



WYAS  
**Archaeological  
Services**

**Annfield Solar Project**

**Lanchester**

**Durham**

**Geophysical Survey**

Report no. 3814  
August 2022

**Client:** Green Power Consultants



# **Annfield Solar Project, Lanchester, Durham**

## **Geophysical Survey**

### *Summary*

*A geophysical (magnetometer) survey was undertaken on approximately 52 hectares of land located to the northeast of Lanchester, Durham. Anomalies of both a definite and a possible archaeological origin have been detected including a square enclosure, a ring ditch and possible structural remains. Medieval or post-medieval ridge and furrow cultivation have been detected along with former field boundaries and modern ploughing. Large areas of geological responses within the dataset are likely to be associated to past mining.*

## Report Information

Client: Green Power Consultants  
Report Type: Geophysical Survey  
Location: Moor Leazes Farm, Lanchester  
County: Durham  
Grid Reference: NZ 1732 4825  
Period(s) of activity: Prehistoric / Roman / medieval / modern  
Report Number: 3814  
Project Number: XD50  
Site Code: MLF22  
OASIS ID: archaeol11-508721  
Date of fieldwork: July 2022  
Date of report: August 2022  
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Photography: Jake Freeman  
Research: Emma Brunning  
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Authorisation for  
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## Document Issue Record

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## 1 Introduction

Archaeological Services ASWYAS has been commissioned by Green Power Consultants to undertake a geophysical survey at Moor Leazes Farm, Lanchester, Durham to inform a planning application for the proposed Annfield Solar Project. This was undertaken in line with current best practice (CIfA 2020; Schmidt *et al.* 2016). The survey was carried out between 25th and 28th July 2022 to provide additional information on the archaeological resource of the Site.

### Site location, topography and land-use

The Site is located at NZ 1732 4825 (approximate centre), comprising c. 52ha across ten fields of farmland to the northeast of Lanchester (see Fig. 1; Plates 1-6).

The majority of the Site is situated to the west of Moor Leazes Farm with the northern most area located to the west of Chapman's Well Farm. An access track bounds the Site to the east, and is bounded to the west by Black Wood and to the south by Peth Lane. The Site lies at approximately 230m above Ordnance Datum (aOD) in the north falling to 118m aOD in the south.

### Soils and geology

The recorded bedrock geology comprises Pennine Middle Coal Measures Formation - Mudstone, siltstone and sandstone. Sedimentary bedrock formed between 318 and 309.5 million years ago during the Carboniferous period. Superficial deposits have been recorded as Till, Devensian - Diamicton. Sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period (BGS 2022). The overlying soils are described as slowly permeable seasonally wet acid loamy and clayey (Soilscape 17) (CSAI 2022).

## 2 Archaeological Background

The archaeological background below is taken from available online resources.

Located within the southern half of the Site lies 'the approximate site of Maiden Law Barrow' (PRN: D1846/ HER UID 1846) (KP 2022). No further information has been obtained from the online sources.

Approximately 1.8km to the southwest of the Site lies *Longovicium* Roman Fort (Scheduled Monument number 1002361). *Longovicium* was an auxiliary fort located on Dere Street built around AD150. Dere Street (8d) left Binchester Roman Fort in a north westerly direction to Willington and then on to Lanchester, passing the south wall of the fort and then on to Corbridge (Margary 1973).

A geophysical survey was conducted to the north of *Longovicium* in 2008 by Archaeological Services Durham University (ASDU 2008). Results recorded a complex of anomalies representing the northern part of the *vicus* and Dere Street. In 2009 a geophysical survey to the east of the fort identified the continuation of the *vicus* to the east and southeast of the fort and Dere Street (ASDU 2009). In 2014 a geophysical survey to the west and south of the fort recorded ditches and the extent of a roman reservoir (ASDU 2014).

### **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 objectives 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 1:7500 whilst Figure 3 shows the interpretation at the same scale. Processed and minimally processed data, together with interpretation of the survey results are presented in Figures 4 to 21 inclusive at a scale of 1:1500.

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 Her 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 21)**

### **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 area of magnetic disturbance (**F1**) in Area 2 has been caused by an electricity pylon within the field. The location of a former pylon (**F3**) has been recorded in Area 9, in which a 'button-like' anomaly is due to the 4 legs/foundations of the pylon remaining *in situ*.

An area of magnetic disturbance (**F2**) in Area 3 corresponds to an old gravel pit shown on historic mapping dating from 1895 (NLS 2022).

Magnetic disturbance along the limits of the survey areas are due to metal fencing within the field boundaries and interference from the adjacent roads and electricity pylons.

A linear dipolar trend has been recorded along the western boundary of Area 3 and a short length in Area 6 which are likely to be buried services.

### **Geological anomalies**

The survey has detected a number 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. Strong responses (**G1**) in Area 1 are likely to be associated with surface mining which has been recorded in the area (CA 2022). Historic mapping dated 1895 shows a gravel pit located in this area (NLS 2022).

The anomalies in Area 10 have a more sinuous form and are consistent with former water channels.

### **Agricultural anomalies**

The data in the west of the Site is dominated by strong parallel linear trends, representing medieval/post-medieval ridge and furrow cultivation. The strength of the cultivation trends has made interpretation difficult in some of the areas and is potentially masking archaeology. It is particularly strong in Areas 4 and 5, with those in Area 4 being on multiple alignments.

A number of field boundaries have been detected throughout the Site. Those at **FB1**, **FB2**, **FB5**, **FB6**, **FB10** and **FB11** correspond to historic mapping dating from 1895. Responses **FB1**, **FB3**, **FB4**, **FB7**, **FB8** and **FB9** are not shown on the available mapping but are also likely to be post-medieval field boundaries.

Modern ploughing trends can be seen within a number of the areas and follow the current direction of the cultivation or can be seen on Google imagery. The interpretation figures show the direction of the ploughing, but not all have been digitised, unless especially prominent within the dataset.

A handful of linear trends have been recorded as field drains and are likely to consist of a plastic pipe within backfilled trenches due to their weak magnetic strength.

### **Uncertain anomalies**

Anomalies within the survey area which have been interpreted as *uncertain* have proved difficult to ascertain a definite origin. These include response **U1** in Area 6. It is possible that it is a former boundary or headland, being a continuation of **P8**. It is also possible that is a geological response associated with the topography of the area or this former boundary that has been subjected to post-medieval dumping enhancing the magnetic properties of the anomaly.

Anomalies (**U2**) in Area 10 have been recorded which may have a possible archaeological origin as it has a more coherent form. However, a geological origin is also possible given the other geological responses in the area.

### **Possible and definite archaeological anomalies**

Anomalies of both a definite and possible archaeological origin have been recorded within the survey area which include a rectangular enclosures, ditches and a ring ditch. The

enclosure (**A1**) in Areas 4 and 5 measures approximately 45m by 45m and is situated on a high elevation overlooking the Lanchester valley. Due to the Roman archaeology within the vicinity it is possible that this represents a signal station or settlement site with appended later enclosures to the east. Unfortunately the ridge and furrow in this area has made interpretation difficult. An east and west entrance way could be present but both may have been created by ridge and furrow. There are also hints of internal features but again the ridge and furrow could be masking them or be part of the ploughing. For the purposes of a clear interpretation only ridge and furrow have been identified on the diagrams. It is likely that the enclosure is Iron Age or Roman in date but both earlier and later dates cannot be ruled out by the survey.

To the immediate east of **A1** lies a short length of ditch (**A2**), again due to the ridge and furrow it is difficult to see any further anomalies associated with this ditch. It could however be a later appended enclosure to **A1**.

Situated in the south of Area 7 a ring ditch (**A3**) has been recorded measuring approximately 15m in diameter. The LiDAR data (NLS 2022) shows that it lies on a ridge of high land and it also lies in the vicinity of Maiden Law Barrow. The HER records the possible location of this barrow in this area, which is no longer extant on the surface, and it is highly likely that the geophysical survey has discovered the barrow's actual location.

Linear ditch response (**P1**) in Areas 2 and 3 may represent a former boundary or part of a prehistoric field system. In the north of Area 3 to the east of **P1** rectangular responses (**P2**) have been recorded. They have a strong magnetic signature and as such may represent burning. The anomalies appear to consist of a positive interior response with a negative outer response, in which the latter may suggest foundations. This interpretation is purely speculative, although the anomalies are definitely of some interest. They could be the product of later extraction but only on a very small scale.

Curving ditch response (**P3**) has been recorded in Area 4 with it likely to continue into Area 3 and as with **P1** may represent a boundary or part of a prehistoric field system. Linear anomaly (**P4**) in Area 4 lies on the same alignment as the ridge and furrow but is giving a stronger magnetic response. It may be a deeper cut furrow or it could be something of more interest.

Rectangular anomalies (**P5** and **P6**) in Area 4 have a similar appearance to those at **P2** and the same interpretation can be given. Although **P5** may be a result of the differing alignments of the ridge and furrow so this is more tentative. Neither anomalies appear to coincide with former boundaries nor do they match other landscape features such as ponds.

In the south of Area 7 semi-circular anomaly (**P7**) has been recorded on the western edge of the survey area. Whilst a possible further ring ditch is preferred the response may be

associated with the ridge and furrow and geological responses giving the illusion of a circular feature.

Linear ditch response (**P8**) in Area 6 is likely to be a former boundary or headland as the ridge and furrow stops and is contained to the south of the response. However, there is a faint linear trend (**P9**) and along with **P8** may form a rectilinear enclosure. It is likely that the *uncertain* response **U1** may be connected. It is also possible that these anomalies are geological, associated with the topography of the area or this former boundary that has been subjected to post-medieval dumping enhancing the magnetic properties of the anomaly.

Possible archaeological responses which have not been mentioned above include linear and curvilinear trends. Most of these have a weaker magnetic strength than those mentioned above and given the amount of cultivation in the area they may be a result of agricultural regimes, although a possible archaeological origin remains.

## 5 Conclusions

The geophysical survey has detected a number of anomalies of an archaeological and possible archaeological origin. These include a rectilinear enclosure with possible extension to the east, which may represent a Roman signal station or settlement and a ring ditch which is likely to be associated with Maiden Law Barrow. At least 3 rectilinear responses have the potential to be of archaeological interest.

Medieval or post-medieval ridge and furrow cultivation has been recorded throughout which in places has given a strong magnetic response making interpretation of other anomalies difficult in places. Former field boundaries have been recorded, some of which correlate to historic mapping.

Large areas of geological responses within the dataset are likely to be associated with past mining. Magnetic disturbance around the periphery of the fields is due to metal fencing within the boundaries.

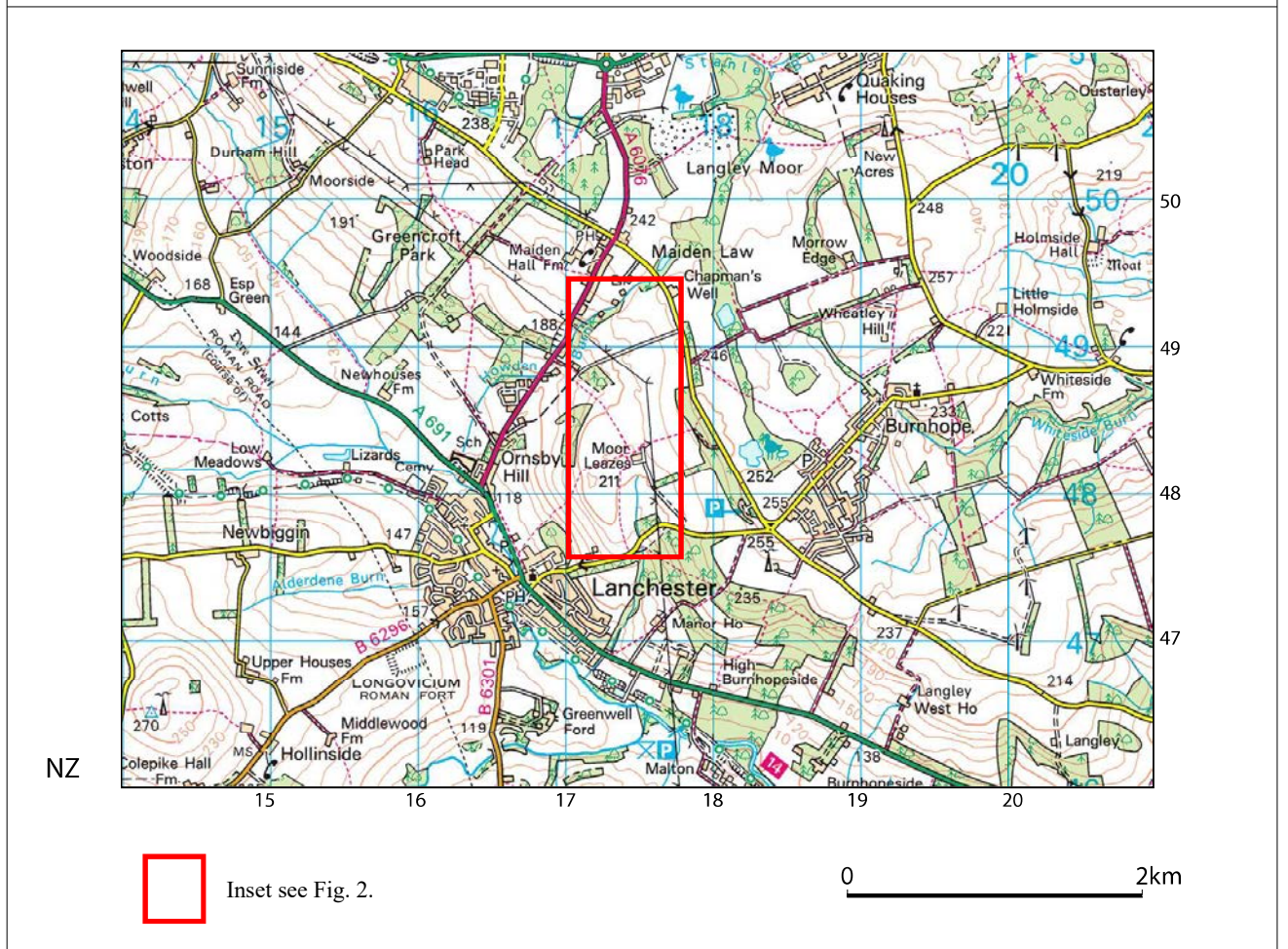
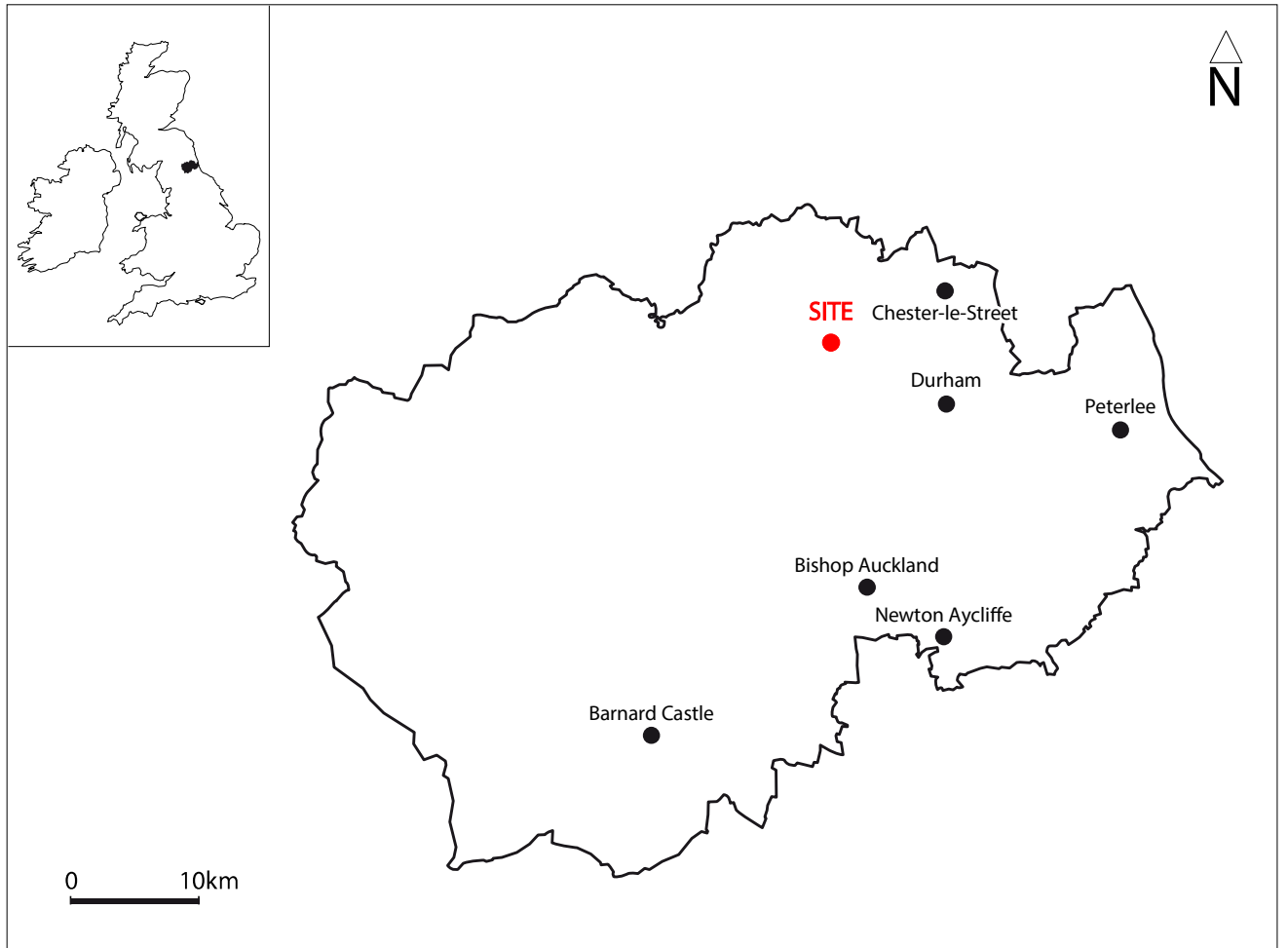
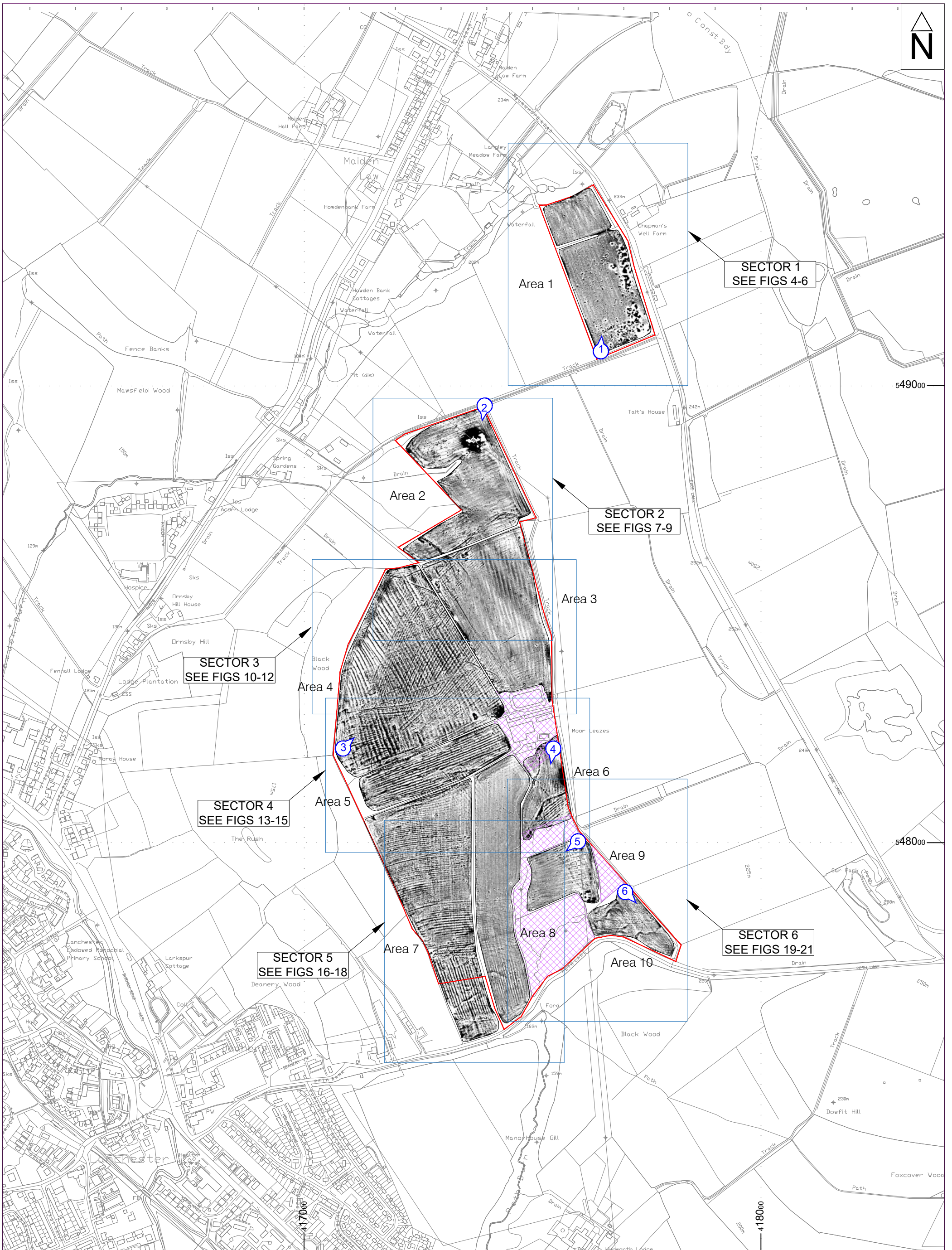



Fig. 1. Site location








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Survey location showing processed greyscale magnetometer data

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	SECTOR BOUNDARY
	UNSUITABLE FOR SURVEY
	PHOTO LOCATIONS



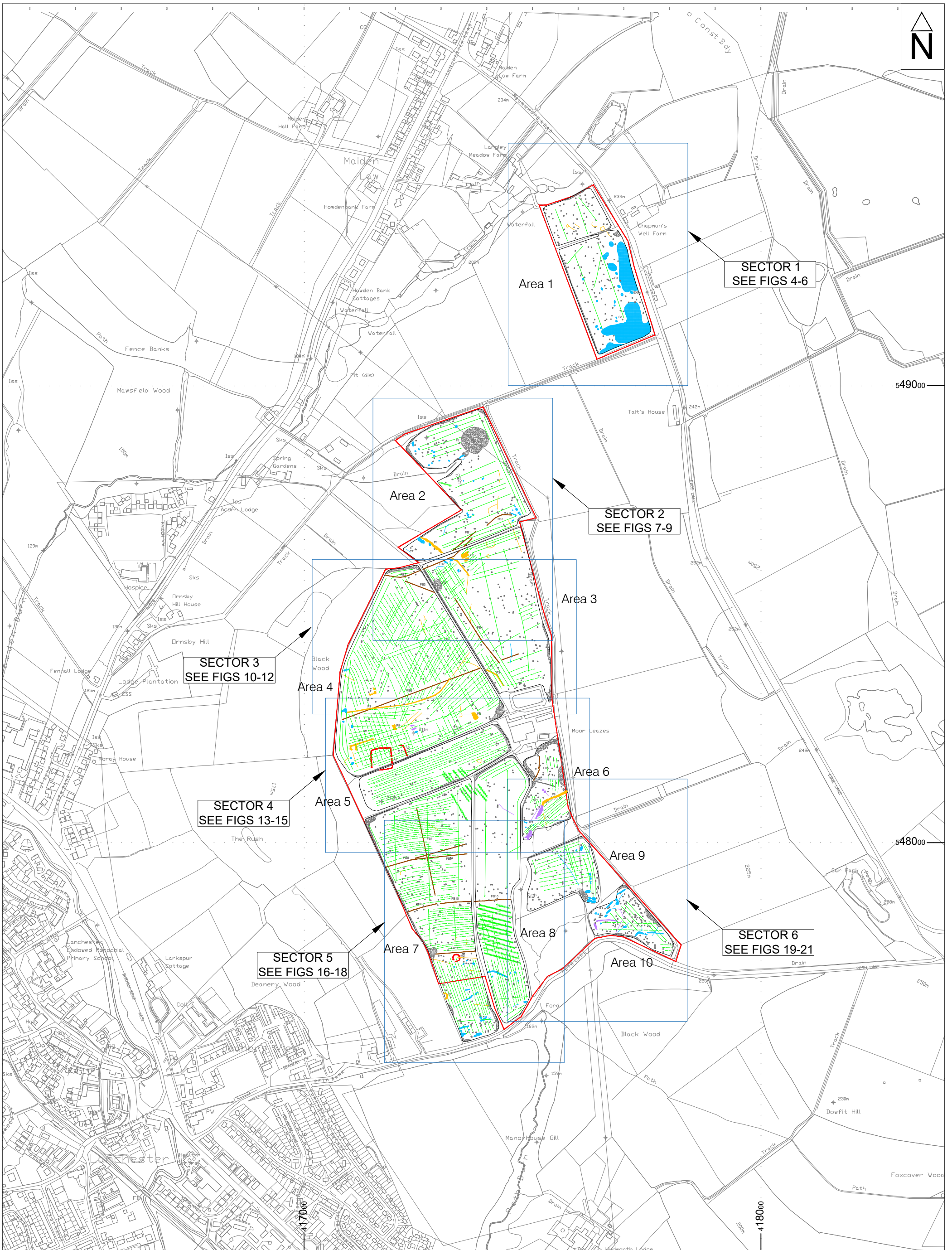

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Fig.2















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Overview interpretation of magnetometer data

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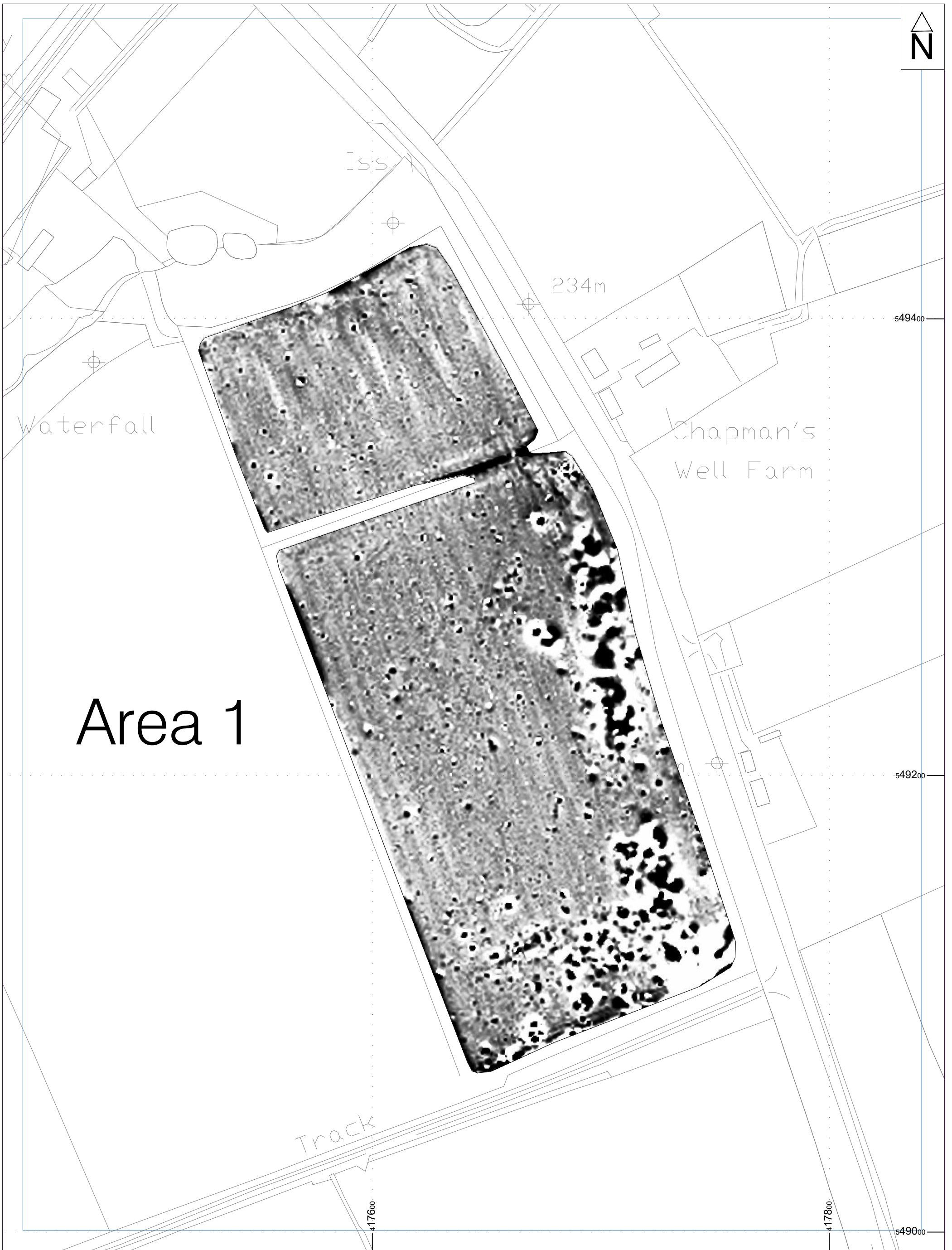
**Interpretation**


	FERROUS		RIDGE & FURROW		UNCERTAIN
	SERVICE PIPE		AGRICULTURAL		ARCHAEOLOGY?
	MAGNETIC DISTURBANCE		FORMER FIELD BOUNDARY		ARCHAEOLOGY
	FIELD DRAIN		GEOLOGY		

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Fig.3




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Processed greyscale magnetometer data; Sector 1

Title

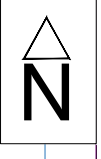
SECTOR BOUNDARY




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Fig. 4

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# Area 1


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 Project ID: XD50\_MLF22  
 XY trace plot of minimally processed magnetometer data;  
 Sector 1

Title  
 SECTOR BOUNDARY

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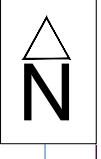
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Fig. 5










# Area 1


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 Interpretation of magnetometer data; Sector 1

### Interpretation

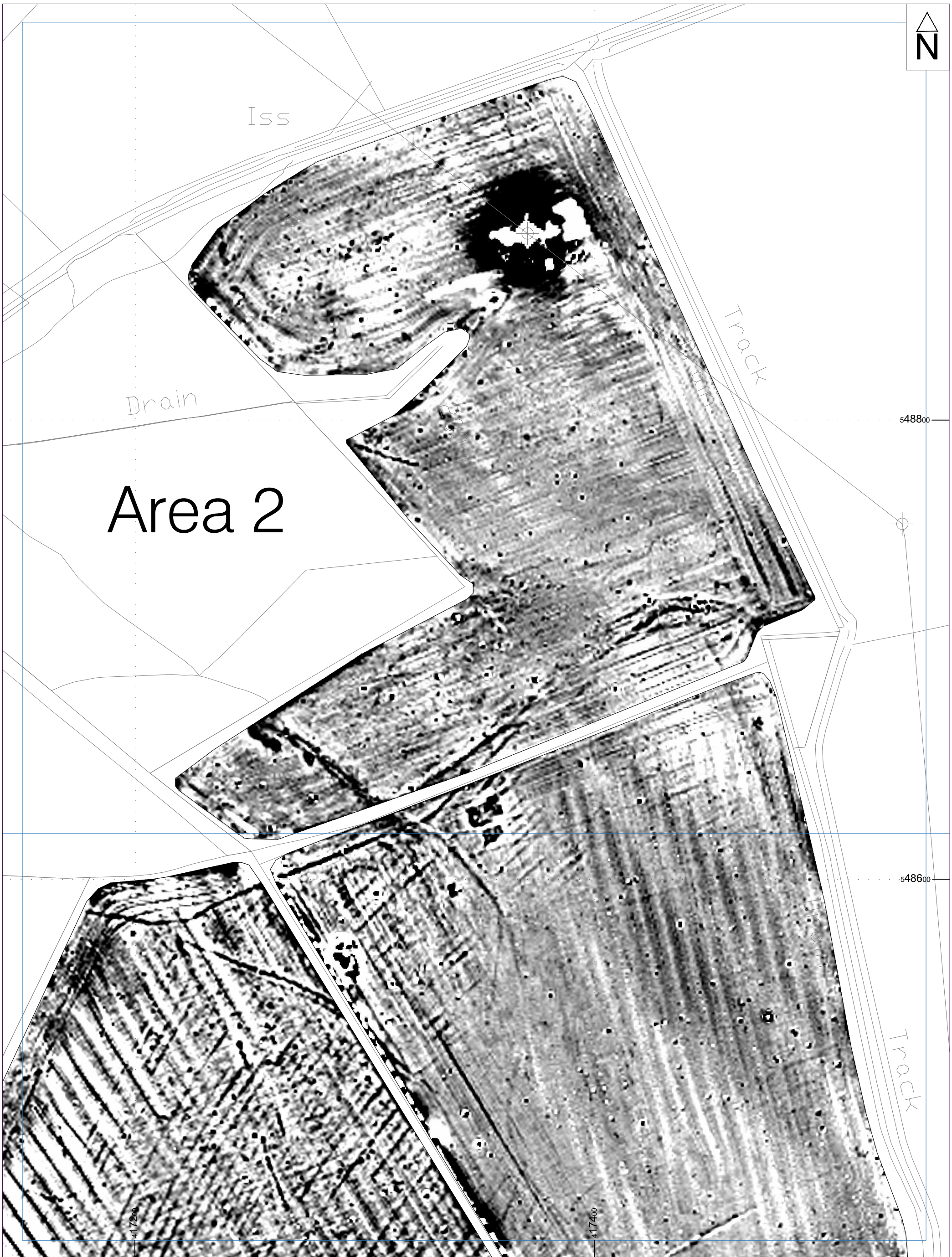
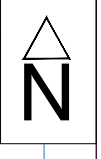
 FERROUS	 AGRICULTURAL	 ARCHAEOLOGY?
 MAGNETIC DISTURBANCE	 GEOLOGY	




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Fig. 6





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Processed greyscale magnetometer data; Sector 2

Title

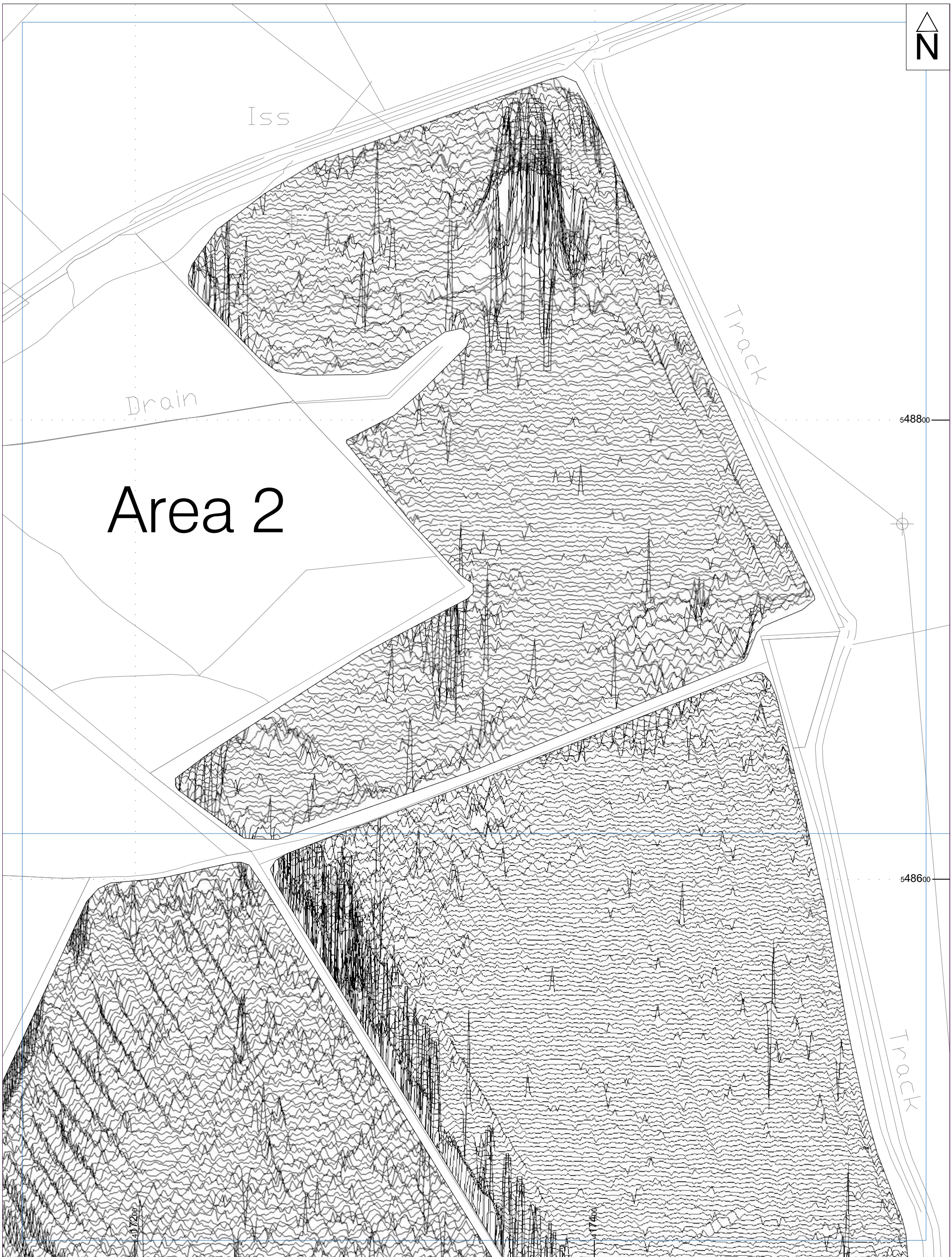
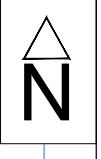
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Fig. 7



# Area 2


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 Project ID: XD50\_MLF22  
 XY trace plot of minimally processed magnetometer data;  
 Sector 2

Title  
 SECTOR BOUNDARY

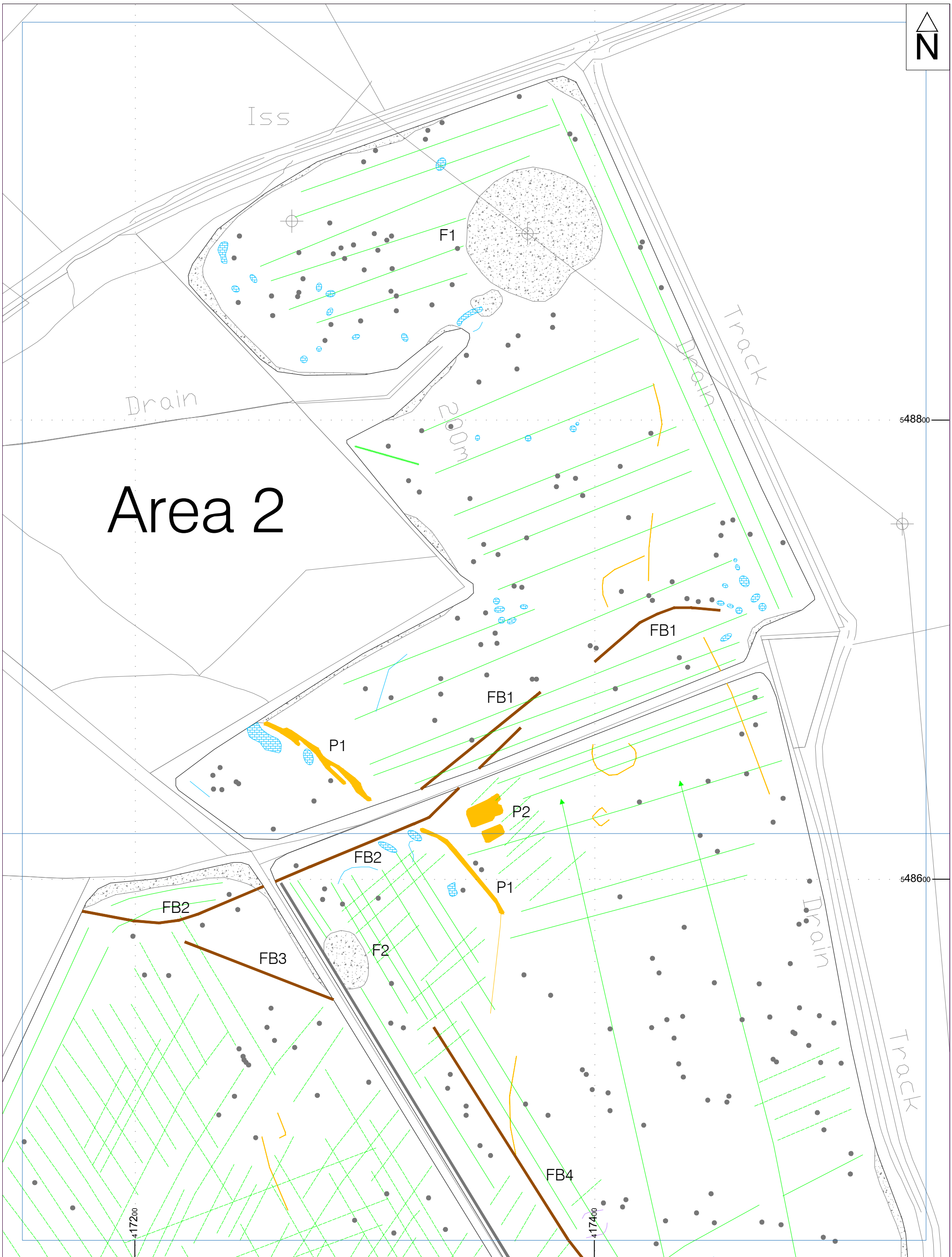
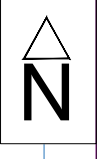
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Fig. 8



# Area 2












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Interpretation of magnetometer data; Sector 2

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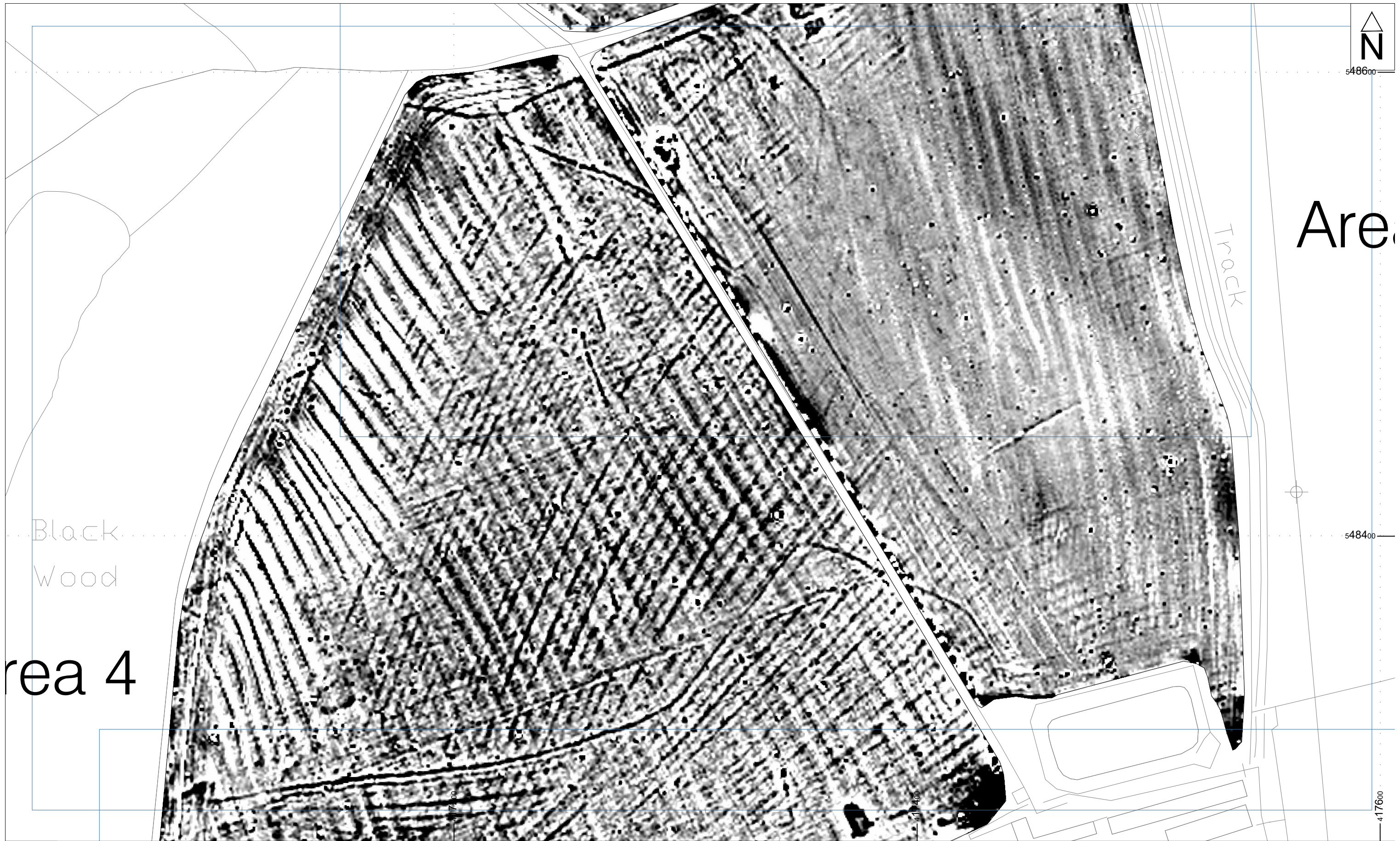
### Interpretation


 FERROUS	 RIDGE & FURROW	 UNCERTAIN
 SERVICE PIPE	 AGRICULTURAL	 ARCHAEOLOGY?
 MAGNETIC DISTURBANCE	 FORMER FIELD BOUNDARY	
 FIELD DRAIN	 GEOLOGY	



1:1500 @ A3

Fig. 9




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Processed greyscale magnetometer data; Sector 3

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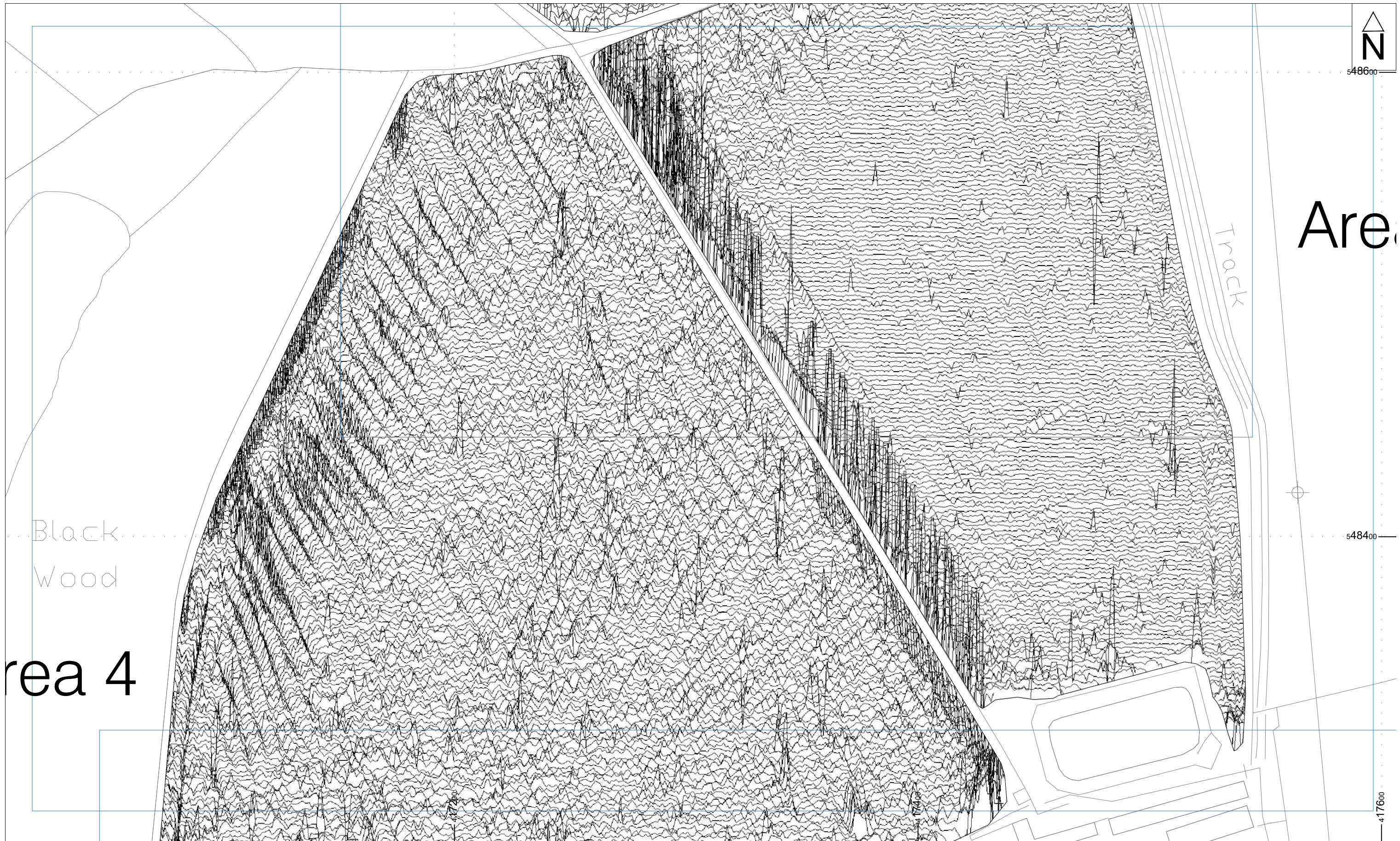
Title


 SECTOR BOUNDARY



1:1500 @ A3

Fig. 10



548600

Area


Track

Black Wood

Area 4

548400

417600


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Project ID: XD50\_MLF22

XY trace plot of minimally processed magnetometer data;  
Sector 3

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Title

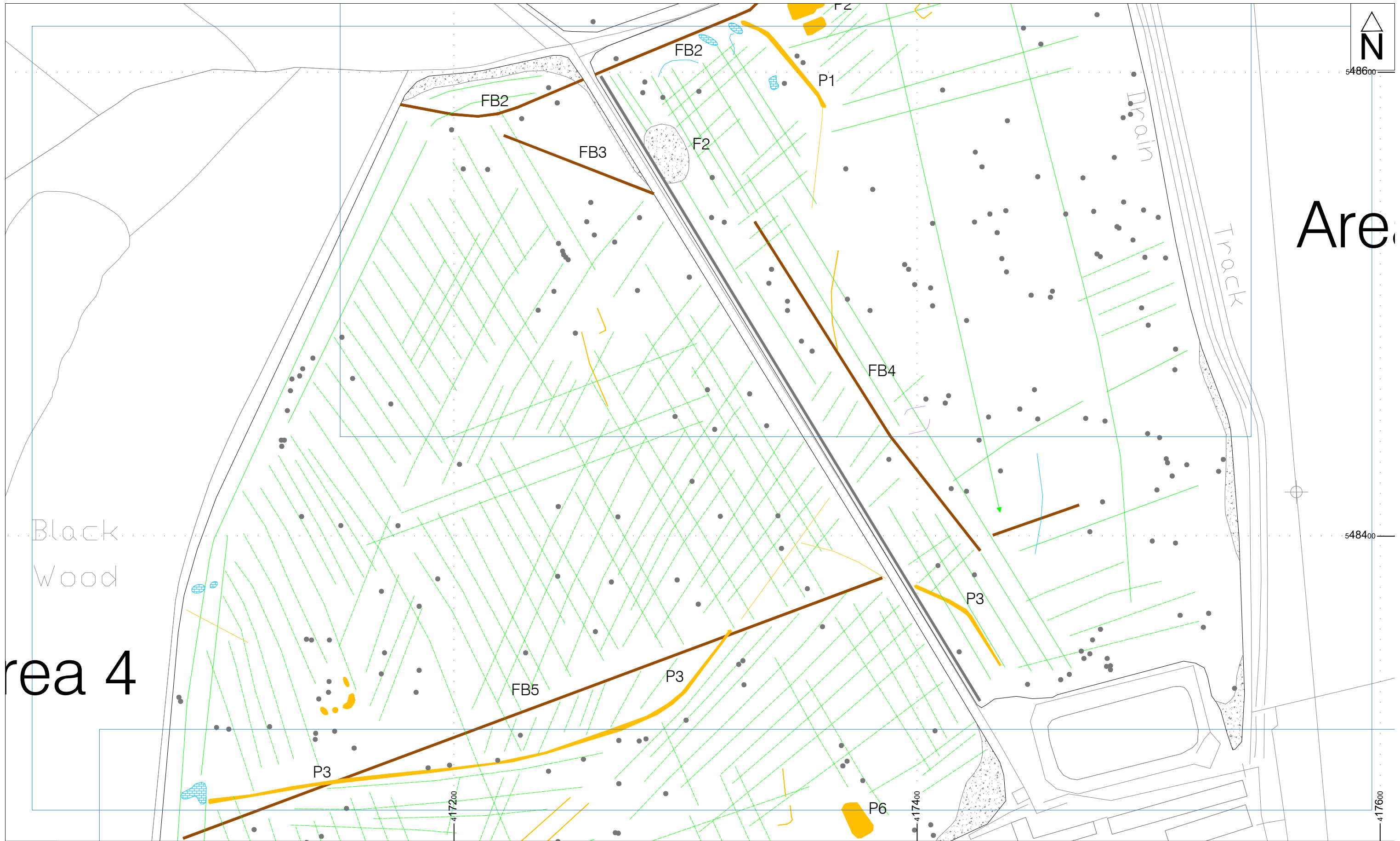
SECTOR BOUNDARY


15.0 nT/cm

0 50m

1:1500 @ A3

Fig. 11





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


Interpretation of magnetometer data; Sector 3

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**Title**

	SECTOR BOUNDARY
---	-----------------

**Interpretation**

	FERROUS		RIDGE & FURROW		UNCERTAIN
	SERVICE PIPE		AGRICULTURAL		ARCHAEOLOGY?
	MAGNETIC DISTURBANCE		FORMER FIELD BOUNDARY		
	FIELD DRAIN		GEOLOGY		

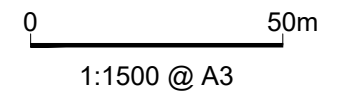
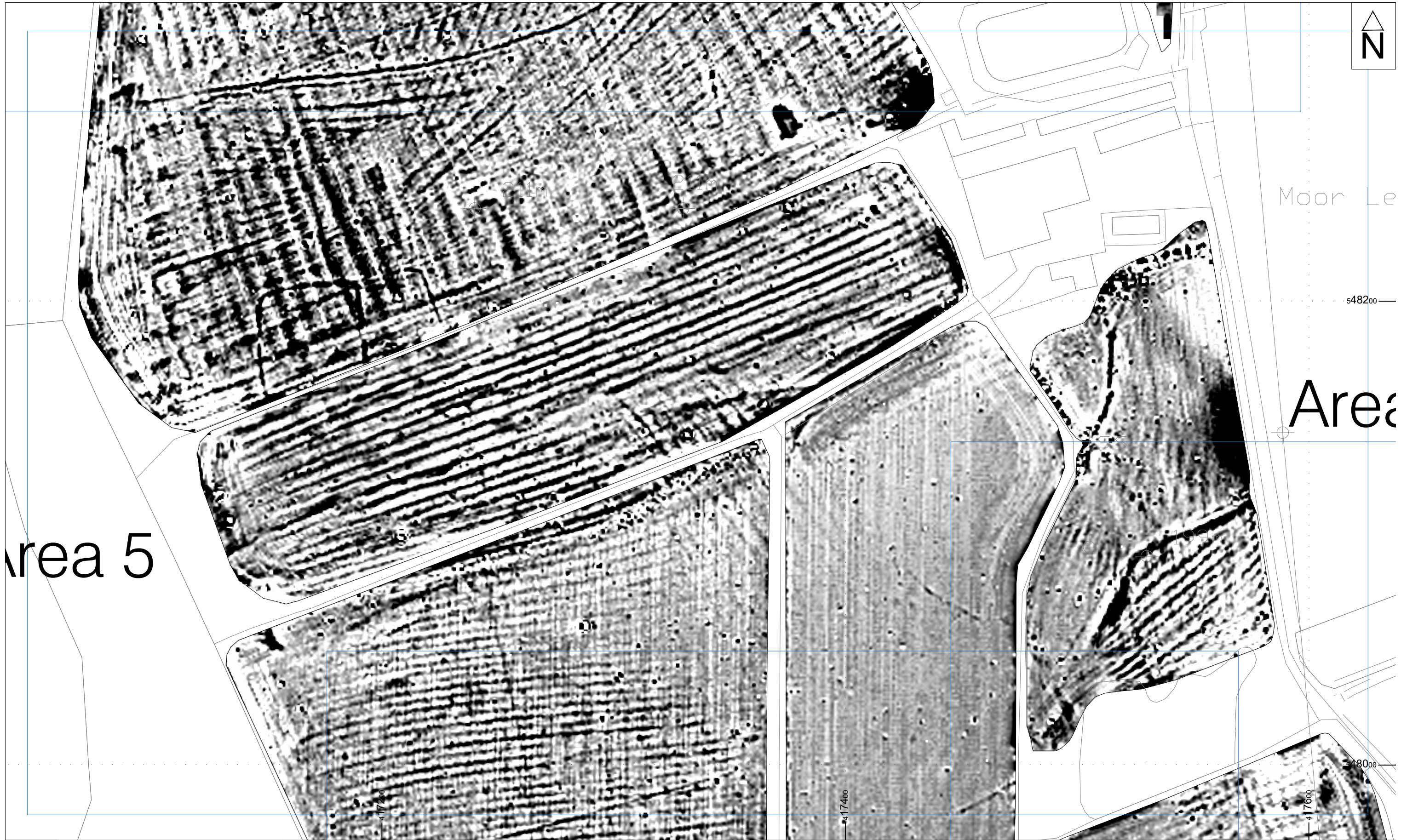



Fig. 12





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Project ID: XD50\_MLF22

Processed greyscale magnetometer data; Sector 4

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Title

 SECTOR BOUNDARY

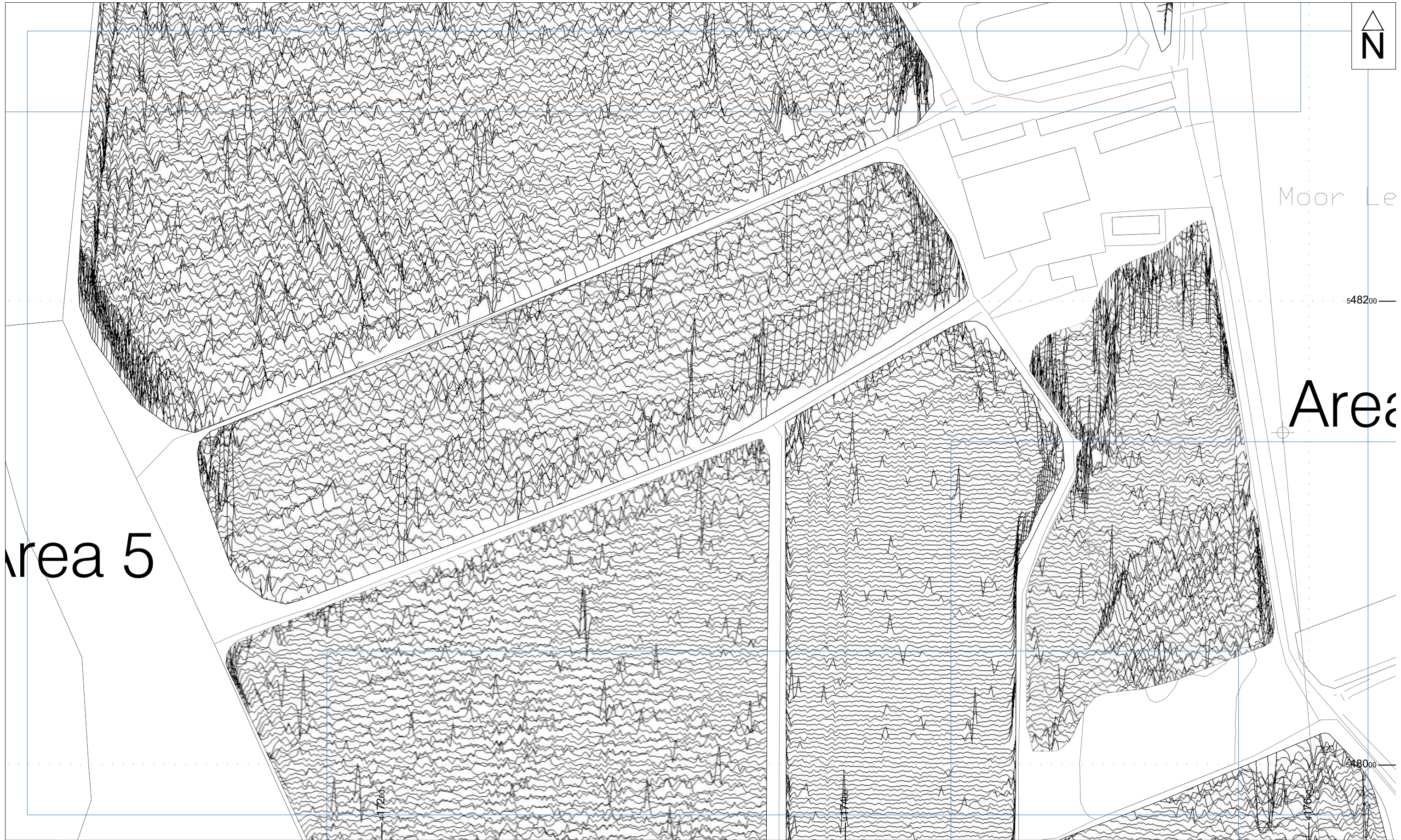



0 50m

1:1500 @ A3

Fig. 13







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 XY trace plot of minimally processed magnetometer data;  
 Sector 4

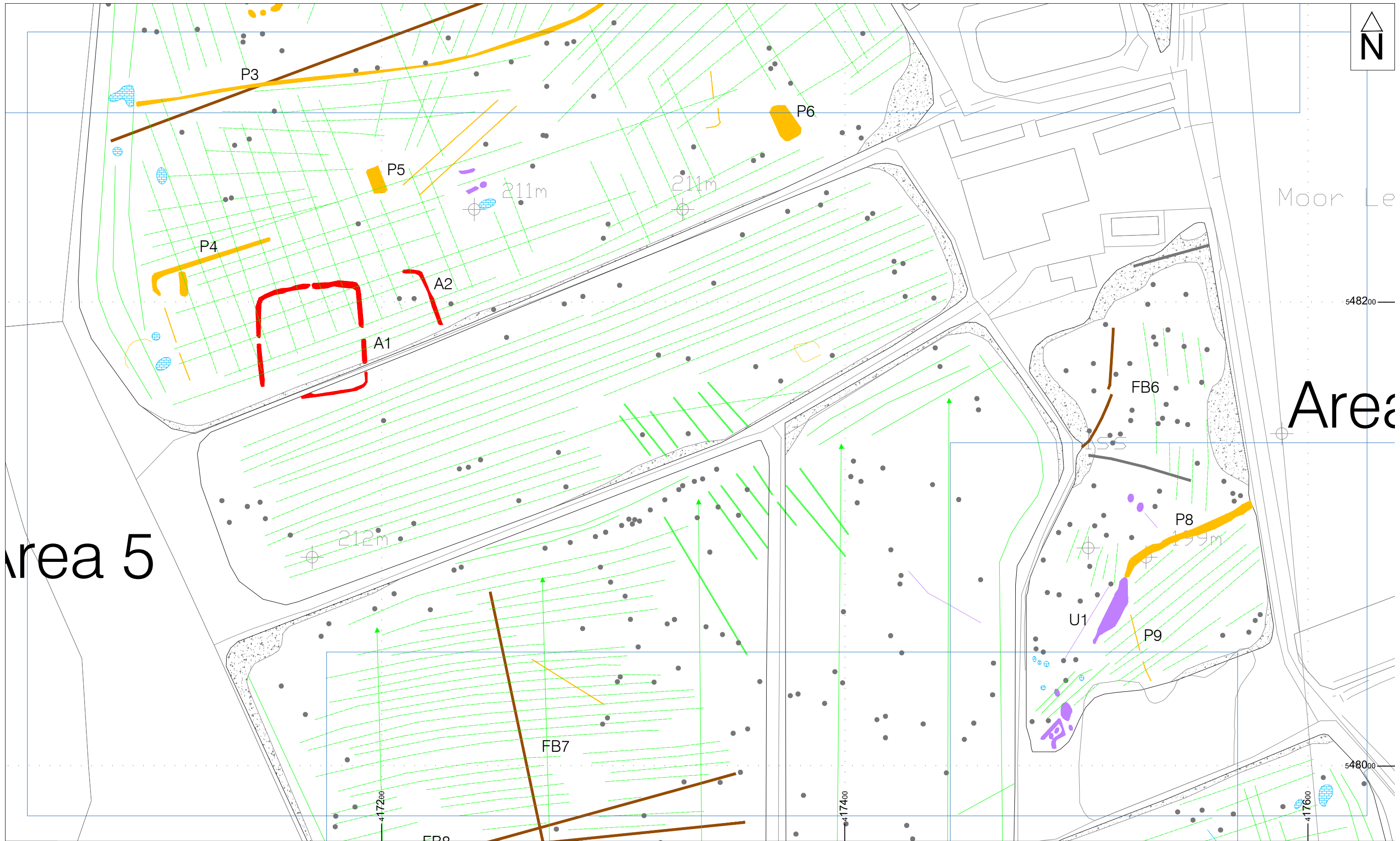
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Title  
 SECTOR BOUNDARY


15.0 nT/cm

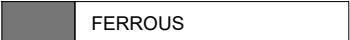










0 50m  
 1:1500 @ A3

Fig. 14



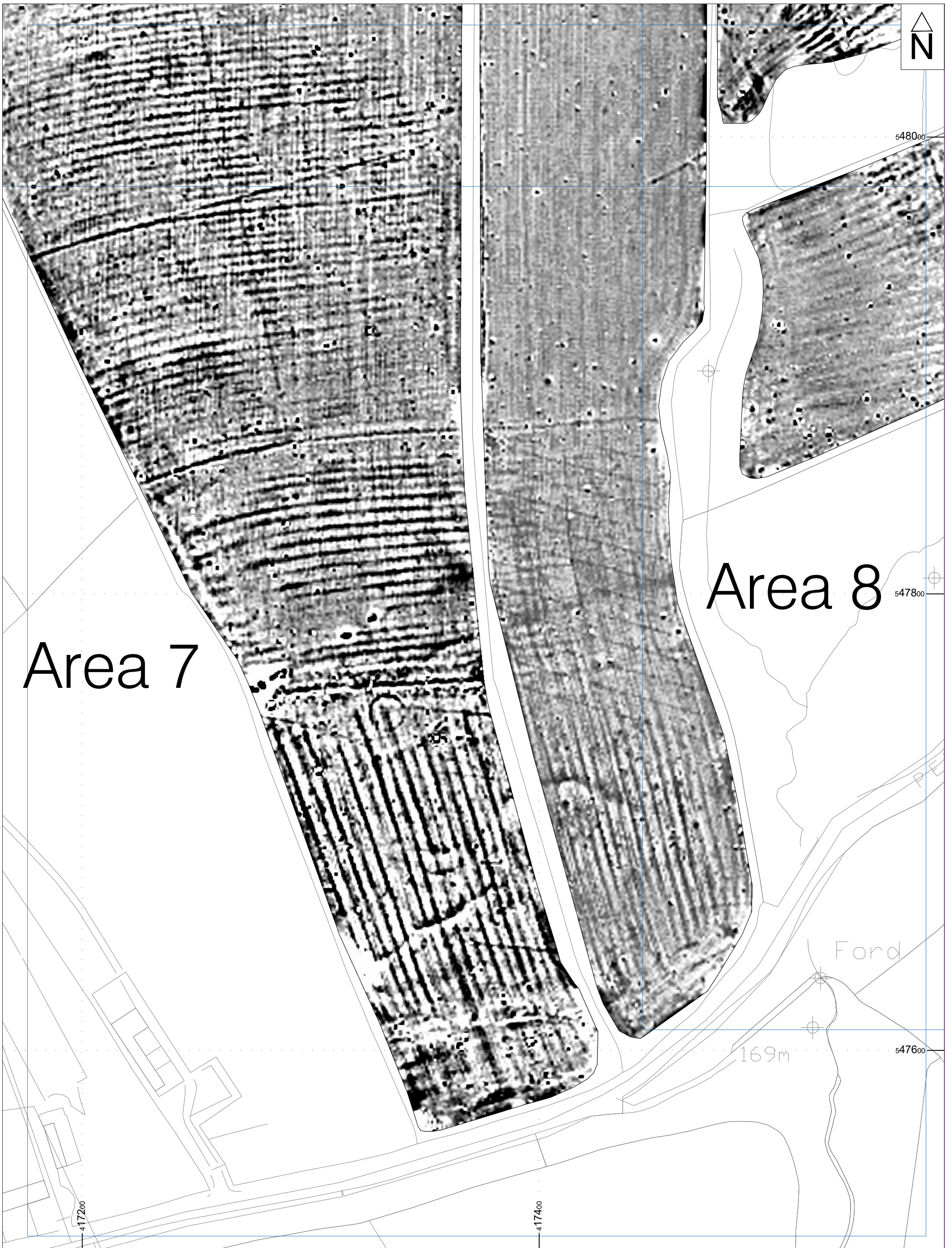

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 Interpretation of magnetometer data; Sector 4  
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Title	
	SECTOR BOUNDARY

Interpretation					
	FERROUS		RIDGE & FURROW		UNCERTAIN
	SERVICE PIPE		AGRICULTURAL		ARCHAEOLOGY?
	MAGNETIC DISTURBANCE		FORMER FIELD BOUNDARY		ARCHAEOLOGY
	FIELD DRAIN		GEOLOGY		

0 50m  
 1:1500 @ A3

Fig. 15





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Project ID: XD50\_MLF22

Processed greyscale magnetometer data; Sector 5

Title

 SECTOR BOUNDARY



1:1500 @ A3

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Fig. 16



Area 7

Area 8

Ford

169m


54800

547800

547600

417200


417400


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Project ID: XD50\_MLF22

XY trace plot of minimally processed magnetometer data;  
Sector 5

Title

 SECTOR BOUNDARY

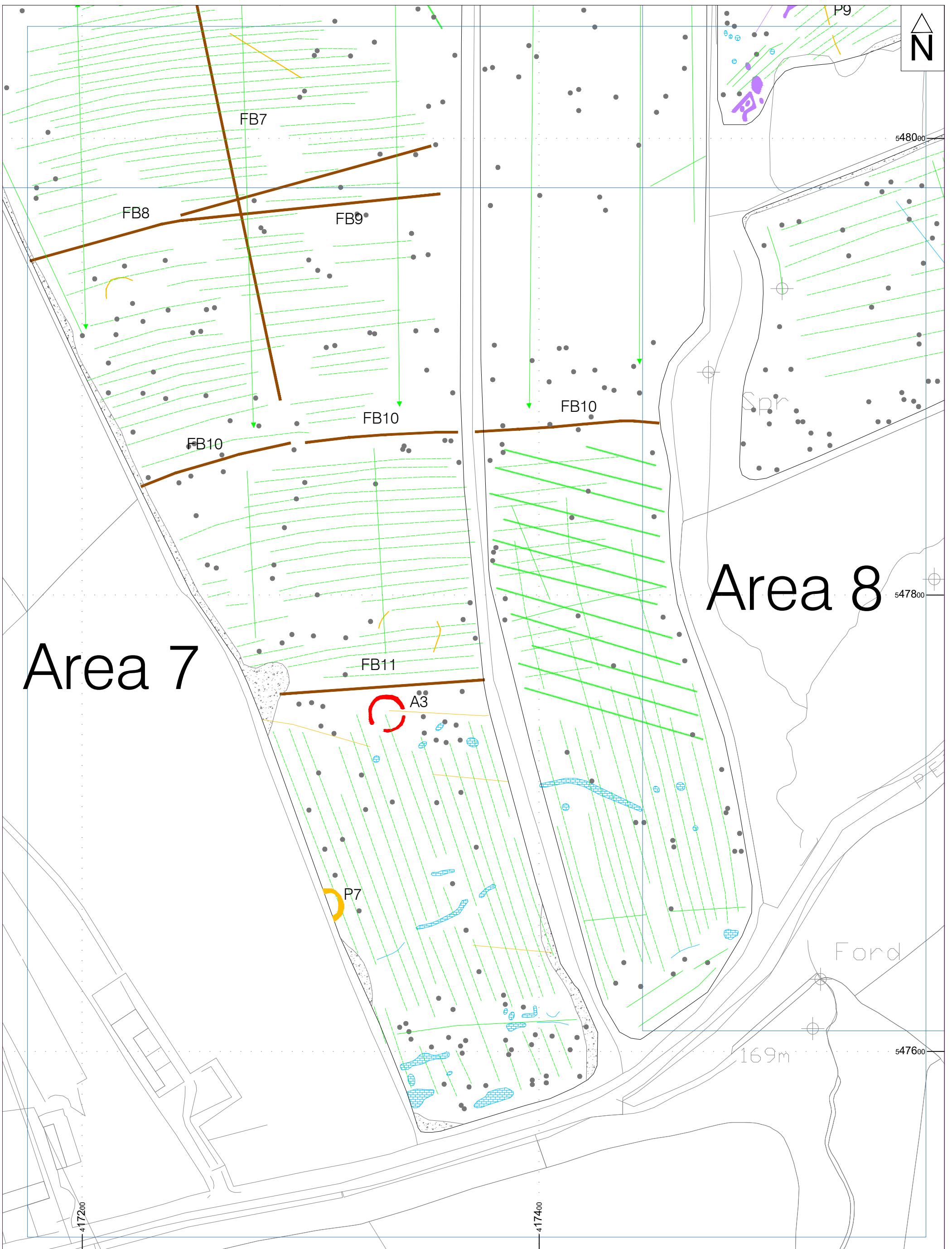
15.0 nT/cm


0 50m

1:1500 @ A3

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Fig. 17














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Project ID: XD50\_MLF22

Interpretation of magnetometer data; Sector 5

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Interpretation					
	FERROUS		RIDGE & FURROW		UNCERTAIN
	MAGNETIC DISTURBANCE		AGRICULTURAL		ARCHAEOLOGY?
	FIELD DRAIN		FORMER FIELD BOUNDARY		ARCHAEOLOGY
	GEOLOGY				


0 50m

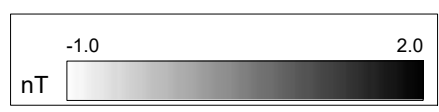
1:1500 @ A3

Fig. 18




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 Project ID: XD50\_MLF22  
 Processed greyscale magnetometer data; Sector 6

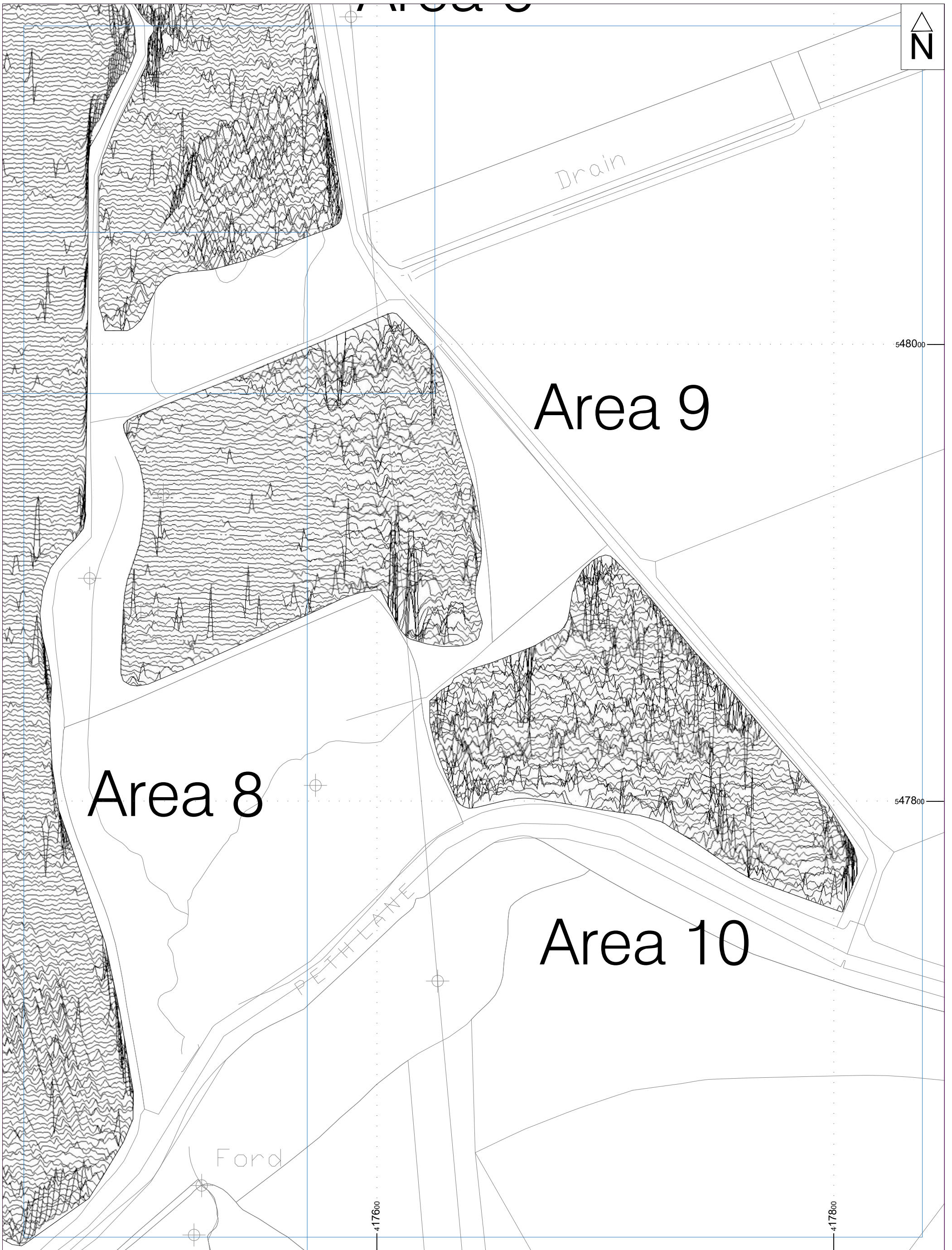
Title  
 SECTOR BOUNDARY




1:1500 @ A3

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Fig. 19




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 Project ID: XD50\_MLF22

Title  
 SECTOR BOUNDARY

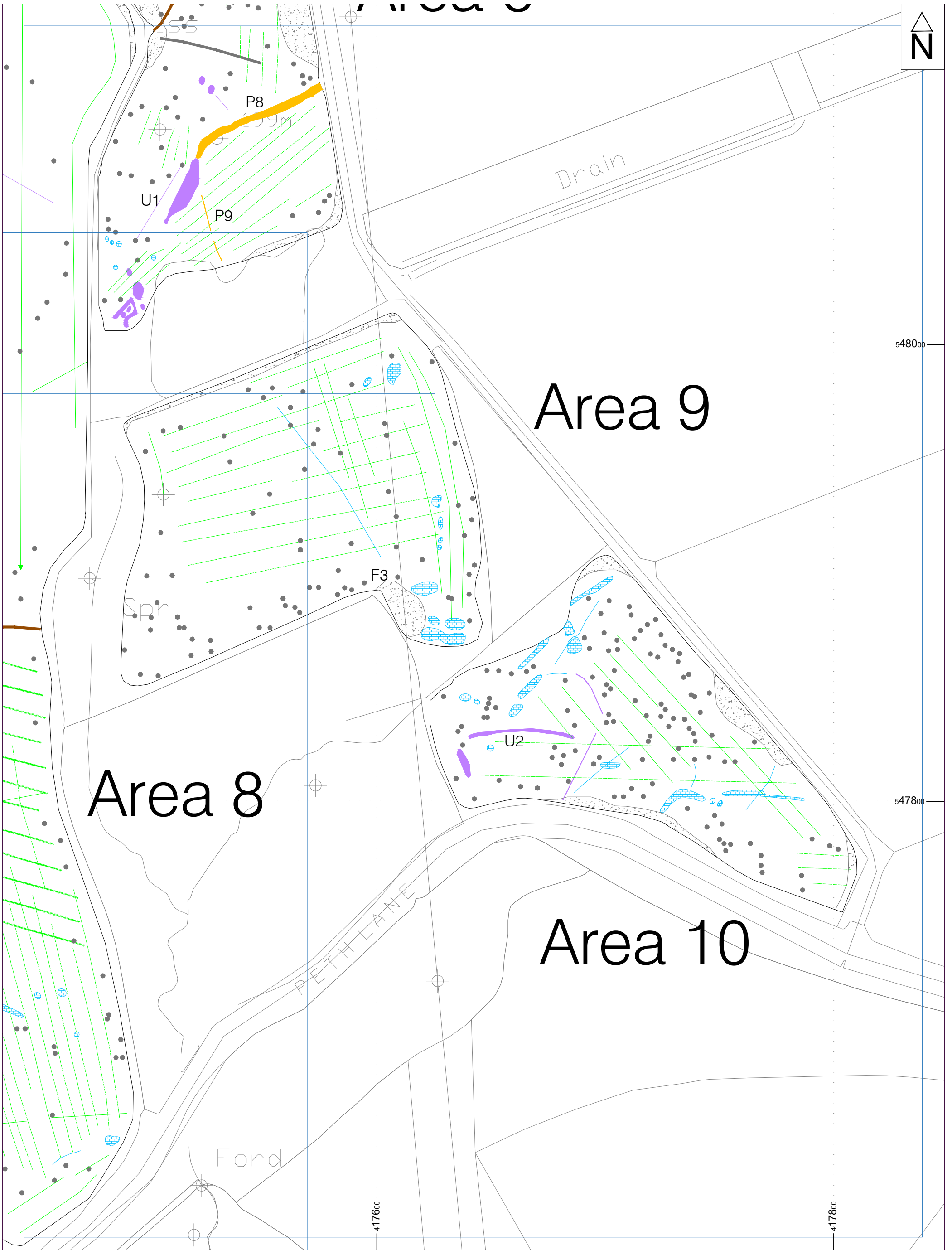
15.0 nT/cm


0 50m

1:1500 @ A3











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Fig. 20




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 Project ID: XD50\_MLF22  
 Interpretation of magnetometer data; Sector 6

**Interpretation**

 FERROUS	 RIDGE & FURROW	 UNCERTAIN
 SERVICE PIPE	 AGRICULTURAL	 ARCHAEOLOGY?
 MAGNETIC DISTURBANCE	 FORMER FIELD BOUNDARY	
 FIELD DRAIN	 GEOLOGY	

0 50m

1:1500 @ A3

Fig. 21

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*Plate 1. General view of Area 1, looking north*



*Plate 2. General view of Area 2, looking south*



*Plate 3. General view of Area 4, looking northeast*



*Plate 4. General view of Area 6, looking south*



*Plate 5. General view of Area 9, looking southwest*



*Plate 6. General view of Area 10, looking southeast*

## **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**

Data was recorded onto a device, using a Carlson GNSS BRx7 Smart antenna, for centimetre accuracy. These readings were stored in the memory of the instrument and downloaded for processing and interpretation. The accuracy of the BRx7 is between 0.15cm – 0.8cm. The BRx7 has a built in tilt sensor to correct collected point coordinates to within 2cm.

The survey data were then super-imposed onto a base map provided by the client to produce the displayed 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 Durham Historic Environment Record).

**Appendix 4: Oasis form**



# Summary for archaeol11-508721

OASIS ID (UID)	archaeol11-508721
Project Name	Geophysical Survey at Moor Leazes Farm, Lanchester
Sitename	Moor Leazes Farm, Lanchester
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	25-Jul-2022 - 28-Jul-2022
Location	Moor Leazes Farm, Lanchester NGR : NZ 17320 48250 LL : 54.8287894311671, -1.73192171502844 12 Fig : 417320,548250
Administrative Areas	Country : England County : Durham District : County Durham Parish : Lanchester
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 52 hectares of land located to the northeast of Lanchester, Durham. Anomalies of both a definite and a possible archaeological origin have been detected including a square enclosure, a ring ditch and possible structural remains. Medieval or post-medieval ridge and furrow cultivation have been detected along with former field boundaries and modern ploughing. Large areas of geological responses within the dataset are likely to be associated to past mining. Based on the magnetic survey the archaeological potential of the Site is deemed to be high in the west of the survey area and medium to low elsewhere.
Keywords	Ring Ditch - BRONZE AGE - FISH Thesaurus of Monument Types Signal Station - ROMAN - FISH Thesaurus of Monument Types
Funder	
HER	Durham County Council HER - noRev - LITE
Person Responsible for work	Emma, Brunning
HER Identifiers	
Archives	

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