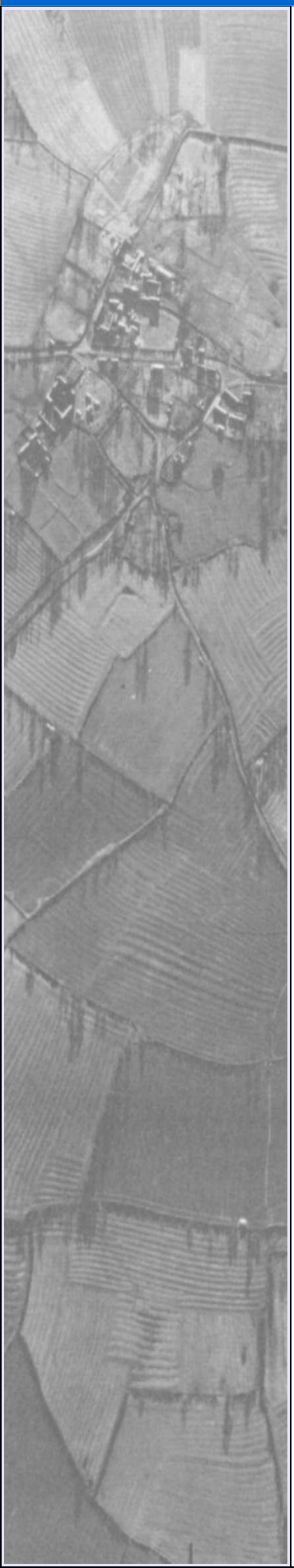

Childrey Warren WTW Abstraction Closure Oxfordshire

MAGNETOMETER SURVEY REPORT

for

SMB JV

Kerry Donaldson & David Sabin

January 2018

Ref. no. J733

ARCHAEOLOGICAL SURVEYS LTD

Childrey Warren WTW Abstraction Closure Oxfordshire

Magnetometer Survey Report

for

SMB JV

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

Survey dates – 10th, 13th to 17th, 20th to 23rd, 29th & 30th November
& 5th, 6th, 8th & 12th December 2017

Ordnance Survey Grid Reference – between **SU 410606 87186** & **SU 36570 84881**

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SUMMARY

A geophysical survey was carried out by Archaeological Surveys Ltd along the route of a new water pipeline between Lark Hill reservoir and Childrey Warren Water Treatment Works to the south of Wantage in Oxfordshire. The results of the survey indicate widespread magnetic contamination introduced during soil conditioning/manuring within the majority of the survey areas, which could have obscured weaker features if present. However, several areas of archaeological potential have been located which include a positive linear anomaly associated with a former boundary within Area 6, negative linear anomalies and magnetic debris associated with possible 19th century or earlier structural remains in Area 9 and a number of ditches, enclosures and pits within Area 10. Further enclosures, linear ditches, pits and a possible ring ditch have also been located at the western end of the survey corridor within Area 13. LiDAR data analysis reveals a landscape containing a series of long, linear boundary banks forming a widespread field system, with several of these banks existing within many of the survey areas. They do not, however, have a corresponding magnetic response.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by SMB JV, on behalf of Thames Water, to undertake a magnetometer survey of a corridor of land between Lark Hill reservoir and Childrey Warren Water Treatment Works (WTW), to the south of Wantage in Oxfordshire. Low water flows within the Letcombe Brook at Wantage has lead to an agreement between Thames Water and the Environment Agency to cease borehole water abstraction at Childrey Warren WTW. SMB JV is a joint venture between Skanska, MWH Global and Balfour Beatty, selected by Thames Water to deliver their Asset Management Programme (AMP) 6 water infrastructure improvement programme between April 2015 and March 2020. SMB are part of the wider eight$_2$O delivery alliance for Thames Water.

1.1.2 The geophysical survey was carried out in accordance with a Written Scheme of Investigation (WSI) produced by Archaeological Surveys (2017) and approved by Hugh Coddington, County Archaeologist for Oxfordshire County Council. However, the original scoping by SMB JV had not been finalised at the time of issuing the WSI and starting the survey, and it included a preferred option to construct a pipeline between Lark Hill reservoir and Childrey Warren WTW and an option to extend a pipeline further west to Hackpen Hill reservoir. However, during survey the design was progressed sufficiently so that only the preferred option needed to be surveyed up to Childrey Warren WTW removing the need for any survey towards the Hackpen Hill reservoir. Additional to this reduction in survey area, within one area to the west of Manor Road (Area 6), the original scoping included the entire field but the design route was finalised

within a straight line corridor and, therefore, the survey area was reduced. Further to this, one field had been roughly ploughed (Area 12) and ground conditions were physically impossible to survey. This will be subject to survey once ground conditions are suitable, likely to be Spring 2018. The overall survey area therefore reduced from 102.5ha, as originally planned, to 48ha of surveyable land.

1.2 Survey objectives and techniques

1.2.1 The geophysical survey aims to assist with the outline design so that a final route alignment can be identified that will avoid or mitigate any buried archaeology. The objective of the survey was to use magnetometry to locate geophysical anomalies that may be archaeological in origin so that they may be assessed prior to construction of the new water pipeline. 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 survey corridor is located between Lark Hill reservoir (Lockinge) SU 41060 87186, extending south (Areas 1 & 2), then west (Areas 3 & 4) to cross the B4494 at Chain Hill (Wantage). It continues between the B4494 and A388 Manor Road (Area 5) and on to Warborough Road to the south of Letcombe Regis (Areas 6 -9). It then continues north east of Letcombe Bassett (Areas 10 & 11) and ends at Childrey Warren Water Treatment Works at SU 36570 84881 (Area 13) see Figs 01, 02 & 03.

1.3.2 The geophysical survey covers approximately 48ha within twelve land parcels, labelled Areas 1 to 11 and Area 13, see Table 1. Area 12 had been roughly ploughed after harvest and left fallow and after a prolonged period of rainfall was too rough and too wet to survey. This area will be subject to survey during Spring 2018 when the ground conditions are suitable and it will be reported on separately.

Area	Central OS NGR	Ground cover/use	Conditions
1	441065 187133	Soil - arable	Dry – good
2	441087 186960	Tall arable regrowth	Poor due to height of vegetation
3	441146 186431	Soil - arable	Dry – good
4	441025 186332	Soil – emerging crop	Wet, sticky, very poor – survey initially

			abandoned and completed when frozen
5	440295 186260	Soil – emerging crop	Wet, sticky, very poor – survey abandoned twice and completed when frozen and snow covered
6	439273 185804	Rape crop with some open soil	Wet, sticky, very poor – survey completed on frozen ground
7	438682 185538	Sheep grazed pasture	Wet but good
8	438496 185461	Sheep grazed pasture	Wet but good
9	438466 185513	Sheep grazed pasture	Wet but good
10	438094 185378	Sheep grazed pasture	Wet but good
11	437660 185278	Pasture	Good
12	437171 185267	Roughly cultivated with crop regrowth	Very rutted and waterlogged ground - unsurveyable
13	436734 184971	Soil – emerging crop	Dry – good

Table 1: Survey areas with ground cover and conditions

1.4 Site history and archaeological potential

1.4.1 The Oxfordshire Historic Environment Record lists a number of heritage assets within and close to the survey area. At the eastern end of the survey area, to the south of Lark Hill reservoir, is the location of a Bronze Age barrow (MOX1036) 170m south-east of the south eastern edge of the survey area. The findspot of a post-medieval conical seal matrix (MOX24035) is also located 100m south of Area 5 to the east of the A338, Manor Road. Located 200m to the south of Area 7, between the A338 Manor Road and Warborough Road, is the site of a medieval or post-medieval lynchet (MOX24134). Lying 200m north of Area 10, situated between Warborough Road and Bassett Road to the south of Letcombe Regis, is the site of a large late prehistoric or Roman curvilinear enclosure (MOX24277). Situated 700m to the south of the survey corridor and split by the Warborough Road is the scheduled monument of Segsbury Camp (Letcombe Castle hillfort) (MOX321, List entry no.1017717).

1.4.2 Further west, to the north of Childrey Warren Water Treatment Works and Area 13, are a number of Bronze Age barrows (MOX10599 and MOX24207), a circular enclosure (MOX24289), a possible square enclosure (MOX24208) and a number of ditched boundary features (MOX24290 and MOX24288).

1.4.3 The surface conditions across arable fields were suitable for the observation of cultural material during the course of the survey. No significant scatters were noted with the exception of Area 13 where Romano-British pottery sherds were widespread but more concentrated within the north eastern part of the area.

1.4.4 Very broad linear earth banks were seen to cross the survey corridor in several places and were considered likely to represent early land division or field boundaries. They appear to extend for some distance and the majority

are not clearly related to extant boundaries, although some are fossilised as parish boundaries. They relate to a widespread field system which can still be seen clearly on LiDAR imagery (Fig 19) and which could date to the prehistoric/Romano-British periods.

1.5 Geology and soils

1.5.1 The underlying solid geology across the majority of the site is West Melbury Marly Chalk Formation with Zig Zag Chalk Formation at the south western end of Area 6 and within Area 7. Areas 8 & 9 and part of Area 13 also contain head deposits of clay, silt, sand and gravel (BGS, 2017).

1.5.2 The overlying soil across the survey area is from the Wantage 1 association and is a grey rendzina. It consists of a well drained, calcareous silty soil in places shallow over argillaceous rock (Soil Survey of England and Wales, 1983).

1.5.3 The underlying geology and soils are frequently associated with low magnetic contrast and low levels of magnetic susceptibility. However, cut features of archaeological potential may be located where human activity has altered the magnetic characteristics of the soil sufficiently. The underlying geology and soils are, therefore, considered acceptable for magnetic survey.

2 METHODOLOGY

2.1 Technical synopsis

2.1.1 Magnetometry survey records localised magnetic fields that can be associated with features formed by human activity. Magnetic susceptibility and magnetic thermoremnance 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 ±0.1nT and ±10,000nT. 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.

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 ±10000nT and clipped for display at ±3nT or ±2nT. Data are interpolated to a resolution of effectively 0.5m between tracks and 0.15m along each survey track.

2.3.4 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.

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

2.3.6 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.

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

2.3.8 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.

2.3.9 The abstraction and interpretation procedure has been supported by analysis of a digital terrain model derived from the Environment Agency's LiDAR data with shaded relief plots created using Surfer 10.

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 twelve survey areas covering approximately 48ha.

3.1.2 Magnetic anomalies located can be generally classified as positive and negative anomalies of archaeological potential, positive and negative anomalies of an uncertain origin, anomalies associated with land management, linear anomalies of an agricultural 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 3.4 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 Anomalies associated with former cut features are generally weak and have poor magnetic contrast. The geology and soil are known to be associated with low levels of magnetic susceptibility probably mainly due to comparatively low levels of iron minerals combined with other factors, such as low organic content and waterlogging in some areas.

3.2.3 Most of the survey areas contain widespread moderate levels of magnetic debris with some arable areas showing the highest densities. It is likely that this material is related to 'soil conditioners' that contain small ferrous particles. Some of the areas have evidence for the recent spreading of 'green waste'

which is frequently highly contaminated with non-organic materials such as metals (ferrous and non-ferrous) and plastic. Area 13 appears to have been recently spread with this material as many plastic fragments were visible and the data indicate a very high density of ferrous particles. The associated noise has been very detrimental to the abstraction and interpretation of anomalies having archaeological potential within this survey area.

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, 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 relating to land management	Anomalies are mainly linear and may be indicative of the magnetically enhanced fill of cut features (i.e. ditches). The anomalies may be long and/or form rectilinear elements and they may relate to topographic features or be visible on early mapping. Associated agricultural anomalies (e.g. headlands, plough marks and former ridge and furrow) may support the interpretation. Land drains can appear in a classic herringbone pattern of interconnected multiple dipolar linear anomalies, or as parallel linear anomalies. The multiple dipolar response indicates ceramic land drains.
Anomalies with an agricultural origin	The anomalies are often linear and form a series of parallel responses or are parallel to extant land boundaries. Where the response is broad, former ridge and furrow is likely; narrow response is often related to modern ploughing. This category does not include agricultural features of early date or considered to be of archaeological potential (e.g. animal stockades, enclosures, farmsteads, etc).
Anomalies associated with magnetic debris	Magnetic debris often appears as areas containing many small dipolar anomalies that may range from weak to very strong in magnitude. They often occur where there has been dumping or ground make-up and are related to magnetically thermoremnant materials such as brick or tile or other small fragments of ferrous material. This type of response is occasionally associated with kilns, furnace structures, hearths and nail spreads from former wooden structures or rooves and may, therefore, be archaeologically significant. It is also possible that the response may be caused by natural material such as certain gravels and fragments of igneous or metamorphic rock. Strong discrete dipolar anomalies are responses to ferrous objects within the topsoil.
Anomalies with a modern origin	The magnetic response is often strong and dipolar indicative of ferrous material and may be associated with extant above surface features such as wire fencing, cables, pylons etc.. Often a significant area around these features has a strong

	magnetic flux which may create magnetic disturbance; such disturbance can effectively obscure low magnitude anomalies if they are present. Fluxgate sensors may respond erratically adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.

Table 2: List and description of interpretation categories

3.4 List of anomalies - Areas 1 to 5

Area 1 centred on OS NGR 441065 187133, see Fig 04.
Area 2 centred on OS NGR 441087 186960, see Fig 04.
Area 3 centred on OS NGR 441146 186431, see Figs 05 & 06.
Area 4 centred on OS NGR 441025 186332, see Fig 06.
Area 5 centred on OS NGR 440295 186260, see Figs 06 – 09.

Areas 1 and 2 contain a small number of very weakly positive linear anomalies with no coherent morphology. Strong, discrete dipolar anomalies are widespread and numerous within all survey areas and indicate spreads of magnetically contaminated manure and green waste containing ferrous and magnetically thermoremnant material. Area 5 is also highly contaminated, with two zones of very strong responses. Two pipes or services also cross the western end of Area 5. Broad, linear field boundaries associated with a probable prehistoric/Romano-British field system, seen within the LiDAR imagery and located within all of the survey areas, do not have a magnetic response.

3.5 List of anomalies - Area 6

Area centred on OS NGR 439273 185804, see Figs 10 – 12.

Anomalies with an uncertain origin

(1) – A positive linear anomaly extends across the eastern part of the survey area and appears to relate to a cut, ditch-like feature, although there may be an association with anomaly (2). As with other survey areas, a number of short, weakly positive linear anomalies have been located elsewhere, but they lack a coherent morphology for them to be interpreted as cut features.

(2) – A broad, positive response lies within a shallow dry valley which is likely to relate to a former water channel dating to the Quaternary period. The response is likely to be to colluvium within the shallow linear depression; however, an anthropogenic origin for the magnetic enhancement is possible.

Anomalies associated with land management

(3) - A positive linear anomaly relates to a former boundary feature associated with the large field system visible within LiDAR imagery.

3.6 List of anomalies - Area 7 & 8

Area 7 centred on OS NGR 438682 185538, see Fig 13.
Area 8 centred on OS NGR 438496 185461, see Fig 13.

Areas 7 and 8 contain magnetic debris from dumped and burnt material.

3.7 List of anomalies - Area 9

Area centred on OS NGR 438466 185513, see Fig 13.

Anomalies of archaeological potential

(4) - A former L shaped boundary, mapped during the late 19th century contains a series of negative linear anomalies and associated magnetic debris. The linear anomalies and magnetic debris appear to relate to a series of former structures, possibly up to 5 of them, with dimensions of 6-8m by 11m. No structures have been mapped on any Ordnance Survey mapping from the 1st edition onwards.

Anomalies with an uncertain origin

(5) - A number of positive and negative linear anomalies are parallel with the current field boundaries and also anomalies (4). They may indicate former agricultural activity although an association with (4) is also possible.

3.8 List of anomalies - Area 10

Area centred on OS NGR 438094 185378, see Figs 14 & 15.

Anomalies of archaeological potential

(6) - Positive linear anomalies forming a D shaped enclosure. It is partly formed of linear ditch (7) and further cut features are situated to the west (8).

(7) - Positive linear anomalies forming T shaped linear ditches.

(8) - Weakly positive linear anomalies relating to further cut features associated with (6 & 7).

Anomalies with an uncertain origin

(9) - Weak and short or fragmented linear anomalies cannot be confidently

interpreted as cut features, but given the presence of archaeological features to the east, an association should be considered.

3.9 List of anomalies - Area 11

Area centred on OS NGR 437660 185278, see Fig 16.

Anomalies with an uncertain origin

(10) - A number of positive linear anomalies extend across the southern part of the survey area. They appear to relate to cut features; however, an association with further horse tracks/gallops cannot be discounted

(11) – A weakly positive linear anomaly may be a continuation of anomaly (12) relating to the former parish boundary

Anomalies associated with land management

(12) – A short, positive linear anomaly corresponds to the line of the parish boundary and would have related to a boundary ditch that has been infilled.

(13) - Responses to former horse track/gallops.

3.10 List of anomalies - Area 12

Area centred on OS NGR 437171 185267, ground conditions too rough and sticky to survey.

3.11 List of anomalies - Area 13

Area centred on OS NGR 436734 184971, see Figs 17 & 18.

Anomalies of archaeological potential

(14) - A series of sub-rectangular, sub-circular and triangular enclosure ditches are located within the northern part of the site. They are situated on the higher, south east facing ground. A number of discrete and linear anomalies are associated with them, indicating that they contain other ditches, pits and/or areas of burning. Negative linear and rectilinear anomalies are a response to material with a lower magnetic susceptibility than the surrounding soils, such as stone or subsoil.

(15) - Fragmented positive linear anomalies could relate to a ring ditch indicating a round house.

(16)- Broad, positive linear responses appear to relate to former boundary features, directly associated with the enclosures.

(17) - Situated partly in the valley base and partly up the south facing valley slope in the western part of the survey area are a cluster of discrete positive responses. They indicate a large number of pit-like features and have a response of 3.5-7nT, similar to the archaeological features located to the east (14).

Anomalies with an uncertain origin

(18) - A number of short, positive linear anomalies are located at the far western edge of the survey area. It is not possible to determine their origin.

Anomalies with a modern origin

(19 & 20) - Several water pipes extend from/towards the Childrey Warren WTW immediately south west of the survey area. They have associated magnetic disturbance which may have obscured weaker anomalies.

4 DISCUSSION

4.1.1 Within the eastern part of the survey corridor from Lark Hill reservoir to Manor Road, (Areas 1 to 5), no anomalies of archaeological potential could be identified within the magnetometer data, despite the presence of a number of broad linear boundary banks within all of the survey areas. These banks relate to a widespread field system that can be clearly seen within LiDAR images, with a main north south long axis traceable within the landscape for 1.5-2km (see Fig 19). The underlying marly chalk is often associated with low levels of magnetic susceptibility and, as a consequence, the features have no magnetic contrast. The survey areas have also been subject to manuring or spreading with composted green waste containing tiny fragments of ferrous material resulting in widespread magnetic debris.

4.1.2 Area 6 lies between Manor Road and Court Hill Road and does contain a positive linear anomaly (3) that appears to be associated with one of the low former boundary banks. Other extant linear banks elsewhere within the field, including one to the west that is fossilised as the parish boundary, do not have any corresponding magnetic response. Situated 130m east of anomaly (3) is a positive linear anomaly (1) that could relate to a cut feature and a broad, amorphous, positive response (2) that corresponds to a shallow dry valley within the field. The response may relate to colluvial deposits; however, an anthropogenic origin for the magnetic enhancement is possible.

4.1.3 Area 9 occupies a small area of pasture, immediately west of Warborough Road and north of Warborough Cottages. The magnetometer results indicate

the presence of former structural remains within the survey area. There have been no recorded structures within the survey area from the 1st Edition Ordnance Survey mapping onwards; however, the surrounding boundary is mapped between 1899 and 1938. It is possible that they relate to former dwellings or possibly agricultural buildings which may be 20th century in date and unmapped, or possibly removed prior to 1887 and therefore of at least early 19th century date or earlier and of archaeological potential.

4.1.4 To the east of Warborough Road, within Area 10, are a number of positive linear, curvilinear and discrete responses which relate to cut features of archaeological potential. These include what appears to be a D-shaped enclosure and a T-shaped boundary feature. A large, irregular curvilinear prehistoric or Romano-British enclosure containing pits and boundary features has been identified from cropmarks (MOX24277) and is located less than 200m to the north. The anomalies located during the survey may indicate a continuation of associated cut features.

4.1.5 Area 11 contains a number of anomalies associated with former horse tracks or gallops; however, several other weakly positive linear and some negative linear anomalies have also been located. Some may be associated with the parish boundary that extends through the field and while others could also be associated with further horse tracks, cut features with some archaeological potential cannot be discounted.

4.1.6 Area 12 is situated to the west of Letcombe Bassett; however, roughly ploughed land with tall regrowth, coupled with waterlogged land, has resulted in ground conditions that were impossible to traverse. The area will be subject to a separate survey and report in the Spring of 2018 once field conditions are suitable.

4.1.7 Area 13 lies to the south west of Area 12 and Holborn Hill leading to Childrey Warren WTW and contains a number of rectilinear and triangular enclosures. The anomalies are weak and very truncated; however, they appear to be associated with pits and a possible fragmented ring ditch. Further west, beyond the main focus of enclosures, is a group of approximately 100 discrete positive responses. These appear to relate to pits, and although a natural origin is possible for such responses, they are in a confined group with such responses not seen elsewhere within the entire survey corridor. An archaeological origin for the pits is, therefore, possible. The Oxfordshire HER lists a number of archaeological sites to the north and south of Area 13; a circular enclosure (MOX24289), a possible square enclosure (MOX24208) and a number of ditched boundary features (MOX24290 and MOX24288). During the course of the survey numerous Romano-British pottery sherds were observed and appeared widespread across the area but with a higher concentration in the north eastern part.

5 CONCLUSION

5.1.1 The magnetometer survey has located a number of areas with archaeological potential along the new water pipeline survey corridor. These include a positive linear anomaly within Area 6 that appears to be associated with a low former boundary bank related to a widespread former field system. Former structural remains also appear to have been located immediately east of Warborough Road within Area 9; however, the age or function of these structures cannot be determined. To the west of Warborough Road, Area 10 contains a number of positive anomalies that relate to enclosures, ditches and pits that could be of prehistoric or Roman origin.

5.1.2 In the far west of the survey corridor, within Area 13, are a number of positive linear, rectilinear, triangular and discrete responses that relate to a series of enclosures containing further cut features. It is possible that a fragmented positive curvilinear anomaly relates to a small ring ditch, but the full extent of the anomaly cannot be determined due to the fragmentation. All of the anomalies have been subject to truncation due to agricultural activity. Further west towards the Childrey Warren WTW are a group of approximately 100 pits, which although could relate to naturally formed features, are not seen elsewhere within the survey areas and the strength of the response and clustering indicates that an archaeological origin should be considered.

5.1.3 All of the survey areas contain spreads of magnetic debris to some degree. Usually introduced as ferrous contamination within composted green waste during the process of manuring, the small ferrous fragments result in widespread dipolar anomalies which can obscure weaker anomalies when in concentrations. The underlying marly chalk geology is often associated with low levels of magnetic susceptibility and so any features that lack a magnetic contrast will not be located during the survey. LiDAR imagery reveals a landscape of long linear boundaries extending northwards from the higher chalk in the south, with many of these boundaries existing as low, broad banks within the majority of the survey areas. However, these low banks do not have a sufficient magnetic contrast for them to be represented by magnetic anomalies and are, therefore, not visible within the magnetometer results.

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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 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 ±5nT and ±3nT 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

Filename: J733-mag-Area1-proc.xcp
Description: Imported as Composite from: J733-mag-Area1.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 441033.913288921, 187187.769359493 m
Southeast corner: 441091.063288921, 187074.219359493 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702
Source GPS Points: 132700
Dimensions
Composite Size (readings): 381 x 757
Survey Size (meters): 57.2 m x 114 m
Grid Size: 57.2 m x 114 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.52
Mean: -0.07
Median: 0.09
Composite Area: 0.64894 ha
Surveyed Area: 0.44202 ha
PROGRAM
Name: TerraSurveyor
Version: 3.0.23.0
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 -3.00 to 3.00 nT

Area 2

Filename: J733-mag-Area2-proc.xcp
Description: Imported as Composite from: J733-mag-Area2.asc
Northwest corner: 441050.935770736, 187077.400654422 m
Southeast corner: 441124.205770736, 186848.920654422 m
Source GPS Points: 285200
Dimensions
Composite Size (readings): 431 x 1344
Survey Size (meters): 73.3 m x 228 m
Grid Size: 73.3 m x 228 m
X Interval: 0.17 m
Y Interval: 0.17 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.02
Mean: 0.00
Median: 0.01
Composite Area: 1.6741 ha
Surveyed Area: 0.94018 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 -3.00 to 3.00 nT

Area 3a

Filename: J733-mag-Area3a-proc.xcp
Description: Imported as Composite from: J733-mag-Area3a.asc
Northwest corner: 441086.819035472, 186851.648989674 m
Southeast corner: 441190.169035472, 186393.548989674 m
Source GPS Points: 479600
Dimensions
Composite Size (readings): 689 x 3054
Survey Size (meters): 103 m x 458 m
Grid Size: 103 m x 458 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.09
Mean: 0.01
Median: 0.00
Composite Area: 4.7345 ha
Surveyed Area: 1.6258 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 -3.00 to 3.00 nT

Area 3b

Filename: J733-mag-Area3b-proc.xcp
Description: Imported as Composite from: J733-mag-Area3b.asc
Northwest corner: 440826.844381489, 186480.503762416 m
Southeast corner: 441162.244381489, 186356.753762416 m
Source GPS Points: 315400

Dimensions
Composite Size (readings): 2236 x 825
Survey Size (meters): 335 m x 124 m
Grid Size: 335 m x 124 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.23
Mean: 0.03
Median: 0.01
Composite Area: 4.1506 ha
Surveyed Area: 1.0197 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 -3.00 to 3.00 nT

Area 4

Filename: J733-mag-Area4-proc.xcp
Description: Imported as Composite from: J733-mag-Area4.asc
Northwest corner: 440848.866645759, 186382.110395714 m
Southeast corner: 441199.866645759, 186288.060395714 m
Source GPS Points: 448900
Dimensions
Composite Size (readings): 2340 x 627
Survey Size (meters): 351 m x 94.1 m
Grid Size: 351 m x 94.1 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 0.98
Mean: 0.02
Median: 0.03
Composite Area: 3.3012 ha
Surveyed Area: 1.7755 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 -3.00 to 3.00 nT

Area 5

Filename: J733-mag-Area5.xcp
Description: Imported as Composite from: J733-mag-Area5.asc
Northwest corner: 439754.123226866, 186345.017806689 m
Southeast corner: 440844.173226866, 185951.867806689 m
Source GPS Points: 3078500
Dimensions
Composite Size (readings): 7267 x 2621
Survey Size (meters): 1.09E003 m x 393 m
Grid Size: 1.09E003 m x 393 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.32
Mean: 0.03
Median: 0.04
Composite Area: 42.855 ha
Surveyed Area: 10.927 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 -3.00 to 3.00 nT

Area 6

Filename: J733-mag-Area6-proc.xcp
Description: Imported as Composite from: J733-mag-Area6.asc
Northwest corner: 438827.157856573, 186009.488469193 m
Southeast corner: 439731.957856573, 185601.788469193 m
Source GPS Points: 3467587
Dimensions
Composite Size (readings): 6032 x 2718
Survey Size (meters): 905 m x 408 m
Grid Size: 905 m x 408 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 2.21
Min: -2.20
Std Dev: 0.56
Mean: 0.02
Median: 0.01
Composite Area: 36.889 ha
Surveyed Area: 11.074 ha
Processes: 1
1 Base Layer
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Clip from -2.00 to 2.00 nT

Area 7

Filename: J733-mag-Area7-proc.xcp
Description: Imported as Composite from: J733-mag-Area7.asc
Northwest corner: 438521.251769857, 185633.974544921 m
Southeast corner: 438874.951769857, 185447.374544921 m
Source GPS Points: 586300
Dimensions
Composite Size (readings): 2358 x 1244
Survey Size (meters): 354 m x 187 m
Grid Size: 354 m x 187 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 0.95
Mean: 0.03
Median: 0.01
Composite Area: 6.6 ha
Surveyed Area: 2.0024 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 -3.00 to 3.00 nT

Area 8

Filename: J733-mag-Area8-proc.xcp
Description: Imported as Composite from: J733-mag-Area8.asc
Northwest corner: 438468.287232062, 185493.76447786 m
Southeast corner: 438529.787232062, 185436.61447786 m
Source GPS Points: 77900
Dimensions
Composite Size (readings): 410 x 381
Survey Size (meters): 61.5 m x 57.2 m
Grid Size: 61.5 m x 57.2 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.73
Mean: -0.03
Median: 0.11
Composite Area: 0.35147 ha
Surveyed Area: 0.23875 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 -3.00 to 3.00 nT

Area 9

Filename: J733-mag-Area9-proc.xcp
Description: Imported as Composite from: J733-mag-Area9.asc
Northwest corner: 438418.326536223, 185549.722906331 m
Southeast corner: 438505.876536223, 185476.962906331 m
Source GPS Points: 106800
Dimensions
Composite Size (readings): 515 x 428
Survey Size (meters): 87.6 m x 72.8 m
Grid Size: 87.6 m x 72.8 m
X Interval: 0.17 m
Y Interval: 0.17 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.29
Mean: 0.03
Median: 0.00
Composite Area: 0.63701 ha
Surveyed Area: 0.37786 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 -3.00 to 3.00 nT

Area 10

Filename: J733-mag-Area10-proc.xcp
Description: Imported as Composite from: J733-mag-Area10.asc
Northwest corner: 437770.562769242, 185523.366145628 m
Southeast corner: 438414.362769242, 185250.966145628 m
Source GPS Points: 1382500
Dimensions
Composite Size (readings): 4292 x 1816
Survey Size (meters): 644 m x 272 m
Grid Size: 644 m x 272 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 2.21
Min: -2.20
Std Dev: 0.65
Mean: 0.02
Median: 0.00
Composite Area: 17.537 ha
Surveyed Area: 5.2546 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 11

Filename: J733-mag-Area11-proc.xcp
Description: Imported as Composite from: J733-mag-Area11.asc
Northwest corner: 437507.289055637, 185383.234363027 m
Southeast corner: 437786.439055637, 185179.834363027 m
Source GPS Points: 1099300
Dimensions
Composite Size (readings): 1861 x 1356
Survey Size (meters): 279 m x 203 m
Grid Size: 279 m x 203 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 2.21
Min: -2.20
Std Dev: 0.73
Mean: 0.03
Median: 0.01
Composite Area: 5.6779 ha
Surveyed Area: 4.1756 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 13

Filename: J733-mag-Area13-proc.xcp
Description: Imported as Composite from: J733-mag-Area13.asc
Northwest corner: 436522.148105837, 185200.802051574 m
Southeast corner: 436920.648105837, 184814.902051574 m
Source GPS Points: 2310200
Dimensions
Composite Size (readings): 3985 x 3859
Survey Size (meters): 399 m x 386 m
Grid Size: 399 m x 386 m
X Interval: 0.1 m
Y Interval: 0.1 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.57
Mean: 0.02
Median: 0.02
Composite Area: 15.378 ha
Surveyed Area: 7.2067 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 -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 draft digital copy of the summary report (in PDF format) shall be supplied to the office of the County Archaeological Officer; for verification and assessment by the CAO or his representative; when the report has been agreed a final digital copy will then be supplied to the Oxfordshire Historic Environment Record (HER) at archaeology@oxfordshire.gov.uk on the understanding that it will become a public document after an appropriate period of time (generally not exceeding six months). The report will also be uploaded to the Online AccesS to the Index of archaeological investigationS (OASIS).

Archive contents:

Geophysical data path: J733 Childrey Warren\Data				
Path and Filename	**Software**	**Description**	**Date**	**Creator**
childrey1\MX\.prm,.dgb,.disp childrey2\MX\.prm,.dgb,.disp childrey3a\MX\.prm,.dgb,.disp childrey3b\MX\.prm,.dgb,.disp childrey4\MX\.prm,.dgb,.disp childrey5\MX\.prm,.dgb,.disp childrey6\MX\.prm,.dgb,.disp childrey7\MX\.prm,.dgb,.disp childrey8\MX\.prm,.dgb,.disp childrey9\MX\.prm,.dgb,.disp childrey10\MX\.prm,.dgb,.disp childrey11\MX\.prm,.dgb,.disp childrey13\MX\.prm,.dgb,.disp	Sensys MXPDA	Proprietary data formats representing magnetometer survey traverses logged to a PDA.	10/11/17 10/11/17 10/11/17 10/11/17 29/11/17 12/12/17 21/11/17 16/11/17 16/11/17 16/11/17 15/11/17 22/11/17 06/12/17	D.J.Sabin
childrey1\MX\J733-mag-Area1.asc childrey2\MX\J733-mag-Area2.asc childrey3a\MX\J733-mag-Area3a.asc childrey3b\MX\J733-mag-Area3b.asc childrey4\MX\J733-mag-Area4.asc childrey5\MX\J733-mag-Area5.asc childrey6\MX\J733-mag-Area6.asc childrey7\MX\J733-mag-Area7.asc childrey8\MX\J733-mag-Area8.asc childrey9\MX\J733-mag-Area9.asc childrey10\MX\J733-mag-Area10.asc childrey11\MX\J733-mag-Area11.asc childrey13\MX\J733-mag-Area13.asc	Sensys DLMGPS	ASCII CSV (tab) file representing survey area in eastings, northings (UTM Z30N), magnetic measurement, traverse file and sensor number.	20/11/17 20/11/17 20/11/17 20/11/17 4/12/17 12/12/17 22/11/17 20/11/17 20/11/17 20/11/17 20/11/17 28/11/17 7/12/17	K.T.Donaldson
Area1\comps\J733-mag-Area1.xcp Area2\comps\J733-mag-Area2.xcp Area3a\comps\J733-mag-Area3a.xcp Area3b\comps\J733-mag-Area3b.xcp Area4\comps\J733-mag-Area4.xcp Area5\comps\J733-mag-Area5.xcp Area6\comps\J733-mag-Area6.xcp Area7\comps\J733-mag-Area7.xcp Area8\comps\J733-mag-Area8.xcp Area9\comps\J733-mag-Area9.xcp Area10\comps\J733-mag-Area10.xcp Area11\comps\J733-mag-Area11.xcp Area13/comps\J733-mag-Area13.xcp	TerraSurveyor 3.0.23.0	Composite data file derived from ASCII CSV.	20/11/17 20/11/17 20/11/17 20/11/17 4/12/17 12/12/17 22/11/17 20/11/17 20/11/17 20/11/17 20/11/17 28/11/17 7/12/17	K.T.Donaldson
Area1\comps\J733-mag-Area1-proc.xcp Area2\comps\J733-mag-Area2-proc.xcp Area3a\comps\J733-mag-Area3a-proc.xcp Area3b\comps\J733-mag-Area3b-proc.xcp Area4\comps\J733-mag-Area4-proc.xcp Area5\comps\J733-mag-Area5-proc.xcp Area6\comps\J733-mag-Area6-proc.xcp Area7\comps\J733-mag-Area7-proc.xcp Area8\comps\J733-mag-Area8-proc.xcp Area9\comps\J733-mag-Area9-proc.xcp Area10\comps\J733-mag-Area10-proc.xcp Area11\comps\J733-mag-Area11-proc.xcp Area13/comps\J733-mag-Area13-proc.xcp	TerraSurveyor 3.0.23.0	Processed composite data file (zmt and clipping to ±2nT or ±3nT).	20/11/17 20/11/17 20/11/17 20/11/17 4/12/17 12/12/17 22/11/17 20/11/17 20/11/17 20/11/17 20/11/17 28/11/17 7/12/17	K.T.Donaldson

Graphic data - path: J733 Childrey Warren\Data				
Area1\graphics\J733-mag-Area1-proc.tif Area2\graphics\J733-mag-Area2-proc.tif Area3a\graphics\J733-mag-Area3a-proc.tif Area3b\graphics\J733-mag-Area3b-proc.tif Area4\graphics\J733-mag-Area4-proc.tif Area5\graphics\J733-mag-Area5-proc.tif Area6\graphics\J733-mag-Area6-proc.tif Area7\graphics\J733-mag-Area7-proc.tif Area8\graphics\J733-mag-Area8-proc.tif Area9\graphics\J733-mag-Area9-proc.tif Area10\graphics\J733-mag-Area10-proc.tif Area11\graphics\J733-mag-Area11-proc.tif Area13\graphics\J733-mag-Area13-proc.tif	TerraSurveyor 3.0.23.0	TIF file showing a minimally processed greyscale plot clipped to ±3nT. TIF file showing a minimally processed greyscale plot clipped to ±3nT. TIF file showing a minimally processed greyscale plot clipped to ±3nT. TIF file showing a minimally processed greyscale plot clipped to ±3nT. TIF file showing a minimally processed greyscale plot clipped to ±3nT. IF file showing a minimally processed greyscale plot clipped to ±3nT TIF file showing a minimally processed greyscale plot clipped to ±2nT. TIF file showing a minimally processed greyscale plot clipped to ±3nT. TIF file showing a minimally processed greyscale plot clipped to ±3nT. TIF file showing a minimally processed greyscale plot clipped to ±3nT. TIF file showing a minimally processed greyscale plot clipped to ±2nT. TIF file showing a minimally processed greyscale plot clipped to ±2nT. TIF file showing a minimally processed greyscale plot clipped to ±3nT.	20/11/17 20/11/17 20/11/17 20/11/17 4/12/17 12/12/17 22/11/17 20/11/17 20/11/17 20/11/17 20/11/17 28/11/17 7/12/17	K.T.Donaldson
Area1\graphics\J733-mag-Area1-proc.tfw Area2\graphics\J733-mag-Area2-proc.tfw Area3a\graphics\J733-mag-Area3a-proc.tif Area3b\graphics\J733-mag-Area3b-proc.tfw Area4\graphics\J733-mag-Area4-proc.tfw Area5\graphics\J733-mag-Area5-proc.tfw Area6\graphics\J733-mag-Area6-proc.tfw Area7\graphics\J733-mag-Area7-proc.tfw Area8\graphics\J733-mag-Area8-proc.tfw Area9\graphics\J733-mag-Area9-proc.tfw Area10\graphics\J733-mag-Area10-proc.tfw Area11\graphics\J733-mag-Area11-proc.tfw Area13\graphics\J733-mag-Area13-proc.tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.	20/11/17 20/11/17 20/11/17 20/11/17 4/12/17 12/12/17 22/11/17 20/11/17 20/11/17 20/11/17 20/11/17 28/11/17 7/12/17	K.T.Donaldson
CAD data - path: J733 Childrey Warren\CAD				
J733 version 3.dwg	ProgeCAD 2016	CAD file for creating plots of greyscales, abstraction, interpretation and mapping. Grid coordinates as OSGB. AutoCAD 2010 format.	07/12/17	K.T.Donaldson
Text data - path: J733 Childrey Warren				
J733 report.odt	OpenOffice.org 3.0.1 Writer	Report text as an Open Office document.	07/12/17	K.T.Donaldson

Table 3: File archive information

Appendix E – CAD layers for abstraction and interpretation plots

Table 3 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 NEG STRUCTURAL ARCHAEOLOGY		0,38,76	Line, polyline or polygon (solid)
AS-ABST MAG NEG LINEAR ARCHAEOLOGY		127,0,255	Line, polyline or polygon (solid)
AS-ABST MAG POS ENCLOSURE DITCH		127,0,255	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 POS UNCERTAIN		255,127,0	Polygon (cross hatched ANSI37)
Anomalies relating to land management			

AS-ABST MAG BOUNDARY		127,0,0	Line, polyline or polygon (solid or cross hatched ANSI37)
AS-ABST MAG TRACK		0, 153,153	Line, polyline or polygon (solid or partly cross hatched ANSI38)
Anomalies with an agricultural origin			
AS-ABST MAG AGRICULTURAL		Green 0,255,0	Line or polyline
Anomalies associated with magnetic debris			
AS-ABST MAG DEBRIS		132, 132, 132	Polygon (cross hatched ANSI37)
AS-ABST MAG STRONG DIPOLAR		132, 132, 132	Solid donut, point or polygon (solid)
Anomalies with a modern origin			
AS-ABST MAG DISTURBANCE		132, 132, 132	Polygon (hatched ANSI31)
AS-ABST MAG SERVICE		132, 132, 132	Line or polyline

Table 4: CAD layering

Appendix F – copyright and intellectual property

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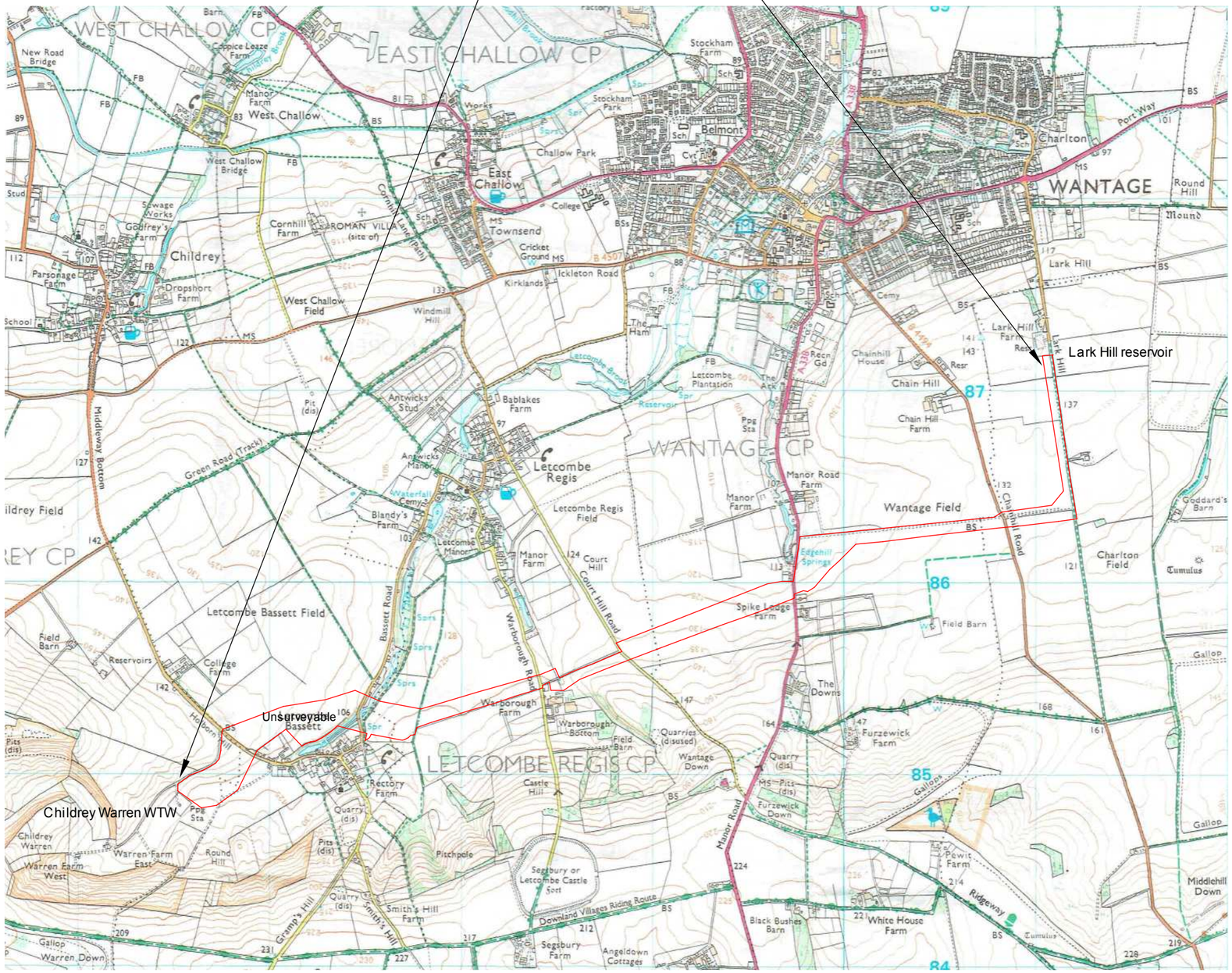
Survey location

N

Lark Hill reservoir

Unsurveyable

Childrey Warren WTW



Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Map of survey area

● Survey location

Site located between OS NGR SU 41060 87186 and SU 36570 84881

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

FIG 01

Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Referencing information - east

Referencing grid to OSGB36 datum at 100m intervals

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

SCALE 1:8000

0m 80 160 240 320 400m

SCALE TRUE AT A3

FIG 02

Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Referencing information - west

Referencing grid to OSGB36 datum at 100m intervals

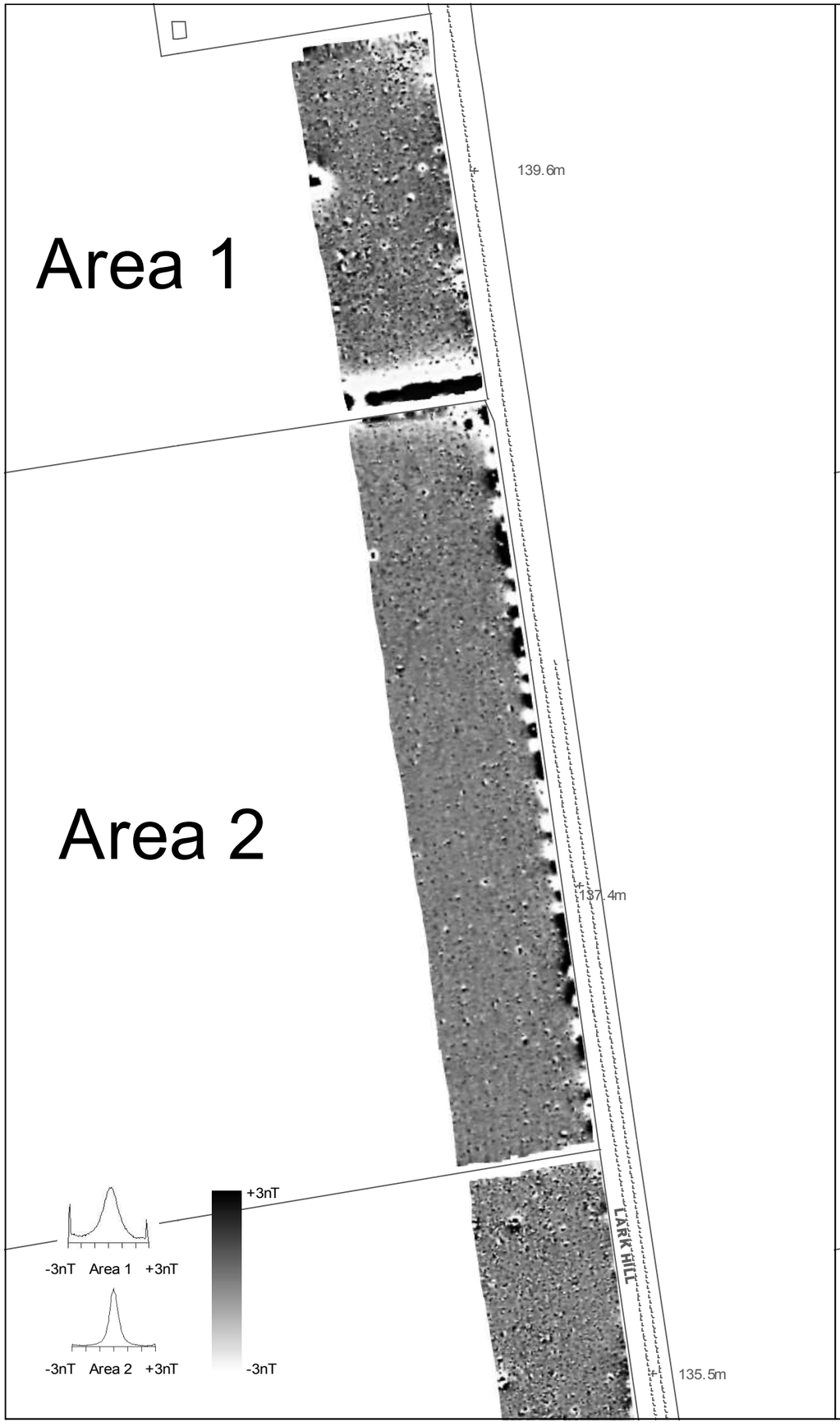
Data collected at 20Hz and georeferenced to ETRS89 zone 30 with conversion to OSGB36 using OSTN02

SCALE 1:8000

0m 80 160 240 320 400m

SCALE TRUE AT A3

FIG 02



Archaeological Surveys Ltd

Geophysical Survey Childrey Warren WTW Abstraction Closure Oxfordshire

Greyscale plot of minimally processed magnetometer data and abstraction and interpretation of magnetic anomalies - Areas 1 & 2

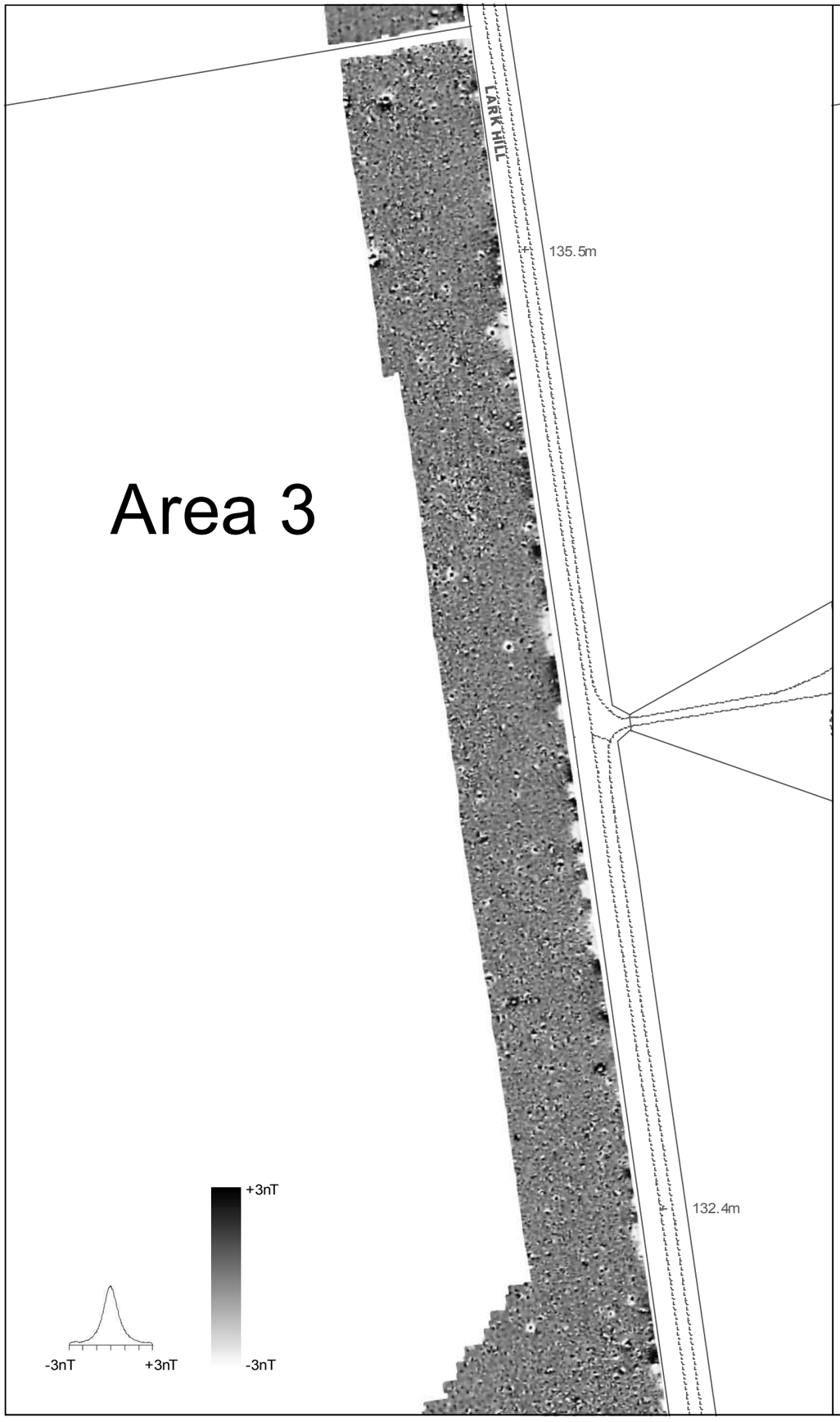
- Positive linear anomaly - possible ditch-like feature
- Discrete positive response - possible pit-like feature
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

SCALE 1:1500

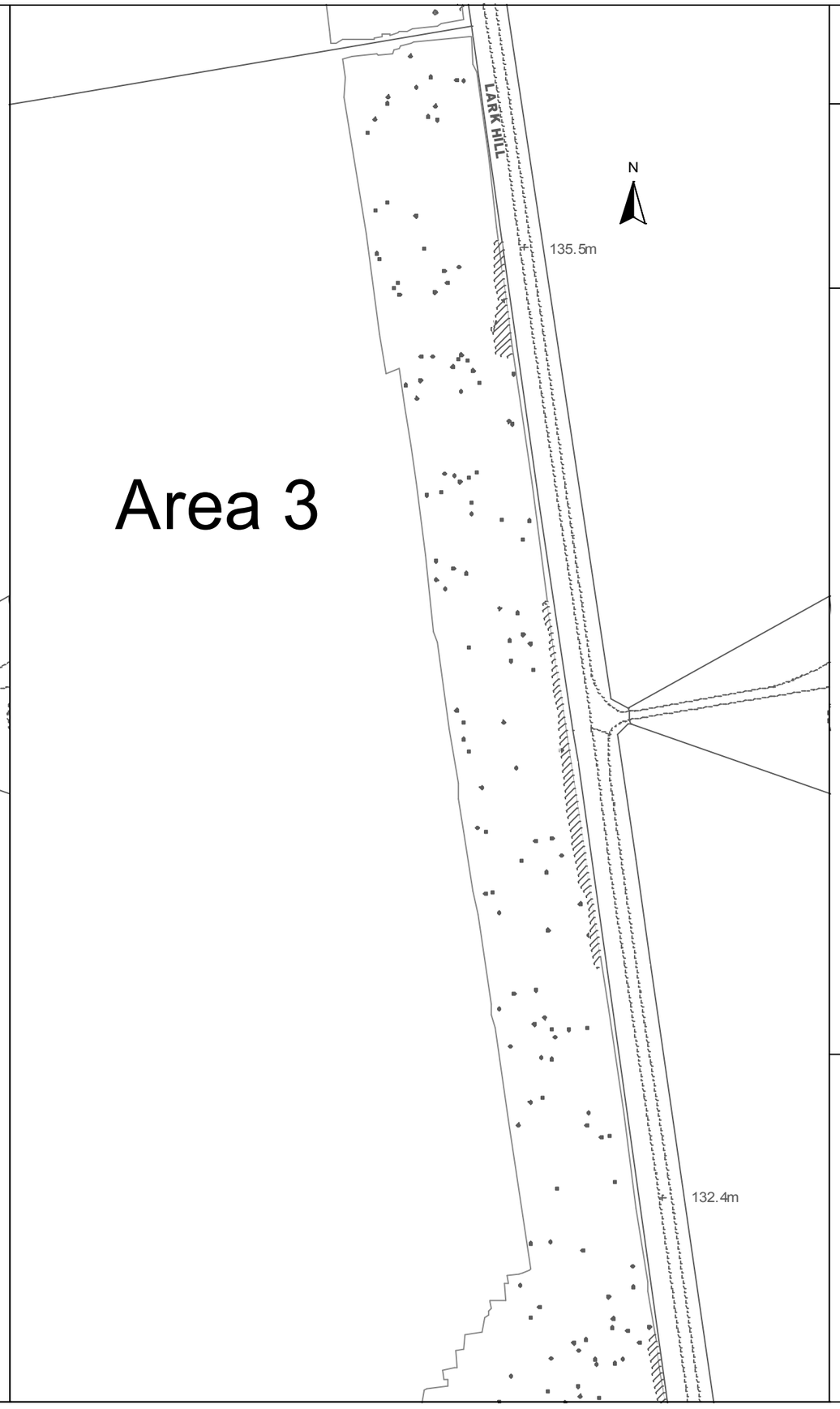
0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 04



Area 3



Area 3

Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Greyscale plot of minimally processed magnetometer data and abstraction and interpretation of magnetic anomalies - Area 3 north

Magnetic disturbance from ferrous material

Strong dipolar anomaly - ferrous object

SCALE 1:1500

0m 10 20 30 40 50m

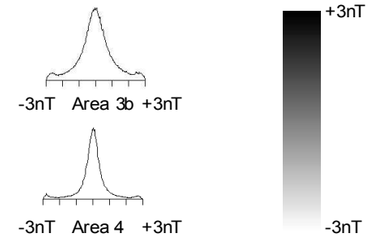
SCALE TRUE AT A3

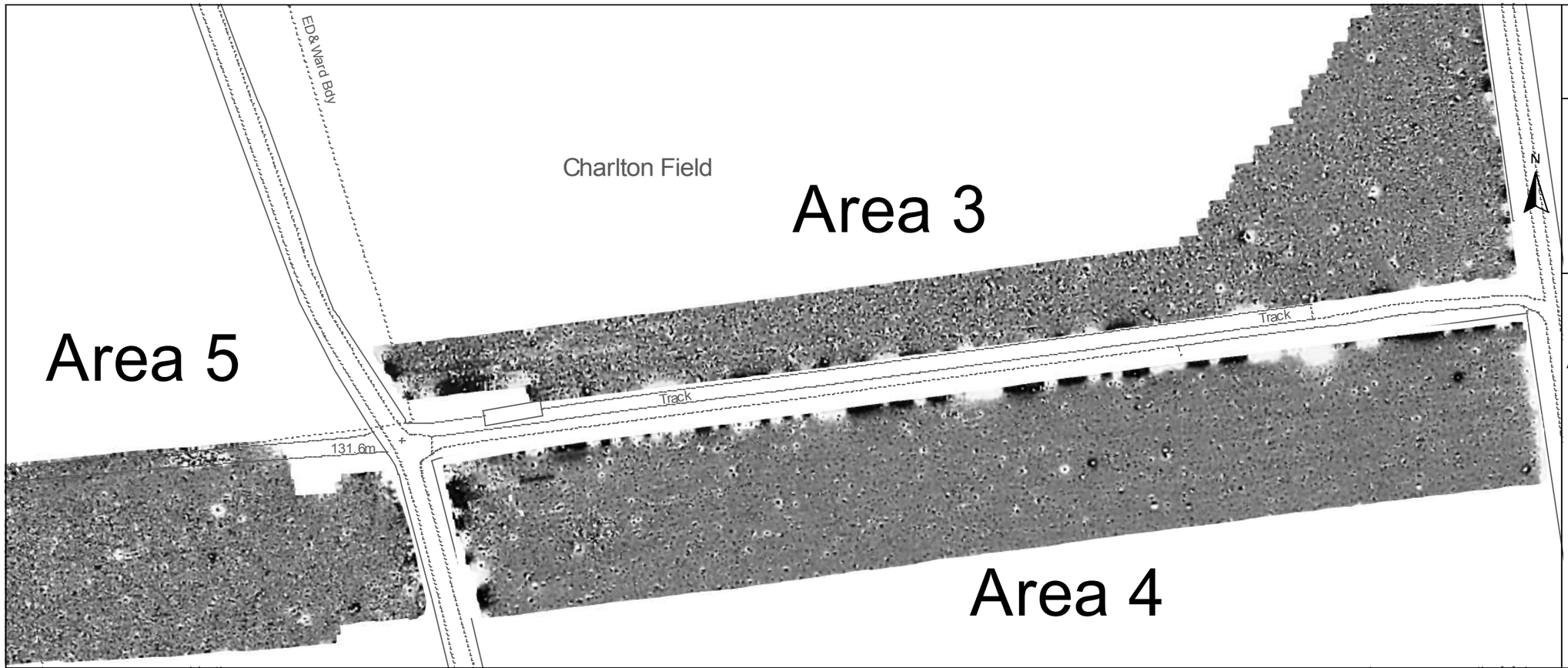
FIG 05

Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Greyscale plot of minimally processed magnetometer data - Area 3 south, Area 4 & Area 5 east

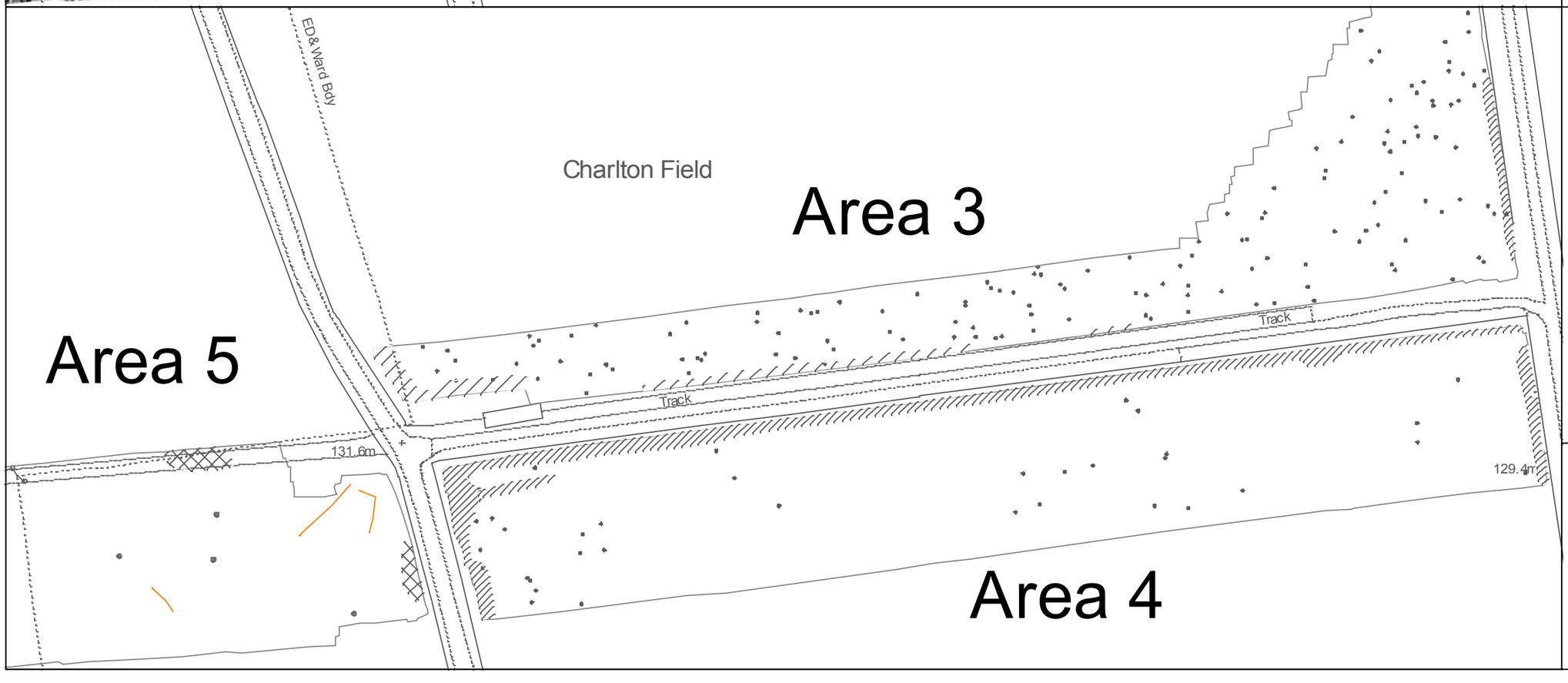




Abstraction and interpretation of magnetic anomalies

Magnetic disturbance from ferrous material

Strong dipolar anomaly - ferrous object



SCALE 1:1500

0m 10 20 30 40 50m

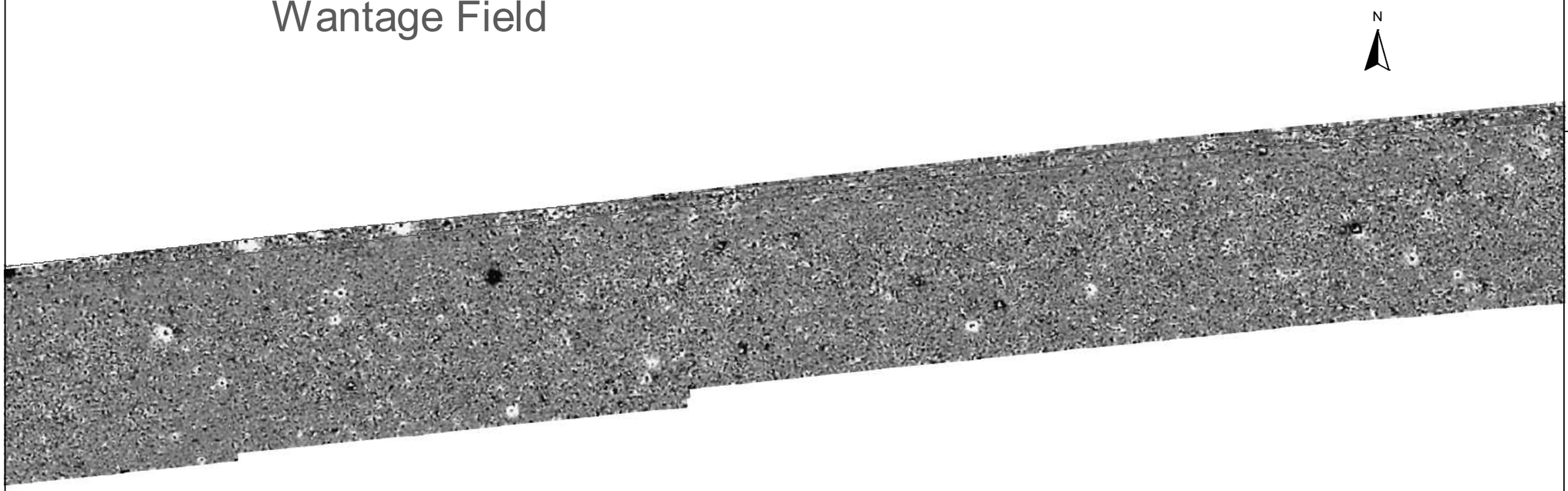
SCALE TRUE AT A3

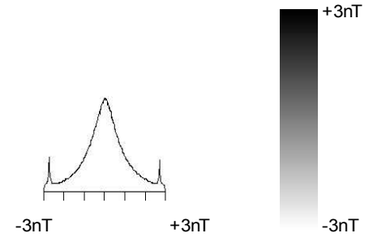
FIG 06

Archaeological Surveys Ltd

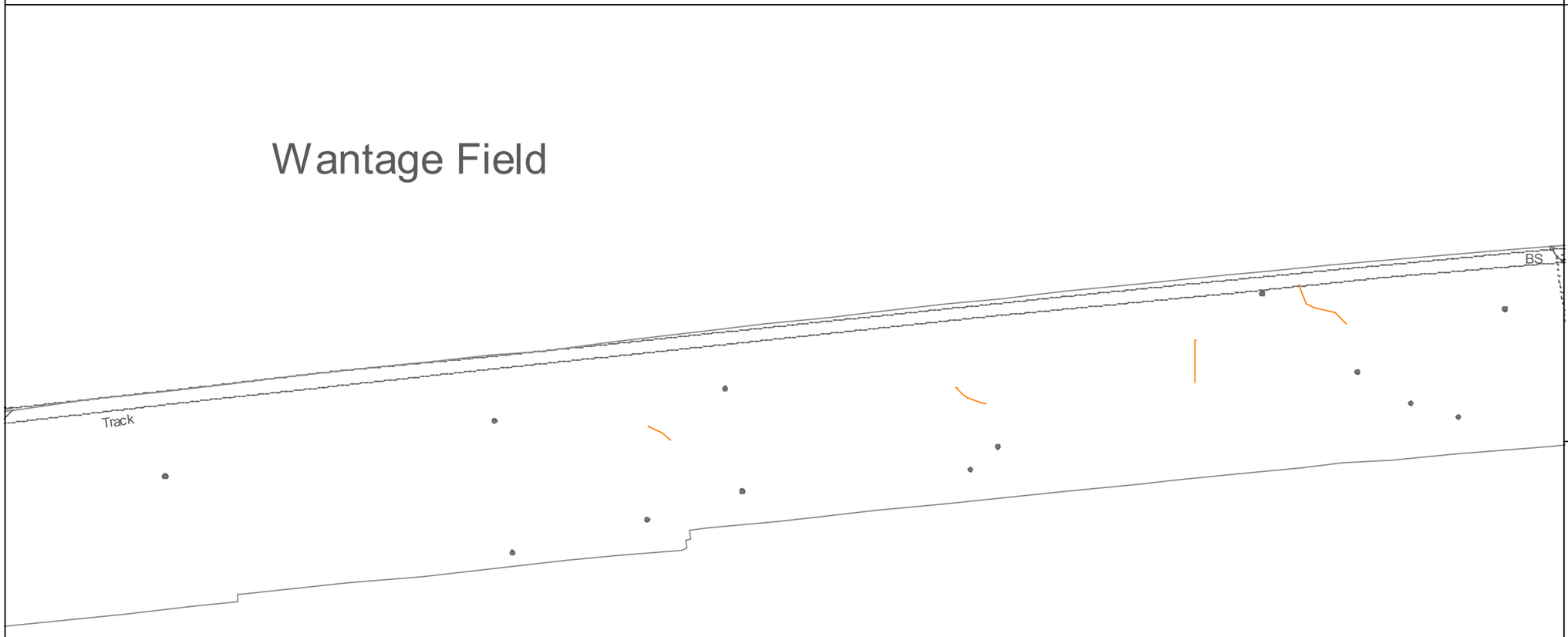
Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Greyscale plot of minimally processed magnetometer data - Area 5 centre





Abstraction and interpretation of magnetic anomalies



Positive linear anomaly - possible ditch-like feature

Strong dipolar anomaly - ferrous object

SCALE 1:1500

0m 10 20 30 40 50m

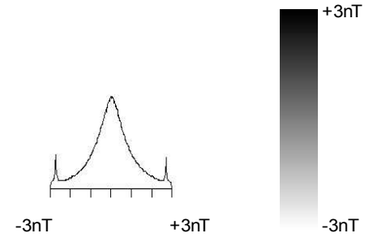
SCALE TRUE AT A3

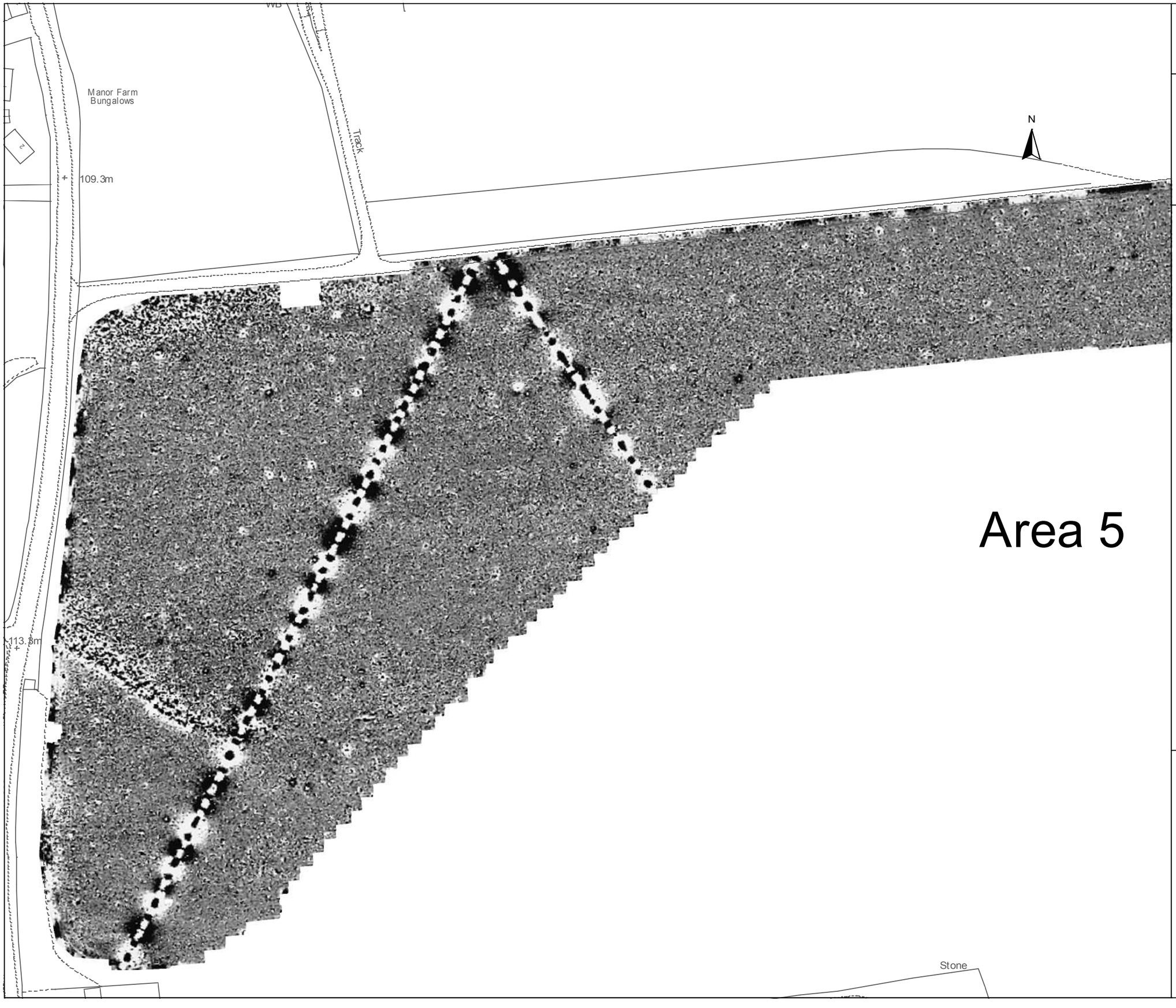
FIG 07

Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Greyscale plot of minimally processed magnetometer data - Area 5 west





SCALE 1:1500

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 08

Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Abstraction and interpretation of magnetic anomalies - Area 5 west

- Positive linear anomaly - possible ditch-like feature
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- Strong dipolar anomaly - ferrous object

SCALE 1:1500

0m 10 20 30 40 50m

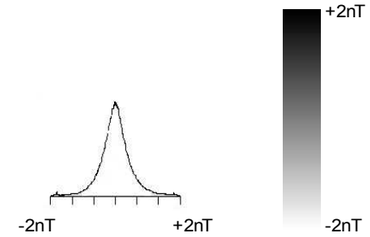
SCALE TRUE AT A3

FIG 09

Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Greyscale plot of minimally processed magnetometer data - Area 6 east



Abstraction and interpretation of magnetic anomalies

- Positive linear anomaly - possible ditch-like feature
- Positive linear anomaly - former field boundary
- Positive anomaly - magntically enhanced material of uncertain origin
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- Strong dipolar anomaly - ferrous object

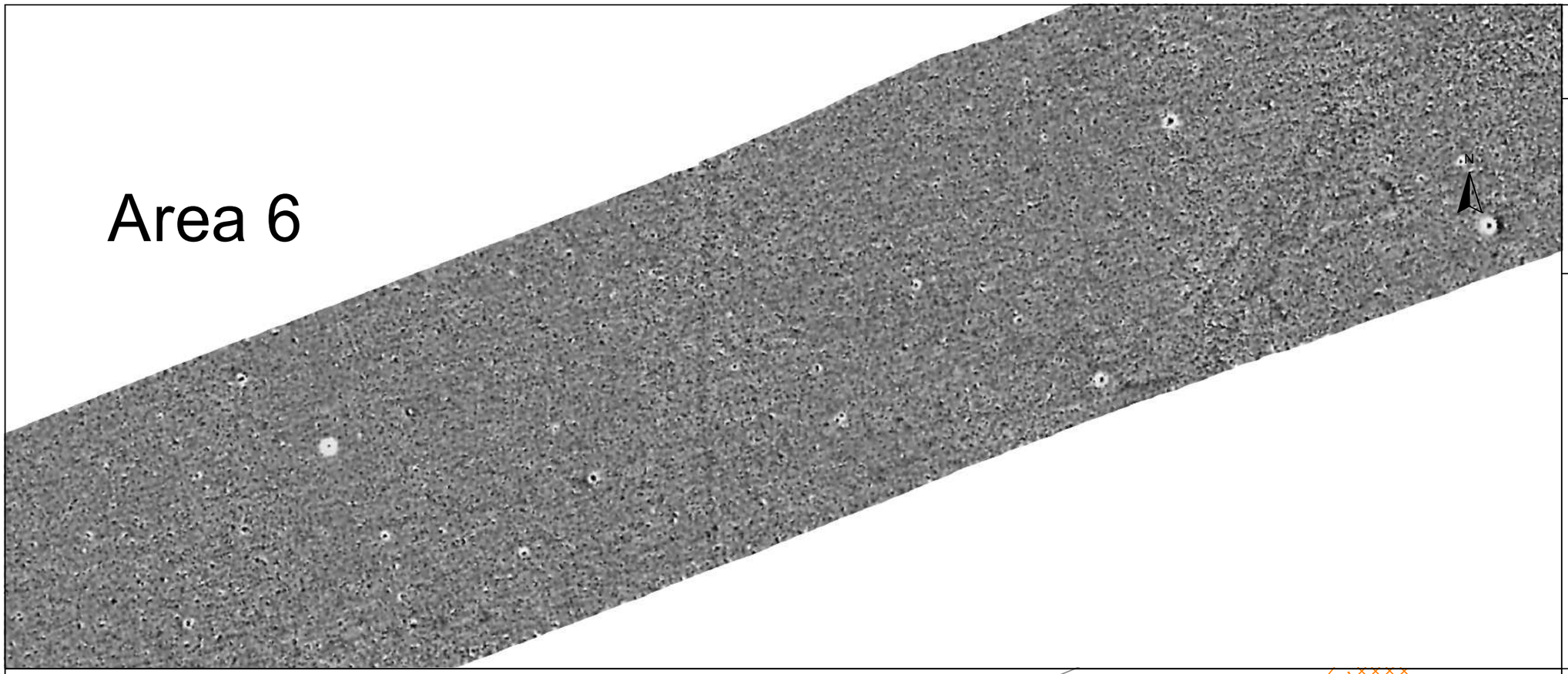
SCALE 1:1500

0m 10 20 30 40 50m

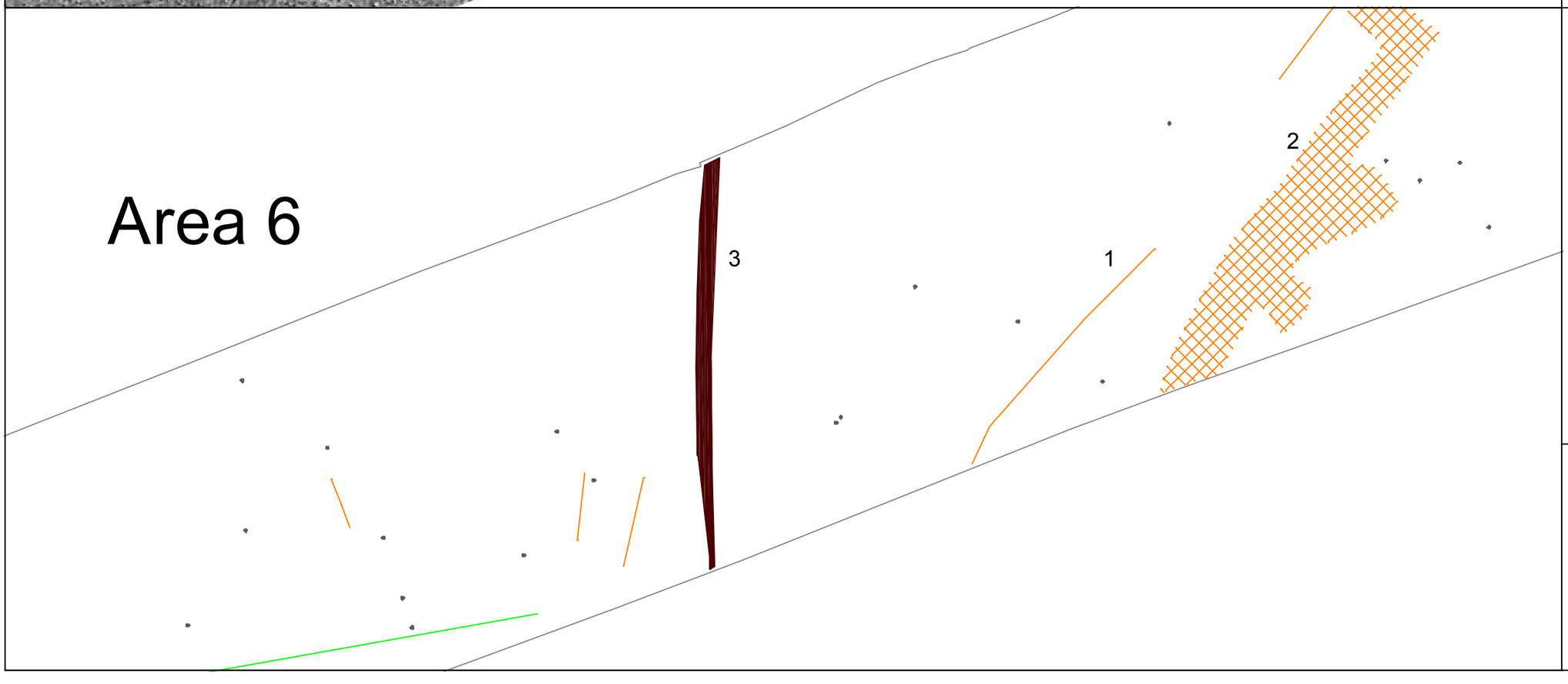
SCALE TRUE AT A3

FIG 10

Area 6



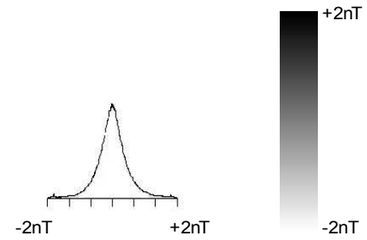
Area 6



Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Greyscale plot of minimally processed magnetometer data - Area 6 centre



Abstraction and interpretation of magnetic anomalies

- Positive linear anomaly - possible ditch-like feature
- Positive linear anomaly - possible former field boundary
- Discrete positive response - possible pit-like feature
- Positive anomaly - magntically enhanced material of uncertain origin
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- Strong dipolar anomaly - ferrous object

SCALE 1:1500

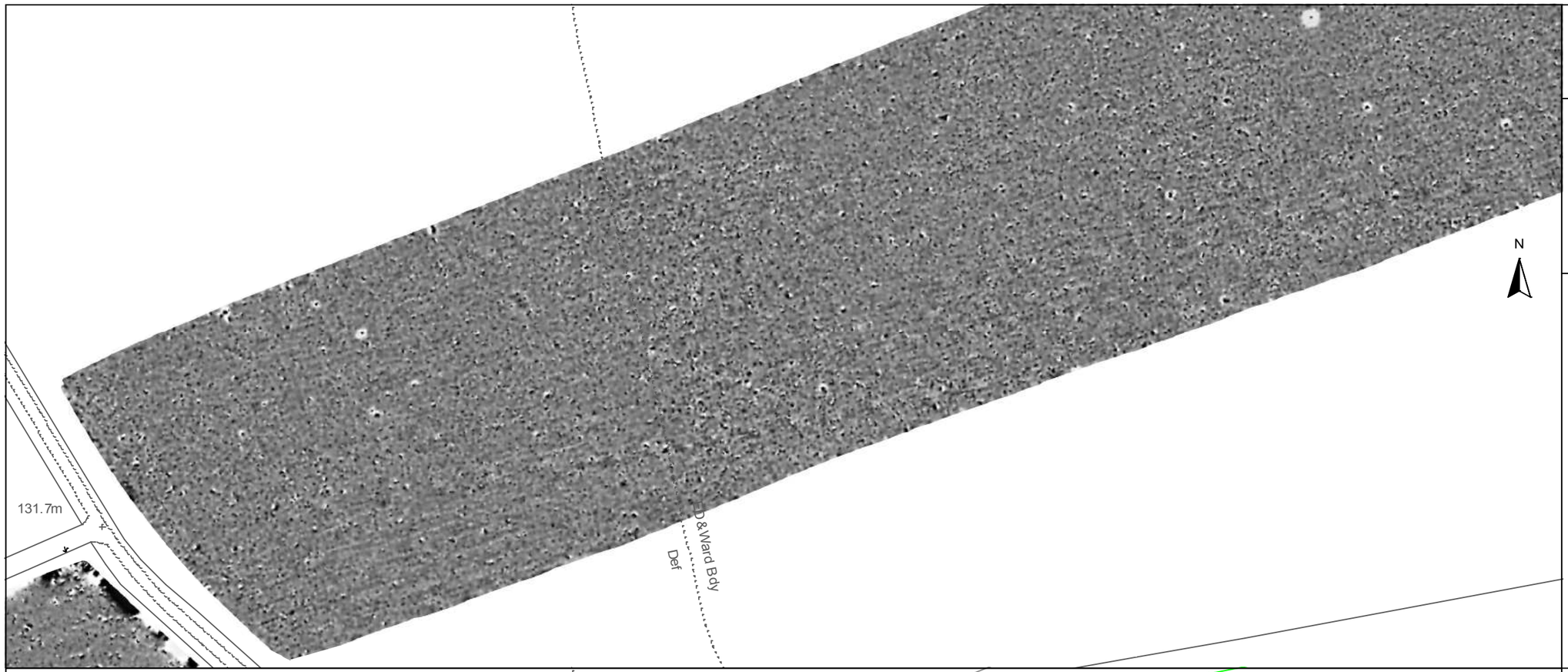
0m 10 20 30 40 50m

SCALE TRUE AT A3

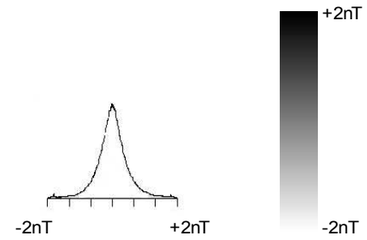
FIG 11

Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire



Greyscale plot of minimally processed magnetometer data - Area 6 west



Abstraction and interpretation of magnetic anomalies

- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - of agricultural origin
- Discrete positive response - possible pit-like feature
- Strong dipolar anomaly - ferrous object

SCALE 1:1500

0m 10 20 30 40 50m

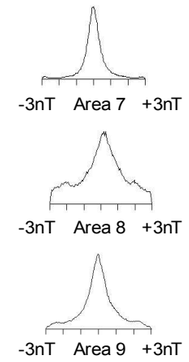
SCALE TRUE AT A3

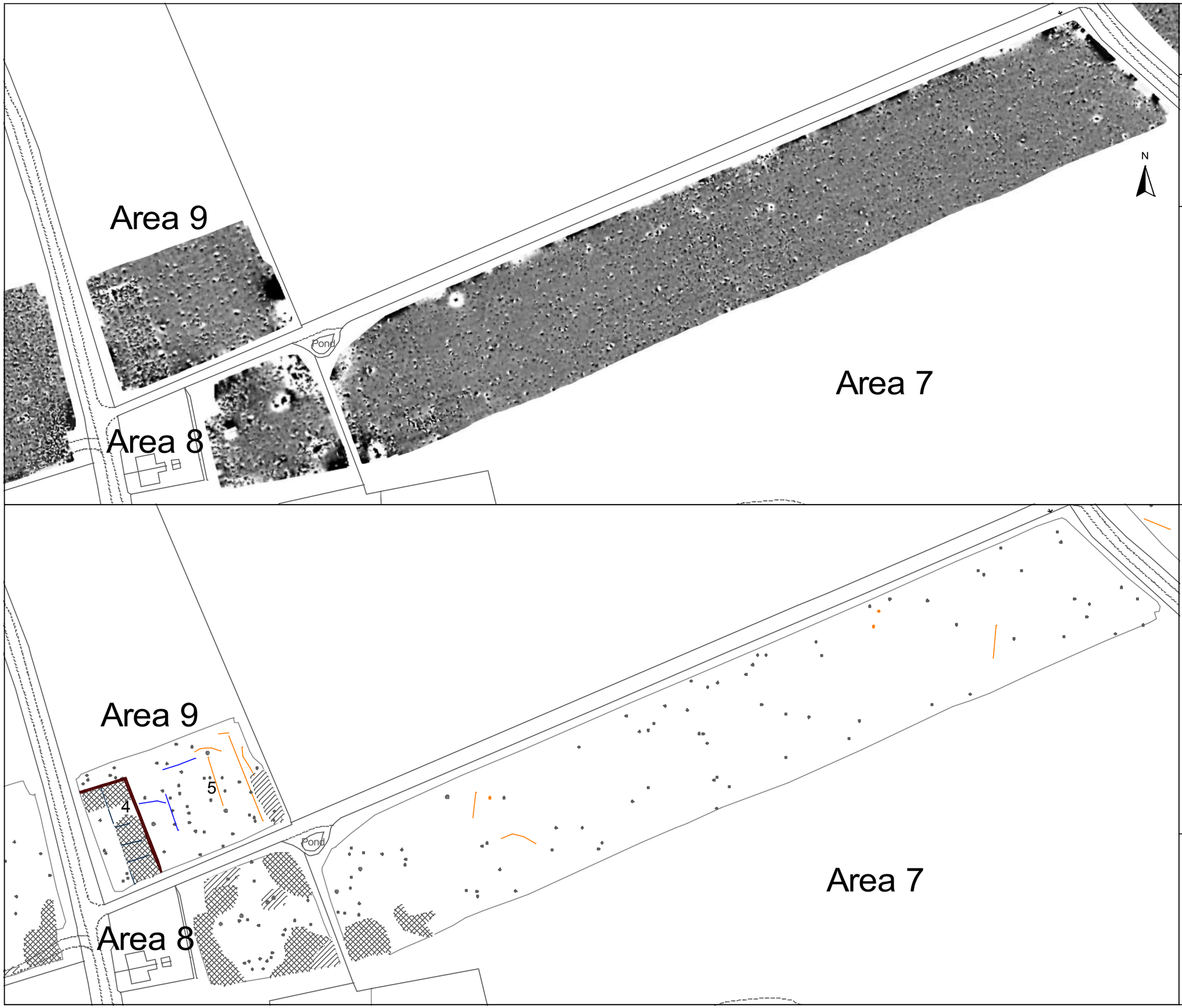
FIG 12

Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Greyscale plot of minimally processed magnetometer data - Areas 7, 8 & 9





Abstraction and interpretation of magnetic anomalies

- Negative linear anomaly - structural remains of archaeological potential
- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Positive linear anomaly - possible former field boundary
- Discrete positive response - possible pit-like feature
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

SCALE 1:1500

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 13

Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Area 10

Area

Track

Greyscale plot of minimally processed magnetometer data - Area 10 east

+2nT

-2nT +2nT -2nT

Area 10

Area

4

7

9

6

8

Track

Abstraction and interpretation of magnetic anomalies

- Positive linear anomaly - cut feature of archaeological potential
- Positive linear anomaly - possible ditch-like feature
- Discrete positive response - cut feature of archaeological potential
- Discrete positive response - possible pit-like feature
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

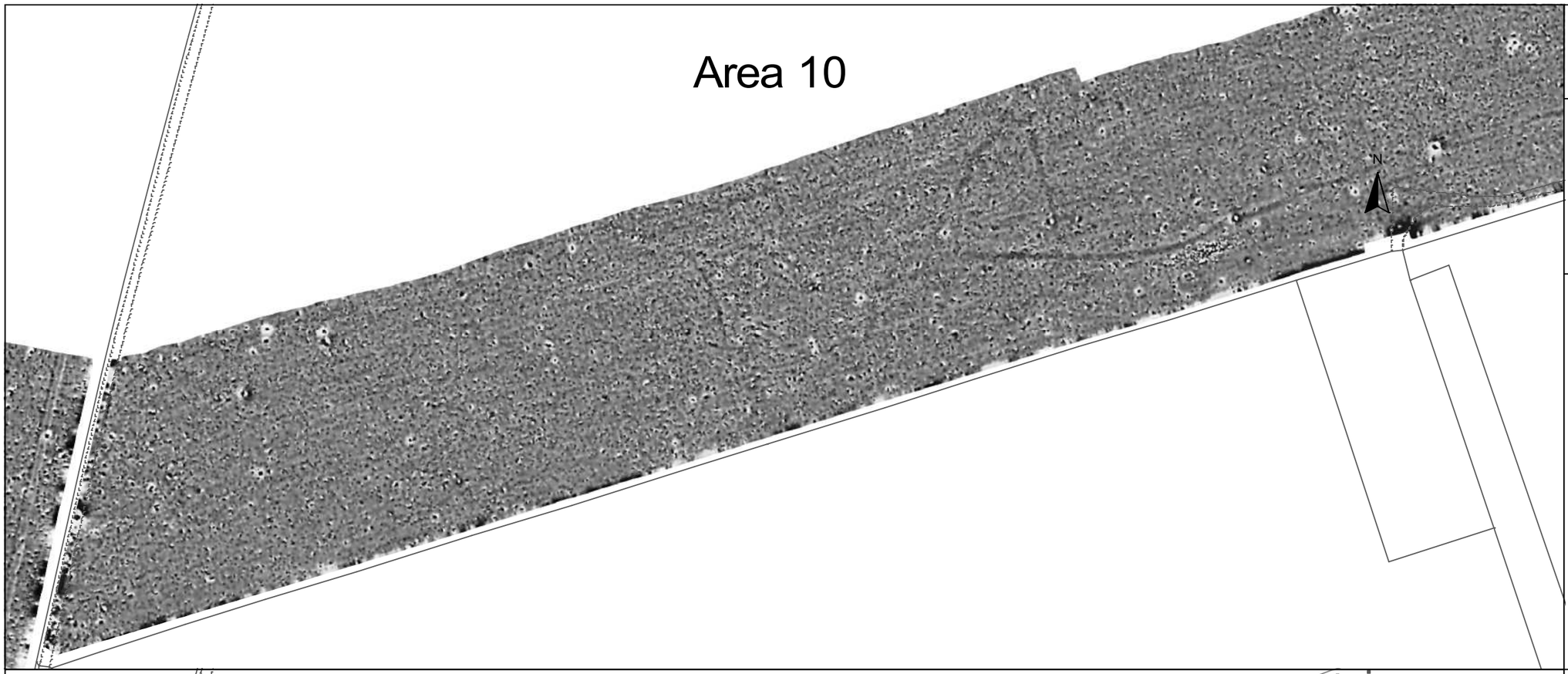
SCALE 1:1500

0m 10 20 30 40 50m

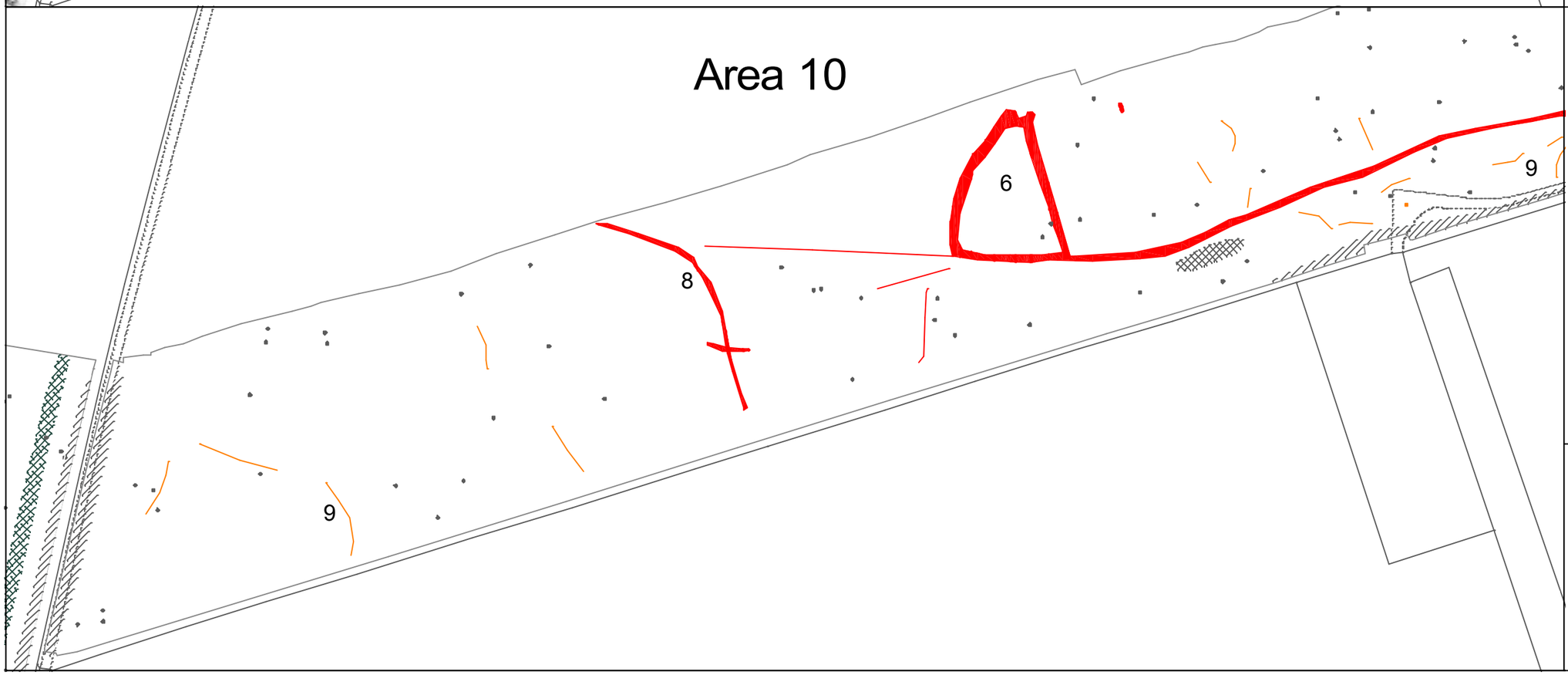
SCALE TRUE AT A3

FIG 14

Area 10



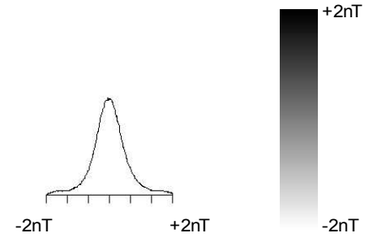
Area 10



Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Greyscale plot of minimally processed magnetometer data - Area 10 west



Abstraction and interpretation of magnetic anomalies

- Positive linear anomaly - cut feature of archaeological potential
- Positive linear anomaly - possible ditch-like feature
- Discrete positive response - cut feature of archaeological potential
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

SCALE 1:1500

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 15

Area 11

Foot Bridge

Drain

SS

Watercress Bed

Spring

106.4m

112.2m

s Farm

N

Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Greyscale plot of minimally processed magnetometer data - Area 11

+2nT

-2nT

+2nT

-2nT

Area 11

12

11

13

10

9

Abstraction and interpretation of magnetic anomalies

- Positive linear anomaly - possible ditch-like feature
- Positive linear anomaly - possible former field boundary
- Negative linear anomaly - material of low magnetic susceptibility
- Positive anomaly flanked by negative responses - former horse track/gallops
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

SCALE 1:1500

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 16

Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Greyscale plot of minimally processed magnetometer data - Area 13

+3nT

-3nT +3nT -3nT

144.1m
BS
122m RH
HOLBORN HILL
Holborn House
123.7m
Track
Spanswick Fa
Cottages
N
Area 13
Water Pumping Station

SCALE 1:1500

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 17

Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Abstraction and interpretation of magnetic anomalies - Area 13

- Positive linear anomaly - cut feature of archaeological potential
- Negative rectlinear anomaly - of archaeological potential
- Positive curvilinear/rectilinear anomaly - enclosure ditch
- Positive linear anomaly - possible ditch-like feature
- Discrete positive response - cut feature of archaeological potential
- Positive anomaly - magnetically enhanced material of archaeological potential
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- Strong dipolar anomaly - ferrous object

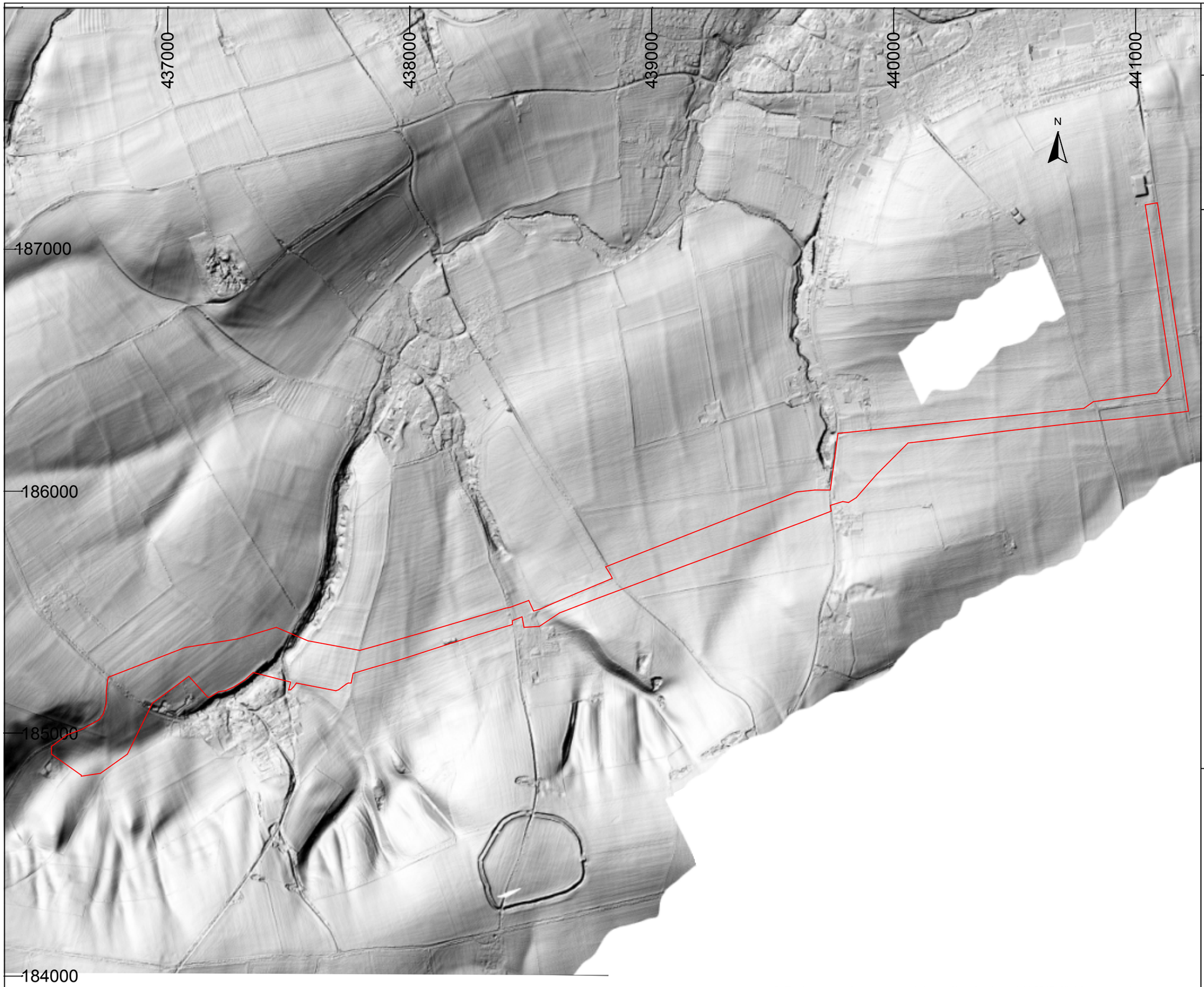
SCALE 1:1500

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 18

144.1m
BS
122m RH
HOLBORN HILL
N
135.4m
Holborn House
123.7m
Track
Und
14
15
16
17
18
19
20
Area 13
Water Pumping Station



Archaeological Surveys Ltd

Geophysical Survey
Childrey Warren WTW
Abstraction Closure
Oxfordshire

Digital Terrain Model

Derived from Environment Agency's LiDAR data 1m resolution

SCALE 1:15 000

0m 100 200 300 400 500m

SCALE TRUE AT A3

FIG 19