WYAS Archaeological Services

Park Hill Golf Course

Seagrave

Leicestershire

Geophysical Survey

Report no. 3105
March 2018

Client: Leicester City Football Club Ltd

REGISTERED CIfA ORGANISATION

West Yorkshire Joint Services

Park Hill Golf Course
Seagrave
Leicestershire

Geophysical Survey

Summary

A cart-based geophysical (magnetometer) survey, covering approximately 75 hectares was undertaken on a former golf course in Seagrave, Leicestershire. This was in advance of a proposed new football training ground. Anomalies of both an archaeological and possible archaeological origin have been recorded in the forms of rectilinear enclosures, ring ditches and linear and curvi-linear trends. Responses associated with the golf course have been recorded throughout, along with possible medieval ridge and furrow cultivation of an unknown date. Former field boundaries have also been detected. The magnetic survey has worked well on this site despite the former land use, therefore the likelihood of encountering unrecorded archaeology, away from those areas of archaeological potential is low.

WYAS
Archaeological
Services

Report Information

Client:	Leicester City Football Club Ltd
Address:	King Power Stadium, Filbert Way, Leicester, LE2 7FL
Report Type:	Geophysical Survey
Location:	Seagrave
County:	Leicestershire
Grid Reference:	SK 62464 16675
Period(s) of activity:	Prehistoric? / medieval? / modern
Report Number:	3105
Project Number:	8228
Site Code:	SLE 18
OASIS ID:	archaeol11-312613
Date of fieldwork:	February - March 2018
Date of report:	March 2018
Project Management:	Emma Brunning BSc MCIfA
Fieldwork:	Alastair Trace BSc MSc
	Clare Asplin BA
Report:	Emma Brunning
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Authorisation for distribution: ---

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1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by the Environmental Dimension Partnership Ltd (EDP), on behalf of Leicester City Football Club Ltd, to undertake a geophysical (magnetometer) survey on land to the south of Park Hill Lane, at the former Park Hill Golf Course to inform a proposed development, in line with current best practice (CIfA 2014; David *et al*. 2008). The survey was carried out between the 12th February and the 6th March 2018 to provide additional information on the archaeological resource of the Proposed Development Area (PDA).

Site location, topography and land-use

The PDA was approximately 75ha within the grounds of the former golf course. The survey area is enclosed by Park Hill Lane to the north and the A46 (Fosse Way) forms part of the eastern boundary of the site. The south and west of the site is surrounded by agricultural land. (see Fig. 1). At the time of survey the ground cover was a mixture of managed grass-land and scrub areas. The survey area was centered at SK 62464 16675 and the topography was undulating, with various earthworks associated with the golf course. The height above Ordnance Datum (aOD) is between 75m and 105m.

Soils and geology

The bedrock geology of the survey area belongs to the Scunthorpe Mudstone formation. Superficial deposits belong to the Oadby Member formation (BGS 2018). The soils of the survey area are assigned (411d) to the Hanslope formation and described as slowly permeable clayey soils. (SSEW 1983).

2 Archaeological Background

The east of the survey area is bound by the route of the A46 which at this point follows the line of the Roman Fosse Way from Leicester to Lincoln. The Fosse way was a major route in the Roman period and at one point marked the western frontier of Roman rule in Britain.

An Archaeological and Heritage Assessment was prepared by The Environmental Dimension Partnership Ltd (EDP 2018) in which seven previously recorded non-heritage assets lie within the site including prehistoric flint scatters and Iron Age pottery.

Approximately 800m to the north of the survey area an undated rectangular enclosure was identified from aerial photographs (Monument 964943). Roman pottery and a quern stone have been found approximately 700m to the southeast at Sileby (Monument 964958). An undated pond, also at Sileby, has been identified from aerial photographs (Monument 964960). Earthworks associated with the manor house in Seagrave (thought to have been on the site of Hall Farm) are located approximately 350m to the northwest of the site (Monument 319364).

The location of a mill mound is recorded on the north side of Park Hill Lane (Monument 319380) however a mill is shown on the 1884 Ordnance Survey on the south side of the road on a parcel of land not incorporated in the survey area. The mill mound to the north of Park Hill Lane first appears on mapping of 1967 with no structure shown in this location prior to this.

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 survey was undertaken using a Sensys Magneto®MXPDA cart-based magnetometer system. This system has five FGM650 fluxgate gradiometers mounted at 0.5m intervals with readings of between ±0.1nT and ±10,000nT recorded at 20Hz. The gradiometers are linked to a Trimble R6 Real Time Kinetic (RTK) differential Global Positioning System (dGPS) allowing for the geo-referencing of all measurement points within ±1cm accuracy. The data is recorded by Sensys Magneto®MXPDA software on a Personal Data Assistant (PeDA) device and stored on a Secure Digital (SD) memory card within the PeDA. Terrasurveyor (DW Consulting) software was used to process and present the data. Further details are given in Appendix 1.

Reporting

A general site location plan, incorporating the 1:50000 Ordnance Survey (OS) mapping, is shown in Figure 1. Figure 2 displays an overview of the processed magnetometer data at a scale of 1:4000, with the overall interpretation, at the same scale in Figure 3. The minimally processed data, together with an interpretation of the survey results are presented in Figures 4 to 17 inclusive at a scale of 1:1250.

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 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 17)

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

Magnetic disturbance along the limits of Area 4 (Figs 8-9) are due to high metal fencing surrounding the driving range. Further areas of magnetic disturbance can be seen in Area 5 (Figs 6-7) and Area 8 (Figs 8-9) and are due to the location of the adjacent buildings.

A number of responses within the dataset correspond to the golf course layout showing as both areas of a low and a high magnitude. These have been marked on the interpretation diagram as *Golf Course* and correspond to both aerial photography and in the field consisting of putting greens and teeing grounds. There are a number of gaps within the data along the fairways which are largely due to sand bunkers and water features.

Agricultural anomalies

A number of former field boundaries have been detected which correspond to Ordnance survey mapping dating between 1888-1913 (NLS 2018). These can be seen in Areas 1, 6, 7, 8, 10, 16, 17, 19 and 23.

Parallel linear trends can be seen throughout and are likely to be associated with medieval or later ridge and furrow cultivation. The trends, particularly in the eastern areas (19-23) have a stronger magnetic response than those elsewhere. There is a possibility that they may be associated with a more modern origin such as field drains, but they do not have the typical magnetic signature of drains.

Field drains have been identified in Area 19 (Figs 10-11, 16-17) and have been recorded as negative linear trends.

Possible archaeological anomalies

A number of responses have been recorded as having a possible archaeological origin and consist of linear and curvi-linear trends and ditch-like features.

Faint linear trends (**P1**) (Areas 2 and 3, Figs 4-5) have been recorded, it is possible that they represent field boundaries but are not shown on any available mapping, hence the possible archaeological interpretation.

Anomalies (**P2**) (Area 4, Figs 8-9) are adjacent to a large potential enclosure (see below). These responses are weaker than the main enclosure, but may consist of a smaller enclosure. It is not possible to say if these responses are contemporary with one another.

A possible ring ditch has been recorded (**P3**) (Area 14, Figs 6-7). The feature measures approximately 12m in diameter. The location of this feature lies within a number of ferrous responses and has a higher level of magnetic background noise, which is why **P3** has been categorised as possible archaeology only and may be of a modern origin. Linear trends have also been recorded in the same area which may be of archaeological interest.

A handful of possible archaeological anomalies (**P4**) (Area 7, Figs 8-9) can be seen surrounding the group of archaeological anomalies **A2** (see below). These consist of a possible ring ditch, pits and linear trends.

Further anomalies (**P5**) (Areas 12 and 16, Figs 8-9), **P6** (Area 18, Figs 10-11) and **P7** (Area 15, Figs 10-11) have also been recorded consisting of linear and curvilinear trends and ditch lengths.

Responses (**P8**) (Area 6, Figs 12-13) consist of a ditch type anomaly and a curvi-linear trend, these are perhaps a little more tentative than the rest of the anomalies and may also be associated with geology or the golf course.

A small possible ring ditch and rectilinear response can be seen (**P9**) (Area 7, Figs 12-13). The ring ditch measures approximately 6m in diameter and the rectilinear responses measures 11.5m along its longest length. These responses are located to the immediate northeast of a highly plausible ring ditch **A4**.

A further possible ring ditch has been recorded (**P10**) (Area 10, Figs 14-15). This is magnetically weak and measures approximately 15m in diameter.

A collection of anomalies (**P11**) (Area 8, Figs 14-15) are located to the immediate east of enclosure **A3**. They appear to represent a series of rectilinear enclosures.

Archaeological anomalies

A large rectilinear enclosure with internal features (**A1**) (Area 4, Figs 6-7) is clearly the strongest feature of all the anomalies recorded. It measures approximately 63m by 52m. Internal features consist of an enclosure abutting the northeastern corner, a ring ditch measuring 16m in diameter with a curving ditch joining this to the southern extent of the main enclosure.

A series of rectilinear enclosures (**A2**) (Area 7, Figs 8-9) consist of possible three separate enclosures. The easternmost one measures approximately 15m by 15m and is on a slightly different alignment than the ones to the west. The remaining features consist of a larger enclosure with an internal division or two separate enclosures. The responses are weaker in the west and has made interpretation difficult.

Further enclosures (**A3**) (Area 8, Figs 14-15) have been recorded to the east of **A2** and are likely to be of the same complex. This enclosure measures approximately 18m by 20m.

A ring ditch can be seen (**A4**) (Area 6, Figs 12-13) measuring 11m in diameter. There also appears to be a central pit. It is unfortunate that a bunker is obscuring the northern section.

Another rectilinear enclosure (**A5**) (Area 9, Figs 12-13) can be seen in the south of the site. This measures approximately 31m by 34m. As above, a bunker, the tee and also a pond are obscuring parts of the enclosure.

5 Conclusions

The magnetic survey has detected anomalies of a highly likely archaeological origin consisting of a large enclosure with internal features, smaller enclosures and ring ditches. Responses of possible archaeology have also been detected, again as enclosures, ring ditches and pits.

Probable medieval ridge and furrow cultivation has been recorded throughout the site along with a number of former field boundaries marked on OS mapping.

Responses associated with the golf course can be seen as both low and high magnetic responses associated with putting greens and the teeing grounds. Field drains can also be seen in the east of the site.

The remaining anomalies are of a modern ferrous nature in the forms of responses associated with metal fencing, buildings and isolated modern debris.

The survey has worked particularly well on this geology and land-use detecting anomalies of archaeological origin through to modern. Away from the areas of archaeological potential, the likelihood of encountering hitherto unrecorded archaeology is considered to be low.

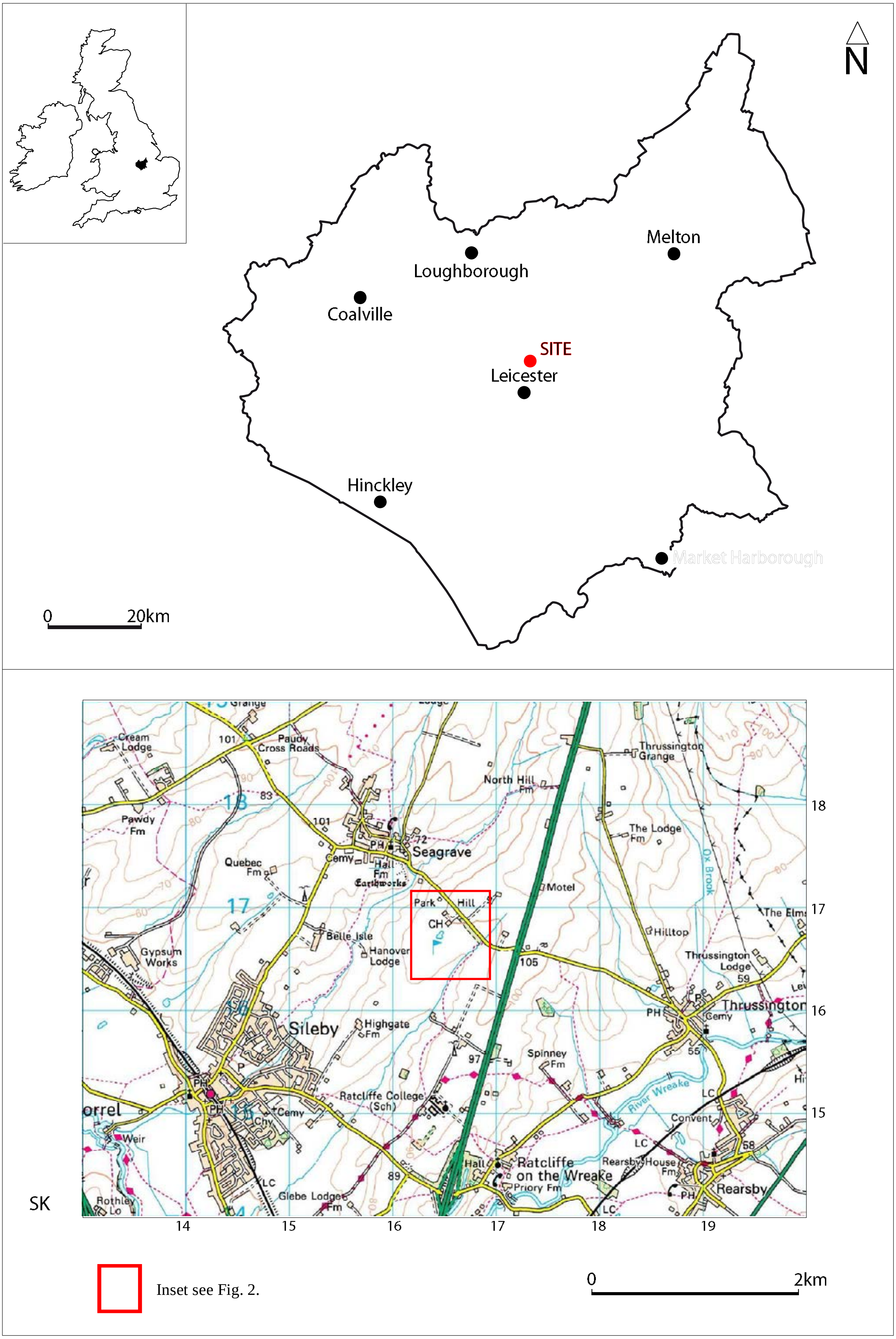

Fig. 1. Site location

Fig. 2. Survey location showing greyscale magnetometer data (1:4000 @ A3)

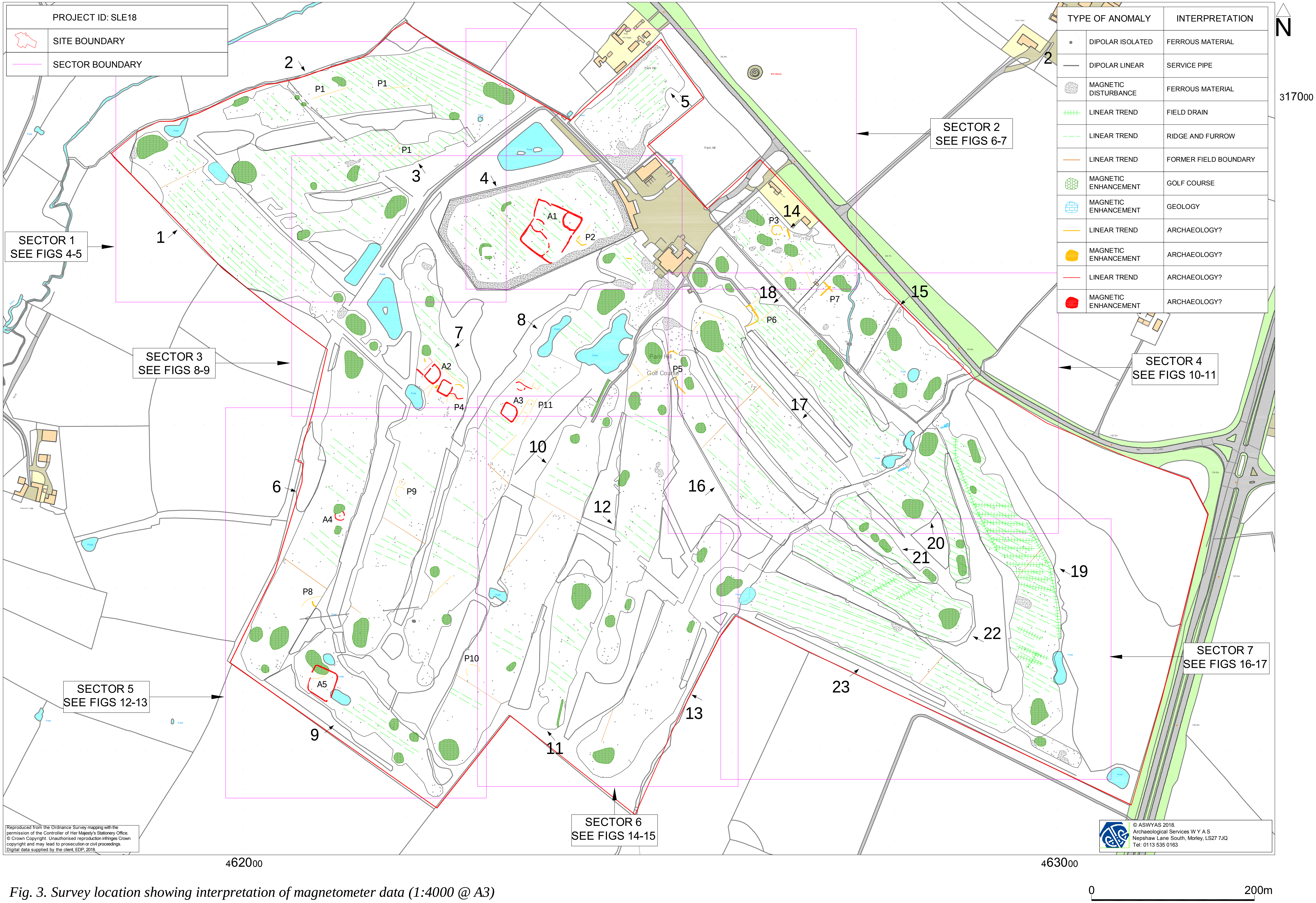

Fig. 3. Survey location showing interpretation of magnetometer data (1:4000 @ A3)

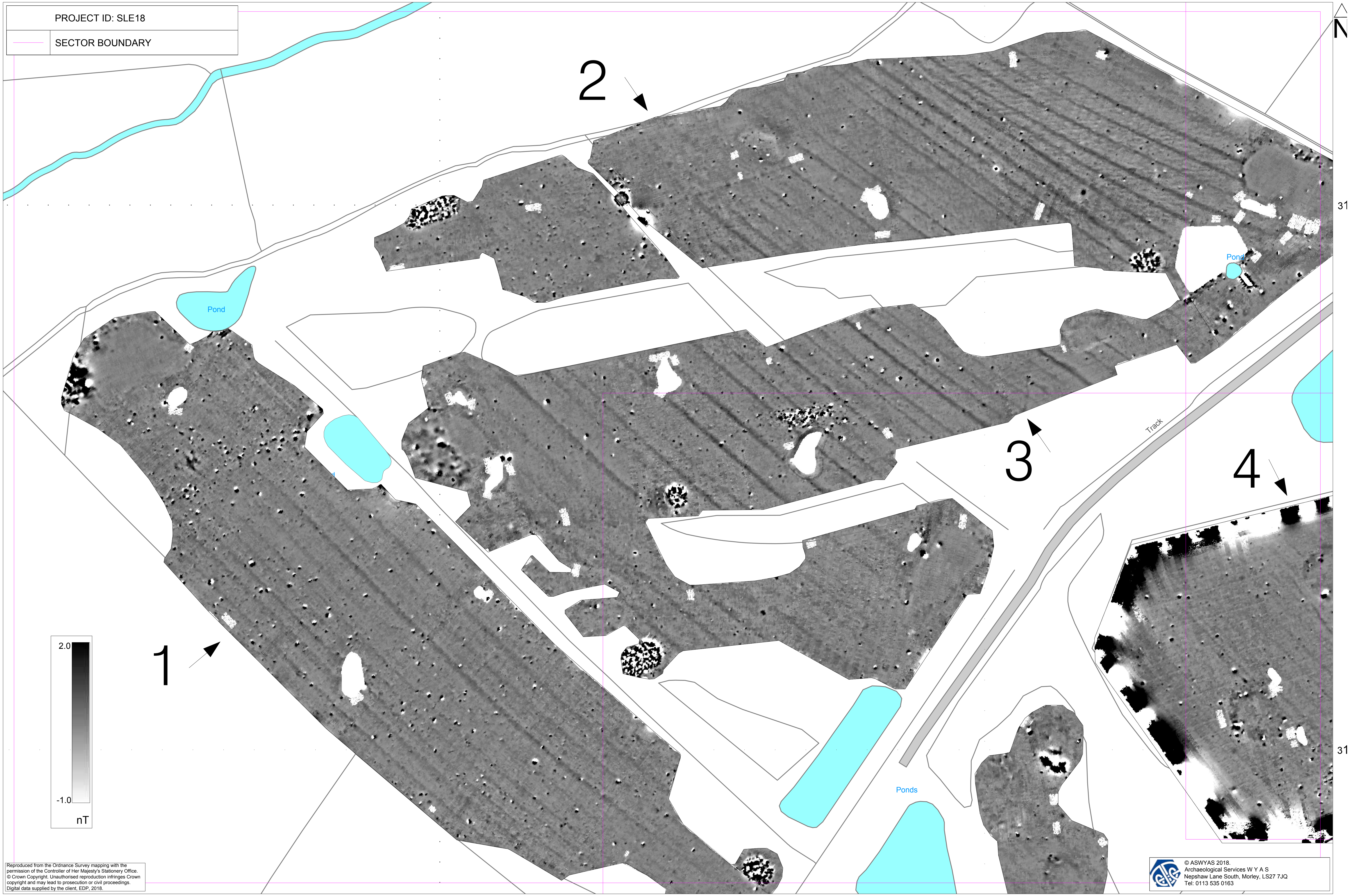

Fig. 4. Greyscale magnetometer data; Sector 1 (1:1250 @ A3)

0 50m

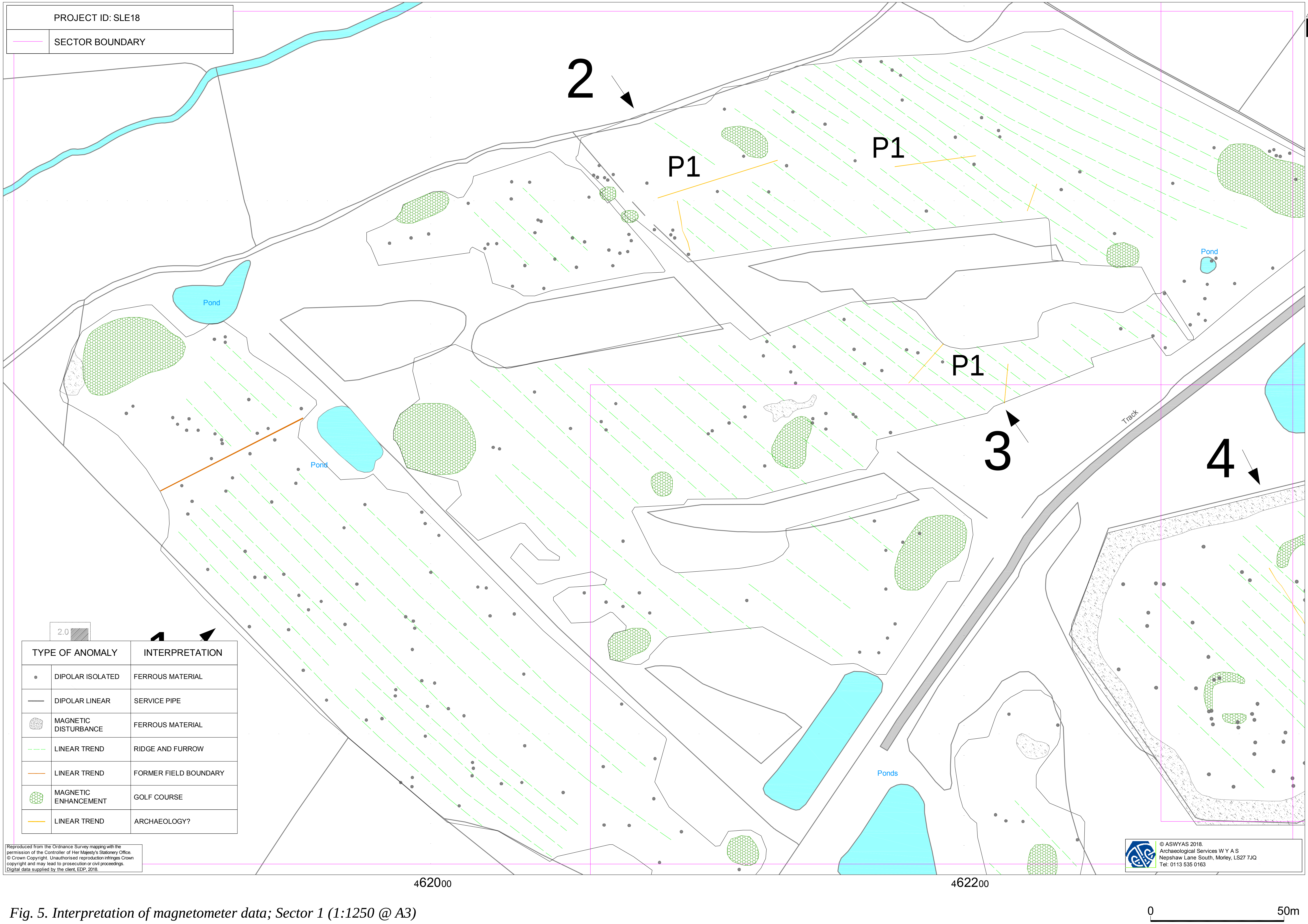

Fig. 5. Interpretation of magnetometer data; Sector 1 (1:1250 @ A3)

Fig. 6. Greyscale magnetometer data; Sector 2 (1:1250 @ A3)

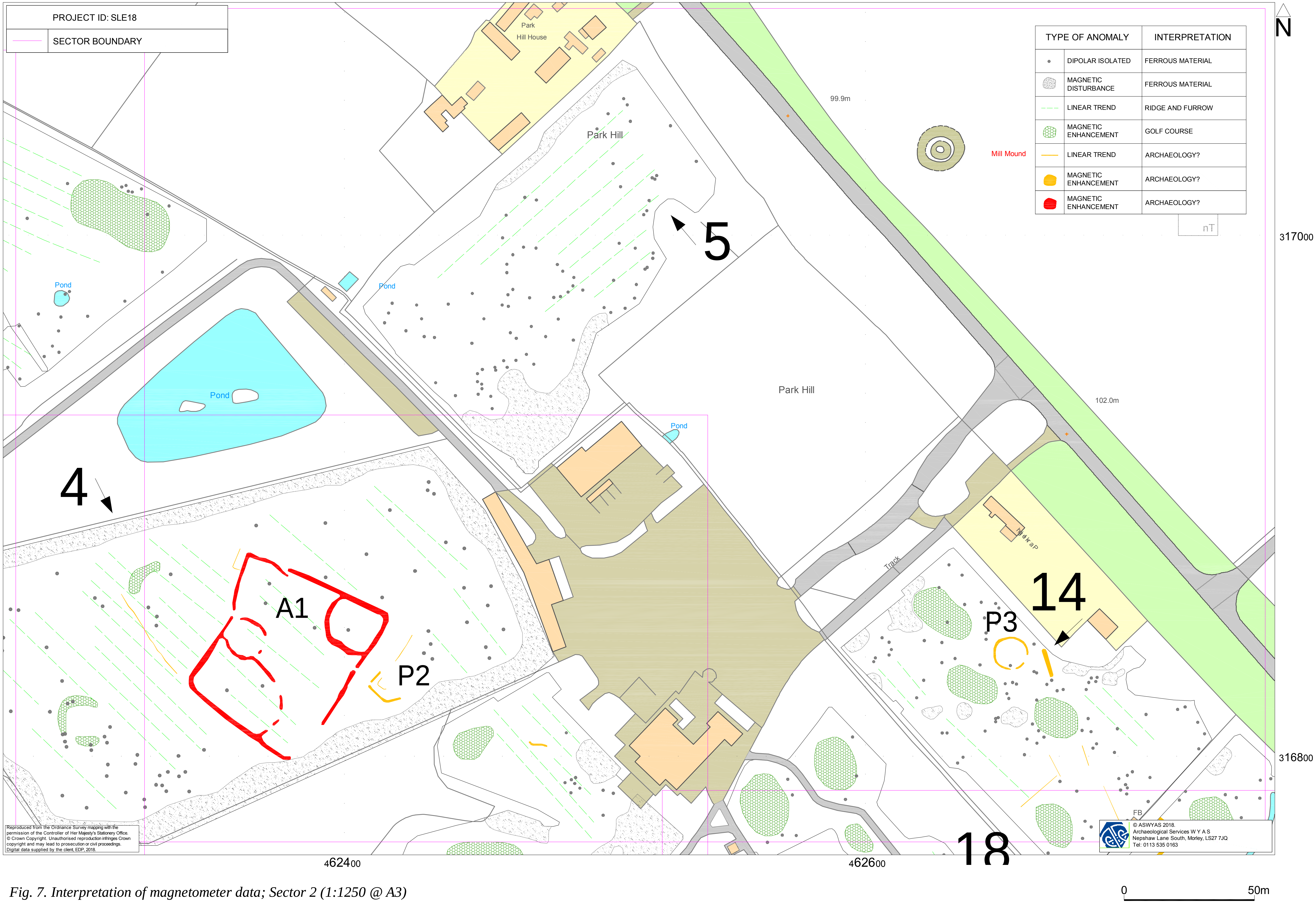

Fig. 7. Interpretation of magnetometer data; Sector 2 (1:1250 @ A3)

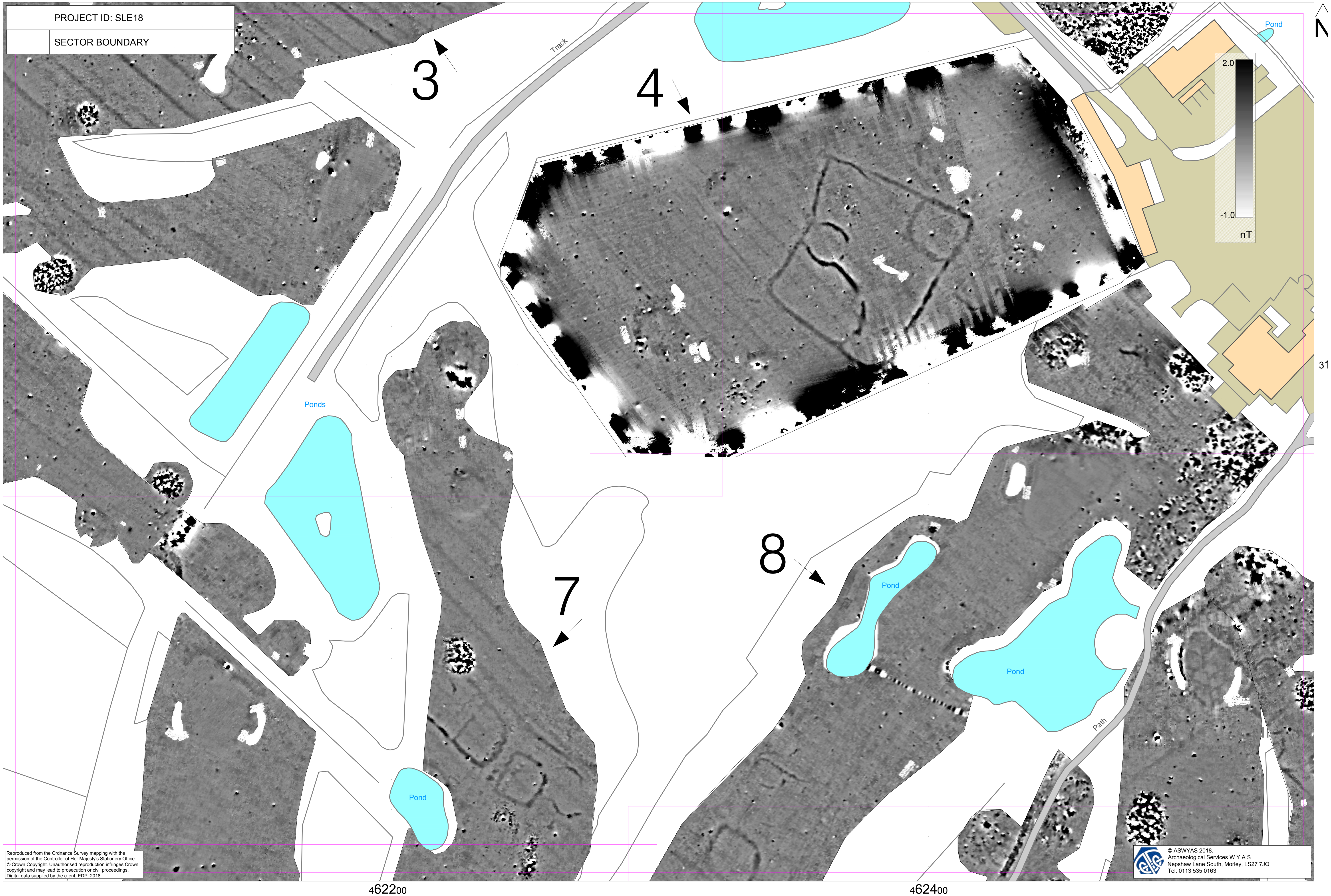

Fig. 8. Greyscale magnetometer data; Sector 3 (1:1250 @ A3)

0 50m

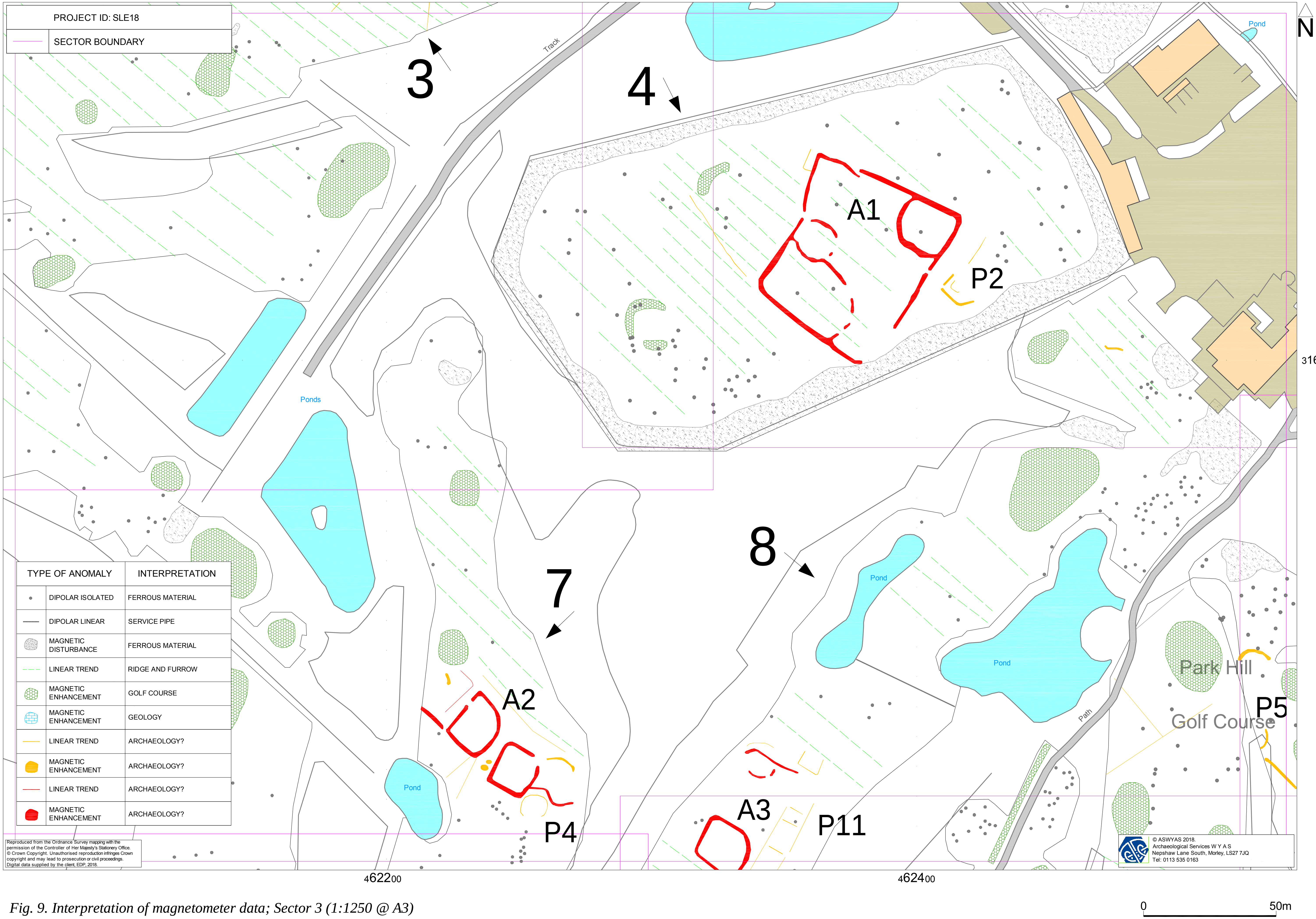

Fig. 9. Interpretation of magnetometer data; Sector 3 (1:1250 @ A3)

Fig. 10. Greyscale magnetometer data; Sector 4 (1:1250 @ A3)

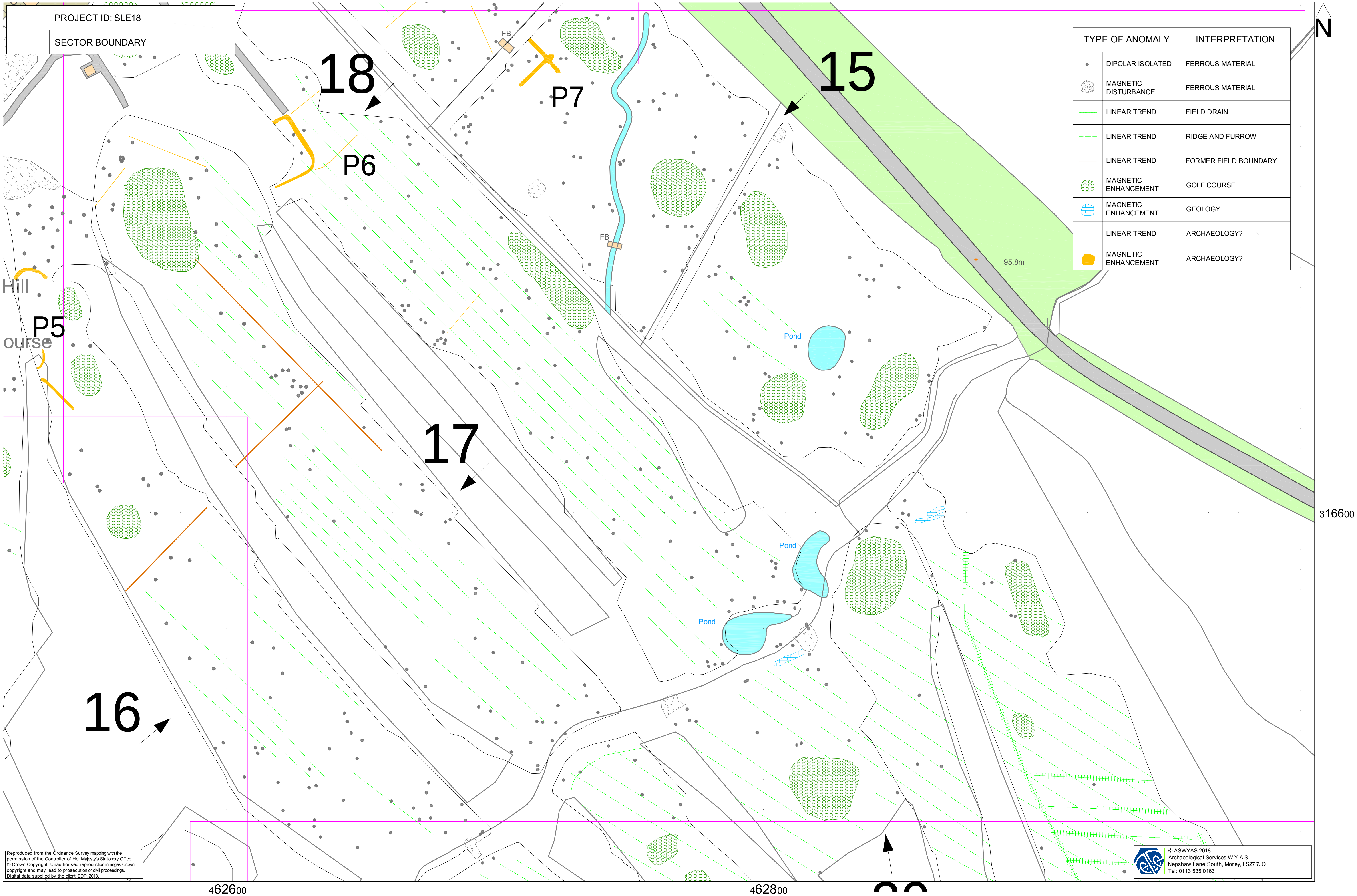

Fig. 11. Interpretation of magnetometer data; Sector 4 (1:1250 @ A3)

0 50m

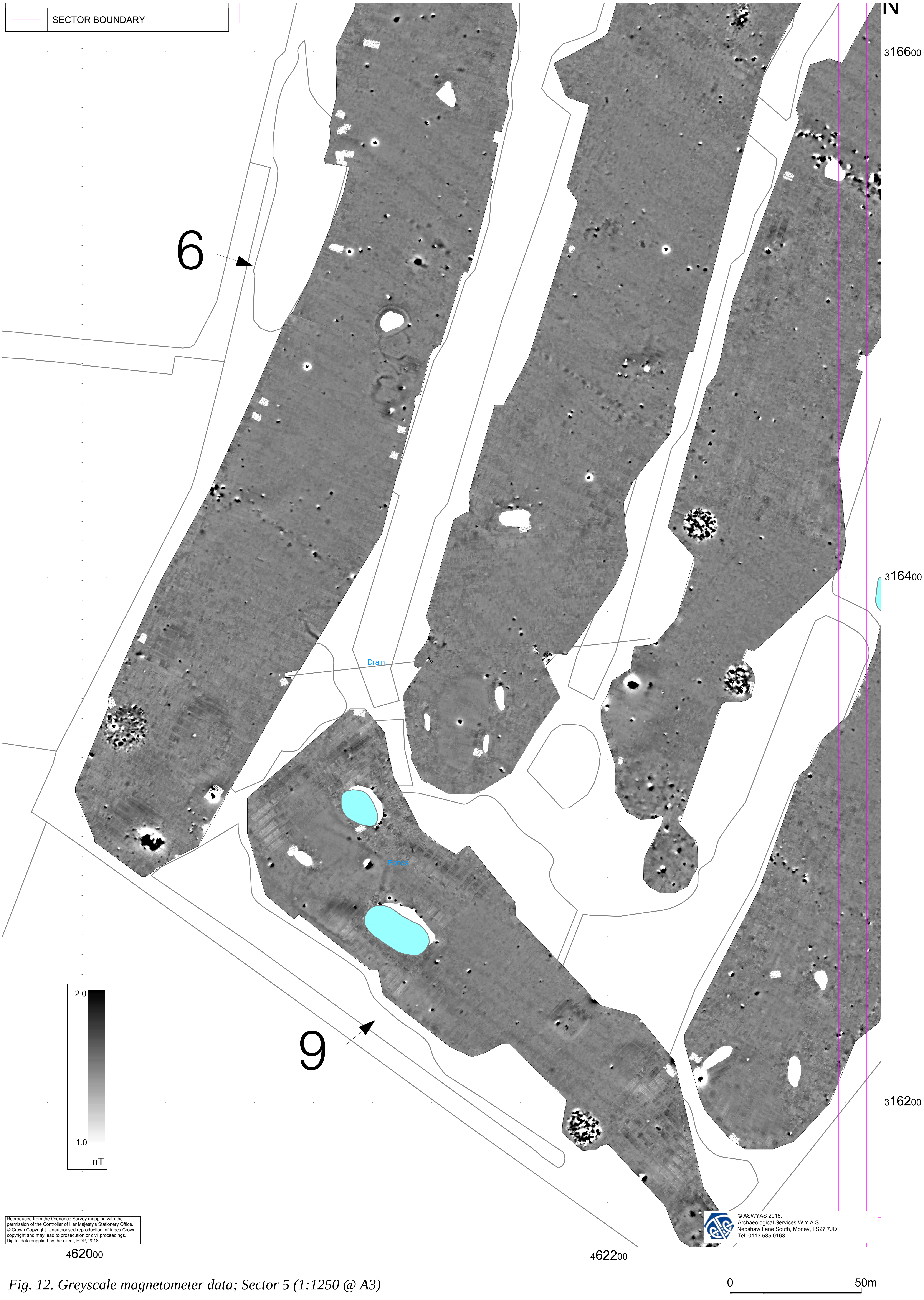

Fig. 12. Greyscale magnetometer data; Sector 5 (1:1250 @ A3)

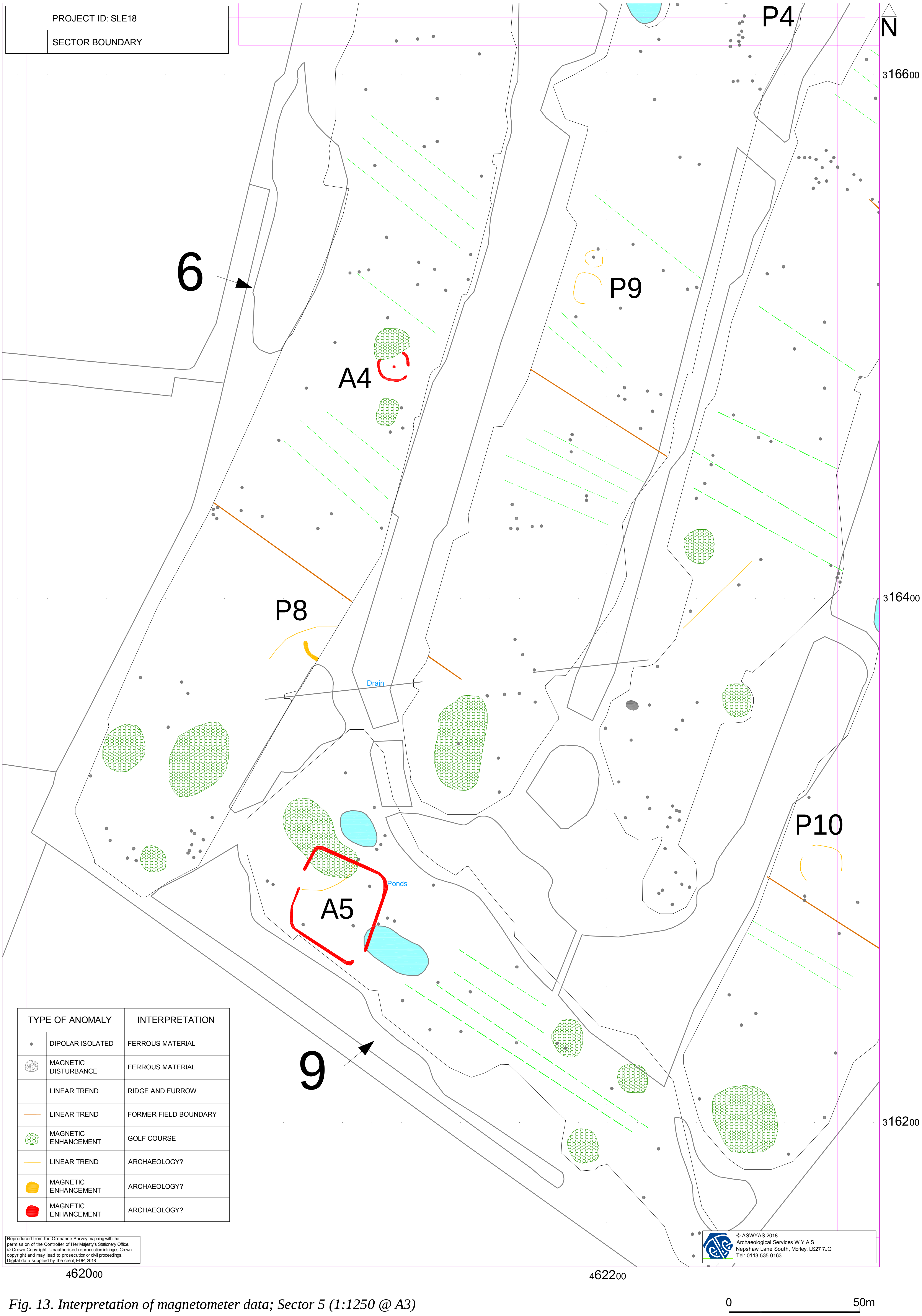

Fig. 13. Interpretation of magnetometer data; Sector 5 (1:1250 @ A3)

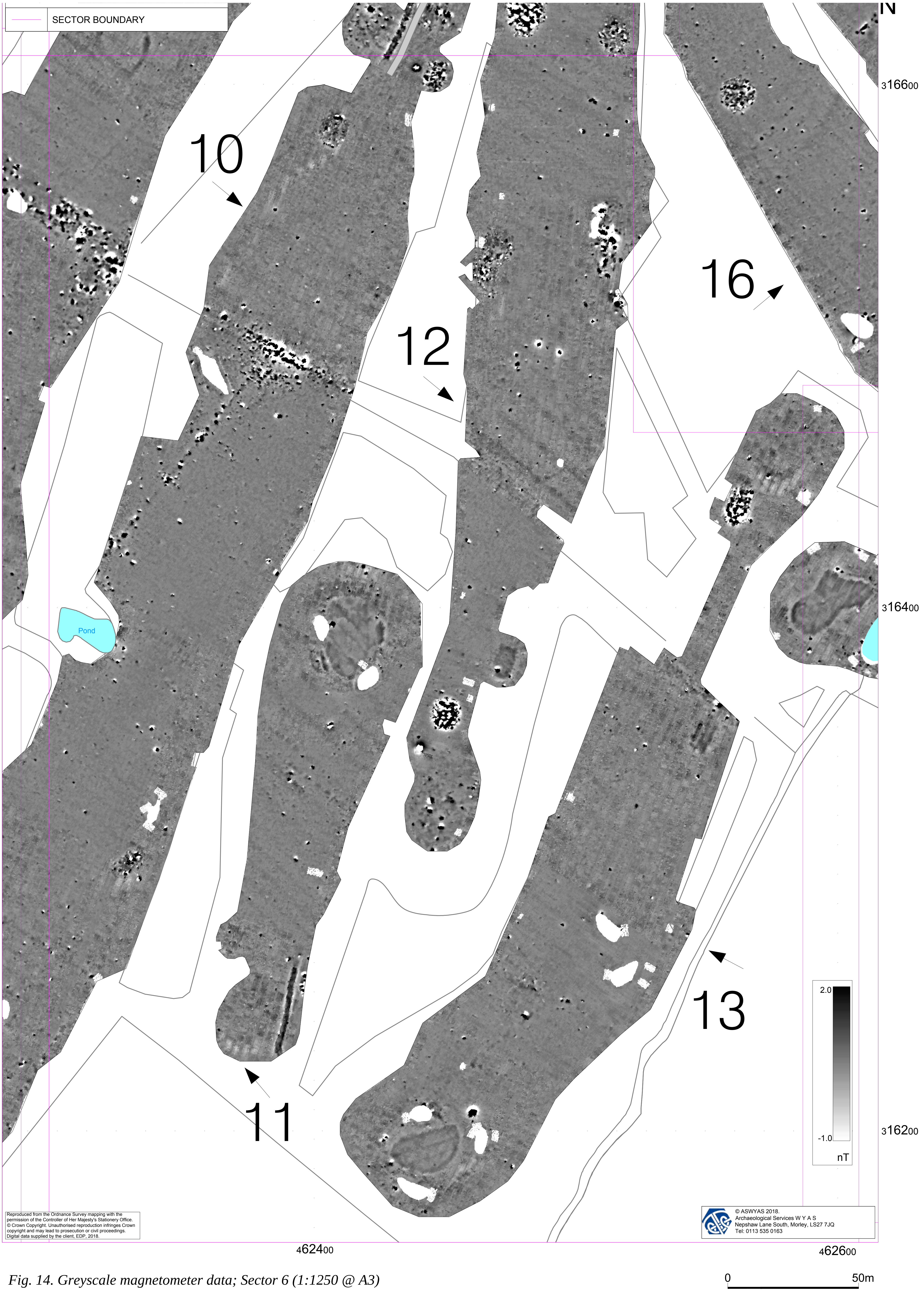

Fig. 14. Greyscale magnetometer data; Sector 6 (1:1250 @ A3)

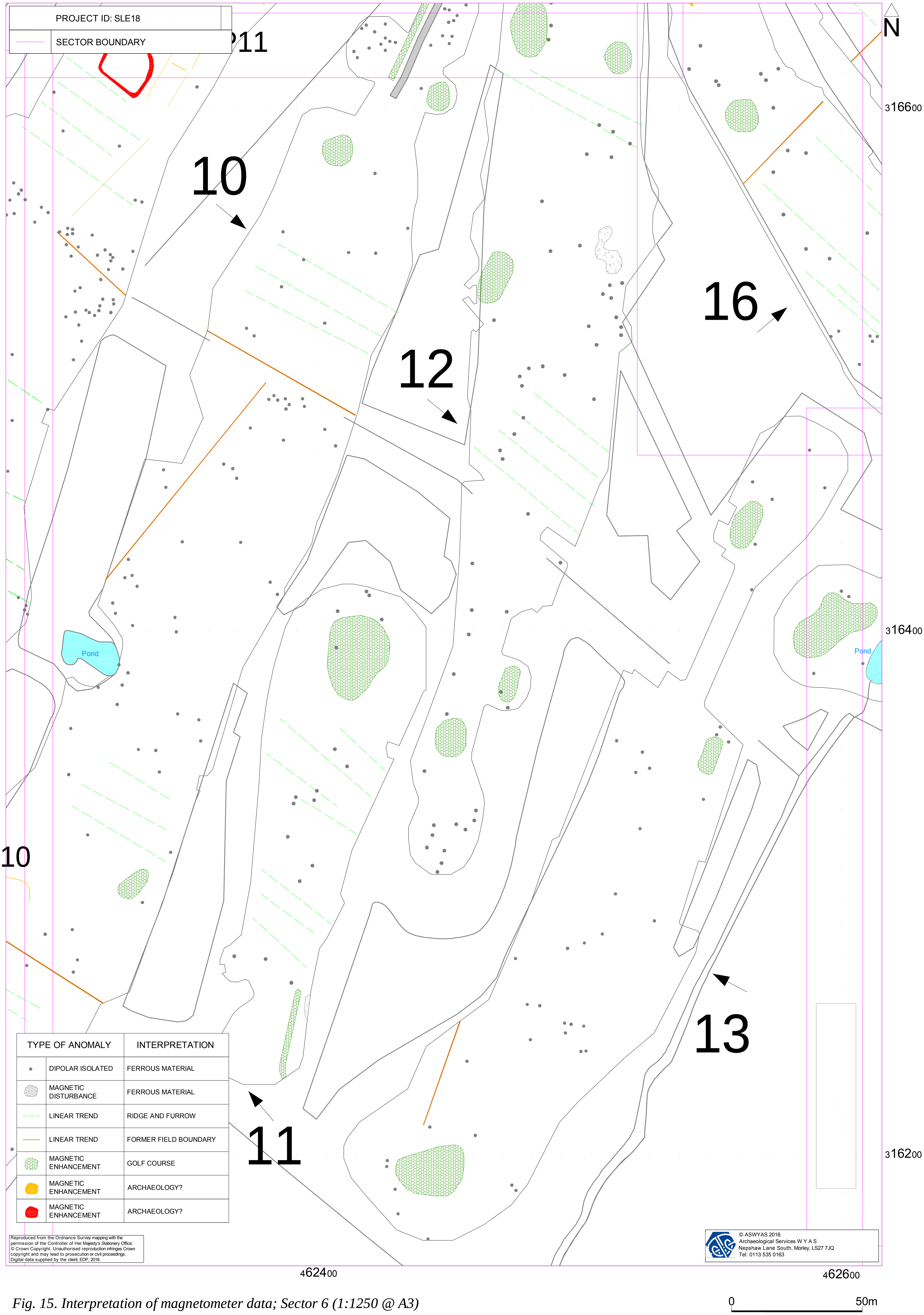

Fig. 15. Interpretation of magnetometer data; Sector 6 (1:1250 @ A3)

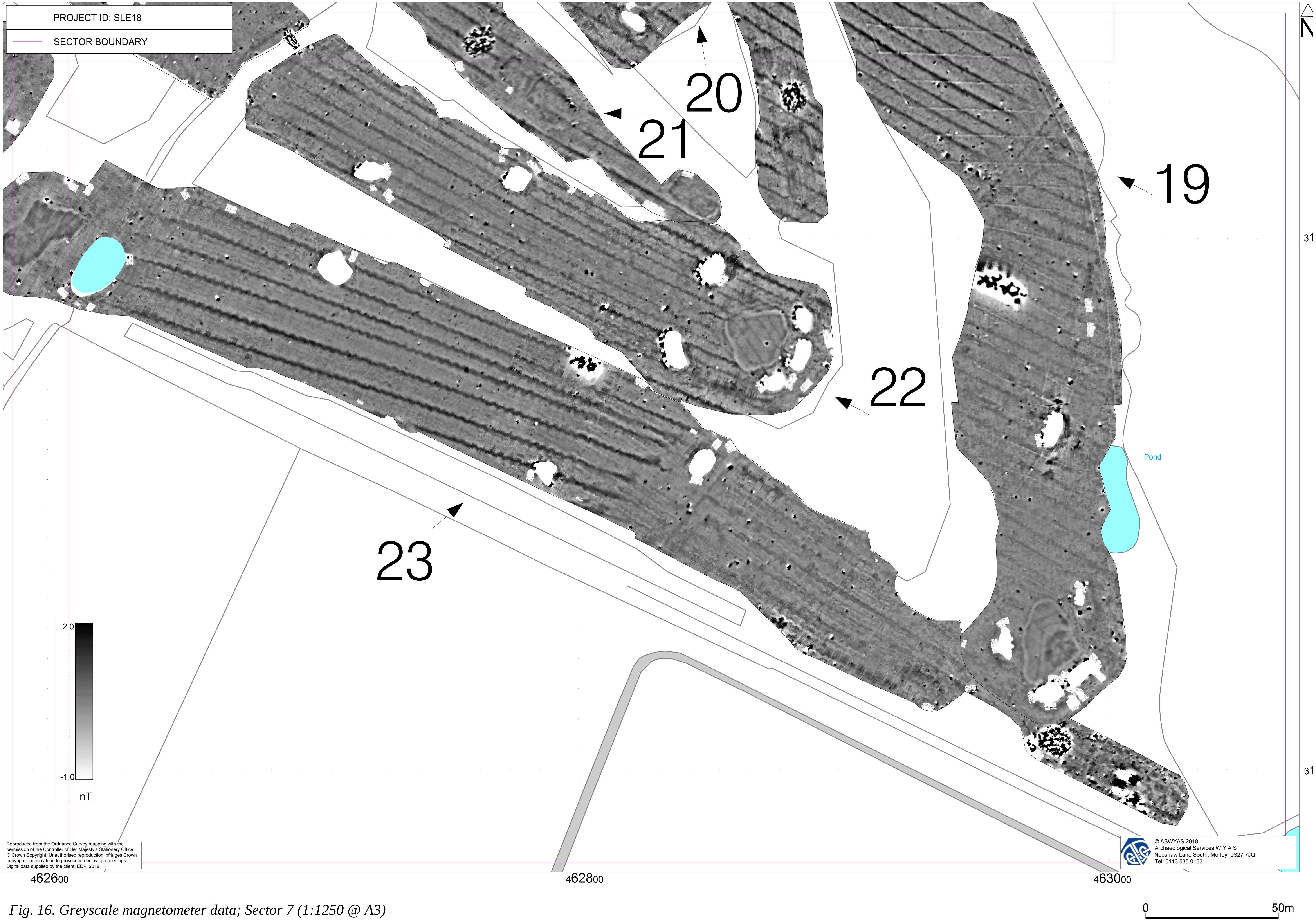

Fig. 16. Greyscale magnetometer data; Sector 7 (1:1250 @ A3)

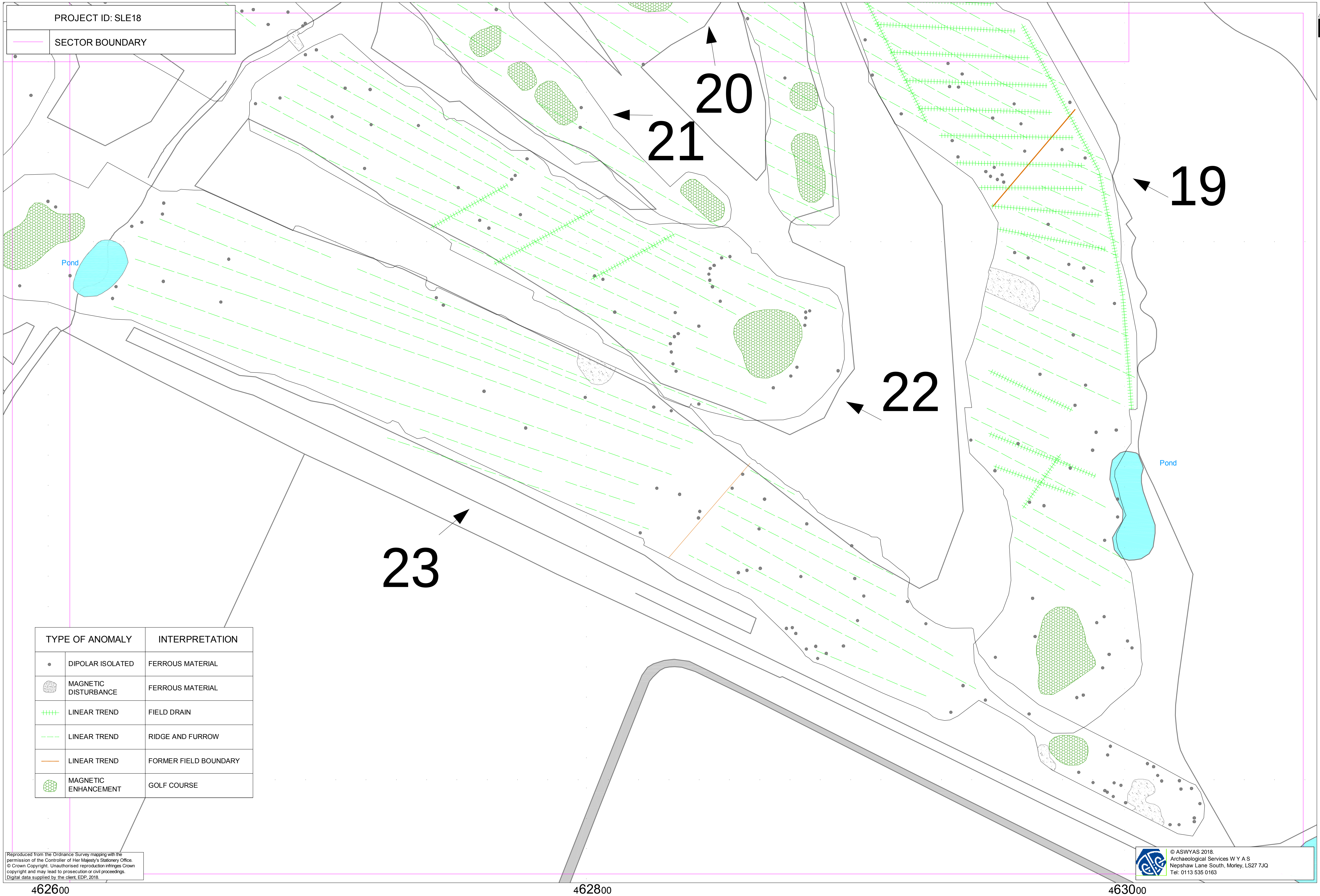

Fig. 17. Interpretation of magnetometer data; Sector 7 (1:1250 @ A3)

0 50m

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 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) software was used to process and present the data

Data Processing and Presentation

The detailed gradiometer data has been presented in this report in processed greyscale format. 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.

MAGNETO was used to produce the greyscale images. All greyscale plots are displayed using a linear incremental scale.

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 than 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 CS6 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 Leicestershire Historic Environment Record).

Appendix 4: Oasis form

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: archaeol11-312613

Project details

Project name	Park Hill Golf Course, Seagrave
Short description of the project	A cart-based geophysical (magnetometer) survey, covering approximately 75 hectares was undertaken on a former golf course in Seagrave, Leicestershire. This was in advance of a proposed new football training ground. Anomalies of both an archaeological and possible archaeological origin have been recorded in the forms of rectilinear enclosures, ring ditches and linear and curvi-linear trends. Responses associated with the golf course have been recorded throughout, along with possible medieval ridge and furrow cultivation of an unknown date. Former field boundaries have also been detected. The magnetic survey has worked well on this site despite the former land use, therefore the likelihood of encountering unrecorded archaeology, away from those areas of archaeological potential is low.
Project dates	Start: 12-02-2018 End: 06-03-2018
Previous/future work	No / Not known
Any associated project reference codes	8228 - Sitecode
Type of project	Field evaluation
Current Land use	Other 14 - Recreational usage
Monument type	FLINTS Late Prehistoric
Monument type	POTTERY Iron Age
Significant Finds	RING DITCHES Late Prehistoric
Significant Finds	ENCLOSURES Late Prehistoric
Significant Finds	RIDGE AND FURROW Medieval
Methods & techniques	''Geophysical Survey''
Development type	Sports training ground
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Pre-application
Solid geology (other)	MUDSTONES
Drift geology	CLAY WITH FLINTS

Techniques	Magnetometry

Project location

Country	England
Site location	LEICESTERSHIRE CHARNWOOD SILEBY Park Hill Golf Course, Seagrave
Study area	75 Hectares
Site coordinates	SK 624 166 52.743079910589 -1.075566249651 52 44 35 N 001 04 32 W Point
Height OD / Depth	Min: 75m Max: 105m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Environmental Dimension Partnership
Project design originator	Environmental Dimension Partnership
Project director/manager	E Brunning
Project supervisor	A. Trace

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Environmental Dimension Partnership
Digital Contents	"Survey"
Digital Media available	"Geophysics","Images raster / digital photography","Survey","Text"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Park Hill Golf Course, Seagrave, Leicestershire
Author(s)/Editor(s)	Brunning, E
Date	2018
Issuer or publisher	ASWYAS
Place of issue or publication	Leeds
Description	A4 report with A3 figures

Entered by	Emma Brunning (emma.brunning@aswyas.com)
Entered on	26 March 2018

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