ARCHAEOLOGICAL SERVICES WYAS

Land off Birmingham Road
Alvechurch
Worcestershire

Geophysical Survey

Report no. 2730

March 2015

Client: Barratt Homes

REGISTERED ORGANISATION CIfA

Land off Birmingham Road
Alvechurch
Worcestershire

Geophysical Survey

Summary

A geophysical (magnetometer) survey, covering approximately 7 hectares, was carried out on the north-eastern edge of Alvechurch on land proposed for residential development. Anomalies indicative of the post-medieval agricultural usage of the land and more recent activity have been identified. No anomalies of likely archaeological origin have been recorded. Consequently, on the basis of the survey, the archaeological potential of the site is considered to be very low.

ARCHAEOLOGICAL
SERVICES
WYAS

Report Information

Client:	Barratt Homes
Address:	60, Whitehall Road, Halesowen, West Midlands, B63 3JS
Report Type:	Geophysical Survey
Location:	Alvechurch
County:	Worcestershire
Grid Reference:	SP 026 733
Period(s) of activity:	post-medieval/modern
Report Number:	2730
Project Number:	4377
Site Code:	ALV15
OASIS ID:	archaeol11-205920
Planning Application No.:	13/0026
HER Event No:	WSM66620
Date of fieldwork:	March 2015
Date of report:	March 2015
Project Management:	David Harrison BA MSc MCIfA
Fieldwork:	Becky Goulding BSc MSc
	Alex Schmidt BA
Report:	Alistair Webb BA MCIfA
Illustrations:	David Harrison
Photography:	Alex Schmidt
Research:	n/a

Authorisation for distribution: ----------

PO Box 30, Nepshaw Lane South, Morley, Leeds
LS27 0UG
Telephone: 0113 383 7500.
Email: admin@aswyas.com

Contents

List of Figures

List of Plates

1 Introduction

Archaeological Services WYAS (ASWYAS) was commissioned by Matt Morgan of Environmental Dimension Partnership (the Consultant) on behalf of Barratt Homes Ltd (the Client), to undertake a geophysical (magnetometer) survey of land in Alvechurch, Worcestershire (see Fig. 1). The work was undertaken in order to inform a planning application (ref. 13/0026) which has been submitted to Bromsgrove District Council (BDC) for the development of houses within the south-west of the survey area (Phase 2 on Fig. 2), as well as future proposed phases of development within the remainder of the survey area (Phases 1 and 3 on Fig. 2). The work was undertaken in accordance with policy contained within the National Planning Policy Framework (DCLG 2012), in line with current best practice (CIfA 2014; David *et al.* 2008) and to a Project Design (Harrison 2015) approved by the Consultant and BDC. The survey was carried out on March 4th and March 5th 2015 to provide additional information on the archaeological resource of the site.

Site location, topography and land-use

The proposed development area (PDA) is located on the north-eastern periphery of Alvechurch, centred at NGR SP 026 733, and comprises five fields of mixed arable farmland and pasture (see plates). It covers an area of approximately 6.8 hectares and only small parts of Field 4 and Field 1, to the west of the site, were overgrown and unsuitable for survey. The site is bound by the M42 motorway to the north, Birmingham Road to the west and Old Rectory Lane to the south (see Fig. 2) and is flat, being situated at approximately 120m above Ordnance Datum.

Soils and geology

The underlying bedrock geology comprises Mercia mudstone group overlain by alluvial fan deposits of sand and gravel (British Geological Survey 2015). The soils are classified in the Brockhurst 2 association, characterised as slowly permeable, seasonally waterlogged loams over clay (Soil Survey of England and Wales 1983).

2 Archaeological Background

An archaeological desk-based assessment, which was focussed on the current Phase 2 development boundary, (Birmingham Archaeology 2011) established that the site is located to the north of the historic core of Alvechurch and that there are no archaeological sites recorded within the PDA. The evidence for prehistoric and Roman archaeology in the surrounding landscape is restricted to a small number of unstratified artefactual finds, apart from a Roman coin hoard found *c.* 1.5km to the west. The current pattern of land division has remained unchanged since at least the 18th century.

It is notable that an archaeological evaluation, comprising of 26 trenches, conducted immediately to the south of the site, identified only late medieval – modern remains related to 'low' value agricultural activity, e.g. drains and furrows.

3 Aims, Methodology and Presentation

The general objective of the geophysical survey was to provide information about the presence/absence, character, and extent of any archaeological remains identified within the PDA and to help inform further strategies, should they be required.

Specifically, the 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 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 (1:1500) 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, at a scale of 1:1250.

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)

Across the site the magnetic background is fairly variable resulting in a speckled appearance to the data. This is due to the presence of pockets of gravels in the superficial alluvial fan deposits and the soils that are derived from them. Against this variable background several anomalies have been identified by the survey which are discussed below and cross-referenced to specific examples depicted on the interpretative figures, where appropriate.

Ferrous Anomalies

Ferrous anomalies, as individual 'spikes', 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 (which in this case, there is not), as modern ferrous debris or material is common on rural sites, often being present as a consequence of manuring or tipping/infilling. Generally, there is no obvious pattern or clustering to their distribution on this site to suggest anything other than a random background scatter of ferrous debris in the plough-soil.

On this site several discrete areas of magnetic disturbance are recorded. In Field 1 approximately half of the surveyed area is characterised by very strong magnetic readings. A large spread of ferrous contamination, **A**, reflects the spreading of magnetic material along the Birmingham Road site frontage. A linear band of ferrous responses, **B**, matches the obvious route of a track leading across the field from Birmingham Road (see Plate 1) and probably reflects the tipping of material to improve ground conditions. In Field 3 three discrete piles of rubbish accumulated from probable traveller encampments account for anomalies **C**, **D** and **E** (see Plate 5).

A linear dipolar anomaly, **F**, is due to a sub-surface pipe and corresponds with the line of a foul water sewer shown on the base mapping (see Fig. 3).

Geological Anomalies

Numerous small discrete anomalies across the whole site are due to small changes in the composition of the soils and variation within the superficial deposits. None of these anomalies are considered likely to have an archaeological origin.

Agricultural/Modern Anomalies

Vague parallel linear anomalies, aligned south-west/north-east in Field 5 are interpreted as being caused by ridge and furrow cultivation or more recent agricultural activity. A linear anomaly, **G**, at right angles to the ploughing trends is also considered likely to be of agricultural origin, perhaps an unmarked boundary or a ploughing headland.

Another linear anomaly, **H**, correlates with the line of a public footpath (see Plate 3) that crosses Field 2 and Field 4 and is likely to be associated with the path or perhaps a pipe.

Two similar parallel linear trend anomalies, **I** and **J** in Field 4, at right angles to **H**, are also considered to be modern in origin. The anomalies are on the approximate line of a trackway (see Fig. 3) and might also be associated with a building depicted on the 1884 and 1904 OS mapping in the south-east corner of this field (Field 4).

5 Conclusions

Although several linear and non-linear anomalies have been identified across the site plausible, non-archaeological, origins have been ascribed to all of them. All of these anomalies are due to activity likely to date from the late 18th century to the present day, including ploughing, pipes, a footpath and modern disturbance. No anomalies of archaeological potential have been identified by the magnetic survey. Consequently, on the basis of the survey, the archaeological potential of the site is considered to be very low.

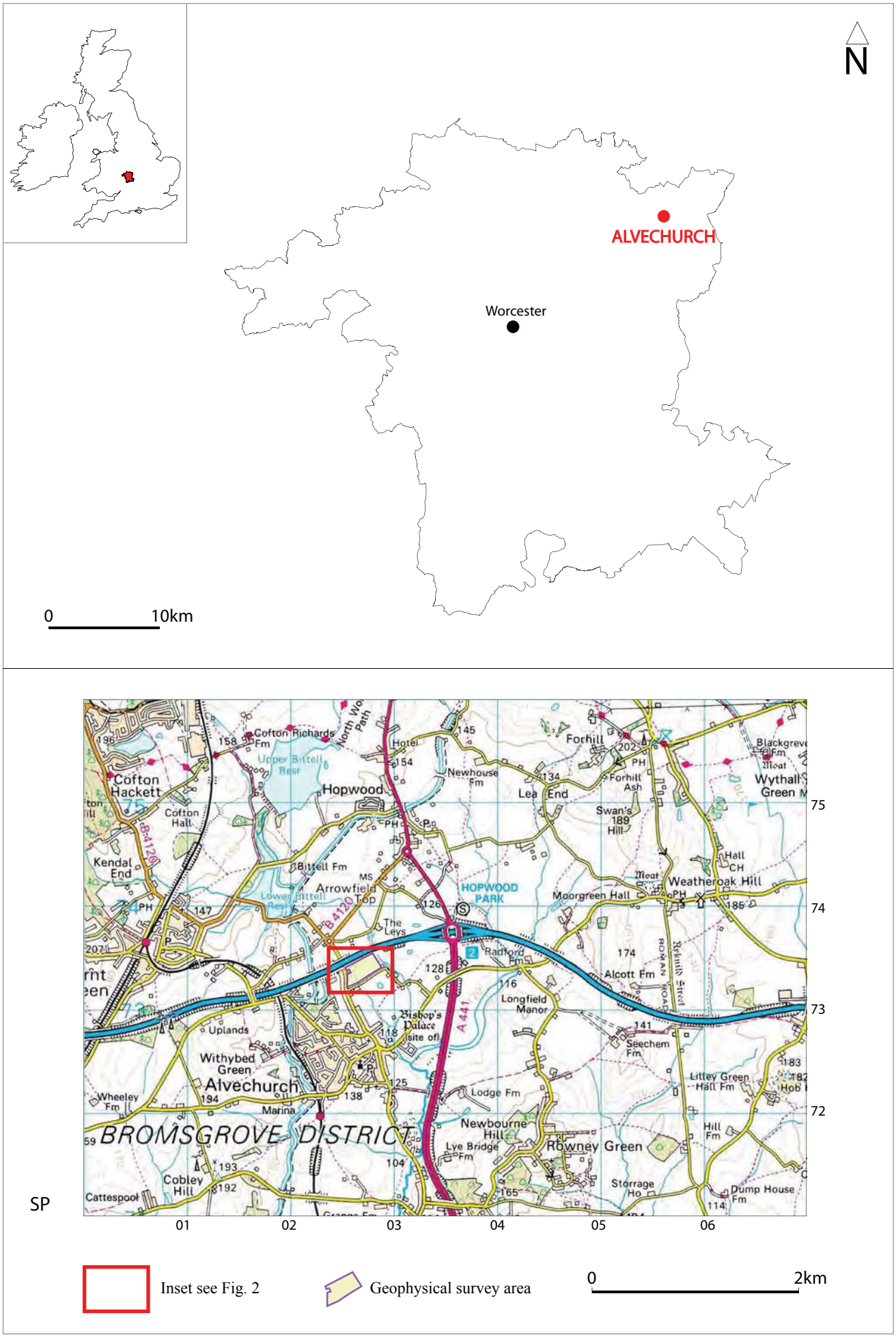

Fig. 1. Site location

Fig. 2. Survey location showing greyscale magnetometer data (1:1500 @ A3)

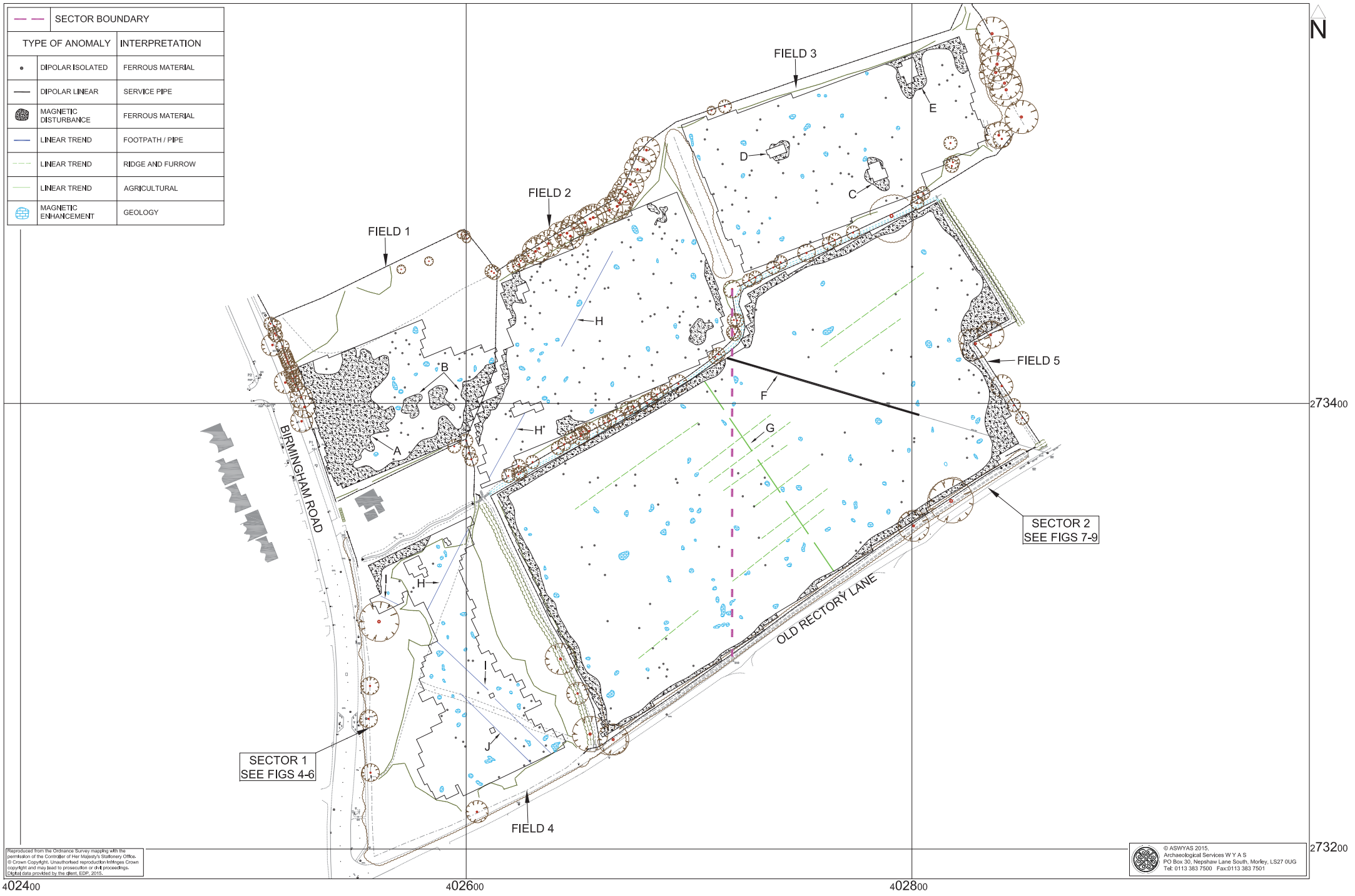

Fig. 3. Overall interpretation of magnetometer data (1:1500 @ A3)

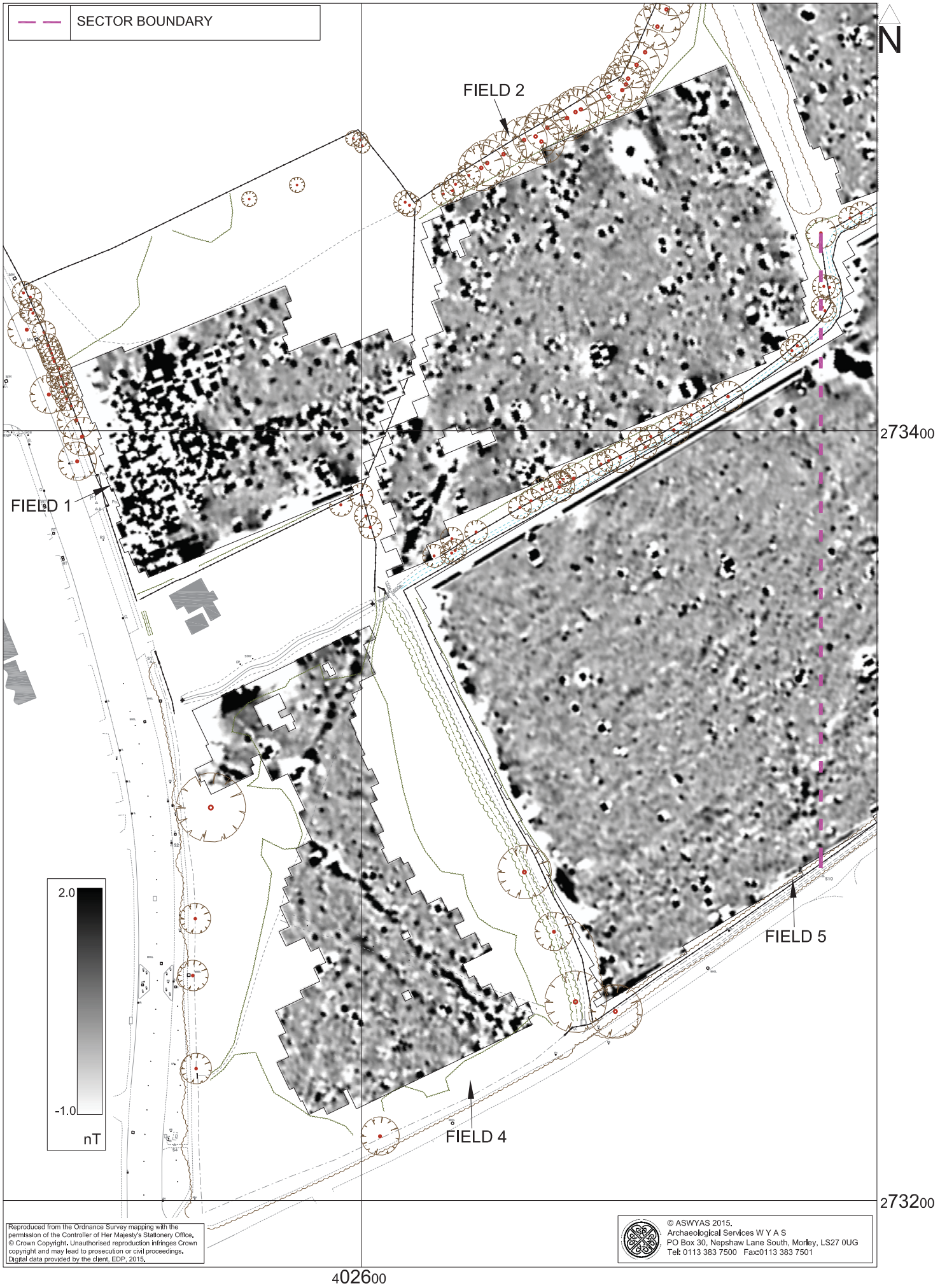

Fig. 4. Processed greyscale magnetometer data; Sector 1 (1:1250 @ A4)

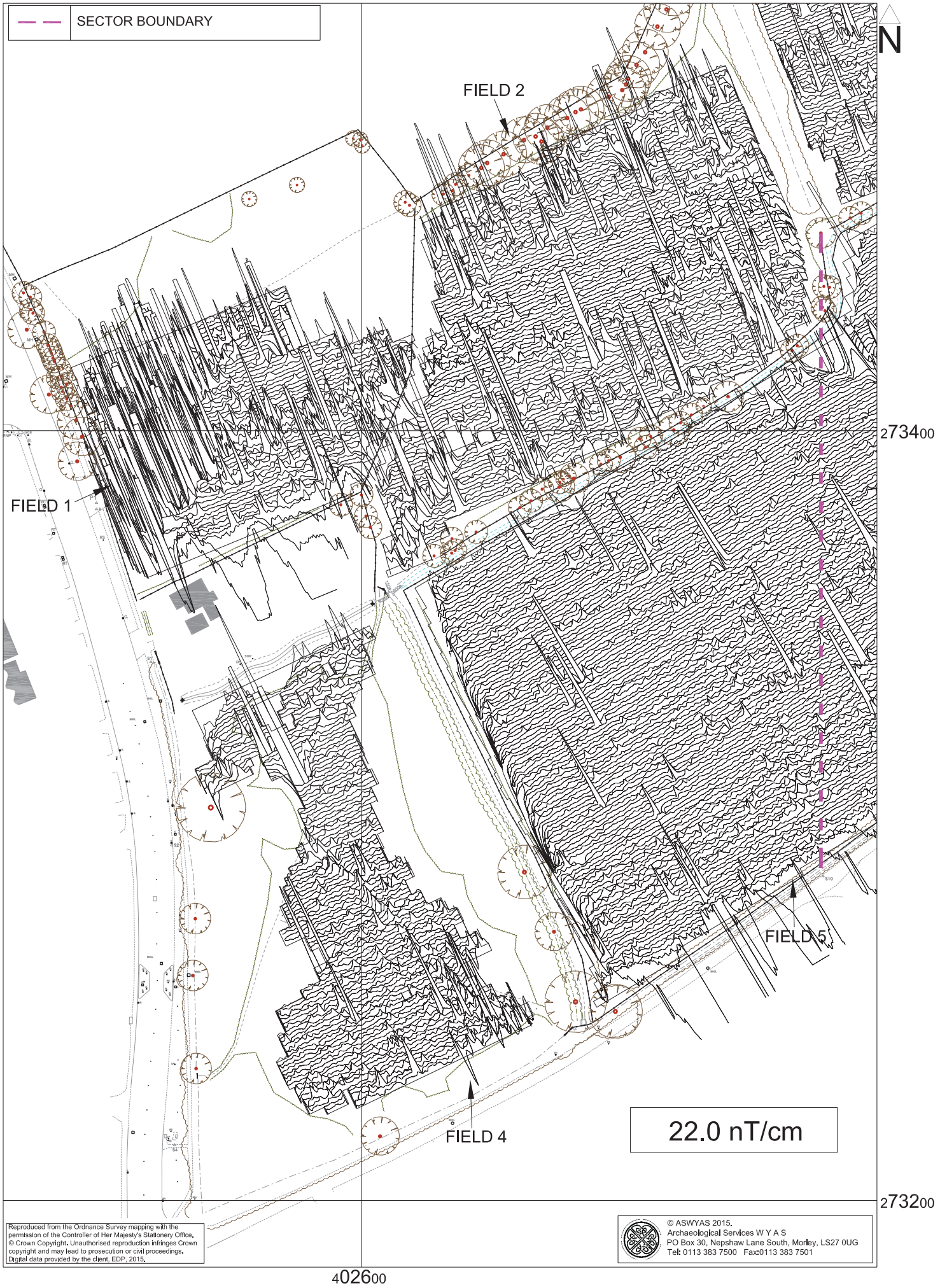

Fig. 5. XY trace plot of minimally processed magnetometer data; Sector 1 (1:1250 @ A4)

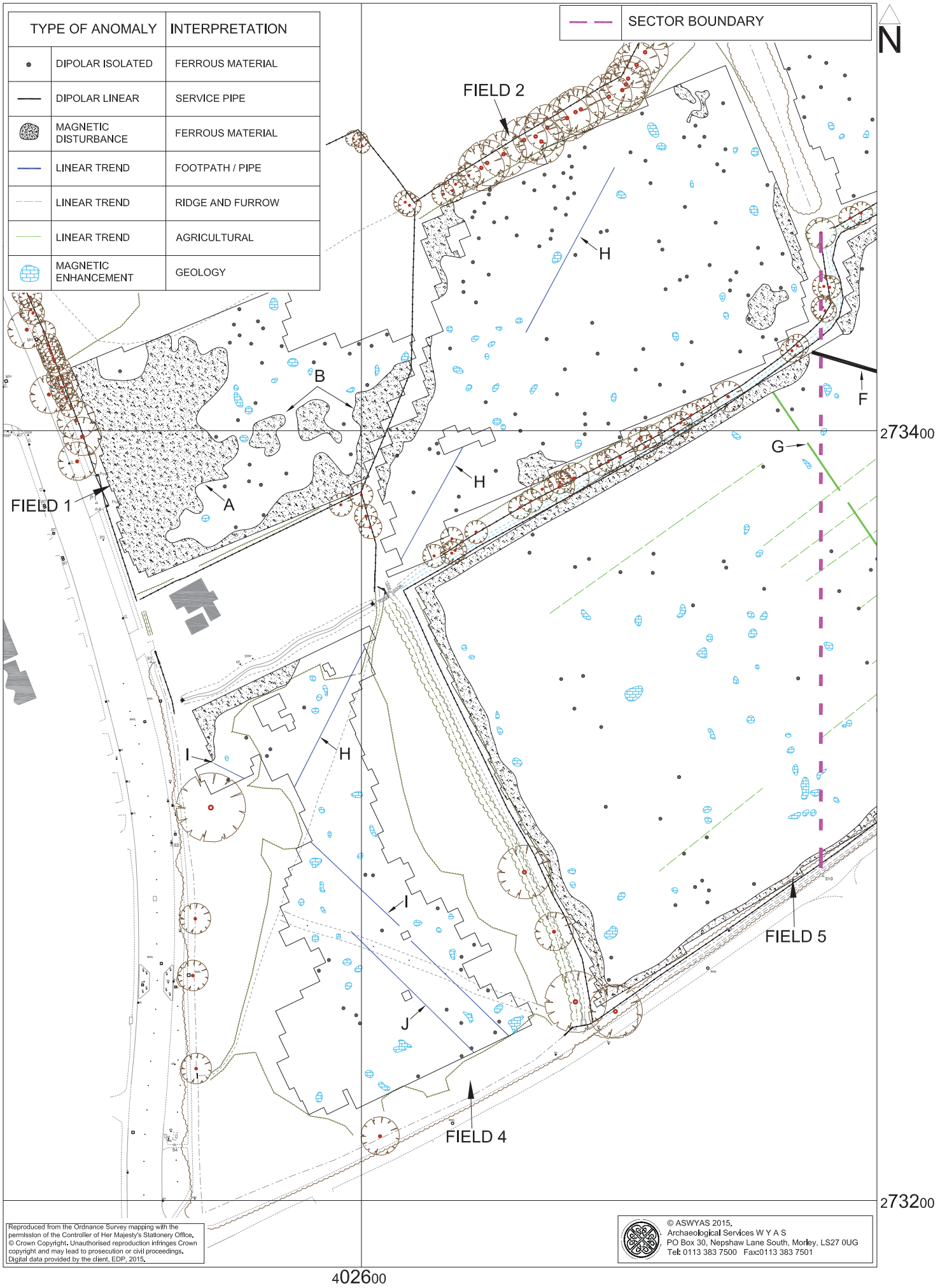

Fig. 6. Interpretation of magnetometer data; Sector 1 (1:1250 @ A4)

Fig. 7. Processed greyscale magnetometer data; Sector 2 (1:1250 @ A4)

Fig. 8. XY trace plot of minimally processed magnetometer data; Sector 2 (1:1250 @ A4)

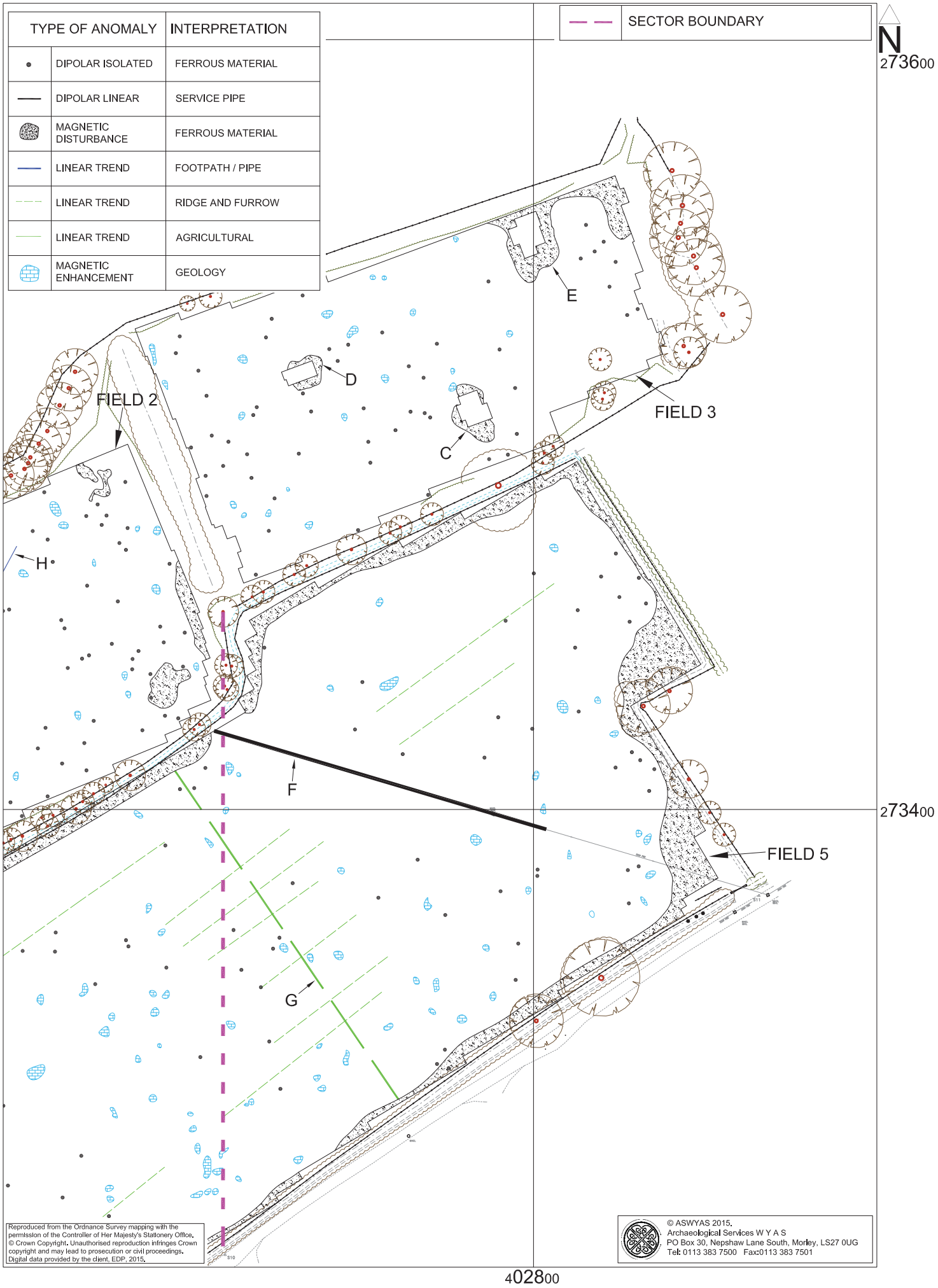

Fig. 9. Interpretation of magnetometer data; Sector 2 (1:1250 @ A4)

Plate 1. General view of Field 1, looking west

Plate 2. General view of Field 4, looking south

Plate 3. General view of Field 4, looking south-west

Plate 4. General view of Field 2, looking south-east

Plate 5. General view of Field 3, looking north-east

Plate 6. General view of Field 5, looking west

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 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 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 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 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 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 Worcestershire Historic Environment Record).

Appendix 4: OASIS Form

OASIS DATA COLLECTION FORM: England

List of Projects | Manage Projects | Search Projects | New project | Change your details | HER coverage | Change country | Log out

Printable version

OASIS ID: archaeol11-205920

Project details

Project name	Land off Birmingham Road, Alvechurch
Short description of the project	A geophysical (magnetometer) survey, covering approximately 7 hectares, was carried out on the north-eastern edge of Alvechurch on land proposed for residential development. Anomalies indicative of the post-medieval agricultural usage of the land and more recent activity have been identified. No anomalies of likely archaeological origin have been recorded. Consequently, on the basis of the survey, the archaeological potential of the site is considered to be very low.
Project dates	Start: 04-03-2015 End: 05-03-2015
Previous/future work	Not known / Not known
Any associated project reference codes	4377 - Contracting Unit No.
Any associated project reference codes	ALV15 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Grassland Heathland 5 - Character undetermined
Monument type	N/A None
Monument type	N/A None
Significant Finds	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded
Solid geology (other)	Mercia Mudstone
Drift geology	ALLUVIUM

Techniques	Magnetometry

Project location

Country	England
Site location	WORCESTERSHIRE BROMSGROVE ALVECHURCH Land off Birmingham Road, Alvechurch
Postcode	B48 7TD
Study area	7.00 Hectares
Site coordinates	SP 026 733 52.3573711085 -1.96181859905 52 21 26 N 001 57 42 W Point

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	The Environmental Dimension Partnership
Project design originator	Archaeological Services WYAS
Project director/manager	Harrison. D
Project supervisor	Schmidt, A.
Type of sponsor/funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive Exists?	No
Digital Media available	"Geophysics"
Paper Archive Exists?	No
Paper Media available	"Report"

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Land off Birmingham Road, Alvechurch, Worcestershire; Geophysical Survey
Author(s)/Editor(s)	Webb, A.
Other bibliographic details	Report No. 2730
Date	2015
Issuer or publisher	ASWYAS
Place of issue or publication	Morley
Description	PDF A4 blue comb-bound report

Entered by	David Harrison (dharrison@aswyas.com)
Entered on	12 March 2015

Bibliography

Birmingham Archaeology, 2011. *Land off Birmingham Road, Alvechurch, Worcestershire: Archaeological Desk-based Assessment*. Unpublished BA Report PN2148

British Geological Survey, 2015. www.bgs.ac.uk/discoveringGeology/geology OfBritain/viewer.html. (Viewed March 10th 2015)

Chartered Institute for Archaeologists, 2014. *Standard and Guidance for archaeological geophysical survey.* CIfA

David, A., N. Linford, P. Linford and L. Martin, 2008. *Geophysical Survey in Archaeological Field Evaluation: Research and Professional Services Guidelines (2nd edition)* English Heritage

DCLG, 2012. *National Planning Policy Framework*. Department of Communities and Local Government

Harrison, D. 2015. *Land off Birmingham Road, Alvechurch, Worcestershire: Geophysical Survey Project Design.* Unpublished ASWYAS document

Soil Survey of England and Wales, 1983. *Soil Survey of England and Wales: Soils of Midland and Western England,* Sheet 3