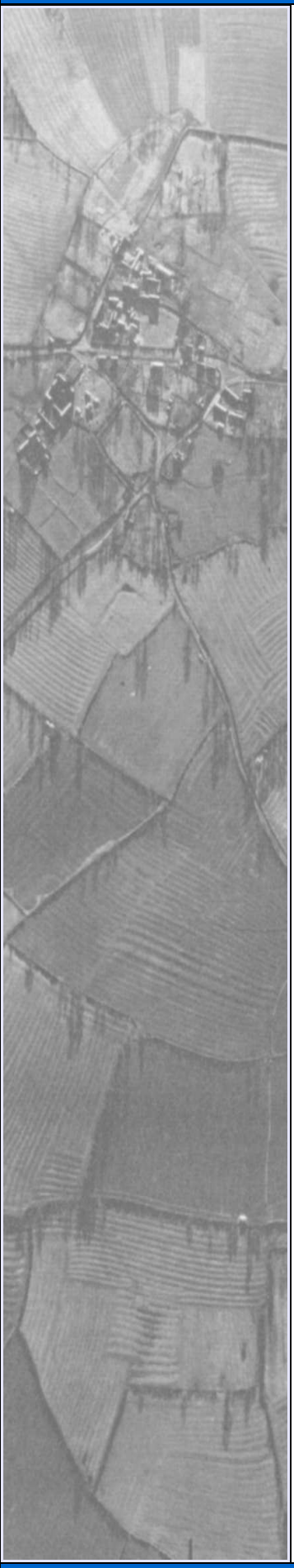

Bohunt Manor
Liphook
Hampshire

MAGNETOMETER SURVEY REPORT

for

Green Village Investments Ltd

David Sabin and Kerry Donaldson

March 2014

Ref. no. 530

ARCHAEOLOGICAL SURVEYS LTD

Bohunt Manor
Liphook
Hampshire

Magnetometer Survey Report

for

Green Village Investments Ltd

Fieldwork by David Sabin
Report by David Sabin BSc (Hons) MIFA and Kerry Donaldson BSc (Hons)

Survey dates – 24th to 26th February 2014
Ordnance Survey Grid Reference – SU 83740 30960

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CONTENTS

SUMMARY.....1

1 INTRODUCTION.....1

1.1 Survey background.....1

1.2 Survey objectives and techniques.....1

1.3 Site location, description and survey conditions.....1

1.4 Site history and archaeological potential.....2

1.5 Geology and soils.....2

2 METHODOLOGY.....2

2.1 Technical synopsis.....2

2.2 Equipment configuration, data collection and survey detail.....3

2.3 Data processing and presentation.....4

3 RESULTS.....6

3.1 General assessment of survey results.....6

3.2 Statement of data quality.....6

3.3 Data interpretation.....6

3.4 List of anomalies - Area 1.....7

3.5 List of anomalies - Area 2.....8

4 CONCLUSION.....10

5 REFERENCES.....10

Appendix A – basic principles of magnetic survey.....11

Appendix B – data processing notes.....12

Appendix C – survey and data information.....13

Appendix D – digital archive.....15

LIST OF FIGURES

Figure 01 Map of survey area (1:25 000)

Figure 02 Referencing information (1:2000)

Figure 03 Greyscale plot of raw magnetometer data (1:2000)

Figure 04 Greyscale plot of processed magnetometer data (1:2000)

Figure 05 Abstraction and interpretation of magnetic anomalies (1:2000)

Figure 06 Greyscale plot of processed magnetometer data (1:1250)

Figure 07 Abstraction and interpretation of magnetic anomalies (1:1250)

Figure 08 Greyscale plot of processed magnetometer data (1:1250)

Figure 09 Abstraction and interpretation of magnetic anomalies (1:1250)

LIST OF TABLES

Table 1: Bartington fluxgate gradiometer sensor calibration results.....4

Table 2: List and description of interpretation categories.....7

SUMMARY

A detailed magnetometer survey was carried out within two fields at Bohunt Manor, Liphook in Hampshire. The survey was commissioned by Green Village Investments Ltd and forms part of an archaeological assessment of the site prior to a proposed mixed use development. The results of the survey revealed a number of positive linear and discrete anomalies that may indicate ditch-like and pit-like features; however, the majority are weak and cannot be confidently interpreted. In the southern part of the site, a possible rectilinear anomaly may indicate former land division, with others possibly associated with agricultural activity.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Michael Heaton Heritage Consultants on behalf of Brian Cox of Green Village Investments Ltd, to undertake a magnetometer survey of an area of land at Bohunt Manor, Liphook, Hampshire. The site has been outlined for a proposed mixed use development and the survey forms part of an archaeological assessment of the site.

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 The survey and report generally follow the recommendations set out by: English Heritage (2008) *Geophysical survey in archaeological field evaluation;* and Institute for Archaeologists (2002) *The use of Geophysical Techniques in Archaeological Evaluations*. The work has been carried out to the Institute for Archaeologists (2011) *Standard and Guidance for Archaeological Geophysical Survey.*

1.3 Site location, description and survey conditions

1.3.1 The site is located at Bohunt Manor, Liphook, close to the the south eastern edge of Hampshire. It is centred on Ordnance Survey National Grid Reference (OS NGR) SU 83740 30960, see Figures 01 and 02.

1.3.2 The geophysical survey covers approximately 9ha within two uncultivated arable fields, labelled Areas 1 and 2 for the purposes of this report. The site lies within the parish of Bramshott and Liphook and just within the border of the South Downs National Park.

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

1.4 Site history and archaeological potential

1.4.1 A Heritage Statement has been prepared for the site by Michael Heaton Heritage Consultants (2014). A number of prehistoric, Roman and medieval surface artefacts are recorded within the site, with several other similar mixed date scatters within 250m of the site. A possible prehistoric settlement enclosure is recorded 380m to the west. The Bramshott Tithe Map of 1846 shows that the northern field was divided in two from north to south and this boundary was removed by 1898.

1.4.2 A number of flint implements were visible on the surface of the site during the survey and although a number of surface artefacts have been recorded within and surrounding the site, it is possible that this may be due to the process of manuring and chance losses. However, there is potential that the survey will record geophysical anomalies that are associated with cut features should they exist.

1.5 Geology and soils

1.5.1 The underlying geology is sandstone from the Hythe Formation (BGS, 2013).

1.5.2 The overlying soils across the site are from the Frilford association which are argillic brown sands. These consist of deep, well drained sandy and coarse loamy soils (Soil Survey of England and Wales, 1983).

1.5.3 Previous magnetometer surveys carried out on similar soils and geologies have demonstrated that their can be useful magnetic contrast between the fill of cut features and the material into which they are cut.

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 are factors associated with the formation of localised fields. Additional details are set out below and within Appendix A.

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).

2.2 Equipment configuration, data collection and survey detail

2.2.1 The detailed magnetic survey was carried out using a Bartington Grad 601-2 gradiometer. The instrument effectively measures a magnetic gradient between two fluxgate sensors mounted vertically 1m apart. Two sets of sensors are mounted on a single frame 1m apart horizontally.

2.2.2 The instrument is extremely sensitive and is able to measure magnetic variation to 0.01nanoTesla (nT), with an effective resolution of 0.03nT. The data are limited to ±100nT when surveying with the highest sensitivity. All readings are saved to an integral data logger for analysis and presentation.

2.2.3 The instrument is operated according to the manufacturer's instructions with consideration given to the local conditions. An adjustment procedure is required, prior to collection of data, in order to balance the sensors and remove the effects of the Earth's magnetic field; further adjustment is required during the survey due to instrument drift often associated with temperature change.

2.2.4 It can be very difficult to obtain optimum balance for the sensors due to localised magnetic vectors that may be associated with large ferrous objects, geological/pedological features, 'magnetic debris' within the topsoil and natural temperature fluctuations. Imperfect balance results in a heading error often visible as striping within the data; this can be effectively removed by software processing and generally has little effect on the data unless extreme.

2.2.5 The Bartington gradiometer undergoes regular servicing and calibration by the manufacturer. A current assessment of the instrument is shown in Table 1 below.

Sensor type and serial numbers	Bartington Grad - 01 – 1000 Nos. 085 and 396
Date of certified calibration/service	Sensors 085 and 396 – October 2013 (Due Oct 2016)
Bandwidth	12Hz (100nT range) both sensors
Noise	<100pT peak to peak
Adjustable errors	<2nT

Table 1: Bartington fluxgate gradiometer sensor calibration results

The instrument was considered to be in good working order prior to the survey, with no known faults or defects.

2.2.6 Data were collected at 0.25m centres along traverses 1m apart. The survey area was separated into 30m by 30m grids (900m²) giving 3600 recorded measurements per grid. This sampling interval is very effective at locating archaeological features and is the recommended methodology for archaeological prospection (English Heritage, 2008).

2.2.7 The survey grids were set out to the Ordnance Survey OSGB36 datum using a Penmap RTK GPS. The GPS is used in conjunction with Leica's SmartNet service, where positional corrections are sent via a mobile telephone link. Positional accuracy of around 10 – 20mm is possible using the system. The instrument is regularly checked against the ETRS89 reference framework using Ordnance Survey ground marker C1ST7784 (Horton).

2.2.8 The fixed orientation of survey grids based on the OSGB36 datum was considered appropriate given that the orientation of land boundaries was variable and consequently partial survey grids were unavoidable. In addition, there is an optimum north – south traverse direction for magnetic survey (English Heritage, 2008). Survey in this direction can produce anomalies with a higher contrast when compared to other orientations; this is a function of their presence within the Earth's magnetic field. A fixed grid across the site also simplifies its relocation should that be required.

2.3 Data processing and presentation

2.3.1 Magnetometry data downloaded from the Grad 601-2 data logger are analysed and processed in specialist software known as TerraSurveyor (formerly ArcheoSurveyor). The software allows greyscale and trace plots to be produced for presentation and display. Survey grids are assembled to form an overall composite of data (composite file) creating a dataset of the complete survey area. Appendix C contains specific information concerning the survey and data attributes and is derived directly from TerraSurveyor; this should be used in conjunction with information provided by Figure 02.

2.3.2 Only minimal processing is carried out in order to enhance the results of the

survey for display. Raw data are always analysed, as processing can modify anomalies. The following schedule sets out the data and image processing used in this survey:

- clipping of the raw data at ±10nT to improve greyscale resolution,
- clipping of processed data at ±3nT to enhance low magnitude anomalies,
- zero median/mean traverse is applied in order to balance readings along each traverse.

Reference should be made to Appendix B for further information on the specific processes carried out on the data. Appendix C metadata includes details on the processing sequence used for each survey area.

2.3.3 An abstraction and interpretation is offered for all geophysical anomalies located by the survey. 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.

2.3.4 The main form of data display prepared for this report is the greyscale plot. . Both 'raw' and 'processed' data have been shown followed by an abstraction and interpretation plot. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing.

2.3.5 Graphic raster images in bitmap format (.BMP) are initially prepared in TerraSurveyor. Regardless of survey orientation, data captured along each traverse are displayed and processed by TerraSurveyor from left to right; this corresponds to a direction of south to north in the field. Prior to displaying against base mapping, raster graphics require a rotation of 90° anticlockwise to restore north to the top of the image.

2.3.6 The raster images are combined with base mapping using ProgeCAD Professional 2009 and AutoCAD LT 2007, creating DWG file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. Quality can be compromised by rotation of graphics in order to allow the data to be orientated with respect to grid north; this is considered acceptable as the survey results are effectively georeferenced allowing relocation of features using GPS, resection method etc.

2.3.7 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 two survey areas covering approximately 9ha.

3.1.2 Magnetic anomalies located can be generally classified as positive anomalies of an uncertain origin, linear anomalies of an agricultural origin, anomalies relating to land management, 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.

3.2 Statement of data quality

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

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 basic explanation of the characteristics of the magnetic anomalies is set out for each category in order to justify interpretation, a basic key is indicated to allow cross referencing to the abstraction and interpretation plot. CAD layer names are included to aid reference to associated digital files (.dwg/.dxf). Sub-headings are then used to group anomalies with similar characteristics for each survey area.

Report sub-heading **CAD layer names and plot colour**	**Description and origin of anomalies**
Anomalies with an uncertain origin AS-ABST MAG POS LINEAR UNCERTAIN AS-ABST MAG POS DISCRETE UNCERTAIN AS-ABST MAG POS UNCERTAIN 	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. 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 AS-ABST MAG BOUNDARY AS-ABST MAG TRACK 	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. Single or multiple linear anomalies associated with

	present or mapped trackway. May be associated with magnetic debris.
Anomalies with an agricultural origin AS-ABST MAG AGRICULTURAL 	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.
Anomalies associated with magnetic debris AS-ABST MAG DEBRIS AS-ABST MAG STRONG DIPOLAR 	Magnetic debris often appears as areas containing many small dipolar anomalies that may range from weak to very strong in magnitude. It often occurs where there has been dumping or ground make-up and is 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, or hearths 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 AS-ABST MAG DISTURBANCE AS-ABST MAG SERVICE 	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 such 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 and with hysteresis adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.

Table 2: List and description of interpretation categories

3.4 List of anomalies - Area 1

Area centred on OS NGR 483740 131065, see Figures 06 & 07.

Anomalies with an uncertain origin

(1) – The survey area contains a number of weakly positive short linear anomalies with a north east to south west orientation. They are not parallel with any extant or former land boundaries; however, their weak and indistinct response prevents confident interpretation.

(2) – A positive linear anomaly appears to cross a group of linear anomalies (1) in the southern part of the survey area. It is not possible to determine if they are associated.

(3) – The survey area contains a number of weakly positive linear or possible curvilinear anomalies. It it not possible to determine their origin or function due to the weak and fragmented magnetic responses.

(4) – Discrete positive anomalies have been located within the survey area. However, it is not possible to determine if they relate to naturally or

anthropogenically formed pit-like features. It is possible that they relate to agricultural activity.

(5) – Two positive linear anomalies may relate to agricultural activity. However, it is possible that one, or both may be associated with a former, unmapped field boundary.

Anomalies relating to land management

(6) – A positive linear anomaly relates to a former field boundary mapped between 1846 and 1895. The boundary is mapped across the entire field, from north to south, but only the southern half has a magnetic response.

(7) – In the south west corner of the survey area is a negative anomaly flanked by positive linear anomalies. This relates to a modern track where the topsoil has been scraped back to reveal the underlying sandy subsoil.

Anomalies with an agricultural origin

(8) – A series of parallel linear anomalies are evident within the field and these relate to agricultural activity.

Anomalies associated with magnetic debris

(9) – Large zones of magnetic debris are located in the north eastern part of the field. These are a response to magnetically thermoremnant material, such as brick and tile.

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

Anomalies with a modern origin

(11) – Magnetic disturbance caused by ferrous objects and material within the survey area.

3.5 List of anomalies - Area 2

Area centred on OS NGR 483785 130840, see Figures 08 & 09.

Anomalies with an uncertain origin

(12) – Positive anomalies appear to join to form a rectilinear feature with a response of 2nT. It is possible that these anomalies relate to former land division that pre-dates the existing and mapped field boundaries.

(13) – Positive anomalies to the north of anomaly (12) may be associated.

(14) – Positive anomaly with a similar response to (12) It is parallel with the western field edge and recent cultivation trend and may relate to agricultural activity.

(15) – A fragmented positive linear anomaly extends across anomaly (12). It appears to bound agricultural anomalies (21) and may relate to a former, unmapped field boundary.

(16) – Two positive linear anomalies are oriented parallel with the eastern field boundary and may relate to agricultural activity, although this is not certain.

(17) – Located in the north western corner of the survey area are a series of positive linear anomalies. It is possible that these relate to agricultural activity.

(18) – A number of short positive linear anomalies are located within the survey area. Their lack of coherent morphology prevents confident interpretation.

(19) - The survey area contains several discrete positive anomalies. It is not possible to determine if they relate to pits or if they have been created by agricultural activity.

Anomalies relating to land management

(20) – A negative response flanked by positive linear anomalies is associated with a modern track that extends across the survey area.

Anomalies with an agricultural origin

(21) – A series of parallel linear anomalies are evident within the western part of the survey area. They appear to extend towards anomaly (15) and may relate to former agricultural activity, possibly indicating ridge and furrow.

Anomalies associated with magnetic debris

(22) – A number of patches of magnetic debris are evident within and surrounding the survey area. These relate to magnetically thermoremnant material that is likely to relate to ground make up and dumping.

4 CONCLUSION

4.1.1 The detailed magnetometer survey located a number of positive linear and discrete anomalies within the two survey areas. Within Area 1, in the northern part of the site, a former mapped field boundary was located, with some possible indication of other unmapped field boundaries associated with it. Several positive linear anomalies in the area could not be confidently interpreted.

4.1.2 Within Area 2, in the southern part of the site, a positive rectilinear anomaly may indicate former land division. Other anomalies may also be associated with land division and former agricultural activity.

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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 gradiometer is a passive instrument consisting of two fluxgate sensors mounted vertically 1m apart. The instrument is carried about 30cm 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 field. The difference between the two sensors will relate to the strength the magnetic field created by the buried feature. If no enhanced feature is present the field measured by both sensors will be similar and the difference close to zero.

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. It has been found that clipping data to ranges between ±5nT and ±1nT often improves the appearance of features associated with archaeology. Different ranges are applied to data in order to determine the most suitable for anomaly abstraction and display.

Zero Median/Mean Traverse

The median (or mean) of 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 slight differences between the set-up and stability of gradiometer sensors and can remove striping. The process can remove archaeological features that run along a traverse so data analysis is also carried out prior its application.

De-stagger

Compensates for small positional errors within data collection by shifting the position of the readings along each traverse by a specified amount. Data lost at the end of each traverse are extrapolated from adjacent value in the same row.

Deslope

Corrects for striping and distortion caused by metal objects/services etc.. The process calculates a curve based on a polynomial best fit mathematical function for each traverse. This curve is then subtracted from the actual data.

Edge Match

Calculates the mean of the 2 lines (rows or columns) of data either side of the edge to match. It then subtracts the difference between the means from all datapoints in the selected area.

FFT (Fast Fourier Transform) spectral filtering

A mathematical process used to determine the frequency components of a traverse. Repetitive features, such as plough marks, produce characteristic spectral zones that can be suppressed allowing greyscale images to appear clearer.

Appendix C – survey and data information

Area 1 raw magnetometer data

COMPOSITE
Filename: J530-mag-Area1-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Direction of 1st Traverse: 90 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 1080 x 390
Survey Size (meters): 270 m x 390 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 10.00
Min: -10.00
Std Dev: 2.11
Mean: -0.09
Median: -0.02
Composite Area: 10.53 ha
Surveyed Area: 6.3233 ha

Processes: 2
1 Base Layer
2 Clip from -10.00 to 10.00 nT

Source Grids: 90
1 Col:0 Row:4 grids\49.xgd
2 Col:0 Row:5 grids\50.xgd
3 Col:0 Row:6 grids\51.xgd
4 Col:0 Row:7 grids\52.xgd
5 Col:1 Row:3 grids\01.xgd
6 Col:1 Row:4 grids\45.xgd
7 Col:1 Row:5 grids\46.xgd
8 Col:1 Row:6 grids\47.xgd
9 Col:1 Row:7 grids\48.xgd
10 Col:1 Row:8 grids\53.xgd
11 Col:1 Row:9 grids\54.xgd
12 Col:1 Row:10 grids\55.xgd
13 Col:1 Row:11 grids\56.xgd
14 Col:1 Row:12 grids\91.xgd
15 Col:2 Row:2 grids\02.xgd
16 Col:2 Row:3 grids\03.xgd
17 Col:2 Row:4 grids\41.xgd
18 Col:2 Row:5 grids\42.xgd
19 Col:2 Row:6 grids\43.xgd
20 Col:2 Row:7 grids\44.xgd
21 Col:2 Row:8 grids\57.xgd
22 Col:2 Row:9 grids\58.xgd
23 Col:2 Row:10 grids\59.xgd
24 Col:2 Row:11 grids\60.xgd
25 Col:2 Row:12 grids\90.xgd
26 Col:3 Row:2 grids\04.xgd
27 Col:3 Row:3 grids\05.xgd
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29 Col:3 Row:5 grids\38.xgd
30 Col:3 Row:6 grids\39.xgd
31 Col:3 Row:7 grids\40.xgd
32 Col:3 Row:8 grids\61.xgd
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35 Col:3 Row:11 grids\64.xgd
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89 Col:8 Row:11 grids\83.xgd
90 Col:8 Row:12 grids\84.xgd

Area 1 processed magnetometer data

COMPOSITE
Filename: J530-mag-Area1-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.13
Mean: -0.03
Median: -0.04
Composite Area: 10.53 ha
Surveyed Area: 6.3233 ha

Processes: 7
1 Base Layer
2 DeStripe Mean Traverse: Grids: 49.xgd 50.xgd 51.xgd 52.xgd 01.xgd 45.xgd 46.xgd 47.xgd 48.xgd 53.xgd 54.xgd 55.xgd 56.xgd 91.xgd 02.xgd 03.xgd 41.xgd 42.xgd 43.xgd 44.xgd 57.xgd 58.xgd 59.xgd 60.xgd 90.xgd 04.xgd 05.xgd 37.xgd 38.xgd 39.xgd 40.xgd 61.xgd 62.xgd 63.xgd 64.xgd 89.xgd 06.xgd 07.xgd 08.xgd 33.xgd 34.xgd 35.xgd 36.xgd 65.xgd 66.xgd 67.xgd 68.xgd 88.xgd 10.xgd 11.xgd 12.xgd 13.xgd 29.xgd 30.xgd 31.xgd 32.xgd 69.xgd 70.xgd 71.xgd 72.xgd 87.xgd 14.xgd 15.xgd 16.xgd 17.xgd 25.xgd 26.xgd 27.xgd 28.xgd 73.xgd 74.xgd 75.xgd 76.xgd 86.xgd Threshold: 1 SDs
3 DeStripe Mean Traverse: Grids: 79.xgd 80.xgd 81.xgd 85.xgd 82.xgd 83.xgd 84.xgd Threshold: 1 SDs
4 DeStripe Mean Traverse: Grids: 18.xgd 21.xgd 22.xgd Threshold: 1 SDs
5 DeStripe Mean Traverse: Grids: 24.xgd 77.xgd 20.xgd 78.xgd Threshold: 1 SDs
6 DeStripe Mean Traverse: Grids: 23.xgd Threshold: 1 SDs
7 Clip from -3.00 to 3.00 nT

Area 2 raw magnetometer data

COMPOSITE
Filename: J530-mag-Area2-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Direction of 1st Traverse: 90 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 960 x 210
Survey Size (meters): 240 m x 210 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 10.00
Min: -10.00
Std Dev: 2.39
Mean: 0.22
Median: 0.27
Composite Area: 5.04 ha
Surveyed Area: 2.1374 ha

Processes: 2
1 Base Layer
2 Clip from -10.00 to 10.00 nT

Source Grids: 36
1 Col:0 Row:4 grids\23.xgd
2 Col:1 Row:3 grids\24.xgd
3 Col:1 Row:4 grids\21.xgd
4 Col:1 Row:5 grids\22.xgd
5 Col:2 Row:2 grids\25.xgd
6 Col:2 Row:3 grids\26.xgd
7 Col:2 Row:4 grids\19.xgd
8 Col:2 Row:5 grids\20.xgd
9 Col:3 Row:1 grids\27.xgd

10 Col:3 Row:2 grids\28.xgd
11 Col:3 Row:3 grids\29.xgd
12 Col:3 Row:4 grids\16.xgd
13 Col:3 Row:5 grids\17.xgd
14 Col:3 Row:6 grids\18.xgd
15 Col:4 Row:1 grids\30.xgd
16 Col:4 Row:2 grids\31.xgd
17 Col:4 Row:3 grids\32.xgd
18 Col:4 Row:4 grids\13.xgd
19 Col:4 Row:5 grids\14.xgd
20 Col:4 Row:6 grids\15.xgd
21 Col:5 Row:0 grids\33.xgd
22 Col:5 Row:1 grids\34.xgd
23 Col:5 Row:2 grids\35.xgd
24 Col:5 Row:3 grids\36.xgd
25 Col:5 Row:4 grids\10.xgd
26 Col:5 Row:5 grids\11.xgd
27 Col:5 Row:6 grids\12.xgd
28 Col:6 Row:0 grids\03.xgd
29 Col:6 Row:1 grids\04.xgd
30 Col:6 Row:2 grids\05.xgd
31 Col:6 Row:3 grids\06.xgd
32 Col:6 Row:4 grids\07.xgd
33 Col:6 Row:5 grids\08.xgd
34 Col:6 Row:6 grids\09.xgd
35 Col:7 Row:1 grids\01.xgd
36 Col:7 Row:2 grids\02.xgd

Area 2 processed magnetometer data

COMPOSITE
Filename: J530-mag-Area2-proc.xcp
Description:
Instrument Type: Bartington (Gradiometer)
Units: nT
Direction of 1st Traverse: 315 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 960 x 210
Survey Size (meters): 240 m x 210 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.29
Mean: -0.01
Median: -0.04
Composite Area: 5.04 ha
Surveyed Area: 2.1374 ha

Processes: 3
1 Base Layer
2 DeStripe Mean Traverse: Grids: All Threshold: 1 SDs
3 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 (see inside cover for address). 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.

Surveys are reported on in hardcopy (recycled paper) using A4 for text and A3 for plots (all plots are scaled for A3).

This report has been prepared using the following software on a Windows XP platform:

- TerraSurveyor version 3.0.23.0 (geophysical data analysis),
- ProgeCAD Professional 2014 (report graphics),
- AutoCAD LT 2007 (report figures),
- OpenOffice.org 3.0.1 Writer (document text),
- PDF Creator version 0.9 (PDF archive).

Digital data produced by the survey and report include the following files:

- TerraSurveyor grid and composite files for all geophysical data,
- CSV files for raw and processed composites,
- geophysical composite file graphics as Bitmap images,
- AutoCAD DWG files in 2000 and 2007 versions,
- report text as OpenOffice.org ODT file,
- report text as Word 2000 doc file,
- report text as rich text format (RTF),
- report text as PDF,
- PDFs of all figures.

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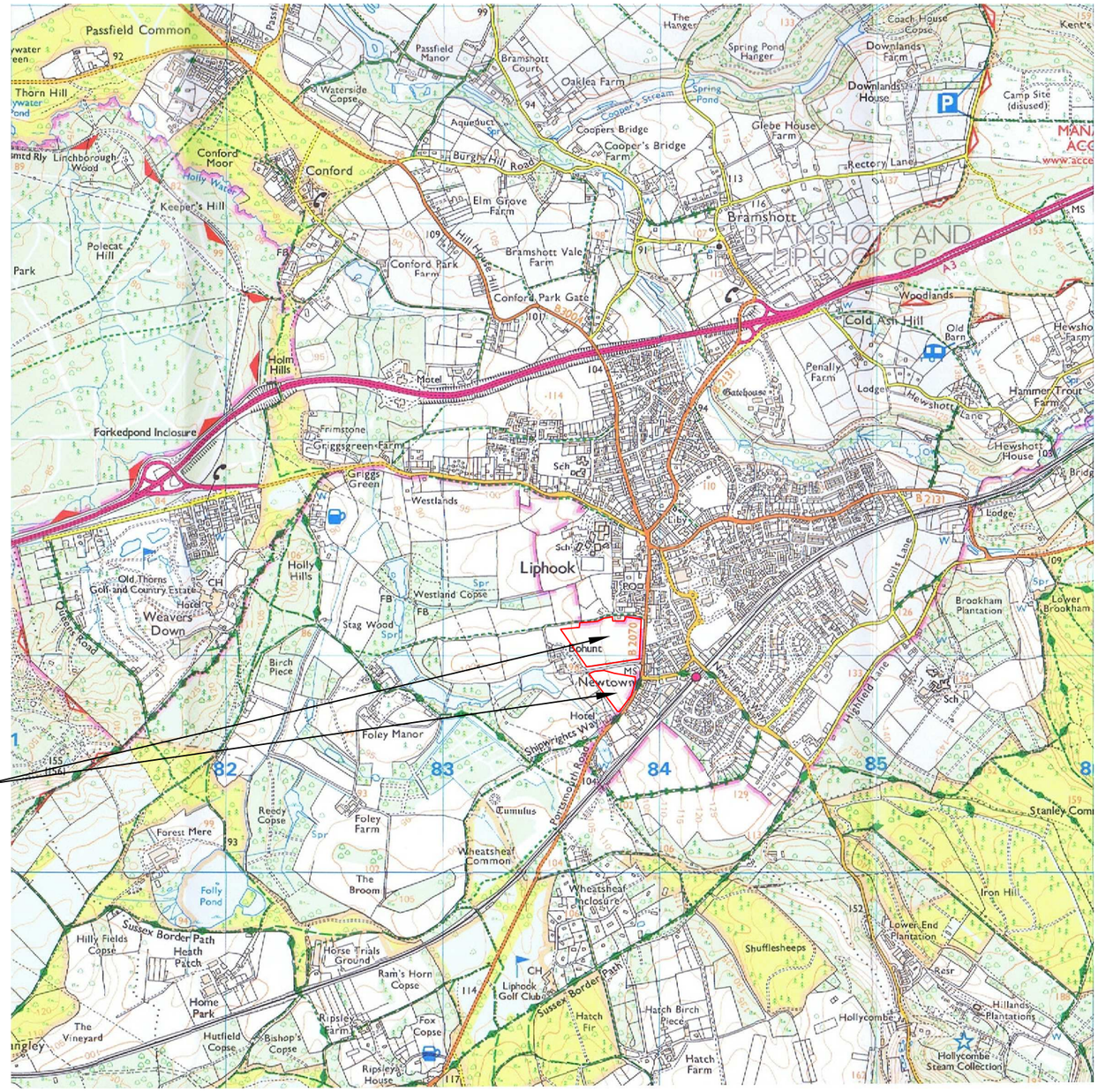
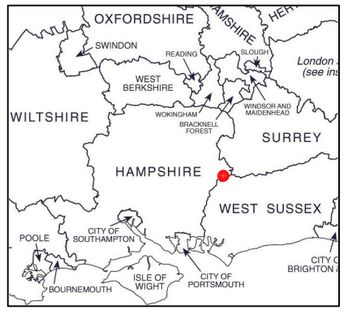
Hampshire

Map of survey area





● Survey location

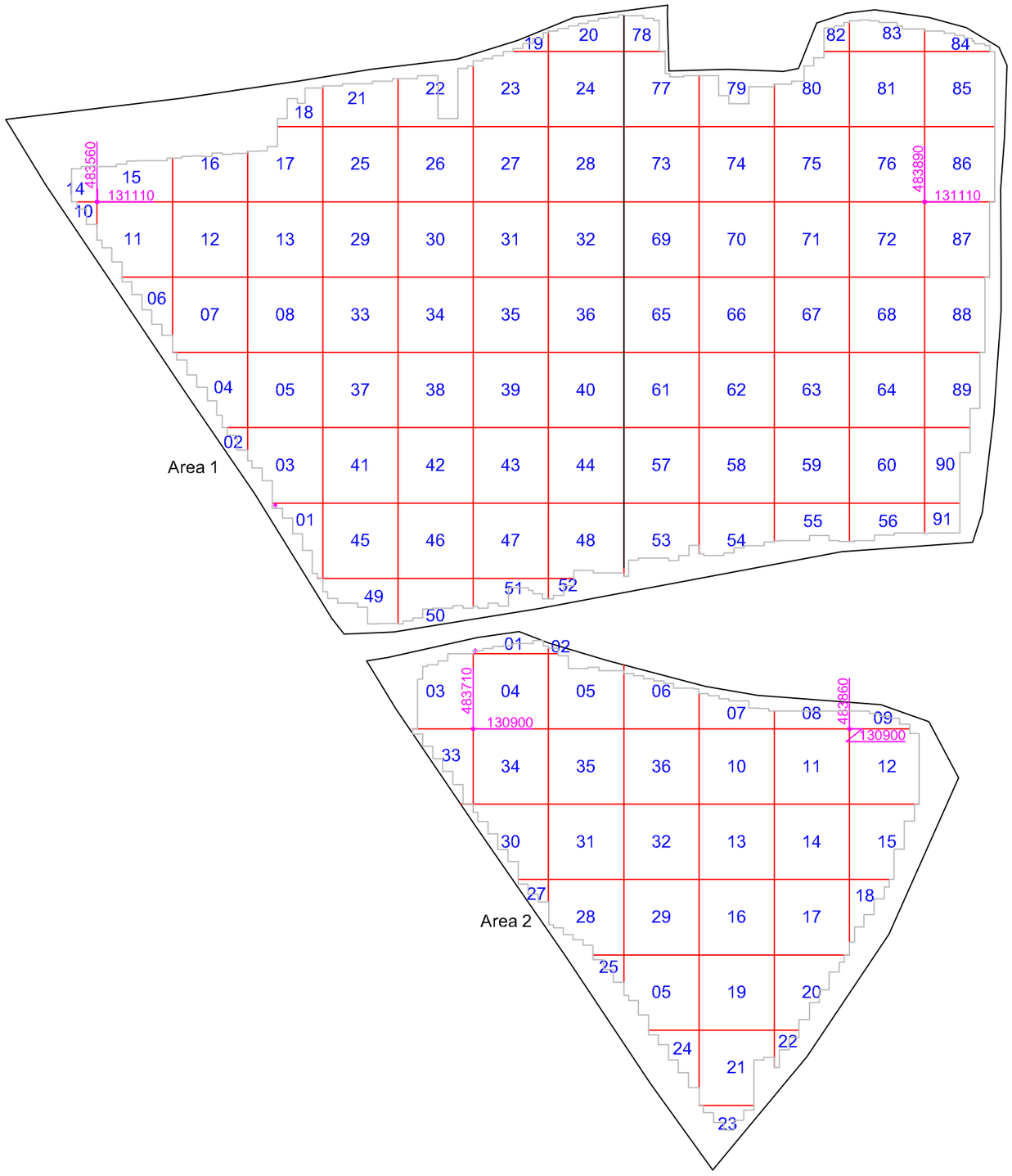
Site centred on OS NGR
SU 837 309

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

FIG 01



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Referencing information

Grid coordinates based on Ordnance Survey OSGB36 datum

Grids set out using RTK GPS with Leica SmartNet correction data RTCMv2 format OSTN02 transformation

Survey grid size = 30m

Survey start and traverse direction

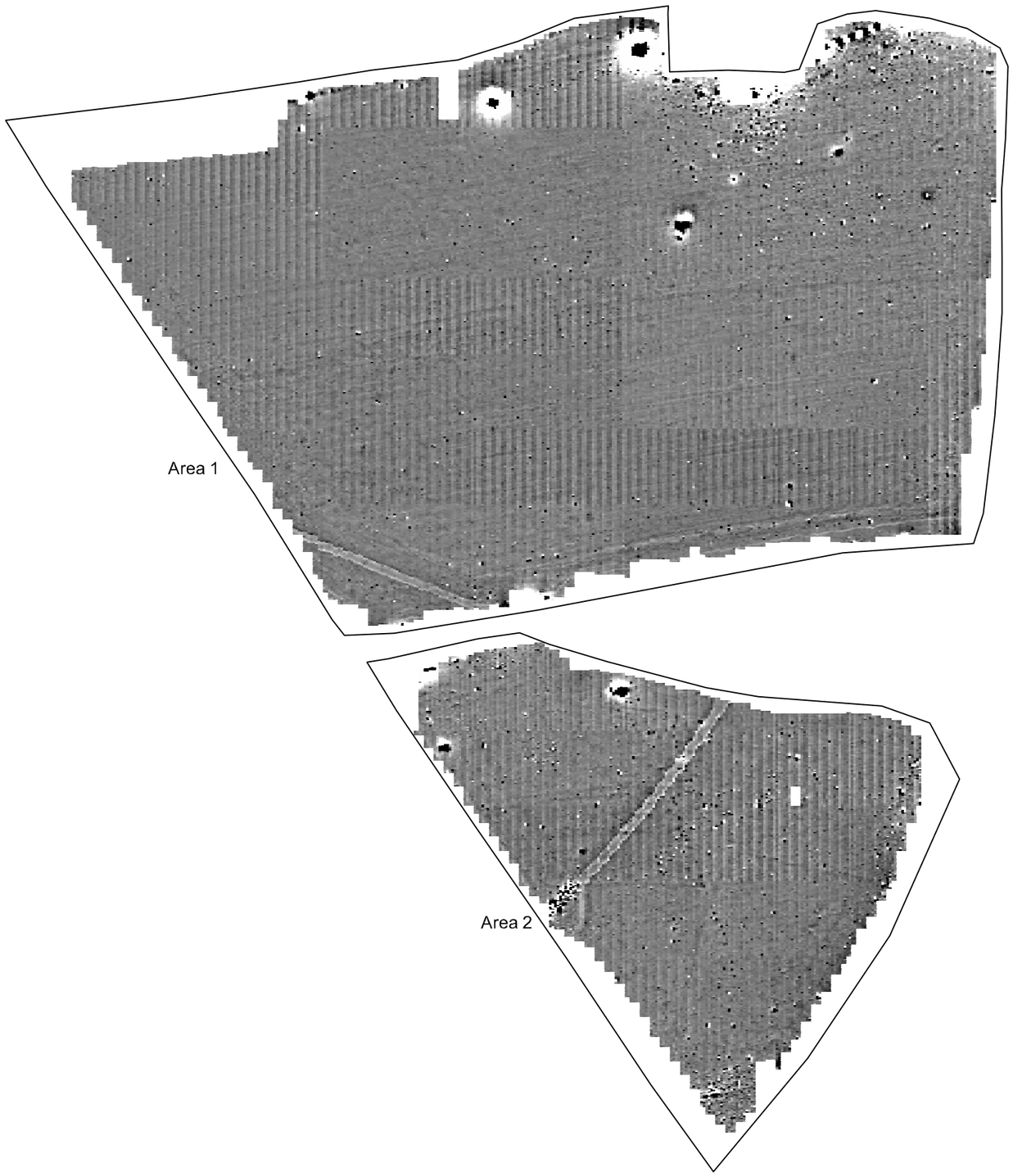
01 Grid reference number and filename

SCALE 1:2000

0m 20 40 60 80 100m

SCALE TRUE AT A3

FIG 02



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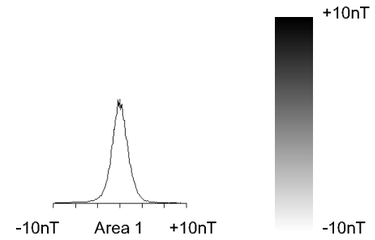
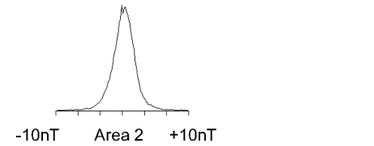
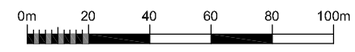
Greyscale plot of raw magnetometer data



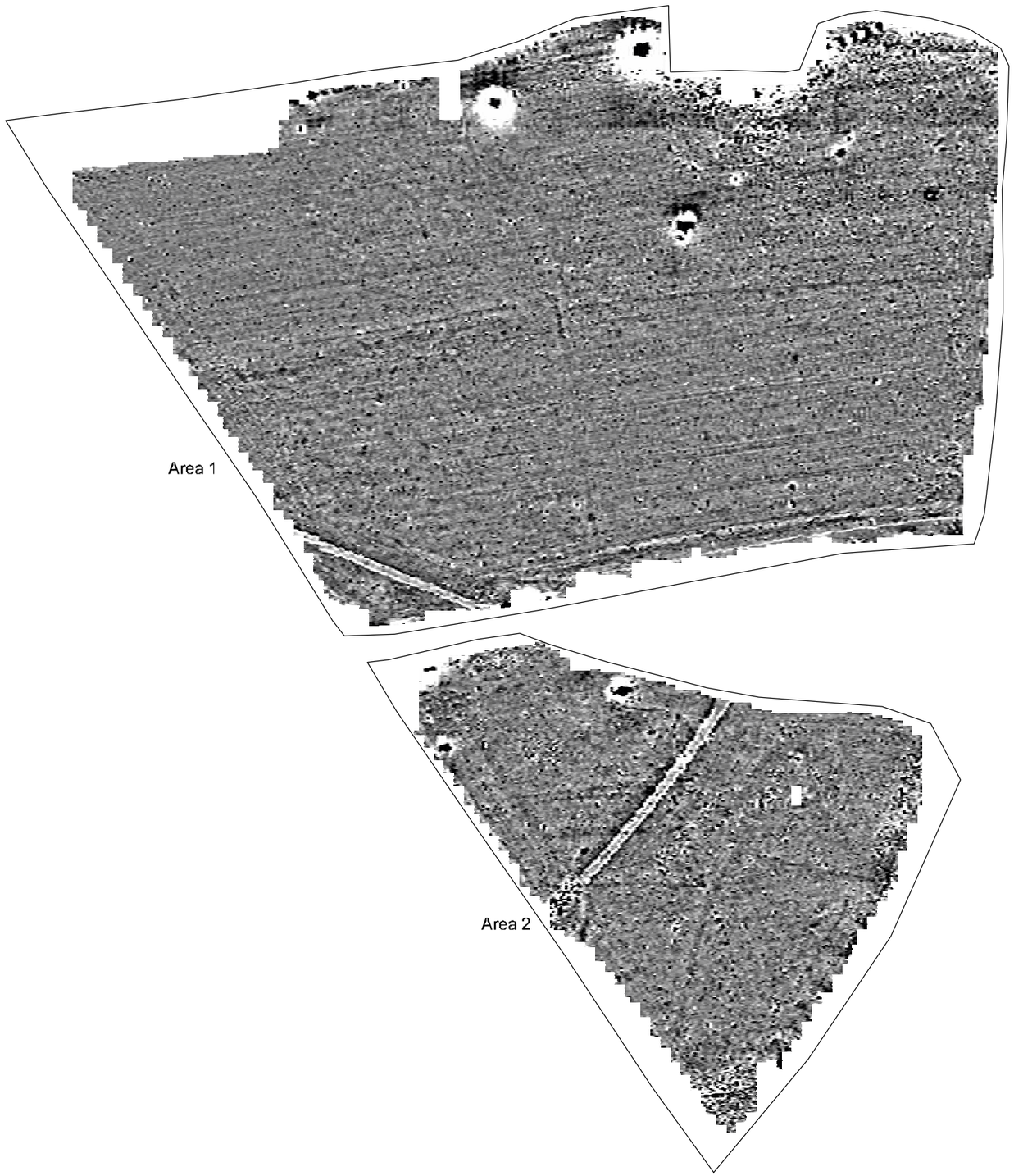


SCALE 1:2000



SCALE TRUE AT A3

FIG 03



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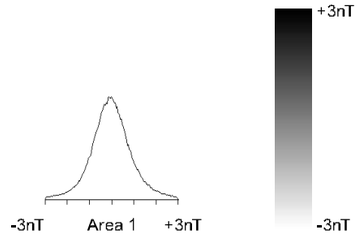
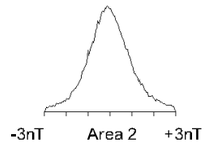
Greyscale plot of processed magnetometer data





SCALE 1:2000

SCALE TRUE AT A0

FIG 04

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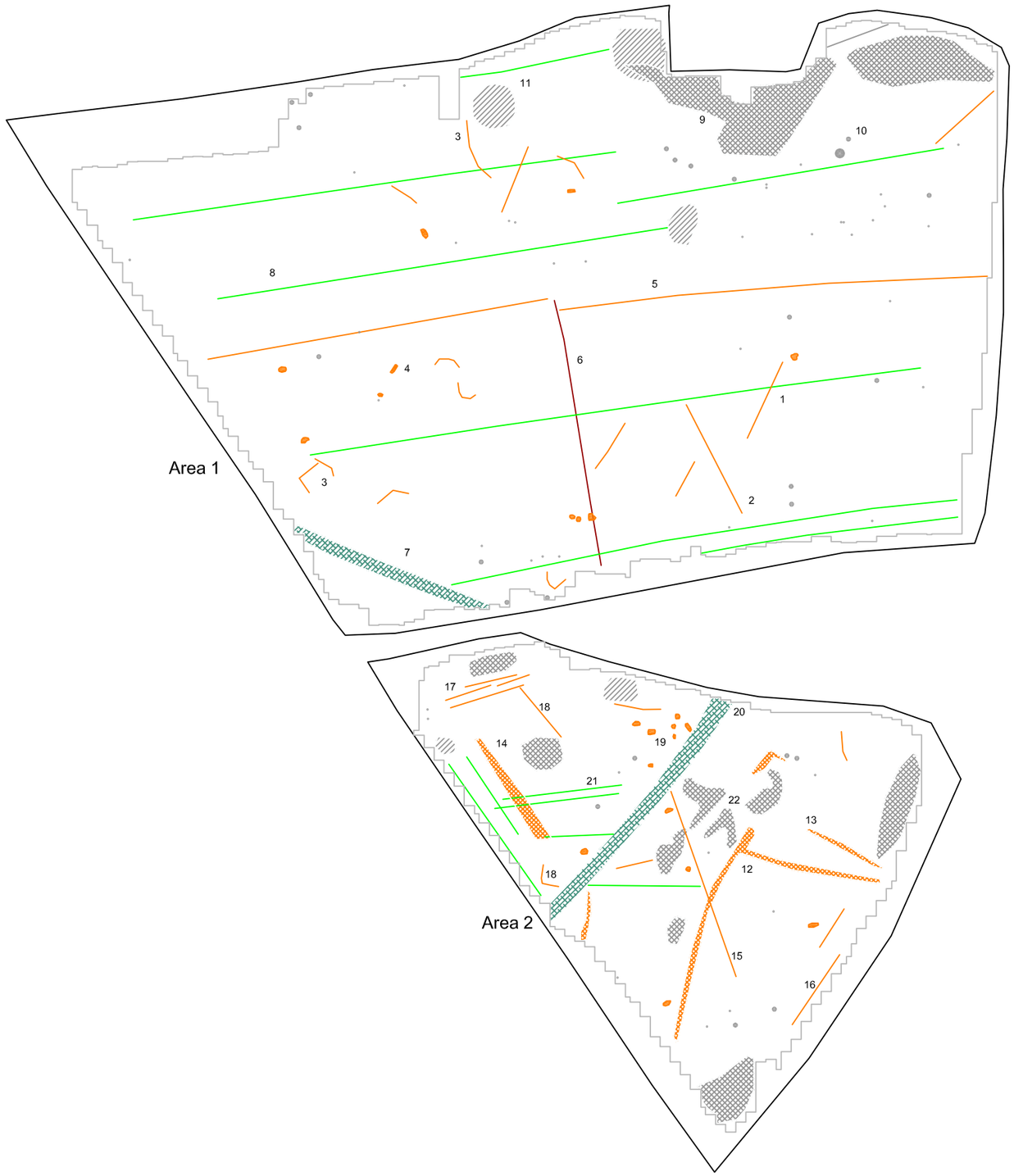
Abstraction and interpretation of magnetometer anomalies



- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - of agricultural origin
- Positive linear anomaly - possible former field boundary
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Negative anomaly - modern track
- 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 1:2000

0m 20 40 60 80 100m

SCALE TRUE AT A3

FIG 05

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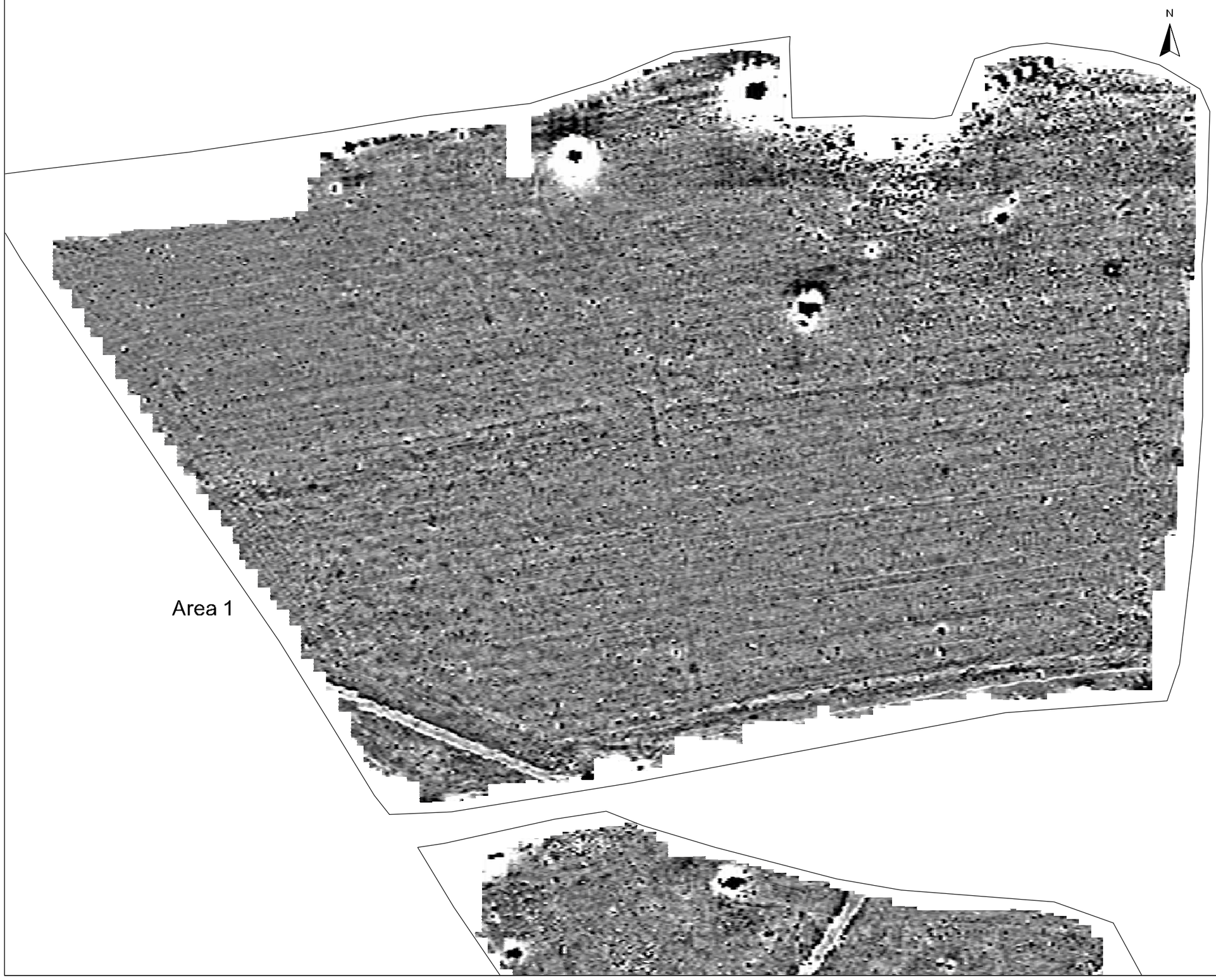
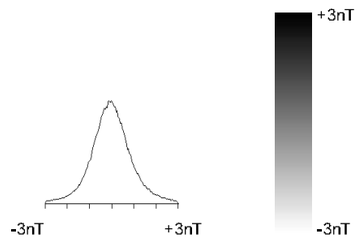
Greyscale plot of processed magnetometer data - Area 1





SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 06

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Abstraction and interpretation of magnetometer anomalies - Area 1

N

Area 1

11
9
10
3
8
5
6
4
1
3
2
7
17
18
20
14
19

- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - of agricultural origin
- Positive linear anomaly - possible former field boundary
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Negative anomaly - modern track
- 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 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 07

Area 1

Area 2

N

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Greyscale plot of processed magnetometer data - Area 2

+3nT

-3nT +3nT

-3nT

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 08

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Abstraction and interpretation of magnetometer anomalies - Area 2

Area 1

Area 2

N

- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - of agricultural origin
- Positive linear anomaly - possible former field boundary
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Negative anomaly - modern track
- 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 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 09