Land at Hinxton Grange, Hinxton Cambridgeshire

Geophysical Survey

Report no. 2910
November 2016

Client: Terence O'Rourke Ltd

Land at Hinxton Grange, Hinxton, Cambridgeshire

Geophysical Survey

Summary

A cart-based geophysical (magnetometer) survey, covering approximately 120 hectares was carried out on agricultural land predominantly to the west and south of Hinxton Grange, Cambridgeshire. The survey was undertaken in advance of agricultural trials. The survey area is close to a number of HER monuments and important archaeological sites. Previously unknown prehistoric barrows, pits and trackways have been identified, alongside Second World War defences. It is highly likely that these features are related to HER monuments which surround the survey area. Within the survey area, a number of possible archaeological anomalies have been detected, and are likely to have an archaeological origin due to the archaeology within the wider landscape. Some ridge and furrow has been detected to the southwestern extent of the site. Anomalies indicative of geology and modern disturbance have been identified. The archaeological potential of the survey area, therefore, is deemed to be high.

WYAS Archaeological Services

Report Information

Client:	Terence O'Rourke ltd.
Address:	Everdene House, Deansleigh Road, Bournemouth, BH7 7DU
Report Type:	Geophysical Survey
Location:	Hinxton
County:	Cambridgeshire
Grid Reference:	TL 49771 46480
Period(s) of activity:	Prehistoric to modern
Report Number:	2910
Project Number:	6436
Site Code:	HXN_16
OASIS ID:	Archaeol11-267643
Date of fieldwork:	August 2016 to October 2016
Date of report:	October 2016
Project Management:	Chris Sykes BA MSc
Fieldwork:	Becky Goulding BSc MSc
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Illustrations:	Emma Brunning and Chris Sykes
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Authorisation for distribution: ---

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1 Introduction

Archaeological Services WYAS (ASWYAS) was commissioned by Terence O'Rourke ltd. on behalf of SmithsonHill to undertake a cart-based geophysical (magnetometer) survey on land at Hinxton Grange, Cambridgeshire, to inform a proposed planning application. The work was undertaken in accordance with a Project Design (Evans 2015). Guidance contained within the National Planning Policy Framework (DCLG 2012) was also followed, in line with current best practice (CIfA 2014; David *et al*. 2008). The survey was carried out between 15th August and 13th October 2016, to provide additional information on the archaeological resource of the Proposed Development Area (PDA).

Site location, topography and land-use

The Proposed Development Area (PDA) consists of five agricultural fields totaling approximately 115 hectares and located on the northern outskirts of Hinxton. The site is surrounded by agricultural fields, bound to the west by the A1301 and to the west by the River Cam for the north western field (see Fig. 1).

The PDA is located approximately 11km to the southeast of Cambridge and consisted of generally level agricultural land under a cover of either short stubble or recently rolled fields, this, along with good weather made it ideal for survey. There were no access issues and the farmer facilitated access following the harvest. The survey area was at a height above Ordnance Datum (aOD) between 26m - 50m and is centred at TL 4921 4738.

Soils and geology

The underlying bedrock for the site comprise either of the Holywell nodular chalk formation or the New Pit chalk formation both of sedimentary bedrocks, formed approximately 89 to 100 million years ago in the Cretaceous period. Superficial deposits have only been recorded in the northwest of the site and consist of river terrace deposits - sand and gravel (BGS 2016). Soils of the area belong to the Swaffham Prior association (511e) consisting of well drained calcareous coarse and fine loamy soils over chalk rubble (SSEW 1983).

2 Archaeological Background

An assessment of aerial imagery and visualised Airborne Laser Scan was commissioned by Terence O'Rourke ltd and undertaken by Air Photo Services in which sixteen individual areas of archaeological interest were recorded in the site or its immediate environs. The site contains an extensive series of buried complex rectilinear settlement enclosures which are likely to date to the Romano British or Iron Age periods. Multiple ring ditches visible as cropmarks indicate Bronze Age funerary monuments. The field to the immediate east of Hinxton Grange has revealed a complex of features which may be indicative of a newly discovered possible Roman high status rural settlement area, this lies outside the geophysical study area but within the aerial imagery study area (APS 2016).

In late 2015 ASWYAS conducted a geophysical survey approximately 4km to the southwest at Ickleton (ASWYAS 2016). A number of previously unknown archaeological enclosures had been detected which were likely to relate to the known Roman settlements nearby (BA 2015).

The Cambridgeshire HER (CHER) have recorded a number of assets within the PDA and immediate surrounding areas. Rectilinear enclosures (09052) are likely to be of medieval date within the parkland of Hinxton Grange. In 1995 excavations at Hinxton Quarry found large numbers of Neolithic/early Bronze Age lithics (11978) scattered across the site. A Roman settlement (08822) at Hinxton comprises large rectilinear complex of enclosures and a ring ditch.

Hinxton Grange (12121) was built in 1835 on an elevated position and is approached by a long shady drive through an avenue of beech trees. The pleasure gardens around the house consist of extensive lawns with an Italian formal garden and conservatory. During the Second World War Hinxton Grange was used as an outstation of the notorious Camp 020 (HAM, Richmond-on-Thames), run by the Home Office where spies were interrogated. It was also the headquarters of the 60th SL (Searchlight) Regiment (Osborne 2013).

3 Aims and Methodology

The main aim of the geophysical survey was to provide sufficient information to enable an assessment to be made of the impact of the 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 amenable parts of the PDA 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 magnetometer survey was undertaken using a Sensys Magneto MXPDA cart-based instrument. The instrument has 5 fluxgate gradiometers spaced 0.5m apart with readings recorded at 20Hz. The gradiometers have a range of recording between 0.1nT and 10,000nT. They are linked to a Trimble R6 RTK dGPS system with data recorded by Sensys Magneto MXPDA software on a rugged PDA device. The data was stored on an SD memory card within the PDA and later downloaded to a computer for processing and interpretation.

MAGNETO (Sensys Gmbh) and TerraSurveyor V3.0.25.0 software was used to process and present the data. Further details are given in Appendix 1.

Data processing

The gradiometer data in this report is displayed in minimally processed greyscale formats from the MAGNETO programme. The decision was made to use MAGNETO for the presentation of data, to ensure that no artificial data constructs are brought into the data. The use of minimally processed data was to maximise the clarity and interpretability of the archaeological anomalies. The display parameters (2, -1nT) were selected in order to create suitable contrast between anomalies of high or low magnitude. This is to make sure that stronger disturbance features do not overshadow weaker anomalies. TerraSurveyor V3.0.25.0 software was used, alongside MAGNETO, to analyse the data recorded by the cart-mounted system.

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 1:10000. An overall interpretation of data is shown in Figure 3, again at a scale of 1:10000. The processed data, together with an interpretation of the survey results are presented in Figures 4 to 41 inclusive at a scale of 1:1000.

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 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 3 to 41)

In order to avoid lengthy repetition, a table of results for both archaeological and possible archaeological anomalies have been created. A general synopsis of the anomalies, which do not have archaeological potential, are discussed below. An in-depth discussion about the relationship between the anomalies will then follow.

Ferrous anomalies

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 to suggest anything other than a random background scatter of ferrous debris in the plough-soil.

Along with numerous small scale ferrous anomalies seen throughout the PDA, a service pipe can be seen in Area B running on a northeast to southwest alignment.

Geological anomalies

Discrete low magnitude anomalies (areas of magnetic enhancement) have been identified throughout the PDA. These are interpreted as geological in origin and are thought to be caused by variations in the depth and composition of the soils and the superficial deposits from which they derive.

Anomalies in Area C are likely due to periglacial fissuring due to the patterns that they form. It must also be noted they these responses can ‘mimic’ archaeological features and due to the large amount of anomalies within the vicinity, it may be possible that they are anthropogenic rather than natural in origin.

Agricultural anomalies

Linear anomalies indicative of agricultural activities are present throughout the survey area. Possible medieval or post-medieval ridge and furrow cultivation are visible in Areas B and E (Figures 10-11, 36-37). Those on Area B are on a north - south alignment whilst those in Area E are on a northwest – southeast alignment.

More recent agricultural activities are present throughout on differing alignments, in which they, on a whole reflect the current field boundaries. Only the strongest of responses have been highlighted in the interpretation diagrams.

As a cultivation practice, ploughing disturbs the subsoil causing variations in the magnetic susceptibility of the soil. As the furrows are backfilled, the magnetic signal of the infill differs from that of the surrounding area. These types of anomalies are not considered to be of high archaeological interest.

Possible WWII anomalies

A prominent "zig-zag" ditch like feature (**W1**) (Figures 12-15), most likely to be associated with Second World War defences, however it is unclear if this was a defence for the nearby airfield of Duxford, or as part of the Stop Line Green which has been defined, to the north by Longport, and broadly follows a north to south alignment. Also due to the headquarters of the 60th SL Regiment being at Hinxton Grange, this feature may have been a training trench exercise. However, given the prehistoric features within the PDA an older origin could also be feasible.

A number of highly magnetic single anomalies (**W2**), which together create an associated inferred line. These may be remnants of temporary fence supports for an internal division within the field, however, it is considered that they are likely to be part of a deterrent measure to protect the airfield of Duxford such as the bases of anti-glider posts (Dobinson 2000).

Possible archaeological anomalies

Unless otherwise stated, anomalies of possible archaeological origin are thought to be caused by infilled cut features, such as pits or ditches. They cannot be satisfactorily interpreted as either being modern, agricultural or geological in origin and are therefore classed as possible archaeological anomalies. There is low magnetic differentiation between these categories, when compared to the magnetic strength of the archaeological anomalies.

Table 1. Possible archaeological anomalies

Anomaly ID	**Dimensions**	**Description**	**Location**	**Figures**
P1	-	Discrete anomalies possibly representing pits	Area A	6,7
P2	44m	A pair of parallel linear trends visible within A7. May possibly be of an earlier date	Area B	10,11
P3	7m – 16m	Semi-circular anomalies, close to A11	Area C	22,23
P4	17m x 17m	Circular anomaly and linear trends, similar to A12/A13 but with a lesser magnetic strength	Area D	26,27
P5	9m x 7m	Small rectilinear anomalies, possible plough damaged ring ditches	Area D	34,35

The majority of possible archaeological anomalies detected are either linear or curvilinear trends close to the definite archaeological responses. It is highly likely that they are of an anthropogenic origin due to the patterns that they create.

Archaeological anomalies

Table 2. Archaeological anomalies

Anomaly ID	**Dimensions**	**Description**	**Location**	**Figures**
A1	22m x 16m	An elongated "D" shaped anomaly, at the northern extent of the scheme	Area A	4,5
A2	29m x 26m	A barrow anomaly, to the south of A1, and probably associated with the spread of pit anomalies (A3)	Area A	4, 5
A3	39m x 36m	A number of small anomalies, comprising of 27 separate responses, between A1 and	Area A	4, 5

Anomaly ID	Dimensions	Description	Location	Figures
		A2. Eight outlying responses, to the north of A1 and A2, are also considered to be contemporary		
A4	112m	A linear response to the western extent of Area A	Area A	6, 7
A5	22m x 22m	A circular anomaly, closely associated to the magnetic responses of A1, A2 and A3	Area A	4, 5, 6, 7
A6	7m x 7m	A circular anomaly in the south of the area.	Area A	6, 7
A7	136m x 86m	A prominent and strong magnetic response which creates a rectilinear enclosure, sub-divided into smaller rectangles. This is likely to be Romano-British in origin and associated with the trackway anomalies of A9. Parts of this archaeological feature had already been identified via aerial photography reconnaissance and is recorded in the CHER, number 08904.	Area B	10,11
A8	500m x 7m	Two parallel and linear responses, at a width of 7m and an overall length of 500m. These linear trends appear to form a trackway associated with the settlement/enclosure of A7, and is fragmented in parts, due to late activity. The trackway extends along a northwest - southeast axis, with intersection at the southern terminus and a second intersection close to the service pipe which cuts through it.	Area B	10, 11, 12, 13, 16, 17, 20, 21
A9	52m x 42m	Linear trends of a similar magnitude to A10, which extend eastwards and may be part of the same defence feature.	Area B	12,13
A10	300m	Two parallel linear trends responses to the west of A9, with an inference that it may form a similar trackway parallel with A9.	Area B and C	18, 19, 22, 23
A11	21m x 19m	A circular anomaly which may be prehistoric in origin.	Area C	22, 23
A12	720m	An inferred continuous linear, orientated along a northwest - southeast axis, broken into two parts (175m and 238m) accordingly. This is likely to form part of a former field boundary system, potentially associated with A9. This feature has been identified on aerial photography reconnaissance, and cuts through feature A13.	Area D	24, 25, 26, 27
A13	18m x 20m	A circular anomaly, with a strong magnetic response, which is bisected by A12. Again this anomaly has been identified by aerial photography.	Area C and D	26, 27
A14	590m	A linear which runs broadly parallel with A12	Area C and D	28, 29, 32, 33
A15	*c*. 7m x 7m	A group of 5 circular responses, lying either side of a linear ditch, parallel with	Area D	34, 35

Anomaly ID	Dimensions	Description	Location	Figures
		A12 and A14		
A16	8m x 8m	A circular response, close to A15	Area D	34, 35
A17	9m x 9m	A circular response, close to A16	Area D	34, 35
A18	12m x 12m	A circular response, previously identified by aerial photography, along an axis of A14	Area D	34, 35
A19	16m x 16m	A circular response, north of A18, comparable in size to A13	Area D	32, 33
A20	200m	A linear, close to the existing track and likely to be a former field boundary, acting as a terminus for A12	Area E	38, 39, 40, 41

A large number of archaeological anomalies have been detected within all areas of the PDA of differing shapes and sizes. Whilst a number of these correspond to cropmarks seen within aerial photography some have been previously unrecorded. This geophysical survey has, therefore, added information to the wider prehistoric landscape surrounding Hinxton Grange. It must also be noted that many of the clusters of archaeological anomalies appear connected by trackways and are therefore likely to be of a contemporary date.

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.

5 Conclusions

The results from the gradiometer survey have identified a number of definite and possible archaeological features in the forms of linear ditches, ring ditches, pits, enclosures and trackways. A substantial enclosure in the north of Area B has been identified through aerial reconnaissance but the results show in detail the layout and dimensions of the feature. A number of ring ditches can be seen throughout, in varying sizes. Whilst some are single features, others are within clusters and a magnetically stronger larger ring ditch, in Area D, lies along a long linear ditch. It is highly likely these represent Bronze Age funerary barrows and many more are known within the wider landscape.

Medieval ridge and furrow cultivation can be seen in the southeast of the PDA and modern ploughing trends have been detected throughout. Possible military features have also been detected; a ‘zig-zag’ long ditch-like response may represent defences or practise trenches whilst numerous large ferrous responses in a linear pattern may also be defensive, in the form of anti-glider post bases.

Geological responses have been detected in the western half of the site. There is the possibility that some of these are archaeological as, with periglacial fissuring can mimic archaeological features. A modern service pipe can be seen within Area B. The archaeological potential of the site, therefore, is high.

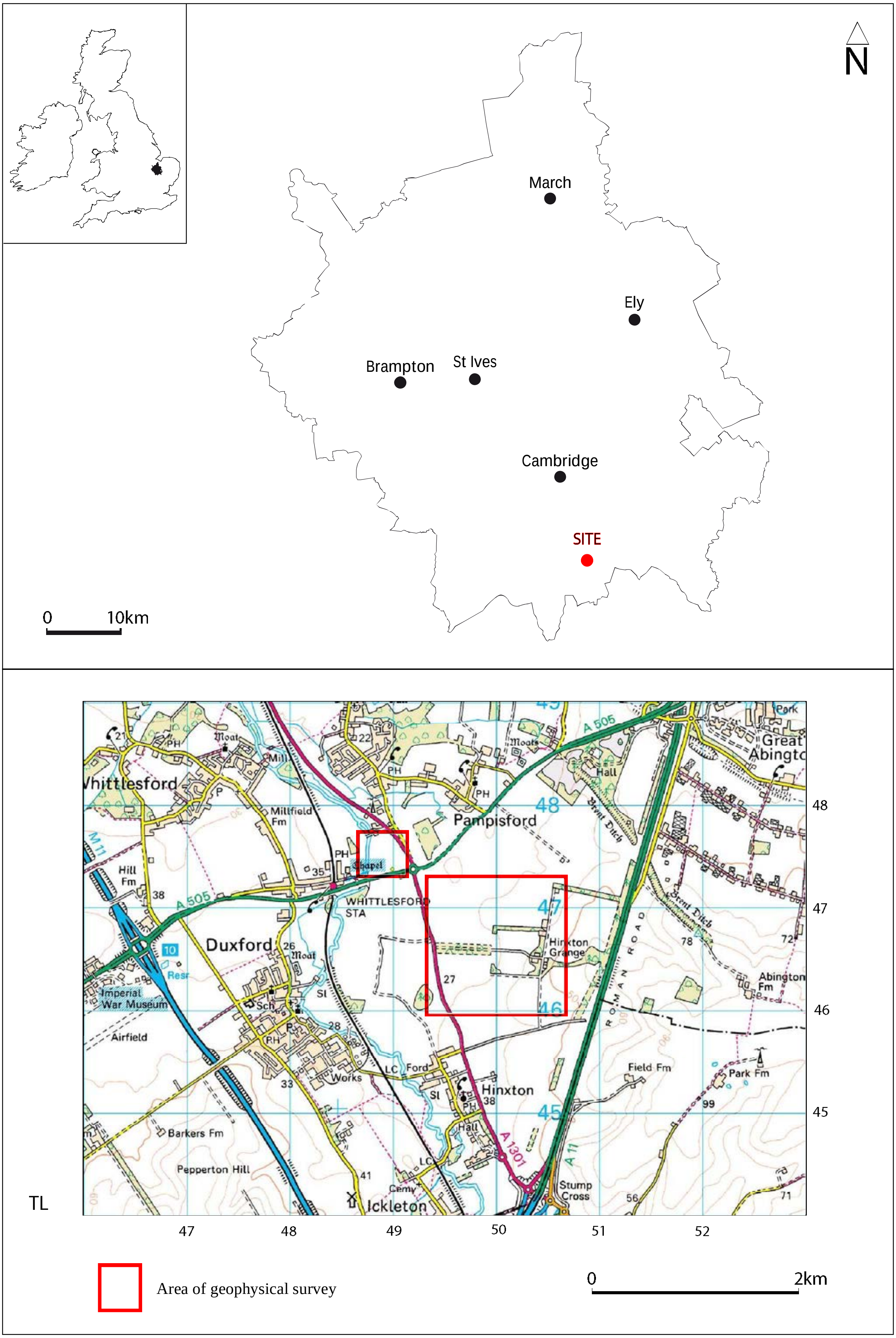

Fig. 1. Site location

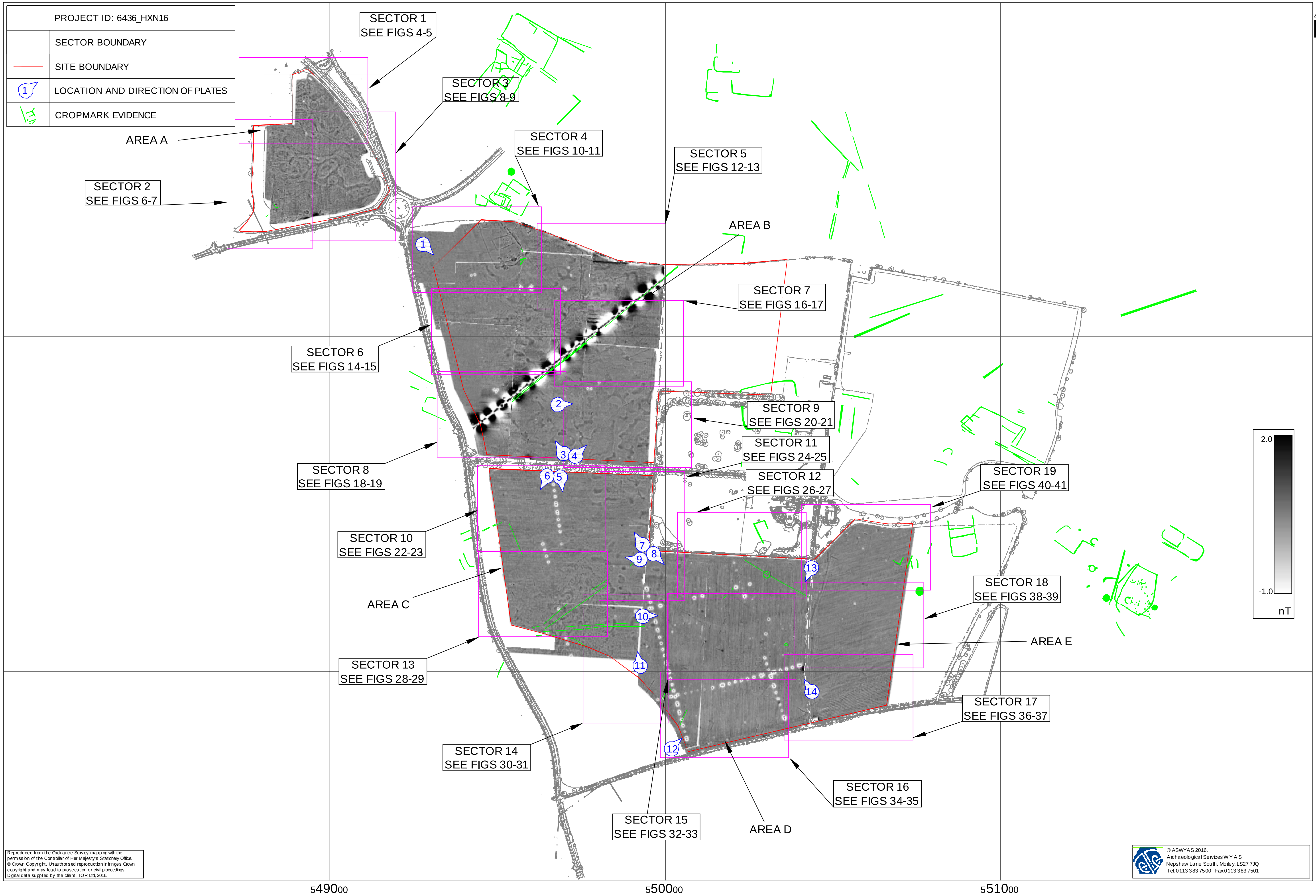

Fig. 2. Survey location showing greyscale magnetometer data (1:10000 @ A3)

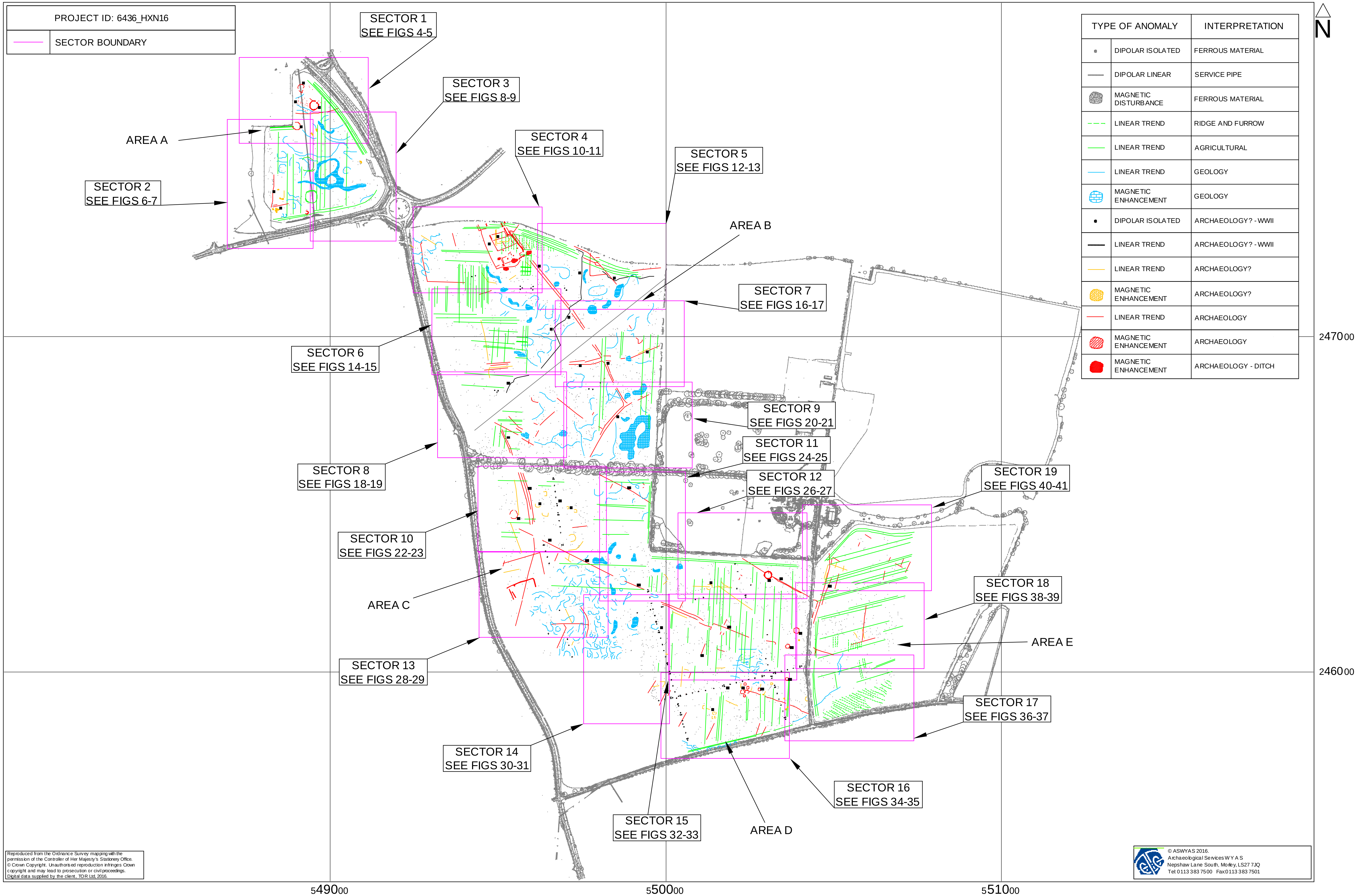

Fig. 3. Overall interpretation of magnetometer data (1:10000 @ A3)

0 200m

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

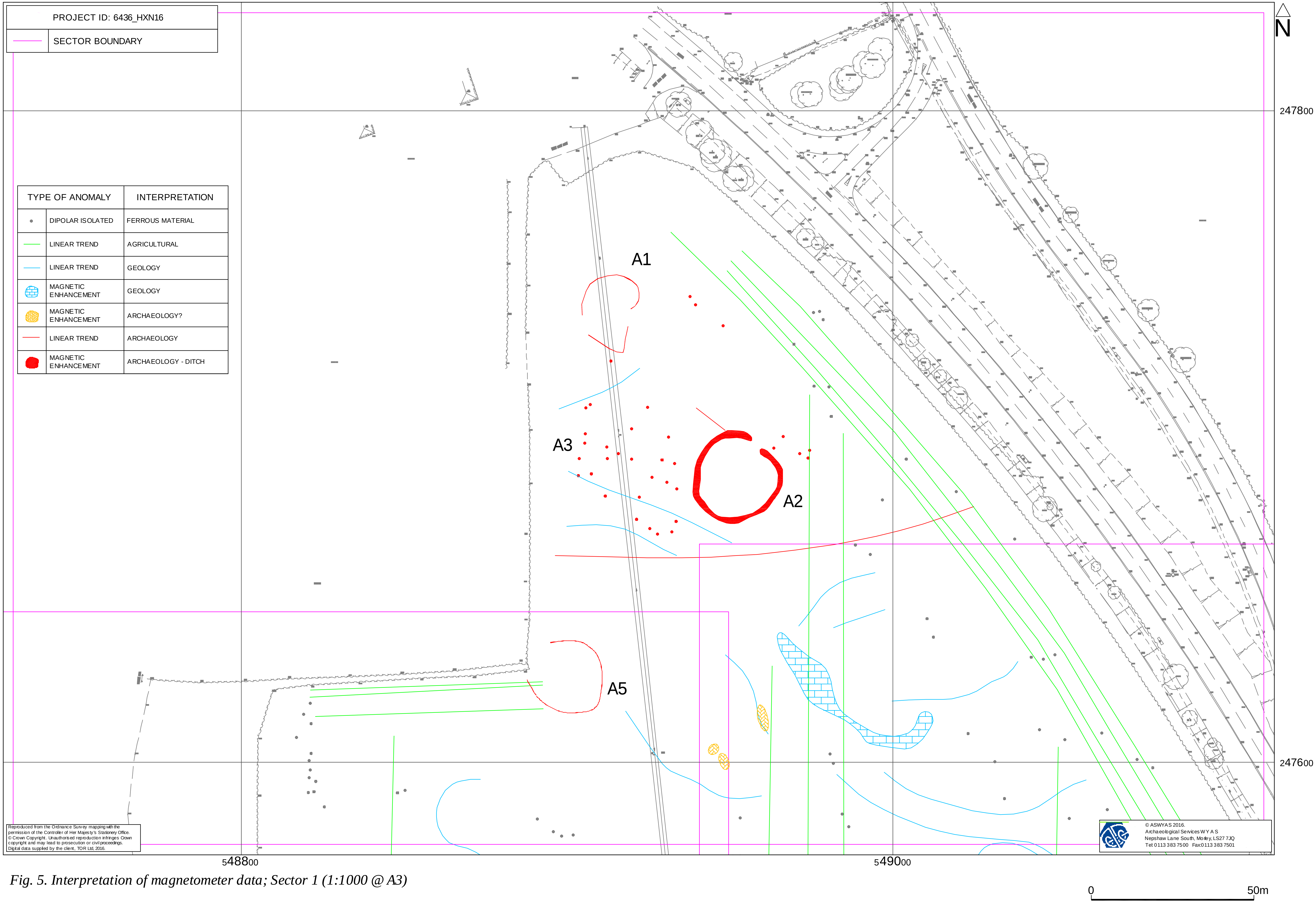

Fig. 5. Interpretation of magnetometer data; Sector 1 (1:1000 @ A3)

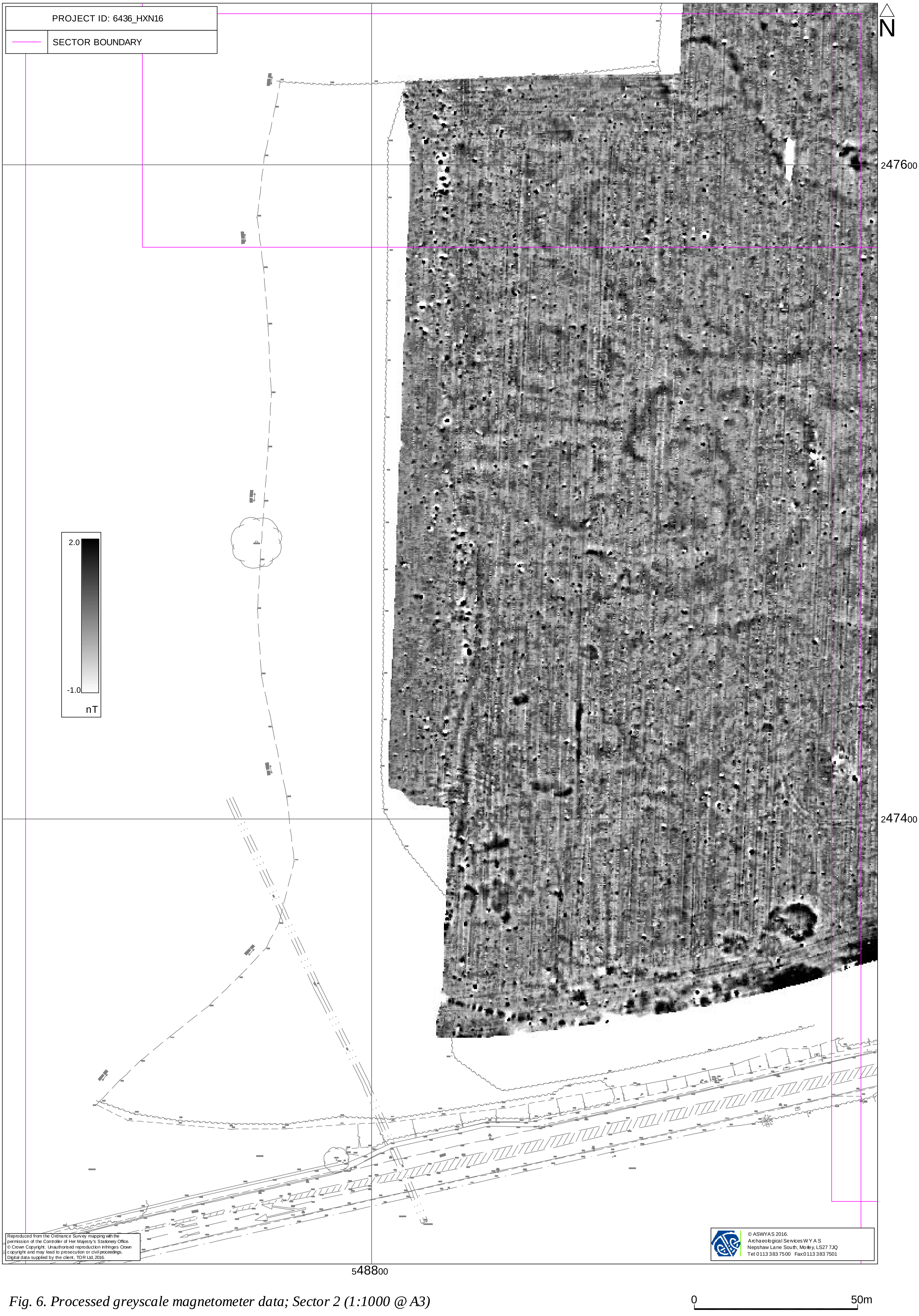

Fig. 6. Processed greyscale magnetometer data; Sector 2 (1:1000 @ A3)

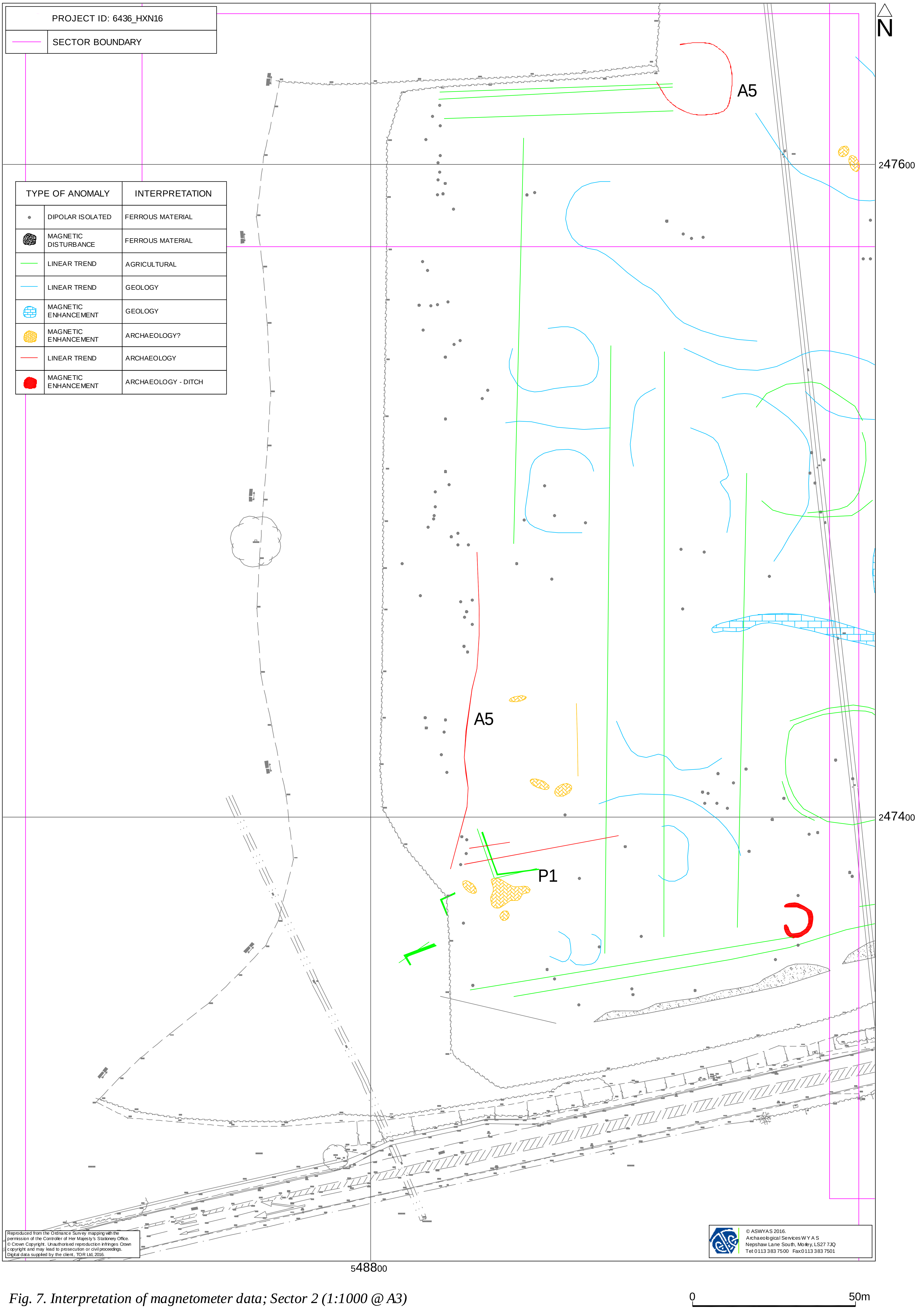

Fig. 7. Interpretation of magnetometer data; Sector 2 (1:1000 @ A3)

Fig. 8. Processed greyscale magnetometer data; Sector 3 (1:1000 @ A3)

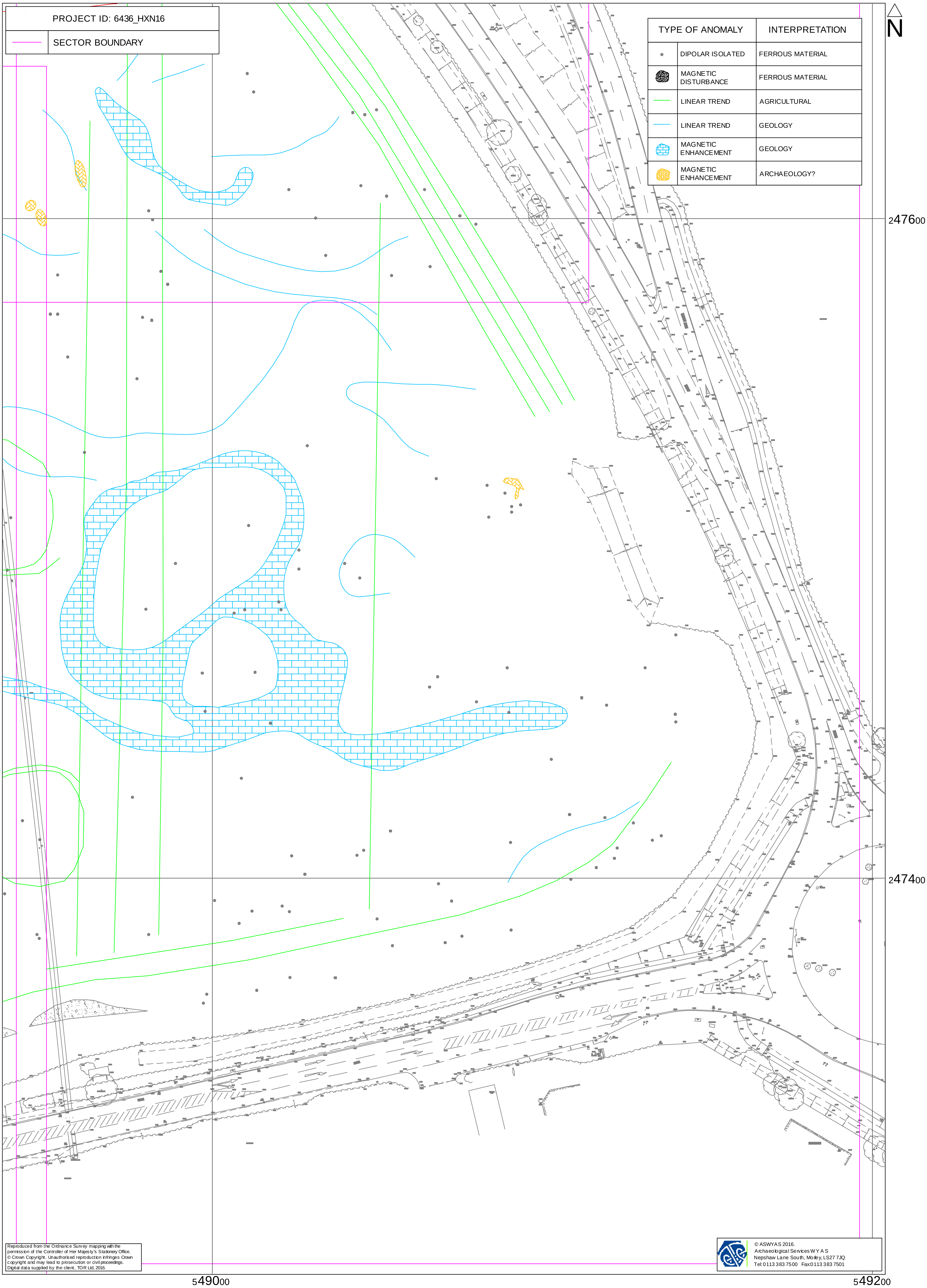

Fig. 9. Interpretation of magnetometer data; Sector 3 (1:1000 @ A3)

Fig. 10. Processed greyscale magnetometer data; Sector 4 (1:1000 @ A3)

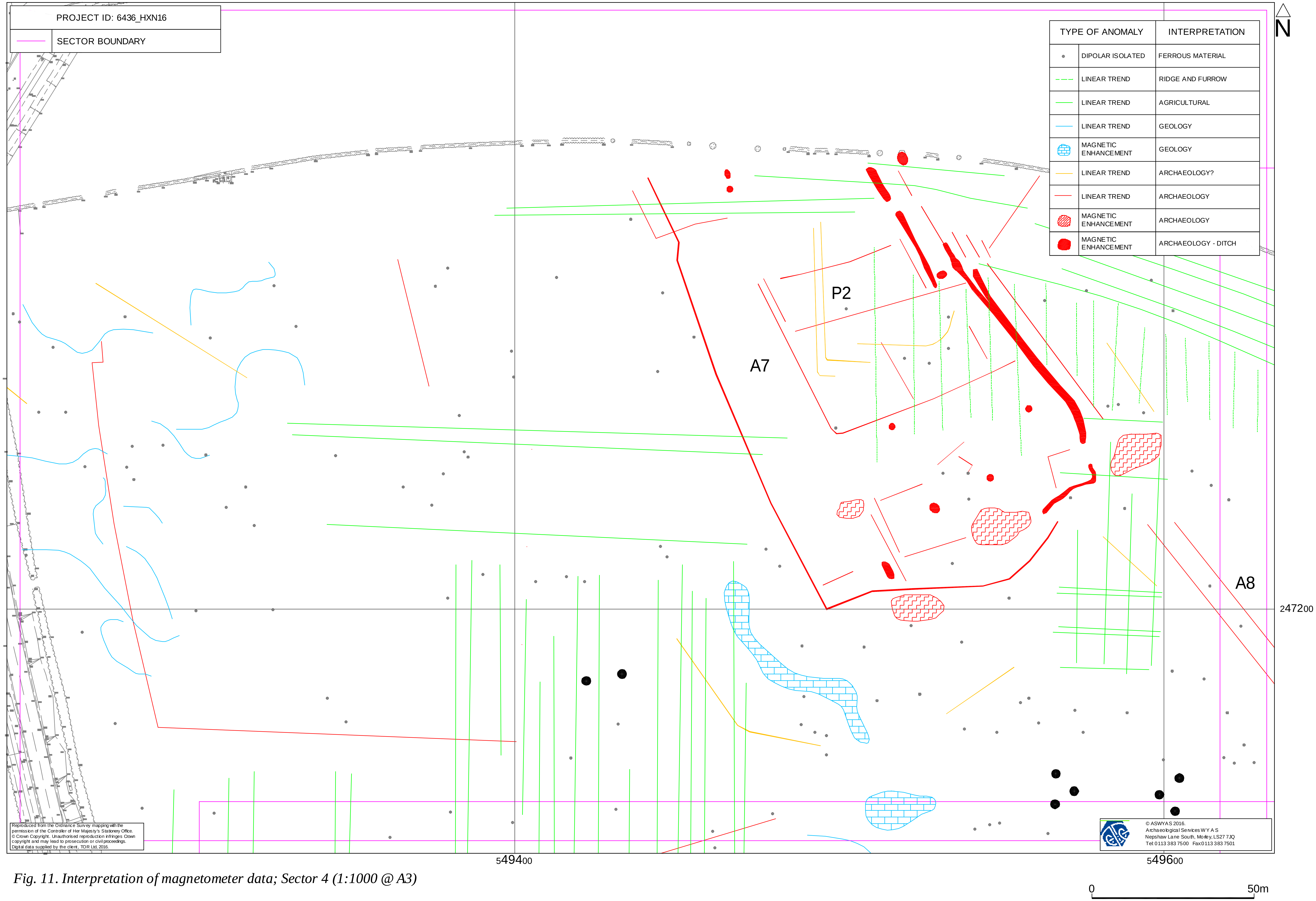

Fig. 11. Interpretation of magnetometer data; Sector 4 (1:1000 @ A3)

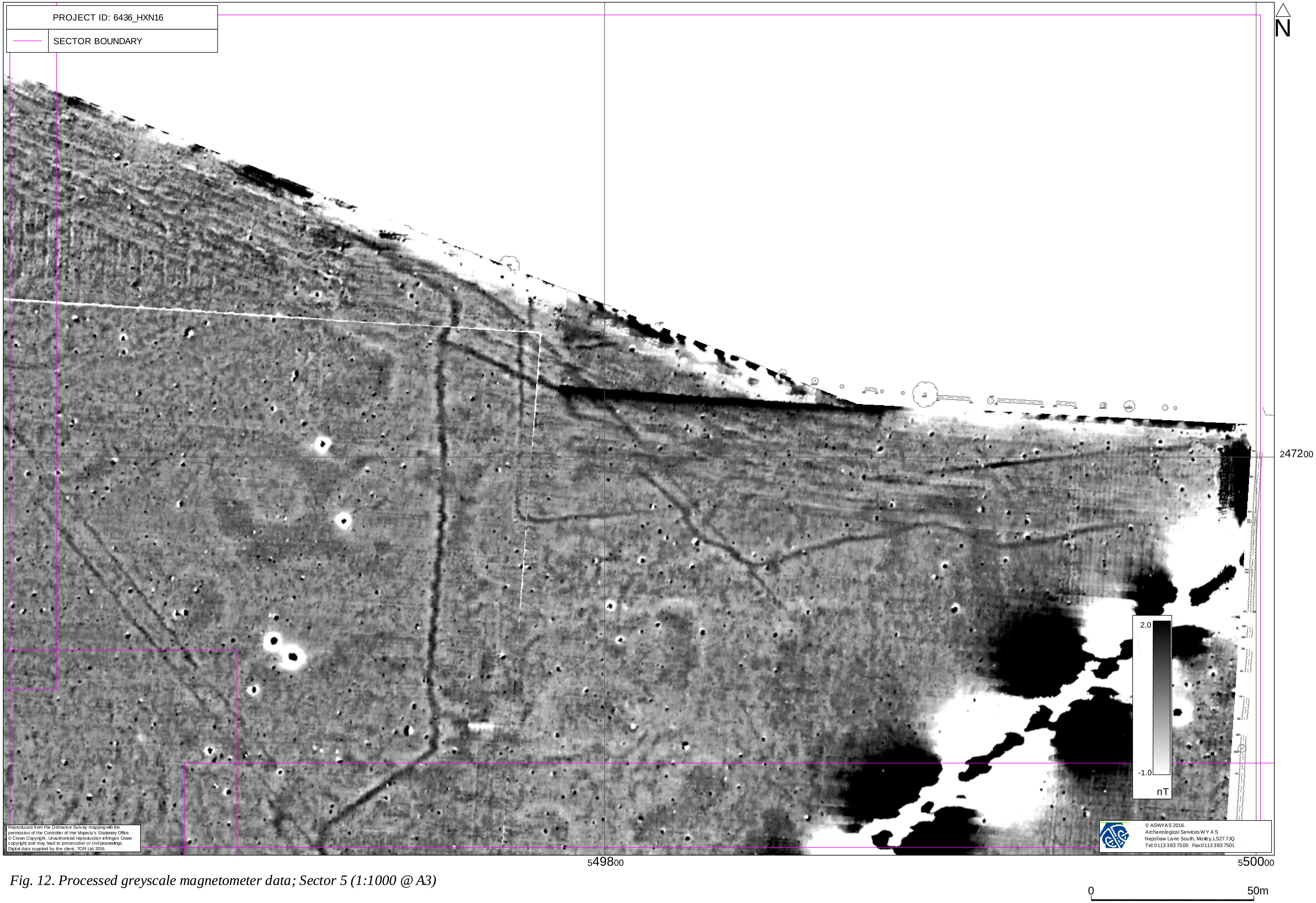

Fig. 12. Processed greyscale magnetometer data; Sector 5 (1:1000 @ A3)

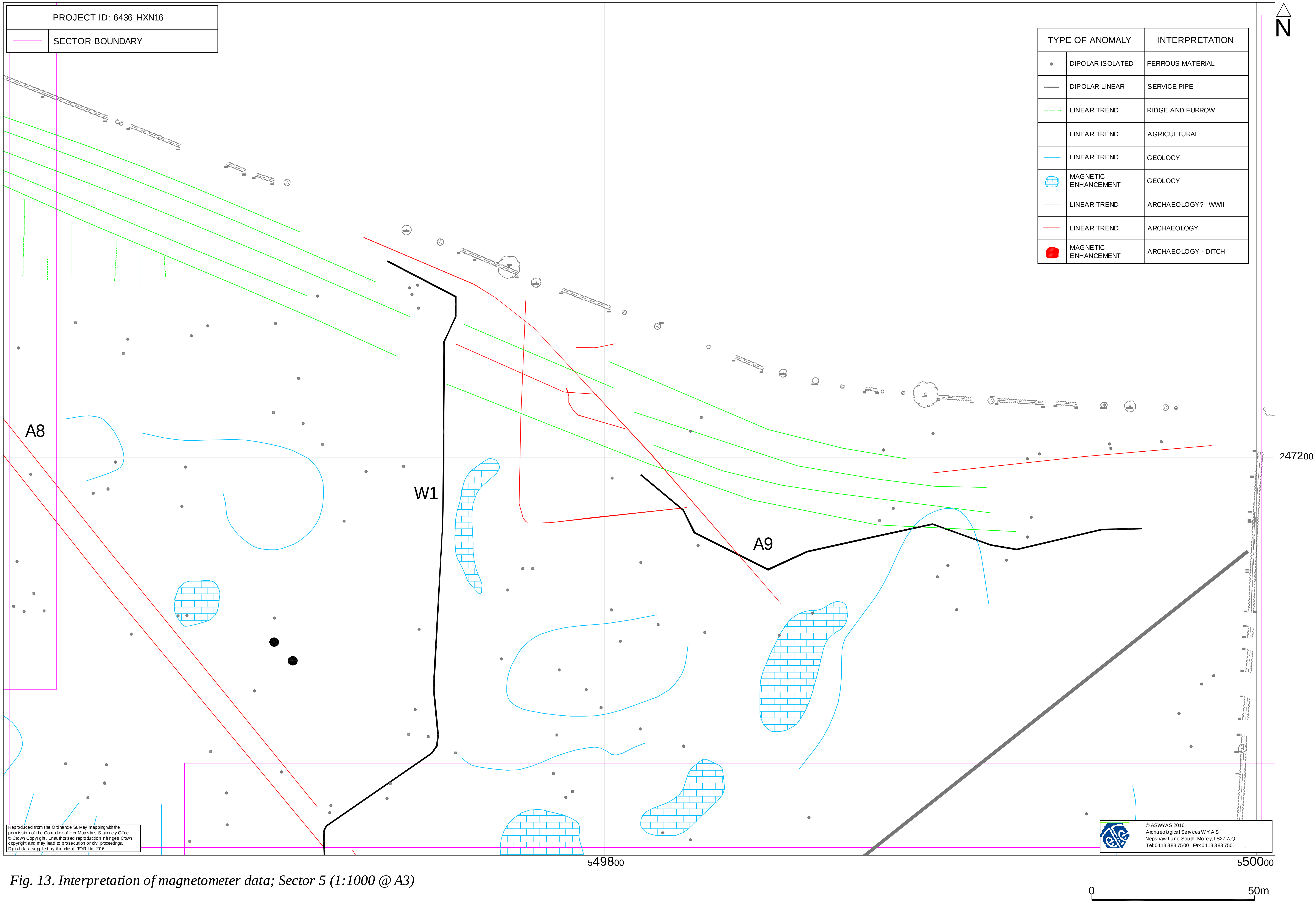

Fig. 13. Interpretation of magnetometer data; Sector 5 (1:1000 @ A3)

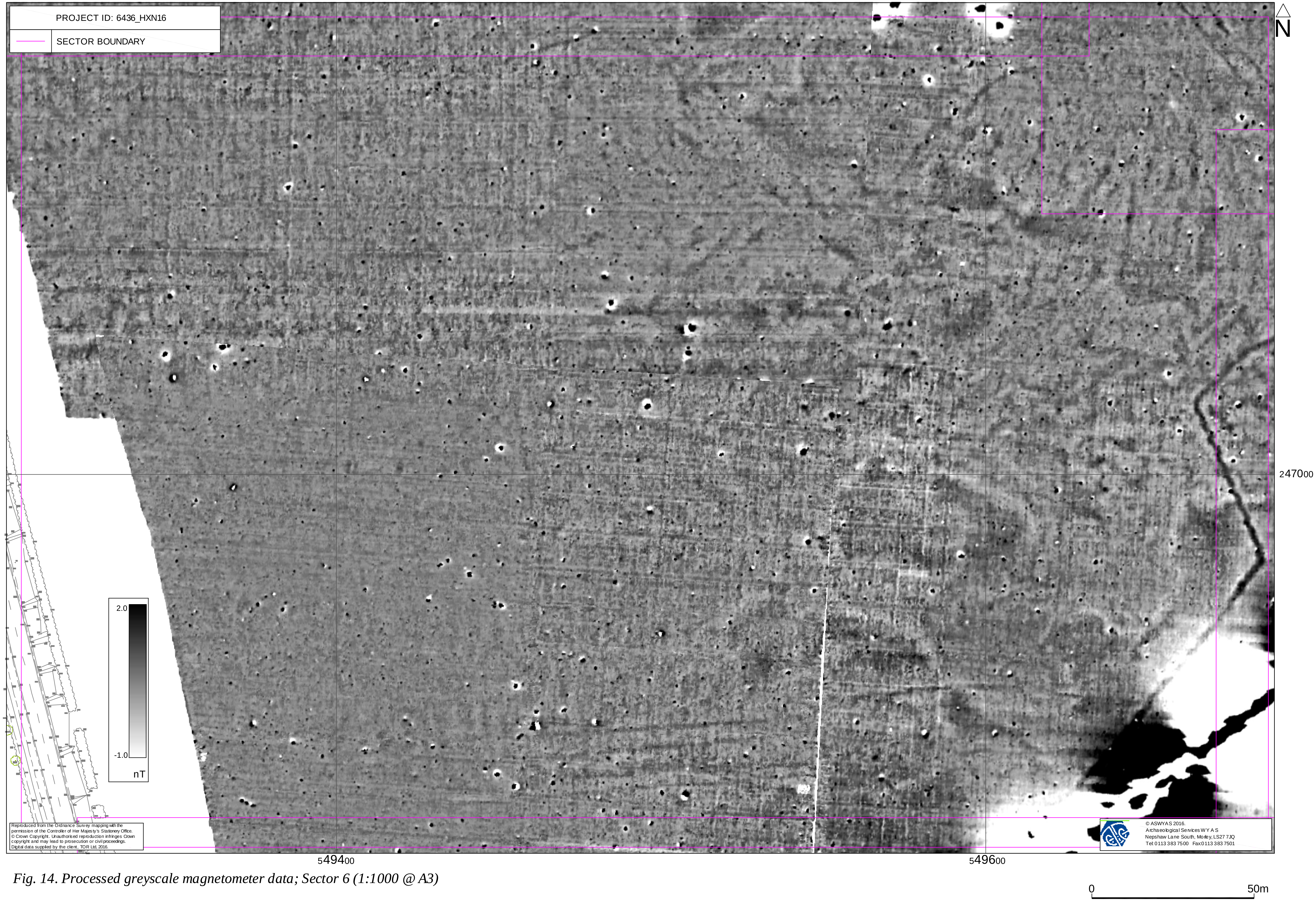

Fig. 14. Processed greyscale magnetometer data; Sector 6 (1:1000 @ A3)

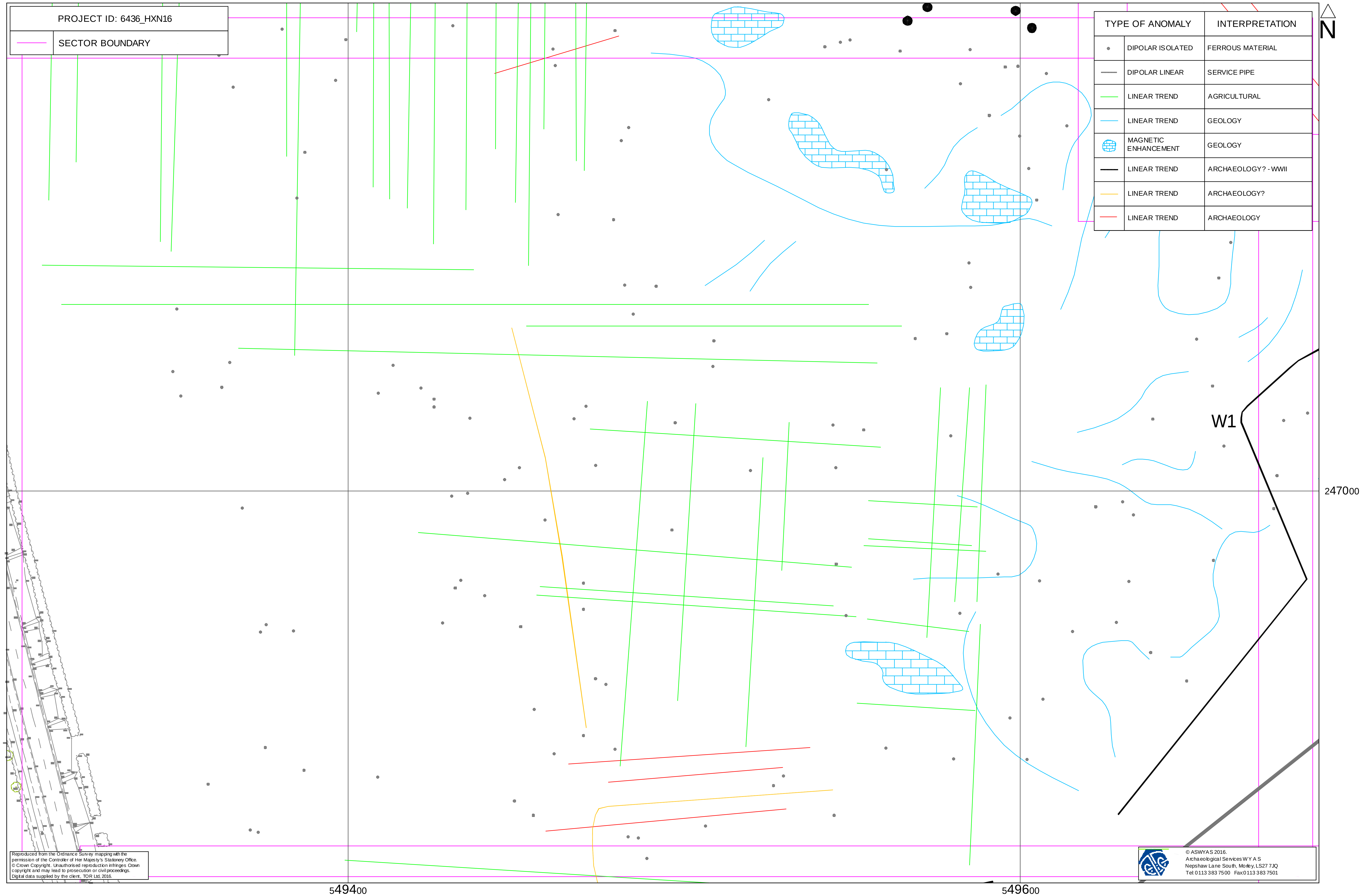

Fig. 15. Interpretation of magnetometer data; Sector 6 (1:1000 @ A3)

0 50m

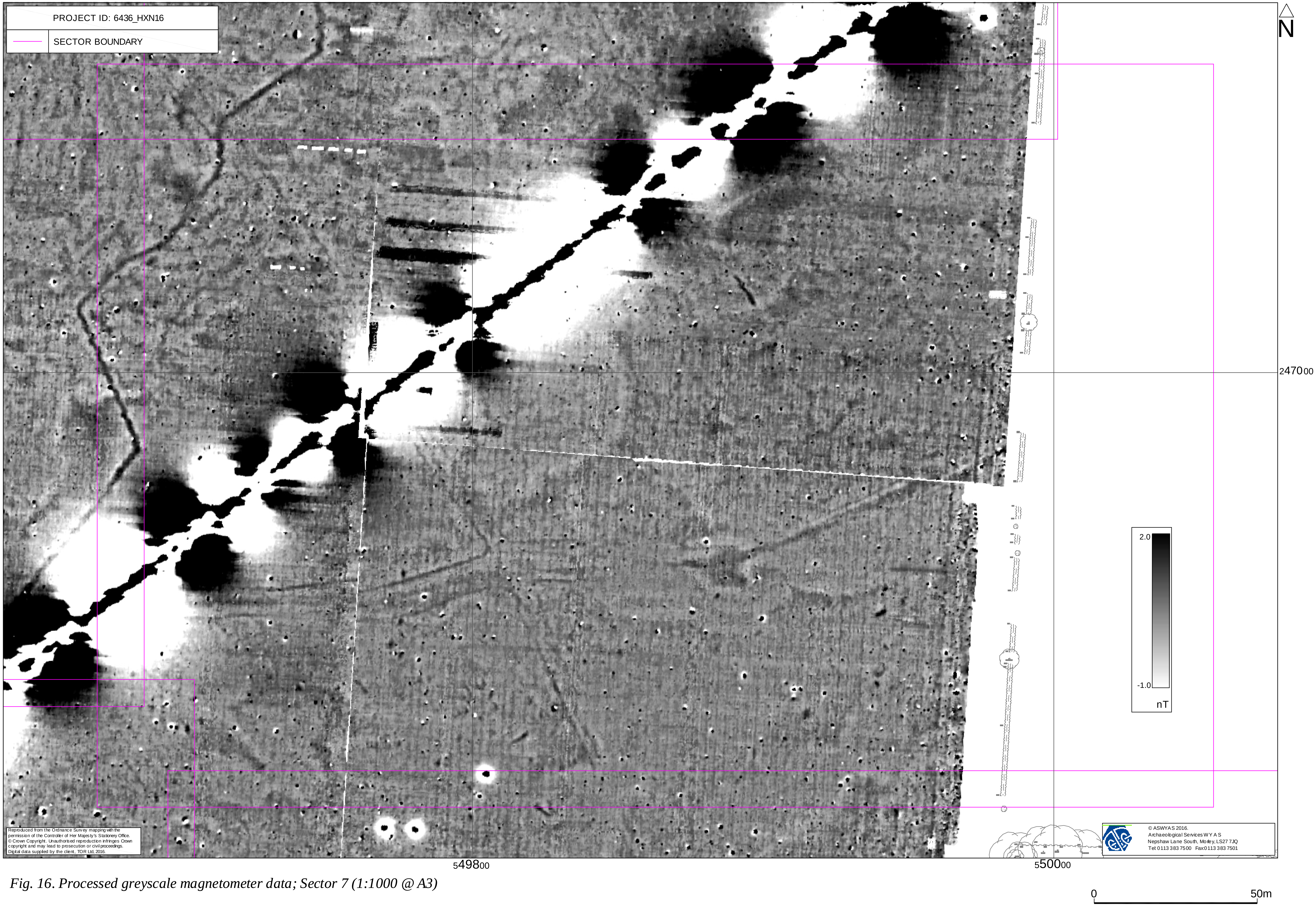

Fig. 16. Processed greyscale magnetometer data; Sector 7 (1:1000 @ A3)

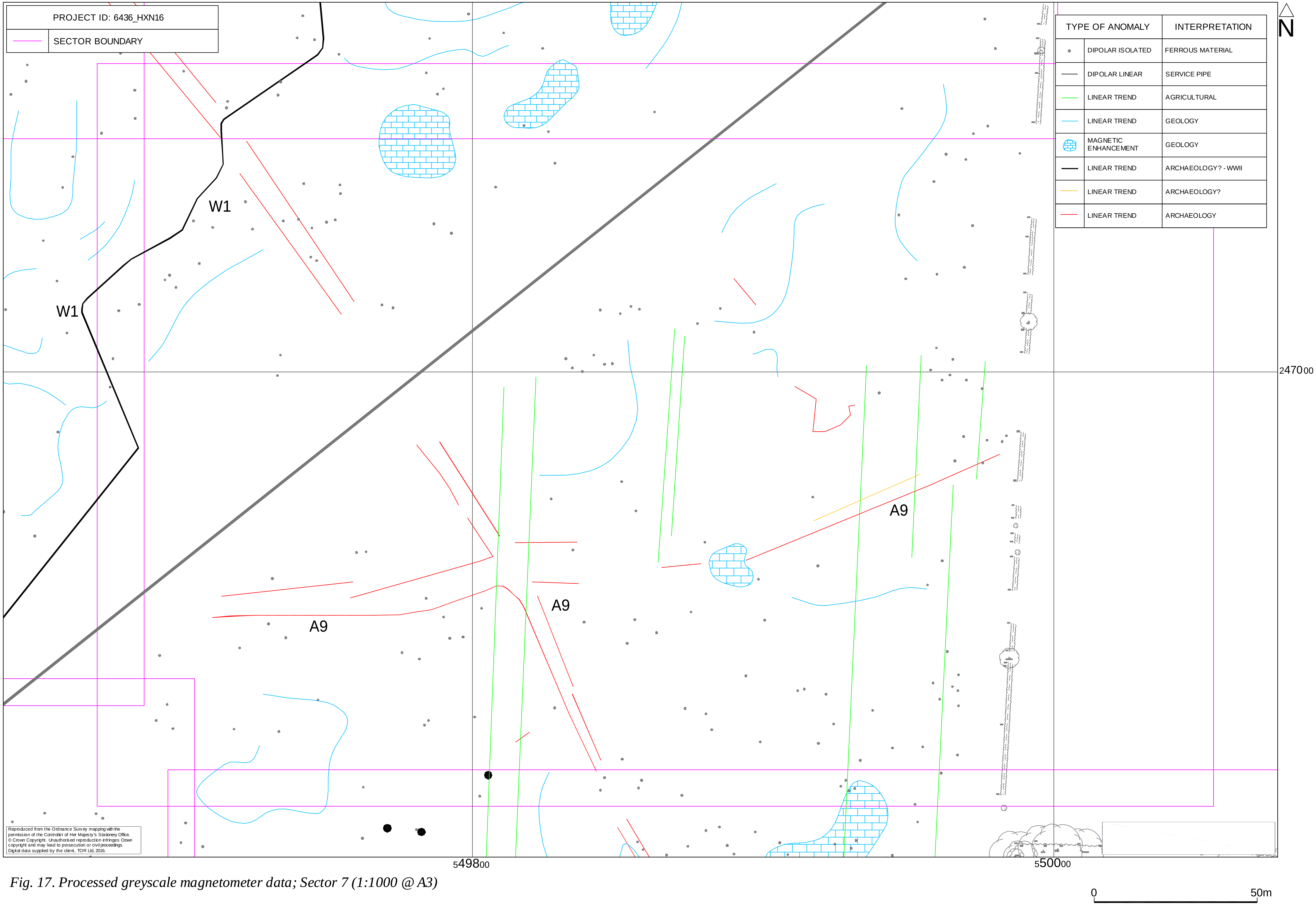

Fig. 17. Processed greyscale magnetometer data; Sector 7 (1:1000 @ A3)

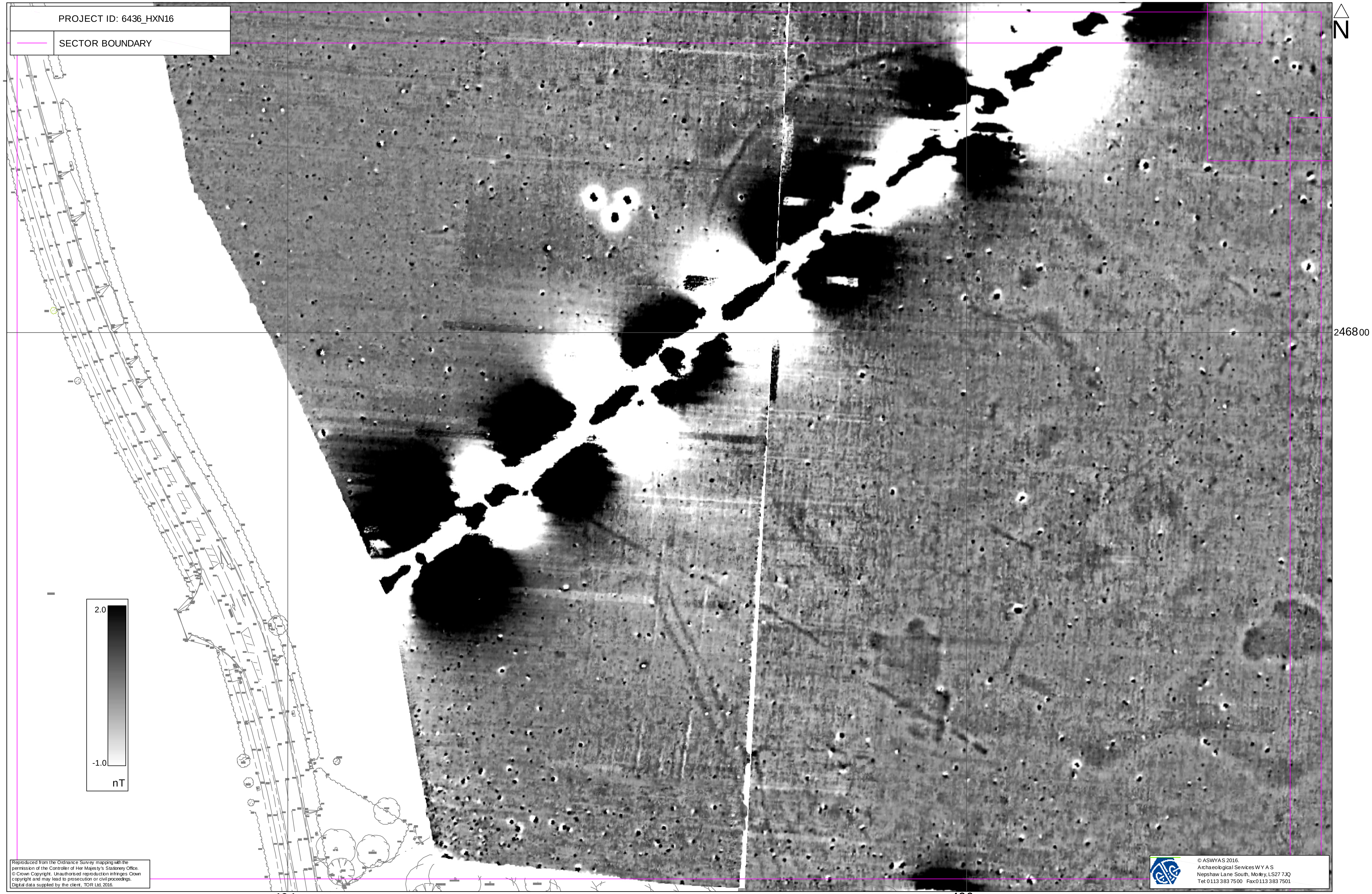

Fig. 18. Processed greyscale magnetometer data; Sector 8 (1:1000 @ A3)

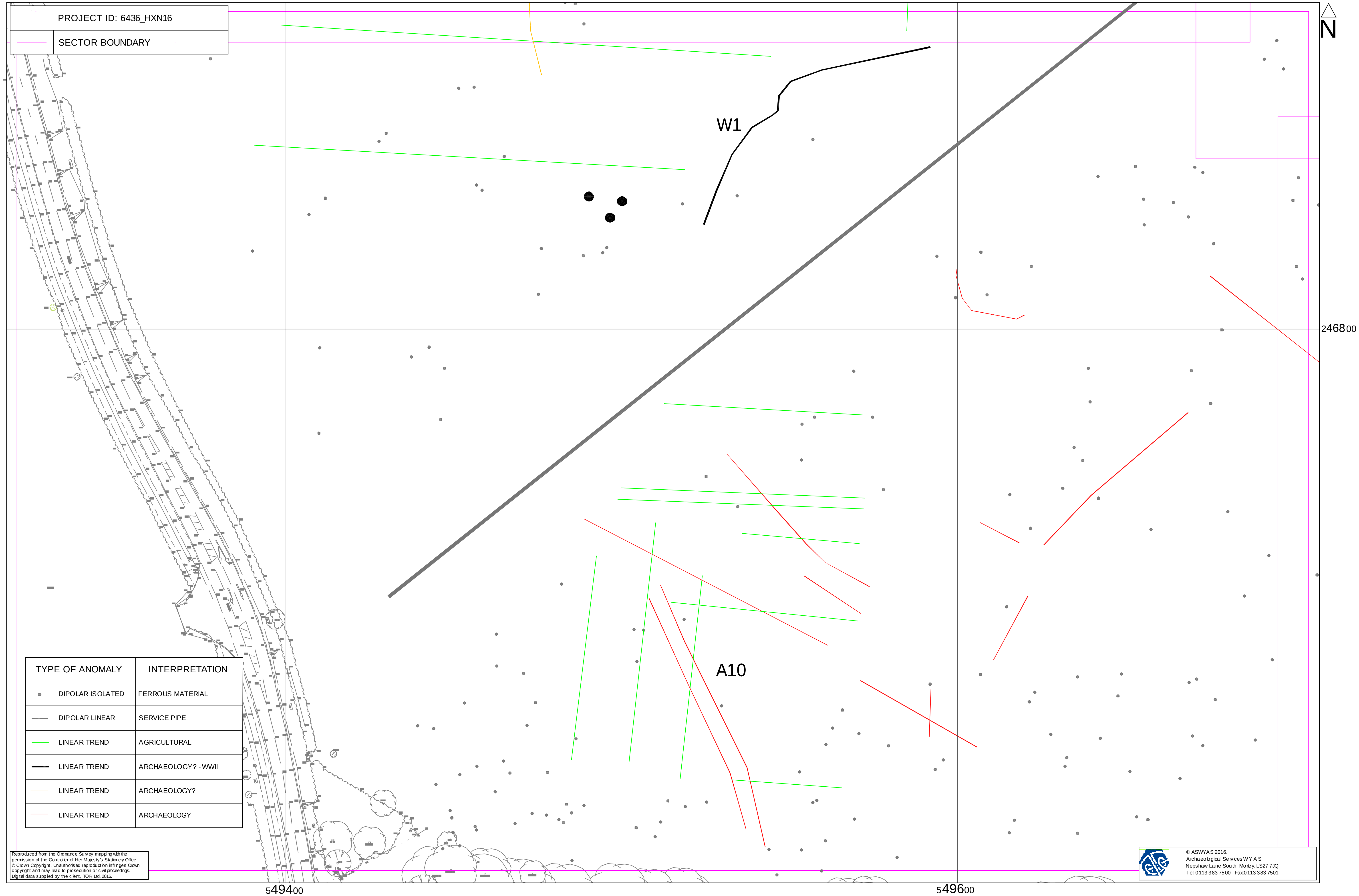

Fig. 19. Interpretation of magnetometer data; Sector 8 (1:1000 @ A3)

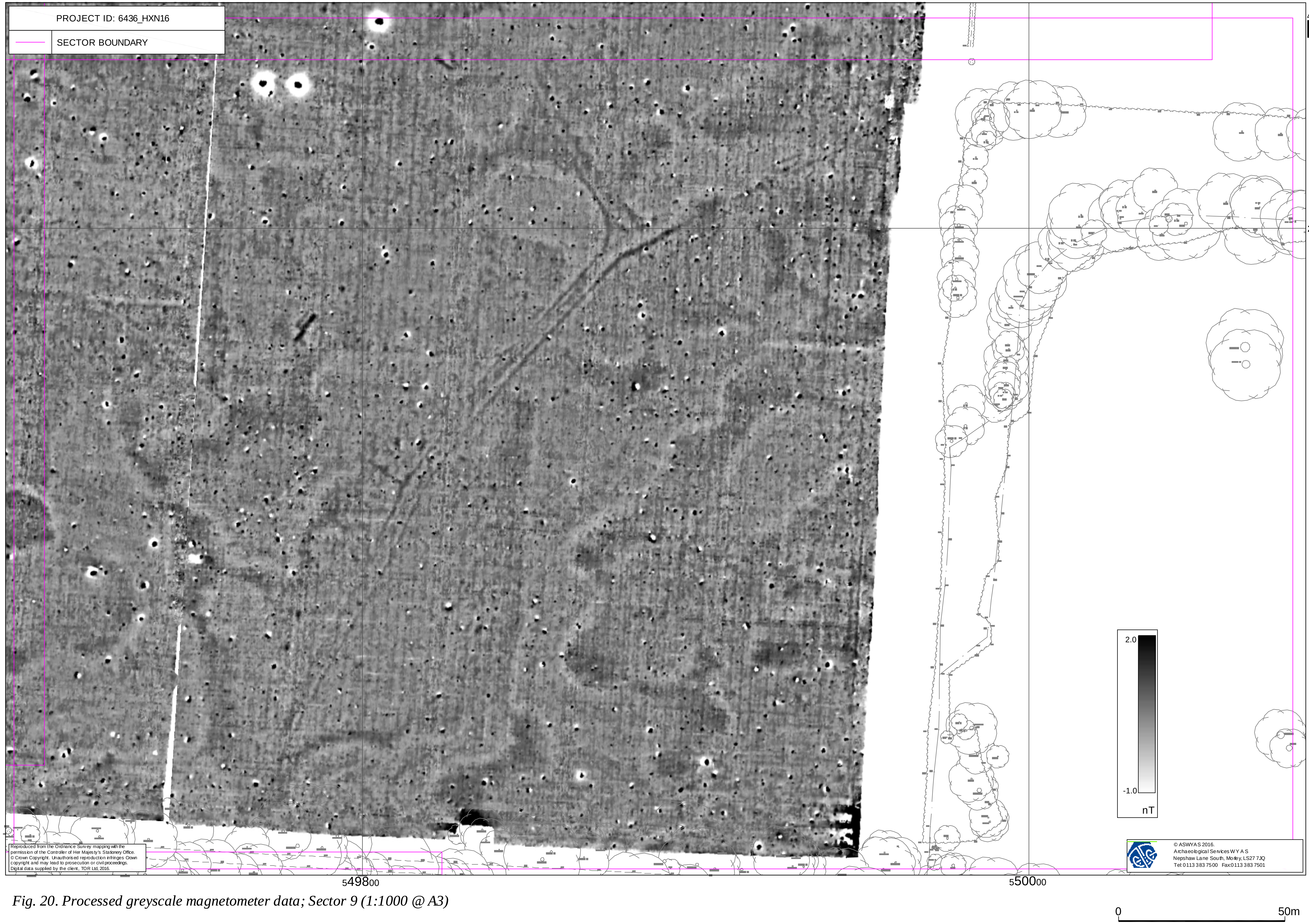

Fig. 20. Processed greyscale magnetometer data; Sector 9 (1:1000 @ A3)

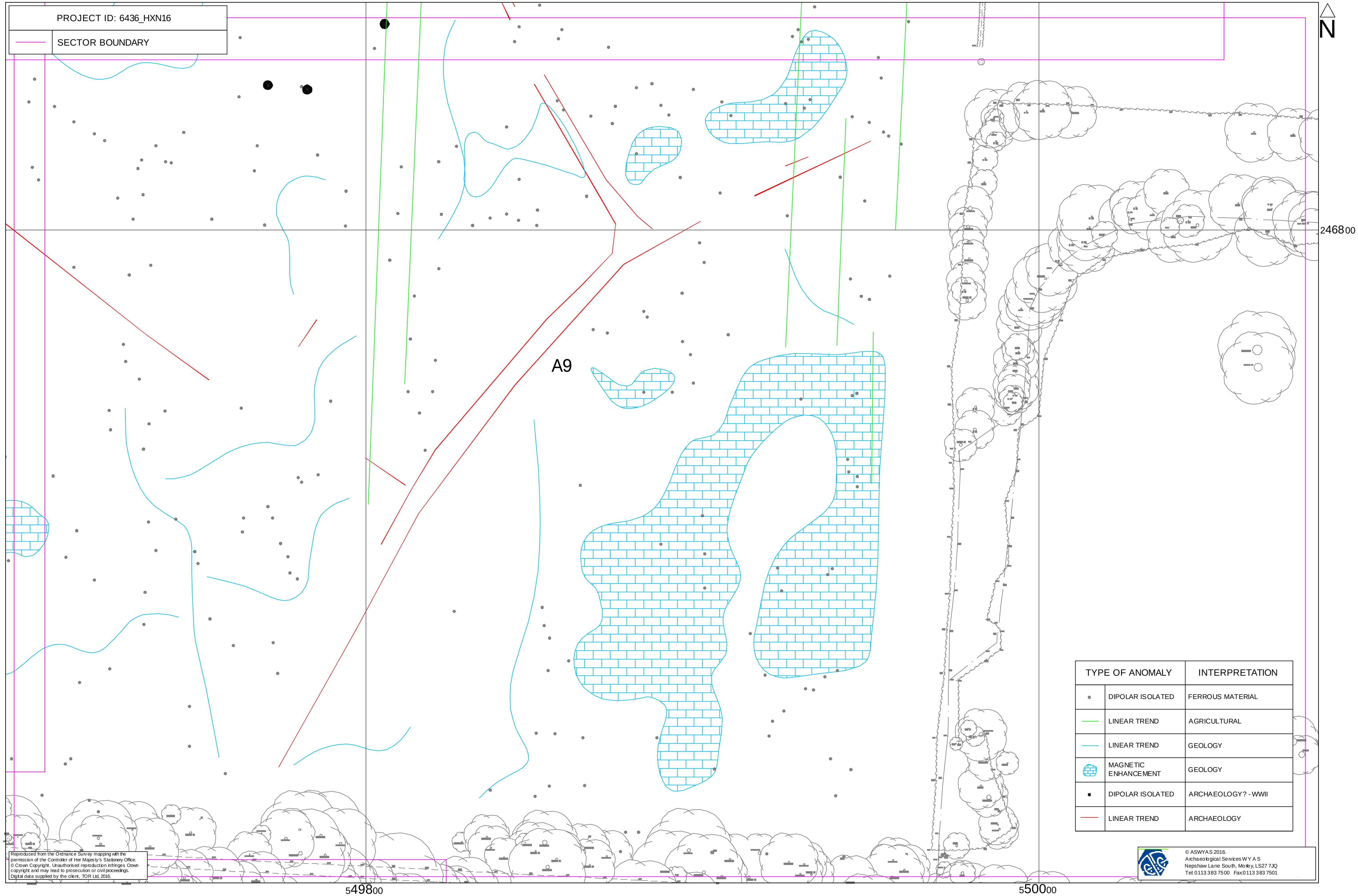

Fig. 21. Interpretation of magnetometer data; Sector 9 (1:1000 @ A3)

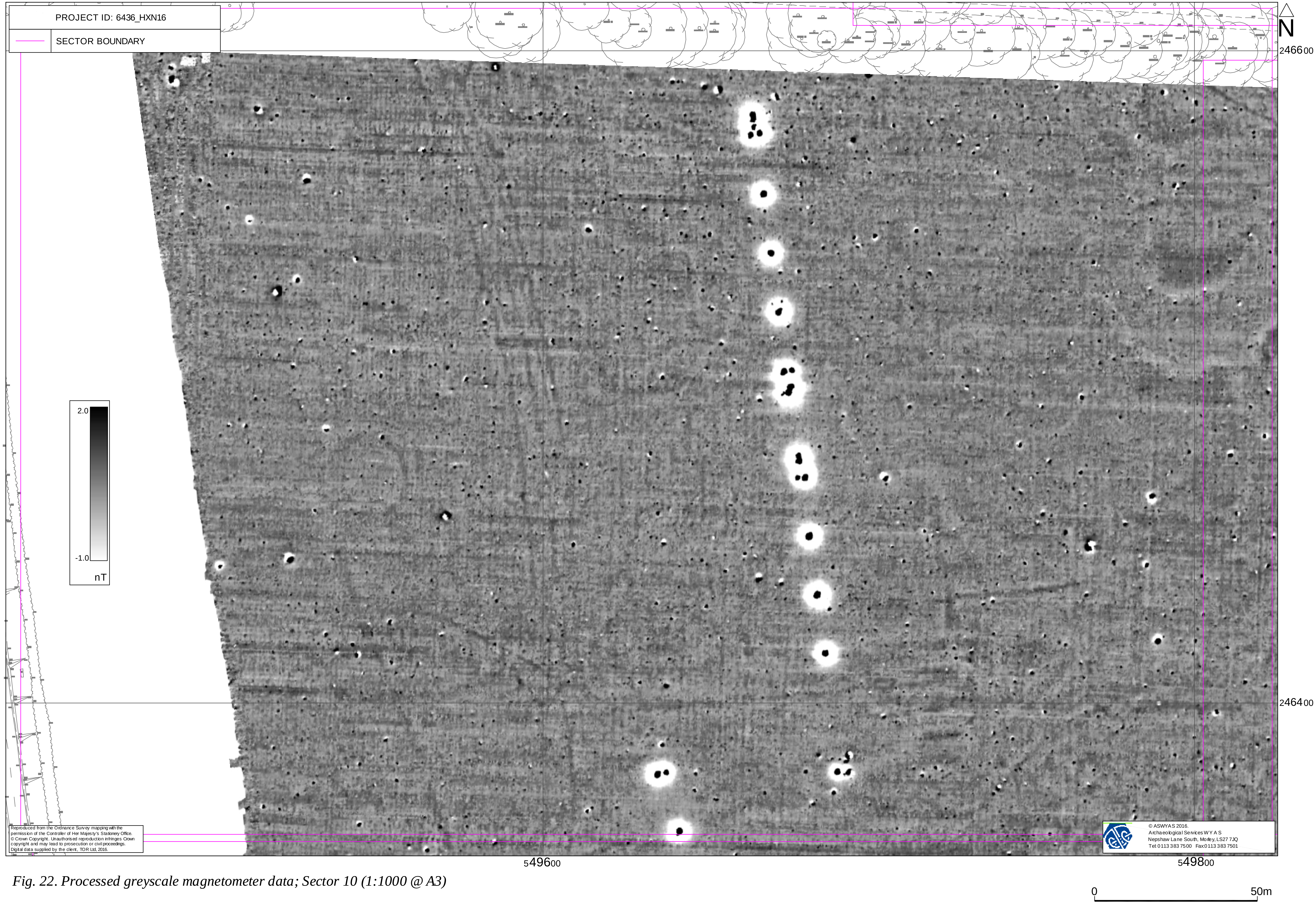

Fig. 22. Processed greyscale magnetometer data; Sector 10 (1:1000 @ A3)

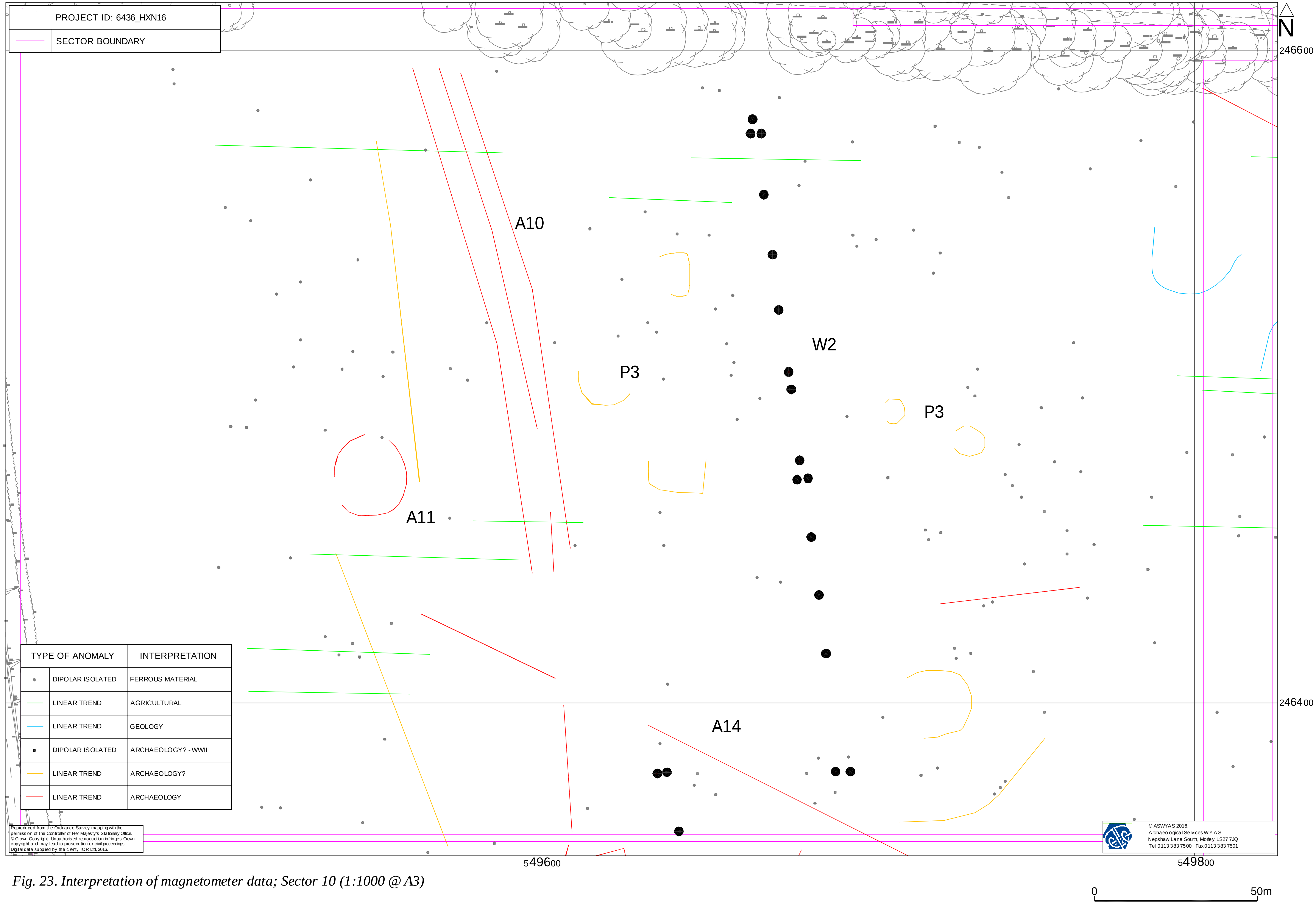

Fig. 23. Interpretation of magnetometer data; Sector 10 (1:1000 @ A3)

Fig. 24. Processed greyscale magnetometer data; Sector 11 (1:1000 @ A3)

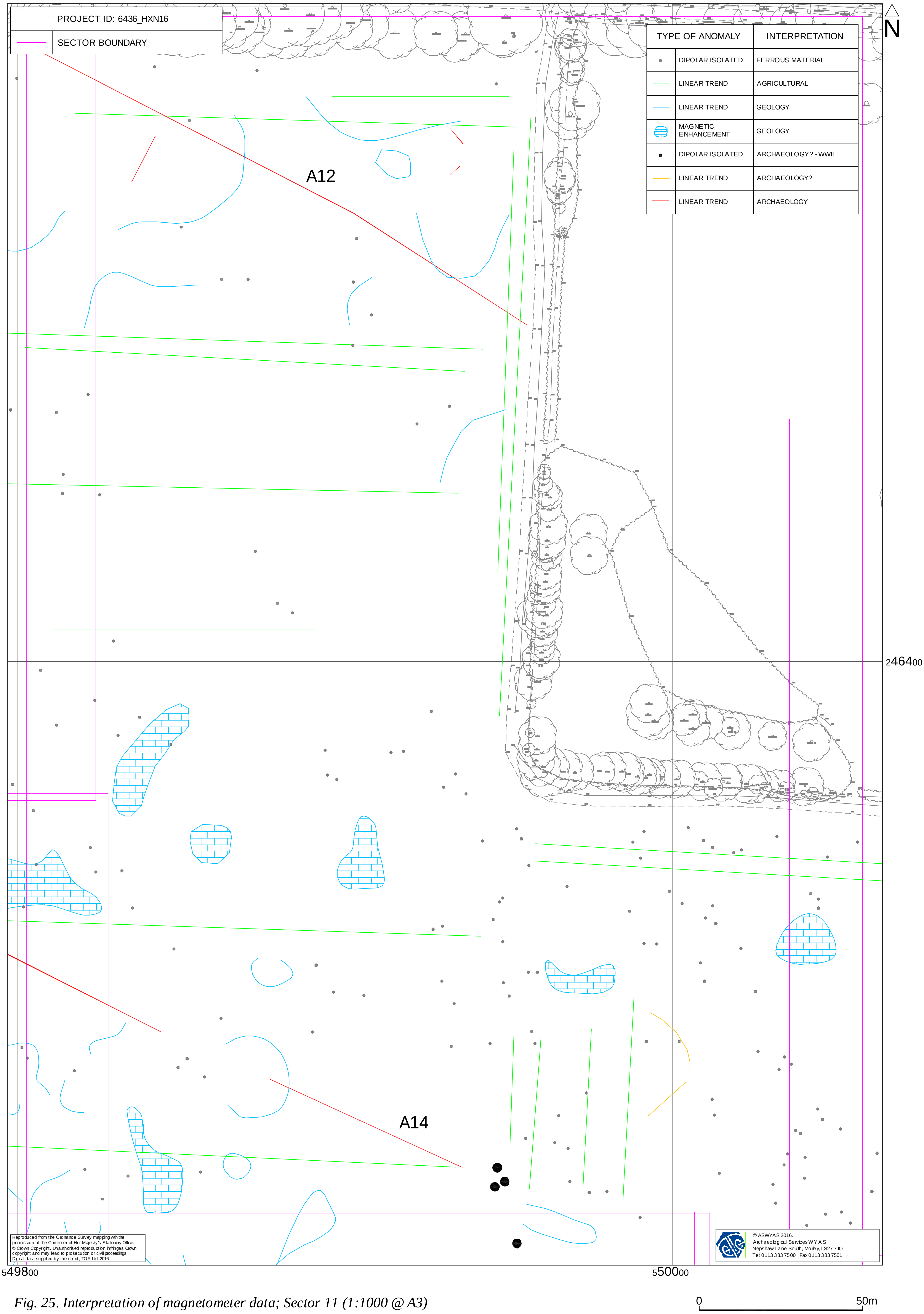

Fig. 25. Interpretation of magnetometer data; Sector 11 (1:1000 @ A3)

Fig. 26. Processed greyscale magnetometer data; Sector 12 (1:1000 @ A3)

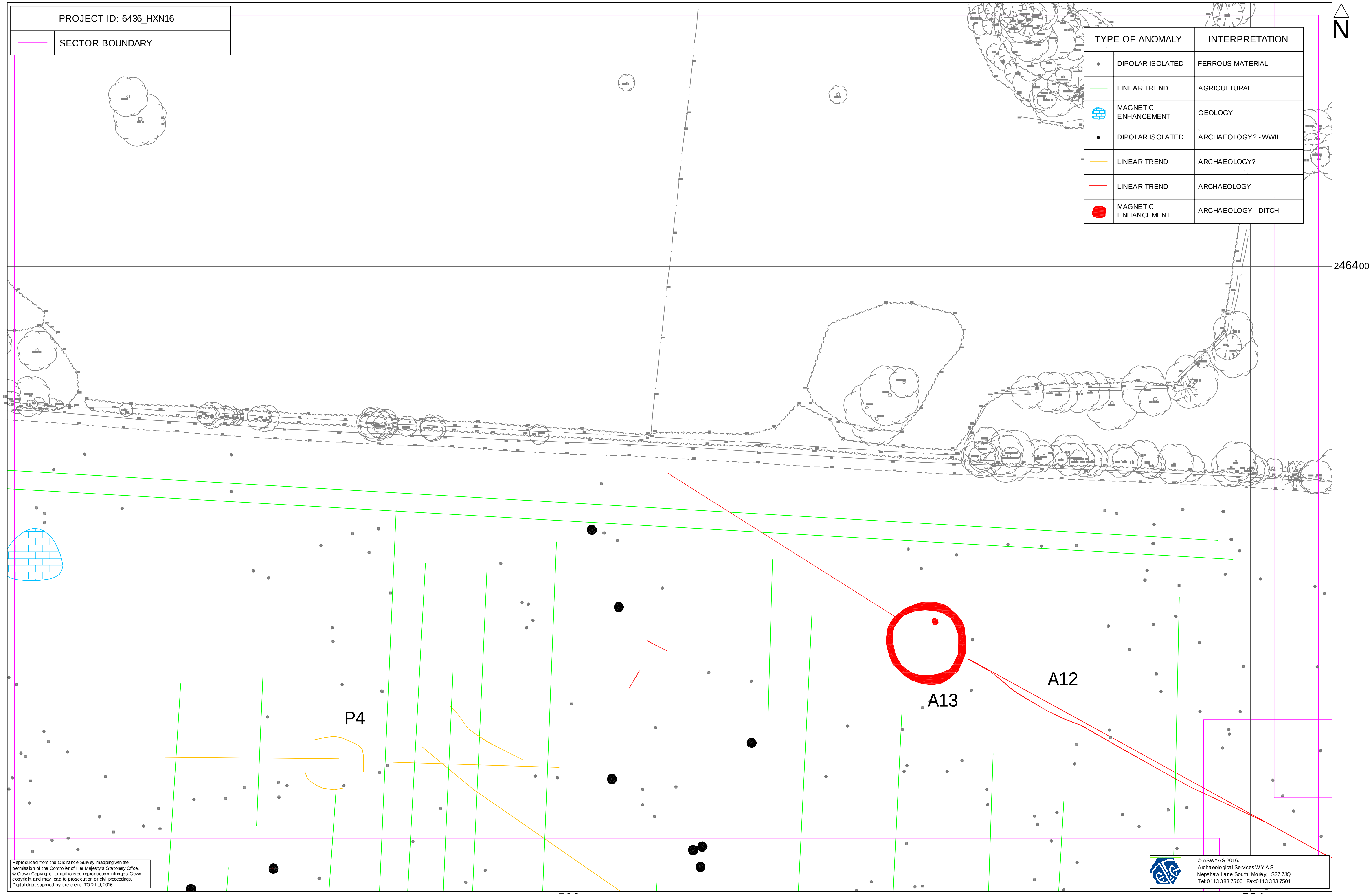

Fig. 27. Interpretation of magnetometer data; Sector 12 (1:1000 @ A3)

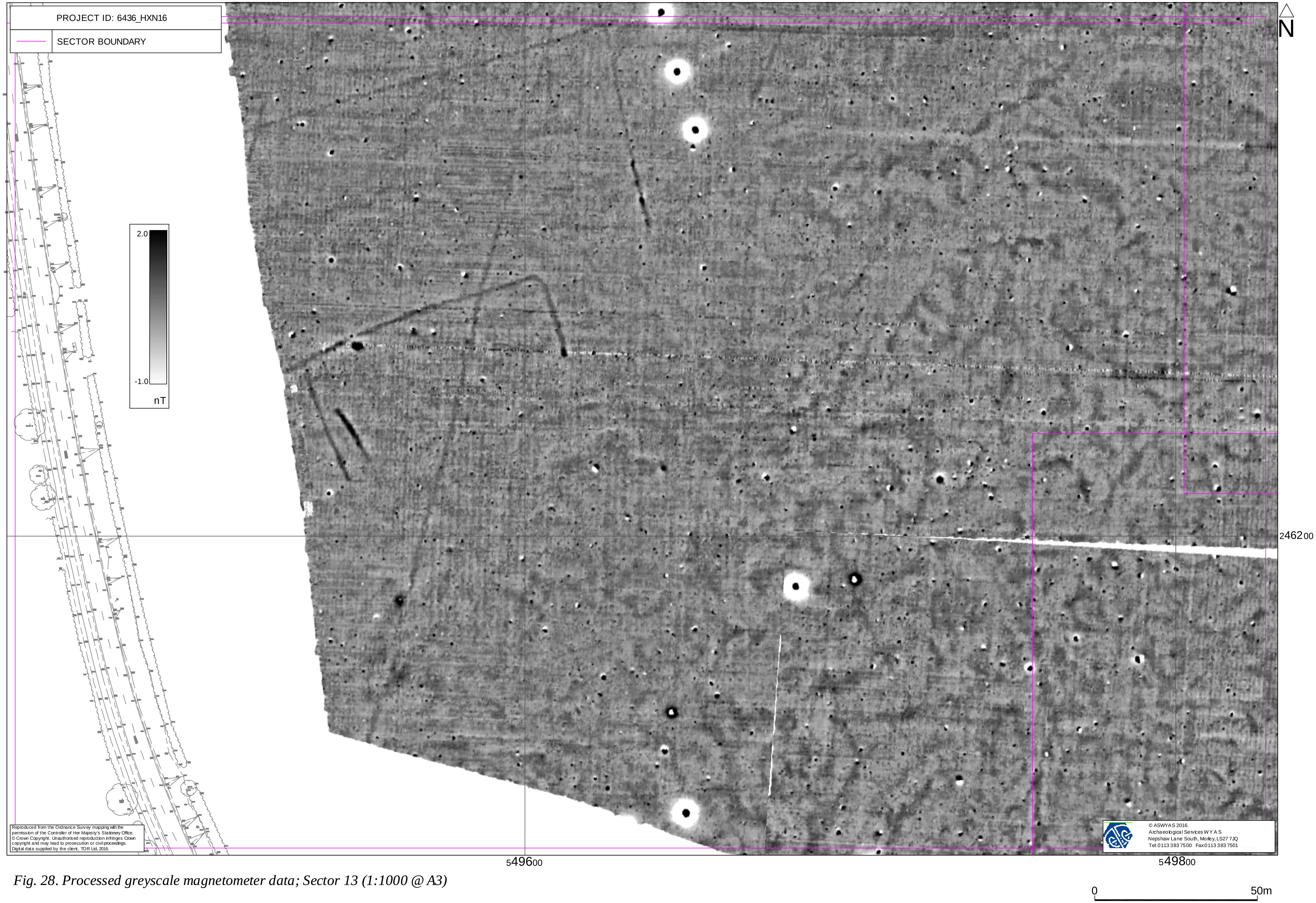

Fig. 28. Processed greyscale magnetometer data; Sector 13 (1:1000 @ A3)

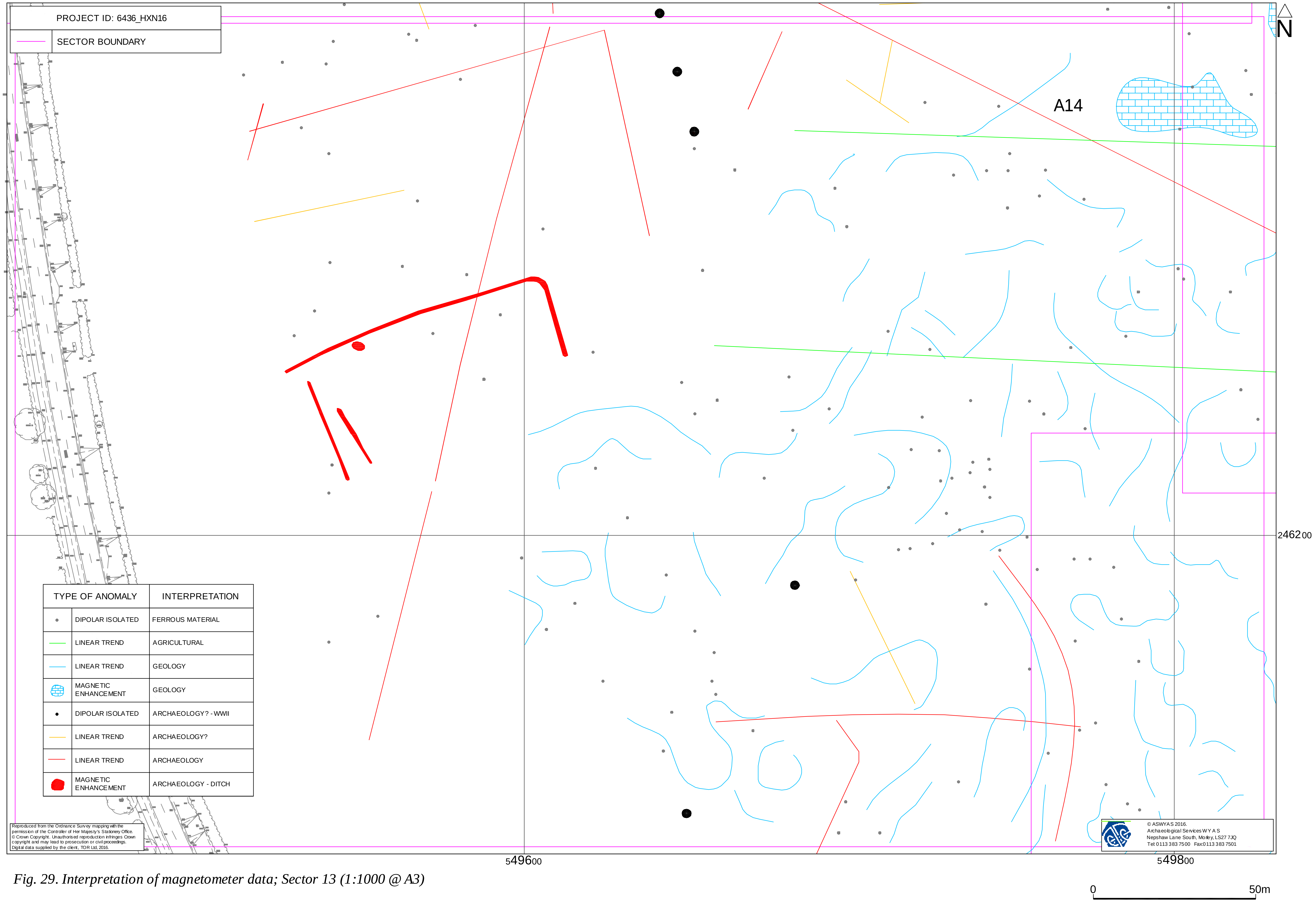

Fig. 29. Interpretation of magnetometer data; Sector 13 (1:1000 @ A3)

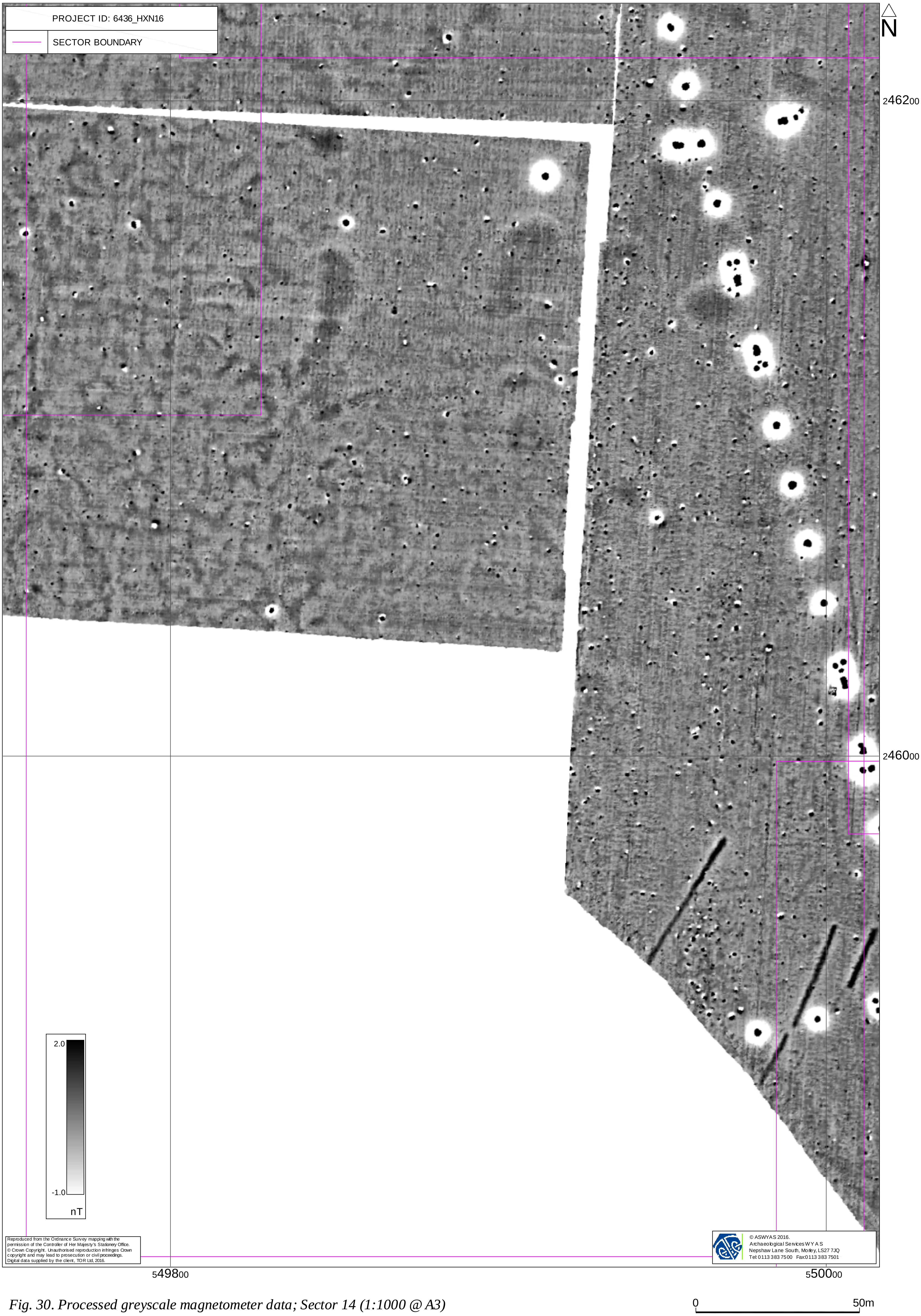

Fig. 30. Processed greyscale magnetometer data; Sector 14 (1:1000 @ A3)

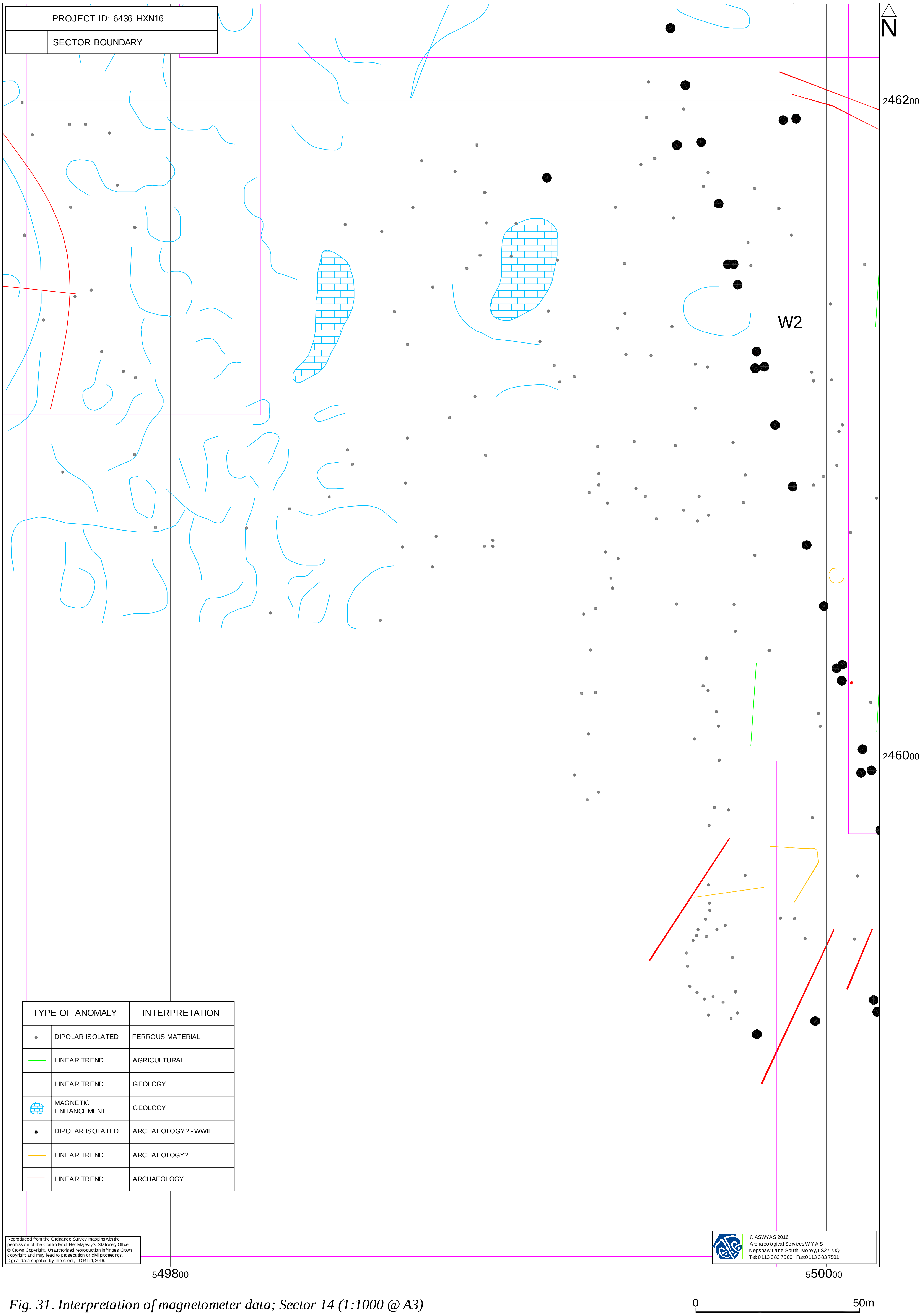

Fig. 31. Interpretation of magnetometer data; Sector 14 (1:1000 @ A3)

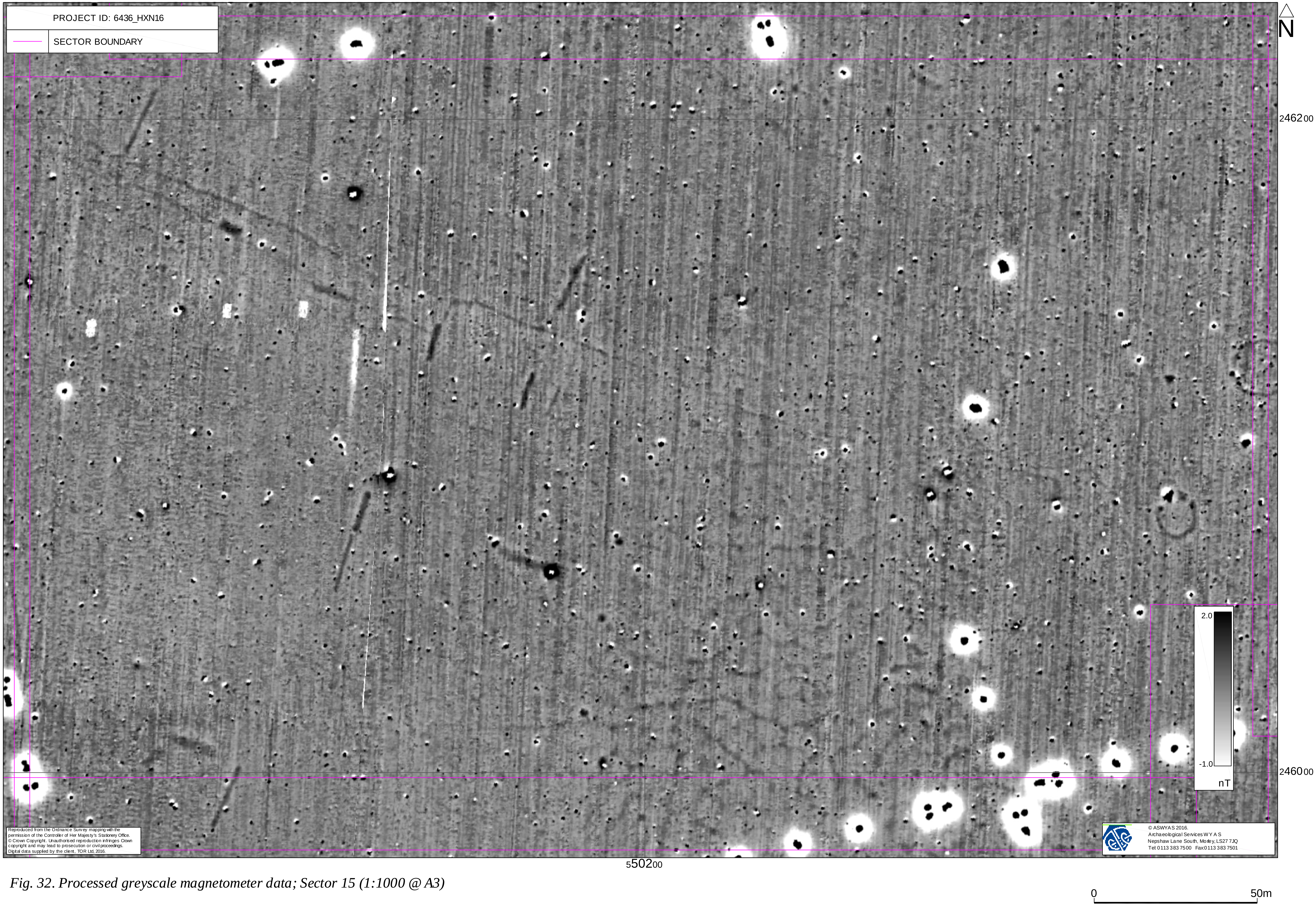

Fig. 32. Processed greyscale magnetometer data; Sector 15 (1:1000 @ A3)

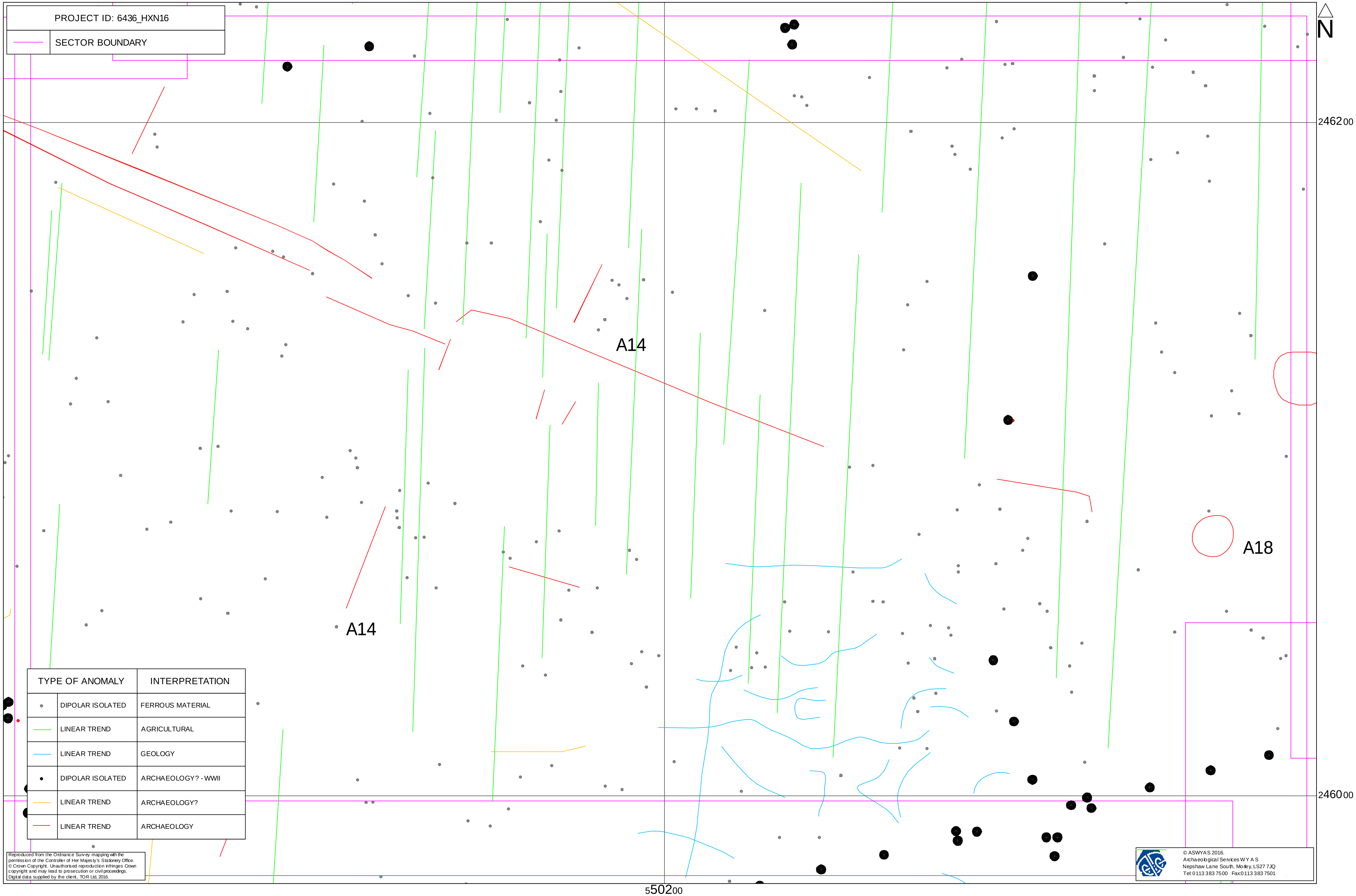

Fig. 33. Processed greyscale magnetometer data; Sector 15 (1:1000 @ A3)

Fig. 34. Processed greyscale magnetometer data; Sector 16 (1:1000 @ A3)

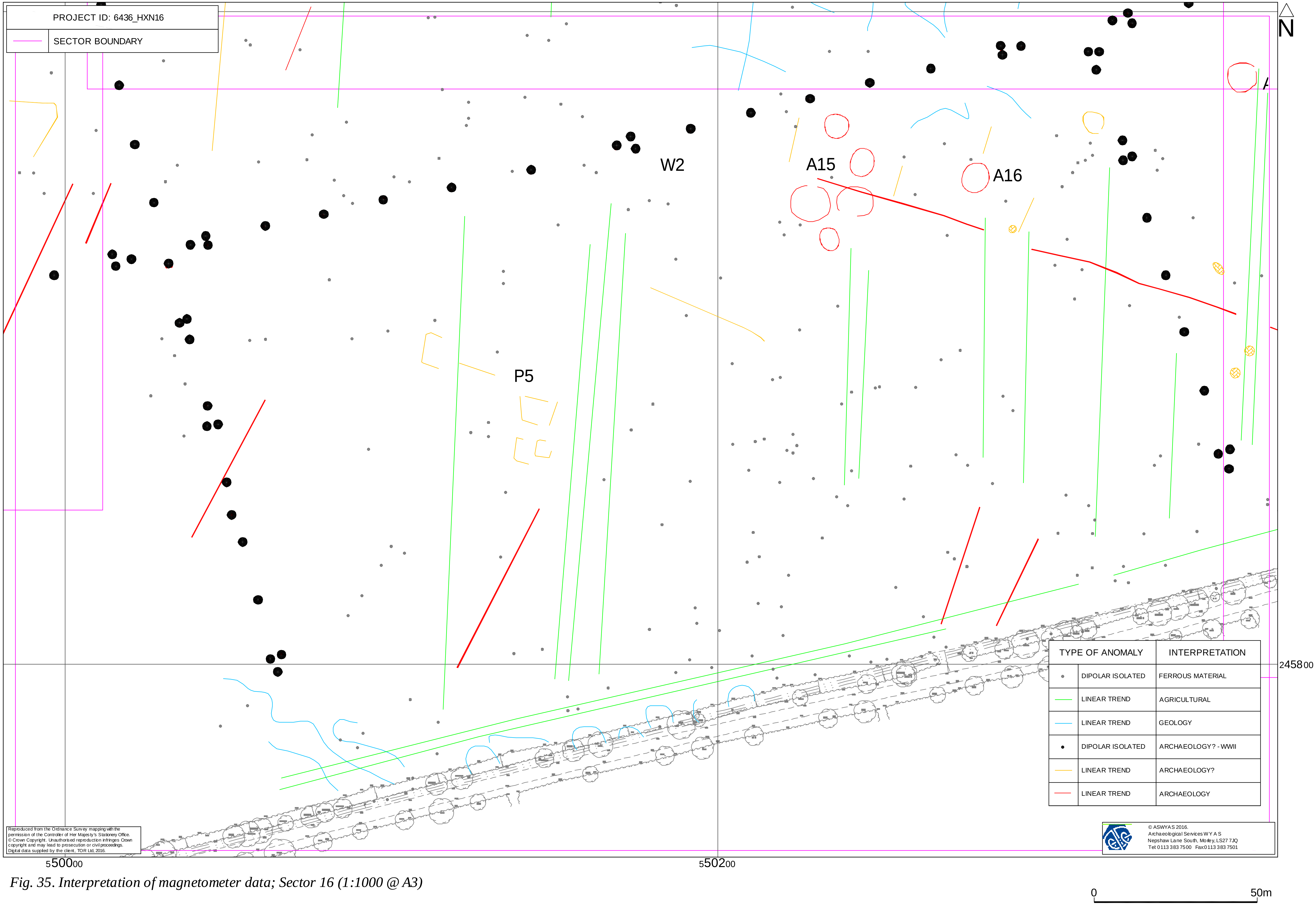

Fig. 35. Interpretation of magnetometer data; Sector 16 (1:1000 @ A3)

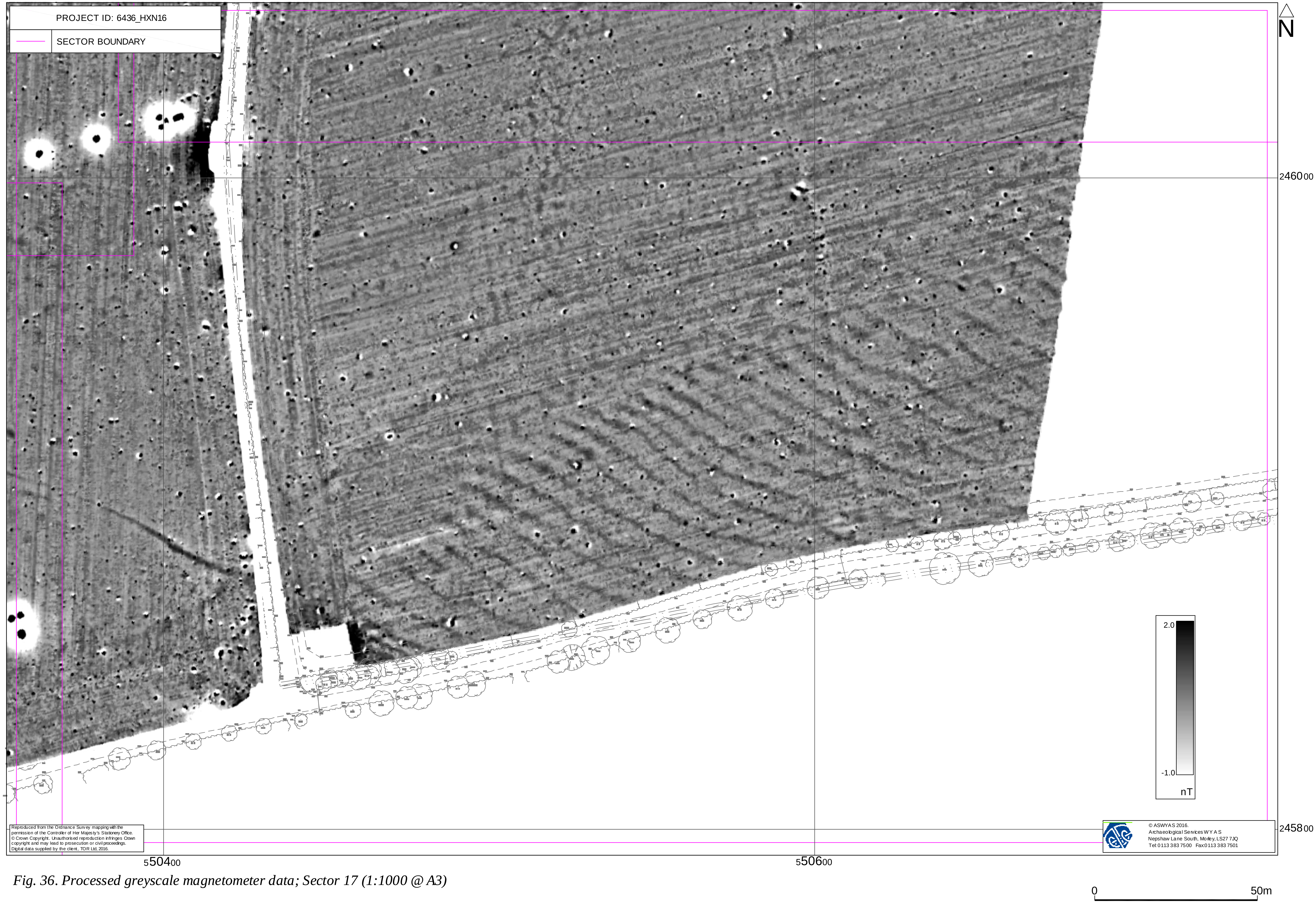

Fig. 36. Processed greyscale magnetometer data; Sector 17 (1:1000 @ A3)

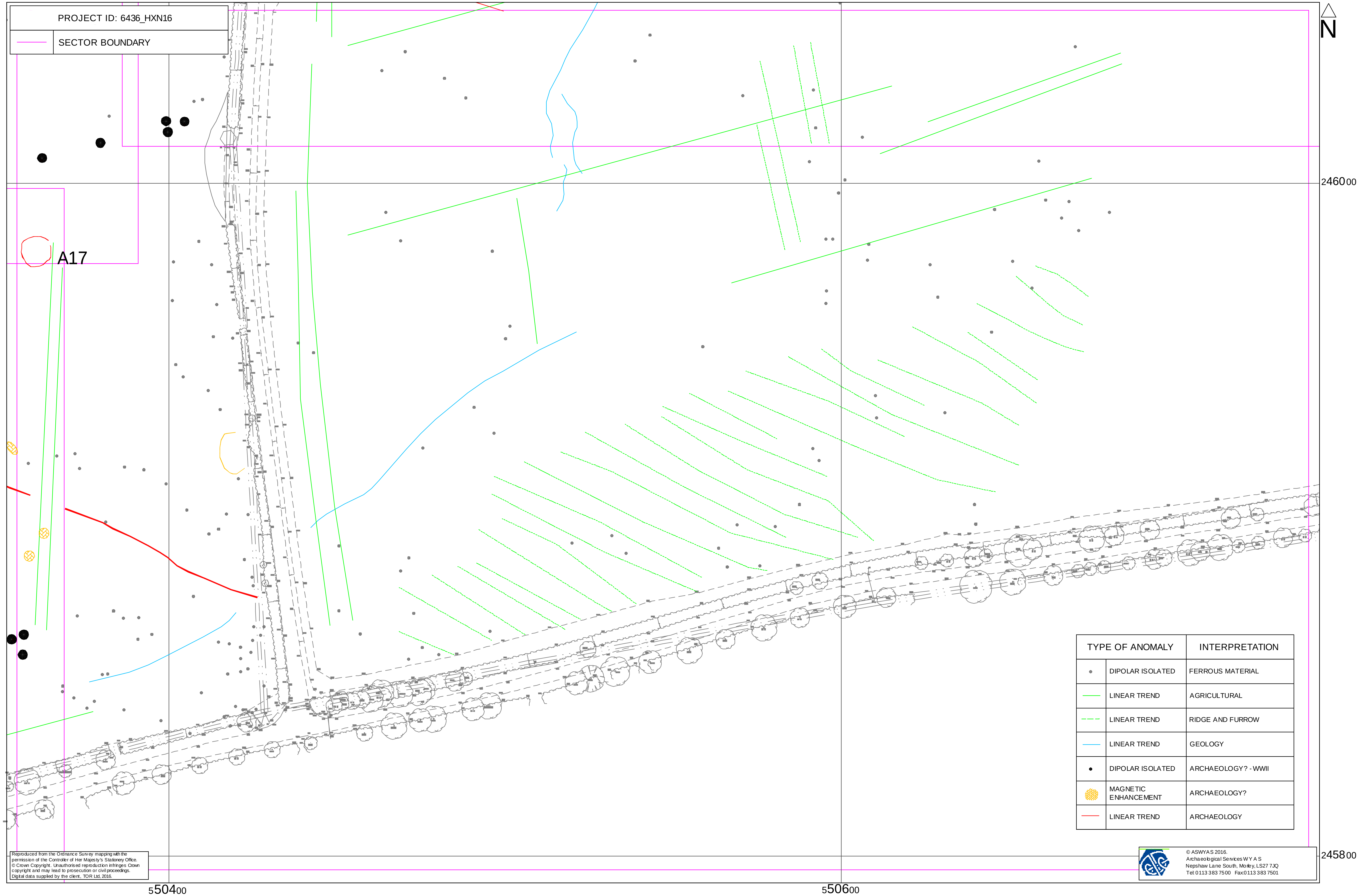

Fig. 37. Interpretation of magnetometer data; Sector 17 (1:1000 @ A3)

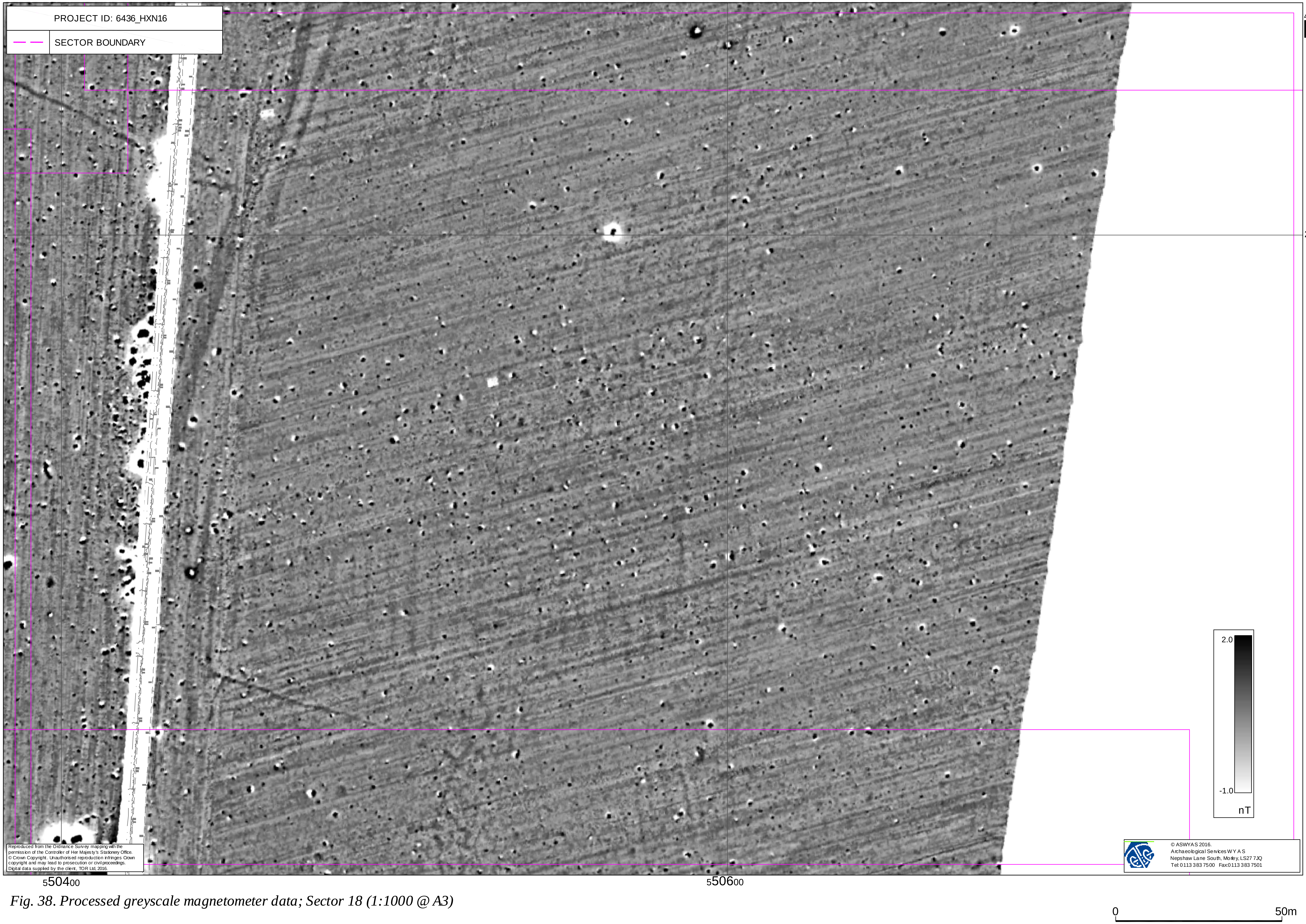

Fig. 38. Processed greyscale magnetometer data; Sector 18 (1:1000 @ A3)

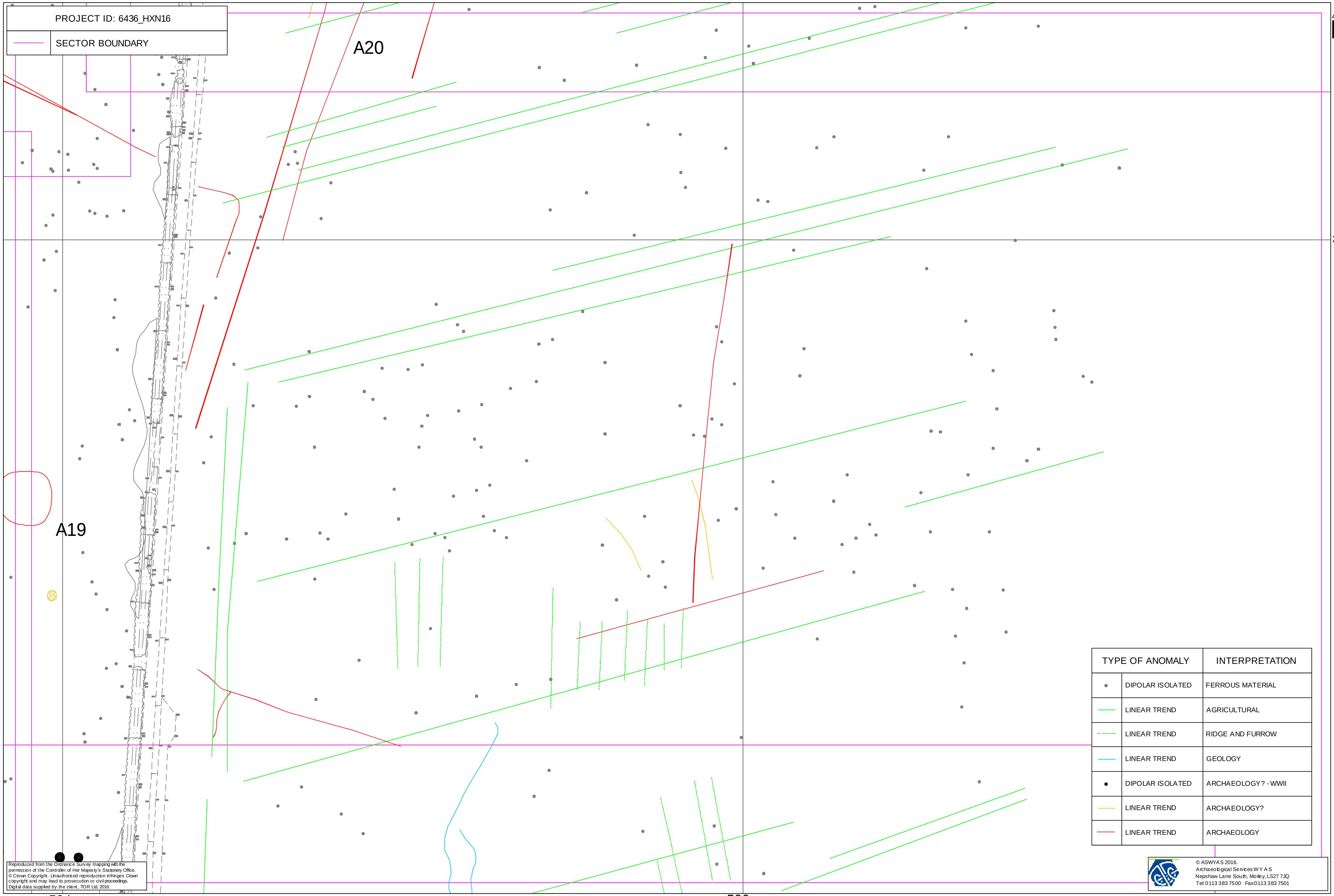

Fig. 39. Interpretation of magnetometer data; Sector 18 (1:1000 @ A3)

0 50m

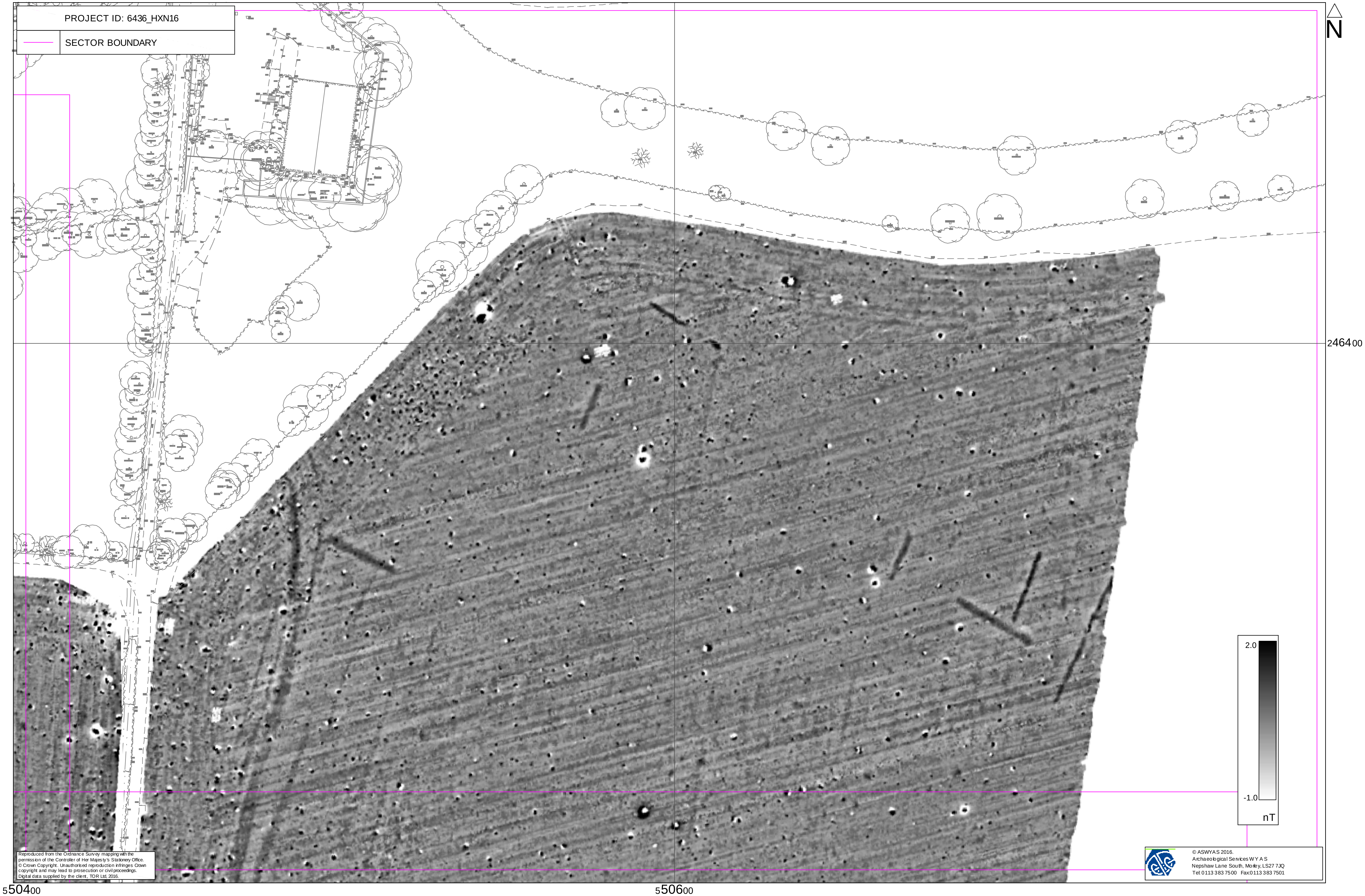

Fig. 40. Processed greyscale magnetometer data; Sector 19 (1:1000 @ A3)

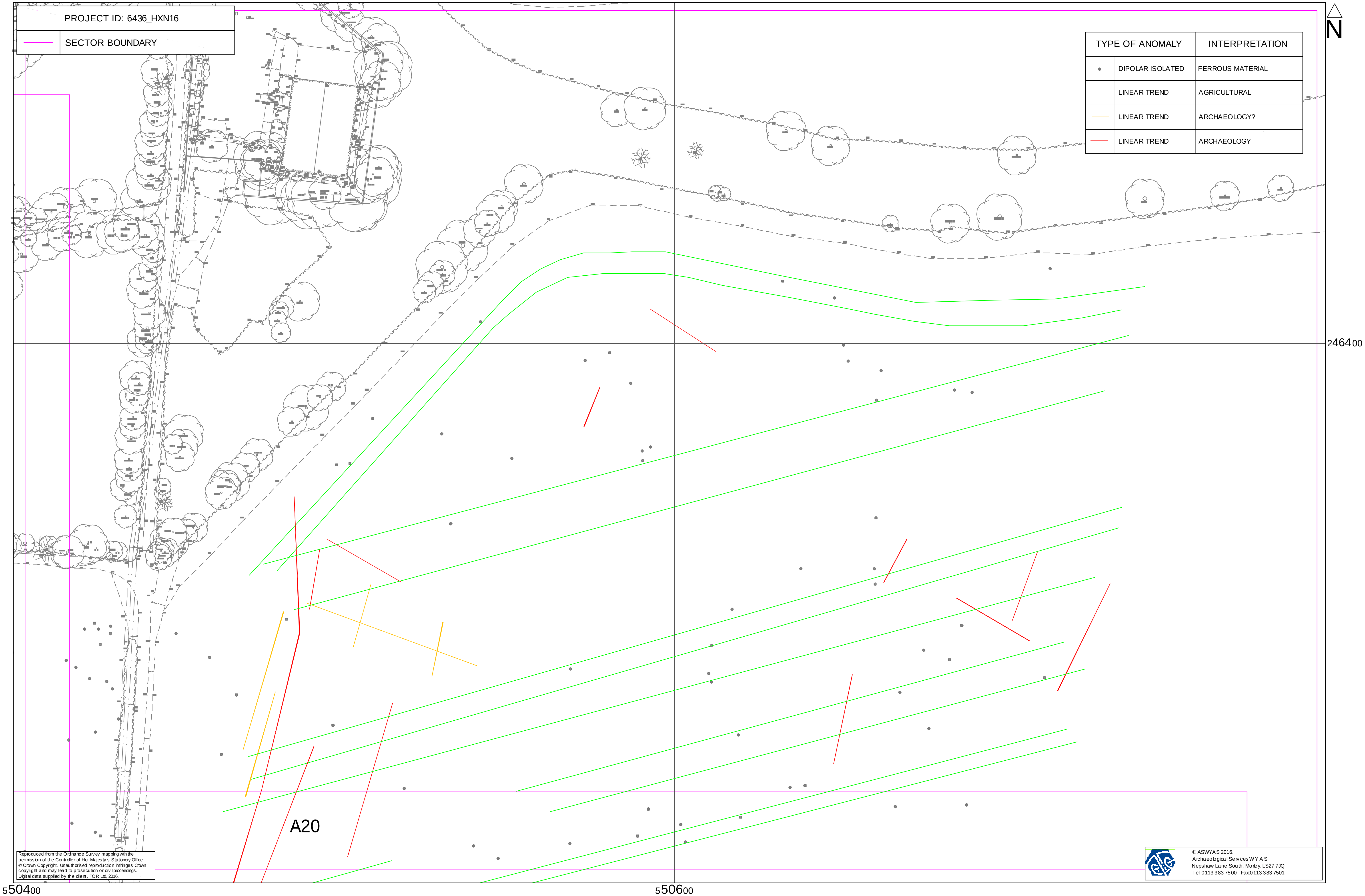

Fig. 41. Interpretation of magnetometer data; Sector 19 (1:1000 @ A3)

Plates

Locations and directions of the plates can be found in Figure 2

Plate 1. General view of Area B, looking southeast

Plate 2. General view of Area B, looking east

Plate 3. General view of Area B, looking northwest

Plate 4. General view of Area B, looking northeast

Plate 5. General view of Area C, looking south

Plate 6. General view of Area C, looking southwest

Plate 7. General view of Area C, looking northwest

Plate 8. General view of Area B, looking southeast

Plate 9. General view of Area C, looking west

Plate 10. General view of Area D, looking east

Plate 11. General view of Area C, looking north

Plate 12. General view of Area D, looking northeast

Plate 13. General view of Area D, looking southwest

Plate 14. Pillbox adjacent to Areas D and E, 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.

Types of Magnetic Anomaly

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

Isolated dipolar anomalies (iron spikes)
These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

Areas of magnetic disturbance
These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Linear trend
This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies
Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies
Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

Methodology: Gradiometer Survey

The survey was undertaken using a Sensys Magneto MXPDA cart-based instrument. The instrument has 5 fluxgate gradiometers spaced 0.5m apart with readings recorded at 20Hz. The gradiometers have a range of recording between 0.1nT and 10,000nT. They are linked to a Trimble R6 RTK dGPS system with data recorded by Sensys Magneto MXPDA software on a rugged PDA device. The data were stored on an SD memory card within the PDA and later downloaded to a computer for processing and interpretation.

Data Processing and Presentation

The detailed gradiometer data has been presented in this report in minimally processed greyscale format. MAGNETO (Sensys Gmbh) software was used to process and present the data. The data in the greyscale images has been selectively filtered to remove extraneous data collected at source, with traverses containing less than four readings removed to maximise the clarity and interpretability of the archaeological anomalies.

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.

Appendix 2: Survey location information

An initial survey station was established using a Trimble VRS differential Global Positioning System (Trimble R6 model). The data was geo-referenced using the geo-referenced survey station with a Trimble RTK differential Global Positioning System (Trimble R6 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 Cambridgeshire 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: archaeol11-267643

Project details

Project name	Land at Hinxton Grange
Short description of the project	A cart-based geophysical (magnetometer) survey, covering approximately 120 hectares was carried out on agricultural land predominantly to the west and south of Hinxton Grange, Cambridgeshire. The survey was undertaken in advance of agricultural trials. The survey area is close to a number of HER monuments and important archaeological sites. Previously unknown prehistoric barrows, pits and trackways have been identified, alongside Second World War defences. It is highly likely that these features are related to HER monuments which surround the survey area. Within the survey area, a number of possible archaeological anomalies have been detected, and are likely to have an archaeological origin due to the archaeology within the wider landscape. Some ridge and furrow has been detected to the southwestern extent of the site. Anomalies indicative of geology and modern disturbance have been identified. The archaeological potential of the survey area, therefore, is deemed to be high.
Project dates	Start: 15-08-2016 End: 13-10-2016
Previous/future work	No / Not known
Any associated project reference codes	6436 - Sitecode
Type of project	Field evaluation
Current Land use	Cultivated Land 1 - Minimal cultivation
Monument type	RING DITCHES Bronze Age
Monument type	ENCLOSURES Late Prehistoric
Monument type	TRACKWAYS Late Prehistoric
Significant Finds	RING DITCHES Bronze Age
Significant Finds	ENCLOSURES Late Prehistoric
Significant Finds	TRACKWAYS Late Prehistoric
Methods & techniques	"Geophysical Survey"
Development type	Not recorded
Prompt	National Planning Policy Framework - NPPF

Position in the planning process	Not known / Not recorded
Solid geology	CHALK (INCLUDING RED CHALK)
Drift geology	RIVER TERRACE DEPOSITS
Techniques	Magnetometry

Project location

Country	England
Site location	CAMBRIDGESHIRE SOUTH CAMBRIDGESHIRE HINXTON Land at Hinxton Grange
Study area	115 Hectares
Site coordinates	TL 492 473 52.103442583437 0.178690350373 52 06 12 N 000 10 43 E Point
Height OD / Depth	Min: 26m Max: 50m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Terence O'Rourke ltd
Project design originator	Terence O'Rourke ltd
Project director/manager	C. Sykes
Project supervisor	B Goulding

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Terence O'Rourke ltd
Digital Contents	"Survey"
Digital Media available	"Images raster / digital photography","Text","Geophysics"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Land at Hinxton Grange, Hinxton, Cambridgeshire
Author(s)/Editor (s)	Brunning, E and Sykes, C
Date	2016
Issuer or publisher	ASWYAS
Place of issue or publication	Morley, Leeds

Description	A4 report with A3 figures
Entered by	Emma Brunning (emma.brunning@aswyas.com)
Entered on	4 November 2016

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