1 Introduction

Archaeological Services ASWYAS has been commissioned by Pegasus Group on behalf of Catesby Estates Plc to undertake a geophysical survey at land at Moat Road, Headcorn, Kent. This was undertaken in line with current best practice (CIfA 2020; Schmidt *et al*. 2015). The survey was carried out between 6th and 7th March 2023 to provide additional information on the archaeological resource of the Site.

Site location, topography and land-use

The Site is located on the western outskirts of Headcorn, approximately 10km to the west of Ashfield, centred at TQ 8291 4457 (see Fig. 1). The development area consists of approximately 7.2ha over two pasture fields (see Plates 1-4). The southeast area of the Site was not suitable for survey due to farm buildings.

The Site is bounded to the south by Moat Road, to the east and north by residential properties and to the west by further pasture and Black Mill Lane. The above Ordnance Datum (aOD) varies from approximately 32m aOD in the north to approximately 21m aOD in the south.

Soils and geology

The underlying bedrock of the Site comprises limestone of the Weald Clay Formation, a sedimentary bedrock formed between 133 and 126 million years ago in the Cretaceous Period (BGS 2023). Soils of the area are described as slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils (Soilscape 18) (CSAI 2023).

2 Archaeological Background

The following archaeological background is taken from a Heritage and Archaeological Assessment prepared by Pegasus Group (Pegasus 2022) and is informed by an initial high-level review of the Kent Historic Environment Record (HER) data sourced from a study area of 1km measured from the boundaries of the Site.

Two Neolithic findspots have been recorded, namely a polished flint axe (84SW7) found *c*. 380m south of Site, and a flint axe (55729) found *c*. 1km northeast of Site.

A possible mid to late Bronze Age vessel within a pit (84SW257) has been recorded *c*. 345m to the east of the Site, and two late Iron Age to early Roman furnace pits were found *c*. 370m east of the Site (84SW258). There is also the findspot of an Iron Age lead alloy weight (95623) *c*. 150m south of the Site.

Within the Site, three Romano-British findspots have been recorded. They comprised an incomplete copper alloy seal box lid (79691), a silver zoomorphic terminal from a finger ring

or bracelet (79692), and a copper alloy key handle in the form of a lion (79693). All artefacts were found by the same individual and their precise findspots are not recorded (i.e. they have been assigned six-digit national grid references) and therefore could have been found beyond the site. No associated features were recorded.

The remains of a homestead moat at Moat Farm (84SW5) are recorded *c*. 40m southeast of the Site boundary. The HER data for this monument identifies that the road constructed between Headcorn and Staplehurst destroyed all traces of the south side of the moat, and the eastern side was filled in leaving no traces. The western side was incorporated into a pond.

The Tithe map of 1841 suggests that a pond, which once extended into the south-eastern area of the Site, may have once been a feeder body of water for the moat.

The settlement of Headcorn (84SW16), which is of medieval origin, lies *c*. 350m southeast of the Site.

Based on the available information, the Site appears to have formed part of the agricultural hinterland of Headcorn during the medieval period.

Within the Site, there is one recorded post-medieval 'monument', namely the farmstead relating to Moat Farm (82239) which extends into the south-eastern section of Site. The HER describes it as a dispersed multiyard farmstead which has been significantly altered to the point of more than a 50% loss of fabric.

The site of a former Royal Observer Corps Underground Monitoring Post (84SW26) is recorded in the north-eastern section of Site. This is thought to have been completed by 1961, with evidence for its construction being visible on aerial photographs from 1960. It was abandoned in 1968 due to defence cutbacks. The above ground elements of the monitoring post, which may have comprised concrete plinths, an access hatch, air vents and monitoring equipment, have been removed. Any surviving below-ground remains are not considered to be of a significance which would represent a constraint to development, although recording of any surviving remains may be appropriate.

3 Aims, Methodology and Presentation

The aims and objectives of the programme of geophysical survey were to gather sufficient information to establish the presence/absence, character and extent, of any archaeological remains within the specific area and to inform an assessment of the archaeological potential of the site. To achieve this aim, a magnetometer survey covering all amenable parts of the Site was undertaken (see Fig. 2).

The general aims of the geophysical survey were:

- to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- to therefore determine the presence/absence and extent of any buried archaeological features; and
- to prepare a report summarising the results of the survey.

Magnetometer survey

The cart-based survey was undertaken using an eight channel SenSYS MX V3 system containing eight FGM650 sensors. Readings are taken every 20MHz (between 0.05 and 0.1m). Data were recorded onto a device, using a Carlson GNSS Smart antenna, for centimetre accuracy. These readings were stored in the memory of the instrument and downloaded for processing and interpretation. DLMGPS and MAGNETO software, alongside bespoke in-house software was used to process and present the data. Further details are given in Appendix 1.

Reporting

A general site location plan, incorporating the 1:50000 Ordnance Survey (OS) mapping, is shown in Figure 1. Figure 2 displays processed magnetometer data at a scale of 1:2000 whilst Figure 3 shows an overview of the interpretation at the same scale. Processed and minimally processed data, together with interpretation of the survey results are presented in Figures 4 to 9 inclusive at a scale of 1:1000.

Technical information on the equipment used, data processing and survey methodologies are given in Appendix 1. Technical information on locating the survey area is provided in Appendix 2. Appendix 3 describes the composition and location of the archive. A copy of the completed OASIS form is included in Appendix 4.

The survey methodology, report and any recommendations comply with guidelines outlined by the European Archaeological Council (Schmidt *et al*. 2015) and by the Chartered Institute for Archaeologists (CIfA 2020). All figures reproduced from Ordnance Survey mapping are with the permission of the controller of His Majesty's Stationery Office (© Crown copyright).

The figures in this report have been produced following analysis of the data in processed formats and over a range of different display levels. All figures are presented to most suitably display and interpret the data from this site based on the experience and knowledge of Archaeological Services staff.

4 Results and Discussion (see Figures 4 to 9)

Ferrous anomalies and magnetic disturbance

Ferrous anomalies, as individual 'spikes', or as large discrete areas are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris or material is common on rural sites, often being present as a consequence of manuring or tipping/infilling. There is no obvious pattern or clustering to their distribution in this survey to suggest anything other than a random background scatter of ferrous debris in the plough-soil.

A large circular ferrous response (**F1**) has been recorded in the northern area and corresponds with the location of the former Royal Observer Corps Underground Monitoring Post (84SW26). The monitoring post can be seen under construction on aerial images from 1960 (Google Earth 2023). The post has caused such a large magnetic response due to the construction materials used, most likely concrete.

A smaller ferrous response (**F2**) to the east of **F1** is likely to be associated with a pylon which is depicted on aerial images from 1960 to 2018 (Google Earth 2023). The response is likely due to foundations which remain *in situ*.

An area of magnetic disturbance (**F3**) situated between the two fields in the east corresponds with a small 'triangle' field which is seen on aerial images from 1940 (Google Earth 2023) and also on the 1970 OS map (Pegasus 2022; Plate 8). On the 2015 image, the boundary has been removed and the Site layout is as it is today. The 1960 image shows some areas of possible hardstanding which is likely to have caused the response.

Magnetic disturbance (**F4**) in the southwest of the southern area is interference from the adjacent electricity substation. Magnetic disturbance along the limits of the survey areas is due to metal fencing within the field boundaries and interference.

Geological anomalies

The survey has detected a handful of anomalies that have been interpreted as geological in origin. It is thought that the responses have been detected because of the variation in the composition and depth of the deposits of superficial material in which they derive. It is also possible that these responses are small ferrous anomalies which are buried at a greater depth and therefore not showing the typical 'spike'.

Agricultural anomalies

The magnetic survey has detected two former field boundaries (**FB1** and **FB2**), both within the northern field. They can be seen on aerial images from 1940 (Google Earth 2023) and

also on the 1970 OS map (Pegasus 2022; Plate 8). By 1990 both boundaries have been removed but remain visible as cropmarks. It is possible that the boundary ditches have been utilised as field drains or small service pipes due to the dipolar magnetic response.

Magnetically weak parallel linear trends can be seen within both areas and are associated with former cultivation.

Uncertain anomalies

Magnetically weak linear and curvilinear trends can be seen just above the magnetic background levels and have proved difficult to ascertain a definite interpretation. Anomaly **U1** in the northern field is a curving response and most likely associated with agricultural activity.

Response **U2** roughly corresponds to a cropmark seen on the 1960 aerial image (Google Earth 2023) which may indicate an old field boundary predating any available historic maps or a footpath.

A small circular response (**U3**) has been recorded in the southern field. It measures approximately 5m in diameter and may be of some archaeological interest. Although due to its weak response and isolation, any interpretation is tentative.

5 Conclusions

The geophysical survey has detected magnetic anomalies associated with past agricultural use of the Site including former field boundaries and cultivation. A large ferrous response corresponds with the site of a Royal Observer Corps Underground Monitoring Post whilst other ferrous responses are associated with a former pylon, possible areas of hard standing/ rubble, interference from the electricity substation and metal fencing within the boundaries.

Uncertain responses within the dataset are likely to be of an agricultural nature, although an archaeological interest cannot be ruled out entirely.

Based on the geophysical survey, the archaeological potential of this Site is deemed to be low.

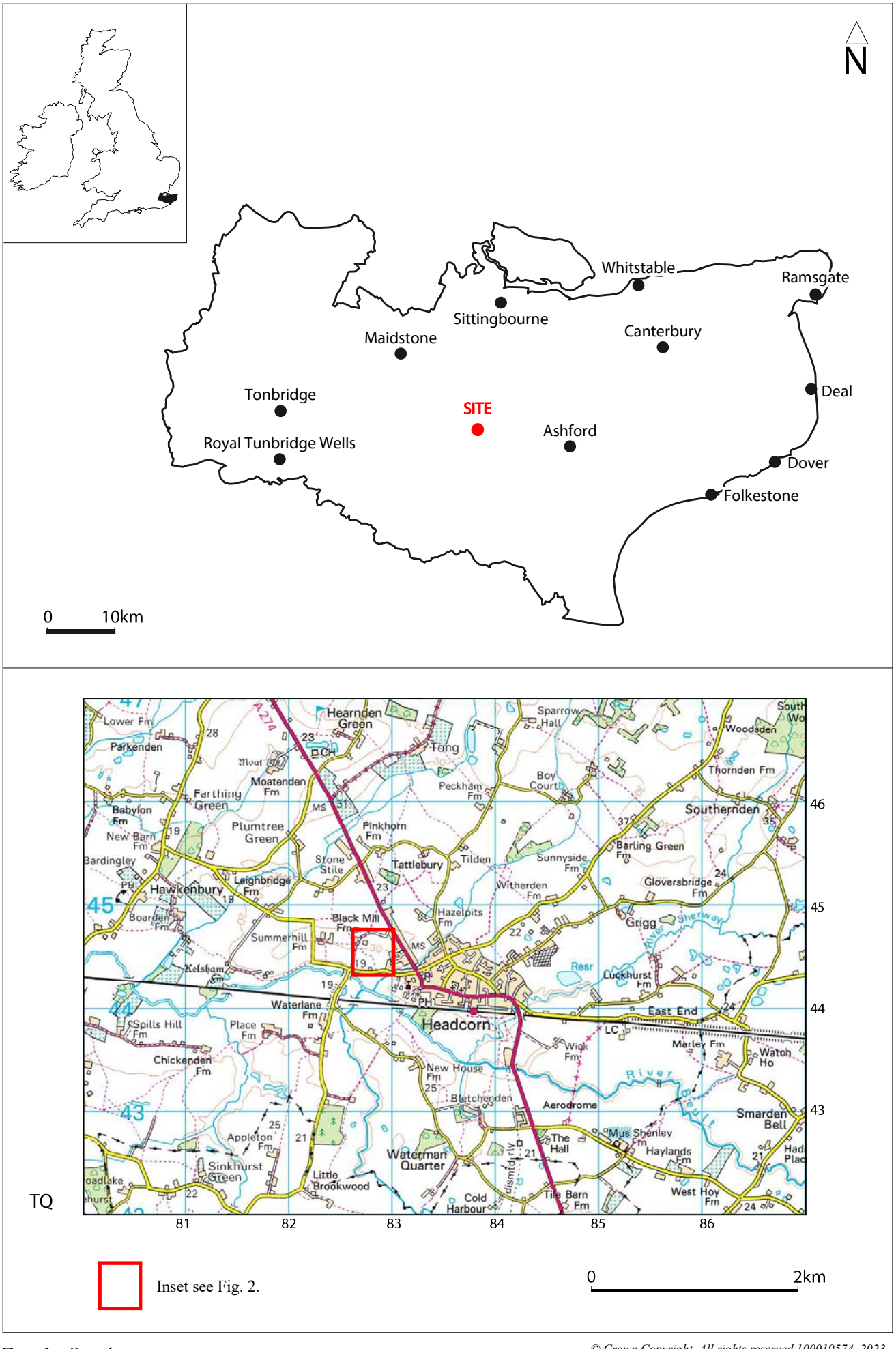
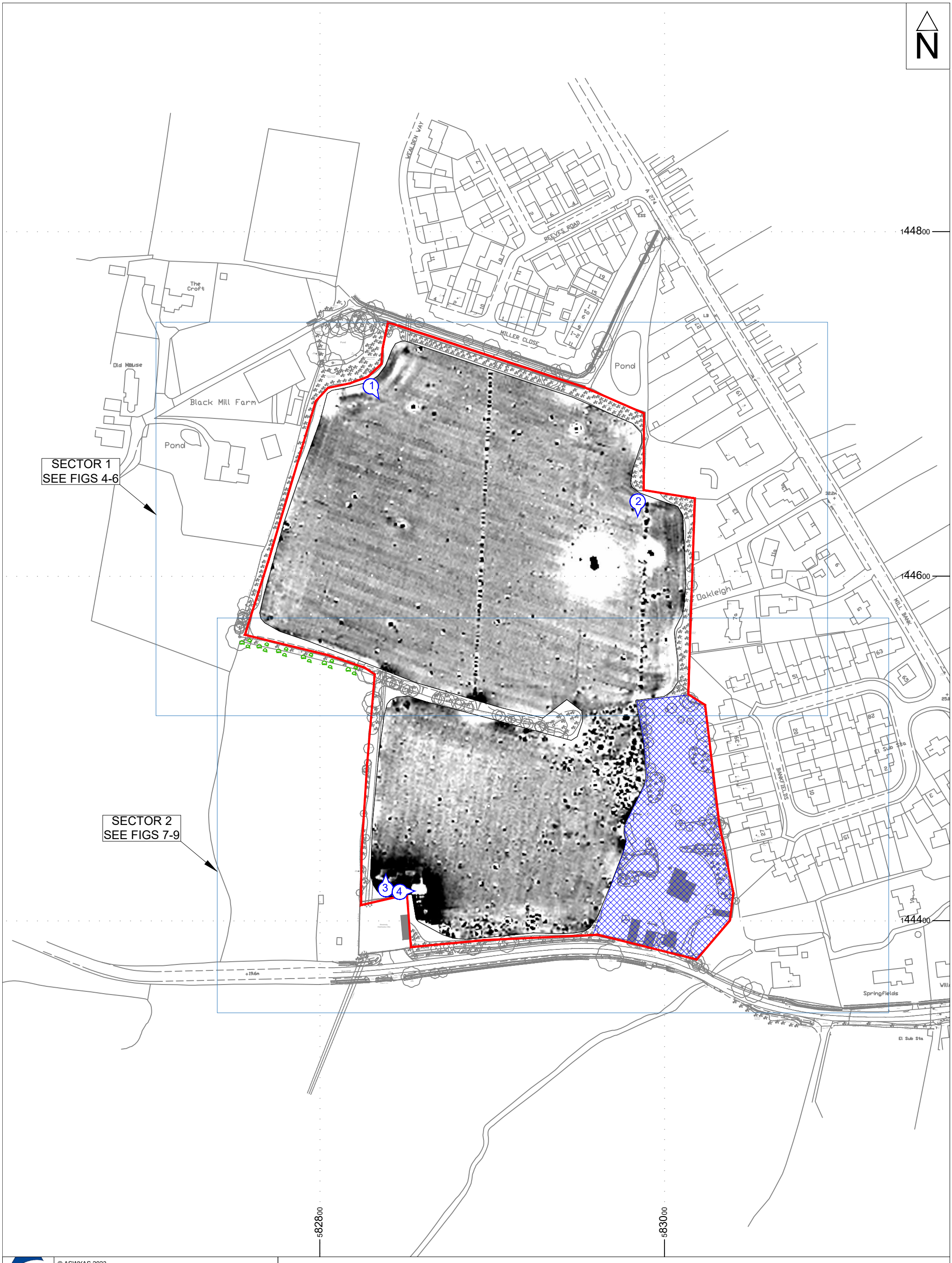


Fig. 1. Site location



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Survey location showing processed greyscale magnetometer data

Fig. 2

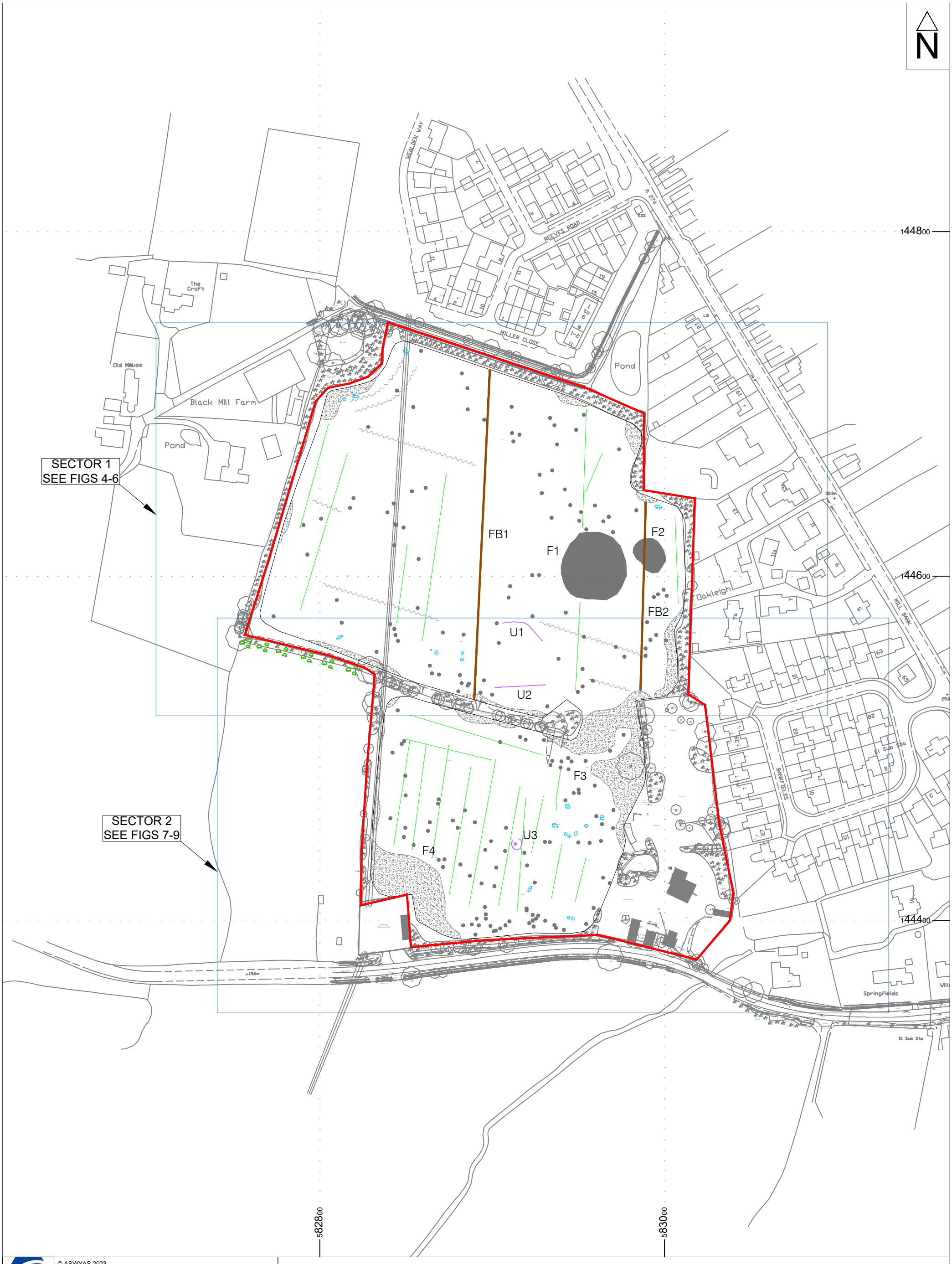
Title

- SURVEY AREA
- SECTOR BOUNDARY
- UNSUITABLE FOR SURVEY
- PHOTO LOCATIONS

nT -1.0 2.0

0 100m

1:2000 @ A3



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Overall interpretation of magnetometer data

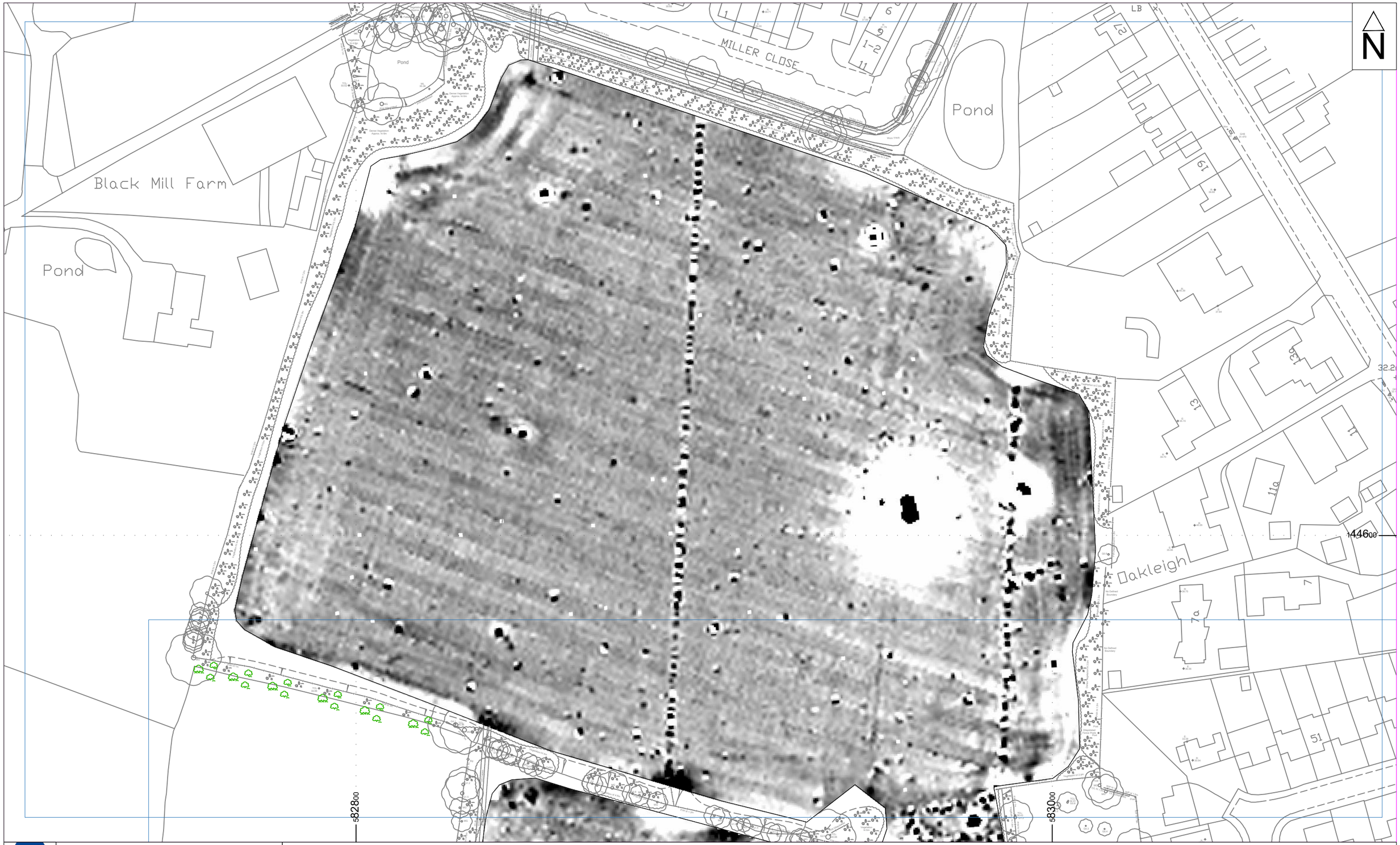
Fig. 3

Interpretation

- FERROUS
- AGRICULTURAL
- UNCERTAIN
- INTERFERENCE
- FORMER FIELD BOUNDARY
- MAGNETIC DISTURBANCE
- GEOLOGY

0 100m

1:2000 @ A3



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Processed greyscale magnetometer data; Sector 1

Fig. 4

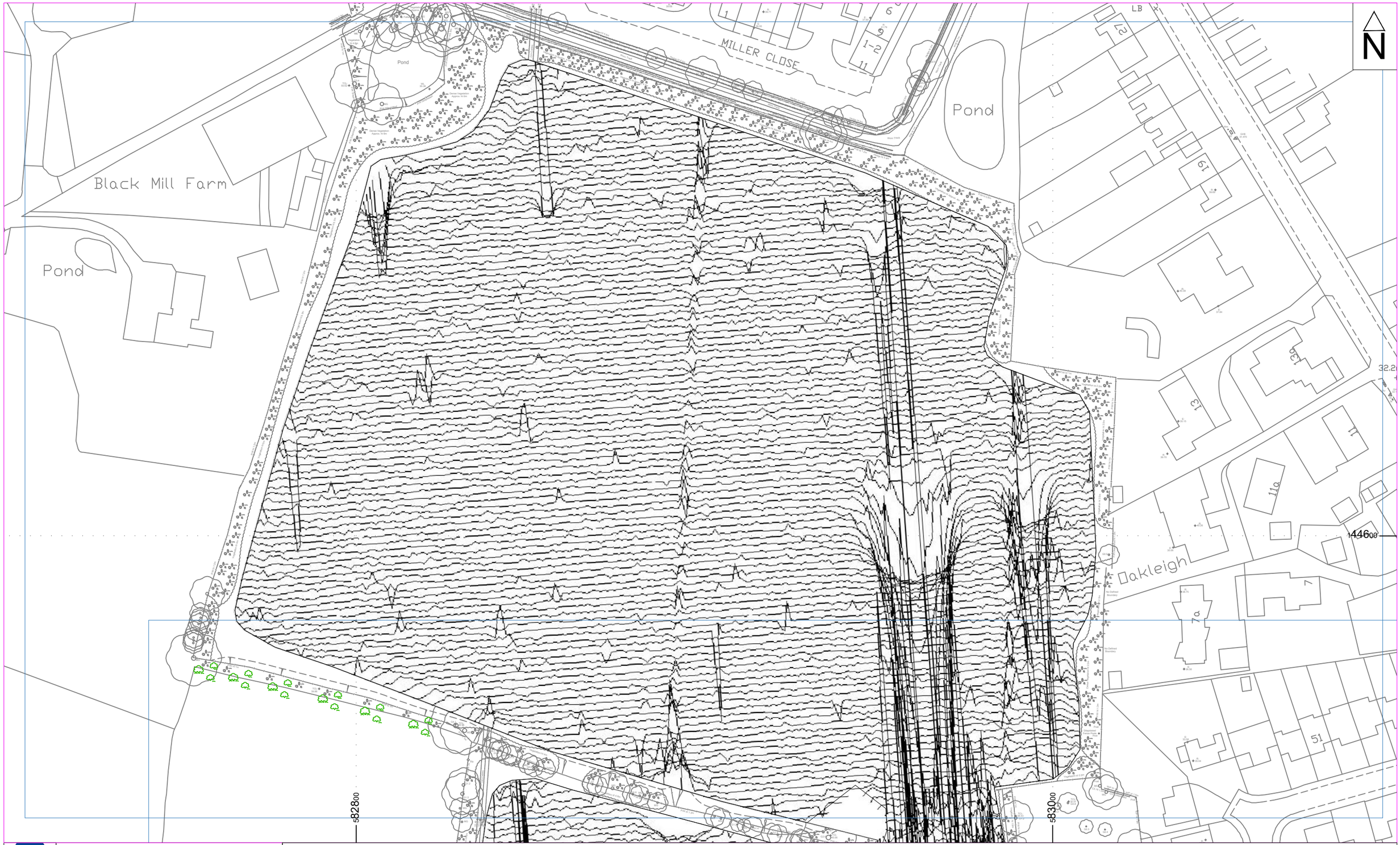
Title

SECTOR BOUNDARY

nT -1.0 2.0

0 50m

1:1000 @ A3



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XY trace plot of minimally processed magnetometer data; Sector 1

Fig. 5

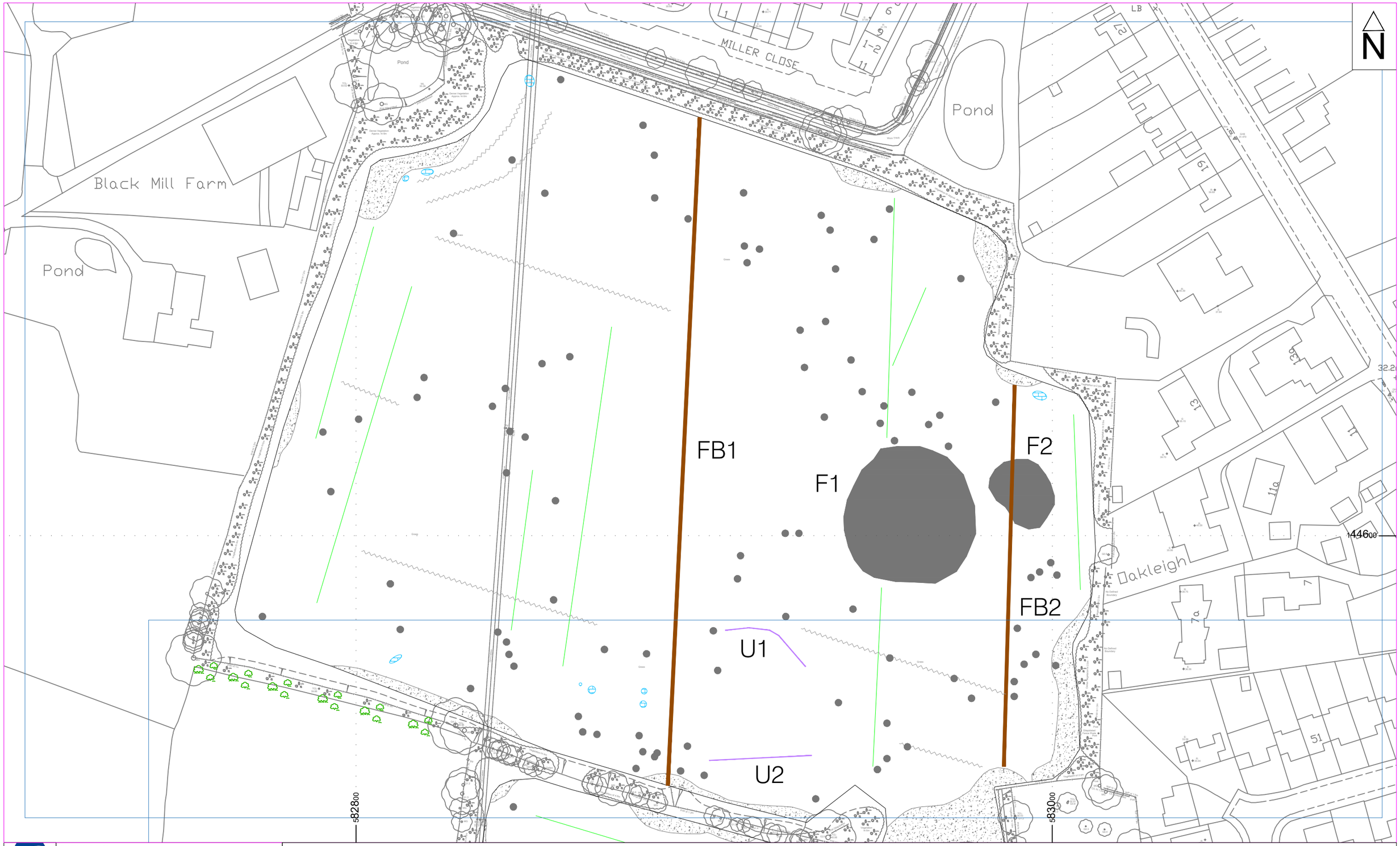
Title

SECTOR BOUNDARY

15.0 nT/cm

0 50m

1:1000 @ A3



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Interpretation of magnetometer data; Sector 1

Fig. 6

Title

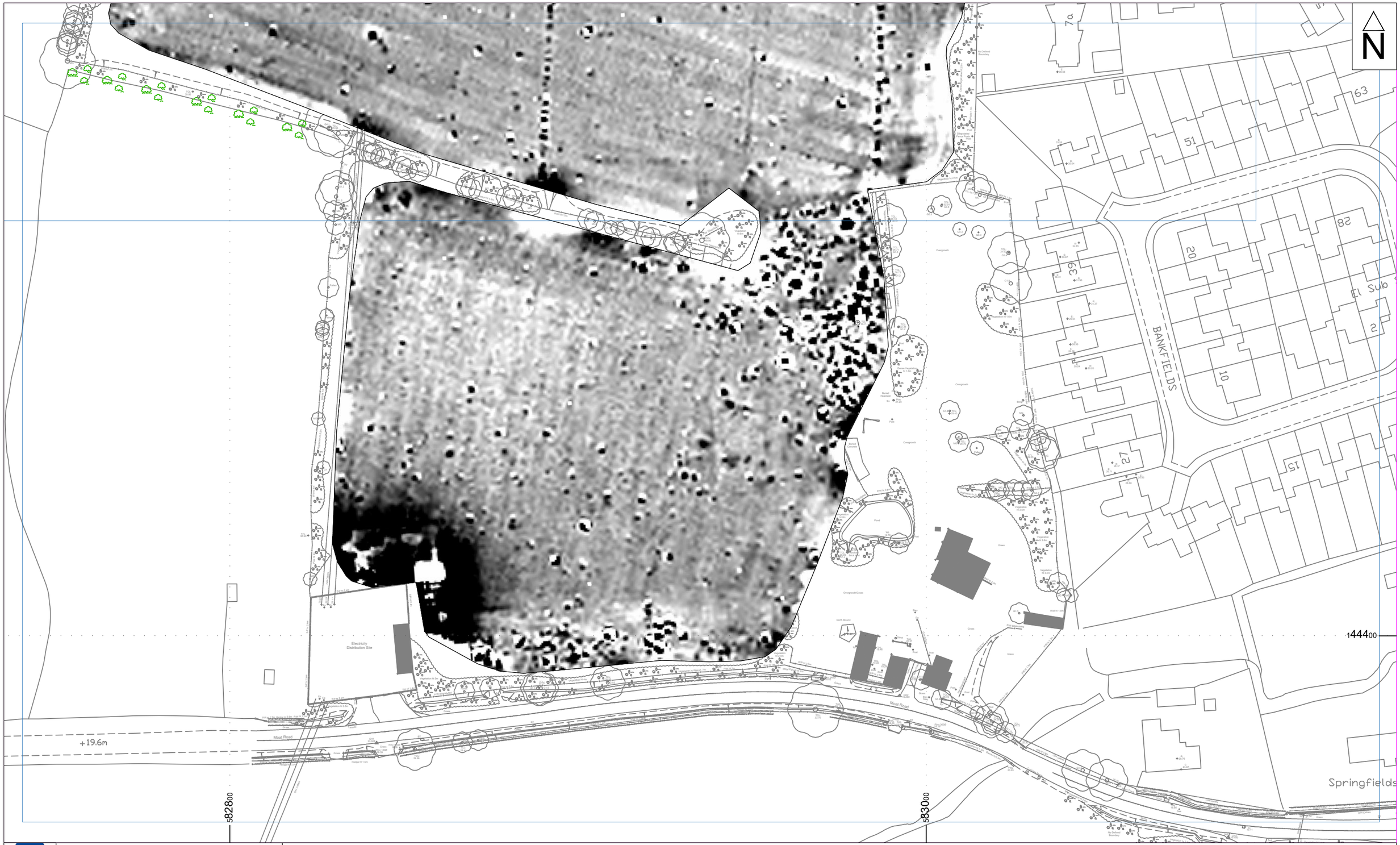
- SECTOR BOUNDARY

Interpretation

- FERROUS
- AGRICULTURAL
- UNCERTAIN
- INTERFERENCE
- FORMER FIELD BOUNDARY
- MAGNETIC DISTURBANCE
- GEOLOGY

0 50m

1:1000 @ A3



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Project ID: XI88_HCK23

Processed greyscale magnetometer data; Sector 2

Fig. 7

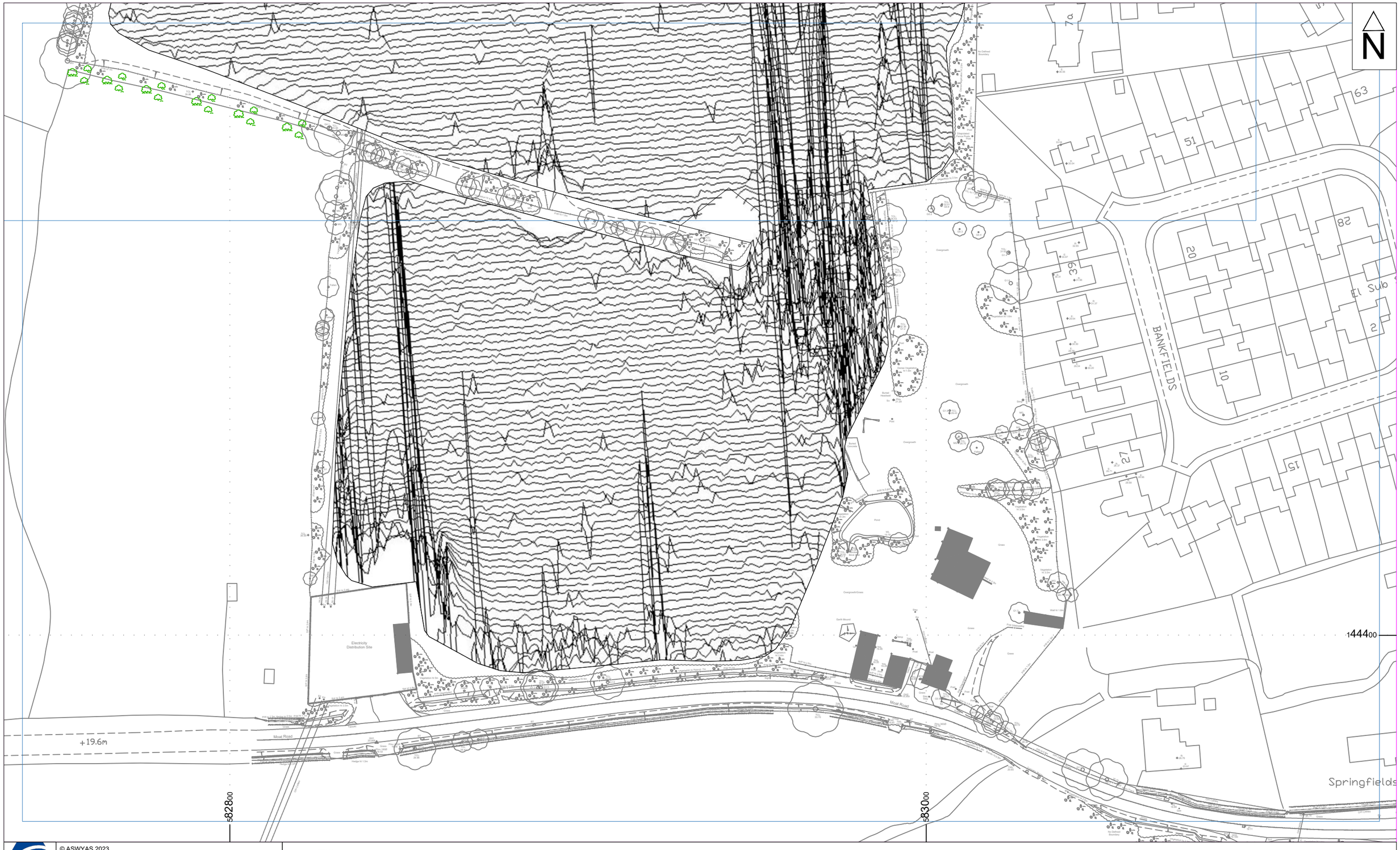
Title

SECTOR BOUNDARY

-1.0 2.0
nT

0 50m

1:1000 @ A3



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Project ID: XI88_HCK23

XY trace plot of minimally processed magnetometer data; Sector 2

Fig. 8

Title

SECTOR BOUNDARY

15.0 nT/cm

0 50m

1:1000 @ A3

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Project ID: XI88_HCK23

Interpretation of magnetometer data; Sector 2

Fig. 9

Title

- SECTOR BOUNDARY

Interpretation

- FERROUS
- AGRICULTURAL
- UNCERTAIN
- INTERFERENCE
- FORMER FIELD BOUNDARY
- MAGNETIC DISTURBANCE
- GEOLOGY

0 50m

1:1000 @ A3

Plate 1. General view of northern area, looking southeast

Plate 2. General view of northern area, looking south

Plate 3. General view of southern area, looking north

Plate 4. General view of southern area, looking east

Appendix 1: Magnetic survey - technical information

Magnetic Susceptibility and Soil Magnetism

Iron makes up about 6% of the Earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haemetite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms. Areas of human occupation or settlement can then be identified by measuring the magnetic susceptibility of the topsoil because of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected. The magnetic susceptibility of a soil can also be enhanced by the application of heat and the fermentation and bacterial effects associated with rubbish decomposition. The area of enhancement is usually quite large, mainly due to the tendency of discard areas to extend beyond the limit of the occupation site itself, and spreading by the plough.

Types of Magnetic Anomaly

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

Isolated dipolar anomalies (iron spikes)

These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

Areas of magnetic disturbance

These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Linear trend

This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies

Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

Methodology: Gradiometer Survey

The main method of using the fluxgate gradiometer for commercial evaluations is referred to as ***detailed survey*** and requires the surveyor to walk at an even pace carrying the instrument within a grid system. A sample trigger automatically takes readings at predetermined points, typically at 0.25m intervals, on traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation.

During this survey an eight channel Sensys MX V3 system containing eight FGM650 sensors was also used which was towed across the area using an ATV. Readings were taken every 20MHz (between 0.05 and 0.1m). Data was be recorded onto a device, using a Carlson GNSS Smart antenna, for centimetre accuracy. These readings were stored in the memory of the instrument and downloaded for processing and interpretation.

The gradiometer data have been presented in this report in processed greyscale format. The data in the greyscale images have been interpolated and selectively filtered to remove the effects of drift in instrument calibration and other artificial data constructs and to maximise the clarity and interpretability of the archaeological anomalies.

Appendix 2: Survey location information

An initial survey station was established using a Trimble VRS differential Global Positioning System (Trimble R6 model). The data was geo-referenced using the geo-referenced survey station with a Trimble RTK differential Global Positioning System (Trimble R6 model). The accuracy of this equipment is better than 0.01m. The survey grids were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if co-ordinates are measured off hard copies of the mapping rather than using the digital co-ordinates.

Archaeological Services WYAS cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

Appendix 3: Geophysical archive and metadata

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2003), and graphics files (Adobe Illustrator CS6 and AutoCAD 2017) files; and
- a full copy of the report.

At present the archive is held by Archaeological Services WYAS although it is anticipated that it may eventually be lodged with the Archaeology Data Service (ADS). Brief details may also be forwarded for inclusion on the English Heritage Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the Kent Historic Environment Record).

Appendix 4: Oasis form

Summary for archaeol11-514243

OASIS ID (UID)	archaeol11-514243
Project Name	Geophysical Survey at Land at Moat Road, Headcorn
Sitename	Land at Moat Road, Headcorn
Activity type	Geophysical Survey, MAGNETOMETRY SURVEY
Project Identifier(s)	
Planning Id	
Reason For Investigation	Planning: Pre application
Organisation Responsible for work	Archaeological Services WYAS
Project Dates	06-Mar-2023 - 07-Mar-2023
Location	Land at Moat Road, Headcorn NGR : TQ 82910 44570 LL : 51.1711176716594, 0.615056157840745 12 Fig : 582910,144570
Administrative Areas	Country : England County : Kent District : Maidstone Parish : Headcorn
Project Methodology	The cart-based survey was undertaken using an eight channel SenSYS MX V3 system containing eight FGM650 sensors. Readings are taken every 20MHz (between 0.05 and 0.1m). Data were recorded onto a device, using a Carlson GNSS Smart antenna, for centimetre accuracy. These readings were stored in the memory of the instrument and downloaded for processing and interpretation. DLMGPS and MAGNETO software, alongside bespoke in-house software was used to process and present the data
Project Results	A geophysical (magnetometer) survey was undertaken on approximately 7 hectares of land located to the west of Headcorn, Kent. Anomalies associated with the past agricultural use of the Site including former field boundaries and cultivation have been detected. A large ferrous response corresponds with the site of a Royal Observer Corps Underground Monitoring Post whilst other ferrous responses are associated with a former pylon, possible areas of hard standing or rubble, interference from an electricity substation and metal fencing within the boundaries. Uncertain responses within the dataset are likely to be of an agricultural nature, although an archaeological interest cannot be ruled out entirely. Based on the geophysical survey, the archaeological potential of this Site is deemed to be low.
Keywords	
Funder	
HER	Kent HER - unRev - STANDARD
Person Responsible for work	Emma, Brunning
HER Identifiers	
Archives	

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Planning (Listed Buildings and Conservation Areas) Act 1990
Town & Country Planning Act 1990 (as amended)
Planning and Compulsory Purchase Act 2004

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