ARCHAEOLOGICAL SERVICES WYAS

North Killingholme Power Project
East Halton
North Lincolnshire

Geophysical Survey

Report no. 2665

November 2014

Client: C. GEN Ltd

REGISTERED ORGANISATION IfA

North Killingholme Power Project
East Halton
North Lincolnshire

Geophysical Survey

Summary

A geophysical (magnetometer) survey covering 18 hectares was carried out on land along the proposed route of a pipeline for the North Killingholme Power Plant, to provide further information on the archaeological resource of the site prior to the submission of a planning application. The survey has successfully identified two areas of archaeological potential. The first is in the field to the north and east of Manor House Farm and includes anomalies consistent with medieval/post-medieval agricultural activity as well as other higher magnitude responses that may be more indicative of activity possibly associated with the former manor. The second area of potential is nearly 1km to the east of Halton and comprises one or more enclosures that are on the same east/west alignment as cropmarks to the north of the corridor. Elsewhere, ridge and furrow cultivation is apparent along the corridor east of Manor House Farm indicating medieval and later cultivation. On the basis of the survey, the archaeological potential of the site is considered to be moderate to high within the vicinity of the two identified sites and low elsewhere.

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Report Information

Client:	C. GEN Ltd
Address:	C. GEN Killingholme Ltd, Clough Lane, North Killingholme, DN40 3JP
Report Type:	Geophysical Survey
Location:	East Halton
County:	North Lincolnshire
Grid Reference:	TA 1246 1972 to TA 1511 2037
Period(s) of activity:	Prehistoric/Medieval
Report Number:	2665
Project Number:	4256
Site Code:	NKP14
OASIS ID:	archaeol11- 196402
Museum Accession No.:	n/a
Date of fieldwork:	June – August 2014
Date of report:	August 2014
Project Management:	Sam Harrison BSc MSc MIfA
Fieldwork:	Christopher Sykes MSc BA
	Alex Schmidt BA
	Thomas Fildes BA
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Illustrations:	David Harrison and Sam Harrison
Photography:	Site Staff
Research:	n/a

Authorisation for distribution: --

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1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by Simon McCudden of Parsons Brinckerhoff (The Consultant) on behalf of C. GEN Ltd (The Client), to undertake a geophysical (magnetometer) survey of land north of East Halton, North Lincolnshire, to support a planning application for the construction of a pipeline as part of the North Killingholme Power Project. The work was undertaken in accordance with a Project Design (Harrison 2014) supplied to and approved by the Consultant, with guidance contained within the National Planning Policy Framework (2012) and in line with current best practice (David *et al.* 2008). The survey was carried out between June 16th and August 22nd 2014 in order to provide additional information on the archaeological potential of the site.

Site location, topography and land-use

The Proposed Development Area (PDA) is located at the village of East Halton, 7km north-west of Immingham, North Lincolnshire (see Fig. 1). The proposed pipeline corridor curves around the west and northern sides of the village from NGR TA 1246 1972, close to College Bridge, on a north-easterly alignment, until it meets and skirts along the southern edge of an east/west aligned disused railway line to TA 1511 2037, at Killingholme Power Station (see Fig. 2). At the time of the survey the PDA was under mixed arable cultivation (see plates) with the pipeline corridor passing through seventeen fields. No access was available to Fields 1 to 5. Field 10 was under overgrown vegetation at the time of the survey and was unsuitable for survey. The eastern half of Field 16 and Field 17 were surveyed as part of a separate programme of work.

The topography across the scheme is flat and low lying, varying slightly between 3m and 9m above Ordnance Datum.

Soils and geology

The solid geology comprises Burnham Chalk Formation which is overlain by superficial deposits of till and localised deposits of alluvium which are associated with East Halton Beck which runs to the west of the PDA (British Geological Survey 2014).

The soils are classified in the Bishampton 1 and Holderness associations, being characterised as deep fine loams with slowly permeable subsoils and slight seasonal waterlogging (Soil Survey of England and Wales 1983).

2 Archaeological Background

The proposed pipeline route passes through a rich archaeological landscape with numerous cropmarks (see Fig. 2) thought to indicate later prehistoric and Roman settlement, land division and enclosure. Several of these sites have been confirmed by previous geophysical survey and excavation programmes. In addition, medieval cultivation is recorded throughout the surrounding landscape.

3 Aims, Methodology and Presentation

The main aim of the geophysical survey was to provide sufficient information to enable an assessment to be made of the impact of the proposed development on potential sub-surface archaeological remains and for further evaluation or mitigation proposals, if appropriate, to be recommended. To achieve this aim a magnetometer survey covering all available parts of the PDA was carried out.

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 site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble 5800 model). Bartington Grad601 magnetic gradiometers were used during the survey, taking readings at 0.25m intervals on zig-zag traverses 1m apart within 30m by 30m grids, so that 3600 readings were recorded in each grid. These readings were stored in the memory of the instrument and later downloaded to computer for processing and interpretation. Geoplot 3 (Geoscan Research) 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 is a large scale survey location plan displaying the processed greyscale magnetometer data, cropmark detail and the extent of previous geophysical surveys at a scale of 1:10000. Figure 3 shows an overall data interpretation, also at a scale of 1:10000. Detailed data plots (‘raw’ and processed) and full interpretative figures are presented at a scale of 1:1000 in Figures 4 to 30 inclusive.

Further technical information on the equipment used, data processing and survey methodologies is given in Appendix 1 and Appendix 2. Appendix 3 describes the composition and location of the site archive.

The survey methodology, report and any recommendations comply with the Project Design (Harrison 2014) and guidelines outlined by English Heritage (David *et al.* 2008) and by the Institute for Archaeologists (IfA 2013). 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 ‘raw’ and 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 Figs 4 to 30 inclusive)

Generally, a variable level of background magnetic response has been recorded throughout the pipeline corridor with numerous parallel linear anomalies giving the data a striped appearance. These anomalies are thought to be agricultural in nature and are discussed in more detail below.

The anomalies identified by the survey fall into several different types and categories according to their origin. These are discussed below and cross-referenced to specific examples and locations within the site, where appropriate.

Ferrous Anomalies

Ferrous responses, either as individual ‘spike’ anomalies or more extensive areas of magnetic disturbance, are typically caused by modern ferrous (magnetic) debris, either on the ground surface or in the plough-soil, or are due to the proximity of magnetic material in field boundaries, buildings or other above ground features. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as ferrous debris or material is common on rural sites, often being present as a consequence of manuring or tipping/infilling. Throughout the PDA individual iron ‘spike’ anomalies are common but there is no obvious pattern or clustering to their distribution to suggest anything other than a random background scatter of ferrous debris in the soil.

Two gas mains, **A** and **B**, have been identified as high magnitude dipolar linear anomalies appearing on a northerly alignment in Field 6 and Field 9 respectively. A third gas main, **C**, is identified on an east/west alignment traversing Fields 13 to 16.

An east/west linear band of magnetic disturbance, **D**, which divides Field 7 and Field 8 is caused by surveying across a metalled farm track.

Within the south-east of Field 9, a broad area of magnetic disturbance, **E**, corresponds to the location of a pond as depicted on the 1887 edition Ordnance Survey map. The anomaly is due to the magnetic properties of the material used to backfill the pond.

Several further high magnitude anomalies and broad areas of magnetic disturbance, all labelled **F**, can be seen in Field 9 to the east of Manor Farm. The origins of these anomalies is unclear, but it is possible that they relate to additional backfilled features or spreads of enhanced material. An archaeological origin for some of these anomalies cannot be dismissed (see below).

The broad area of magnetic disturbance, **G**, towards the centre of Field 16 is at the intersection of two former field boundaries which are depicted on the first edition Ordnance Survey map (1887). It is likely that this anomaly is due a buried large ferrous object.

Areas of magnetic disturbance at the perimeters of the fields are due to ferrous material forming part of, or adjacent to, the field boundaries.

Agricultural Anomalies

Analysis of historical mapping indicates that over the past 130 years the division and layout of land within the pipeline corridor has been altered by the removal of eight former field boundaries to create larger open fields. Four of these former boundaries have been detected as faint and fragmented linear anomalies, **H**, **I**, **J** and **K**; the other four boundaries have not been detected. The reason for this lack of detection is not clear. It is possible that there is a very low magnetic contrast between the soil fill of the cut features (i.e. ditches) and the surrounding soils or that all trace of the former boundaries has been removed by subsequent ploughing. Anomalies **H** and **I** are discussed further below.

In all the fields east of Manor Farm broad, parallel, linear anomalies are clearly identified. These anomalies are due to the medieval and post-medieval agricultural practice of ridge and furrow cultivation and are caused by the magnetic contrast between the soil forming the ridge and the partially filled furrow. Occasional changes in the orientation of these anomalies are bound by apparent headlands, separating the differing alignments of ploughing.

Other parallel linear anomalies have been identified, particularly to the western end of the corridor in Field 6 and Field 7 but also at other locations to the east of the corridor. These anomalies are interpreted as being due to field drains.

Geological Anomalies

Numerous discrete anomalies, characterised as localised areas of enhanced magnetic response, have been identified throughout the pipeline corridor, although they are most prevalent to the west of the corridor in Fields 6, 7 and 8, adjacent to tributaries of Halton Beck. In particular, at the eastern side of Field 8, a cluster of anomalies and linear negative trends, **L**, can be discerned. All these anomalies are also interpreted as geological being due to the presence of alluvium with the linear anomalies perhaps being former stream channels.

?Archaeological Anomalies

Several anomalies have been identified along the corridor that cannot be confidently interpreted as being due to recent or agricultural activity or geological variation, nor are they of definite archaeological origin. Therefore they have been ascribed a possible archaeological interpretation.

The first of these anomalies, **M**, is located in Field 8 aligned north-west/south-east. This anomaly correlates with one of a pair of parallel linear cropmarks. These parallel cropmarks appear to link between two streams (see Fig. 2).

The second, **N**, is towards the eastern end of the corridor in Field 15. There is a degree of linearity to this fragmented anomaly (it is on the same alignment as the ridge and furrow ploughing) suggesting that the anomaly is either a particularly strong agricultural response or that ploughing has spread magnetic material from an earlier feature, perhaps relating to the adjacent disused railway. However, an archaeological interpretation for both **M** and **N** should be considered given the local archaeological context.

Archaeological Anomalies

Two areas of archaeological potential have been identified by the survey.

The first of these is located in Field 9, approximately 100m to the east and 100m to the north-east of Manor House Farm. Numerous high magnitude anomalies have been identified within this inverted L-shaped area (see Figs 16, 17 and 18) some of which correspond to recorded linear cropmarks (see Fig. 2). The anomalies indicate former field boundaries (**H** and **I** – see above), a back-filled pond and a possible former trackway, defined by anomalies **O** and **P**, within the north of the field, as well as the obvious medieval/post-medieval ploughing features. To the south of the area an increased density and magnitude of anomalies makes any confident interpretation difficult and in isolation none can be ascribed a definite archaeological interpretation. However, linear anomalies **Q**, **R** and **S**, when assessed as a group and taking account of the proximity of Manor House Farm, may be features of archaeological interest which may include the areas of disturbance discussed above.

Eight hundred and fifty metres to the east a second area of clear potential is located in Field 15. A clear rectangular ditched enclosure, **T**, has been identified on an east/west orientation measuring 40m from east to west and 24m from north to south. The enclosure is not recorded as a cropmark but appears on the same alignment as the recorded cropmarks to the north and south of East Halton (see Fig. 2). A second possible enclosure, **U**, can be seen appended to its southern boundary with another linear anomaly, **V**, located just to the south-east perhaps forming part of another enclosure or field. Several discrete areas of magnetic enhancement have been identified in the vicinity of the enclosure which may be archaeological in origin, perhaps being due to pits and postholes.

5 Conclusions

The magnetometer survey has successfully identified two areas of archaeological potential along the pipe corridor. The first is in the field to the north and east of Manor House Farm and includes anomalies consistent with medieval/post-medieval agricultural activity as well as other higher magnitude responses that may be more indicative of activity possibly associated with the former manor. The second area of potential is nearly 1km to the east of Halton and comprises one or more enclosures that are on the same east/west alignment as cropmarks to the north of the corridor.

Elsewhere, ridge and furrow cultivation is apparent along the corridor east of Manor House Farm indicating medieval and later cultivation. The ridge and furrow may be of local historical interest but is not thought to be of any archaeological significance.

The results and subsequent interpretation of data from geophysical surveys should not be treated as an absolute representation of the underlying archaeological and non-archaeological remains. Confirmation of the presence or absence of archaeological remains can only be achieved by direct investigation of sub-surface deposits.

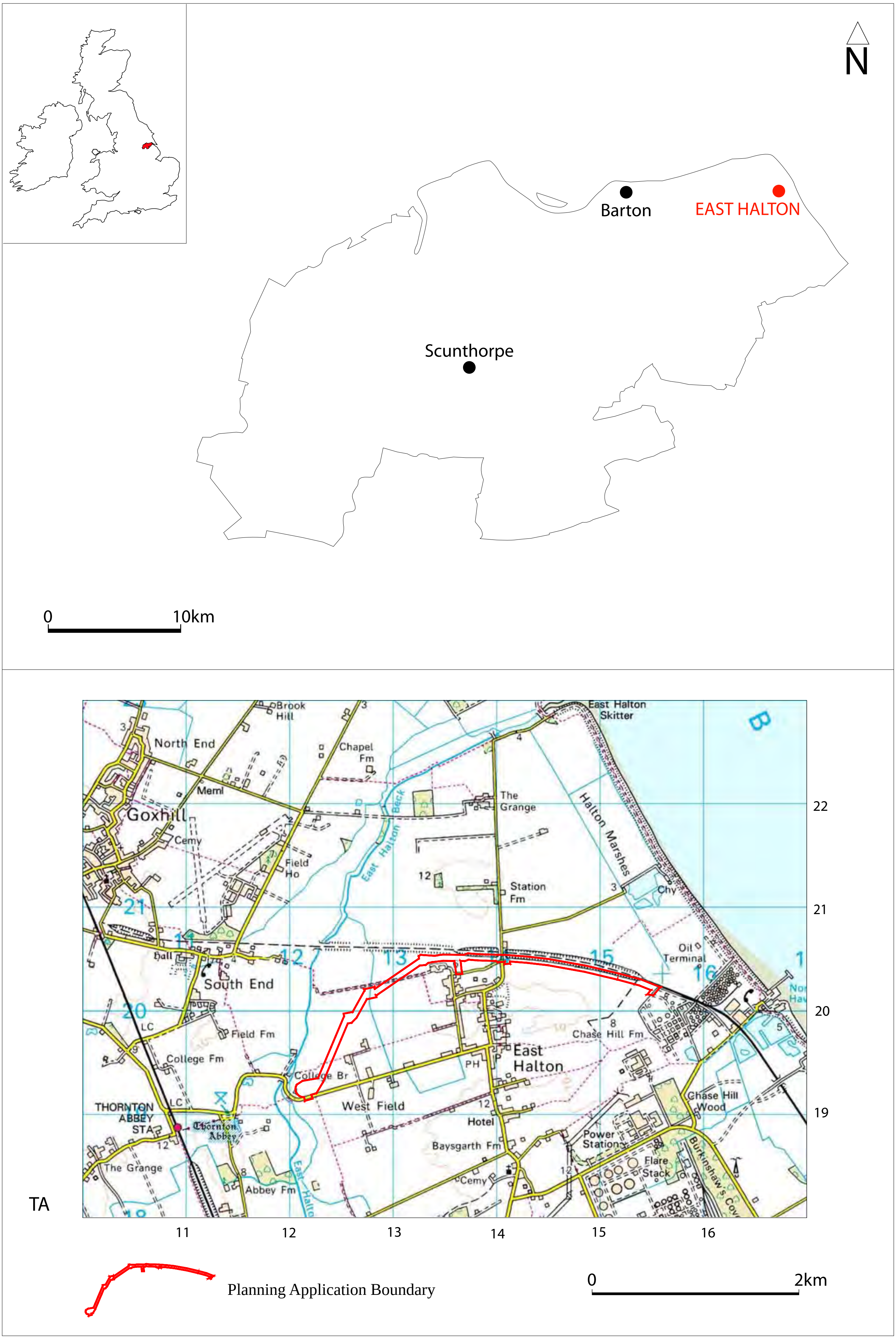

Fig. 1. Site location

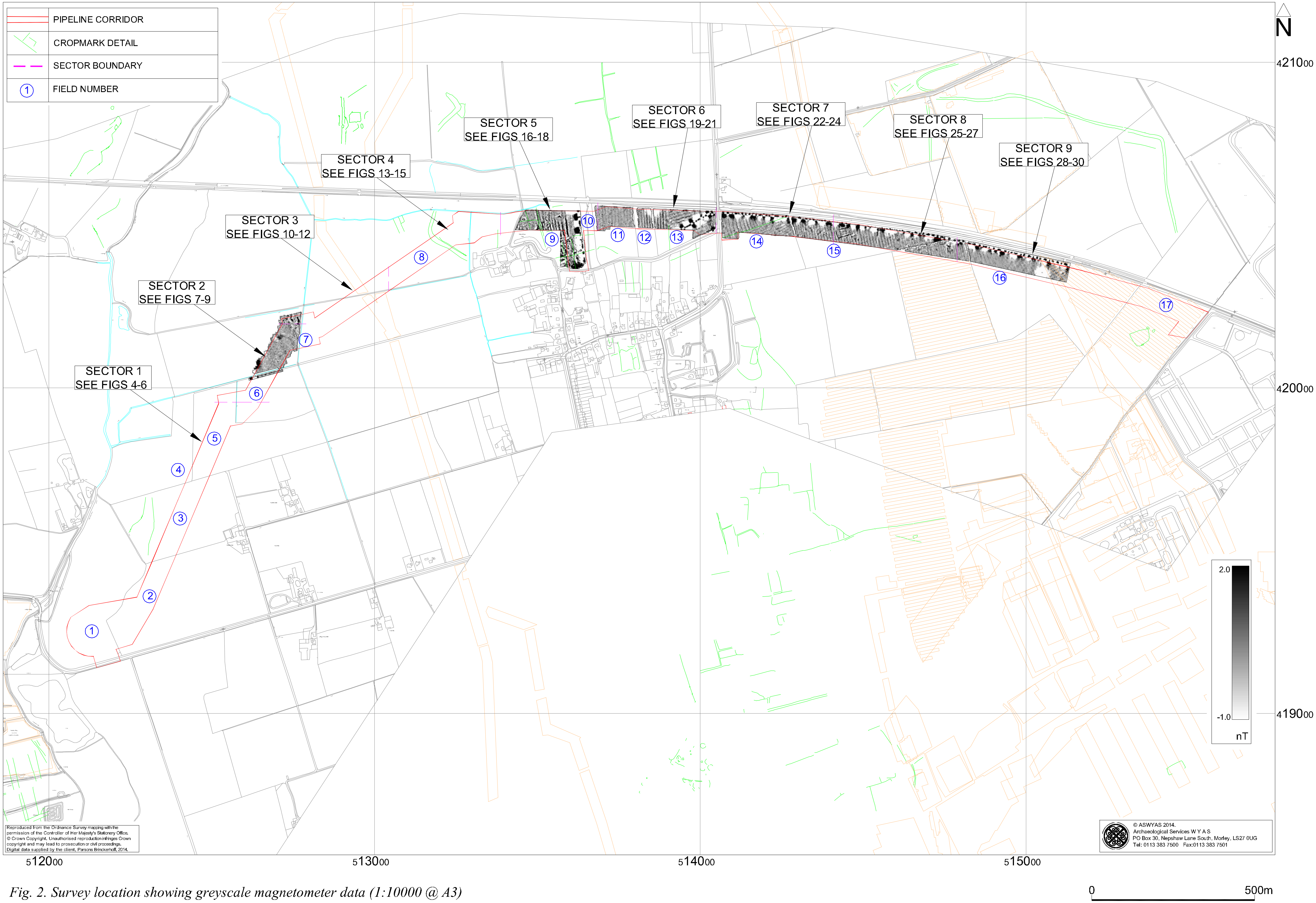

Fig. 2. Survey location showing greyscale magnetometer data (1:10000 @ A3)

Fig. 3. Overall interpretation of magnetometer data (1:10000 @ A3)

0 500m

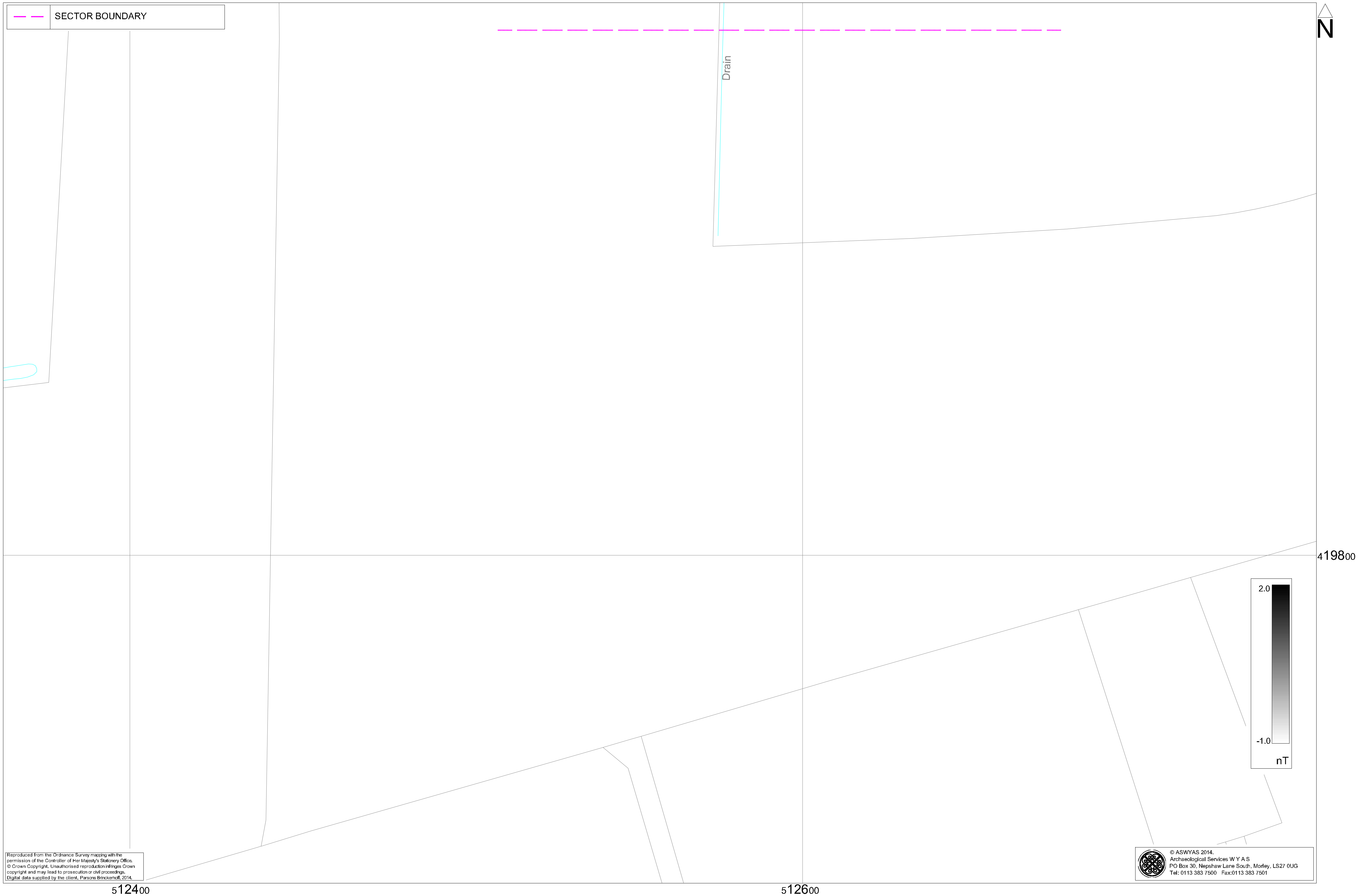

Fig. 4. Processed greyscale magnetometer data; Sector 1 (1:1000 @ A3)

0 50m

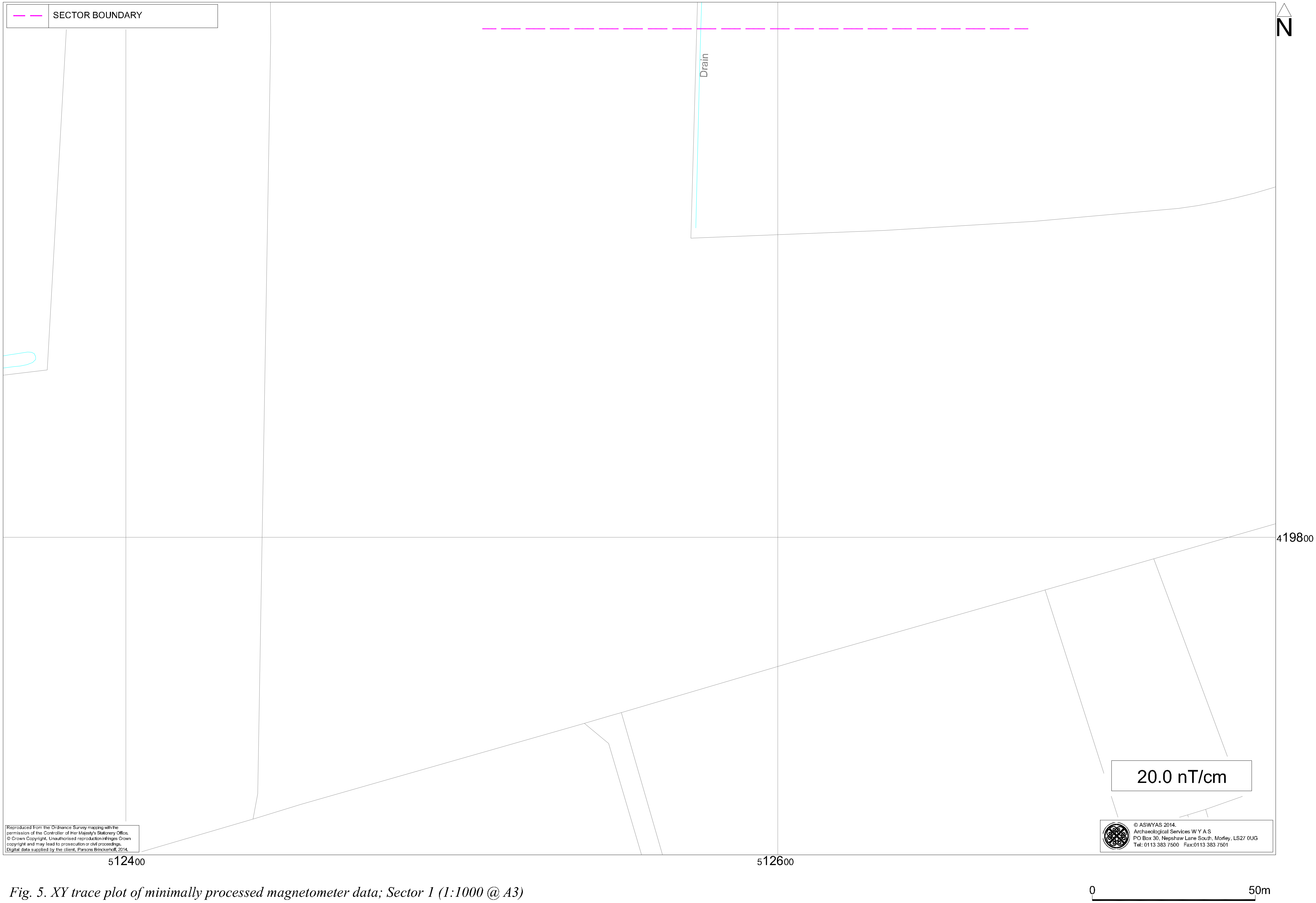

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Fig. 5. XY trace plot of minimally processed magnetometer data; Sector 1 (1:1000 @ A3)

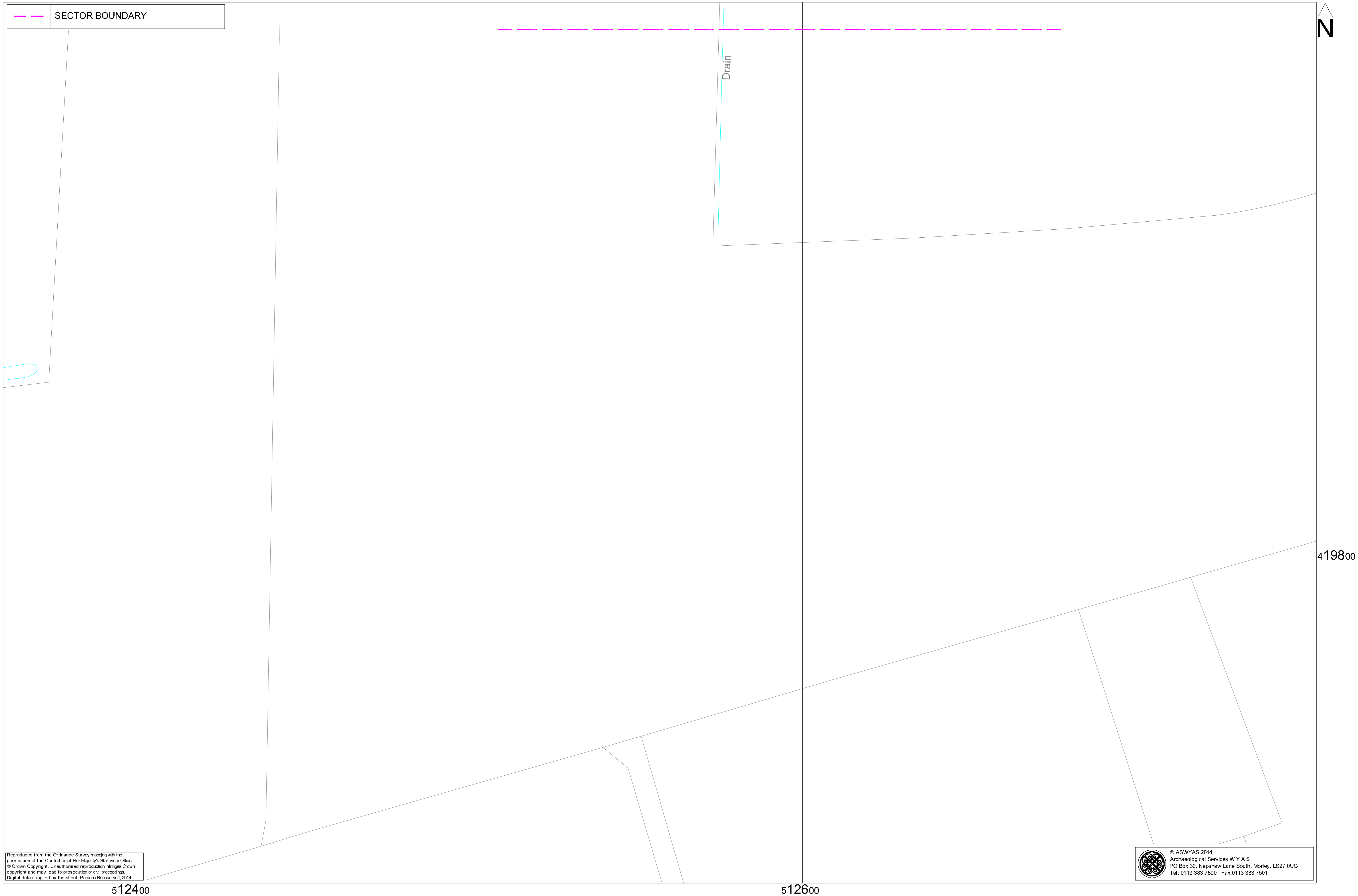

Fig. 6. Interpretation of magnetometer data; Sector 1 (1:1000 @ A3)

0 50m

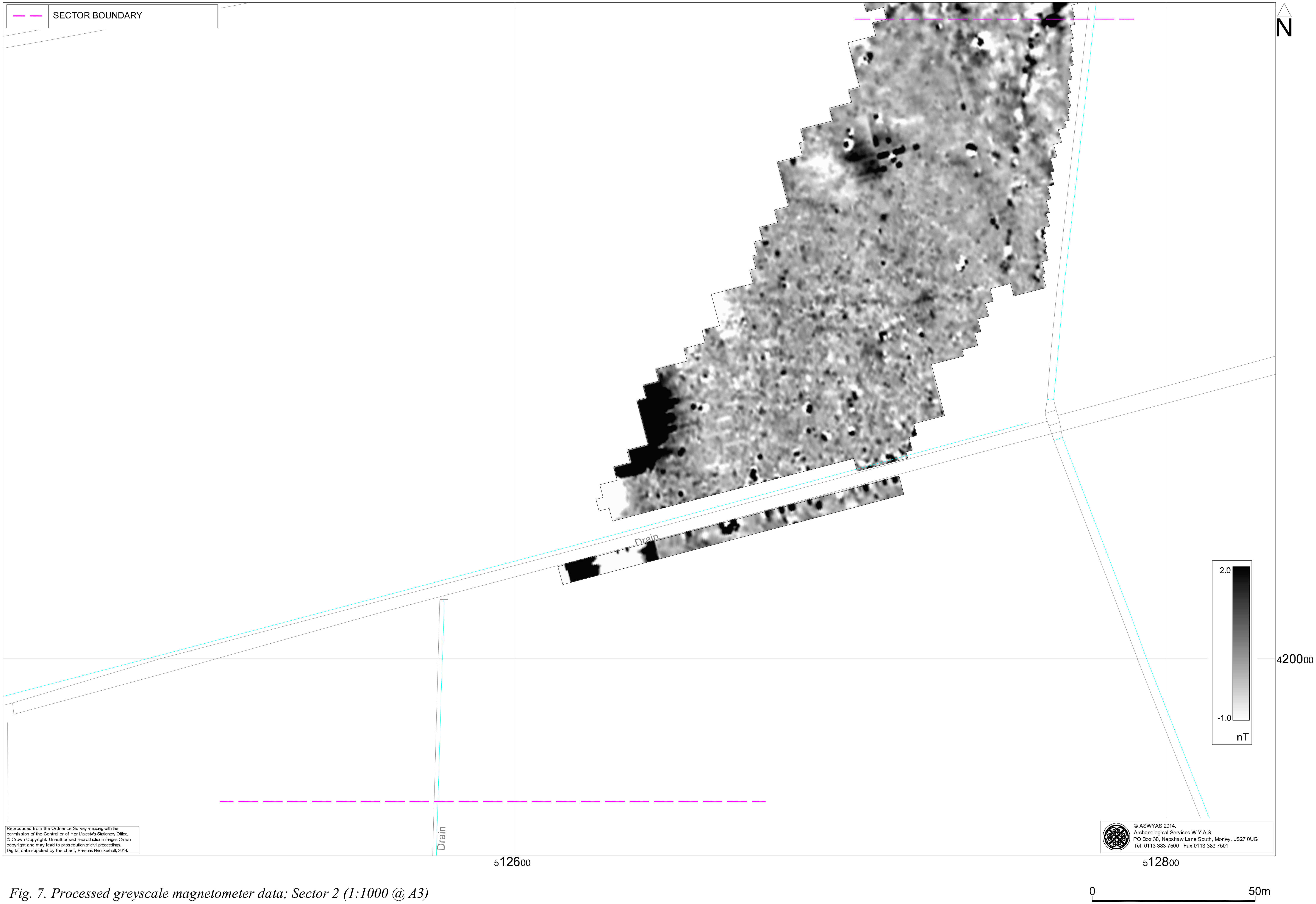

Fig. 7. Processed greyscale magnetometer data; Sector 2 (1:1000 @ A3)

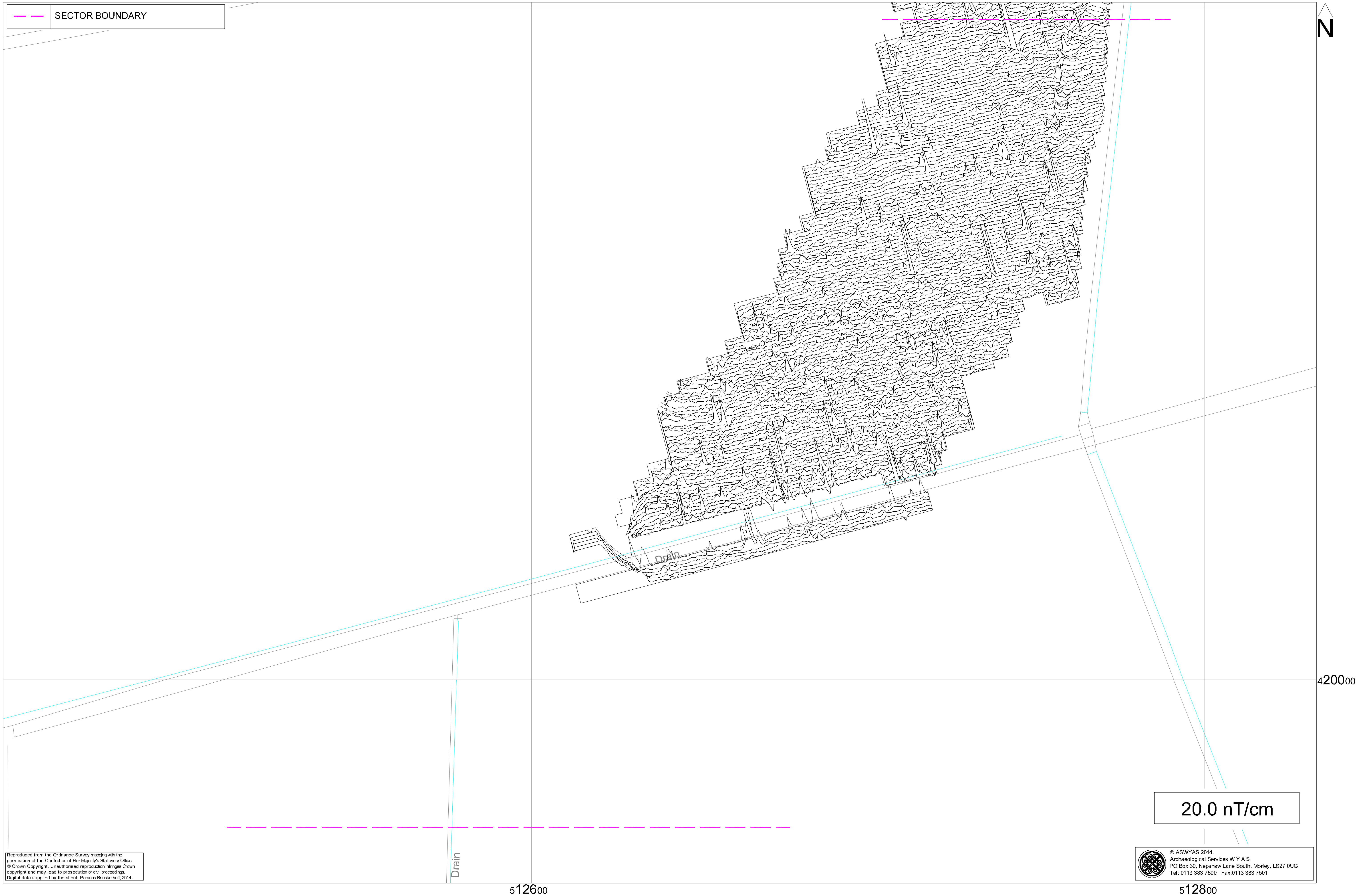

Fig. 8. XY trace plot of minimally processed magnetometer data; Sector 2 (1:1000 @ A3)

0 50m

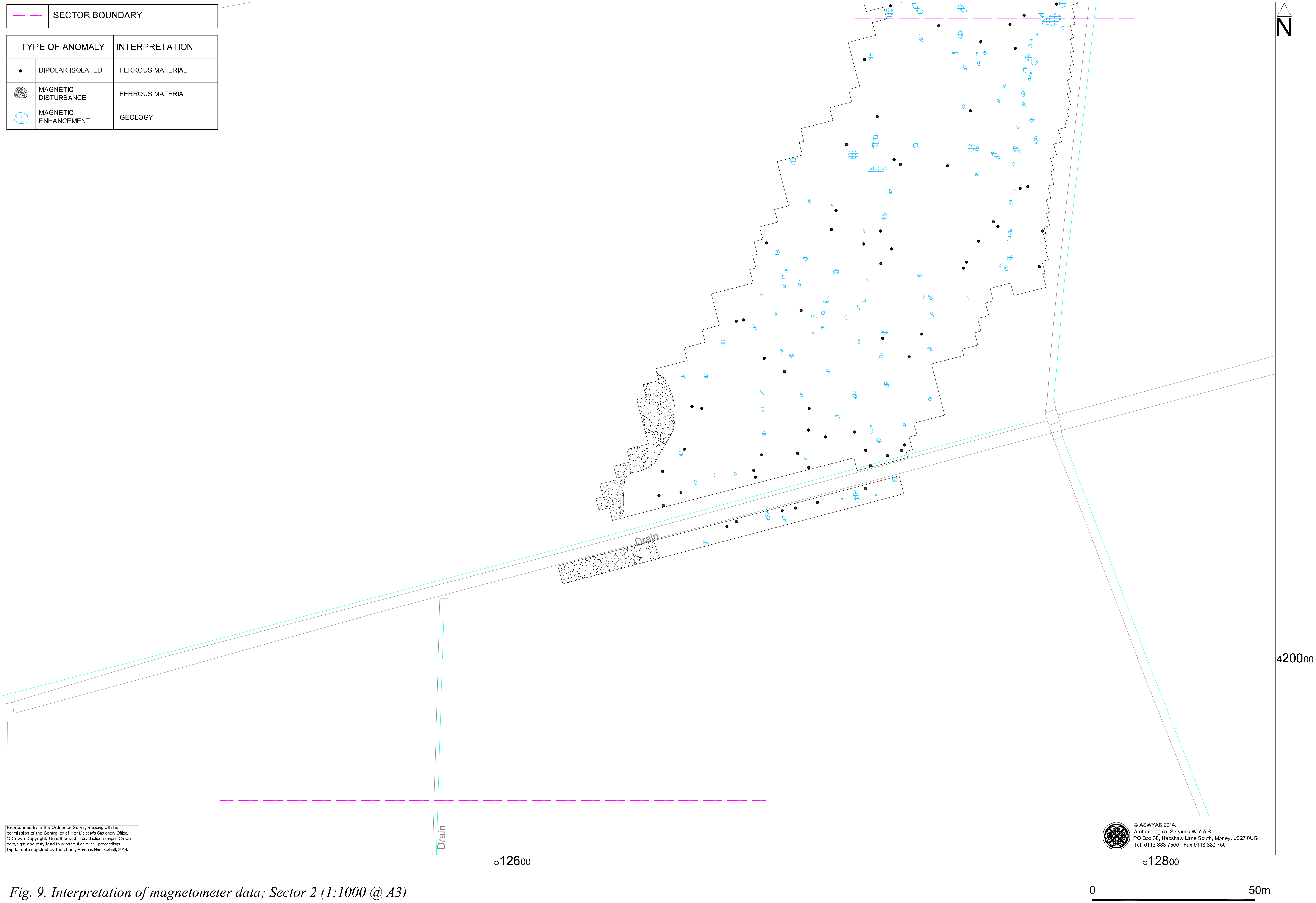

Fig. 9. Interpretation of magnetometer data; Sector 2 (1:1000 @ A3)

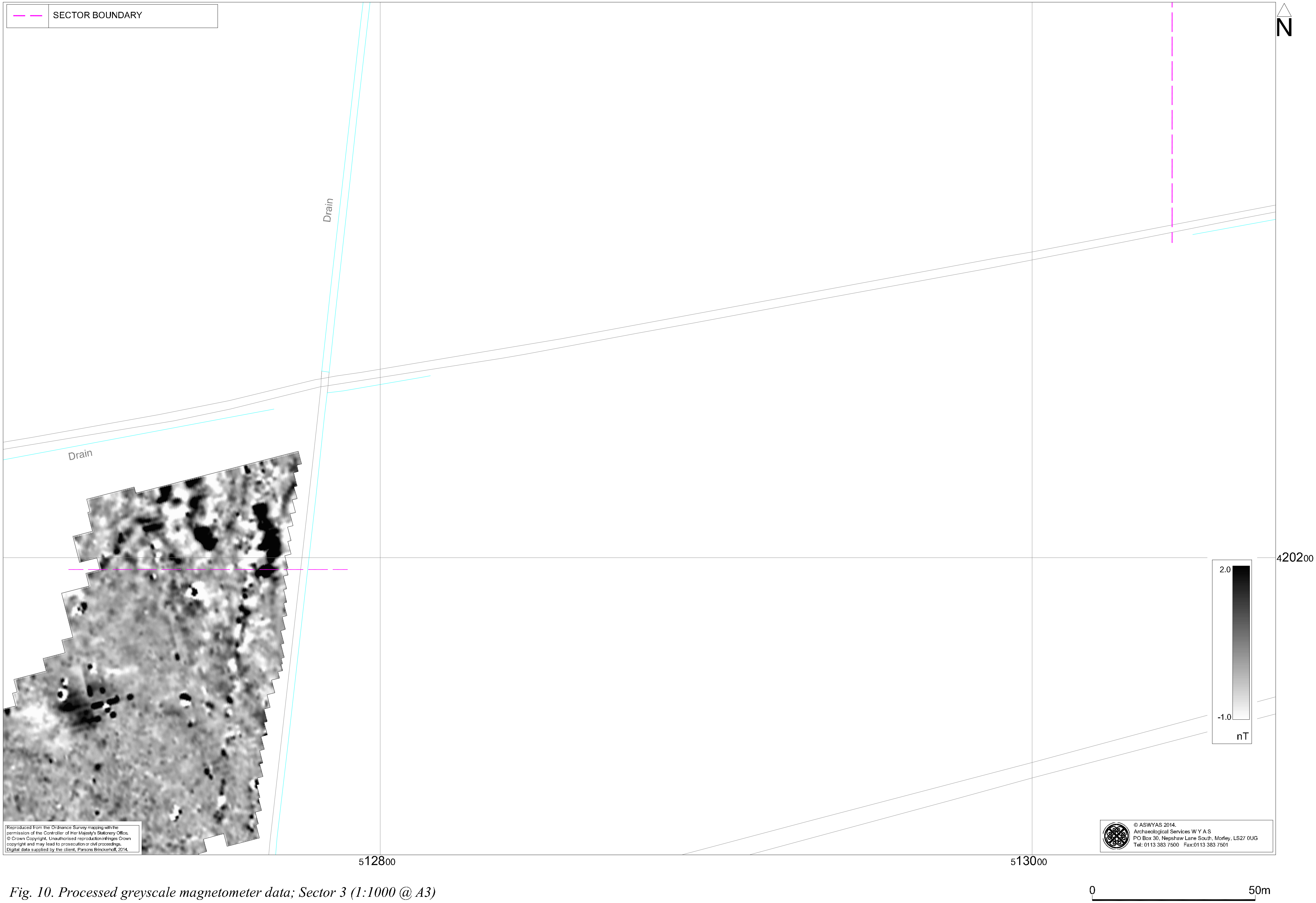

Fig. 10. Processed greyscale magnetometer data; Sector 3 (1:1000 @ A3)

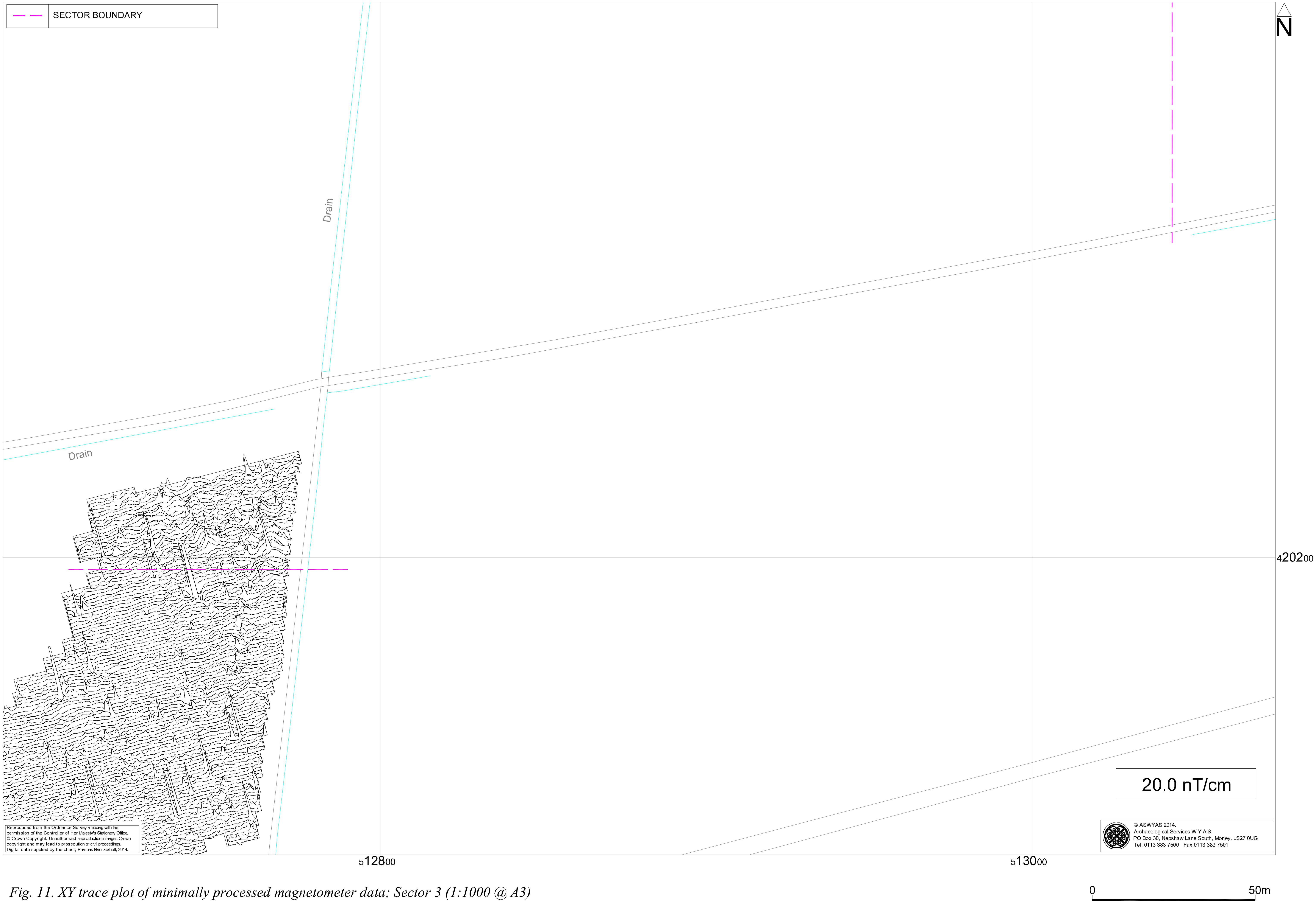

Fig. 11. XY trace plot of minimally processed magnetometer data; Sector 3 (1:1000 @ A3)

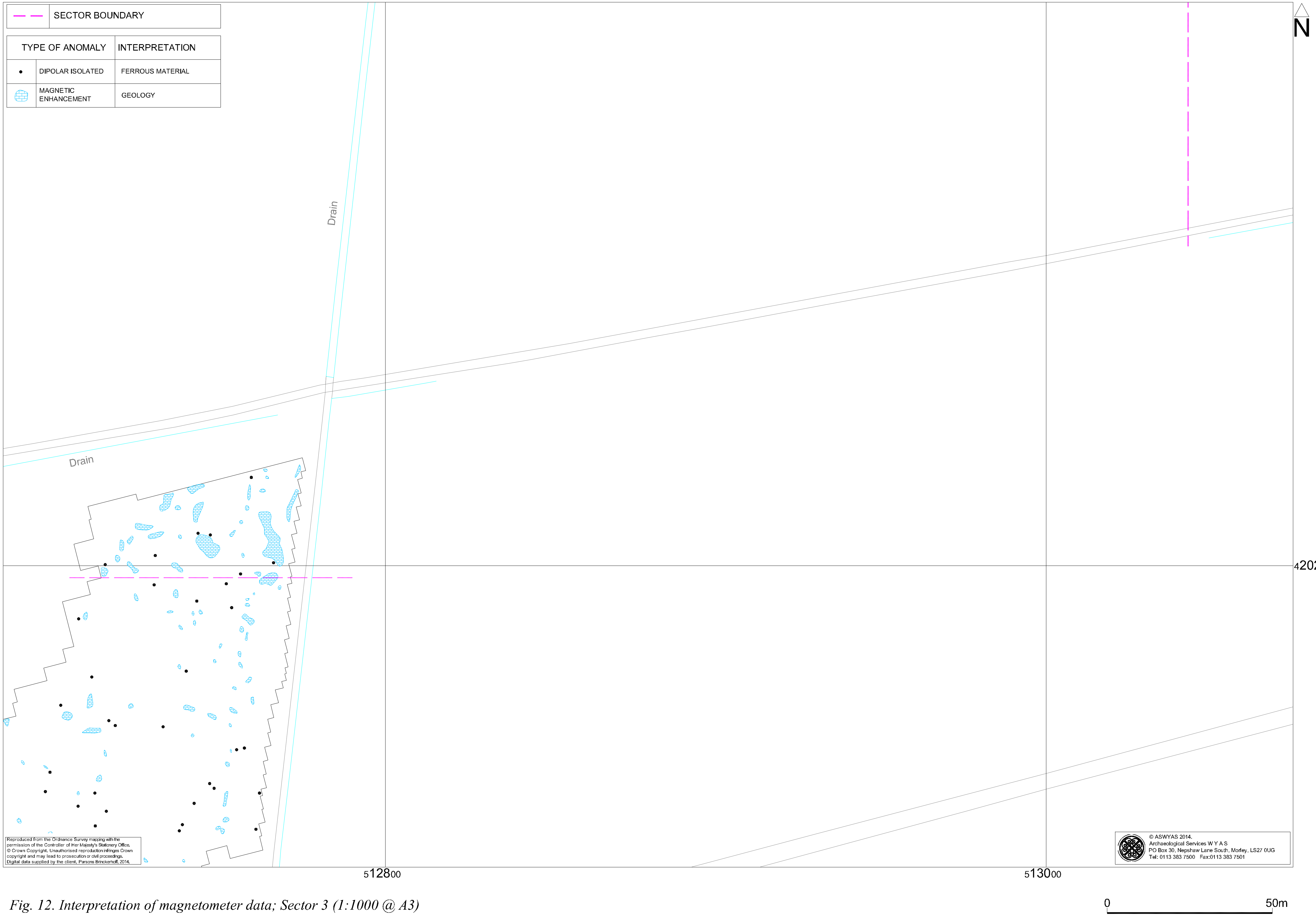

Fig. 12. Interpretation of magnetometer data; Sector 3 (1:1000 @ A3)

Fig. 13. Processed greyscale magnetometer data; Sector 4 (1:1000 @ A3)

Fig. 14. XY trace plot of minimally processed magnetometer data; Sector 4 (1:1000 @ A3)

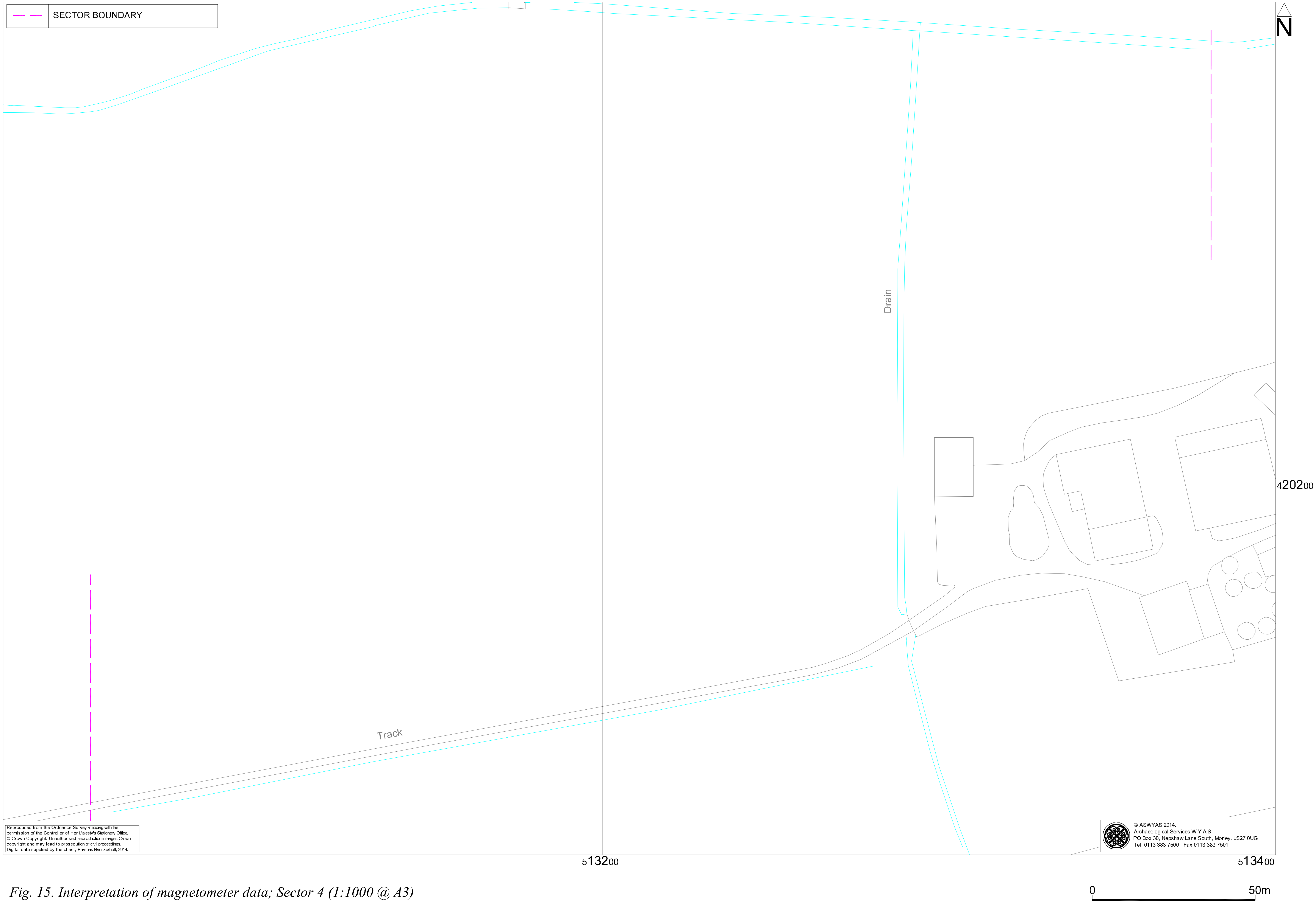

Fig. 15. Interpretation of magnetometer data; Sector 4 (1:1000 @ A3)

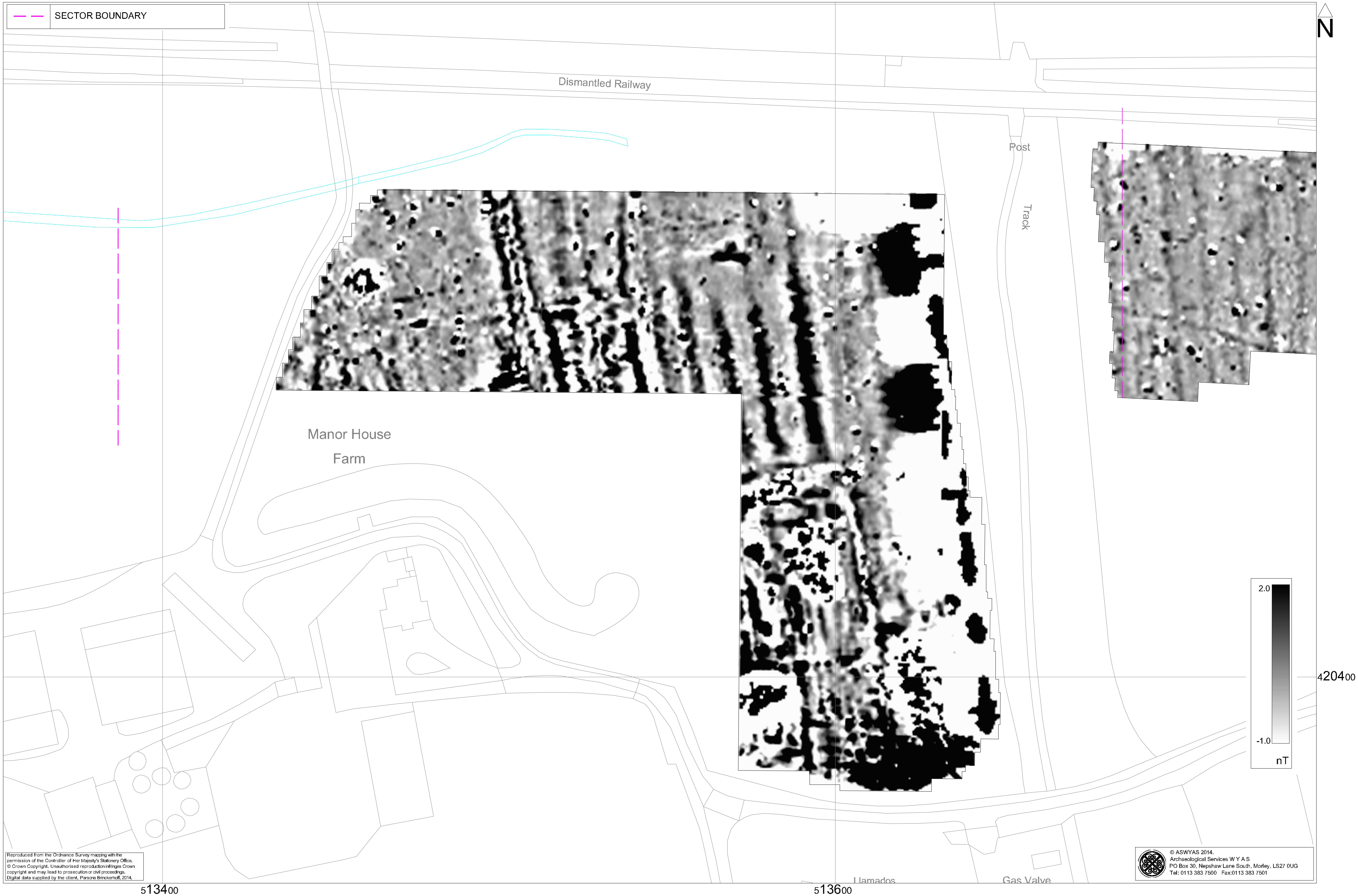

Fig. 16. Processed greyscale magnetometer data; Sector 5 (1:1000 @ A3)

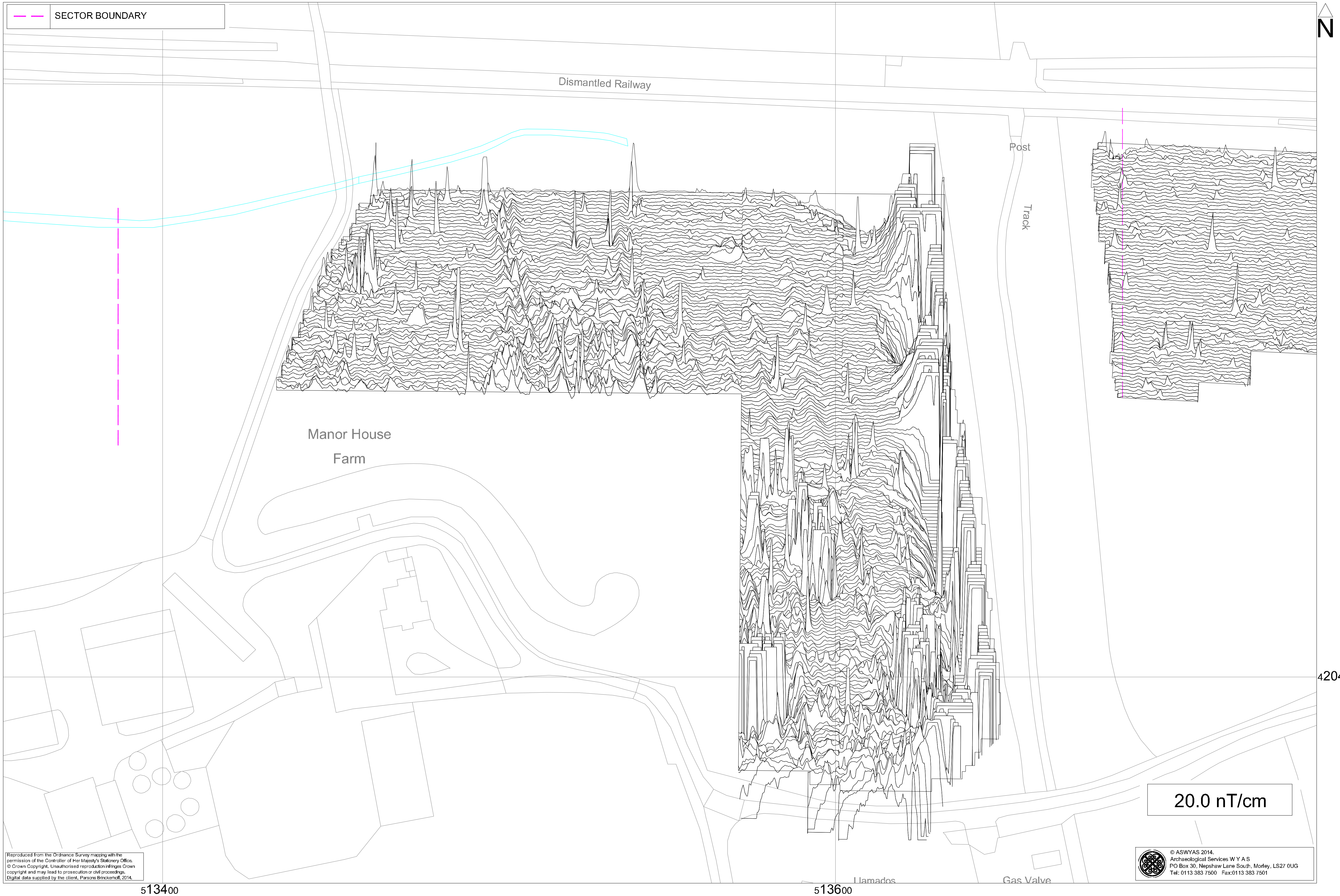

Fig. 17. XY trace plot of minimally processed magnetometer data; Sector 5 (1:1000 @ A3)

0 50m

Fig. 18. Interpretation of magnetometer data; Sector 5 (1:1000 @ A3)

Fig. 19. Processed greyscale magnetometer data; Sector 6 (1:1000 @ A3)

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Fig. 20. XY trace plot of minimally processed magnetometer data; Sector 6 (1:1000 @ A3)

Fig. 21. Interpretation of magnetometer data; Sector 6 (1:1000 @ A3)

Fig. 22. Processed greyscale magnetometer data; Sector 7 (1:1000 @ A3)

Fig. 23. XY trace plot of minimally processed magnetometer data; Sector 7 (1:1000 @ A3)

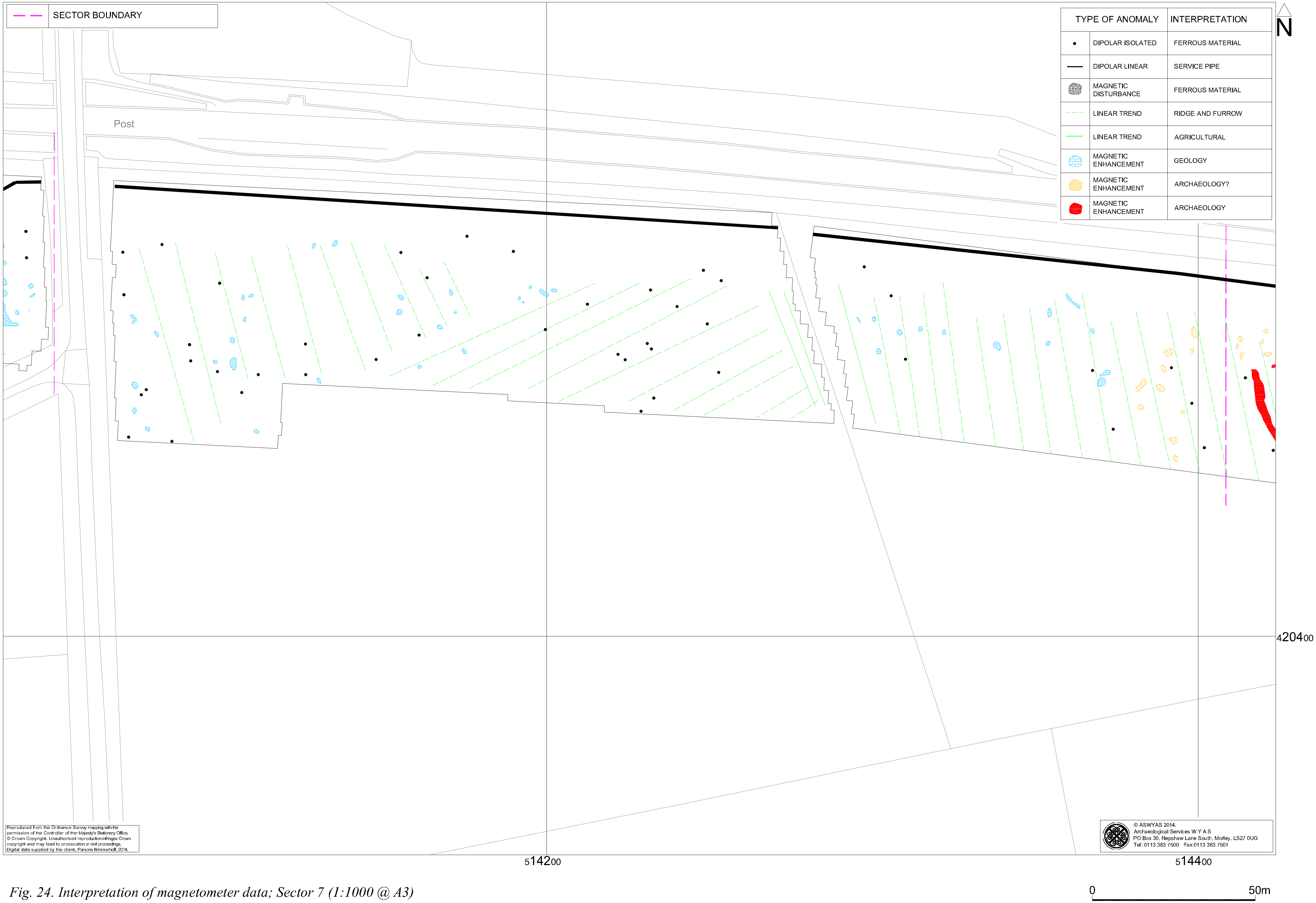

Fig. 24. Interpretation of magnetometer data; Sector 7 (1:1000 @ A3)

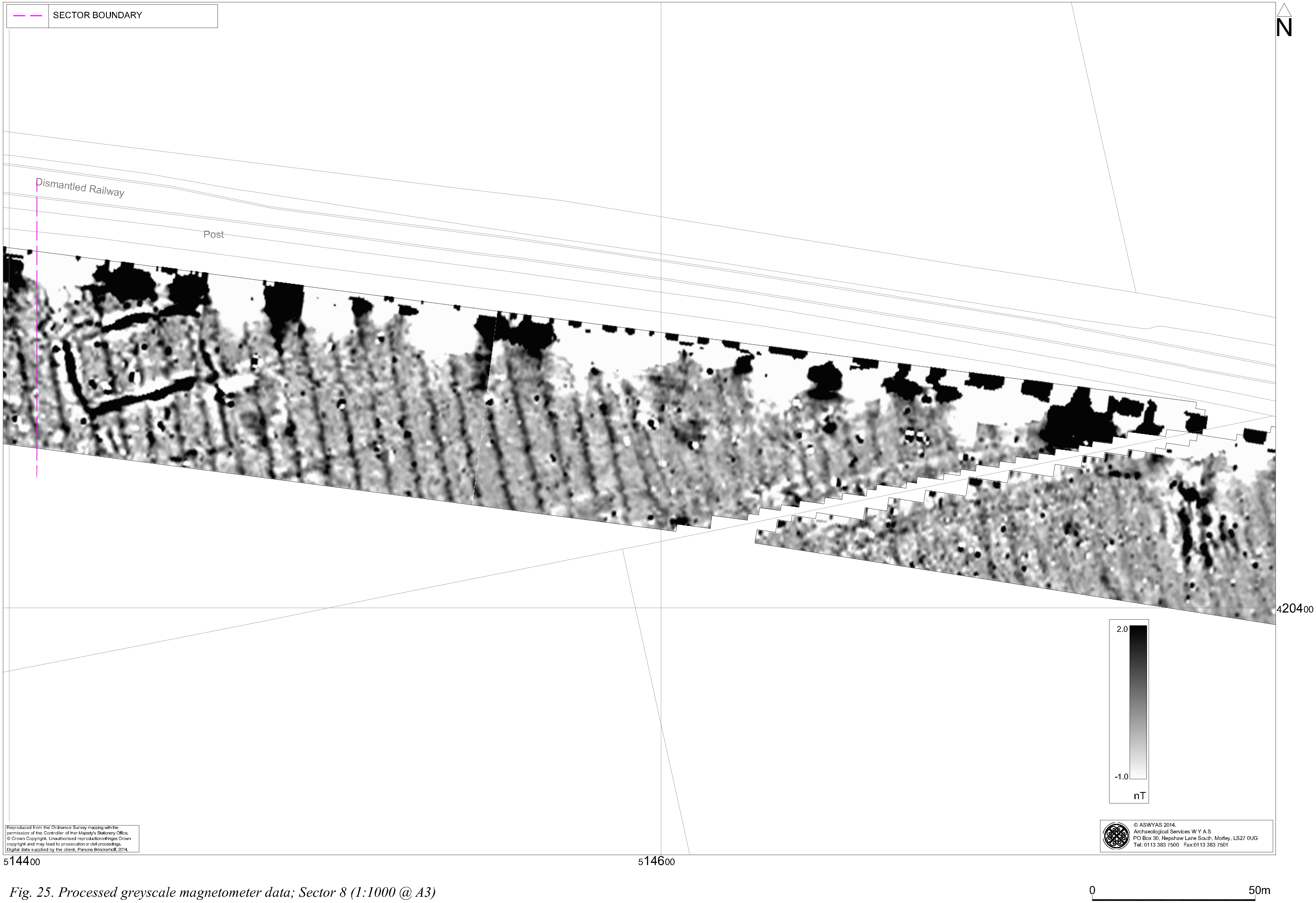

Fig. 25. Processed greyscale magnetometer data; Sector 8 (1:1000 @ A3)

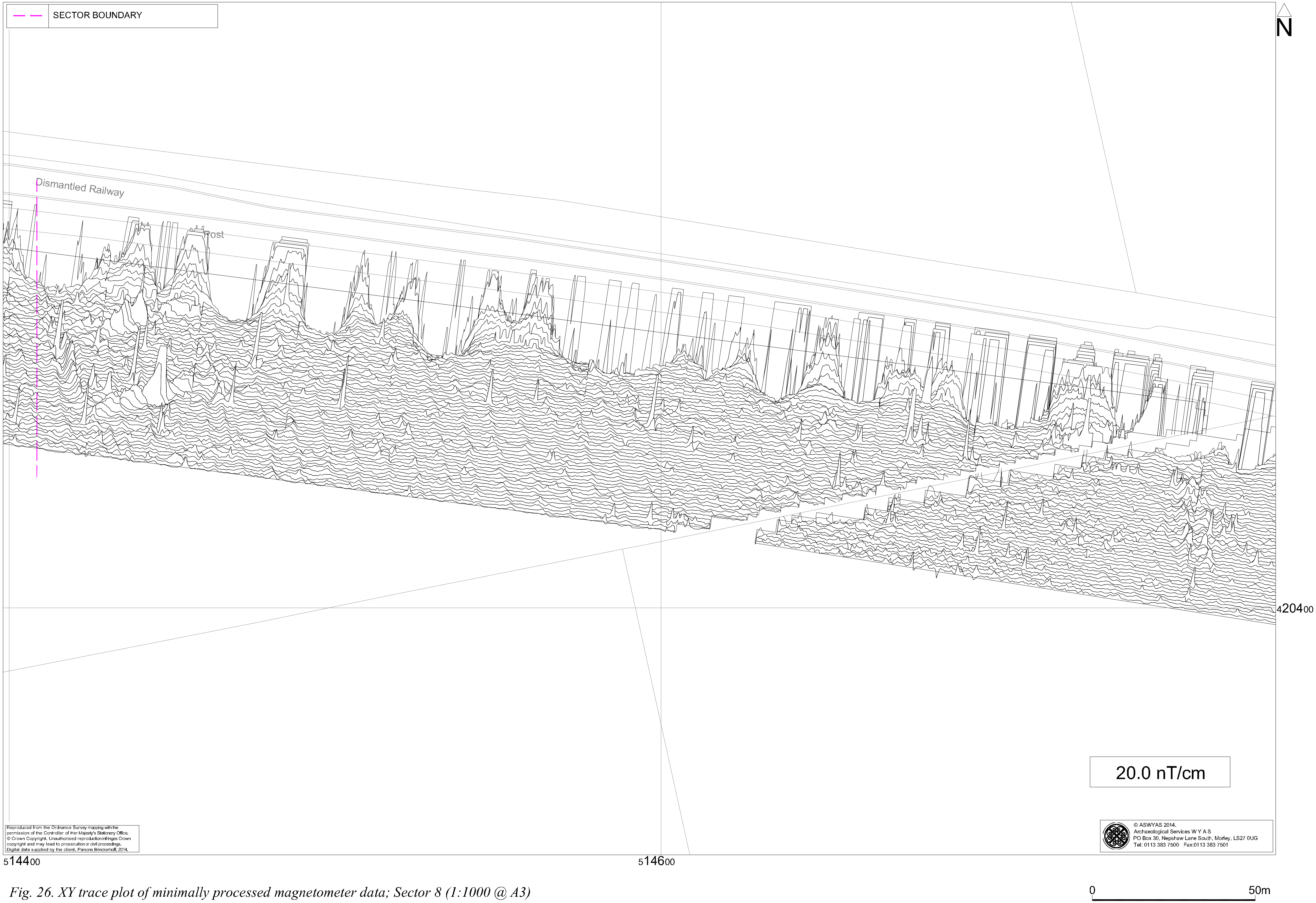

Fig. 26. XY trace plot of minimally processed magnetometer data; Sector 8 (1:1000 @ A3)

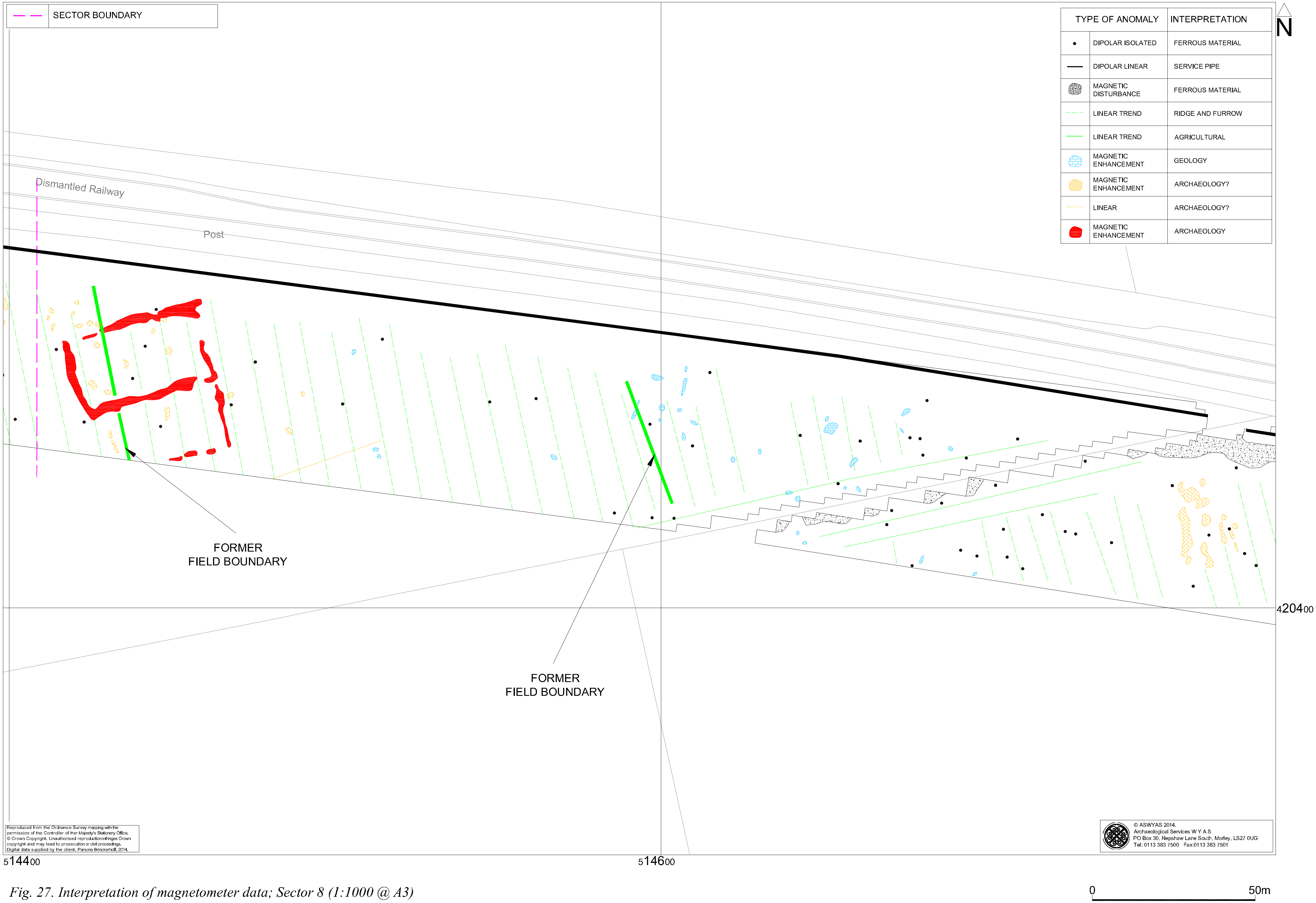

Fig. 27. Interpretation of magnetometer data; Sector 8 (1:1000 @ A3)

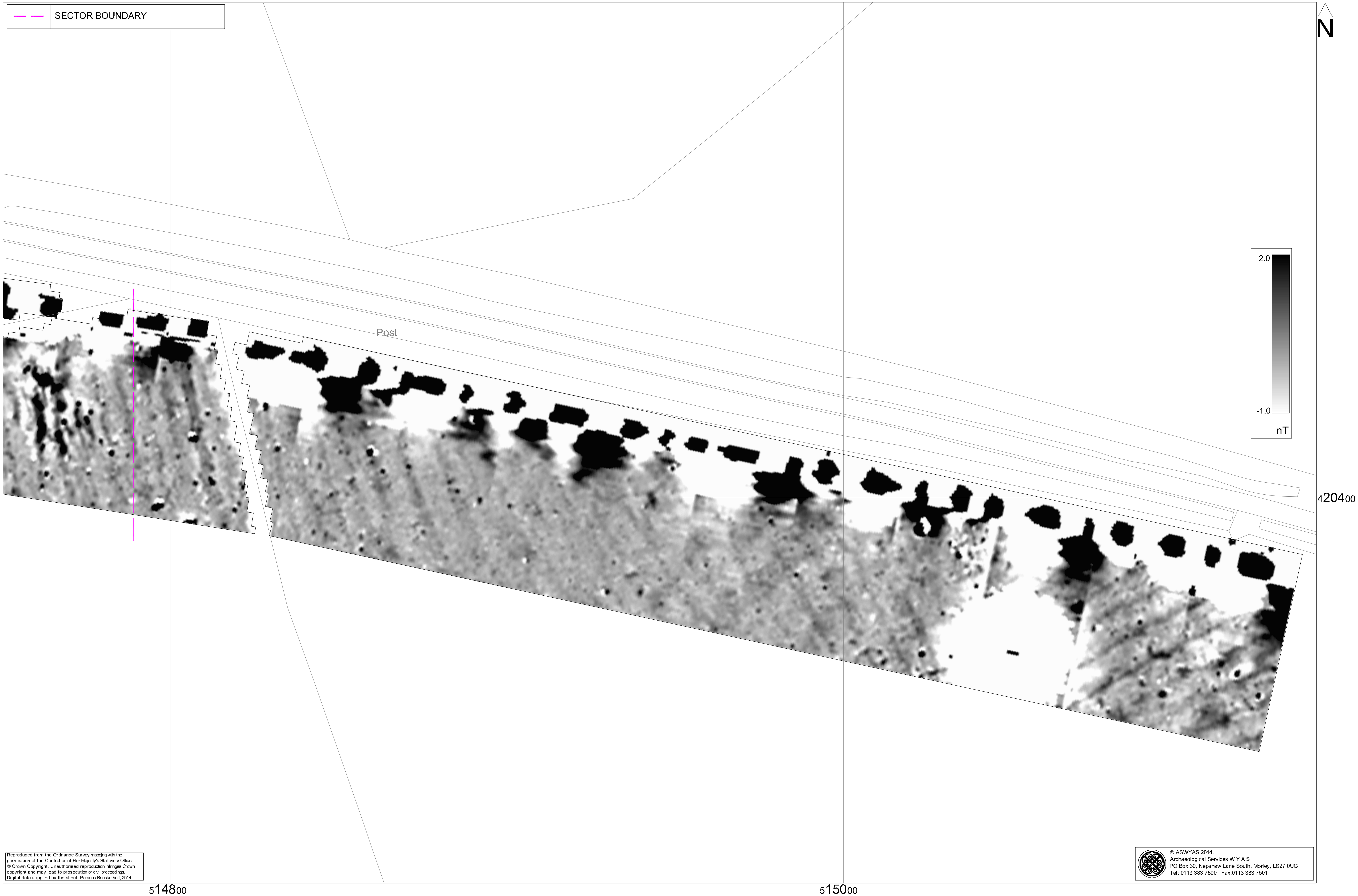

Fig. 28. Processed greyscale magnetometer data; Sector 9 (1:1000 @ A3)

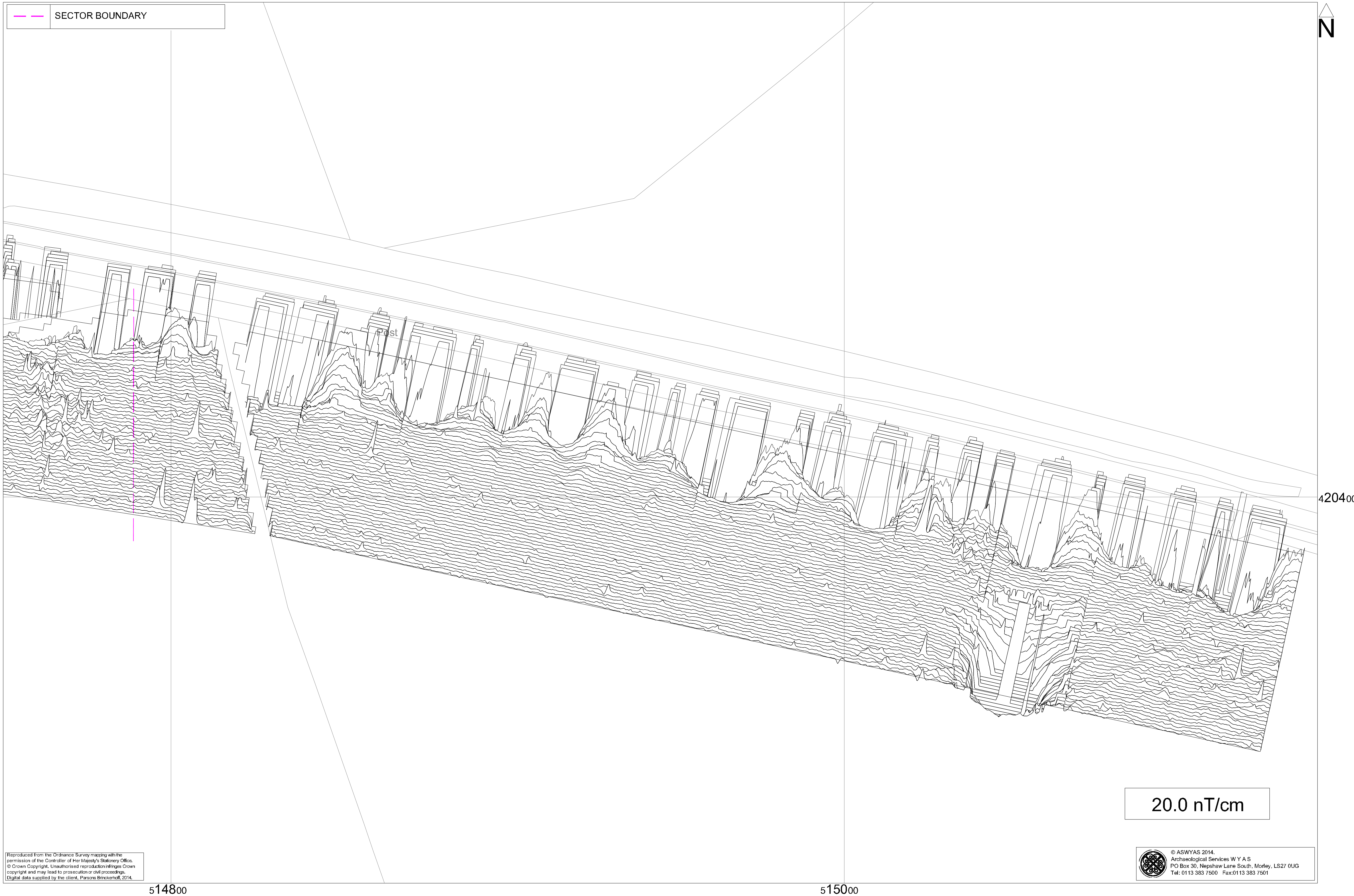

Fig. 29. XY trace plot of minimally processed magnetometer data; Sector 9 (1:1000 @ A3)

0 50m

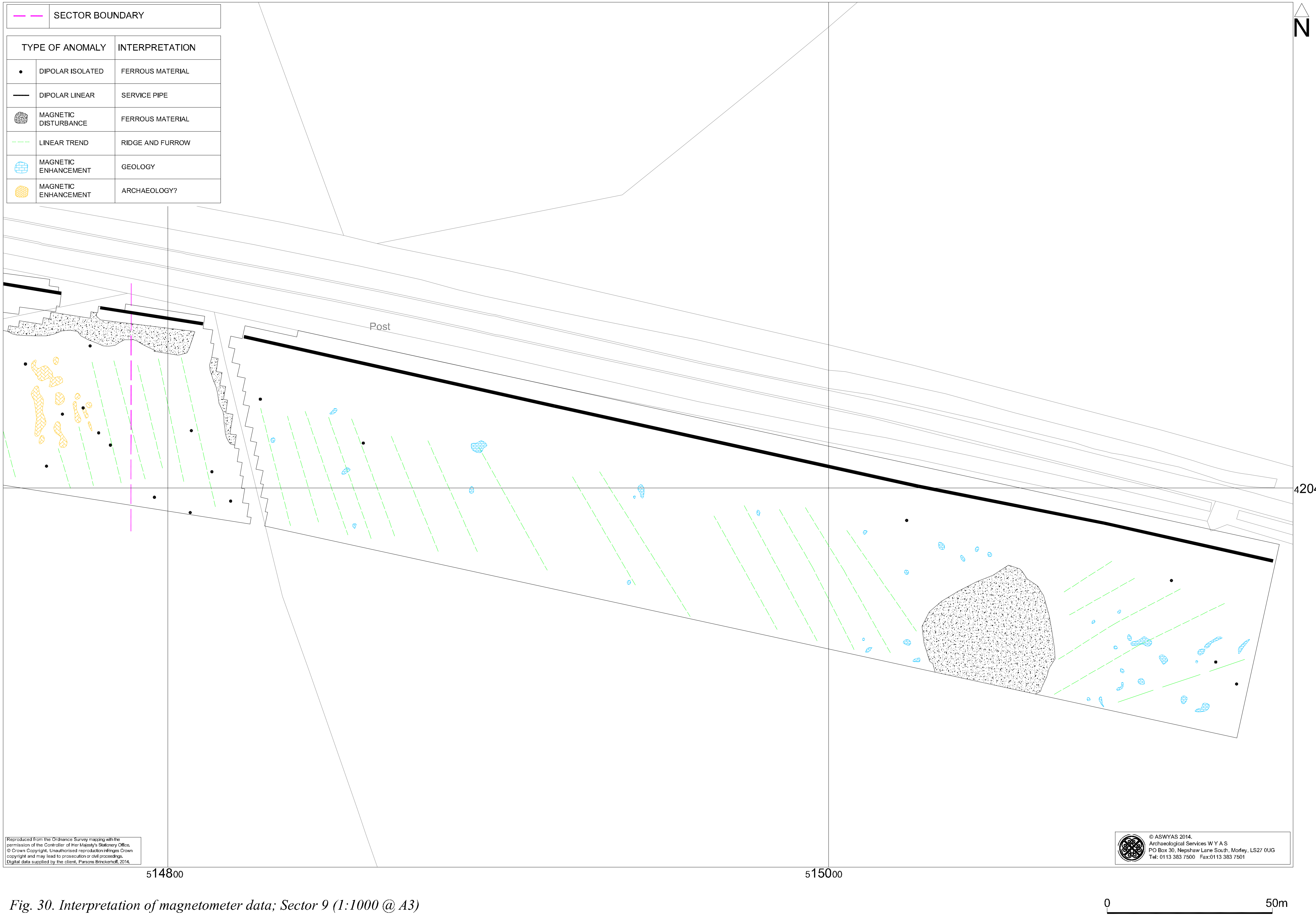

Fig. 30. Interpretation of magnetometer data; Sector 9 (1:1000 @ A3)

Plate 1. General view of Field 6, looking south-west

Plate 2. General view of Field 7, looking south-west

Plate 3. General view of Field 8, looking north-east

Plate 4. General view of Field 9 (west), looking west

Plate 5. General view of Field 9 (east), looking north-east

Plate 6. General view of Field 12, looking north

Plate 7. General view of Field 13 (west), looking north

Plate 8. General view of Field 14, looking east

Plate 9. General view of Field 15, looking west

Plate 10. General view of Field 16, 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 so that by measuring the magnetic susceptibility of the topsoil, areas where human occupation or settlement has occurred can be identified by virtue 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. An advantage of magnetic susceptibility over magnetometry is that a certain amount of occupational activity will cause the same proportional change in susceptibility, however weakly magnetic is the soil, and so does not depend on the magnetic contrast between the topsoil and deeper layers. Susceptibility survey is therefore able to detect areas of occupation even in the absence of cut features. On the other hand susceptibility survey is more vulnerable to the masking effects of layers of colluvium and alluvium as the technique, using the Bartington system, can generally only measure variation in the first 0.15m of ploughsoil.

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 (sometimes only visible on an XY trace plot) 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: Magnetic Susceptibility Survey

There are two methods of measuring the magnetic susceptibility of a soil sample. The first involves the measurement of a given volume of soil, which will include any air and moisture that lies within the sample, and is termed volume specific susceptibility. This method results in a bulk value that it not necessarily fully representative of the constituent components of the sample. For field surveys a Bartington MS2 meter with MS2D field loop is used due to its speed and simplicity. The second technique overcomes this potential problem by taking into account both the volume and mass of a sample and is termed mass specific susceptibility. However, mass specific readings cannot be taken in the field where the bulk properties of a soil are usually unknown and so volume specific readings must be taken. Whilst these values are not fully representative they do allow general comparisons across a site and give a broad indication of susceptibility changes. This is usually enough to assess the susceptibility of a site and evaluate whether enhancement has occurred.

Methodology: Gradiometer Survey

There are two main methods of using the fluxgate gradiometer for commercial evaluations. The first of these is referred to as ***magnetic scanning*** and requires the operator to visually identify anomalous responses on the instrument display panel whilst covering the site in widely spaced traverses, typically 10m apart. The instrument logger is not used and there is therefore no data collection. Once anomalous responses are identified they are marked in the field with bamboo canes and approximately located on a base plan. This method is usually employed as a means of selecting areas for detailed survey when only a percentage sample of the whole site is to be subject to detailed survey.

The disadvantages of magnetic scanning are that features that produce weak anomalies (less than 2nT) are unlikely to stand out from the magnetic background and so will be difficult to detect. The coarse sampling interval means that discrete features or linear features that are parallel or broadly oblique to the direction of traverse may not be detected. If linear features are suspected in a site then the traverse direction should be perpendicular (or as close as is possible within the physical constraints of the site) to the orientation of the suspected features. The possible drawbacks mentioned above mean that a ‘negative’ scanning result should be validated by sample detailed magnetic survey (see below).

The second method is referred to as ***detailed survey*** and employs the use of a sample trigger to automatically take readings at predetermined points, typically at 0.25m intervals, on zig-zag traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation. Detailed survey allows the visualisation of weaker anomalies that may not have been detected by magnetic scanning.

During this survey a Bartington Grad601 magnetic gradiometer was used taking readings on the 0.1nT range, at 0.25m intervals on zig-zag traverses 1m apart within 30m by 30m square grids. The instrument was checked for electronic and mechanical drift at a common point and calibrated as necessary. The drift from zero was not logged.

Data Processing and Presentation

The detailed gradiometer data has been presented in this report in XY trace and greyscale formats. In the former format the data shown is ‘raw’ with no processing other than grid biasing having been done. The data in the greyscale images has 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.

An XY plot presents the data logged on each traverse as a single line with each successive traverse incremented on the Y-axis to produce a ‘stacked’ plot. A hidden line algorithm has been employed to block out lines behind major ‘spikes’ and the data has been clipped. The main advantage of this display option is that the full range of data can be viewed, dependent on the clip, so that the ‘shape’ of individual anomalies can be discerned and potentially archaeological anomalies differentiated from ‘iron spikes’. Geoplot 3 software was used to create the XY trace plots.

Geoplot 3 software was used to interpolate the data so that 3600 readings were obtained for each 30m by 30m grid. The same program was used to produce the greyscale images. All greyscale plots are displayed using a linear incremental scale.

Appendix 2: Survey location information

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble 5800 model). The accuracy of this equipment is better then 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

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2000), and graphics files (Adobe Illustrator CS2 and AutoCAD 2008) 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 North Lincolnshire Historic Environment Record).

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