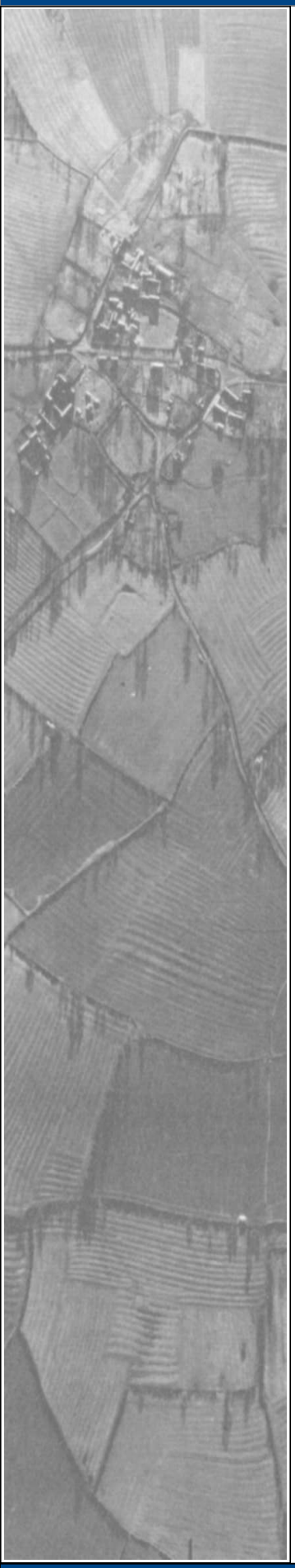

Land at Sheepdrove Farm
East Garston
West Berkshire

MAGNETOMETER AND
GROUND PENETRATING RADAR SURVEY REPORT

for

Mr Bob Brewer

Kerry Donaldson & David Sabin

October 2022

Ref. no. J933

ARCHAEOLOGICAL SURVEYS LTD

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Mr Bob Brewer

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

Survey dates – 14th, 15th, 16th & 20th September 2022
Ordnance Survey Grid Reference – **SU 37110 80630**

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It is a Registered Organisation with the Chartered Institute for Archaeologists.

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SUMMARY

A geophysical survey was carried out within two areas of land at Sheepdrove Farm on the Lambourn Downs, West Berkshire, by Archaeological Surveys Ltd. Aerial photographs have revealed enclosures and pits associated with a possible late prehistoric settlement site on Washmore Hill as well as a ring ditch, likely to be associated with a barrow, a square enclosure, a field system and an Iron Age banjo enclosure to the north. Detailed magnetometry was carried out over a total of 26ha within two fields and confirmed the presence of the archaeological features. The results show a number of D-shaped, pit-filled enclosures in the southern part of the site, surrounded by an irregularly shaped enclosure, and situated on a ridge of land between two shallow dry combes and also between two long linear boundaries associated with a regularly spaced field system. To the north is the banjo enclosure and this also appears to be contained within the former field system. A square enclosure to the east was targeted with ground penetrating radar (GPR) which confirmed the ditch but also possibly some responses within the centre of the enclosure, although it is not clear if they relate to archaeological features or to the underlying geology. A rectilinear ditch within the main settlement site was also targeted with GPR, but the responses were generally weak and indistinct.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Bob Brewer to undertake a magnetometer survey over approximately 26ha on land at Sheepdrove Farm, near Lambourn but within the parish of East Garston in West Berkshire. A number of archaeological features have been identified from aerial photographs and the client commissioned the survey in order to further his research and gain a fuller understanding of the archaeological features within the site. Two small areas were then targeted using ground penetrating radar (GPR) over potential Roman features.

1.2 Survey objectives and techniques

1.2.1 The objective of the survey was to use magnetometry to locate geophysical anomalies in order to assess the archaeological features within the site. Two smaller areas were targeted with GPR to assess if there were potential Romano-British structural remains within the site. The methodology is considered an efficient and effective approach to archaeological prospection.

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

predetermine.

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

1.3.1 The survey and report follow the recommendations set out by: European Archaeological Council (2015) *Guidelines for the Use of Geophysics in Archaeology;* Institute for Archaeologists (2002) *The use of Geophysical Techniques in Archaeological Evaluations.* The work has been carried out to the Chartered Institute for Archaeologists (2014) *Standard and Guidance for Archaeological Geophysical Survey.*

1.3.2 Archaeological Surveys Ltd carries out ground penetrating radar surveys under a Wireless Telegraphy Act licence from Ofcom (No. 078907/01). It is operated in accordance with Ofcom regulations (OfW 350 Requirements and Guidance Notes for Ground Probing Radar).

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

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

1.4 Site location, description and survey conditions

1.4.1 The site is located at Sheepdrove Farm on the Lambourn Downs in West Berkshire. It is situated 4km north east of Lambourn, 1.7km south west of Fawley and 3.6km north East Garston which is also the parish in which the site is located. It is centred on Ordnance Survey National Grid Reference (OS NGR) SU 37110 80630, see Figs 01 and 02.

1.4.2 The magnetometry survey covers approximately 26ha within two fields. Area 1 covers approximately 20ha and contained grass and clover at the time of survey. The field generally slopes down towards the north east from around 205m AODN near the south western corner to 175m AODN near the north eastern corner. It contains two shallow dry combes, the northerly one trends east south east to west north west and is at its deepest in the central northern part of the field. The more southerly combe trends south west to north east and is deepest within the central part of the field. Field boundaries are post and wire fencing and there is an inner section of fencing running parallel to the northern boundary and separated from it by approximately 20m. Survey was

carried out within this strip of land but avoid a fenced off area containing manure at the eastern end of the field.

1.4.3 Only 6ha of Area 2 was surveyed within the field to the north of Area 1 and separated from it by a metalled track. The survey within Area 2 primarily targeting a banjo enclosure, known from aerial photographs within the south eastern part of the field, with a slightly enlarged area also surveyed to the north covering potential crop marks of a feature extending north of the enclosure and ancient field boundary banks and other low earthworks. The area had been roughly cultivated prior to the survey which proved difficult to traverse in places. The general trend is land falling to the east from approximately 195m AODN to 170m AODN. The western part of the area appears to contain a low knoll when viewed from the south and the banjo enclosure was known to be slightly below this on the east facing slope.

Plate 1: Area 1 looking NW towards Area 2

1.4.4 The ground conditions across the site were generally considered to be favourable for the collection of magnetometry data within Area 1 but rather poor in Area 2 due to roughly cultivated soil. Weather conditions during the survey were mainly fine and sunny.

1.5 Site history and archaeological potential

1.5.1 The site contains a number of archaeological features recorded from aerial photos. These include a late prehistoric settlement at Washmore Hill which has a number of enclosures with associated pits, field systems, a Bronze Age round barrow ring ditch and a square enclosure within the larger field (Area 1) and an Iron Age banjo enclosure within the field to the north (Area 2). These have been mapped as part of the Lambourn Downs NMP (Small, 2002) and

the banjo enclosure has also been subject to previous geophysical survey which outlined that it was 38.5m in diameter at its widest point with a 7m wide entrance, and it contained a number of pits within the interior as well as outside (Levick, 2015).

1.5.2 The surface conditions within the site were generally poor for the observation of cultural material during the course of the survey. Although no significant scatters were noted a number of small sarsen stones (<0.4m) were noted in the general area of the banjo enclosure.

1.5.3 The location of the numerous archaeological features identified through aerial photographs and previous geophysical survey indicate that there is very high potential to locate these and possibly other previously unrecorded features through the geophysical survey.

1.6 Geology and soils

1.6.1 The underlying geology is from the Seaford Chalk Formation with overlying superficial Head deposits within the dry combes of Area 1 and the eastern side of Area 2 (BGS, 2022).

1.6.2 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. The southern part of Area 1 contains soils from the Hornbeam 2 association which is a stagnogleyic paleo-argillic brown earth and consists of a deep, fine, loamy over clayey soil (Soil Survey of England and Wales, 1983).

1.6.3 Magnetometry carried out over similar geology and soil has produced good results. The site is, therefore, considered suitable for magnetic survey.

2 METHODOLOGY

2.1 Technical synopsis- Magnetometry

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

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

2.1.3 Magnetic thermoremnance can occur when ferrous minerals have been heated to

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

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

2.2 Technical synopsis- GPR

2.2.1 Ground penetrating radar systems transmit an electromagnetic wave into the ground and record the time delay and amplitude of reflections from buried features. Reflections occur from changes in conductivity or dielectric permittivity.

2.2.2 Electromagnetic waves are increasingly attenuated as frequency increases and, therefore, lower frequencies generally provide greater penetration into the subsurface. However, the longer wavelengths associated with lower frequencies reduce the resolution of buried features. Typical frequencies chosen for archaeological prospection are around 500 and 200 MHz.

2.3 Equipment configuration, data collection and survey detail - magnetometry

2.3.1 The detailed magnetic survey was carried out using a SENSYS MAGNETO® MX V3 6 channel cart-based system. The instrument has 6 fluxgate gradiometers (FGM650) spaced 0.5m apart with readings recorded at 100Hz using an ATV-towed array. Each sensor is not zeroed in the field as the vertical axis alignment is precisely fixed leaving sensor offsets that are removed during data processing. The fixing of the vertical alignment ensures the sensors are not unduly influenced by localised magnetic fields and that the vertical component of a magnetic anomaly is measured. The gradiometers have a measurement range of ±8000nT, although the recorded range is ±3000nT, and resolution is around 0.1nT. They are linked to a Leica GS10 RTK GNSS with data recorded by SENSYS MonMX software on a rugged notebook computer system.

2.3.2 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.

2.3.3 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).

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

2.4 Equipment configuration, data collection and survey detail - GPR

2.4.1 Ground penetrating radar data were acquired using an Utsi Electronics Groundvue 3A system running with a 400MHz shielded antenna. The system utilises a wheeled encoder system on a small cart. A dielectric constant of 10 was used in the field to set up the instrument and view data. The value is for display purposes only and does not affect the recorded data.

2.4.2 A value of 60ns (nanoseconds) was chosen for the time sweep (two way GPR signal travel time) in order to balance potential depth of penetration and resolution.

2.4.3 Data were collected from scans recorded at 0.0295m along traverses separated by 0.5m. The data captured along each traverse were logged to an internal disk drive to allow further processing and analysis.

2.4.4 Ground penetrating radar data were collected along traverses originating from a baseline for the two targeted areas, Area 1a and Area 1b, see Fig 15. The start position for each traverse along the baseline from the start point or origin was measured using a hand tape. A parallel tape was used as a guide to ensure that traverses were surveyed perpendicular to the baseline and parallel to adjacent traverses. The grids were 30m by 30m with the first traverse starting at 0.5m along the baseline heading east in a zig-zag method every 0.5m finishing on the 30m line.

2.4.5 The survey baselines were set out using a Leica GS10 RTK GNSS. The GNSS is used in conjunction with Leica's Smartnet service, where positional corrections are sent via a mobile telephone link.

2.5 Data processing and presentation- magnetometry

2.5.1 Magnetic data collected by the MAGNETO® MX V3 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.

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

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

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

2.5.5 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.

2.5.6 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 data, minimal processing is considered by the manufacturer to be data that which 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 the very high density of data collection. In addition, traceplots cannot be meaningfully plotted against base mapping and in areas of complexity traces may be lost or highly confused. Traceplots may be used to demonstrate characteristic magnetic profiles across discrete features where it is considered beneficial.

2.5.7 The raster images are combined with base mapping using ProgeCAD Professional 2021, creating DWG (2018) file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. The CAD plots are effectively georeferenced facilitating relocation of features using GNSS, resection method, etc.

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

2.5.9 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.

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

2.6 Data processing and presentation- GPR

2.6.1 Ground penetrating radar data are analysed using REFLEX v8 software. Each traverse is analysed as an individual profile to allow a manual assessment of anomalies. In addition, profiles across each survey area are combined and processed in order to create time slices showing the variation in reflector amplitude at various depths. The following processing has been carried out on GPR data captured during this survey:

- background removal - improves the appearance of the data by removal of strong horizontal bands,
- gain - increased with time in order to amplify weaker reflections from deeper features,
- bandpass filtering - lowers noise by the removal of energy below 200MHz and above 800MHz.

2.6.2 Time slices were analysed using both absolute and envelope reflectivity strengths. The latter use a square root function of the energy at an instant in time and is generally the preferred option; however, occasionally the absolute values provide more detailed anomalies.

2.6.3 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. Approximate depth to anomalies is added to the abstraction and interpretation

plot.

2.6.4 The main form of data display prepared for this report is the colour scale time slice plot derived from Reflex as TIF files. Generally blue shades indicate very low amplitude reflections with green and yellow relating to mid range reflections and red indicative of high amplitude reflections. GPR profiles may be used to highlight specific features and their associated reflections.

2.6.5 Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing.

2.6.6 The raster images are combined with base mapping using ProgeCAD Professional 2021 creating DWG file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. A digital archive, including raster images, is produced with this report, see Appendix D below.

3 RESULTS

3.1 General assessment of survey results - magnetometry

3.1.1 The detailed magnetic survey was carried out over a total of two survey areas covering approximately 26ha.

3.1.2 Magnetic anomalies located can be generally classified as positive and negative responses of archaeological potential, positive and negative, anomalies associated with land management, anomalies of an uncertain origin, anomalies with a natural origin, areas of magnetic debris and disturbance, strong discrete dipolar anomalies relating to ferrous objects and strong multiple dipolar linear anomalies relating to buried services or pipelines.

3.1.3 Anomalies located within each survey area have been numbered and are described in 3.5 and 3.6 below with subsequent discussion in Section 4.

3.2 General assessment of survey results - GPR

3.2.1 The GPR survey was carried out over a total of two survey areas covering approximately 1800m² in total.

3.2.2 The GPR data indicate discrete and complex anomalies; however, interpretation is limited by the weak and fragmented nature of anomalies and a lack of characteristic morphology.

3.2.3 An average GPR wave velocity of 0.07m/ns was calculated using hyperbola matching. There were very few clear hyperbola that could be used for the analysis but the velocity would be consistent with the damp soils over chalk geology.

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

3.3.1 Magnetic data are considered representative of the magnetic anomalies present within the site. There are no significant defects within the dataset. GPR data are also considered to be a useful representation of the subsurface within the two target areas with no significant defects.

3.3.2 The magnetic data appear to indicate useful magnetic contrast between the fill of former cut features and the surrounding subsoil and geology. There are a number of anomalies that appear as linear striations, discrete responses and slightly enhanced zones that relate to the underlying geology. These may well be caused by naturally formed features associated with mapped and unmapped superficial deposits, colluvium or small pockets of unmapped Clay-with-flints Formation. It may not be possible to confidently separate naturally formed anomalies to those with anthropogenic origin.

3.3.3 Weak parallel linear anomalies have been caused by former and current cultivation trends and slight sensor offsets associated with changes in the angle of slope across the site. Additional high pass filtering has effectively removed these anomalies; both filtered and unfiltered data are compared to ensure that no anomalies have been altered or removed.

3.3.4 GPR signals appear to have achieved good penetration within both target areas and maximum depth is likely to be approximately 2m. Antenna coupling is good due to short vegetation and the relatively smooth surfaces encountered.

3.3.5 Numerous reflections are visible within the data with sloping trends indicating deepening layers within the underlying geology. Some discrete, shallow features may relate to larger pieces of flint or sarsen within the soil.

3.4 Data interpretation

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

Interpretation category	Description and origin of anomalies
Anomalies with archaeological potential	Anomalies have the characteristics (mainly morphological) of a range of archaeological features such as pits, ring ditches, enclosures, etc. The category is used where there is a high level of confidence which may be due to additional supporting information where morphology is unclear or uncharacteristic.
Anomalies with an uncertain origin	The category applies to a range of anomalies where there is not enough evidence to confidently suggest an origin. Anomalies in this category may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered. Morphology may be unclear or uncharacteristic and there may be a lack of additional supporting information. Positive anomalies are indicative of magnetically enhanced soils that may form the fill of 'cut' features or may be produced by accumulation within layers or 'earthwork' features; soils subject to burning may also produce positive anomalies.

	Negative anomalies are produced by material of comparatively low magnetic susceptibility such as stone and subsoil.
Anomalies associated with magnetic debris	Magnetic debris often appears as areas containing many small dipolar anomalies that may range from weak to very strong in magnitude. They often occur where there has been dumping or ground make-up and are related to magnetically thermoremnant materials such as brick or tile or other small fragments of ferrous material. This type of response is occasionally associated with kilns, furnace structures, hearths and nail spreads from former wooden structures or rooves and may, therefore, be archaeologically significant. It is also possible that the response may be caused by natural material such as certain gravels and fragments of igneous or metamorphic rock. Strong discrete dipolar anomalies are responses to ferrous objects within the topsoil.
Anomalies with a modern origin	The magnetic response is often strong and dipolar indicative of ferrous material and may be associated with extant above surface features such as wire fencing, cables, pylons etc. Often a significant area around these features has a strong magnetic flux which may create magnetic disturbance; such disturbance can effectively obscure low magnitude anomalies if they are present. Fluxgate sensors may respond erratically adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction. Reflections clearly related to modern features such as services, inspection chambers etc.
Anomalies with a natural origin	Naturally formed magnetic anomalies are caused by localised variability in the magnetic susceptibility of soils, subsoils and other drift or solid geologies. Anomalies may be amorphous, linear or curvilinear and may appear 'fluvial' or discrete; the latter are almost impossible to distinguish from pit-like anomalies with an anthropogenic origin. Fluvial, glacial and periglacial processes may be responsible for their formation within drift material and subsoil. Igneous and metamorphic activity can lead to anomalies within more solid geology. Reflections caused by geological/periglacial/pedological features, tree roots, fluvial features etc.

Table 1: List and description of interpretation categories

3.5 List of magnetic anomalies - Area 1

Area centred on OS NGR 437100 180600, see Figs 06 – 11.

Anomalies of archaeological potential

(1) – A sub-rectilinear positive anomaly relates to an enclosure ditch in the western part of Area 1. It has external dimensions of 54.5m by 46m at its widest point, and it appears to be subdivided by an internal ditch. Internally there are also a number of discrete positive responses which relate to pits and an associated negative linear response which indicates an association with spreads of chalk or subsoil. A similar negative response can be seen on the northern and eastern sides of the enclosure, possibly indicating a response to an external bank.

(2) – An irregularly shaped enclosure is located 43m to the south east of enclosure (1). A number of pits are contained within it with several to the north. Although the southern extent lies beyond the limits of the survey area, a linear ditch can be seen extending towards the south western corner of enclosure (3). A linear group of pits extends along the southern side of this ditch and along the southern edge of anomaly (3).

(3) – A D-shaped enclosure appears to have a south east facing entrance and contains a number of discrete positive responses that appear to be associated pits.

(4) – A number of positive linear, rectilinear and sinuous anomalies relate to a large irregularly shaped enclosure surrounding smaller enclosures (2) and (3) with a

westwards extension towards enclosure (1).

(5) – Located 54m to the west of and facing the south east entrance to enclosure (3) are positive rectilinear anomalies that are a continuation of the irregular ditched feature (4). A number of pits are contained within; however, the centre of the enclosed space lies at the head of a dry valley which extends north eastwards and a number of natural, pit-like features are also located within the vicinity.

(6) – A fragmented positive curvilinear anomaly is situated towards the north eastern edge of anomaly (5). While it is weak and poorly defined, it appears to relate to a cut feature and its morphology could suggest a ring ditch associated with an Iron Age round house, but this is not certain.

(7) – Two parallel positive linear anomalies are located in the south western corner of Area 1. It is possible that they extend towards and are associated with former land boundary feature (9).

(8) – Located in the eastern part of Area 1 is a square enclosure ditch with external dimensions of 21m by 20m. The north western enclosure ditch is part of a longer linear boundary ditch (11), and there does not appear to be an entrance. A negative linear response can be seen internally and this could could relate to a former bank or spread of material from the ditch. Other discrete positive and negative responses can be seen internally and it is not clear if they are directly associated with the enclosure, although a negative response could relate to former structural remains.

(9 - 12) – The survey area contains a regular series of positive linear and broader positive and negative responses situated approximately 200m apart. The broad anomalies are responses to broad linear banks that relate to field system boundaries identified from aerial photographs of the Berkshire Downs and northwards into Oxfordshire. The magnetic response is usually weak and often there is no response, even when an extant bank is evident. The narrow, positive linear anomalies relate to cut, linear ditches situated 5-12m to the south east of the broad responses. Linear ditch (11) is contiguous with the northern edge of the square enclosure (8) and it appears that anomaly (9) is associated with or bounds the features associated with the banjo enclosure in Area 2 to the north.

(13) – A positive curvilinear anomaly situated in the central, southern part of Area 1 relates to a ring ditch with an external diameter of 21m. It appears to be a continuous ditch and is likely to relate to a Bronze Age round barrow. Linear anomalies appear to extend up to and possibly cut the ring ditch, but the superimposition is uncertain.

Anomalies with an uncertain origin

(14) – A positive curvilinear anomaly is located towards the south western corner of Area 1. A number of discrete positive responses are located close by. It is not clear if these relate to cut features, with archaeological potential, or if they are associated with naturally formed features.

(15) - A group of discrete positive anomalies are located to the west of enclosure (2). The morphology is generally amorphous and it is not possible to determine if they relate to a continuation of the series of pits located within and between enclosures (2) and (3) to the north east or if they relate to natural features.

(16) – Discrete pit-like anomalies are evident within and surrounding anomalies (1) to (5); however, it is not possible to determine if they relate to natural or anthropogenic features.

(17) – A linear group of four discrete anomalies are located to the south of linear ditch (11). It is not clear if they are naturally formed features or if they relate to a line of pits with archaeological potential.

(18) – An irregularly shaped positive response is locate within the confines of anomaly (4). The response could relate to magnetically enhanced material associated with settlement debris but a natural origin is also possible.

Anomalies with a natural origin

(19) – Two zones of magnetically variable responses relate to the colluvial fill and Head deposits of two shallow dry valleys that bisect Area 1.

(20 & 21) – The site contains a number of discrete positive responses (20) which relate to naturally formed pits within the underlying chalk geology. A number of linear anomalies (21) can be seen mainly in the south western corner of Area 1 and these are also a response to soil-filled natural features.

Anomalies associated with magnetic debris

(22) – A small patch of weakly magnetic debris is situated on the eastern side of linear anomaly (12) in the south eastern corner of Area 1. The response is not strong which would usually be associated with modern ferrous dumped material, but the origin of the material is uncertain.

Anomalies with a modern origin

(23) – A strong, multiple dipolar, linear anomaly extends across the north eastern corner of Area 1 and across the centre of Area 2. It relates to a buried service, probably a water pipe.

3.6 List of magnetic anomalies - Area 2

Area centred on OS NGR 436960 180790, see Figs 12 – 14.

Anomalies of archaeological potential

(24) – A positive curvilinear anomaly relates to a circular enclosure ditch associated

with a banjo enclosure. Negative curvilinear responses on the outer and also inner sides could relate to chalk material excavated from the ditch, possibly indicating an outer and inner bank, although they could relate to spreads of material. A large number of pits are located within the confines of the enclosure, but they are mainly arranged towards the periphery leaving the interior clear.

(25) – Discrete positive responses relate to linear groups of pits extending externally to the eastern and south western sides of the circular enclosure (24).

(26 & 27) – Two positive linear anomalies extend from the circular enclosure (24) to the south east (26) and south west then north west (27) but are not contiguous with it. They relate to the antennae ditches usually associated with banjo enclosures.

(28) – A fragmented linear ditch is located parallel with the north western part of anomaly (27) and appears to be associated. It may extend south eastwards towards former field system boundary ditch (9) located in Area 1 to the south.

(29) – A number of pits are located between the antennae ditches (26) and (27) and field system boundary ditch (9) situated in Area 1 to the south.

Anomalies with an uncertain origin

(30) – A positive curvilinear anomaly is located 14m to the north east of anomaly (26). Although its morphology could suggest a ring ditch type of feature, it is only partial and not fully defined.

(31) – A group of positive linear anomalies and a number of discrete positive responses are located to the east of the banjo enclosure. While it is possible that they relate to cut features, the linear anomalies could be associated with former agricultural activity, the pit-like features could be natural.

(32) – A number of positive linear and discrete anomalies are situated between the circular banjo enclosure (24) and the western antenna ditch (27). While it is possible that they relate to further cut features associated with the banjo enclosure, a natural origin is possible.

(33) – An amorphous magnetically enhanced area is located to the north west of the banjo enclosure. It is not clear if the source of the magnetic enhancement is through natural processes or if it relates to material associated with the banjo enclosure.

(34) – A large group of strongly magnetic discrete responses is located in the western part of Area 2. It is on a similar north west to south east orientation as the banjo enclosure and although it is possible that the magnetic enhancement could be derived through anthropogenic activity, naturally formed pits with an increased depth of topsoil could also have a similar response.

(35) – Broad positive and negative linear and curvilinear responses can be seen to the north east of the banjo enclosure. Broad linear boundary feature (37) appears to extend towards, but not beyond, the anomalies and this type of response is similar

to those associated with former broad linear boundaries, although they are more curvilinear and complex compared to the regularly spaced linear boundaries. Field observations during the survey indicated possible low earthworks in this part of the field.

Anomalies associated with land management

(36) – A broad, positive and negative linear anomaly is parallel with and 200m, 400m and 600m north west of linear boundary features (9-12) seen within Area 1 to the south. It relates to a further broad boundary associated with the north east to south west aligned field system. It is associated with a low earthen bank.

(37) – A broad positive and negative linear anomaly extends towards and joins anomaly (36) and relates to a linear boundary orthogonal to the main trend of the field system.

Anomalies with a modern origin

(38) – Two strong, multiple dipolar linear anomalies relate to buried services.

3.7 List of GPR anomalies - Area 1a

Area centred on OS NGR 437305 180641, see Figs 15 & 16.

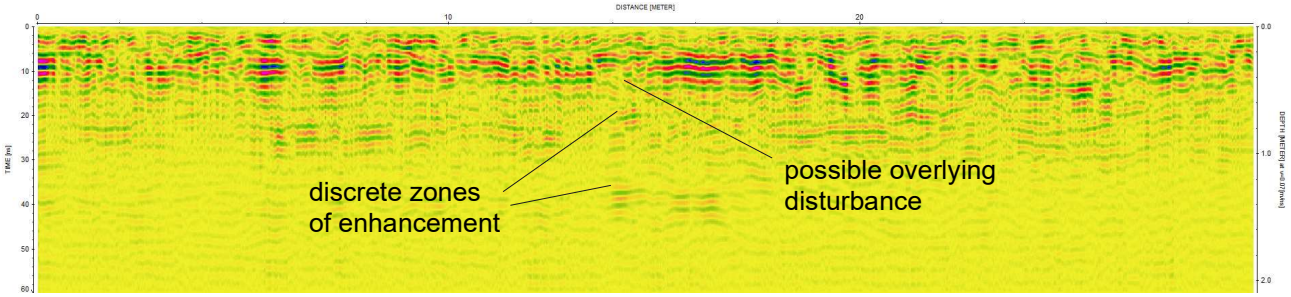
Anomalies of archaeological potential

(39) – A mainly low amplitude or null rectilinear anomaly corresponds with the square enclosure ditch (8) seen within the magnetometry results and corresponding to crop marks. The dimensions are broadly similar at approximately 21m wide, and the ditch appears continuous with no obvious entrances. The feature is present within the data to approximately 45ns equating to a depth of around 1.6m. The initial response appears briefly to be high amplitude at approximately 0.3m – 0.4m probably the base of the current cultivated topsoil. This shallow high amplitude layer (approximately 0.2m thick) may represent an accumulation of flint through natural processes or could be an upper ditch fill of archaeological significance. Narrow high amplitude reflections have also been caused by the edges of the ditch cut and these are visible from about 0.4m to 0.6m. The low amplitude or null linear zones representing the major bulk of the ditch infer a comparatively fine, damp soil fill containing no significant stones etc. and probably resulting from topsoil slowly infilling the feature.

Anomalies with an uncertain origin

(40) – Located in the centre of the square enclosure is a discrete area of high amplitude reflections. Although it is also associated with a zone of reflections caused by the underlying geology and/or subsoil, the response is notably stronger

within a discrete zone which may suggest a possible feature in the centre of the enclosure that is enhancing the reflections from the geological/pedological layers. The first layer showing enhancement occurs at about 0.7m depth with a second layer of enhancement at about 1.3m. There is uncertainty as to the processes involved and it may be that the GPR antenna has passed over thinner vegetation on the surface which has produced a discrete area of superior ground coupling; however, the central position within the enclosure is a factor in highlighting the potential of the GPR responses. Profile 1 below indicates the corresponding reflections and may also indicate a discrete area of disturbance at around 0.4m – 0.5m not visible in the time slices. There is no clear corresponding magnetic anomaly.



Profile 1: File LB031 showing discrete enhancement in centre of enclosure

(41) – A low amplitude or null linear anomaly appears to relate to a narrow cut feature extending from the south western edge of the enclosure towards the centre. The feature is visible in time slices from approximately 0.9m in depth where there is a brief high amplitude reflection probably from the edge of the cut on the northern side, the null response extends to about 1.2m. The depth of this feature and the clear cut through strong reflections caused by a geological/pedological layer may infer an archaeological origin. However, the feature is weak and it is possible that it may be natural in origin. It does not appear at shallow depths, which could imply that it is related to cultivation, and its orientation is reflected by the enclosure sides. There is potential that it could be associated with anomaly (40).

Anomalies with a natural origin

(42) – Much of the survey area contains strong reflectors that relate to bands within the underlying geology or subsoil. There is a general trend for these layers to deepen from north to south. The associated reflections are a mixture of planar and complex responses, and it is possible that these mask or confuse more significant features.

3.8 List of GPR anomalies - Area 1b

Area centred on OS NGR 437119 180528, see Figs 15 & 17.

Anomalies of archaeological potential

(43) – Low amplitude linear anomalies appear to relate to the boundary ditch associated with magnetic anomaly (5). The response is generally unclear but appears around a depth of 0.4m.

(44) – A high amplitude response corresponds to a pit or magnetically enhanced feature within the confines of the enclosure (5). The reflections occur at a depth of approximately 0.35m, probably the base of the plough soil, and extends to about 0.75m.

Anomalies with an uncertain origin

(45 & 46) – A high (45) and low amplitude (46) linear/rectilinear response could relate to a feature associated with rectilinear ditch (43). However, there is no clearly comparable response in the magnetic data and their origin is uncertain. Anomaly (45) occurs from about 0.35m to 0.6m in depth, anomaly (46) is poorly defined at around 0.4m.

(47) – The survey area contains a number of high amplitude linear, curvilinear and rectilinear anomalies. They do not demonstrate a clearly definable morphology and their origin is uncertain. Their depths are generally from the base of the plough soil at about 0.35m to around 0.6m where they fade rapidly.

(48) – A circular high amplitude planar response is located towards the south western corner of the survey area. The origin of the anomaly is uncertain and it is poorly defined occurring at a depth of approximately 0.4m to 0.6m.

4 DISCUSSION

4.1.1 The site contains a large number of archaeological features formerly identified through aerial photography and mapped as part of the Lambourn Downs NMP (Small, 2002). The results of the survey have confirmed the presence of these as well as a number of additional features and further detail.

4.1.2 The southern part of the site contains a number of pit-filled enclosures that cover an area of over 3.3ha in total (1-5). Their morphology would suggest a late prehistoric or possibly Romano-British origin. These include a D-shaped and a rectilinear enclosure that are surrounded by a sinuous, irregular enclosure. The site includes a large number of pits and/or areas of burning, but except for one possible curvilinear response (6), there is no clear sign of any structural remains or anomalies associated with round houses. A small area of GPR targeted over the south eastern corner of the rectilinear enclosure (5) appears to have had some response to the linear ditch, but generally the reflections are inconclusive.

4.1.3 Situated approximately 90m to the north of the irregular enclosure (4) are a group of anomalies associated with a banjo enclosure (24-29). This has been subject to

previous geophysical survey (Levick, 2015), mapped as part of the Lambourn Downs NMP (Small, 2002) and studied as part of a wider group of banjo enclosures on the Lambourn Downs (Winton, 2003). The present survey has added to the detail of the enclosure which can be seen as a positive curvilinear ditch with an outer diameter of between 40m and 46m and it has a 6.4m south east facing entrance. An external negative curvilinear anomaly seen mainly on the northern and eastern sides could relate to an outer bank or material with low magnetic susceptibility in the upper fill of the ditch.

4.1.4 A large number of discrete positive responses (at least 50) are located within the confines of the circular enclosure but mainly towards the outer edge, leaving the interior clear, although a large pit is situated in the centre of the entrance to the enclosure. Negative discrete and curvilinear responses also appear to be associated, possibly relating to the chalk material excavated from the pits. There are a further 23 pits in a linear group around the enclosure to the east and 18 to the west (25). There are also a number of pits (29) to the south of the antennae ditches (26) & (27). The large number of pits would suggest an association with habitation or at least storage, rather than animal husbandry, although there is no evidence for any ring ditches associated with round houses.

4.1.5 The banjo enclosure does not have an elongated funnel-shaped entrance, instead the two antennae ditches are separated from the main circular enclosure with a 3-3.5m gap. The eastern antenna ditch (26) then extends for approximately 43m towards the southern boundary of Area 2, and it cannot be clearly seen in the data to the south. The western antenna ditch (27) is an L-shape, extending approximately 43m to the south west, then turning to the north west for another 40m where it ends abruptly. Situated 10m to the south west, and parallel with it, is another positive linear anomaly (28) which appears to extend southwards into Area 1 to join a linear field boundary (9) and which may be associated with the banjo enclosure; it is possible that the banjo enclosure may have utilised the boundary to the south. Further parallel boundaries have been located to the north and south and they are separated by approximately 200m and are oriented north east to south west. They can be seen on LiDAR imagery as low, broad banks, the magnetic response, however, is generally variable and weak, sometimes to the bank, but generally to a narrow linear ditch that is situated to the south east of the bank. These linear ditches appear to be a later recut. The archaeological features are generally all situated between and abutting the linear boundaries.

4.1.6 Within the eastern part of Area 1 there is a square enclosure, also previously identified from aerial photographs. This is seen as a continuous ditch approximately 1.5m wide and forming an enclosure approximately 21m across both as a positive anomaly within the magnetometry data (8) and also mainly as a null response (39) in the GPR. Internally there are few clearly defined features, most responses in the GPR relate to the underlying geology which appears as dipping layers in the chalk. This could suggest a band of flint, a zone with higher moisture content or a junction between layers in the chalk. There is, however, a high amplitude response in the centre of the enclosure, that does appear to be associated with the underlying geology, but could relate to an associated or overlying feature in the centre of the square enclosure. The north western side of the enclosure coincides with a linear

boundary ditch (11), part of a large system of long, linear boundaries that cross the Downs. The linear ditch is parallel with and 10m south east of a broad response to a field system boundary (10) and suggests that the ditch is a later re-cut. Although the GPR survey has only crossed a small section of this boundary ditch as it extends beyond the north and western corners of the square enclosure, there is no clear evidence for it within the data suggesting it is a much smaller feature and/or contains a dissimilar fill that does not produce a null response, unlike the enclosure ditch itself.

5 CONCLUSION

5.1.1 The results of the survey have confirmed the presence of a number of archaeological features previously identified from aerial photography. These include a former field system, a number of irregularly shaped enclosures, a ring ditch likely to relate to a Bronze Age round barrow, a square enclosure which may relate to a Roman ritual feature and an Iron Age banjo enclosure.

5.1.2 The results of the survey have produced evidence for at least one further enclosure and defined a large number of associated pits. A series of regularly spaced linear boundary features cross the site and they appear to have a direct association with the other archaeological features. There is evidence that some of the linear boundaries have associated recuts to the south east, one of which defines the north western side of a square enclosure in the eastern part of the site that could relate to a Roman ritual feature.

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

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

Appendix B – data processing notes

Clipping

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

High Pass Filter

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

Zero Median/Mean Traverse

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

conditions and results in improperly aligned fluxgate sensors and/or electronic adjustment values.

Appendix C – survey and data information

Area 1 minimally processed data
Filename: J933-mag-Area1-proc.xcp
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 436743.85, 180787.39 m
Southeast corner: 437516.85, 180390.64 m
Collection Method: Randomised
Sensors: 6
Dummy Value: 32702
Dimensions
Survey Size (meters): 773 m x 397 m
X&Y Interval: 0.25 m
Source GPS Points: Active: 10369692, Recorded: 10369696
Stats
Max: 3.00
Min: -3.00
Std Dev: 1.00
Mean: -0.03
Median: -0.07
Composite Area: 30.669 ha
Surveyed Area: 19.646 ha
PROGRAM
Name: TerraSurveyorPre
Version: 3.0.36.17
1 Base Layer.
2 Unit Conversion Layer (UTM to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT

Area 1 filtered data
Filename: J933-mag-Area1-proc-hpf.xcp
Max: 3.00
Min: -3.00
Std Dev: 1.00
Mean: -0.03
Median: -0.03
1 Base Layer.
2 Unit Conversion Layer (UTM to OSGB36).
3 DeStripe Median Traverse:
4 High pass Uniform (median) filter: Window dia: 800
4 Clip from -3.00 to 3.00 nT

Area 2 minimally processed data
Filename: J933-mag-Area2-proc.xcp
Northwest corner: 436785.22, 180985.24 m
Southeast corner: 437155.42, 180660.24m
Dimensions
Survey Size (meters): 370 m x 325 m
X&Y Interval: 0.2 m
Source GPS Points: Active: 5353848, Recorded: 5353854
Stats
Max: 3.00
Min: -3.00
Std Dev: 1.13
Mean: 0.03
Median: 0.00
Composite Area: 12.032 ha
Surveyed Area: 6.0759 ha

Area 2 filtered data
Area 1 filtered data
Filename: J933-mag-Area2-proc-hpf.xcp
Max: 3.00
Min: -3.00
Std Dev: 1.00
Mean: -0.03
Median: -0.03
1 Base Layer.
2 Unit Conversion Layer (UTM to OSGB36).
3 DeStripe Median Traverse:
4 High pass Uniform (median) filter: Window dia: 800
4 Clip from -3.00 to 3.00 nT

Appendix D – digital archive

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

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

Archive contents:

File type	Naming scheme	Description
Data	J933-mag-**[area number/name]**.asc J933-mag-**[area number/name]**.xcp J933-mag-**[area number/name]**-proc.xcp	Raw data as ASCII CSV TerraSurveyor raw data TerraSurveyor minimally processed data
Graphics	J933-mag-**[area number/name]**-proc.tif	Image in TIF format
Drawing	J933-**[version number]**.dwg	CAD file in 2010 dwg format
Report	J933 report.odt	Report text in Open Office odt format

Table 2: Archive metadata

Appendix E – CAD layers for abstraction and interpretation plots

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

Report sub-heading and associated CAD layer names	Colour with RGB index	Layer content
Anomalies with archaeological potential		

AS-ABST MAG POS DISCRETE ARCHAEOLOGY	Red 255,0,0	Solid donut, point or polygon (solid)
AS-ABST MAG POS ARCHAEOLOGY	Red 255,0,0	Polygon (cross hatched ANSI37)
AS-ABST MAG POS LINEAR ARCHAEOLOGY	Red 255,0,0	Polyline or polygon (solid)
AS-ABST MAG POS CURVILINEAR RING DITCH	Magenta 255,0,255	Polyline or polygon (solid)
AS-ABST MAG POS RECTILINEAR ENCLOSURE	51,0,204	Line, polyline or polygon (solid)
AS-ABST MAG NEG LINEAR ARCHAEOLOGY	127,0,255	Line, polyline or polygon (solid)
AS-ABST MAG POS CURVILINEAR ENCLOSURE DITCH	127,0,255	Line, polyline or polygon (solid)
AS-ABST GPR LINEAR ARCHAEOLOGY	255,0,63	Line, polyline or polygon (solid)
Anomalies with an uncertain origin		
AS-ABST MAG POS LINEAR UNCERTAIN	255,127,0	Line, polyline or polygon (solid)
AS-ABST MAG NEG LINEAR UNCERTAIN	Blue 0,0,255	Line, polyline or polygon (solid)
AS-ABST MAG POS DISCRETE UNCERTAIN	255,127,0	Solid donut, point or polygon (solid)
AS-ABST MAG NEG DISCRETE UNCERTAIN	Blue 0,0,255	Solid donut, point or polygon (solid)
AS-ABST MAG POS UNCERTAIN	255,127,0	Polygon (cross hatched ANSI37)
AS-ABST MAG NEG UNCERTAIN	Blue 0,0,255	Polygon (cross hatched ANSI37)
AS-ABST GPR HIGH AREA UNCERTAIN	204,102,0	Polygon (cross hatched ANSI37)
AS-ABST GPR LOW LINEAR UNCERTAIN	0,0,255	Line, polyline or polygon (solid)
Anomalies relating to land management		
AS-ABST MAG BOUNDARY	127,0,0	Line, polyline or polygon (solid or cross hatched ANSI37)
Anomalies associated with magnetic debris		
AS-ABST MAG DEBRIS	132, 132, 132	Polygon (cross hatched ANSI37)
AS-ABST MAG STRONG DIPOLAR	132, 132, 132	Solid donut, point or polygon (solid)
Anomalies with a modern origin		
AS-ABST MAG DISTURBANCE	132, 132, 132	Polygon (hatched ANSI31)
AS-ABST MAG SERVICE	132, 132, 132	Line or polyline
Anomalies with a natural origin		
AS-ABST MAG NATURAL FEATURES	204,178,102	Polygon (stipple hatched)
AS-ABST GPR NATURAL FEATURES	255,255,0	Polygon (cross hatched ANSI37)

Table 3: CAD layering

Appendix F – copyright and intellectual property

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Specialist Geophysical Surveyors

Geophysical Survey
Land at Sheepdrove Farm
East Garston
West Berkshire

Map of survey area

Survey location

Site centred on OS NGR
SU 37110 80630

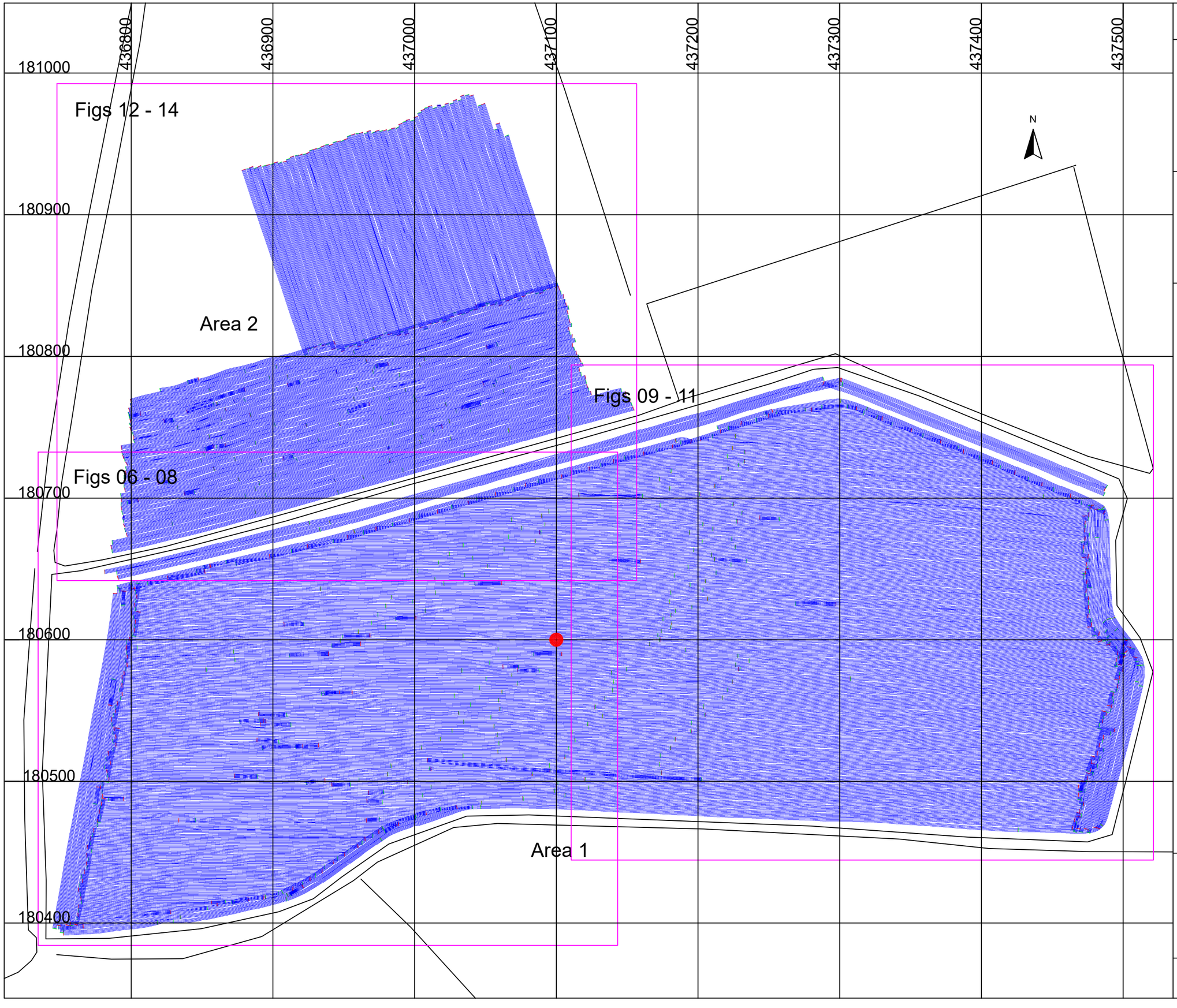
SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 01

Reproduced from OS Explorer map nos.158 & 170 1:25 000 by permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office. © Crown copyright. All rights reserved. Licence number 100043739.



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Geophysical Survey
Land at Sheepdrove Farm
East Garston
West Berkshire

Magneometry referencing information

Referencing grid to OSGB36 datum at 100m intervals

- 437100 180600
- Survey tracks
- Survey track start
- Survey track stop

SCALE 1:2500

0m 50 100m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 02

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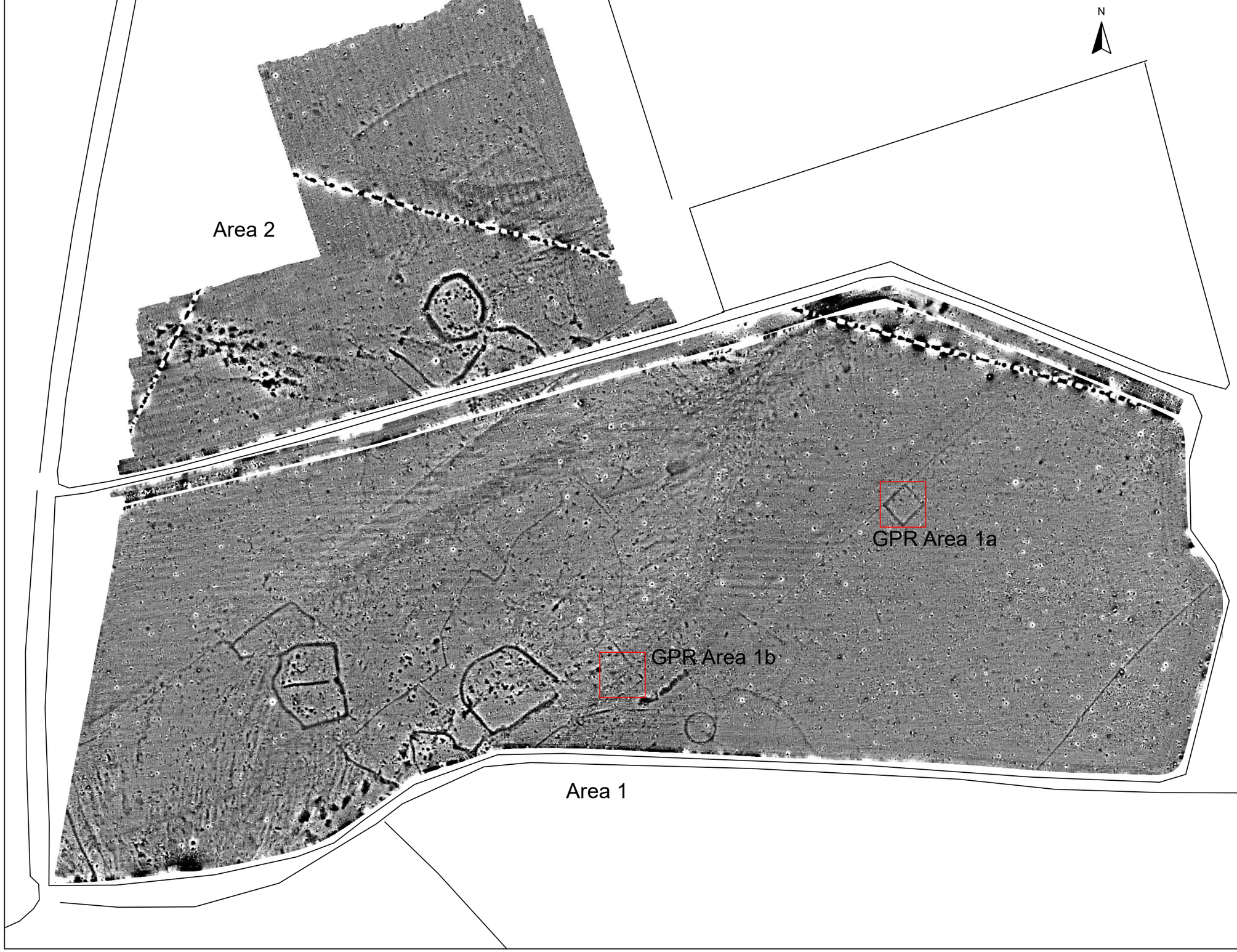
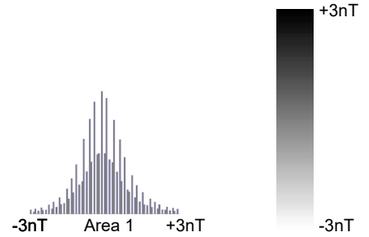
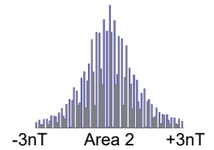
Geophysical Survey
Land at Sheepdrove Farm
East Garston
West Berkshire

Greyscale plot of minimally processed magnetometer data







SCALE 1:2500

0m 50 100m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 03

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Geophysical Survey
Land at Sheepdrove Farm
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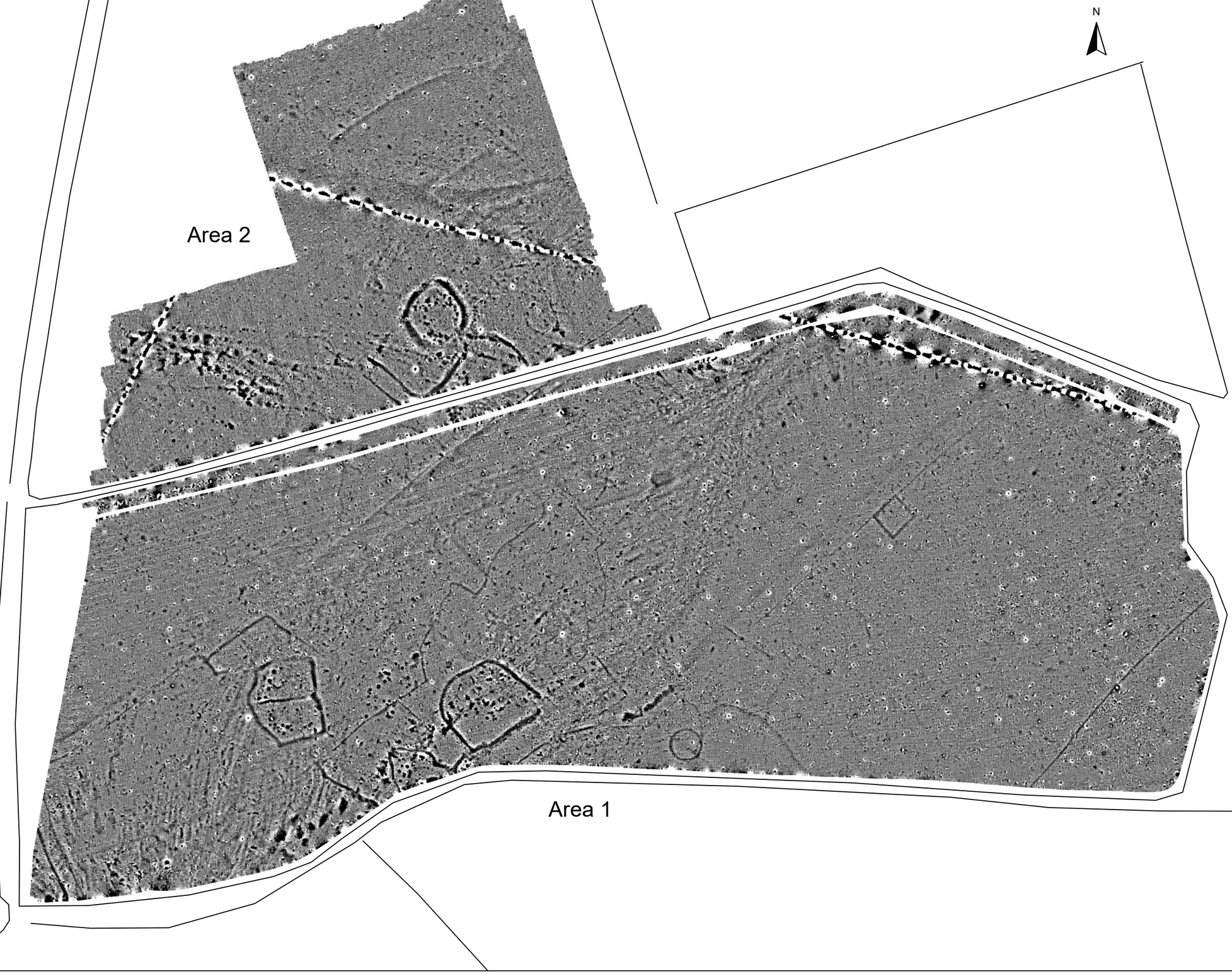
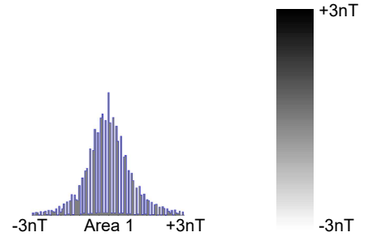
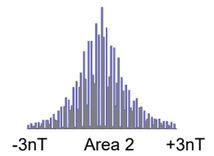
Greyscale plot of filtered magnetometer data







SCALE 1:2500

0m 50 100m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 04

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West Berkshire

Abstraction and interpretation of magnetic anomalies

N

Area 2

Area 1

- Positive linear anomaly - cut feature of archaeological potential
- Negative linear anomaly - of archaeological potential
- Positive curvilinear anomaly - enclosure ditch
- Positive rectilinear anomaly - enclosure ditch
- Positive curvilinear anomaly - ring ditch
- Positive linear anomaly - possible ditch-like feature
- Positive linear anomaly - field system boundary ditch
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - cut feature of archaeological potential
- Discrete positive response - possible pit-like feature
- Broad positive/negative anomaly - field system boundary bank
- Positive anomaly - magnetically enhanced material
- Negative anomaly - material of low magnetic susceptibility
- Variable magnetic response - of natural origin
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- Strong dipolar anomaly - ferrous object

SCALE 1:2500

0m 50 100m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 05

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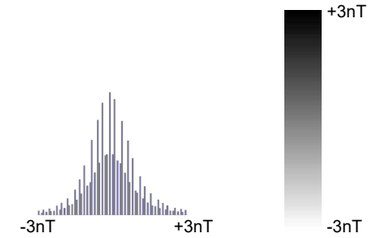
Greyscale plot of minimally processed magnetometer data - Area 1 west



Area 1

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 06

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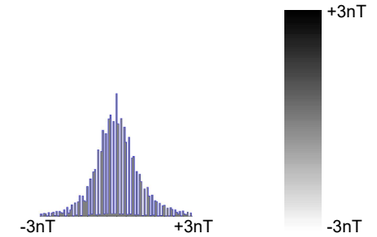
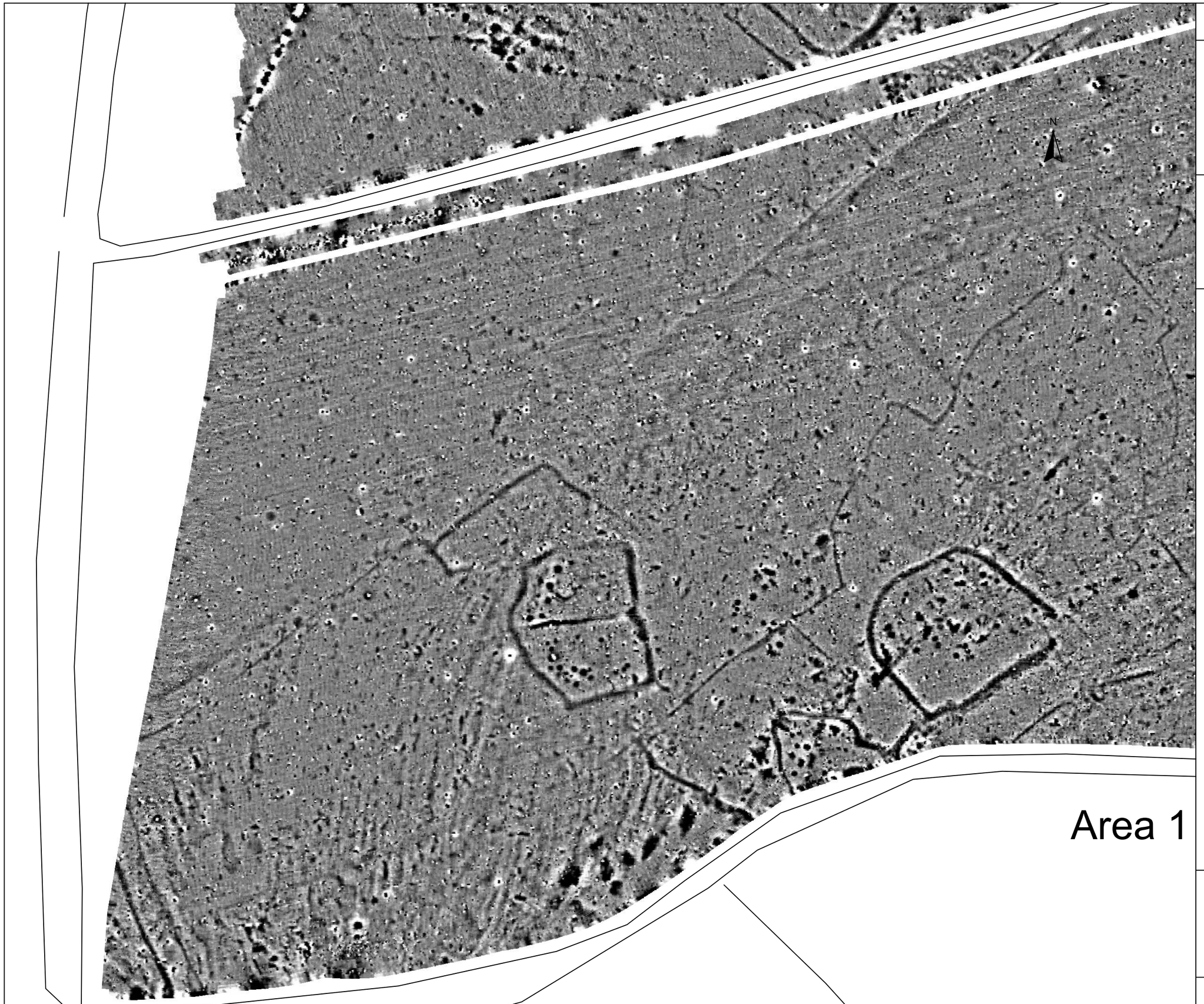
Greyscale plot of filtered magnetometer data - Area 1 west





SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 07

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Abstraction and interpretation of magnetic anomalies

N

Area 1

- Positive linear anomaly - cut feature of archaeological potential
- Negative linear anomaly - of archaeological potential
- Positive curvilinear anomaly - enclosure ditch
- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Positive linear anomaly - of natural origin
- Discrete positive response - of natural origin
- Discrete positive response - cut feature of archaeological potential
- Discrete positive response - possible pit-like feature
- Broad positive/negative anomaly - field system boundary
- Positive anomaly - magnetically enhanced material
- Variable magnetic response - of natural origin
- 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

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 08

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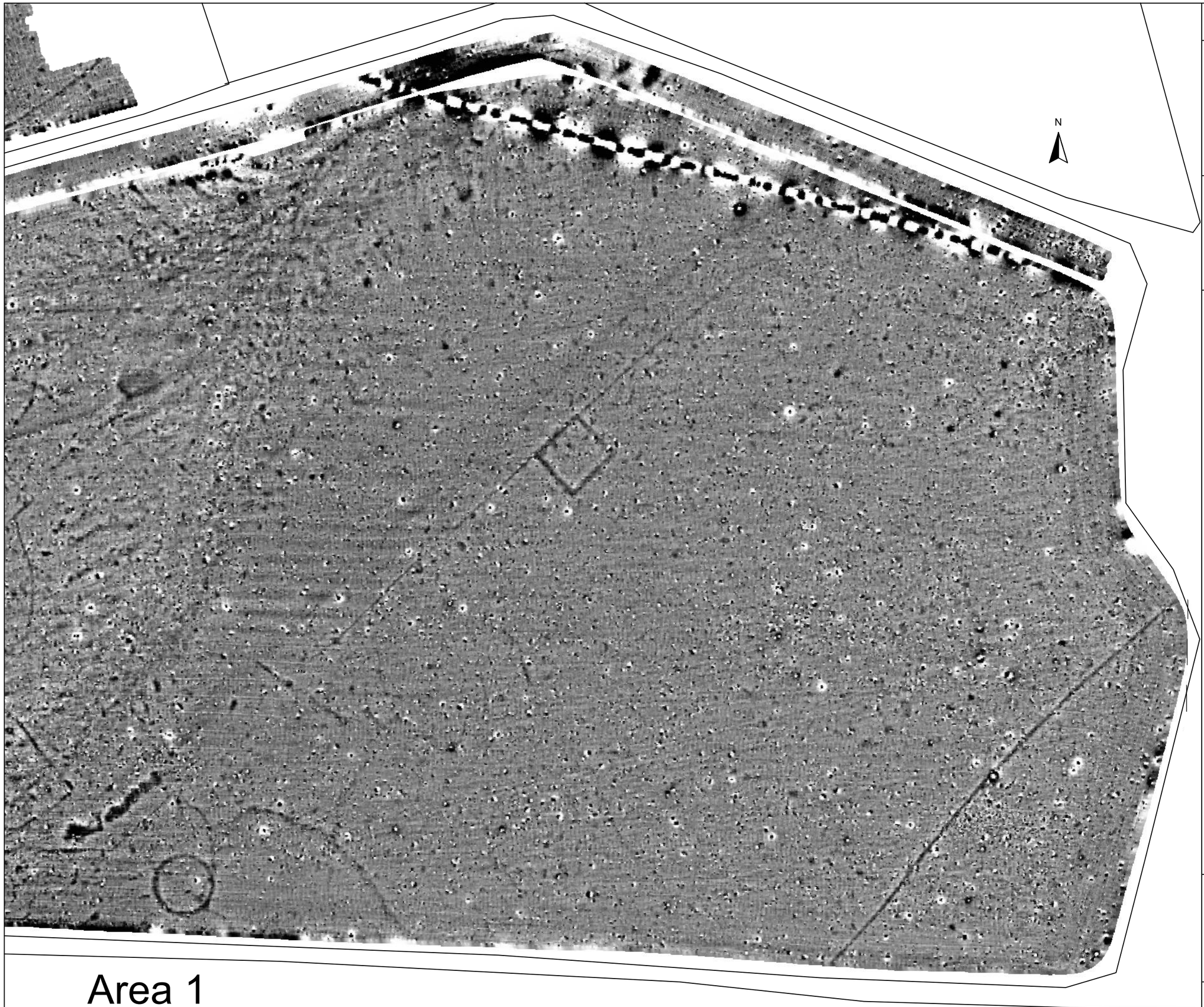
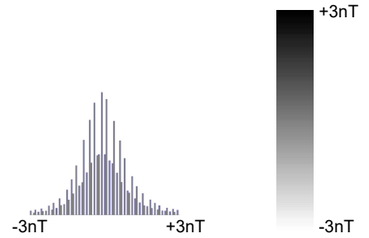
Greyscale plot of minimally processed magnetometer data - Area 1 east





SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 09

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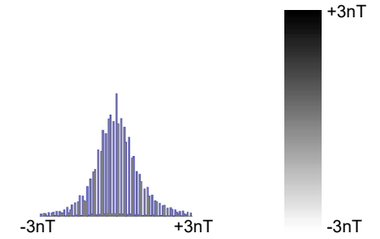
Greyscale plot of filtered magnetometer data - Area 1 east



N

Area 1

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 10

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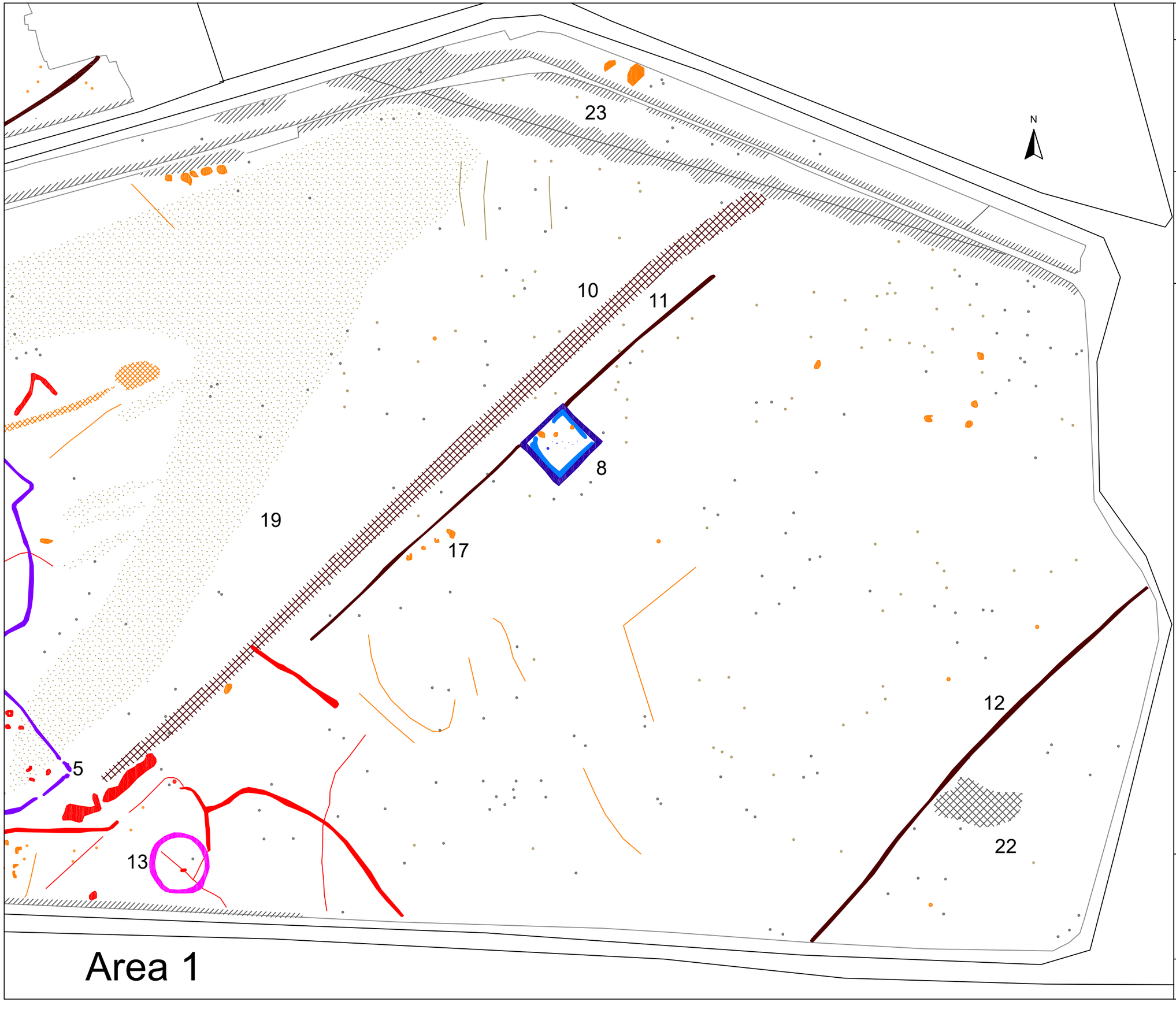
Abstraction and interpretation of magnetic anomalies - Area 1 east



- Positive linear anomaly - cut feature of archaeological potential
- Negative linear anomaly - material of low magnetic susceptiblity of archaeological potential
- Positive rectilinear anomaly - enclosure ditch
- Positive curvilinear anomaly - ring ditch
- Positive linear anomaly - possible ditch-like feature
- Positive linear anomaly - of natural origin
- Discrete positive response - of natural origin
- Discrete positive response - possible pit-like feature
- Discrete negative response - material of low magnetic susceptibility
- Broad positive/negative anomaly - field system boundary
- Positive anomaly - magnetically enhanced material
- Variable magnetic response - of natural origin
- Magnetic debris - spread of magnetically thermoremnant 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

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 11

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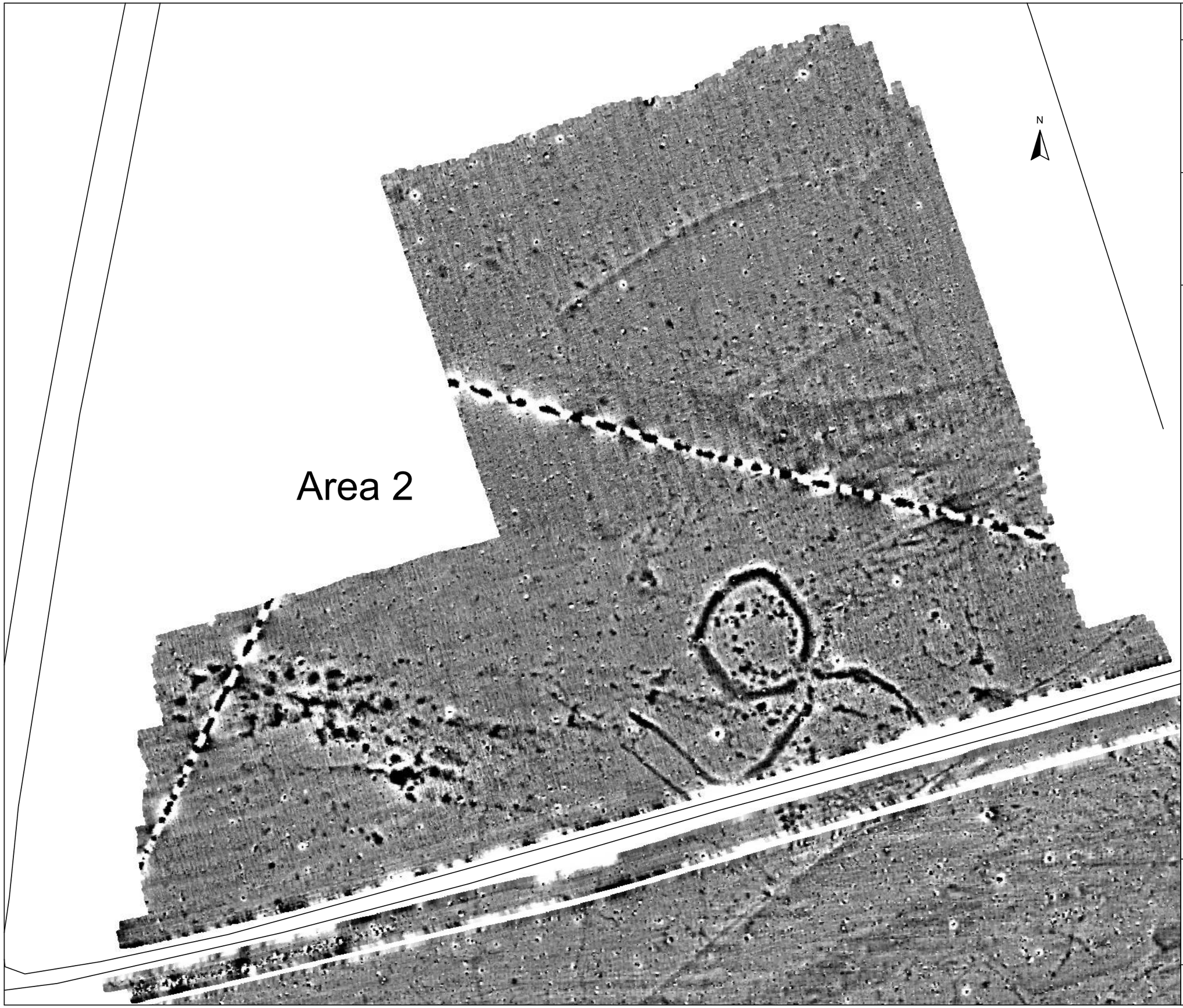
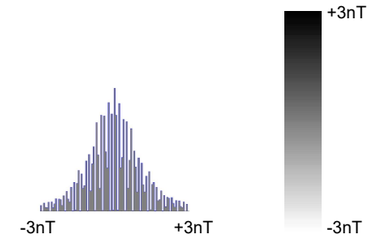
Greyscale plot of minimally processed magnetometer data - Area 2





SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 12

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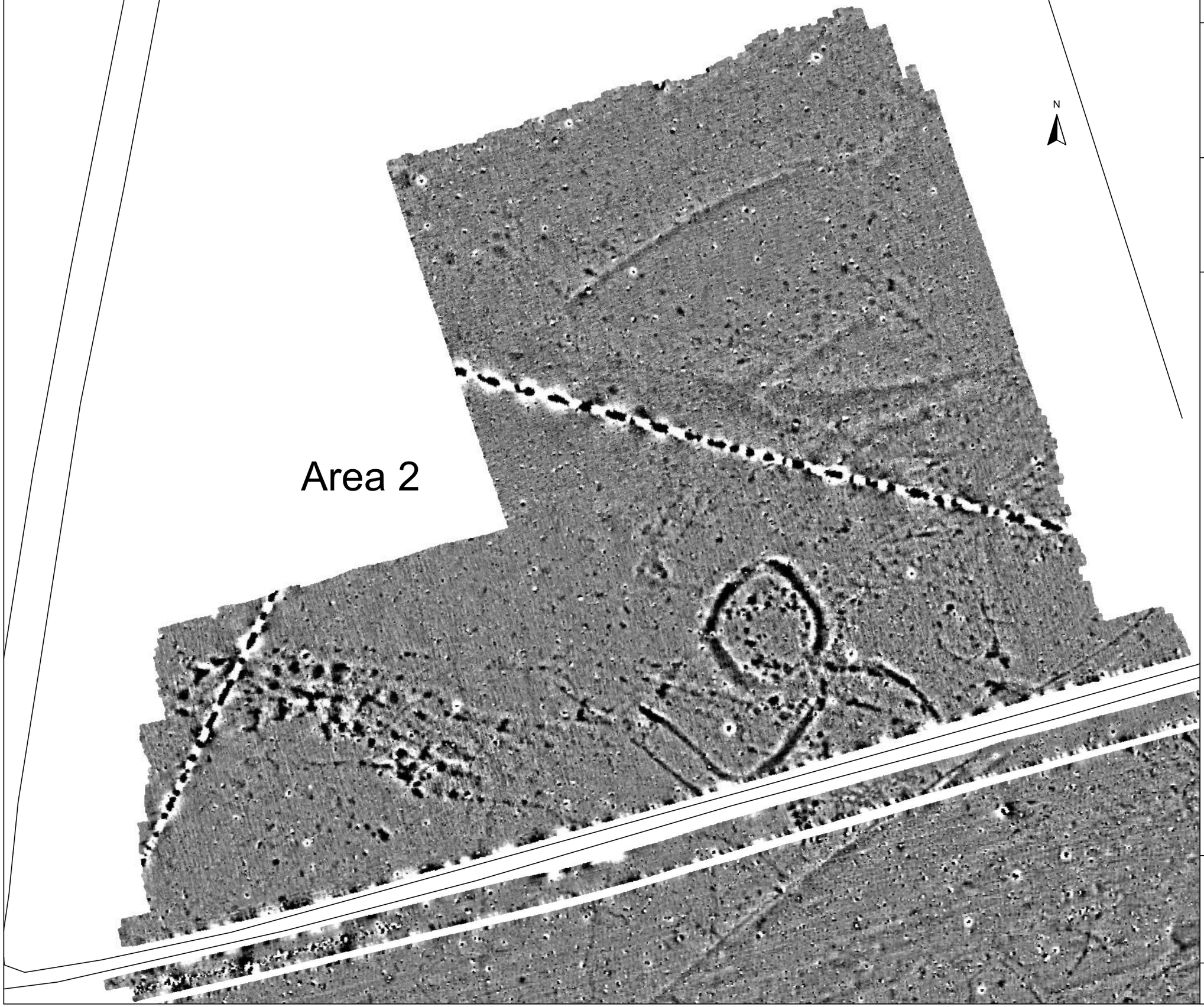
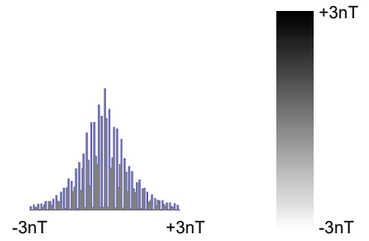
Greyscale plot of filtered magnetometer data





SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 13

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Abstraction and interpretation of magnetic anomalies - Area 2

N

Area 2

36
37
35
38
33
31
24
25
30
32
26
34
29
27
28

- Positive linear anomaly - cut feature of archaeological potential
- Positive curvilinear/rectilinear anomaly - enclosure ditch
- Positive linear anomaly - possible ditch-like feature
- Discrete positive response - of natural origin
- Discrete positive response - possible pit-like feature
- Broad positive/negative anomaly - field system boundary
- Positive anomaly - magnetically enhanced material
- Negative anomaly - material of low magnetic susceptibility
- 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

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KTD	DJS	FIG 14

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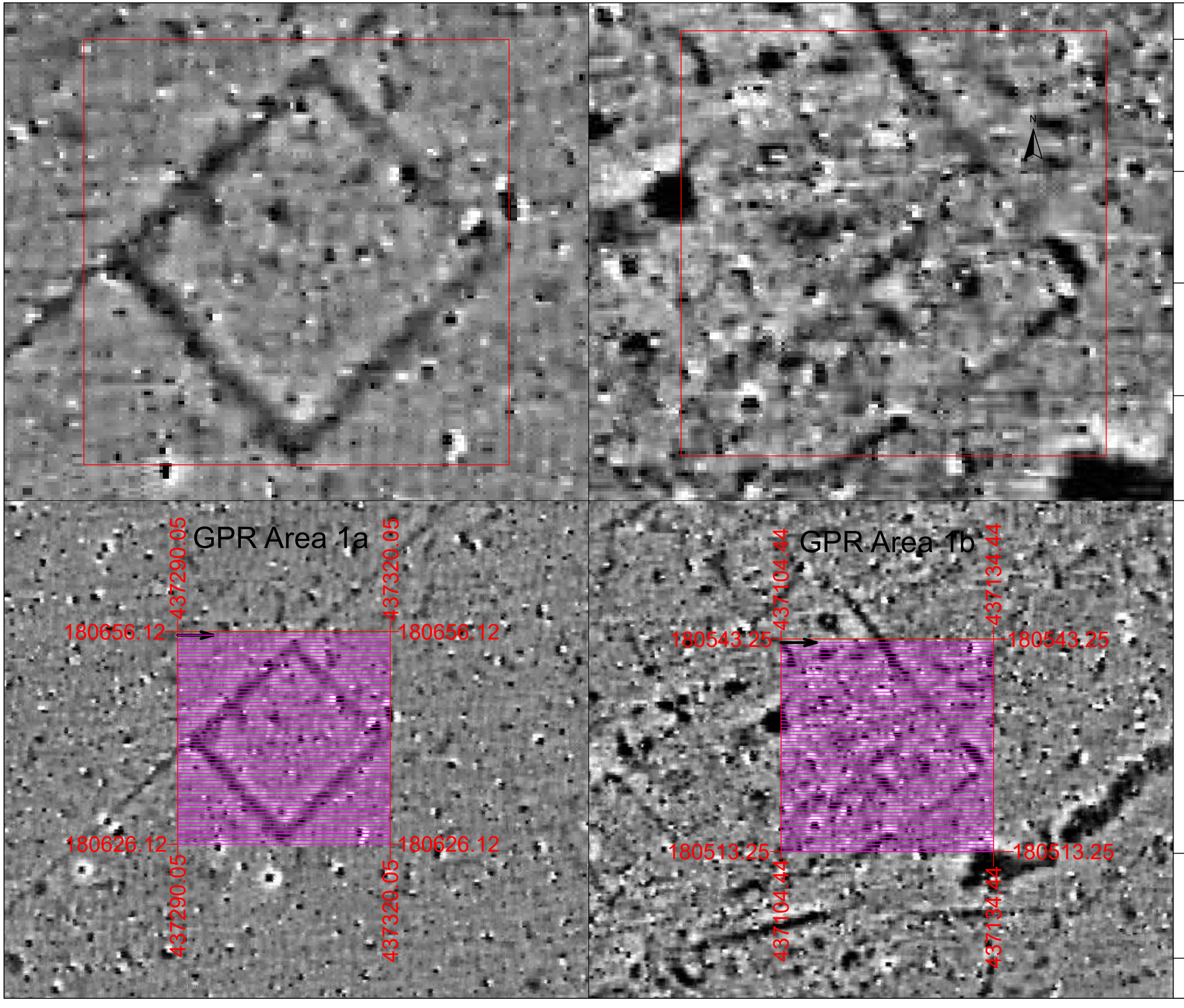
GPR referencing information

GPR grids targeting magnetometry anomalies

SCALE 1:250

0m 5 10m

SCALE TRUE AT A3



GPR 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

Zig-zag data collection

→ Survey start and traverse direction at 0.5m south of NW 30m grid node

SCALE 1:500

0m 5 10 15 20 25m

SCALE TRUE AT A3

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KTD	DJS	FIG 15

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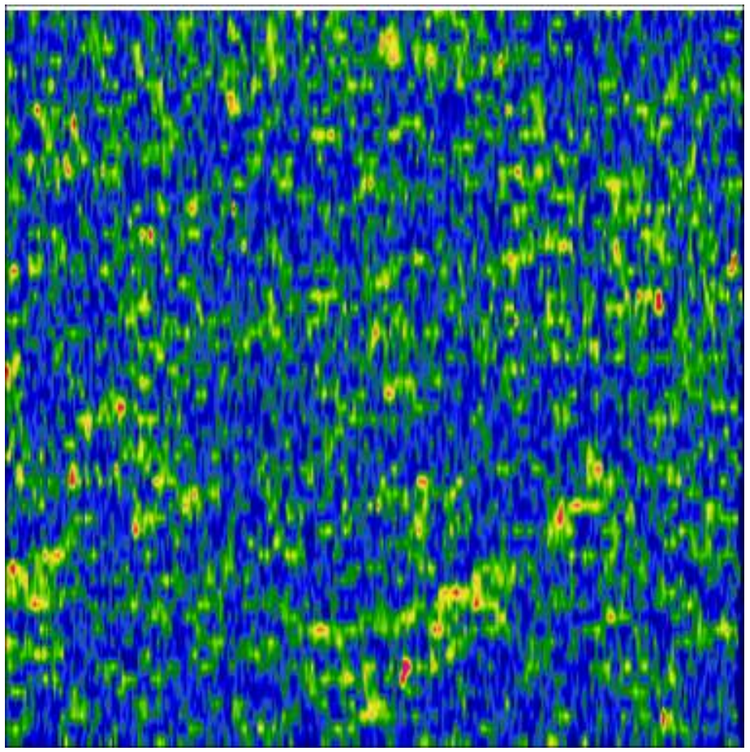
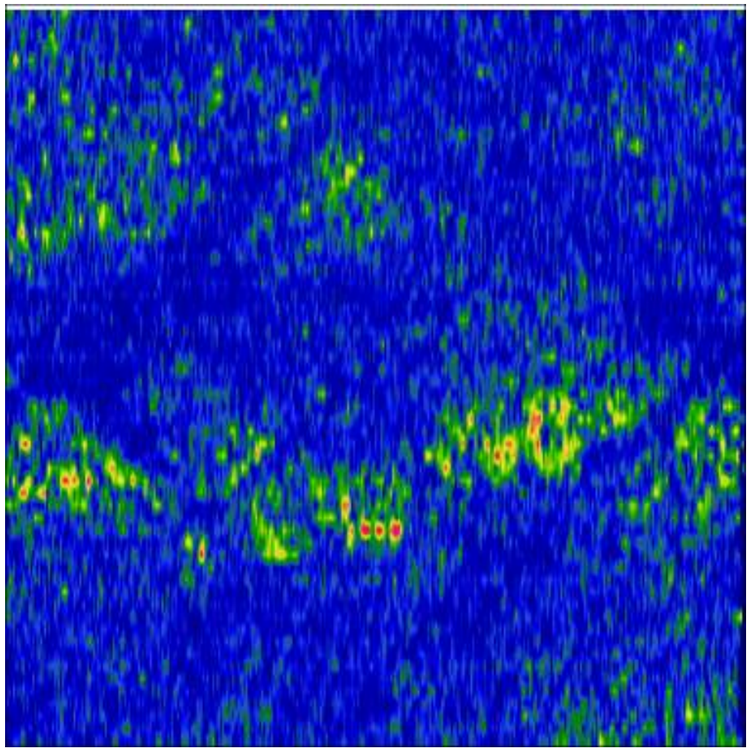
GPR time slices & abstraction & interpretation - Area 1a

GPR time slice 10.31ns

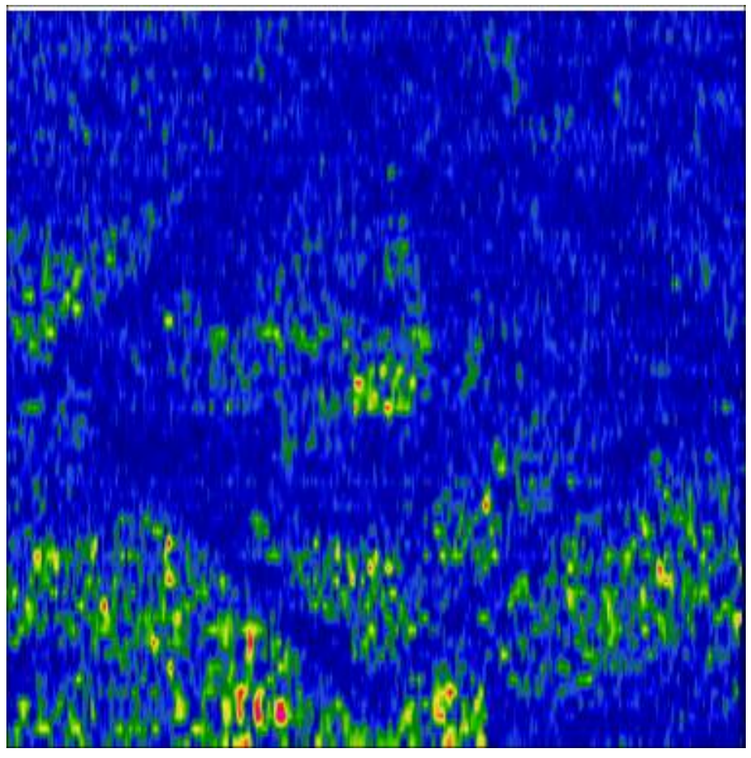


GPR time slice 30.47ns

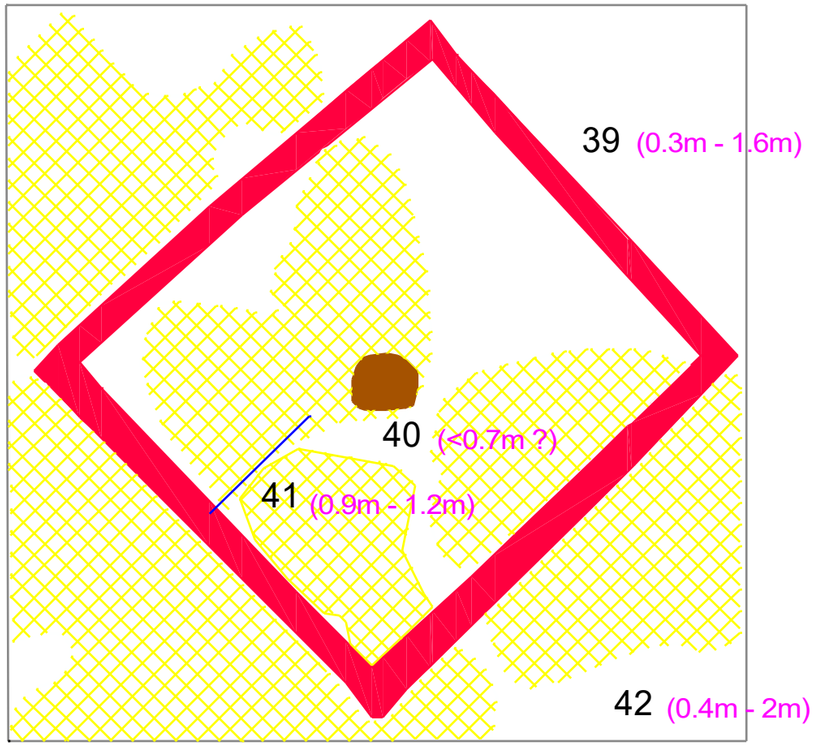


N

GPR time slice 37.73ns



Abstraction & interpretation of GPR anomalies



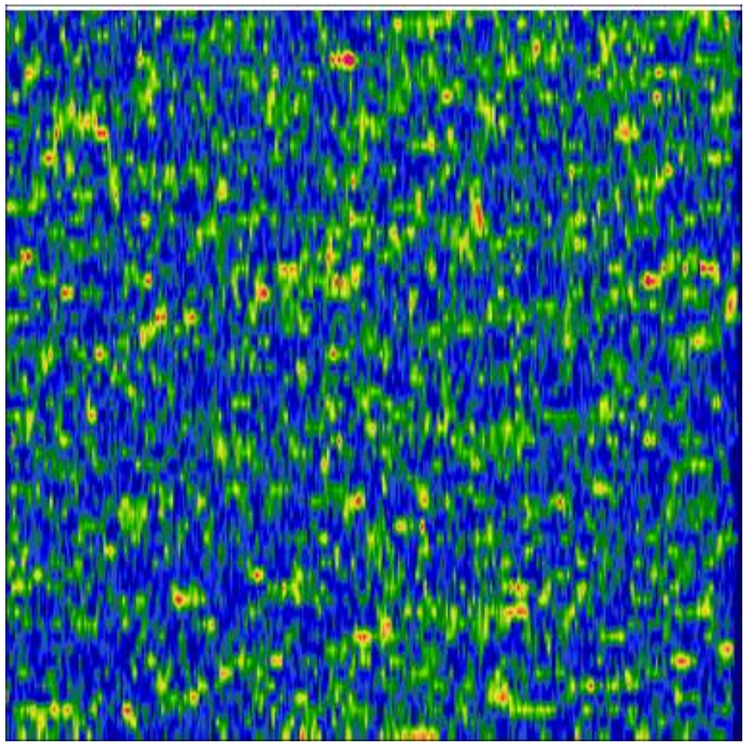
- Rectilinear anomaly - enclosure ditch
- Low amplitude linear anomaly of uncertain origin
- Discrete high amplitude response of uncertain origin
- High amplitude reflections of natural origin (geology)
- (0.6m) Approximate anomaly depth range

SCALE 1:250

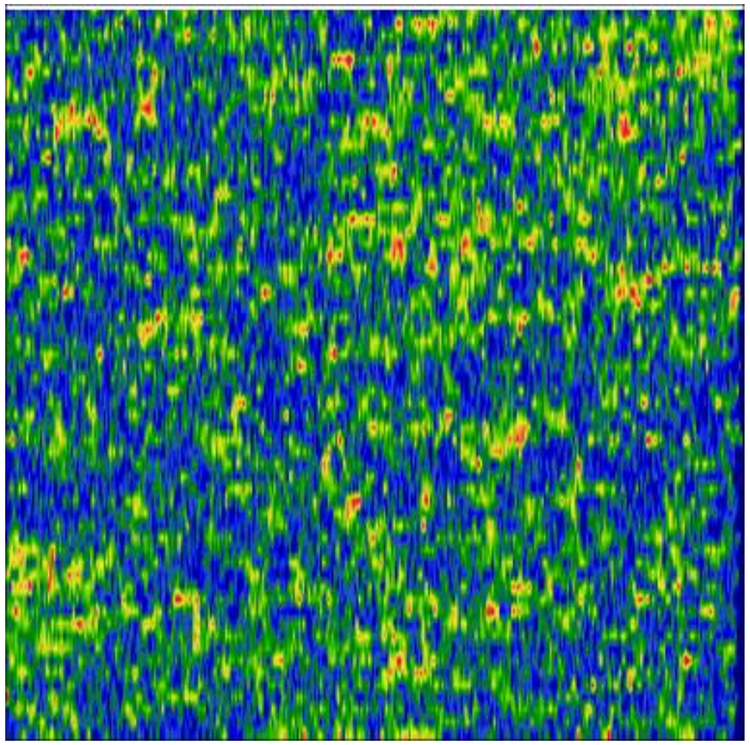
0m 5 10m

KTD	DJS	FIG 16

GPR time slice 9.84ns

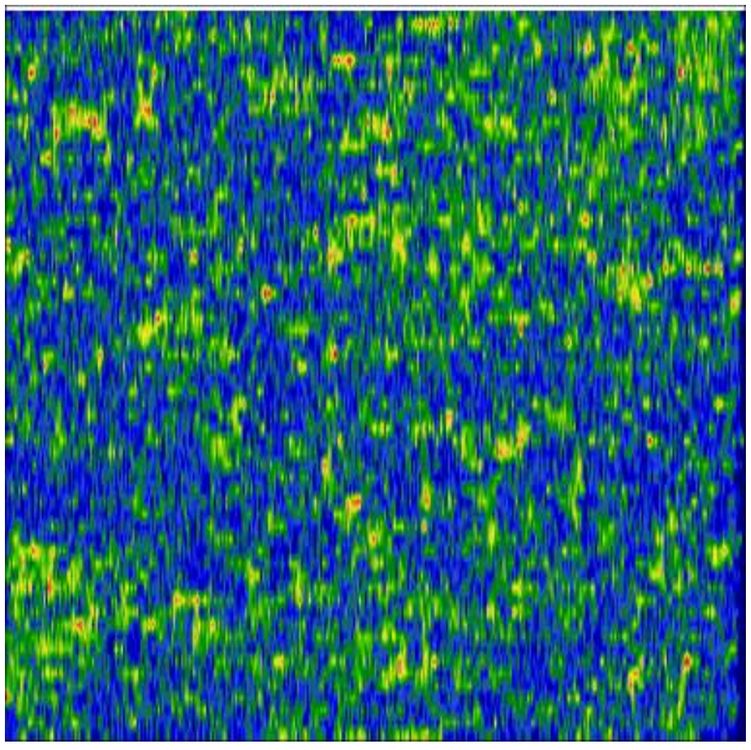


GPR time slice 14.3ns

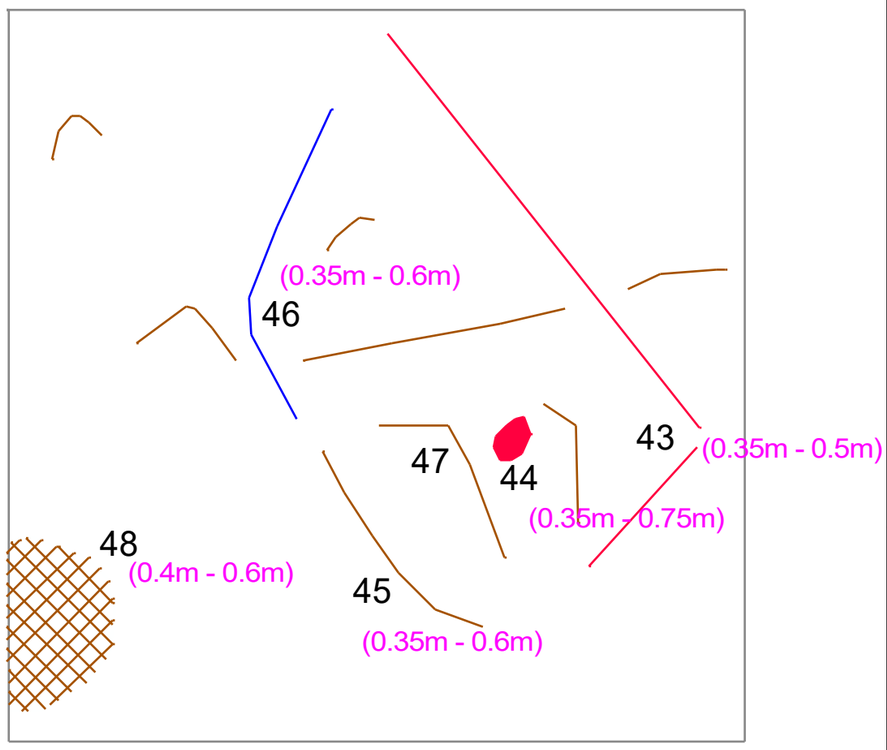


N

GPR time slice 15.93ns



Abstraction & interpretation of GPR anomalies



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GPR time slices & abstraction & interpretation - Area 1b

- Low amplitude refections - enclosure ditch
- High amplitude linear anomaly - of uncertain origin
- Low amplitude linear anomaly - of uncertain origin
- Discrete high amplitude response - of archaeological potential
- High amplitude reflections - of uncertain origin
- (0.6m) Approximate anomaly depth range

SCALE 1:250

0m 5 10m

KTD | DJS | FIG 17