

**Baltic Farm  
Bishops Cannings  
Wiltshire**

**MAGNETOMETER SURVEY REPORT**

for

**Historic England**

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ARCHAEOLOGICAL SURVEYS LTD

**Baltic Farm**  
**Bishops Cannings**  
**Wiltshire**

Magnetometer Survey Report

for

**Historic England**

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## SUMMARY

A detailed magnetometer survey was carried out to the north of Baltic Farm, Bishops Cannings, Wiltshire, over 21ha within a site that has three scheduled areas containing seventeen recorded barrows, with eight of them upstanding monuments. The extant barrows are subject to damage by animal burrowing and the survey aims to assist with the ongoing management of the site including badger exclusion measures. The survey produced useful results with ring ditches relating to both extant and levelled barrows. There is, however, some discrepancy with the number of ring ditches in the data and the number of scheduled barrows and ring ditches. The north western part of the site also contains a scheduled Iron Age enclosure lying within a co-axial field system and the magnetometer survey has responded well to the associated ditches. Several discrete pit-like anomalies were located that may have archaeological potential and these include a possible cluster or ring of pits. Amorphous anomalies located at the northern boundary of the survey are immediately adjacent to a Roman road and may be related to small quarries associated with its construction or maintenance.

## 1 INTRODUCTION

### 1.1 Survey background and site designations

- 1.1.1 Archaeological Surveys Ltd was commissioned by Dr Neil Linford, Senior Geophysicist with the Historic England Geophysics Team, to undertake a magnetometer survey of an area of land at Baltic Farm, Bishops Cannings near Devizes in Wiltshire. The site contains a number of scheduled round barrows and an Iron Age enclosure. The barrows are subject to damage by animal burrowing and the survey aims to assist with the ongoing management of the site including badger exclusion measures.
- 1.1.2 The survey area covers approximately 21ha and encompasses three scheduled areas: *Eleven round barrows 1000m north of Baltic Farm forming part of a barrow cemetery, a probably enclosed Iron Age farmstead on North Down* (List entry no: 1013773), *Five round barrows 1040m NNE of Baltic Farm forming part of a barrow cemetery on North Down* (List entry no: 1014737) and *Round barrow 1260m NNE of Baltic Farm, 75m south of Roman Road, forming part of a barrow cemetery on North Down* (List entry no: 1013774).
- 1.1.3 The survey was carried out within the scheduled areas with a licence required under Section 42 of the 1979 Ancient Monuments and Archaeological Areas Act (as amended by the National Heritage Act 1983) issued by Hugh Beamish, Historic England Assistant Inspector of Ancient Monuments.
- 1.1.4 The site is located within the North Wessex Downs Area of Outstanding Natural Beauty and is currently farmed under an Environmental Stewardship

scheme due to both its archaeological and environmental value. As part of the scheme there is permissive access to the site from a Roman road and byway that runs along the northern boundary.

## 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 with regard to the ongoing management of the site including the exclusion of burrowing animals from the barrows. 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*; 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*.

## 1.3 Site location, description and survey conditions

- 1.3.1 The site is located on North Down at Baltic Farm within the parish of Bishops Cannings to the north east of Devizes in Wiltshire. It is centred on Ordnance Survey National Grid Reference (OS NGR) SU 04455 67695, see Figs 01 and 02.
- 1.3.2 The general topography is of land sloping down gently towards the east north east along a broad ridge formed by a spur that extends from high ground at Morgan's Hill (260m ODN) to the south west of the site. The western part of the area is around 200m ODN while the east is approximately 175m ODN. The northern side of the spur or ridge and site boundary is traversed by a Roman road and byway with land further to the north falling more steeply to Ranscombe Bottom to the east of Calstone Wellington. Land on the southern side of the spur, and forming the majority of the surveyed area and the location of the barrows, has a southerly or south easterly aspect. There are extensive views to the Cotswolds forming the horizon to the north west, to Oldbury hillfort in the north and Silbury Hill to the east. Shelter belt tree plantations are located immediately to the east and west of the site.
- 1.3.3 The geophysical survey covers approximately 20ha (Areas 2 & 3) within a large area of pasture that is currently part of an Environmental Stewardship scheme. At the time of survey the site was grazed by a small flock of sheep and the ground cover was generally short grass. A 1.5ha block of survey is located immediately adjacent to the south of the 20ha area within the northern part of an arable field (Area 1).
- 1.3.4 There are three main areas of survey separated by post and wire fencing and

netting. The arable area included a rough field margin along the northern side. Survey was also attempted over the barrows, although due to their steep sides and rough terrain this was extremely difficult.

- 1.3.5 Several of the barrows contained evidence of former and current badger disturbance with further burrowing in the vicinity of the scheduled enclosure. One of the barrows appeared extremely disturbed with numerous large holes, collapses and a large amount of excavated material. Two of the barrows appeared to contain the dilapidated remains of previous attempts to control badgers in the form of wooden stakes, wire and other ferrous material.
- 1.3.6 The ground conditions across the site were generally considered to be favourable for the collection of magnetometry data. Weather conditions during the survey were variable and frequently challenging due to high winds and periods of heavy rain, sleet, snow and hail.



#### 1.4 Site history and archaeological potential

- 1.4.1 The western part of the site contains the scheduled remains of 17 barrows forming a cemetery group on North Down containing 18 round barrows in total. The scheduled sites within the survey area include *Eleven round barrows 100m north of Baltic Farm forming part of a barrow cemetery*, and a *probable enclosed Iron Age farmstead on North Down* (List entry no 1013773). This contains a linear group of three upstanding bell barrows alternating with

two bowl barrows in between and a further six levelled barrows which survive as ring ditches, recorded from aerial photographs.

- 1.4.2 To the east of this are the scheduled remains of *Five round barrows 1040m NNE of Baltic Farm forming part of a barrow cemetery on North Down* (List entry no 1014737). These are listed to contain two disc barrows at the southern end, a pond barrow, a bell barrow and a bowl barrow. To the north east of these is the location of a single scheduled *Round barrow 1260m NNE of Baltic Farm, 75m south of Roman Road, forming part of a barrow cemetery situated on North Down* (List entry no 103774). This has been recorded from aerial photographs to have had a mound 26m wide with a 2m wide surrounding ring ditch.
- 1.4.3 A number of barrows were partially excavated by William Cunnington in 1804 with limited records by Colt Hoare in 1885. He indicates that several were opened, with one "second from the hill - of the Druid kind", containing burnt bones, a piece of slate, a small urn, several long amber beads and two ivory or bone beads. This is one of the disc barrows within the eastern part of the site. Another lower down the slope contained a black urn with burnt bones and again further down slope another disc barrow contained a skeleton and "a small round urn of burnt bones inverted over the skull beneath the primary interment". Several of these were re-opened in 1857 by John Thurnham (1859) who indicates that "the most southern is upwards of seven feet high and remarkable for an enclosing dyke of earth which surrounds its foss". This is likely to be the most south western of all the barrows within the western part of the site. The excavation, generally consisted of digging a hole 3-3.65m square in the centre of the barrow, sinking a shaft to the original ground surface to find the primary interment. The hole was then methodically back filled. During this process they located a George III half penny and a square lead plate stamped "OPEN'D 1804 W.C' at a depth of 2.4m. He then indicates that within the fourth of the group, a small bowl barrow, they found a black and brittle wide-mouthed urn, 0.5m deep, and fragments of burnt bones with another of William Cunnington's lead plates beneath. It is possible that this relates to the ploughed out small bowl barrow within the western part of the site. From the limited antiquarian records it is not clear which group of barrows or which individual barrow within those groups are being discussed.
- 1.4.4 The site is also known to contain a probable Iron Age enclosure and a field system overlying some of the barrows which have been recorded from aerial photographs. The northern edge of the site is bounded by the Roman road between *Cunetio* to the east and *Verlucio* to the west. The location of a number of Bronze Age round barrows, enclosures and field systems within the site indicate that the survey should locate anomalies associated with these known archaeological features. There is also potential for the survey to locate further anomalies associated with previously unrecorded archaeological features should they exist within the site. Previous excavations, animal burrowing, remedial measures and dumping are all likely to cause anomalies within the barrows themselves, making it difficult at times to determine the archaeological potential of the anomalies.



- 1.4.5 Observations during the course of the survey noted the presence of a small flint scraper and limestone tile with a single nail hole in material recently excavated by badgers from one of the barrows. Some of the burrows were large enough to observe the structure of the barrow for a length of 2m. Badger excavations in the vicinity of the scheduled enclosure had revealed a fragment of a large animal bone also.

## 1.5 *Geology and soils*

- 1.5.1 The underlying geology is Holywell Nodular Chalk Formation and New Pit Chalk Formation (BGS, 2017).
- 1.5.2 The overlying soil across the site is from the Andover 1 association and is a brown rendzina. It consists of a shallow, well drained, calcareous, silty soil over chalk with striped soil patterns locally (Soil Survey of England and Wales, 1983).
- 1.5.3 Magnetometry carried out over similar geology and soil has produced good results, although soil magnetic susceptibility is frequently very low outside of areas of former settlement. The site is, however, considered suitable 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 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 SENSYS MAGNETO®MXPDA 5 channel cart-based system. The instrument has 5 fluxgate gradiometers (FGM650) spaced 0.5m apart with readings recorded at 20 Hz. 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 range of recording data between  $\pm 0.1\text{nT}$  and  $\pm 10,000\text{nT}$ . They are linked to a Leica GS10 RTK GPS 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 is manifest 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. Due to extreme and rapid temperature changes during the course of the survey, related to wintry showers, traverse time were frequently lower to <60s.

## *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 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  $\pm 10000\text{nT}$  and clipped for display at  $\pm 2\text{nT}$  with filtered data at  $\pm 1\text{nT}$ . Data are interpolated to a resolution of effectively  $0.5\text{m}$  between tracks and  $0.15\text{m}$  along each survey track.
- 2.3.4 Additional data processing has been carried out for all the survey areas 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 and rapid temperature change. Low pass filtering has also been applied to remove high frequency variation along a traverse that has been caused by uneven ground and associated vibration primarily over the barrows. Data treated to additional processing has 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 is considered by the manufacturer to be data that is 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 very high density of data collection.

- 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 GPS, resection method, etc.
- 2.3.8 An abstraction and interpretation is also 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.
- 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. Where further interpretation is possible, or where a number of possible origins should be considered, more subjective discussion is set out in Section 4.
- 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 main survey areas covering approximately 21ha. The results will be outlined as Areas 1, 2 and 3. Area 1, in the southern part of the site, covers a 1.5ha block within the scheduled area, Area 2 in the west covers 12.9ha which also contains separate composite survey Areas 6, 7, 8 & 9 over the extant barrows. Area 3 covers 7.3ha in the eastern part of the site which also contains separate composite survey Areas 4 & 5 over two extant barrows. Note: two other low barrows were surveyed as part of the Area 3 composite.
- 3.1.2 Magnetic anomalies located can be generally classified as positive responses of archaeological potential, positive and negative anomalies of an uncertain origin, areas of magnetic debris and disturbance and strong discrete dipolar anomalies relating to ferrous objects.
- 3.1.3 Anomalies located within each survey area have been numbered and are described in 3.4 below with subsequent discussion in Section 4.




### 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 Some additional high pass filtering was carried out to remove very weak linear anomalies likely to relate to recent cultivation prior to the land becoming pasture and some magnetic disturbance caused by wire netting used in fencing. Low pass filtering was also used to remove high frequency magnetic noise probably related to the uneven surface. Analysis of unfiltered data was carried out to ensure that anomalies were not unduly altered by the additional processing.
- 3.2.3 Data collected over extant barrows was generally poor due to steeply sloping sides with burrows and excavated ground producing very uneven surfaces. It was not possible to maintain a vertical orientation to the sensors or to prevent erratic movements from side to side. High and low pass filtering were also used to improve the appearance of the data.

### 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
<p><b>Anomalies with archaeological potential</b></p> <p>AS-ABST MAG POS LINEAR ARCHAEOLOGY AS-ABST MAG POS DISCRETE ARCHAEOLOGY AS-ABST MAG POS CURVILINEAR RING DITCH AS-ABST MAG POS ENCLOSURE DITCH</p> 	<p>Anomalies have the characteristics (mainly morphological) of a range of archaeological features such as pits, ring ditches, enclosures, etc.</p>
<p><b>Anomalies with an uncertain origin</b></p> <p>AS-ABST MAG POS LINEAR UNCERTAIN AS-ABST MAG NEG LINEAR UNCERTAIN AS-ABST MAG POS DISCRETE UNCERTAIN AS-ABST MAG POS UNCERTAIN</p> 	<p>The category applies to a range of anomalies where <u>there is not enough evidence to confidently suggest an origin</u>. Anomalies in this category <u>may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered</u>. 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.</p>
<p><b>Anomalies associated with magnetic debris</b></p> <p>AS-ABST MAG DEBRIS AS-ABST MAG STRONG DIPOLAR</p> 	<p>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 <u>may therefore be archaeologically significant</u>. It is also possible that the response may be caused by natural material such as certain gravels and</p>


	fragments of igneous or metamorphic rock. Strong discrete dipolar anomalies are responses to ferrous objects within the topsoil.
<p><b>Anomalies with a modern origin</b></p> <p>AS-ABST MAG DISTURBANCE </p> <p>AS-ABST MAG SERVICE</p>	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.

Table 1: List and description of interpretation categories

### 3.4 List of anomalies - Area 1

Area centred on OS NGR 404416 167508, see Figs 06-08.

#### *Anomalies of archaeological potential*

(1) - Extending across the western edge of the survey area are two parallel positive linear anomalies. It appears that one is likely to be a continuation of a linear ditch extending towards a large enclosure (17) seen within Area 2 just to the north west.

#### *Anomalies with an uncertain origin*

(2) - A number of short, weak and fragmented positive and negative linear anomalies. Some are oriented north west to south east, generally parallel with the long axis of the field system and enclosures (18) seen to the north. It is possible, therefore, that they are associated. Others do not have any coherent pattern or morphology and it is difficult to confidently interpret their origin.

(3) - The survey area contains a large number of discrete positive responses. It is not possible to determine if they are natural or anthropogenic in origin.

#### *Anomalies associated with magnetic debris*

(4) - A broad, L-shaped zone of magnetic debris relates to material associated with, or used to infill a recently removed field boundary.

(5) - Strong, discrete, dipolar anomalies are a response to ferrous and other magnetically thermoremanent objects within the topsoil. The entire site contains these responses.

### 3.5 List of anomalies - Area 2

Area centred on OS NGR 404284 167663, see Figs 06 -11.

#### *Anomalies of archaeological potential*

(6) - A positive curvilinear anomaly relating to a ring ditch with a 40m diameter surrounding an extant bell barrow. Although there appear to be anomalies associated with the barrow, due to the rough terrain and magnetic contamination it is not possible to determine the origin of the internal positive anomalies.

(7) - Situated 14m south west of anomaly (6) is a smaller ring ditch relating to a former bowl barrow 15m in diameter with a gap in the north and with a later boundary ditch (19) overlying the south western part. There are a small number of discrete positive responses towards the western edge of the ring ditch, and while these may relate to associated archaeological features, a more modern origin should also be considered. A small number of very weakly positive curvilinear anomalies appear to cluster around the ring ditch, but their origin is uncertain.

(8) - A positive curvilinear anomaly relates to a ring ditch surrounding an extant bell barrow, with a diameter of over 42m and a response 3m wide. While there are a number of discrete positive responses within the barrow area, it is not possible to determine their origin. At the time of survey there was evidence of severe badger disturbance across the entire monument.

(9) - Lying 44.5m south west of anomaly (8) is a smaller extant bowl barrow with a ring ditch of 30.5m diameter. Within the ring ditch, is an internal positive curvilinear anomaly and also a number of discrete responses.

(10) - An oval ring ditch situated 35m south west of anomaly (9) and surrounding an extant bell barrow. It has dimensions of 29.5m by 37m and the width of the ditch is 2.5m. It is surrounded by a negative curvilinear response relating to a low external bank. There are a number of discrete positive responses internally, which may be archaeologically significant, but a modern or antiquarian origin is possible.

(11) - A ring ditch known from aerial photographs within the scheduled area. It is 15.8m in diameter and appears to contain a central pit. It also appears to have a flanged 'entrance' facing south east. It has been overlain in the centre by a later boundary ditch (18).

(12) - A second ring ditch also recorded from aerial photographs within the scheduled area. It has a diameter of 15.1m and appears to have a central pit.

(13) - Located towards the south eastern edge of the survey area is an incomplete positive curvilinear anomaly (see Figs 06-08). Although only the western part is apparent in the data, and the southern part is obscured by magnetic disturbance, the response is similar to anomalies (7), (11) & (12), and it appears to relate to a previously unrecorded ring ditch outside of the scheduled area. It also appears to

have been overlain by later boundary feature (18).

(14) - Situated 25m north west of anomaly (10) is a very weakly positive curvilinear anomaly. This appears to relate to a previously unrecorded ring ditch with a diameter of 11m and possibly a central pit-like response lying outside of the scheduled area.

(15) - A sub-square enclosure with dimension of 68m by 76m lies 35m north west of ring ditch (8). It relates to the probable Iron Age enclosure included in the scheduled area. It has an entrance facing west north west, leading into a second rectilinear enclosure with dimensions of 52m by 100m. On the western side of this is a third enclosure, 36m by 40m. There are a small number of positive discrete and linear anomalies within the enclosures but the majority lack a coherent morphology.

(16) - Situated within the central enclosure (15) are a ring of pits and strong, discrete dipolar responses with other discrete responses outlying. They appear to form a ring of pits or postholes with a diameter of 23m across.

(17 & 18) - A large, rectilinear enclosure (17) with dimensions of 182m by 253m extends around the smaller enclosures (15). The north eastern corner incorporates the barrow ditch of the most north easterly barrow in the group (6). Other linear and rectilinear anomalies extend to the south west forming a large co-axial field system. Anomaly (18) extends across the centre of two small ring ditches.

(19 & 20) - A positive linear anomaly (19) extends westwards from ring ditch (34) in Area 3, changing direction as it extends across the south western part of ring ditch (7) heading north westwards to join the northern edge of large enclosure (17). The longest axis is parallel with anomaly (20) situated 85m to the north and oriented west south west to east north east. These have a different orientation to the majority of the other linear and rectilinear features but again utilise a number of ring ditches in their layout.

(21) - A positive rectilinear anomaly appears to have elements broadly parallel with linear anomalies (37) seen in the north eastern part of Area 3 to the east but on a slightly different orientation to the main field system. It may have been cut by anomaly (20).

#### *Anomalies with an uncertain origin*

(22, 23, 24) - A very weakly positive curvilinear anomaly (22) is situated 35m south west of barrow ditch (7) and has a diameter of 7.5m. Situated 24m to the south is a cluster of pits with a broad curvilinear response (23) and another weak curvilinear response (24) with a 6.3m diameter situated another 9m further south west. Four additional ring ditches have been recorded from aerial photographs within this part of the scheduled area and it is possible that these responses are associated.

(25) - A group of very weakly positive curvilinear responses appear to cluster around barrow ditch (7). They have a diameter of 6-9m, their origin is uncertain.



(26) - A number of very weakly positive curvilinear responses appear to form oval anomalies. They are extremely weak and indistinct and it is not possible to determine their origin.

(27) - The survey area contains a number of short, very weakly positive linear anomalies. Their indistinct response and lack of coherent morphology do not allow for confident interpretation.

(28) - A negative linear anomaly extending between two former boundary ditches may relate to a former linear bank although this is not certain (see Figs 06-08).

(29) - A number of weakly positive linear and possible rectilinear anomalies of uncertain origin are situated to the south east of barrow ditch (10).

(30) - In the northern part of the survey area are a number of zones of magnetically enhanced material. The response may be indicative of quarrying, and it is possible that they are associated with small quarries flanking the Roman road immediately to the north.

### 3.6 *List of anomalies - Area 3*

Area centred on OS NGR 404700 167775, see Figures 11 - 14.

#### *Anomalies of archaeological potential*

(31) - A positive curvilinear anomaly representing a 50m diameter external ring ditch surrounding a pond barrow. Inside is a negative curvilinear response relating to a low bank with another positive curvilinear response inside. A number of strongly magnetic responses relate to modern material associated with deterring burrowing animals. A pit (2.7nT), 2.75m by 3.3m, lies 40m west of the barrow ditch, and although at a distance, this may be archaeologically significant and possibly associated.

(32) - A positive curvilinear anomaly relating to a ring ditch 27m in diameter surrounding an extant bell barrow.

(33) - A positive curvilinear anomaly 37m in diameter and surrounded by a negative curvilinear anomaly relate to a ring ditch with external bank surrounding a disc barrow. There are a large number of discrete positive responses within but it is not possible to determine if they relate to archaeological features or to modern or antiquarian disturbance.

(34) - A positive curvilinear anomaly with an external diameter of 26.6m and an outer negative curvilinear response relating to the surrounding bank of the extant disc barrow.

(35) - Situated 100m south east of the line of scheduled barrows is a small ring ditch 11m in diameter and previously identified from aerial photographs. There appears to be a pit to the south west of it with a response of up to 3nT, stronger than the majority of pit-like responses across the site. It is possible that this may be associated. A linear boundary ditch crosses the western side.

(36) - Towards the north eastern corner of the survey area is an L-shaped positive rectilinear anomaly. It ends abruptly at the southern end but is generally parallel with the co-axial field system. It relates to a rectilinear boundary feature mapped from aerial photographs. To the east is a positive linear anomaly extending east to west, and to the west are two very weak positive parallel linear responses.

(37) - Two pairs of parallel linear anomalies, spaced 11m apart, are associated with former boundary features relating to the field system. They may, however, indicate a trackway extending towards the north west which is likely to be overlain by the Roman road.

#### *Anomalies with an uncertain origin*

(38) - The northern part of the survey area contains widespread and numerous discrete positive responses with others in the southern part of the survey area. While many of the responses are amorphous and around 1nT, several are around 3nT or above. They lack a coherent pattern or morphology, suggesting a natural origin. Several can be seen in the area of the supposed single scheduled ring ditch, but these are similar to the scatter seen either side.

(39) - A very weakly positive curvilinear anomaly is located at the northern edge of the survey area. It may relate to a cut feature.

(40) - Located between anomalies (31) and (35) is a very weakly positive curvilinear anomaly. It may relate to a further ring ditch.

## 4 DISCUSSION

4.1.1 Area 1, in the southern part of the site, is a continuation of the western scheduled area mainly covered by Area 2; however, no anomalies that could be attributed to a round barrow or ring ditch can be seen in the data in this area. A number of linear anomalies and a large number of pit-like responses have been located and while it is possible that the linear anomalies relate to cut features, the discrete responses may be natural in origin.

4.1.2 Area 2, in the western part of the site, contains five ring ditches in a linear formation relating to four upstanding barrows within the scheduled area (6, 8, 9 & 10), one has been completely ploughed away (7). The survey has located two other ring ditches (11 & 12) within the scheduled area although the scheduling lists eleven barrows in total; there are a number of small, very

weakly positive curvilinear responses in the area that could relate to further ring ditches (22 -25). Two other previously unrecorded ring ditches outside of the scheduled area (within Area 2) can be seen in the results but one is incomplete (13) and the other very weak (14).

- 4.1.3 The Iron Age enclosure has also been mapped from aerial photographs along with a large field system. The magnetometry has added to the detail of the enclosure (15), revealing an entrance on the western side leading to a second enclosure. This second enclosure possibly contains a ring of pits or postholes towards the south western corner (16), and although there are other discrete and linear anomalies elsewhere within the enclosures, they are generally weak or poorly defined. The enclosures are incorporated into a larger co-axial field system with several of these former boundary features either extending round the edge of the larger barrow ditches (17), or directly over the top of the smaller barrows (18).
- 4.1.4 Within Area 3, there are two scheduled areas, one listed as containing five barrows with another separate barrow to the north. The survey has located ring ditches associated with four extant barrows (31-34), identified as two disc barrows to the south west, a bell barrow and a large pond barrow to the north east. A bowl barrow is recorded in the literature in the vicinity of the disc barrows, but there is no obvious anomaly within the results. The single round barrow in the northern part of the area also does not have any corresponding ring ditch visible within the data and although a number of pit-like responses (38) are located in the vicinity, they are part of a much wider scatter of such responses which lack a coherent pattern and which may relate to naturally formed pits. A small ring ditch (35), recorded from aerial photos but outside of the scheduled areas has also been located in the south eastern part of the site, with the survey area extended slightly to cover the whole of the feature.

## 5 CONCLUSION

- 5.1.1 The western part of the site is listed as containing eleven ring ditches within the scheduled area (Areas 1 & 2). The detailed magnetometer survey located seven definite ring ditches in the western group, four relate to upstanding barrows, with three ploughed out. Further to this, another two previously unrecorded ring ditches were identified within the western part of the site (Area 2). In the vicinity of the group of extant barrows and included in the scheduling are recorded four possible ring ditches. The survey did locate a number of very small weakly positive curvilinear anomalies that may be associated with these features, but they are not clear. No further ring ditches could be seen extending southwards into the continuation of the scheduled area within Area 1.

- 5.1.2 The scheduling in the western part of the site also includes a rhomboid enclosure, known to contain Iron Age and Roman pottery with a north eastern entrance and lying within a contemporary field system. The magnetometer data demonstrate a corresponding rectilinear enclosure with entrance, but also indicate that it joins another enclosure with a smaller one to the west. A possible ring of pits or postholes within the second enclosure can also be seen, and although of archaeological potential, their function is not known. Other internal anomalies are very weak and indistinct and cannot be resolved. The enclosures lie within a landscape containing a main co-axial field system oriented north west to south east with ditches that join the enclosures.
- 5.1.3 In the eastern part of the site (Area 3) a group of five scheduled barrows and another single scheduled barrow have been recorded, either as upstanding monuments or from aerial photographs. The results of the magnetometer survey indicate a line of four ring ditches associated with four extant barrows, not five. A small ring ditch, previously recorded from aerial photographs but not within the scheduled area, can also be seen in the south eastern part of Area 3. There is also no obvious response to the scheduled ring ditch in the north eastern part of the site.
- 5.1.4 The survey also located several discrete and linear anomalies that may relate to other features of archaeological potential although many positive, discrete anomalies of uncertain origin may be caused by natural features. Amorphous anomalies along the northern side of Area 2 are located immediately adjacent to a Roman road. It is possible that they relate to localised quarrying associated with construction or maintenance of the road.

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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 thermoremanent 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.

Thermoremanent 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. Thermoremanent features include ovens, hearths, and kilns. In addition thermoremanent 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 field. The difference between the two sensors will relate to the strength 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. It has been found that clipping data to ranges between  $\pm 5\text{nT}$  and  $\pm 3\text{nT}$  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 (destripe) 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 differences between the baseline value of gradiometer sensors.

### *High Pass Filtering*

A mathematical process used to remove low frequency anomalies relating to survey tracks, modern agricultural features and other large magnetic bodies within or adjacent to survey areas.

### *Low Pass Filtering*

A mathematical process used to remove high frequency anomalies relating to uneven ground, vibration, etc.

## Appendix C – survey and data information

### Area 1 minimally processed data

Filename: J704-mag-Area1-proc.xcp  
 Description: Imported as Composite from: J704-mag-Area1.asc  
 Instrument Type: Sensys DLMGPS  
 Units: nT  
 UTM Zone: 30U  
 Survey corner coordinates (X/Y): OSGB36  
 Northwest corner: 404331.167974279, 167574.003522459 m  
 Southeast corner: 404500.067974279, 167445.903522459 m  
 Collection Method: Randomised  
 Sensors: 5  
 Dummy Value: 32702  
 Source GPS Points: 397200  
 Dimensions  
 Composite Size (readings): 1126 x 854  
 Survey Size (meters): 169 m x 128 m  
 Grid Size: 169 m x 128 m  
 X Interval: 0.15 m  
 Y Interval: 0.15 m  
 Stats  
 Max: 2.00  
 Min: -2.00  
 Std Dev: 0.78  
 Mean: 0.01  
 Median: 0.01  
 Composite Area: 2.1636 ha  
 Surveyed Area: 1.4366 ha  
 PROGRAM  
 Name: TerraSurveyor  
 Version: 3.0.23.0  
 Processes: 2  
 1 Base Layer  
 2 Clip from -2.00 to 2.00 nT  
 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

### Area 1 filtered data

Filename: J704-mag-Area1-proc-hpf.xcp  
 Description: Imported as Composite from: J704-mag-Area1.asc  
 Stats  
 Max: 2.21  
 Min: -2.20  
 Std Dev: 0.69  
 Mean: 0.01  
 Median: 0.00  
 Composite Area: 2.17 ha  
 Surveyed Area: 1.4437 ha  
 Processes: 1  
 1 Base Layer  
 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: 153  
 5 Clip from -2.00 to 2.00 nT

### Area 2 minimally processed data

Filename: J704-mag-Area2-proc.xcp  
 Description: Imported as Composite from: J704-mag-Area2.asc  
 Instrument Type: Sensys DLMGPS  
 Units: nT  
 UTM Zone: 30U  
 Survey corner coordinates (X/Y): OSGB36  
 Northwest corner: 404008.045702526, 167855.896116943 m  
 Southeast corner: 404565.895702526, 167490.046116943 m  
 Collection Method: Randomised  
 Sensors: 5  
 Dummy Value: 32702  
 Source GPS Points: 3683400  
 Dimensions  
 Composite Size (readings): 3719 x 2439  
 Survey Size (meters): 558 m x 366 m  
 Grid Size: 558 m x 366 m  
 X Interval: 0.15 m  
 Y Interval: 0.15 m  
 Stats  
 Max: 3.32  
 Min: -3.30  
 Std Dev: 0.48  
 Mean: 0.01  
 Median: 0.00  
 Composite Area: 20.409 ha  
 Surveyed Area: 12.703 ha  
 Processes: 1  
 1 Base Layer  
 GPS based Proce4  
 1 Base Layer  
 2 Unit Conversion Layer (Lat/Long to OSGB36)  
 3 DeStripe Median Traverse:  
 4 Clip from -2.00 to 2.00 nT

### Area 2 filtered data

Filename: J704-mag-Area2-proc-hpf-lpf.xcp  
 Description: Imported as Composite from: J704-mag-Area2.asc  
 Stats  
 Max: 2.00

Min: -2.00  
 Std Dev: 0.32  
 Mean: 0.01  
 Median: 0.00  
 Composite Area: 20.409 ha  
 Surveyed Area: 12.703 ha  
 Processes: 2  
 1 Base Layer  
 2 Clip from -1.00 to 1.00 nT  
 GPS based Proce6  
 1 Base Layer  
 2 Unit Conversion Layer (to OSGB36)  
 3 DeStripe Median Traverse:  
 4 Clip from -3.00 to 3.00 nT  
 5 High pass Uniform (median) filter: Window dia: 300  
 6 Lo pass Uniform (median) filter: Window dia: 13

### Area 3 minimally processed data

Filename: J704-mag-Area3-proc.xcp  
 Description: Imported as Composite from: J704-mag-Area3.asc  
 Instrument Type: Sensys DLMGPS  
 Units: nT  
 UTM Zone: 30U  
 Survey corner coordinates (X/Y): ODGB36  
 Northwest corner: 404535.686801125, 167965.113206975 m  
 Southeast corner: 404886.536801125, 167626.863206975 m  
 Collection Method: Randomised  
 Sensors: 5  
 Dummy Value: 32702  
 Source GPS Points: 2023700  
 Dimensions  
 Composite Size (readings): 2339 x 2255  
 Survey Size (meters): 351 m x 338 m  
 Grid Size: 351 m x 338 m  
 X Interval: 0.15 m  
 Y Interval: 0.15 m  
 Stats  
 Max: 2.00  
 Min: -2.00  
 Std Dev: 0.49  
 Mean: 0.01  
 Median: 0.00  
 Composite Area: 11.868 ha  
 Surveyed Area: 7.1412 ha  
 Processes: 2  
 1 Base Layer  
 2 Clip from -2.00 to 2.00 nT  
 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

### Area 3 filtered data

Filename: J704-mag-Area3-proc-hpf-lpf.xcp  
 Description: Imported as Composite from: J704-mag-Area3.asc  
 Stats  
 Max: 1.00  
 Min: -1.00  
 Std Dev: 0.30  
 Mean: 0.01  
 Median: 0.00  
 Composite Area: 11.868 ha  
 Surveyed Area: 7.1412 ha  
 Processes: 2  
 1 Base Layer  
 2 Clip from -1.00 to 1.00 nT  
 GPS based Proce6  
 1 Base Layer  
 2 Unit Conversion Layer (Lat/Long to OSGB36)  
 3 DeStripe Median Traverse:  
 4 Clip from -3.00 to 3.00 nT  
 5 High pass Uniform (median) filter: Window dia: 300  
 6 Lo pass Uniform (median) filter: Window dia: 13

### Area 4 minimally processed data

Filename: J704-mag-Area4.xcp  
 Description: Imported as Composite from: J704-mag-Area4.asc  
 Instrument Type: Sensys DLMGPS  
 Units: nT  
 UTM Zone: 30U  
 Survey corner coordinates (X/Y): OSGB36  
 Northwest corner: 404695.312090706, 167843.85239055 m  
 Southeast corner: 404750.362090706, 167788.05239055 m  
 Collection Method: Randomised  
 Sensors: 5  
 Dummy Value: 32702  
 Source GPS Points: 62200  
 Dimensions  
 Composite Size (readings): 367 x 372  
 Survey Size (meters): 55.1 m x 55.8 m  
 Grid Size: 55.1 m x 55.8 m  
 X Interval: 0.15 m  
 Y Interval: 0.15 m  
 Stats  
 Max: 2.00  
 Min: -2.00  
 Std Dev: 0.98  
 Mean: -0.04  
 Median: 0.01  
 Composite Area: 0.30718 ha  
 Surveyed Area: 0.17413 ha  
 Processes: 2

1 Base Layer  
 2 Clip from -2.00 to 2.00 nT  
 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

### Area 4 filtered data

Filename: J704-mag-Area4-hpf-lpf.xcp  
 Description: Imported as Composite from: J704-mag-Area4.asc  
 Stats  
 Max: 1.11  
 Min: -1.10  
 Std Dev: 0.50  
 Mean: -0.02  
 Median: -0.01  
 Composite Area: 0.30884 ha  
 Surveyed Area: 0.17736 ha  
 Processes: 1  
 1 Base Layer  
 GPS based Proce8  
 1 Base Layer  
 2 Unit Conversion Layer (Lat/Long to OSGB36)  
 3 DeStripe Median Traverse:  
 4 High pass Uniform (median) filter: Window dia: 150  
 5 Clip from -2.00 to 2.00 nT  
 6 Lo pass Uniform (median) filter: Window dia: 13  
 7 Clip from -2.00 to 2.00 nT  
 8 Clip from -1.00 to 1.00 nT

### Area 5 minimally processed data

Filename: J704-mag-Area5.xcp  
 Description: Imported as Composite from: J704-mag-Area5.asc  
 Instrument Type: Sensys DLMGPS  
 Units: nT  
 UTM Zone: 30U  
 Survey corner coordinates (X/Y): OSGB36  
 Northwest corner: 404662.475614196, 167767.105097177 m  
 Southeast corner: 404693.975614196, 167738.155097177 m  
 Collection Method: Randomised  
 Sensors: 5  
 Dummy Value: 32702  
 Source GPS Points: 27200  
 Dimensions  
 Composite Size (readings): 212 x 195  
 Survey Size (meters): 31.8 m x 29.3 m  
 Grid Size: 31.8 m x 29.3 m  
 X Interval: 0.15 m  
 Y Interval: 0.15 m  
 Stats  
 Max: 2.00  
 Min: -2.00  
 Std Dev: 0.79  
 Mean: 0.09  
 Median: -0.01  
 Composite Area: 0.093015 ha  
 Surveyed Area: 0.06435 ha  
 Processes: 2  
 1 Base Layer  
 2 Clip from -2.00 to 2.00 nT  
 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

### Area 5 filtered data

Filename: J704-mag-Area5-proc-hpf-lpf.xcp  
 Description: Imported as Composite from: J704-mag-Area5.asc  
 Stats  
 Max: 1.11  
 Min: -1.10  
 Std Dev: 0.49  
 Mean: 0.06  
 Median: 0.01  
 Composite Area: 0.093663 ha  
 Surveyed Area: 0.0645 ha  
 Processes: 1  
 1 Base Layer  
 GPS based Proce7  
 1 Base Layer  
 2 Unit Conversion Layer (Lat/Long to OSGB36)  
 3 DeStripe Median Traverse:  
 4 Lo pass Uniform (median) filter: Window dia: 13  
 5 High pass Uniform (median) filter: Window dia: 203  
 6 Clip from -2.00 to 2.00 nT  
 7 Clip from -1.00 to 1.00 nT

### Area 6 minimally processed data

Filename: J704-mag-Area6-proc.xcp  
 Description: Imported as Composite from: J704-mag-Area6.asc  
 Instrument Type: Sensys DLMGPS  
 Units: nT  
 UTM Zone: 30U  
 Survey corner coordinates (X/Y): OSGB36  
 Northwest corner: 404308.805573216, 167741.905557528 m  
 Southeast corner: 404348.105573216, 167704.855557528 m  
 Collection Method: Randomised  
 Sensors: 5  
 Dummy Value: 32702



Source GPS Points: 56100  
 Dimensions  
 Composite Size (readings): 262 x 247  
 Survey Size (meters): 39.3 m x 37.1 m  
 Grid Size: 39.3 m x 37.1 m  
 X Interval: 0.15 m  
 Y Interval: 0.15 m  
 Stats  
 Max: 2.00  
 Min: -2.00  
 Std Dev: 0.97  
 Mean: -0.04  
 Median: 0.03  
 Composite Area: 0.14561 ha  
 Surveyed Area: 0.10846 ha  
 Processes: 2  
 1 Base Layer  
 2 Clip from -2.00 to 2.00 nT  
 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

**Area 6 filtered data**

Filename: J704-mag-Area6-proc-hpf-lpf.xcp  
 Description: Imported as Composite from: J704-mag-Area6.asc  
 Area6.asc  
 Stats  
 Max: 1.11  
 Min: -1.10  
 Std Dev: 0.52  
 Mean: 0.00  
 Median: 0.01  
 Composite Area: 0.14657 ha  
 Surveyed Area: 0.1094 ha  
 Processes: 1  
 1 Base Layer  
 GPS based Proce7  
 1 Base Layer  
 2 Unit Conversion Layer (Lat/Long to OSGB36).  
 3 DeStripe Median Traverse:  
 4 High pass Uniform (median) filter: Window dia: 153  
 5 Lo pass Uniform (median) filter: Window dia: 13  
 6 Clip from -2.00 to 2.00 nT  
 7 Clip from -1.00 to 1.00 nT

**Area 7 minimally processed data**

Filename: J704-mag-Area7-proc.xcp  
 Description: Imported as Composite from: J704-mag-Area7.asc  
 Area7.asc  
 Instrument Type: Sensys DLMGPS  
 Units: nT  
 UTM Zone: 30U  
 Survey corner coordinates (X/Y): OsGB36  
 Northwest corner: 404221.138727957, 167691.528788979 m  
 Southeast corner: 404263.588727957, 167652.978788979 m  
 Collection Method: Randomised  
 Sensors: 5  
 Dummy Value: 32702  
 Source GPS Points: 57000  
 Dimensions  
 Composite Size (readings): 283 x 257  
 Survey Size (meters): 42.5 m x 38.6 m  
 Grid Size: 42.5 m x 38.6 m  
 X Interval: 0.15 m  
 Y Interval: 0.15 m  
 Stats  
 Max: 2.00  
 Min: -2.00  
 Std Dev: 0.81  
 Mean: 0.07  
 Median: -0.01  
 Composite Area: 0.16364 ha  
 Surveyed Area: 0.12598 ha  
 Processes: 2  
 1 Base Layer

-2 Clip from -2.00 to 2.00 nT  
 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

**Area 7 filtered data**

Filename: J704-mag-Area7-proc-hpf-lpf.xcp  
 Description: Imported as Composite from: J704-mag-Area7.asc  
 Area7.asc  
 Stats  
 Max: 1.00  
 Min: -1.00  
 Std Dev: 0.42  
 Mean: 0.02  
 Median: 0.00  
 Composite Area: 0.16364 ha  
 Surveyed Area: 0.12598 ha  
 Processes: 2  
 1 Base Layer  
 2 Unit Conversion Layer (Lat/Long to OSGB36).  
 3 DeStripe Median Traverse:  
 4 High pass Uniform (median) filter: Window dia: 153  
 5 Lo pass Uniform (median) filter: Window dia: 13  
 6 Clip from -1.00 to 1.00 nT

**Area 8 minimally processed data**

Filename: J704-mag-Area8-proc.xcp  
 Description: Imported as Composite from: J704-mag-Area8.asc  
 Area8.asc  
 Instrument Type: Sensys DLMGPS  
 Units: nT  
 UTM Zone: 30U  
 Survey corner coordinates (X/Y):  
 Northwest corner: 404160.054980277, 167642.124440054 m  
 Southeast corner: 404192.604980277, 167609.274440054 m  
 Collection Method: Randomised  
 Sensors: 5  
 Dummy Value: 32702  
 Source GPS Points: 34800  
 Dimensions  
 Composite Size (readings): 217 x 219  
 Survey Size (meters): 32.6 m x 32.9 m  
 Grid Size: 32.6 m x 32.9 m  
 X Interval: 0.15 m  
 Y Interval: 0.15 m  
 Stats  
 Max: 2.00  
 Min: -2.00  
 Std Dev: 0.75  
 Mean: 0.03  
 Median: 0.00  
 Composite Area: 0.10693 ha  
 Surveyed Area: 0.080768 ha  
 Processes: 2  
 1 Base Layer  
 2 Clip from -2.00 to 2.00 nT  
 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

**Area 8 filtered data**

Filename: J704-mag-Area8-proc-hpf-lpf.xcp  
 Description: Imported as Composite from: J704-mag-Area8.asc  
 Area8.asc  
 Stats  
 Max: 2.21  
 Min: -2.20  
 Std Dev: 0.51  
 Mean: 0.02

Median: 0.00  
 Composite Area: 0.10824 ha  
 Surveyed Area: 0.081472 ha  
 Processes: 1  
 1 Base Layer  
 GPS based Proce6  
 1 Base Layer  
 2 Unit Conversion Layer (Lat/Long to OSGB36).  
 3 DeStripe Median Traverse:  
 4 High pass Uniform (median) filter: Window dia: 153  
 5 Lo pass Uniform (median) filter: Window dia: 13  
 6 Clip from -2.00 to 2.00 nT

**Area 9 minimally processed data**

Filename: J704-mag-Area9-proc.xcp  
 Description: Imported as Composite from: J704-mag-Area9.asc  
 Area9.asc  
 Instrument Type: Sensys DLMGPS  
 Units: nT  
 UTM Zone: 30U  
 Survey corner coordinates (X/Y): OSGB36  
 Northwest corner: 404105.790024858, 167608.106118987 m  
 Southeast corner: 404141.490024858, 167570.366118987 m  
 Collection Method: Randomised  
 Sensors: 5  
 Dummy Value: 32702  
 Source GPS Points: 38300  
 Dimensions  
 Composite Size (readings): 210 x 222  
 Survey Size (meters): 35.7 m x 37.7 m  
 Grid Size: 35.7 m x 37.7 m  
 X Interval: 0.17 m  
 Y Interval: 0.17 m  
 Stats  
 Max: 2.00  
 Min: -2.00  
 Std Dev: 0.79  
 Mean: 0.02  
 Median: 0.01  
 Composite Area: 0.13473 ha  
 Surveyed Area: 0.10325 ha  
 Processes: 2  
 1 Base Layer  
 2 Clip from -2.00 to 2.00 nT  
 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

**Area 9 filtered data**

Filename: J704-mag-Area9-proc-hpf-lpf.xcp  
 Description: Imported as Composite from: J704-mag-Area9.asc  
 Area9.asc  
 Stats  
 Max: 1.00  
 Min: -1.00  
 Std Dev: 0.44  
 Mean: 0.01  
 Median: 0.01  
 Composite Area: 0.13604 ha  
 Surveyed Area: 0.10486 ha  
 Processes: 3  
 1 Base Layer  
 2 Clip from -2.00 to 2.00 nT  
 3 Clip from -1.00 to 1.00 nT  
 GPS based Proce6  
 1 Base Layer  
 2 Unit Conversion Layer (Lat/Long to OSGB36).  
 3 DeStripe Median Traverse:  
 4 High pass Uniform (median) filter: Window dia: 153  
 5 Lo pass Uniform (median) filter: Window dia: 13  
 6 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 printed copy of the report will be supplied to the Historic England South West office, with a PDF supplied to Hugh Beamish, Historic England Inspector of Ancient Monuments, copied to Paul Linford, Historic England Geophysics Team Leader. Three printed copies, along with the geophysical data, report text and CAD will be sent to Neil Linford, Senior Geophysicist for Historic England. A printed copy of the report and a PDF copy will be supplied to the Wiltshire Historic Environment Record. The report will also be uploaded to the Online Access to the Index of archaeological investigations (OASIS).

Archive contents:

Geophysical data - path: J704 Baltic Farm\Data\				
Path and Filename	Software	Description	Date	Creator
baltic1\MX\ to baltic9\MX\ .prm .dgb .disp	Sensys MXPDA	Proprietary data formats representing magnetometer survey traverses logged to a PDA.	24/02/17 to 06/03/17	D.J.Sabin
baltic1\MX\J704-mag-Area1.asc to baltic9\MX\J704-mag-Area9.asc	Sensys DLMGPS	ASCII CSV (tab) file representing survey area in eastings, northings (UTM Z30N), magnetic measurement, traverse file and sensor number.	06/03/17	K.T.Donaldson
Area1\comps\J704-mag-Area1.xcp to Area9\comps\J704-mag-Area9.xcp	TerraSurveyor 3.0.23.0	Composite data file derived from ASCII CSV.	06/03/17	K.T.Donaldson
Area1\comps\J704-mag-Area1- proc.xcp to Area9\comps\J704-mag-Area9- proc.xcp	TerraSurveyor 3.0.23.0	Processed composite data file (zmt and clipping to $\pm 2nT$ ).	07/03/17	K.T.Donaldson
Area1\comps\J704-mag-Area1-proc- hpf-lpf.xcp to Area9\comps\J704-mag-Area9-proc- hpf-lpf.xcp	TerraSurveyor 3.0.23.0	Filtered composite data file (zmt, high pass and or low pass filtering and clipping to $\pm 1nT$ ).	10/03/17	K.T.Donaldson
Graphic data - path: J704 Baltic Farm\Data\				
Area1\graphics\ J704-mag-Area1-proc-2nT.tif to Area9\graphics\ J704-mag-Area1-proc-2nT.tif	TerraSurveyor 3.0.23.0	TIF file showing a minimally processed greyscale plot clipped to $\pm 2nT$ .	06/03/17	K.T.Donaldson
Area1\graphics\ J704-mag-proc-2nT.tfw to Area9\graphics\ J704-mag-Area9-proc-2nT.tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.	06/03/17	K.T.Donaldson
Area1\graphics\ J704-mag-Area1-proc-hpf-lpf-1nT.tif to Area9\graphics\ J704-mag-Area9-proc-hpf-lpf-1nT.tif	TerraSurveyor 3.0.23.0	Filtered composite data file (zmt, high pass and or low pass filtering and clipping to $\pm 1nT$ ).	10/13/17	K.T.Donaldson
Area1\graphics\ J704-mag-Area1-proc-hpf-lpf-1nT.tfw to Area9\graphics\ J704-mag-Area9-proc-hpf-lpf-1nT.tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.	10/03/17	K.T.Donaldson
CAD data - path: J704 Baltic Farm\CAD\				
J704 version 1.dwg	ProgeCAD 2016	CAD file for creating plots of greyscales, abstraction, interpretation and mapping. Grid coordinates as OSGB. AutoCAD 2010 format.	22/02/17	K.T.Donaldson
Text data - path: J704 Baltic Farm\Documentation\				
J704 report.odt	OpenOffice.org 3.0.1 Writer	Report text as an Open Office document.	28/02/17	K.T.Donaldson

## Appendix E – copyright and intellectual property

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## Historic England Geophysical Survey Database Questionnaire

### Survey Details

**Name of Site:** Baltic Farm, Bishops Cannings

**County:** Wiltshire

**NGR Grid Reference** (Centre of survey to nearest 100m):SU 04455 67695

**Start Date:** 24th February 2017 **End Date:** 6th March 2017

**Geology at site** (Drift and Solid): Chalk (Holywell Nodular Chalk Formation & New Pit Chalk Formation)

### **Known archaeological Sites/Monuments covered by the survey**

(Scheduled Monument No. or National Archaeological Record No. if known)

Eleven round barrows 1000m north of Baltic Farm forming part of a barrow cemetery, a probably enclosed Iron Age farmstead on North Down (List entry no: 1013773).

Five round barrows 1040m NNE of Baltic Farm forming part of a barrow cemetery on North Down (List entry no: 1014737).

Round barrow 1260m NNE of Baltic Farm, 75m south of Roman Road, forming part of a barrow cemetery on North Down (List entry no: 1013774).

### **Archaeological Sites/Monument types detected by survey**

(Type and Period if known. "?" where any doubt).

Ring ditch (round barrow) - Bronze Age

Field system - Iron Age/Roman

Enclosures - Iron Age/Roman

**Surveyor** (Organisation, if applicable, otherwise individual responsible for the survey):David Sabin & Kerry Donaldson, Archaeological Surveys Ltd



**Name of Client, if any:** Historic England

**Purpose of Survey:** To better understand the archaeology within the site in regard to proposals to protect two scheduled barrow groups from further damage from animal burrowing ahead of suitable exclusion measures.

**Location of:**

**a) Primary archive, i.e. raw data, electronic archive etc:**

Archaeological Surveys Ltd, 1 West Nolands, Nolands Road, Yatesbury, Calne, SN11 8YD

**b) Full Report:** As above with copy to OASIS and HER

### **Technical Details**

(Please fill out a separate sheet for each survey technique used)

**Type of Survey** (Use term from attached list or specify other):  
Magnetometry

**Area Surveyed, if applicable** (In hectares to one decimal place): 21ha

**Traverse Separation, if regular:** 0.5m

**Reading/Sample Interval:**20Hz

**Type, Make and model of Instrumentation:**

Sensys Magneto MXPDA (multiple fluxgate gradiometers)

**Land use at the time of the survey** (Use term/terms from the attached list or specify other):

Area 1 - arable

Areas 2 & 3 - grassland pasture



**Geophysical Survey  
Baltic Farm  
Bishops Cannings  
Wiltshire**

**Map of survey area**

Reproduced from OS Explorer map no.157 1:25 000  
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Controller of Her Majesty's Stationery Office.  
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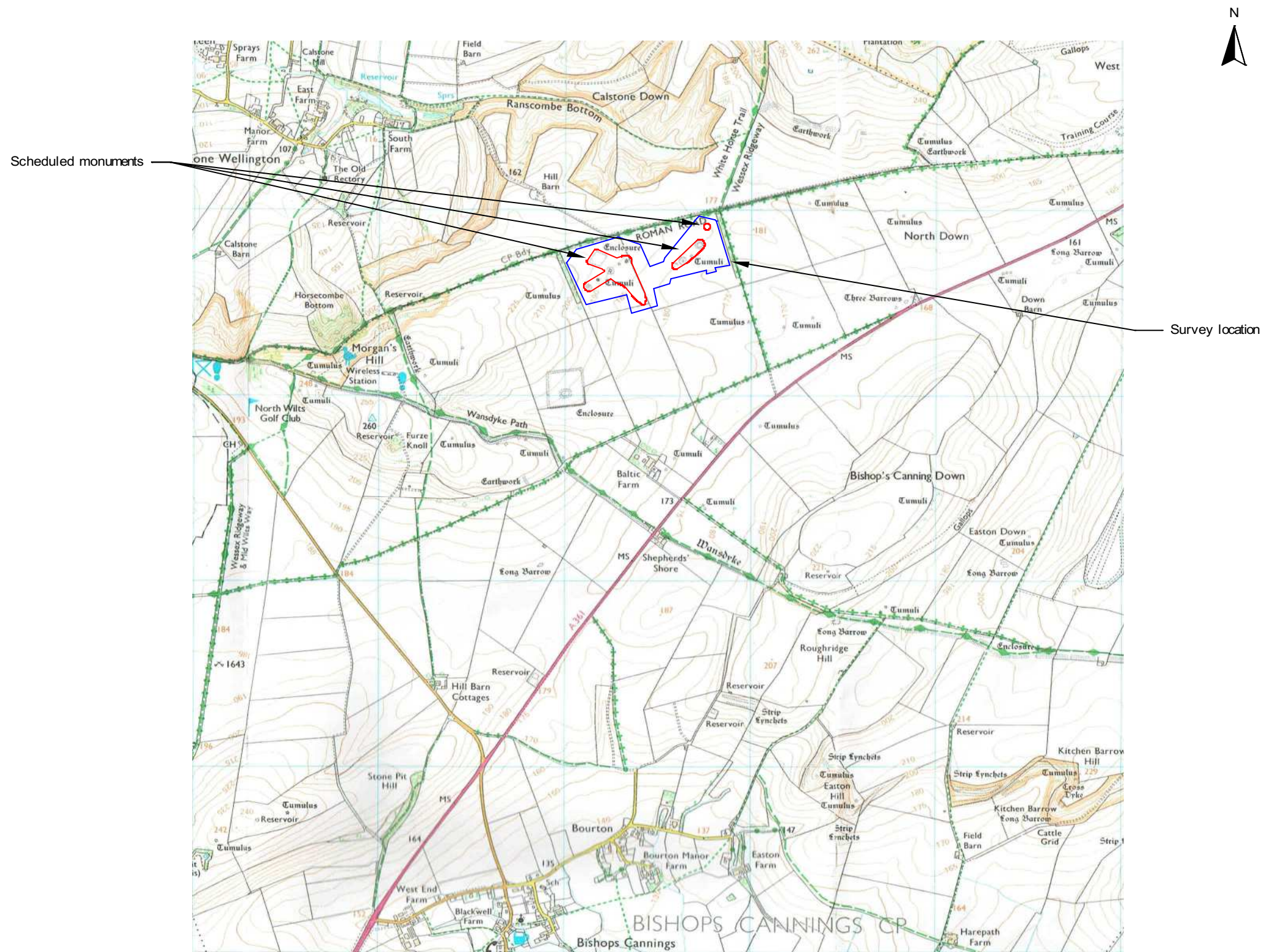
● Survey location

Site centred on OS NGR  
SU 04455 67695

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SCALE TRUE AT A3





**Geophysical Survey  
Baltic Farm  
Bishops Cannings  
Wiltshire**

**Referencing information**

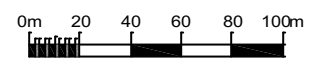
Referencing grid to OSGB36 datum at 100m intervals

Data collected at 20Hz and georeferenced to ETRS89 zone 30 with conversion to OSGB36 using OSTN02

● 404100 167800

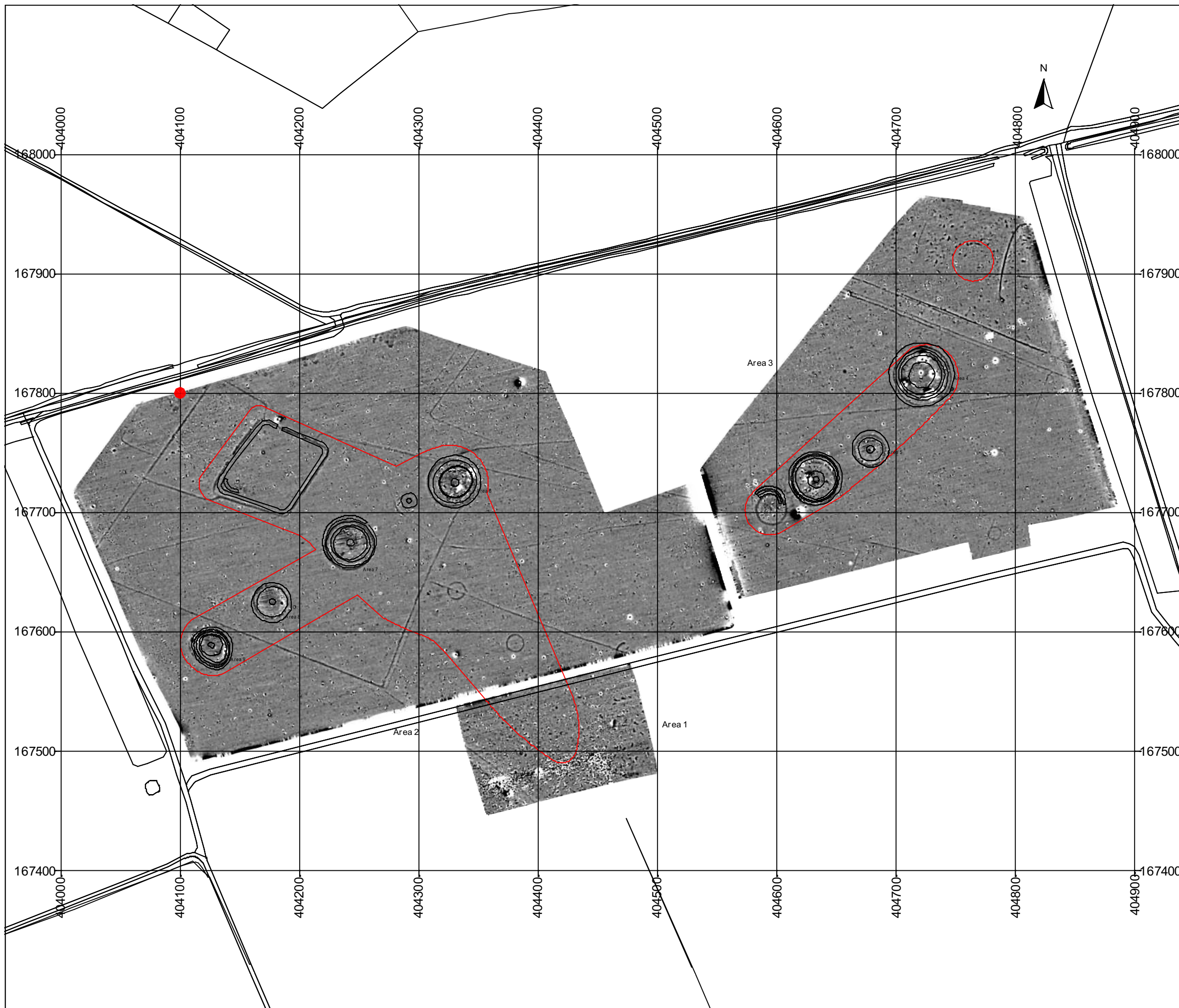
 Scheduled monuments

SCALE 1:3000



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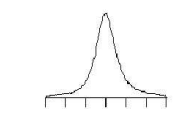
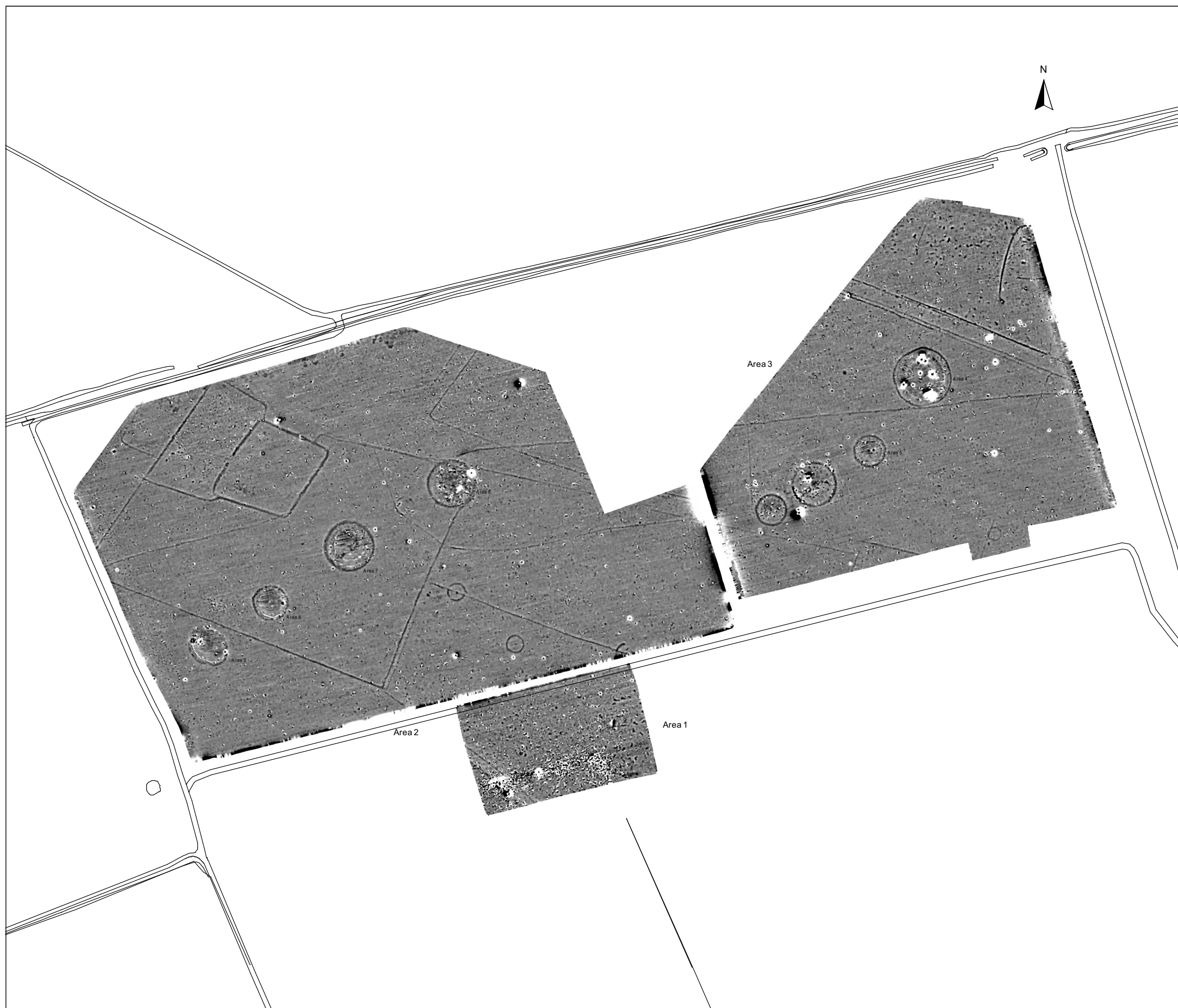
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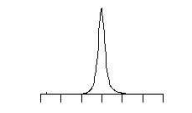


**Geophysical Survey  
Baltic Farm  
Bishops Cannings  
Wiltshire**

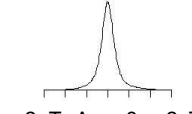
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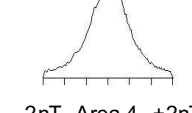
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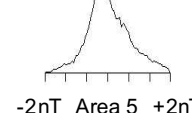
-2nT Area 2 +2nT



-2nT Area 3 +2nT



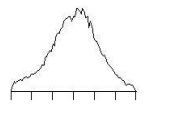
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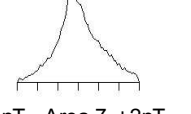
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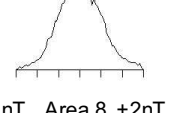
-2nT Area 6 +2nT



-2nT Area 7 +2nT

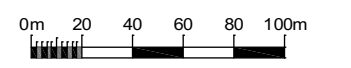


-2nT Area 8 +2nT



-2nT Area 9 +2nT

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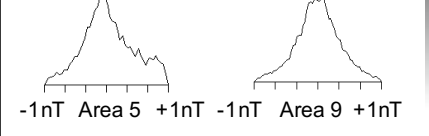
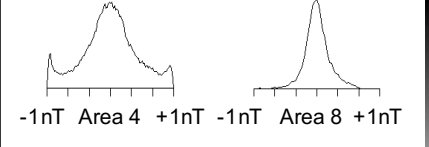
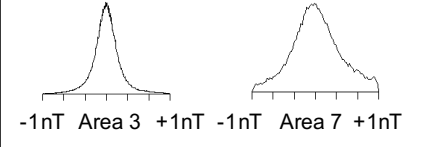
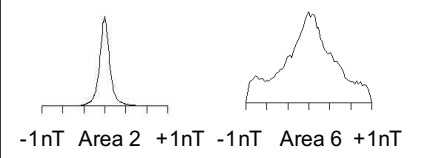
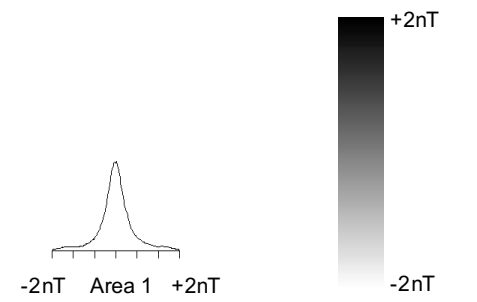
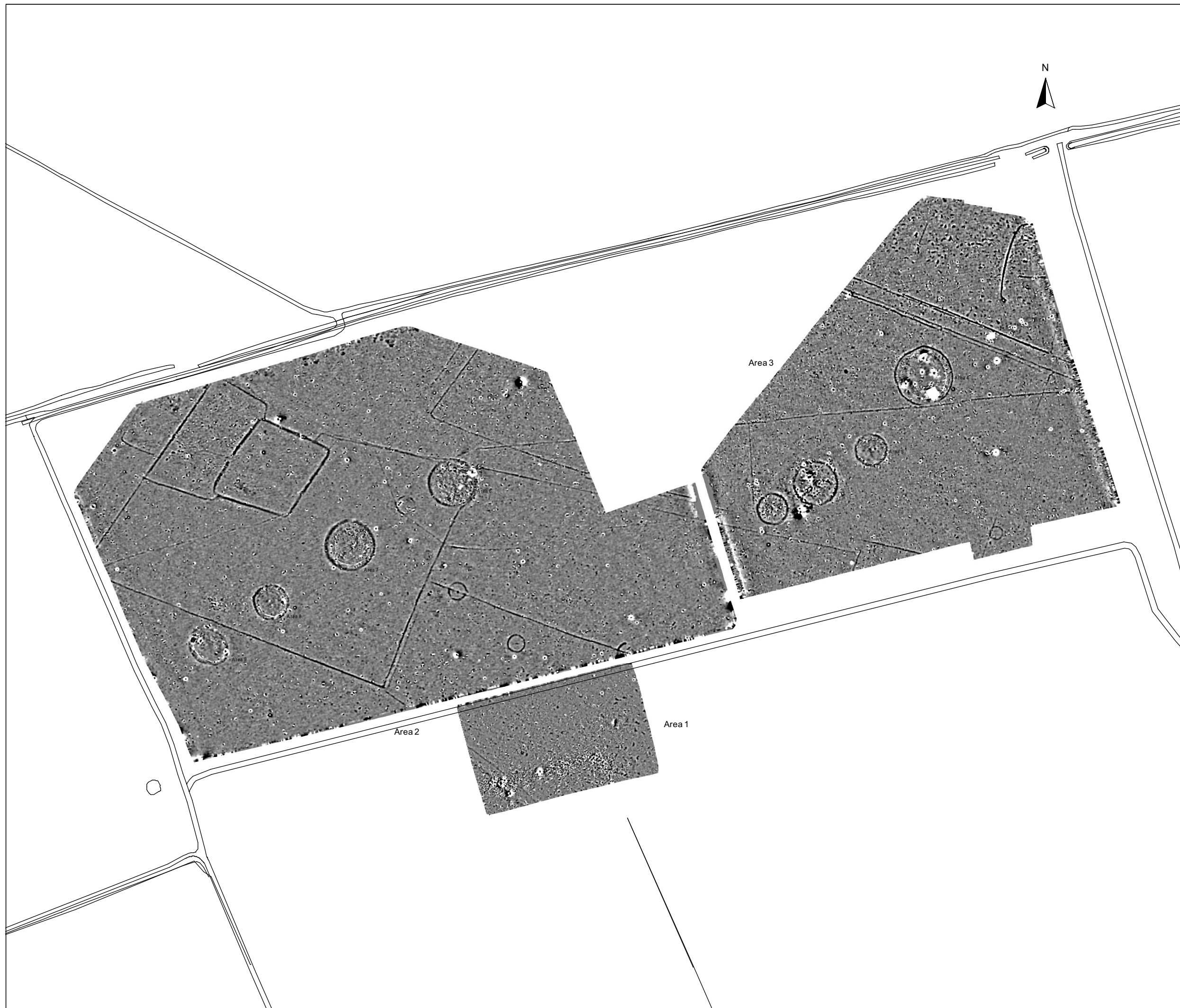
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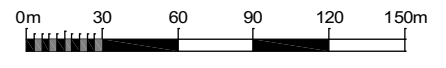


**Geophysical Survey  
Baltic Farm  
Bishops Cannings  
Wiltshire**

**Greyscale plot of filtered  
magnetometer data**



**SCALE 1:3000**















SCALE TRUE AT A3

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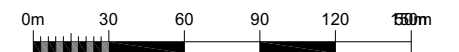
**FIG 04**

**Geophysical Survey  
Baltic Farm  
Bishops Cannings  
Wiltshire**

**Abstraction and interpretation of  
magnetic anomalies**

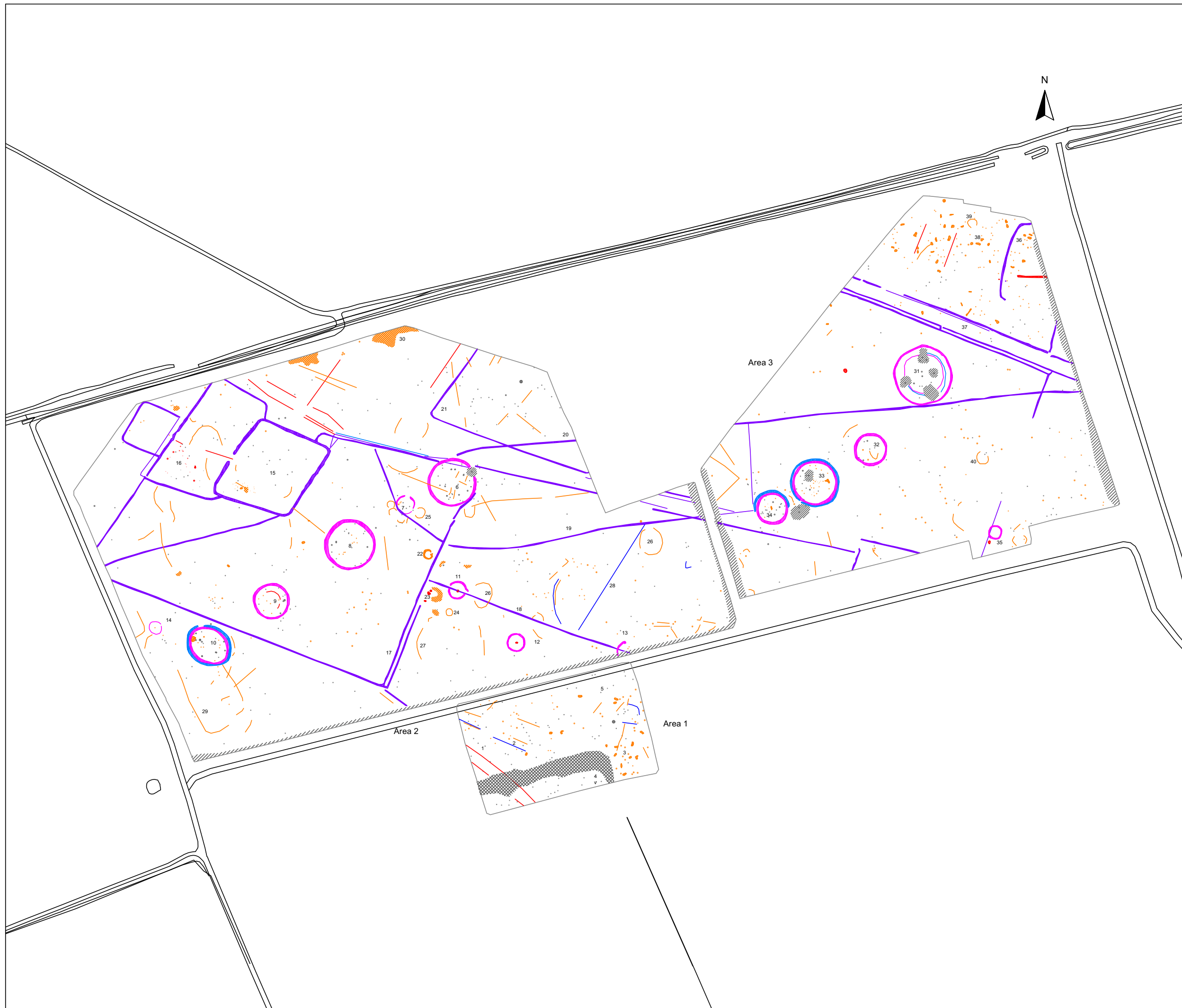
-  Positive linear anomaly - cut feature of archaeological potential
-  Positive curvilinear anomaly - ring ditch
-  Positive curvilinear/rectilinear anomaly - enclosure ditch
-  Negative curvilinear/linear anomaly - bank
-  Positive linear anomaly - possible ditch-like feature
-  Negative linear anomaly - material of low magnetic susceptibility
-  Discrete positive response - cut feature of archaeological potential
-  Discrete positive response - possible pit-like feature
-  Positive anomaly - magnetically enhanced material
-  Magnetic debris - spread of magnetically thermoremanent/ferrous material
-  Magnetic disturbance from ferrous material
-  Strong dipolar anomaly - ferrous object

SCALE 1:3000



SCALE TRUE AT A3

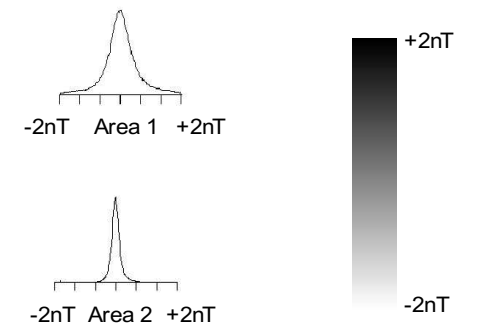
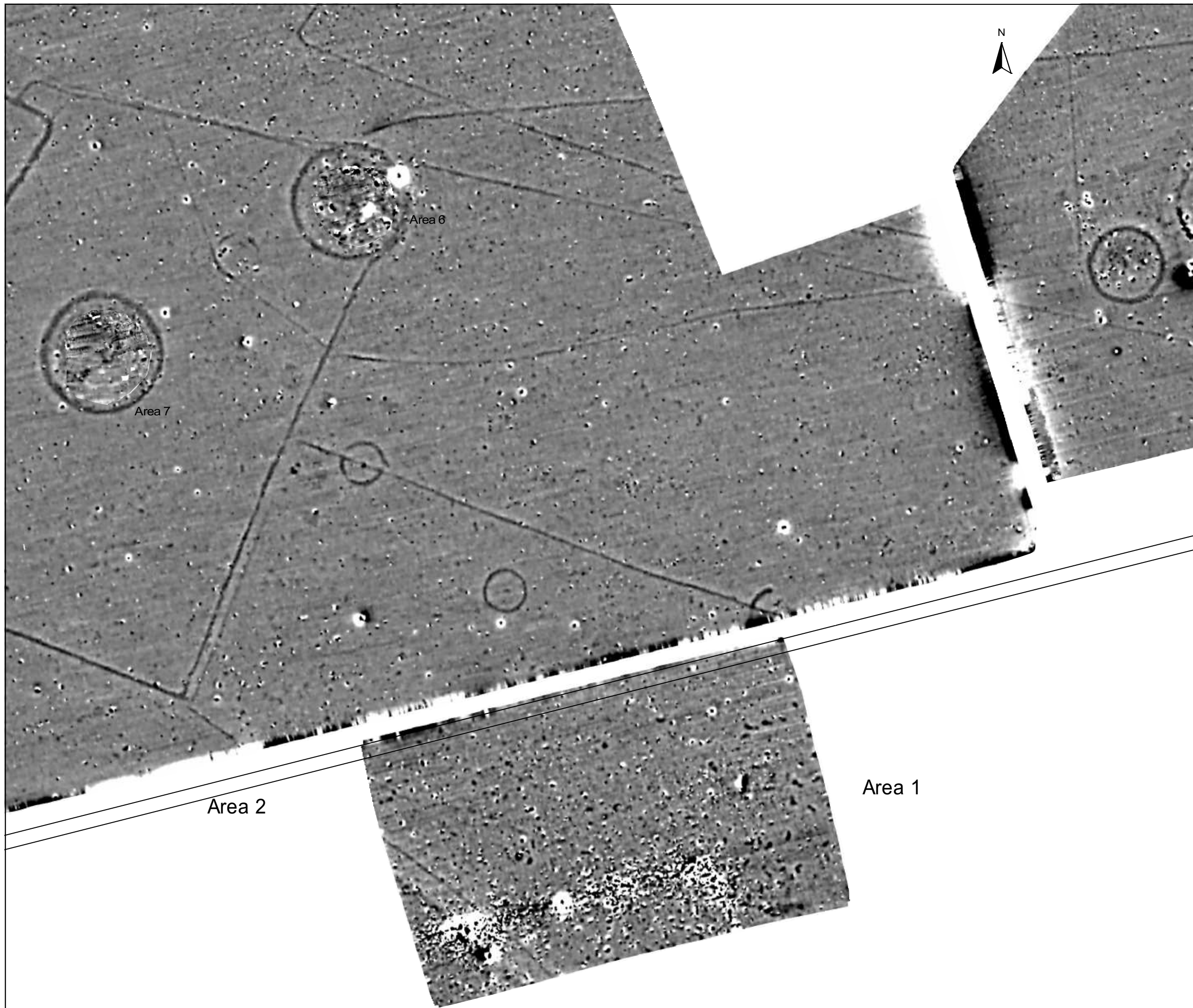
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**Geophysical Survey  
Baltic Farm  
Bishops Cannings  
Wiltshire**

**Greyscale plot of minimally  
processed magnetometer data -  
Area 1 & 2 east**



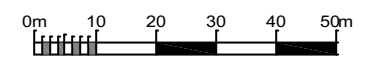
Area 2

Area 1

Area 6

Area 7

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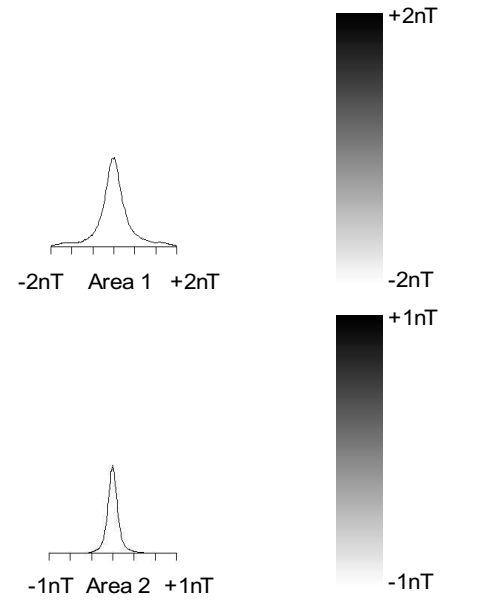
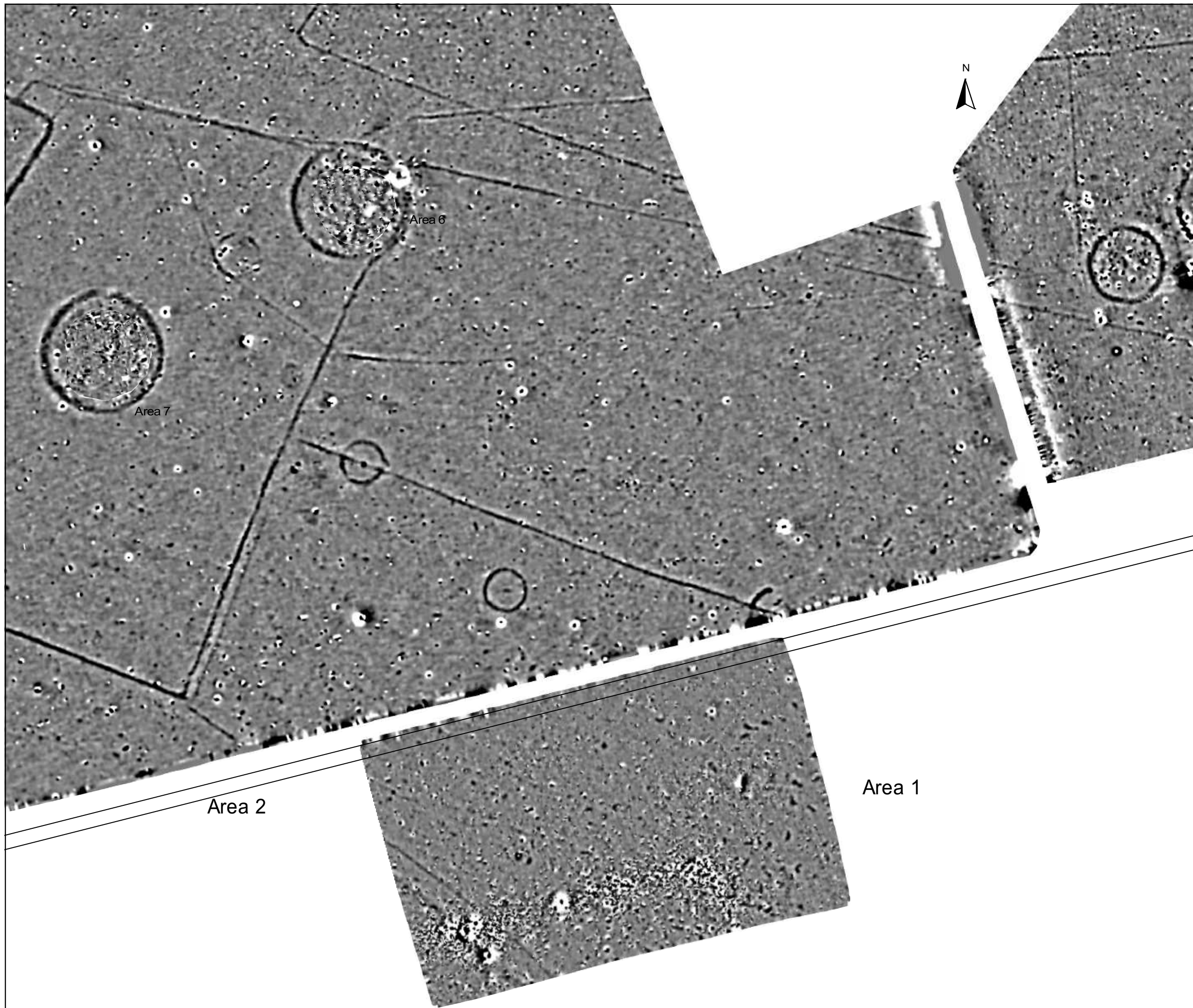
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**Geophysical Survey  
Baltic Farm  
Bishops Cannings  
Wiltshire**

**Greyscale plot of filtered  
magnetometer data -  
Areas 1 & 2 east**



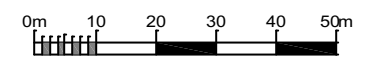
Area 2

Area 1

Area 6

Area 7

SCALE 1:1250















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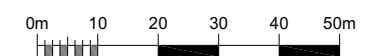


**Geophysical Survey  
Baltic Farm  
Bishops Cannings  
Wiltshire**

**Abstraction and interpretation of  
magnetic anomalies -  
Areas 1 & 2 east**

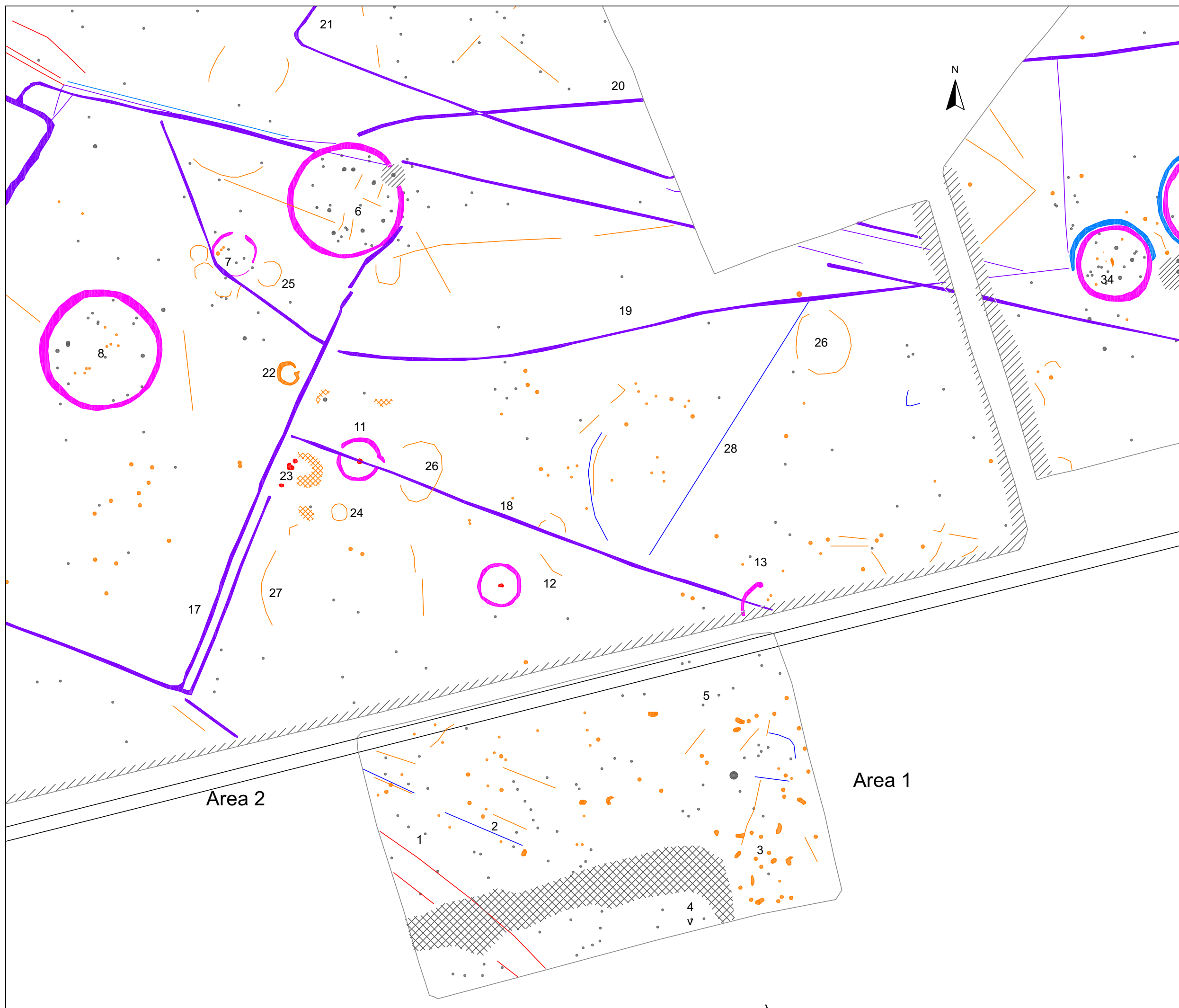
-  Positive linear anomaly - cut feature of archaeological potential
-  Positive curvilinear anomaly - ring ditch
-  Positive curvilinear/rectilinear anomaly - enclosure ditch
-  Negative curvilinear/linear anomaly - bank
-  Positive linear anomaly - possible ditch-like feature
-  Negative linear anomaly - material of low magnetic susceptibility
-  Discrete positive response - cut feature of archaeological potential
-  Discrete positive response - possible pit-like feature
-  Positive anomaly - magnetically enhanced material
-  Magnetic debris - spread of magnetically thermoremanent/ferrous material
-  Magnetic disturbance from ferrous material
-  Strong dipolar anomaly - ferrous object

SCALE 1:1250



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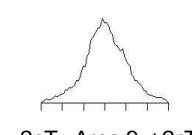
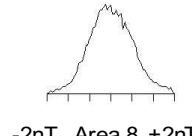
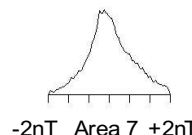
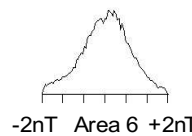
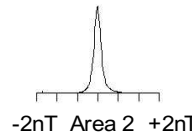
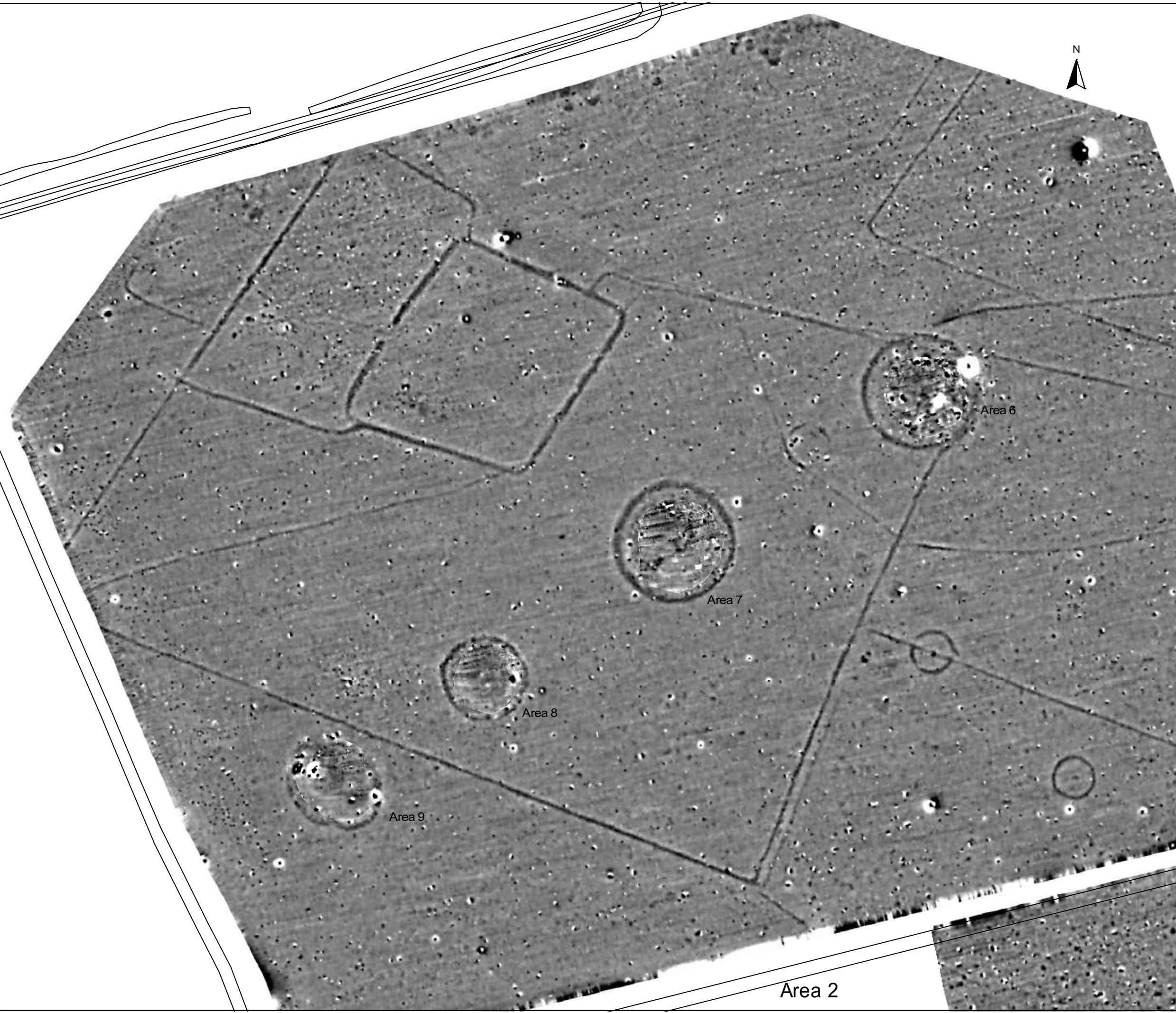
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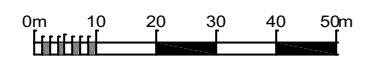


**Geophysical Survey  
Baltic Farm  
Bishops Cannings  
Wiltshire**

**Greyscale plot of minimally  
processed magnetometer data -  
Area 2 west**



SCALE 1:1250



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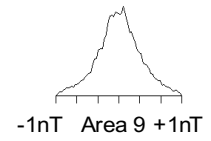
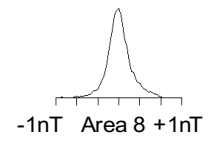
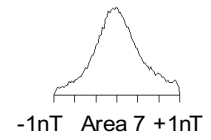
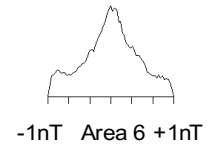
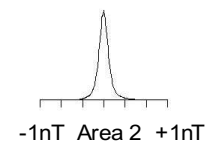
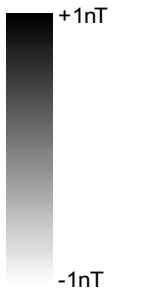
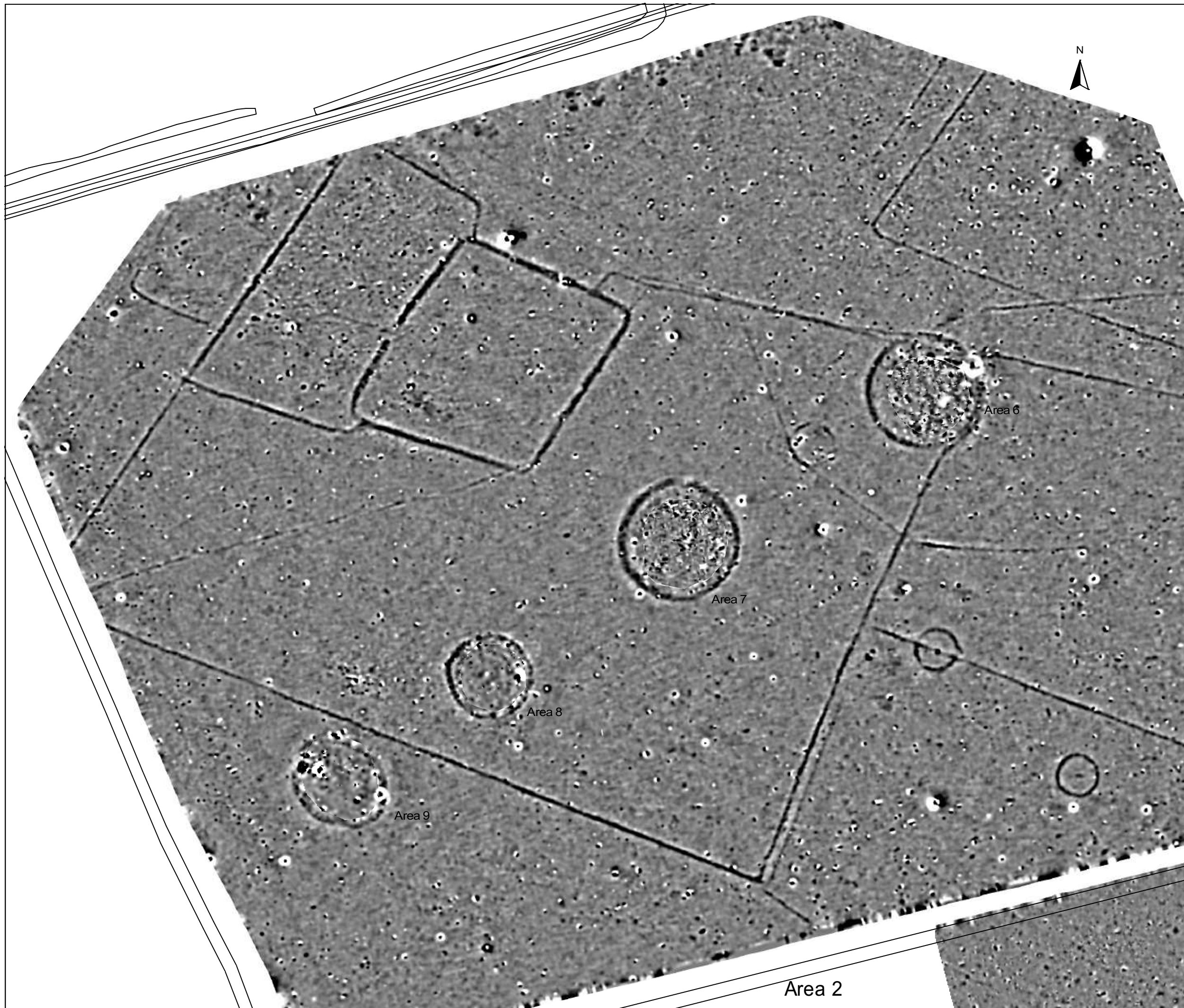
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Area 2

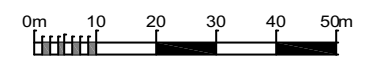


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Wiltshire**

**Greyscale plot of filtered  
magnetometer data -  
Area 2 west**



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Area 2

FIG 10

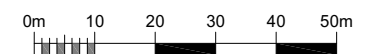


**Geophysical Survey  
Baltic Farm  
Bishops Cannings  
Wiltshire**

**Abstraction and interpretation of  
magnetic anomalies -  
Area 2 west**

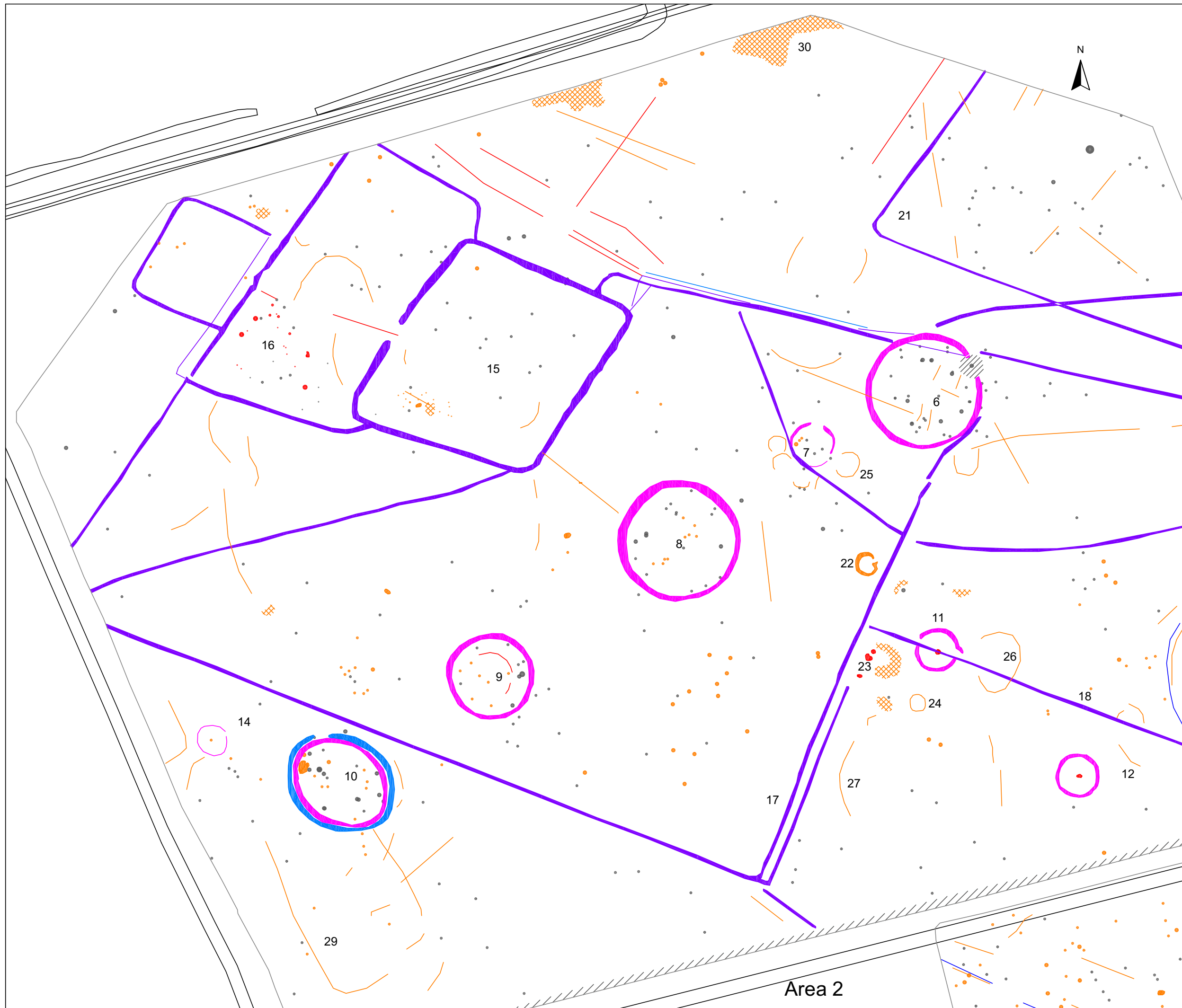
-  Positive linear anomaly - cut feature of archaeological potential
-  Positive curvilinear anomaly - ring ditch
-  Positive curvilinear/rectilinear anomaly - enclosure ditch
-  Negative curvilinear/linear anomaly - bank
-  Positive linear anomaly - possible ditch-like feature
-  Negative linear anomaly - material of low magnetic susceptibility
-  Discrete positive response - cut feature of archaeological potential
-  Discrete positive response - possible pit-like feature
-  Positive anomaly - magnetically enhanced material
-  Magnetic disturbance from ferrous material
-  Strong dipolar anomaly - ferrous object

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Area 2



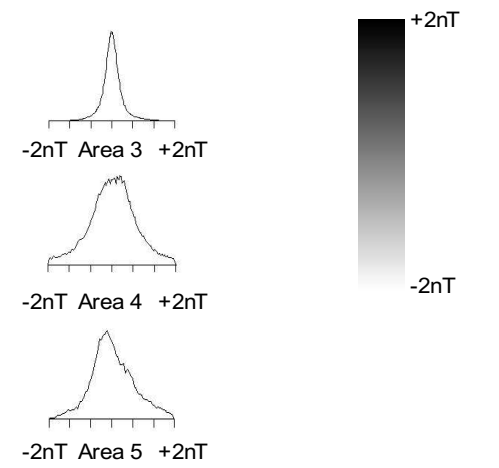
**Geophysical Survey  
Baltic Farm  
Bishops Cannings  
Wiltshire**

**Greyscale plot of minimally  
processed magnetometer data -  
Area 3**

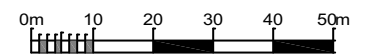
Area 3

Area 4

Area 5



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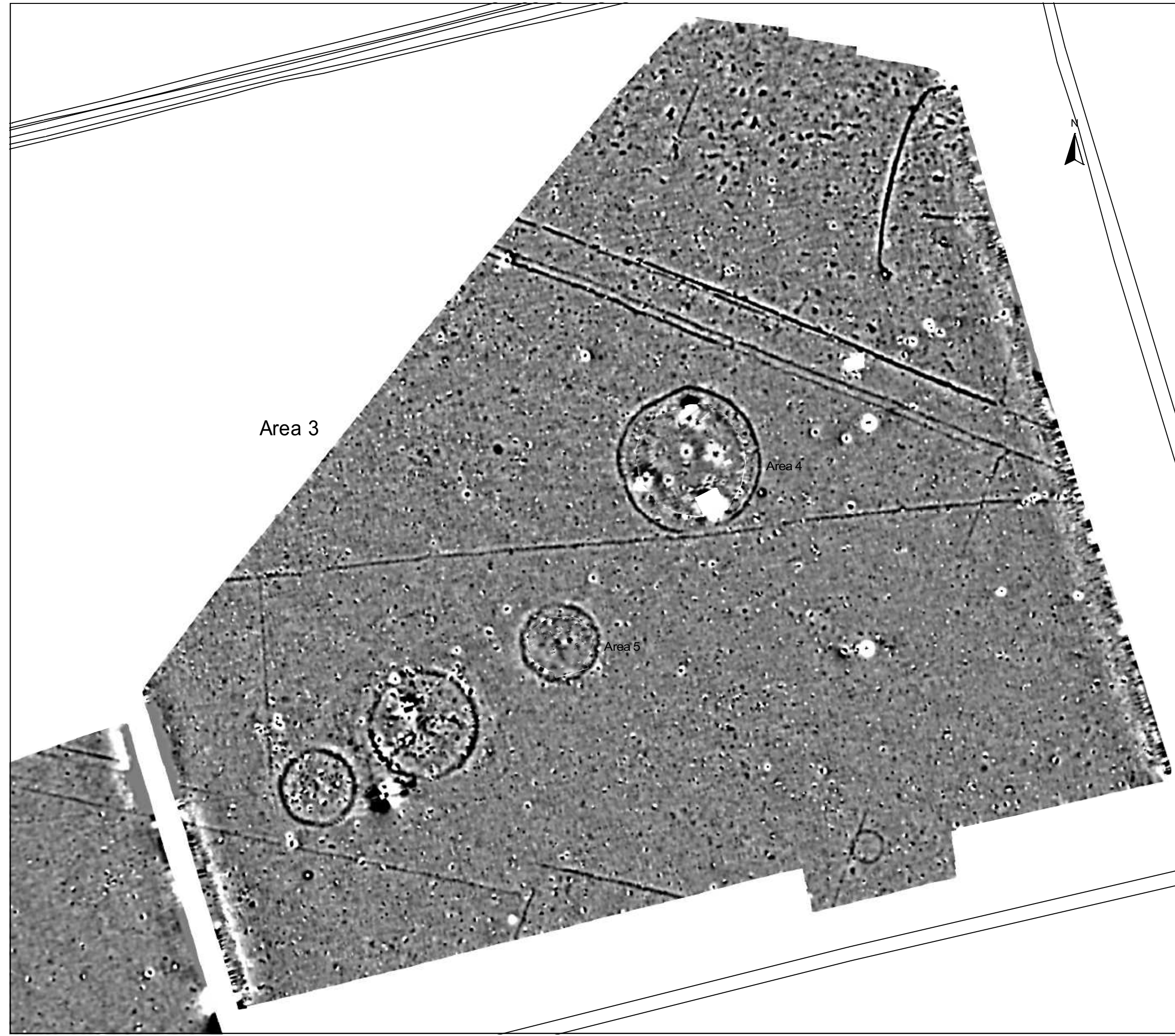
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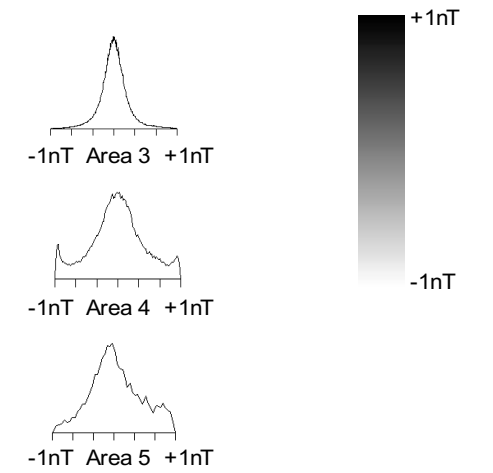
**Greyscale plot of filtered  
magnetometer data - Area 3**



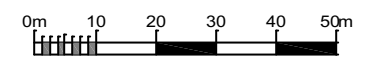
Area 3

Area 4

Area 5



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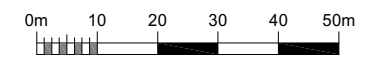
FIG 13

**Geophysical Survey  
Baltic Farm  
Bishops Cannings  
Wiltshire**

**Abstraction and interpretation of  
magnetic anomalies - Area 3**

-  Positive linear anomaly - cut feature of archaeological potential
-  Positive curvilinear anomaly - ring ditch
-  Positive curvilinear/rectilinear anomaly - enclosure ditch
-  Negative curvilinear/linear anomaly - bank
-  Positive linear anomaly - possible ditch-like feature
-  Discrete positive response - cut feature of archaeological potential
-  Discrete positive response - possible pit-like feature
-  Magnetic disturbance from ferrous material
-  Strong dipolar anomaly - ferrous object

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FIG 14

