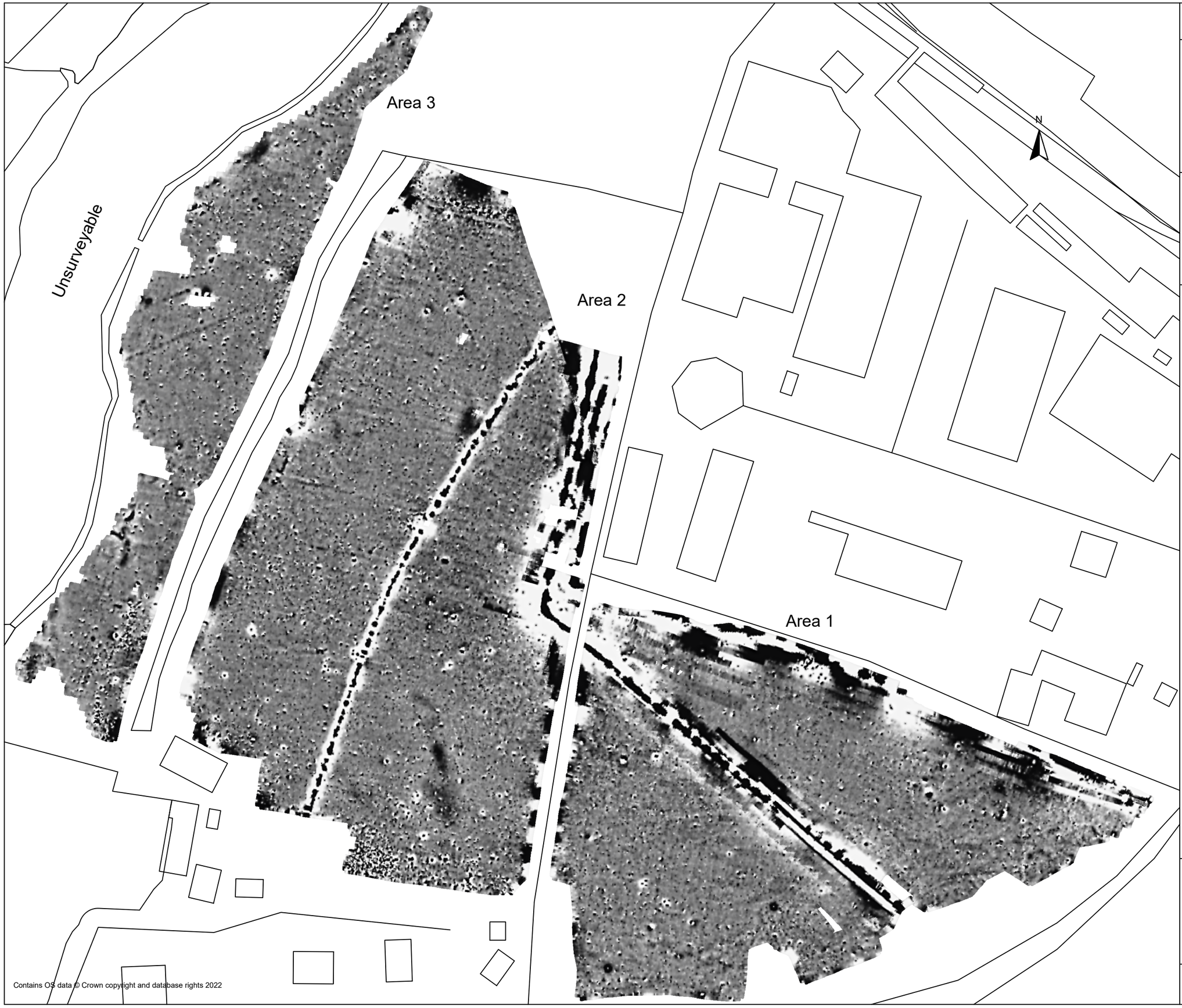
SCALE TRUE AT A3

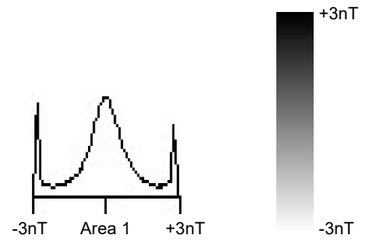
DRAWN BY	CHECKED BY	
KTD	DJS	FIG 02

Archaeological Surveys
Specialist Geophysical Surveyors

Geophysical Survey
Sherecroft Farm
Botley
Hampshire

Greyscale plot of minimally processed magnetometer data





SCALE 1:1500

0m 10 20 30 40 50m

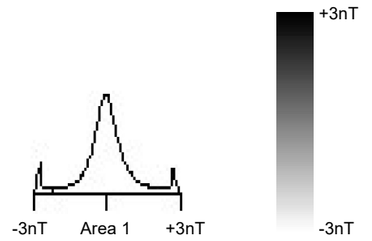
SCALE TRUE AT A3

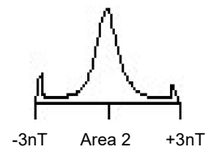
DRAWN BY	CHECKED BY	
KTD	DJS	FIG 03

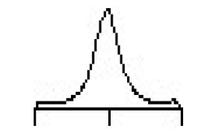
Archaeological Surveys
Specialist Geophysical Surveyors

Geophysical Survey
Sherecroft Farm
Botley
Hampshire

Greyscale plot of filtered magnetometer data







SCALE 1:1500

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 04

Archaeological Surveys
Specialist Geophysical Surveyors

Geophysical Survey
Sherecroft Farm
Botley
Hampshire

Abstraction and interpretation of magnetic anomalies

Area 3

Area 2

Area 1

Unsurveyable

N

18
21
19
17
16
20
9
10
7
7
11
5
8
14
15
6
6
6
12
13
4
1
2
3

- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Positive linear anomaly - former field boundary
- Positive/weak multiple dipolar linear anomaly - possible land drain
- Linear anomaly - of agricultural origin
- Discrete positive response - possible pit-like feature
- Variable magnetic response - of natural origin
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- Strong dipolar anomaly - ferrous object

SCALE 1:1500

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 05