WYAS Archaeological Services

Belvoir Solar Farm

Bottesford

Leicestershire

Geophysical Survey

Report no. 3476
October 2020

Client:

JBM Solar Projects 10 Ltd

Belvoir Solar Farm, Bottesford, Leicestershire

Geophysical Survey

Summary

A geophysical (cart-based magnetometer) survey was undertaken on approximately 134 hectares of land located to the south of Bottesford, Leicestershire. Anomalies of a possible archaeological origin have been detected including a ring ditch, sub-rectangular enclosures, linear features and pit-like responses. Medieval ridge and furrow cultivation have also been detected along with former field boundaries and modern ploughing. Geological responses can be seen throughout whilst ferrous responses are associated with modern debris, pylons and overhead power cables. Based on the geophysical survey and interpretation of the results the archaeological potential of the site is medium to high in the northwest and low elsewhere.

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Report Information

Client:	JBM Solar Projects 10 Ltd
Address:	33 Cavendish Square, London, W1G 0PW
Report Type:	Geophysical Survey
Location:	Bottesford
County:	Leicestershire
Grid Reference:	SK 8212 3747 (approximate centre)
Period(s) of activity:	Modern
Report Number:	3476
Project Number:	X195
Site Code:	BTD20
OASIS ID:	archaeol1-405580
Date of fieldwork:	September 2020
Date of report:	October 2020
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1 Introduction

Archaeological Services ASWYAS has been commissioned by Pegasus Group on behalf of JBM Solar Projects 10 Ltd to undertake a geophysical survey at Belvoir Solar Farm, Bottesford, Leicestershire. This was undertaken in line with current best practice (CIfA 2014; Schmidt *et al.* 2015). A Written Scheme of Investigation was approved by Richard Clark, Principal Archaeologist at Leicestershire County Council, on 25th August 2020. The survey was carried out between 7th and 25th September 2020 to provide additional information on the archaeological resource of the site.

Site location, topography and land-use

The site is located at SK 8212 3748 (approximate centre), comprising *c.* 134ha situated to the south of Bottesford (see Fig. 1).

The site is almost completely bound by agricultural land with the A52, Bottesford Bypass lying to the north, to the west is Castle View Road. At the time of survey the land consisted of recently harvested crop. The site lies at 45m (above Ordnance Datum) aOD in the north, falling to approximately 39m aOD in the south. In the east the aOD is 49m falling to 40m aOD in the west.

Soils and geology

The underlying geology of the site is relatively complex, containing a mixture of formations. From north to south; the sedimentary bedrock belongs to the Beckingham Member, followed by the Stubton Limestone Beds, the Foston Member and finally the Littlegate Limestone Beds. All of these bedrocks were formed 191 to 199 million years ago during the Jurassic Period. Superficial deposits of River Terrace deposits – undifferentiated sand and gravels are in the very northwest corner. Elsewhere on site they have not been recorded (BGS 2020). The majority of soil in the survey are described as lime-rich loamy and clayey soils with impeded drainage (SoilScapes 2020).

2 Archaeological Background

The archaeological background below has been provided by Pegasus Group and is based on a review of the National Heritage List for England (NHLE), Leicestershire Historic Environment Record (HER) data available online at Heritage Gateway and historic maps available online at The Genealogist and the National Library of Scotland.

Three ‘monuments’ are recorded within the site by the HER. All are located in the north-western corner, between Castle View Road and the A52. They comprise the cropmarks of a possible Bronze Age ring ditch and associated linear ditch (MLE3405), the cropmarks of a

possible Iron Age sub-rectangular enclosure (MLE343404), and the findspot of an Anglo-Saxon brooch (MLE9243).

Further evidence of prehistoric and Saxon activity is recorded immediately to the north-east of the site, on the north side of Easthope Lane. First identified as cropmarks, a targeted excavation carried out in 1988 revealed a sub-rectangular enclosure preserving evidence for ironworking; it seems to have been in use during the Iron Age and infilled gradually during the Roman and Saxon periods (MLE3400).

Also in the vicinity of the site are numerous 'monuments' relating to medieval settlement and activity. Earthworks recorded at 'California', immediately to the west of the site on the opposite side of Castle View Road, may signify the location of Toston deserted village (MLE9845). Earthworks to the east of the site at Muston represent the remains of a moated grange (MLE16636).

The earliest available historic mapping of the site is the 1849 tithe map for the parish of Muston. It shows a slightly greater number of fields than exist today, but no buildings are identified. The land was owned by the Duke of Rutland and was attached to Peacock Farm. No features of note are marked within the site on the first or later editions of the Ordnance Survey.

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 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 an overview of the interpretation at the same scale. Minimally processed data, together with interpretation of the survey results are presented in Figures 4 to 25 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 2014). 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 25)

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.

Large circular areas of magnetic disturbance within Fields 13 and 15 correspond to the location of large steel pylons. Between these pylons, the overhead power cables and their

electromagnetic effect have caused a 'mottled' affect in the data and has been marked on the interpretation diagrams.

Bisecting the middle of the survey area (through Fields 7, 8, 10, 12 and 11), a linear dipolar trend has been recorded which corresponds to a buried service.

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.

The survey data is very smooth and suggests that the underlying geological deposits are not causing undue interference or masking the magnetic signatures of any archaeological remains.

Where the geological anomalies have been detected they are located close to field margins and this suggests that these areas may have been subjected to slightly deeper ploughing, therefore bringing more of the underlying geology to the surface.

Agricultural anomalies

Former field boundaries have been detected throughout the survey area and are recorded on first edition Ordnance Survey mapping dating from 1884 (NLS 2020). These boundaries can be seen in Fields 2, 3, 4, 5, 6, 8, 10, 12, 13 and 15. The historical mapping indicates that there was little change to the layout of the fields from 1884 until the latest available online mapping dated 1990. The current digital mapping seems to show certain field boundaries that no longer exist.

Parallel linear trends can be seen within all areas and are associated with both modern ploughing and medieval ridge and furrow cultivation. The survey area lies between the medieval settlements recorded at California (MLE9845) to the west of site and at Muston (MLE16636) to the east. It is likely that the ridge and furrow detected forms part of the wider medieval agricultural landscape.

Possible archaeological anomalies

Anomalies of a possible archaeological origin have been recorded in the northwest of the dataset and sporadically throughout.

Anomalies (**P1, P2** and **P3**) in Field 1 relate to the HER entry named 'Cropmarks north of Easthorpe Cottage' Ref MLE3404/5. The HER refers to a possible ring ditch which could be **P1**, a possible sub-rectangular enclosure **P2** and linear features **P3**. The ring ditch measures approximately 20m in diameter whilst the sub-rectangular enclosure measures approximately 32m in length by 10m in width. The linear feature **P3** has been recorded as a series of pit-like

responses. It is likely that the ploughing within this field has truncated the feature, rather than it being a series of pits, although this cannot be ruled out. A number of other responses within this area have been recorded as possible archaeology and may be contemporary.

Anomalies (**P4** and **P5**) in Field 2 show further possible archaeological areas of interest, both in the forms of sub-rectangular enclosures. Anomaly **P4** measures approximately 60m in length and 8m in width, with internal divisions. **P5** is located along the eastern boundary of the survey area but measures 23m in length and at least 15m in width. Although located adjacent to a field boundary this could be a small enclosure perhaps of prehistoric or later date. A number of other faint linear responses can be seen within this area.

A faint response (**P6**) in Field 16, in the south of the survey area has been recorded. It measures approximately 16m x 12m and may be associated with an enclosure. However, given the isolation of this feature with no other similar responses in this area, the interpretation is tentative.

5 Conclusions

The geophysical survey has detected a number of magnetic anomalies with possible archaeological origins in the north-western part of the site. These were formerly identified as cropmarks and appear to represent sub-rectangular enclosures, linear features, a ring ditch and pits.

Medieval ridge and furrow cultivation has been recorded along with former field boundaries and modern ploughing. Geological anomalies have been recorded throughout due to variations within the soils. A service pipe runs through the middle of the survey area on a northwest to southeast alignment. Other modern responses are associated with pylons, overhead power cables and modern debris.

Based on the geophysical survey and interpretation of the results the archaeological potential of the site is medium to high in the northwest and low elsewhere.

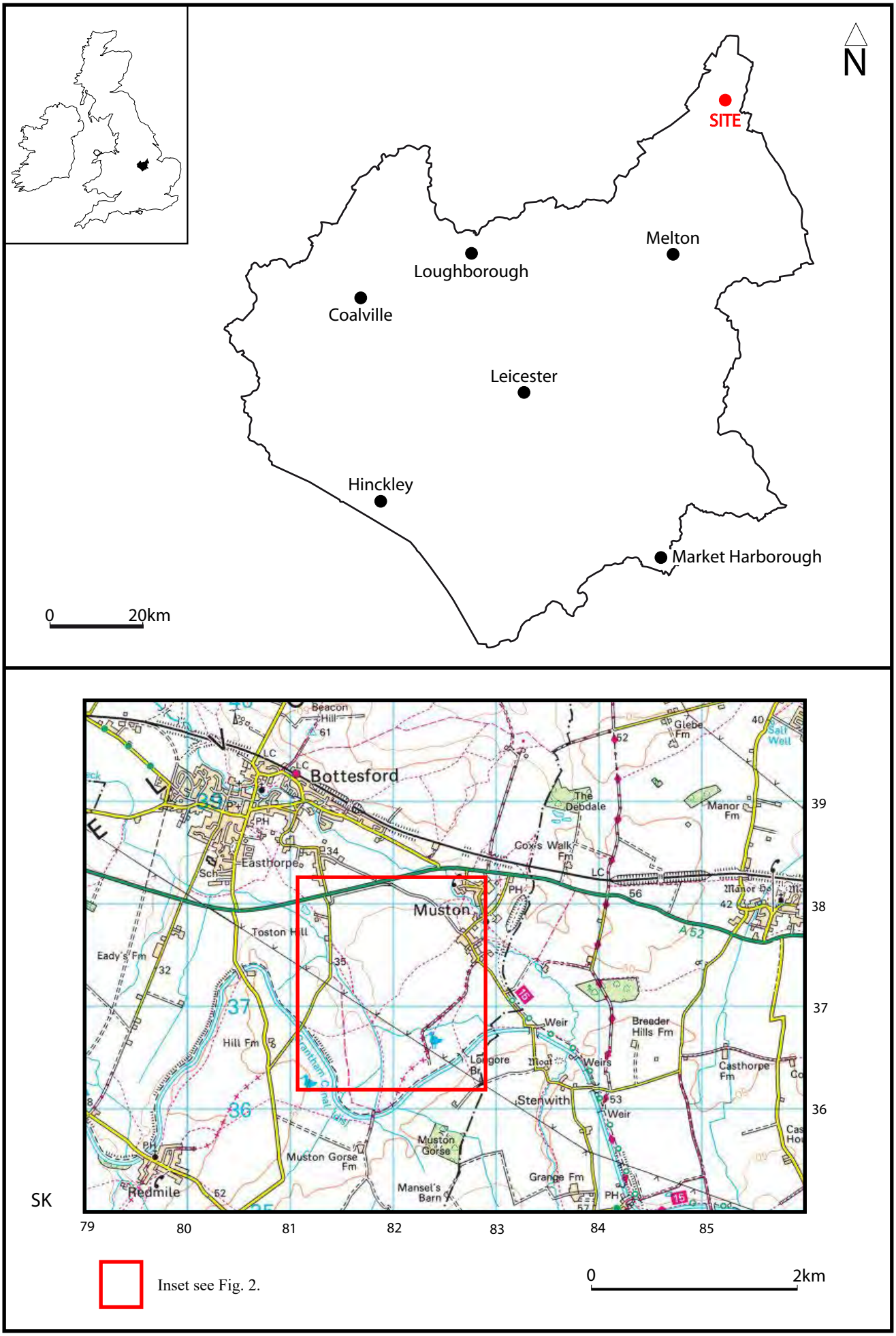

Fig. 1. Site location

	PROJECT ID: X195_BTD20
	SURVEY AREA
	SECTOR BOUNDARY
1	PHOTO LOCATIONS
1	FIELD NUMBERS

N

SECTOR 1
SEE FIGS 4-5

SECTOR 2
SEE FIGS 6-7

SECTOR 3
SEE FIGS 8-9

SECTOR 4
SEE FIGS 10-11

SECTOR 5
SEE FIGS 12-13

SECTOR 6
SEE FIGS 14-15

SECTOR 7
SEE FIGS 16-17

SECTOR 8
SEE FIGS 18-19

SECTOR 9
SEE FIGS 20-21

SECTOR 10
SEE FIGS 22-23

SECTOR 11
SEE FIGS 24-25

2.0
-1.0
nT

338000
337000
336000
482000

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0 250m

Fig. 2. Survey location showing processed greyscale magnetometer data (1:7500 @ A3)

PROJECT ID: X195_BTD20	
	SURVEY AREA
	SECTOR BOUNDARY

N

SECTOR 1
SEE FIGS 4-5

SECTOR 2
SEE FIGS 6-7

SECTOR 3
SEE FIGS 8-9

SECTOR 4
SEE FIGS 10-11

SECTOR 5
SEE FIGS 12-13

SECTOR 6
SEE FIGS 14-15

SECTOR 7
SEE FIGS 16-17

SECTOR 8
SEE FIGS 18-19

SECTOR 9
SEE FIGS 20-21

SECTOR 10
SEE FIGS 22-23

SECTOR 11
SEE FIGS 24-25

P1 P2 P3 P4 P5 P6

338000

337000

336000

482000

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	DIPOLAR LINEAR	SERVICE PIPE
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	OVERHEAD POWERLINES
	LINEAR TREND	INTERFERENCE
	LINEAR TREND	RIDGE AND FURROW
	LINEAR TREND	AGRICULTURAL
	LINEAR TREND	FORMER FIELD BOUNDARY
	LINEAR TREND	GEOLOGY
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?

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0 250m

Fig. 3. Overall interpretation of magnetometer data (1:7500 @ A3)

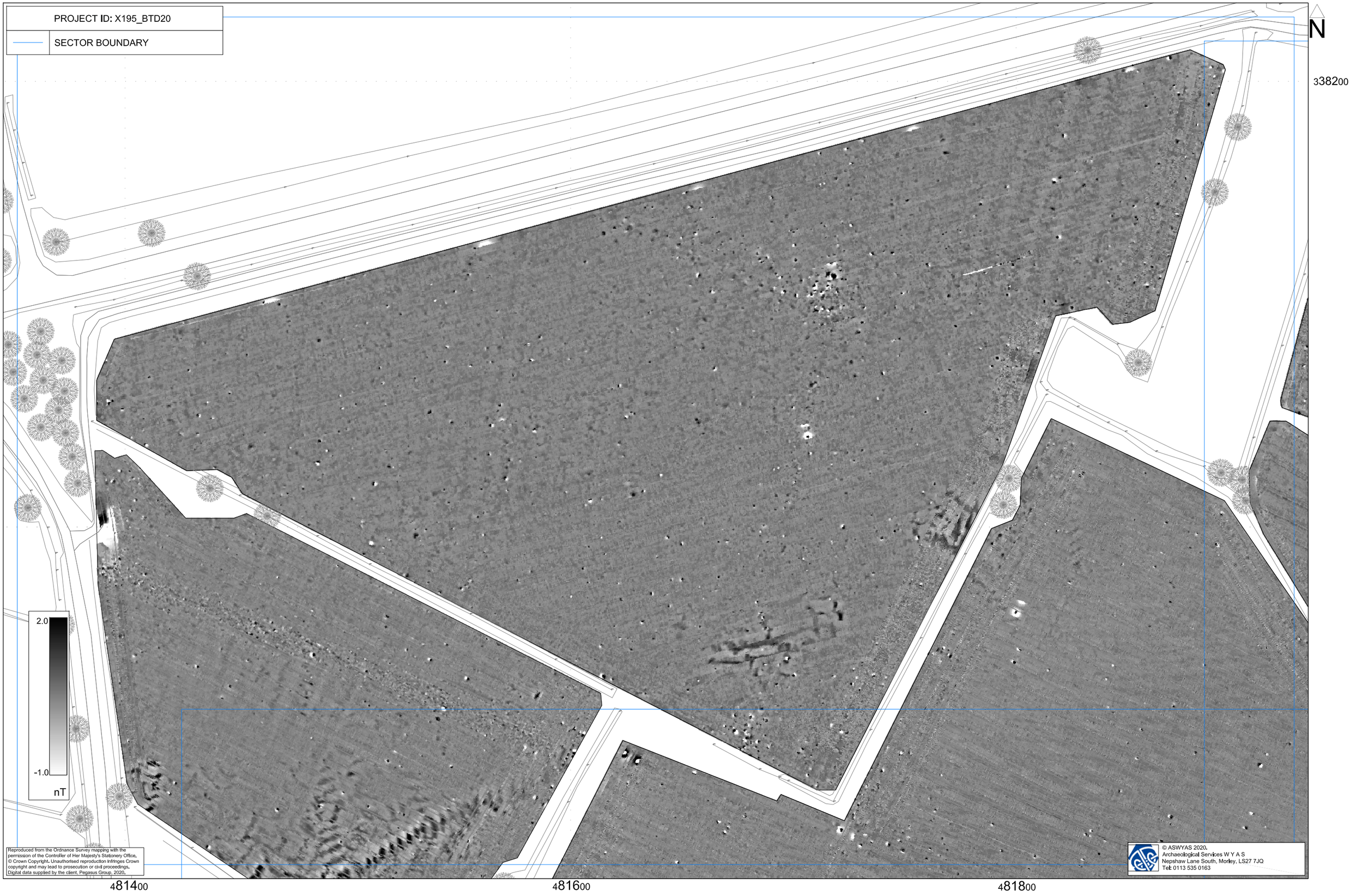

Fig. 4. Minimally processed greyscale magnetometer data; Sector 1 (1:1500 @ A3)

PROJECT ID: X195_BTD20	
	SECTOR BOUNDARY

TYPE OF ANOMALY		INTERPRETATION
	DIPOLAR ISOLATED	FERROUS MATERIAL
	LINEAR TREND	RIDGE AND FURROW
	LINEAR TREND	AGRICULTURAL
	LINEAR TREND	FORMER FIELD BOUNDARY
	LINEAR TREND	GEOLOGY
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?

N

338200

P1

P2

P3

P4

P5

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481400 481600 481800

0 100m

Fig. 5. Interpretation of magnetometer data; Sector 1 (1:1500 @ A3)

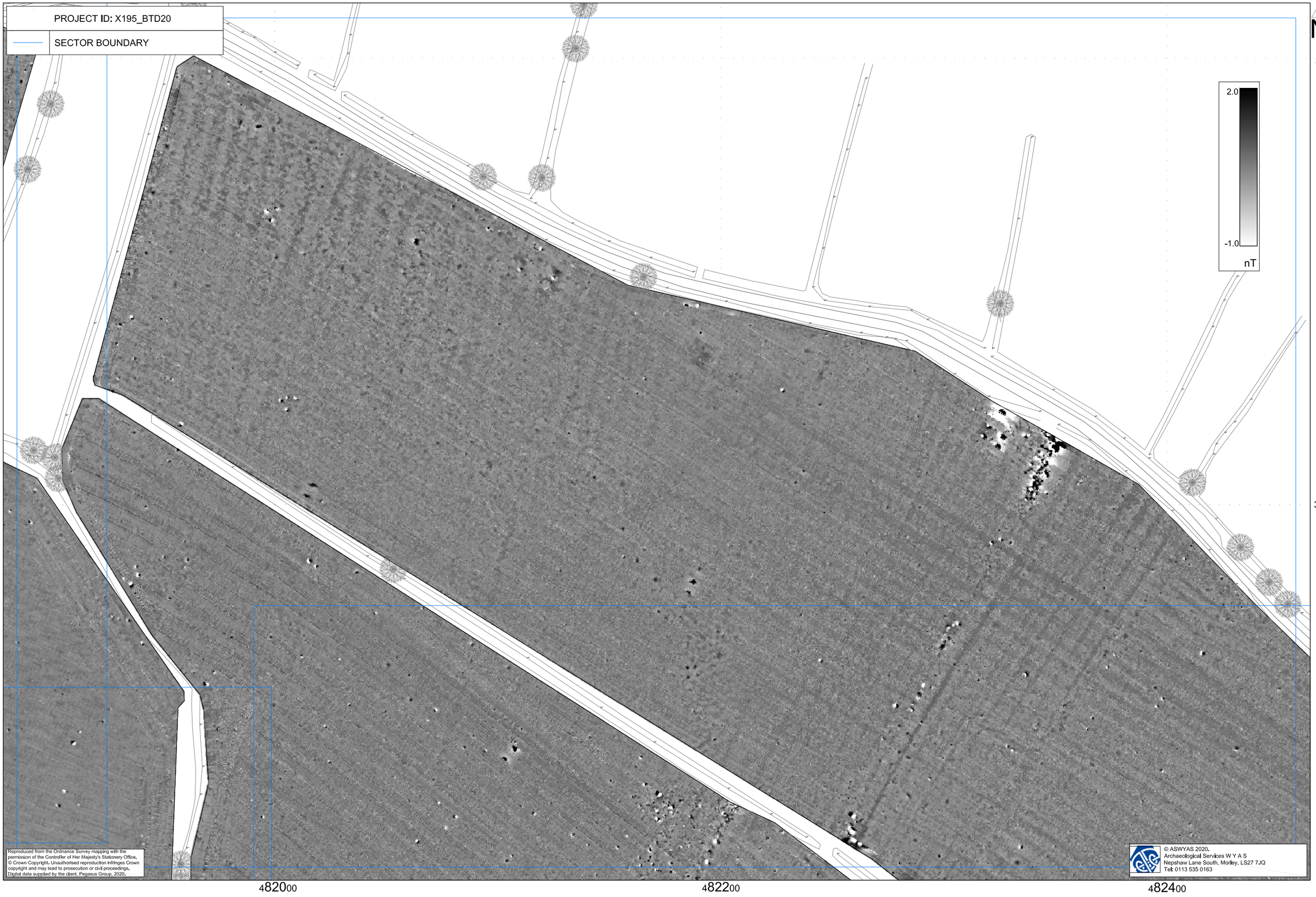

Fig. 6. Minimally processed greyscale magnetometer data; Sector 2 (1:1500 @ A3)

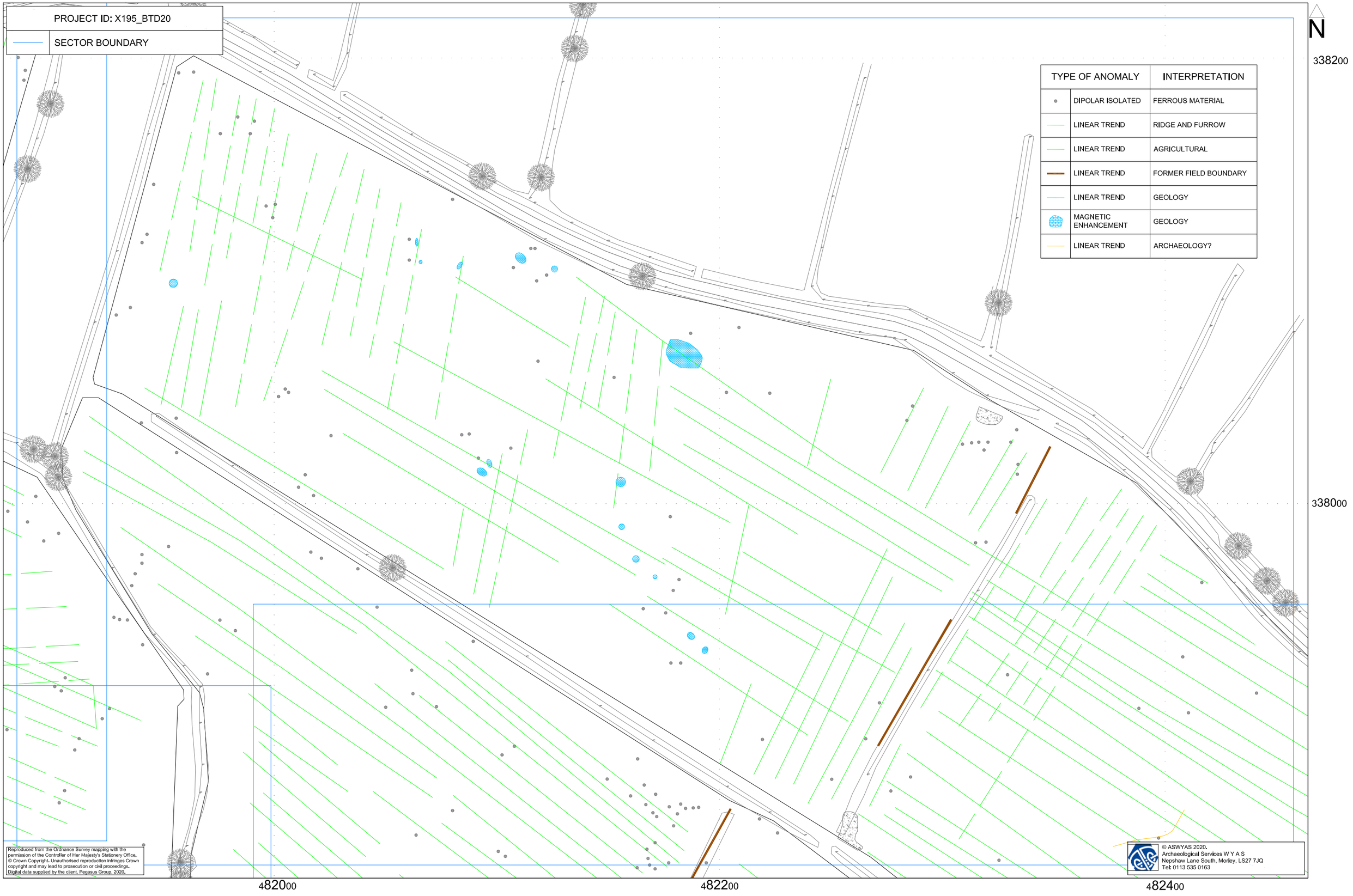

Fig. 7. Interpretation of magnetometer data; Sector 2 (1:1500 @ A3)

PROJECT ID: X195_BTD20

SECTOR BOUNDARY

N

337800

2.0

-1.0

nT

376600

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481600

481800

0 100m

Fig. 8. Minimally processed greyscale magnetometer data; Sector 3 (1:1500 @ A3)

PROJECT ID: X195_BTD20

SECTOR BOUNDARY

N

337800

337600

481600

481800

0 100m

TYPE OF ANOMALY		INTERPRETATION
	DIPOLAR ISOLATED	FERROUS MATERIAL
	LINEAR TREND	RIDGE AND FURROW
	LINEAR TREND	AGRICULTURAL
	LINEAR TREND	FORMER FIELD BOUNDARY
	LINEAR TREND	GEOLOGY
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?

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Fig. 9. Interpretation of magnetometer data; Sector 3 (1:1500 @ A3)