WYAS Archaeological Services

Kettering Cold Store

Burton Latimer

Northamptonshire

Geophysical Survey

Report no. DRAFT
September 2015

Client: Stratus Environmental Ltd

REGISTERED CIfA ORGANISATION

West Yorkshire Joint Services

Kettering Cold Store
Burton Latimer
Northamptonshire

Geophysical Survey

Summary

A geophysical (magnetometer) survey covering 12 hectares was carried out on agricultural farmland 2.8km to the east of Burton Latimer to inform planning proposals for a new cold store. The majority of the anomalies are indicative of recent agricultural practice. No anomalies of archaeological significance were identified, making the archaeological potential of the site low.

Report Information

Client:	Stratus Environmental Ltd
Address:	4245 Park Approach, Thorpe Park, Leeds, LS15 8GB
Report Type:	Geophysical Survey
Location:	Burton Latimer
County:	Northamptonshire
Grid Reference:	SP 92946 74710
Period(s) of activity:	Modern
Report Number:	DRAFT
Project Number:	6168
Site Code:	BLT15
OASIS ID:	archaeol11-??????
Planning Application No.:	Pre-application
Museum Accession No.:	n/a
Date of fieldwork:	September 2015
Date of report:	September 2015
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Fieldwork:	Chris Sykes
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Authorisation for distribution: --

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1 Introduction

Archaeological Services WYAS (ASWYAS) was commissioned by The Environmental Dimension Partnership (EDP) on behalf of their client, Stratus Environmental Ltd, to undertake a geophysical (magnetometer) survey of land 2.8km east of Burton Latimer, Northamptonshire (see Fig. 1). The work was undertaken in order to support planning proposals for a new cold store. The work was undertaken in accordance with policy contained within the National Planning Policy Framework (NPPF - DCLG 2012), in line with current best practice (CIfA 2014; David *et al.* 2008) and to a Project Design (Sykes 2015). The survey was carried out between September 14th and September 16th 2015 to provide additional information on the archaeological resource of the site.

Site location and topography and land use

The proposed development area (PDA) covers 12 hectares of agricultural farmland 2.8km to the east of Burton Latimer, immediately to the west of Top Lodge farm centred at SP 92946 74710. The survey area comprises of two separate fields, Field 1 is a roughly rectangular parcel of land. Field 2 is the approximate location of a 30m wide corridor, approximately 230m in length, which represents the proposed access track. These areas are located within larger irregular-sized fields. The fields were under cultivation, bound to the north by Wold Road, to the east by arable fields and Thrapston Road (A510) (see Fig. 2), and further arable fields were located to the south and west. The PDA is located at *c*. 91m above Ordnance Datum (aOD) in the north east corner, sloping down to the south and west to *c*. 94m aOD.

Soils and geology

The solid geology underlying the site comprises Blisworth Limestone formation, overlain by superficial deposits from the Oadby Member (British Geological Survey 2015). The soils of the survey area, are classified in the Hanslope variety, characterised as slowly permeable clays (Soil Survey of England and Wales 1983).

2 Archaeological and Historical Background

There is very little archaeological background available for the survey area. Examination of historic mapping for the area shows that, up until the late 20th century, the fields within which the survey sits were further subdivided by now relict field walls.

3 Aims, Methodology and Presentation

The general objective 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 1.0m 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. A large scale (1:3000) survey location plan, showing the processed data, is provided as Figure 2 with an overall interpretation of the data at the same scale included as Figure 3. The processed and minimally processed data, together with an interpretation of the survey results are presented in Figures 4 to 9 inclusive. Sector 1 (Figures 4-6) are at 1:2500 whilst Sector 2 (Figures 7-9) are at 1:1500.

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

The survey methodology, report and any recommendations comply with guidelines outlined by English Heritage (David *et al.* 2008) 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 '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 Figures 4 to 9 inclusive)

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. There is no obvious pattern or clustering to their distribution to suggest anything other than a random background scatter of ferrous debris in the plough-soil.

A linear dipolar anomaly, running across the northeast corner of Sector 1 is caused by a buried modern service pipe.

Agricultural anomalies

The entirety of the survey area is covered by a series of parallel linear anomalies, on a number of different alignments. The majority of these run on an approximate northwest-southeast alignment, with the exception of a small area in the northeast corner of Sector 1 and those in Sector 2. Each of the anomalies are positioned approximately 7-9m apart, and they represent the remains of post-medieval agricultural activity, specifically ridge and furrow created through ploughing. A former field boundary, anomaly A, represents a no longer extant field boundary which is depicted on historic mapping for the area until the late 20th century. Other former field boundaries are identified as slightly stronger anomalies and are likely to represent the edge of plough areas.

Geological anomalies

Throughout the site numerous small areas of magnetic enhancement have been identified, which are likely to represent small variations in the background geology. A larger area of magnetic enhancement in the northwest corner of Sector 1 is likely to represent modern dumping of material on the perimeter of the agricultural land.

5 Conclusions

No anomalies of archaeological origin have been identified by the geophysical survey. Although anomalies consistent with agricultural activity cover the entirety of the survey area, these are all thought to be post-medieval in date, therefore the archaeological potential of this site is considered to be low.

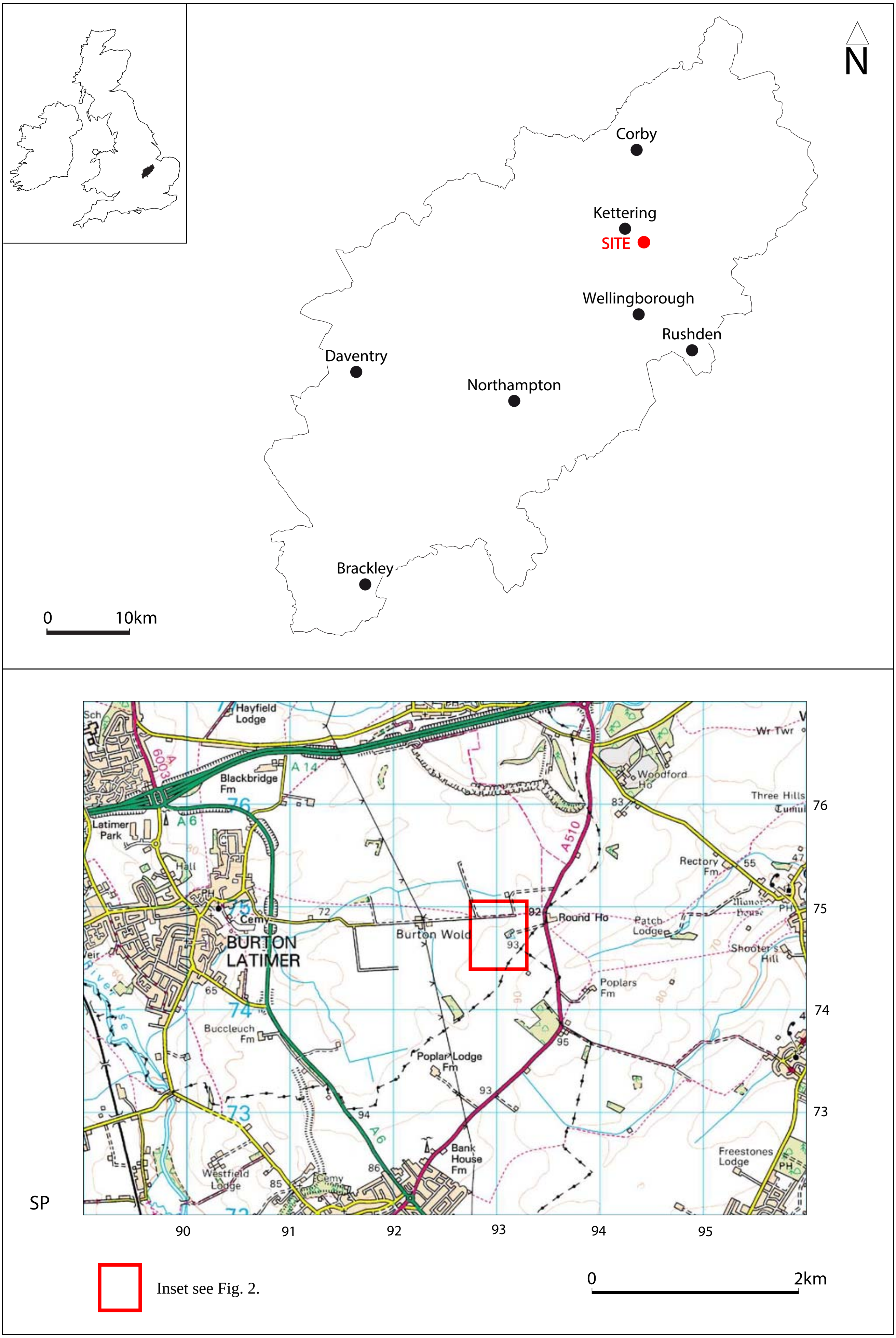

Fig. 1. Site location

Fig. 2. Survey location showing greyscale magnetometer data (1:3000 @ A3)

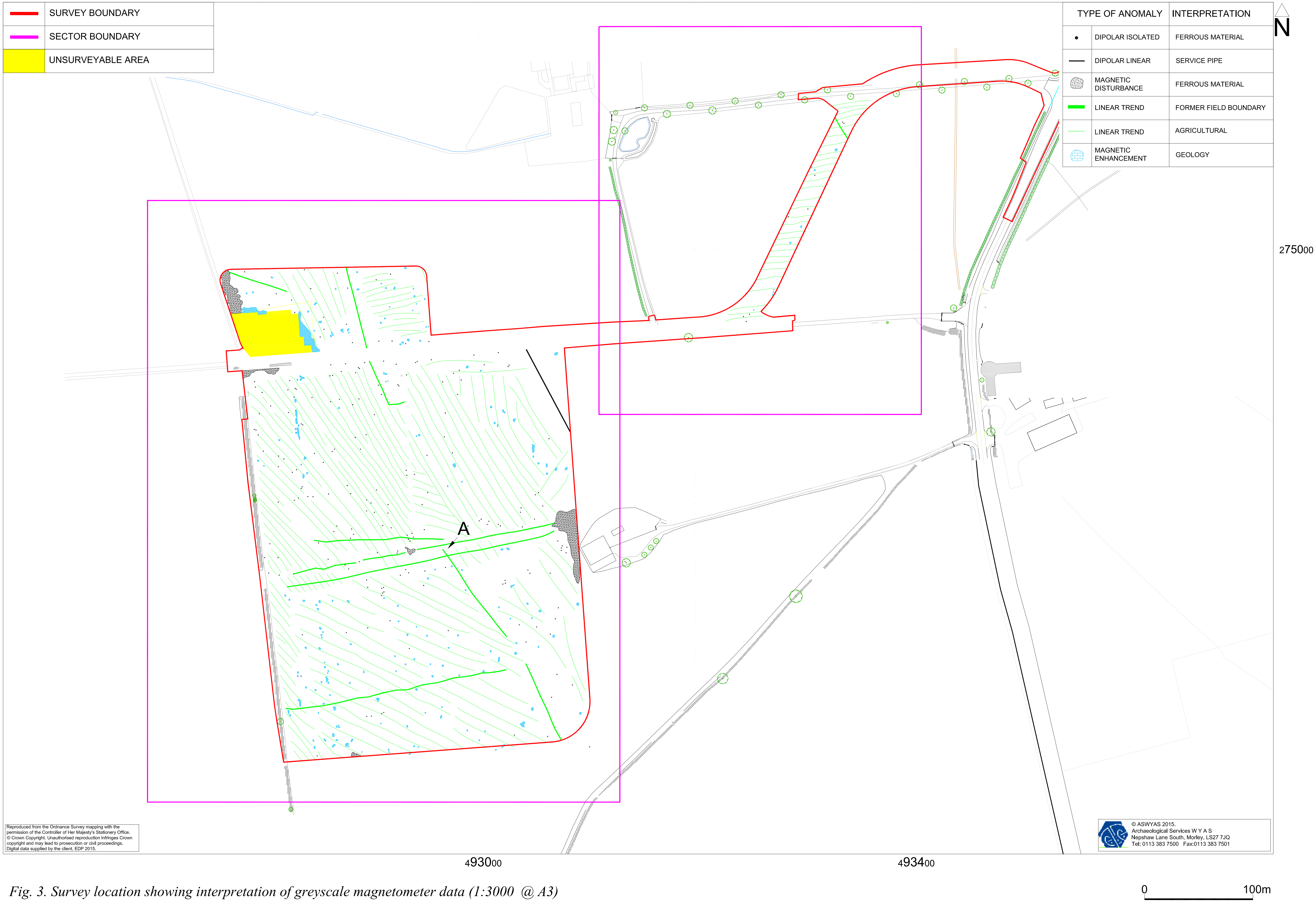

Fig. 3. Survey location showing interpretation of greyscale magnetometer data (1:3000 @ A3)

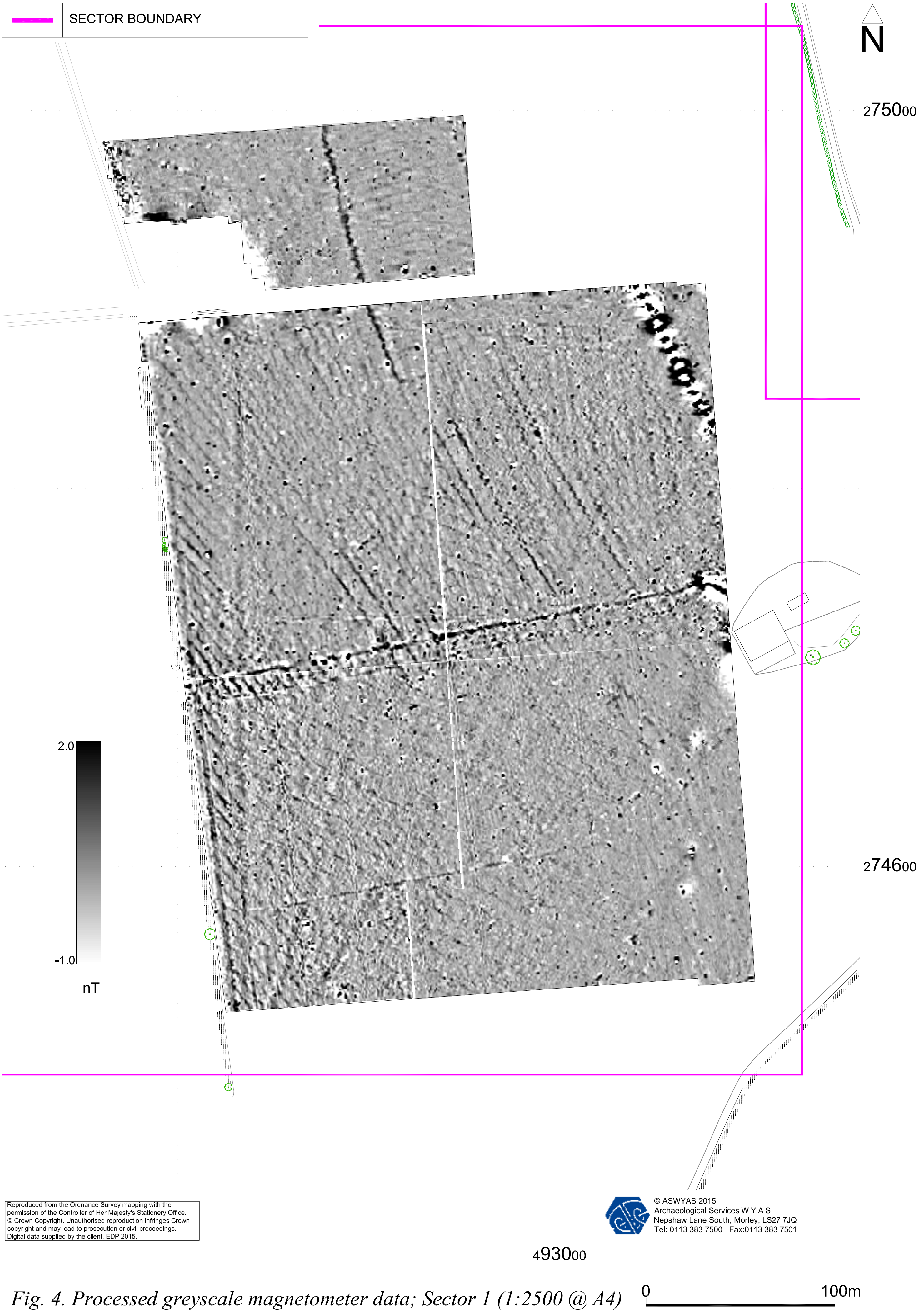

Fig. 4. Processed greyscale magnetometer data; Sector 1 (1:2500 @ A4)

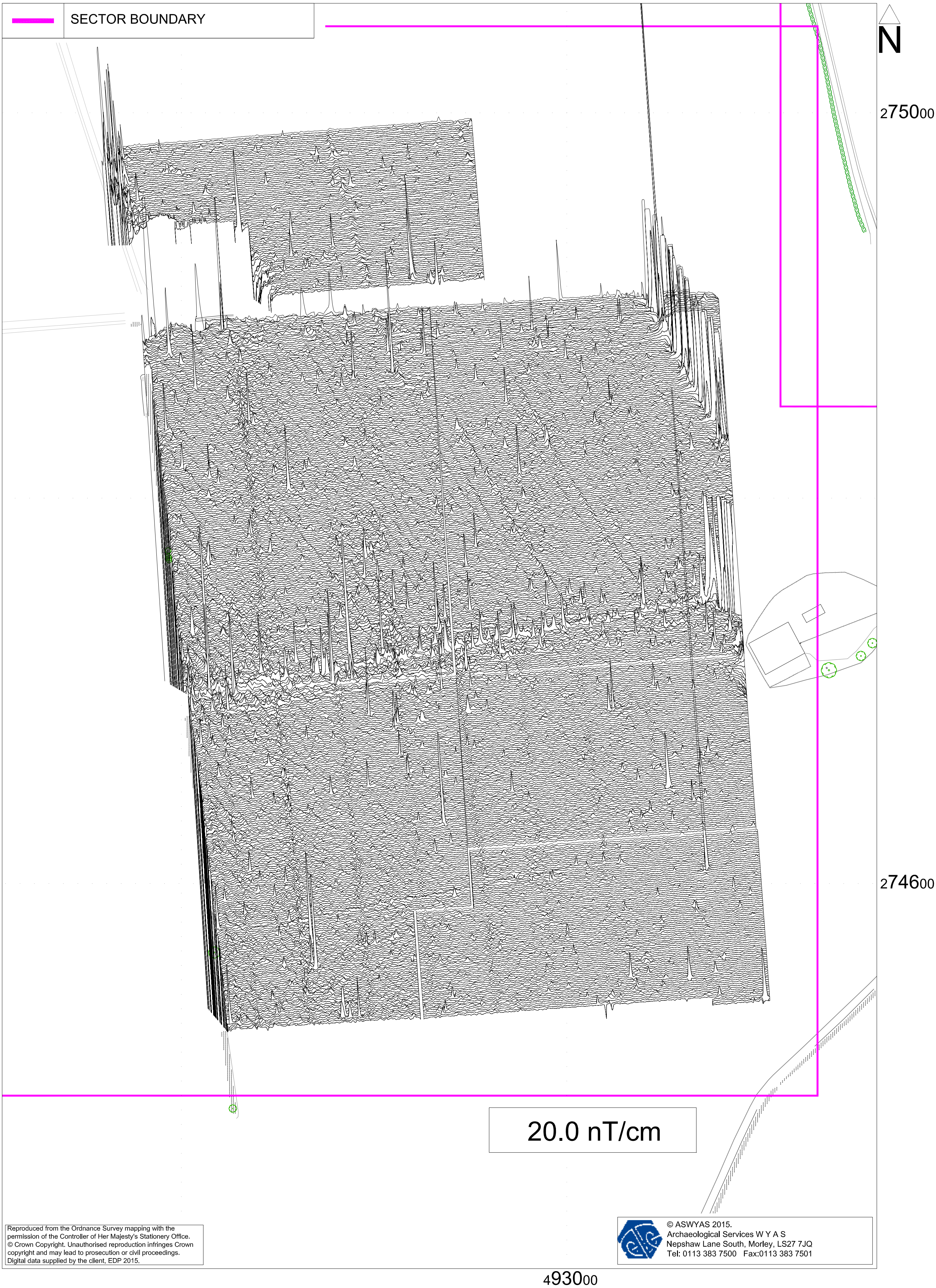

Fig. 5. XY trace plots of minimally processed greyscale magnetometer data; Sector 1 (1:2500 @ A4)

0 100m

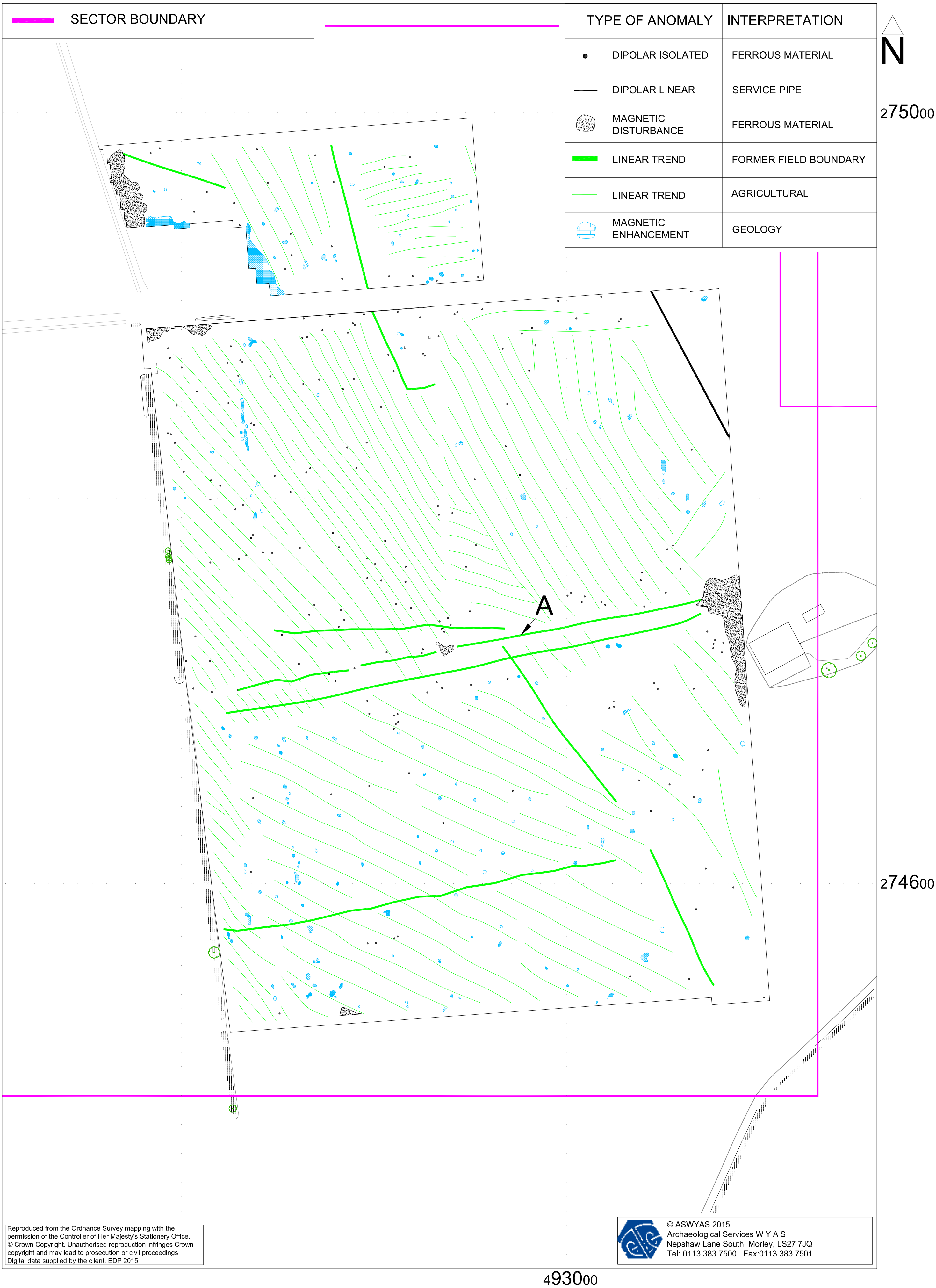

Fig. 6. Interpretation of processed greyscale magnetometer data; Sector 1 (1:2500 @ A4)

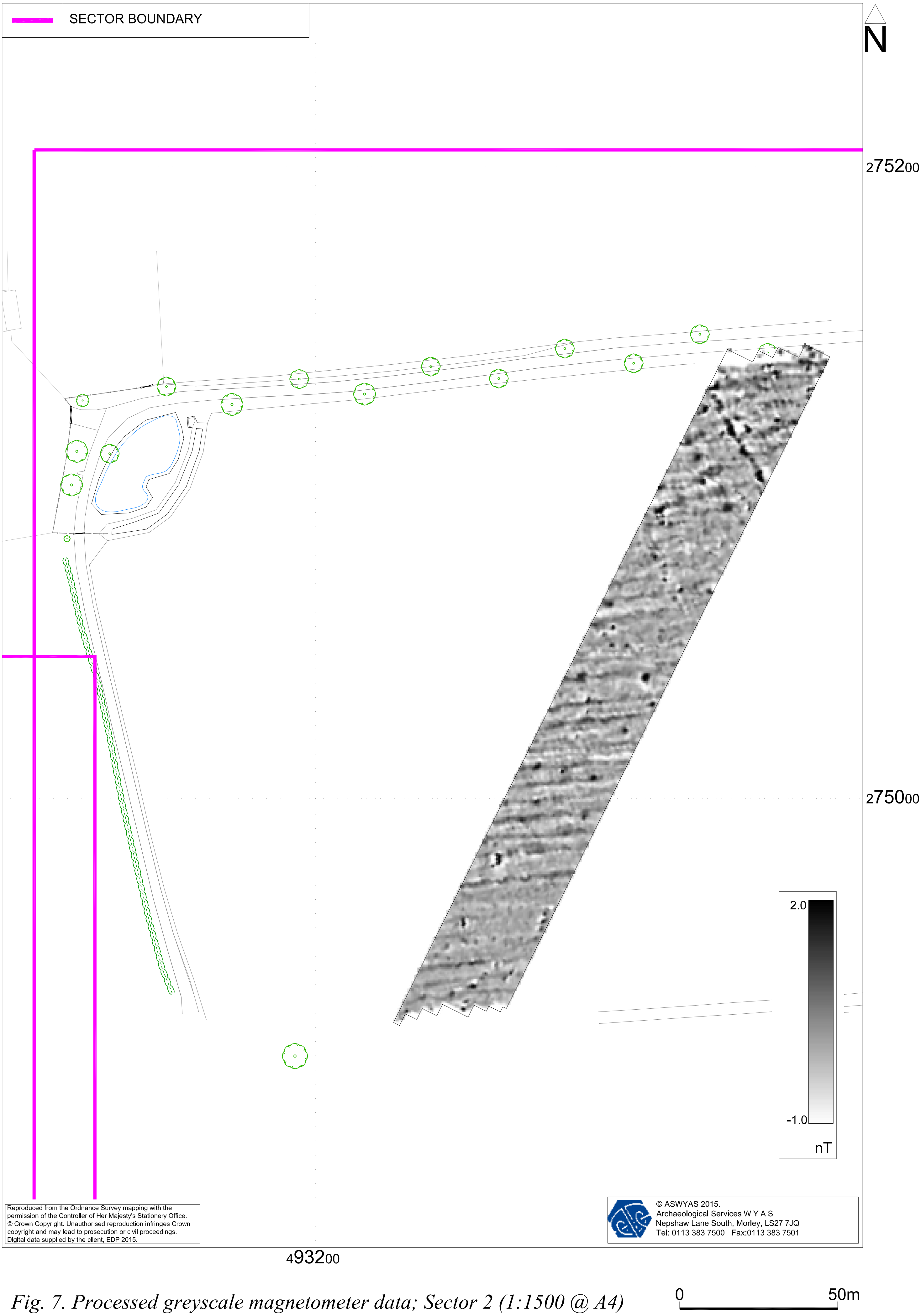

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Fig. 7. Processed greyscale magnetometer data; Sector 2 (1:1500 @ A4)

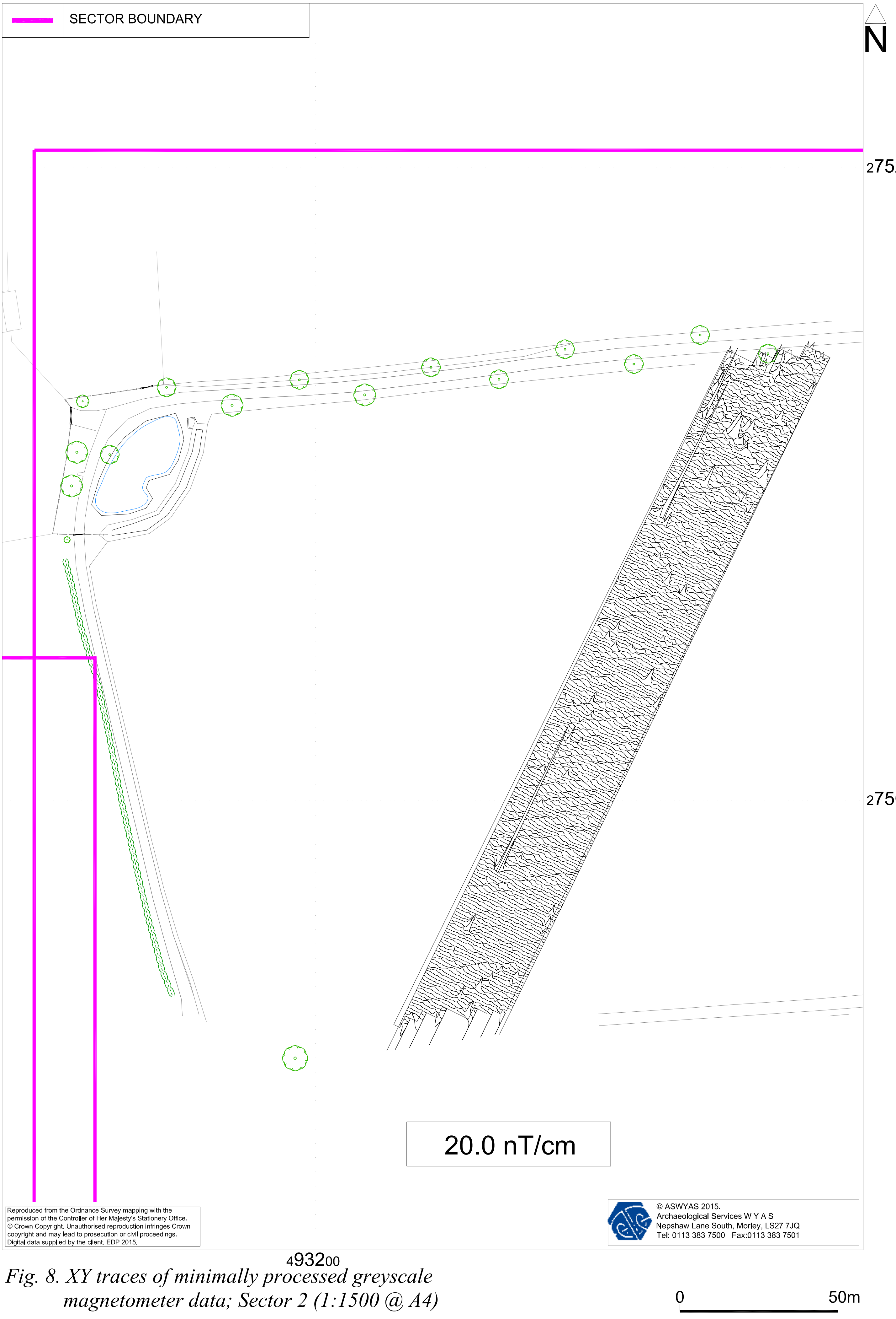

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Fig. 8. XY traces of minimally processed greyscale magnetometer data; Sector 2 (1:1500 @ A4)

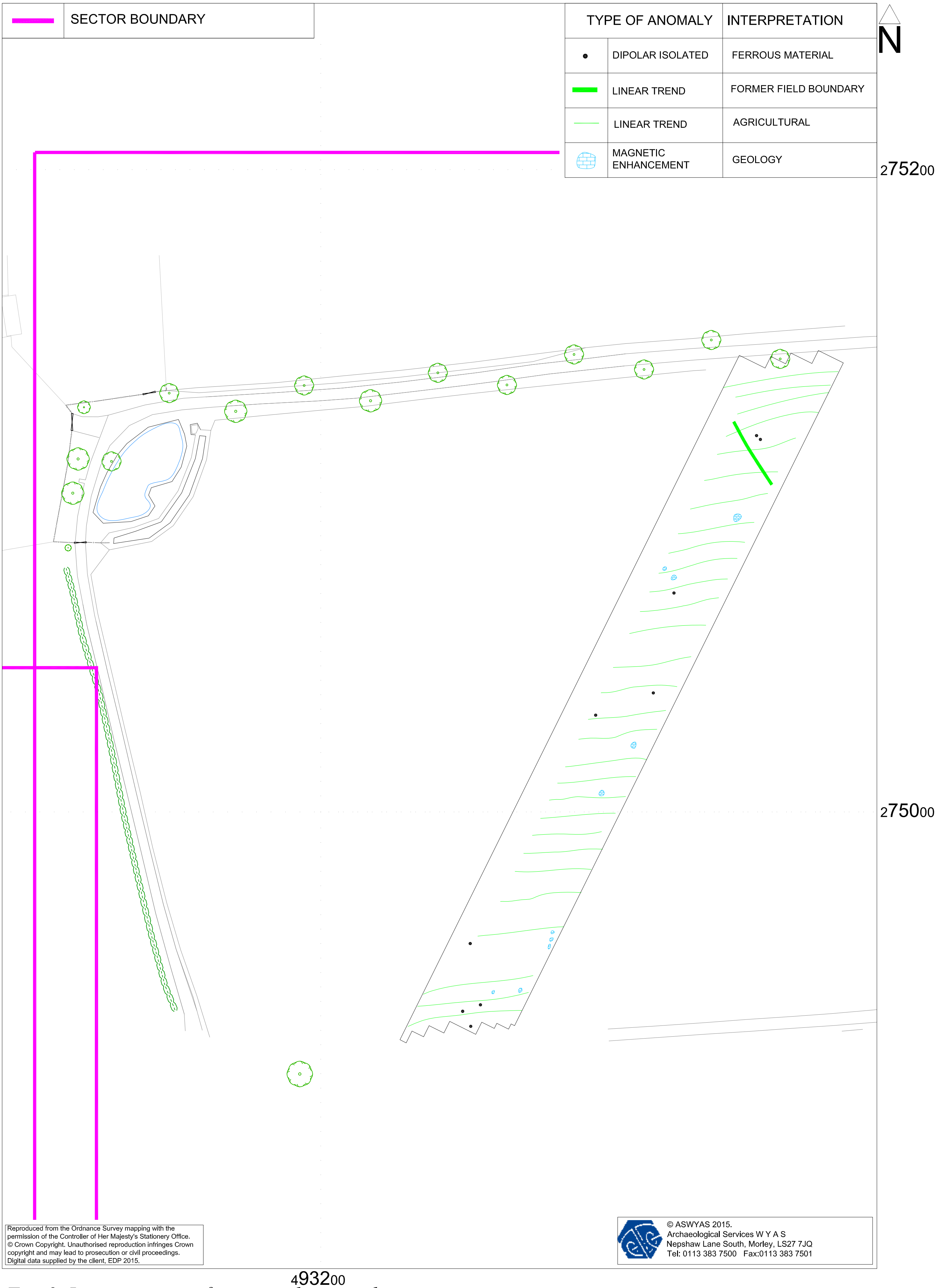

Fig. 9. Interpretation of processed greyscale magnetometer data; Sector 2 (1:1500 @ A4)

Plate 1. General view of site, looking southeast

Plate 2. General view of site, looking northwest

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. 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: 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 a Bartington Grad601 magnetic gradiometer was used taking readings on the 0.1nT range, at 0.25m intervals on zig-zag traverses 0.5m 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 have been presented in this report in XY trace and greyscale formats. In the former format the data shown are ‘raw’ with no processing other than grid biasing having been done. 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.

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 have 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 dual frequency Global Positioning System (GPS) with two Rovers (Trimble 5800 models) working in real-time kinetic mode. The accuracy of such equipment was better than 0.02m. However, it should be noted that Ordnance Survey positional accuracy for digital map data have 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 for relocation purposes.

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 will 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 Northamptonshire Historic Environment Record).

Appendix 4: OASIS form

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