WYAS Archaeological Services

Castle Hill West

Harrogate

North Yorkshire

Geophysical Survey

Report no. 3330
September 2019

Client: Banks Group

Castle Hill West, Harrogate, North Yorkshire

Geophysical Survey

Summary

A geophysical (magnetometer) survey, was undertaken on approximately 12.5 hectares of land located to the west of Whinney Lane, Harrogate. Responses of both an archaeological and possible archaeological origin have been detected in the form of enclosures, areas of settlement, boundaries and ring ditches. Agricultural trends can be seen throughout the survey area in the form of ridge and furrow cultivation, field drains, and former field boundaries. Across the site, scattered isolated ferrous anomalies have been identified along with service pipes and areas of magnetic disturbance.

Based on the results and interpretation of the data, the archaeological potential is considered to be high in the north and southwest and medium to low elsewhere.

WYAS
Archaeological Services

Report Information

Client:	Banks Group
Address:	Inkerman House, St John's Road, Meadowfield, Durham, DH7 8XL
Report Type:	Geophysical Survey
Location:	Harrogate
County:	North Yorkshire
Grid Reference:	SE 28910 52850
Period(s) of activity:	Prehistoric/ Medieval/ Modern
Report Number:	3330
Project Number:	8840
Site Code:	WHN19
OASIS ID:	archaeol11-367899
Date of fieldwork:	August 2019
Date of report:	September 2019
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Authorisation for distribution: ----------

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1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by Banks Group to undertake a geophysical (magnetometer) survey on land at Castle Hill West, Harrogate, North Yorkshire. Guidance contained within the National Planning Policy Framework (MHCLG 2019) was followed, in line with current best practice (CIfA 2014; Schmidt *et al*. 2015). The survey was carried out between the 27th – 29th August 2019 to provide additional information on the archaeological resource of the Proposed Development Area (PDA).

Site location, topography and land-use

The survey area is approximately centered on National Grid Reference SE 28866 52750 and located to the southwest of Harrogate (Fig. 1). The proposed geophysical area is approximately 12.6 hectares comprising of four recently harvested fields. The survey area is bounded to the east and south by Whinney Lane, to the west by Lady Lane and to the north by agricultural land. The site lies between 158m to 181m above Ordnance Datum (aOD).

Soils and geology

The underlying bedrock geology is primarily Bowland Shale Formation Mudstone – mudstone, siltstone and sandstone, a band of Harrogate Roadstone. Limestone crosses the eastern part of the site on a northeast southwest axis. The Harlow Hill Sandstone – Sandstone is present in the northwest of the site. Superficial deposits have been recorded as Harrogate Till Formation – Clay, Sandy, and Gravelly (BGS 2019). The overlying soils are described as Dunkeswick (711p) slowly permeable seasonably waterlogged fine loamy and fine loamy over clayey soils, associated with similar clayey soils (SSEW 1983).

2 Archaeological Background

The following comprises a summary that has been derived from a desk-based assessment by ASWYAS prepared for the client (Horn 2019).

There is little evidence for early prehistoric activity in the Harrogate area, and evidence for Palaeolithic activity in North Yorkshire is largely restricted to upland sites. Several Mesolithic find spots have been identified to the west of the PDA, which include a Mesolithic lithic working site at Blubberhouses, *c.*14km to the north-west of the study area. No evidence for either Palaeolithic or Mesolithic activity has been identified in Harrogate District.

There is extensive evidence for Neolithic and Bronze Age activity in the Vale of York, to the north-east of Harrogate, with a concentration of late Neolithic and early Bronze Age ritual monuments, including a number of henge sites.

To the north-west of the development area, cropmarks have been identified (MNY 32561), indicating the possible presence of a Roman road. The projection of the road is orientated on a north-east to south-east alignment and links Killinghall to Hampsthwaite. The validity of

this road remains uncertain, however, and it is possible that this cropmark may merely be a gas or water pipeline. Activity *c*.1.5km to the north of the PDA during the Roman period is also suggested by the discovery of Roman coins at Harlow Carr and Harlow Hill (NMR no. SE 25 SE 19), while a putative enclosure (of possible Iron Age or Roman date) has been identified by geophysical survey immediately to the north-west of the study area, close to the village of Beckwithshaw (MNY 36364; Webb and Williams 2012).

Neither Pannal Ash nor the parish of Pannal occurs within the Domesday survey. At this time any settlement within the study area would have been located within the Manor of Beckwith with Rossett. Pannal High Ash, as it was also known was close to Castle Hill 'where tradition says Pendragon encamped with his army', although it is acknowledged that no trace of any fortification is visible.

Pannal Ash is situated in an area of common arable and meadow lands and closes. There is evidence of medieval Ridge and Furrow north of Beckwith Lodge Farm, 600m to the west of the PDA (MNY24840 and ENY3378).

Much of the present landscape pattern within the study area developed through the enclosure of land in the late 18th century, and the establishment of regularly surveyed field boundaries, and a network of new turnpike roads. Enclosure within the Forest of Knaresborough had begun by at least 1613 (and probably earlier on a small scale) when a survey was made for the enclosure of parts of the Forest.

In June to August 2018 ASWYAS conducted geophysical surveys in fields to the east, west and north of the current survey area. These results identified linear responses which were situated within an area names as Castle Hill (Freeman 2018, Trace 2018).

During November 2018 Archaeological Services WYAS carried out archaeological evaluation by trial trenching at Castle Hill Farm. Ten trenches were excavated and ten possible archaeological features were recorded within five trenches. The features were identified as former field boundaries, modern field drains, drainage ditches, a modern stone trackway and furrows (Govier 2019).

3 Aims and Methodology

The aims and objectives of the programme of geophysical survey were to gather sufficient information to establish the presence/absence, character and extent, of any archaeological remains within the specific area to inform an assessment of the archaeological potential of the site. 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 site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble R6 model). The survey was undertaken using Bartington Grad601 magnetic gradiometers. These were employed 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. The data was collected across the known and identified ridge and furrow, different for each field. As such grid north was adjusted for each field appropriately.

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 1:4000 with Figure 3 displaying an overall interpretation at the same scale. 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. Figure 10 shows the current and past data at a scale of 1:3000.

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).

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 9)

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 are concentrations of this magnetic disturbance along the edges of a number of the surveyed fields, likely to represent the build-up of plough soil. In addition to a number of sporadic isolated bipolar ferrous anomalies across the survey area.

Modern service pipes have been recorded in Field 4 whilst magnetic disturbance along the limits of the datasets are due to metal fencing within the boundaries. An area of magnetic disturbance in the north of Field 4 corresponds to a former field boundary and trees marked on old mapping dating from 1851 (NLS 2019).

Geological anomalies

The survey has detected low magnitude anomalies scattered throughout that have been interpreted as geological in origin. It is thought that the responses have been detected because of the variation in the composition and depth of the soils and deposits of superficial material in which they derive.

A curving response (**G1**) lies on the intersection of former field boundaries in the southwest of Field 3, it also lies at the end of a watercourse. It has been categorised as geological due to these factors, it is, however, possible that it is of an anthropogenic origin.

Agricultural anomalies

Former field boundaries have been identified in Fields 3 and 4 which correspond to Ordnance Survey First Edition mapping dating from 1851 and periodically removed until 1969 and the fields assumed their current configuration.

Field drains have been recorded throughout Field 1 and can be distinguished by their unique magnetic signature, giving a faintly dipolar response.

Possible archaeological anomalies

In Field 3 a linear anomaly (**P1**) has been identified as having a possible archaeological origin. It does not correspond with any former boundaries recorded in the cartographic evidence of the area although it is slightly aligned with a current boundary to the east. It is possible it is a boundary of medieval date due to its slight 's' shaped curve.

Linear ditch type response (**P2**) runs on the same alignment as the ridge and furrow in the area but is of a much stronger magnetic response. It also roughly aligns with a field boundary shown on the 1778 enclosure map.

A magnetically weak circular response (**P3**) can be seen in Field 4, immediately to the east of enclosure **A3**. It measures approximately 7m in diameter and may be associated with a ring ditch, however due to the strength of this feature this interpretation is tentative.

A cluster of anomalies (**P4**) include both positive and negative responses. The concentration of anomalies may represent an unenclosed settlement. Two negative linear trends are visible leading away from the cluster to the southeast. These measure approximately 33m apart and could be associated with foundations, perhaps representing garden walls, this is however speculative.

A strong magnetic response (**P5**) has been recorded to the east of Field 4. Its magnetic signature could indicate the presence of highly fired material, such as a kiln. However, due to its isolation another explanation such as modern ferrous material is also likely.

Archaeological anomalies

Linear ditch responses (**A1**) located in the northwest of Field 1 forms part of an enclosure which was part identified in the previous geophysical survey to the immediate north (Freeman 2018). It was originally interpreted as possible archaeology but now a full picture can be seen. Overall, the enclosure measures approximately 85m by 75m and is likely to be of a Romano-British date. It is situated on the prominence known as Castle Hill. Within the centre of the enclosure, a circular response (**A2**) has been recorded measuring approximately 16m in diameter these two features are likely to be contemporary with one another.

A second enclosure (**A3**) is located in the west of Field 4, the westernmost section of the enclosure fall out of the survey area, under Lady Lane. This measures approximately 70m along its north-south axis and at least 60m along its east-west axis.

5 Conclusions

The magnetic survey has detected anomalies of both an archaeological and potential archaeological origin in the forms of enclosures, linear ditches, ring ditches and areas of settlement. One of the enclosures is situated on a prominence known as ‘Castle Hill’.

Throughout the survey area magnetic anomalies, characteristic of agricultural practice, have been detected. These have been identified as former field boundaries, ridge and furrow and field drains.

Geological anomalies have also been identified which are likely to reflect the topography of the site and possible association with a water course. Ferrous material and magnetic

disturbance, caused by interference from boundaries and isolated responses are also present throughout.

Based on these results and interpretations the archaeological potential of the site is deemed to be high in the north and southwest and medium to low elsewhere.

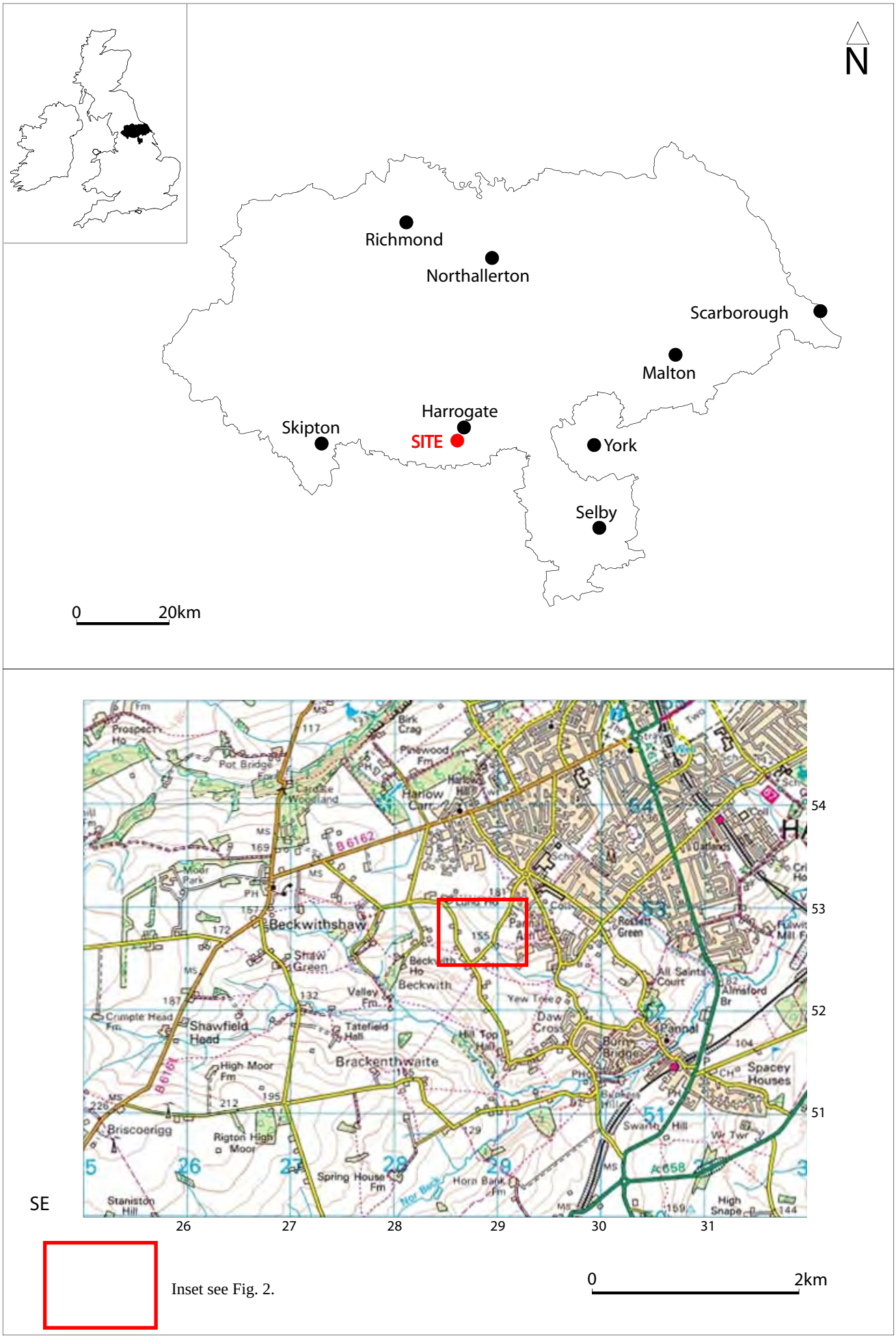

Fig. 1. Site location

PROJECT ID: 8840_WHN19	
	SURVEY AREA
	SECTOR BOUNDARY
1	PHOTO LOCATIONS
	UNSUITABLE FOR SURVEY

SECTOR 1
SEE FIGS 4-6

SECTOR 2
SEE FIGS 7-9

Field 1
Field 2
Field 3
Field 4

Path
Track
Drain
Boro Const Bdy
LADY LANE
WHINNEY LANE
CASTLE HILL DR
VIEW TREE GDNS
BARNWELL CRES
GREEN LA
THE DRIVE
YEW TREE LANE
ASHG A

War Meml
PW
178m
177m
161m
163m
159m
141m
Pav
College
Pannal Ash
Sports Centre
Castlehill Farm
Syke House Poultry Farm
Police Training Centre
Sports Ground
Pavilion
PO
PH
GP
Beckwith Head
Beckwith Lodge Farm
Bark Mill Cottage
Beckwith Cottage Farm
Beckwith Head Farm
Beckwith House
Lund House Green Farm
Lund House Green

N

453200
453000
452800
452600
452400

428200 428400 428600 428800 429000 429200 429400 429600

0 200m

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

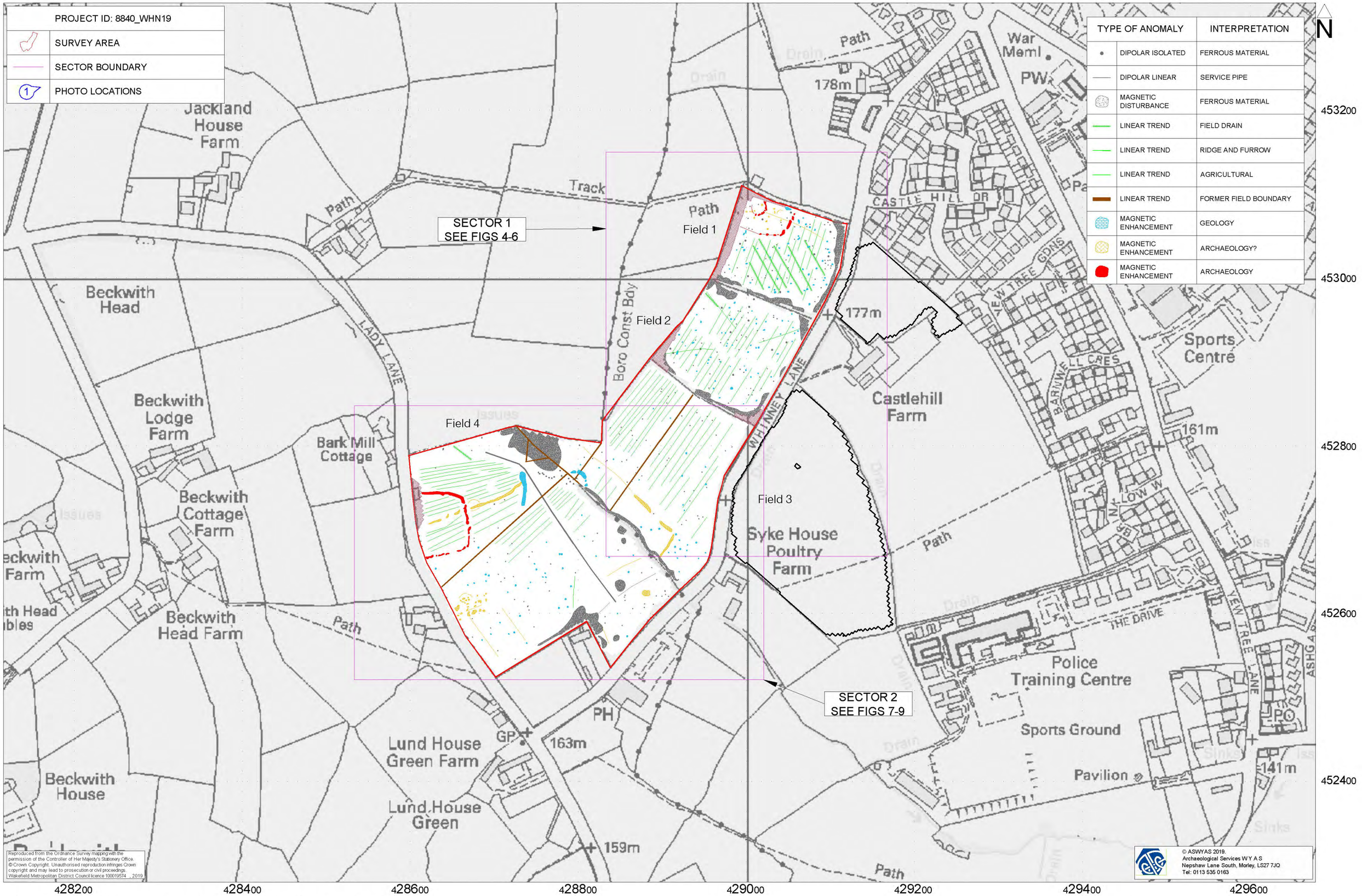

Fig. 3. Overall interpretation of magnetometer data (1:4000 @ A3)

PROJECT ID: 8840_WHN19

SECTOR BOUNDARY

N

Field 1

Field 2

Field 3

Path

Boro Const Bdy

WHINNEY LANE

177m

Drain

Drain

Syke House

Poultry

2.0

-1.0

nT

4530$_{00}$

4528$_{00}$

4290$_{00}$

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

0 50m

PROJECT ID: 8840_WHN19

SECTOR BOUNDARY

N

Path

Field 1

Field 2

Field 3

Boro Const Bdy

WHINNEY LANE

177m

Syke House

Poultry

15.0 nT/cm

4530 00

4528 00

4290 00

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0 50m

Fig. 5. XY trace plot of minimally processed magnetometer data; Sector 1 (1:1250 @ A3)

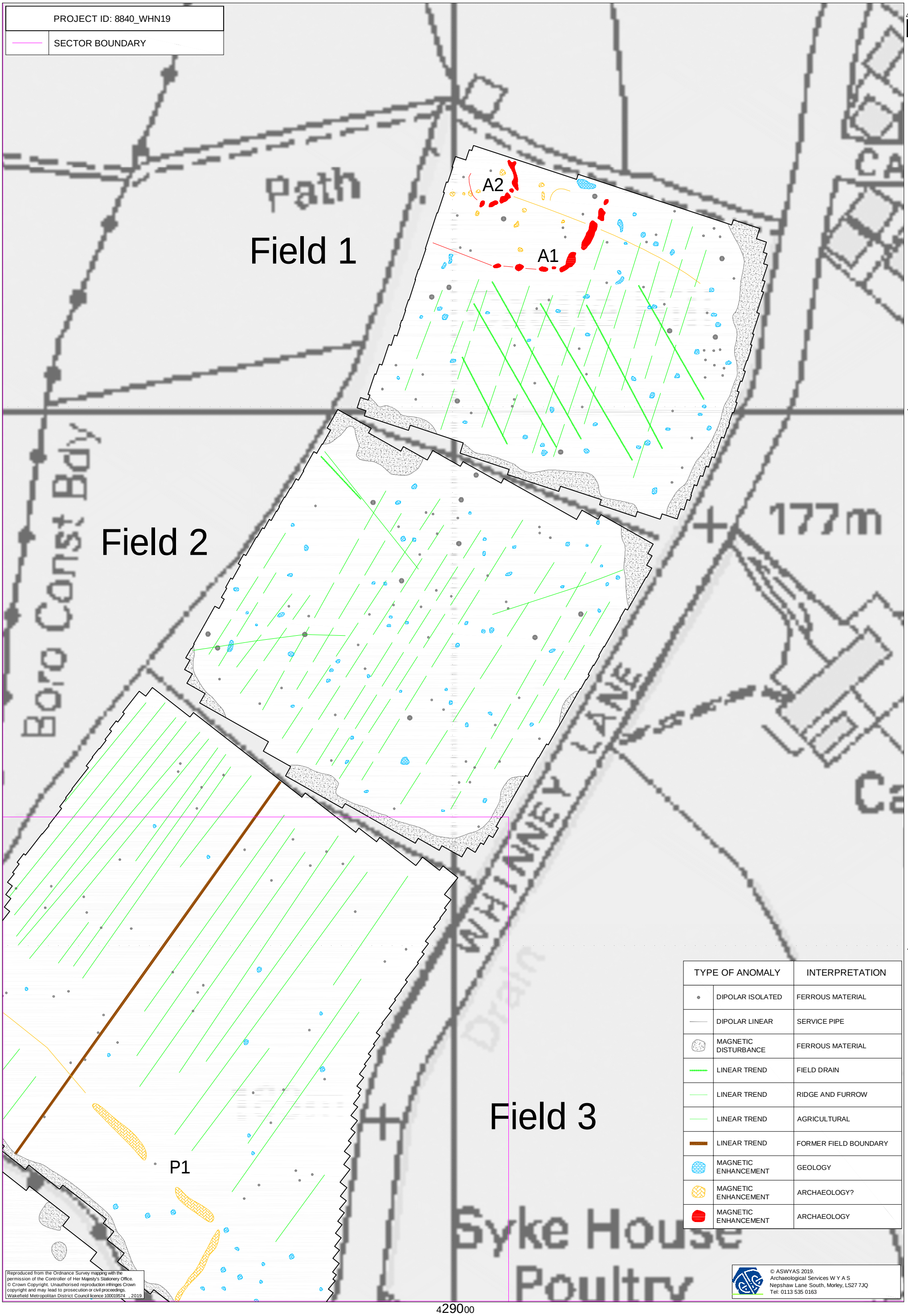

Fig. 6. Interpretation of magnetometer data; Sector 1 (1:1250 @ A3)

PROJECT ID: 8840_WHN19

SECTOR BOUNDARY

Field 4

N

452800

452600

428600

428800

429000

2.0

-1.0

nT

0

50m

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Fig. 7. Processed greyscale magnetometer data; Sector 2 (1:1250 @ A3)

PROJECT ID: 8840_WHN19

SECTOR BOUNDARY

Field 4

N

452800

452600

15.0 nT/cm

0 50m

4286 00

4288 00

4290 00

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Fig. 8. XY trace plot of minimally processed magnetometer data; Sector 2 (1:1250 @ A3)

PROJECT ID: 8840_WHN19

SECTOR BOUNDARY

Field 4

N

A3

P3

P2

G1

P1

P4

P5

TYPE OF ANOMALY		INTERPRETATION
	DIPOLAR ISOLATED	FERROUS MATERIAL
	DIPOLAR LINEAR	SERVICE PIPE
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	FIELD DRAIN
	LINEAR TREND	RIDGE AND FURROW
	LINEAR TREND	AGRICULTURAL
	LINEAR TREND	FORMER FIELD BOUNDARY
	MAGNETIC ENHANCEMENT	GEOLOGY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY

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452800

452600

428600

428800

429000

0 50m

Fig. 9. Interpretation of magnetometer data; Sector 2 (1:1250 @ A3)

Fig. 10. Overview showing current and past data (1:3000 @ A3)

Plate 1. General overview of field 1, facing north west

Plate 2. General overview of field 2, facing south west

Plate 3. General overview of field 3, facing south west

Plate 4. General overview of field 4, facing south east

Appendix 1: Magnetic survey - technical information

Magnetic Susceptibility and Soil Magnetism

Iron makes up about 6% of the Earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haemetite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms. 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 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.

The gradiometer data have been presented in this report in processed greyscale format. The data in the greyscale images have been interpolated and selectively filtered to remove the effects of drift in instrument calibration and other artificial data constructs and to maximise the clarity and interpretability of the archaeological anomalies.

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 CS2 and AutoCAD 2008) files; and
- a full copy of the report.

At present the archive is held by Archaeological Services WYAS although it is anticipated that it may eventually be lodged with the Archaeology Data Service (ADS). Brief details may also be forwarded for inclusion on the English Heritage Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the North Yorkshire Historic Environment Record).

Appendix 4: Oasis form

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: archaeol11-367899

Project details

Project name	Castle Hill West
Short description of the project	A geophysical (magnetometer) survey, was undertaken on approximately 12.5 hectares of land located to the west of Whinney Lane, Harrogate. Responses of both an archaeological and possible archaeological origin have been detected in the form of enclosures, areas of settlement, boundaries and ring ditches. Agricultural trends can be seen throughout the survey area in the form of ridge and furrow cultivation, field drains, and former field boundaries. Across the site, scattered isolated ferrous anomalies have been identified along with service pipes and areas of magnetic disturbance. Based on the results and interpretation of the data, the archaeological potential is considered to be high in the north and southwest and medium to low elsewhere.
Project dates	Start: 27-08-2019 End: 29-08-2019
Previous/future work	Yes / Not known
Any associated project reference codes	8840 - Sitecode
Type of project	Field evaluation
Monument type	ENCLOSURE Late Prehistoric
Significant Finds	ENCLOSURE Late Prehistoric
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)	Bowland Shale
Drift geology	CLAY WITH FLINTS
Techniques	Magnetometry

Project location

Country	England

Site location	NORTH YORKSHIRE HARROGATE HARROGATE Castle Hill West, Harrogate
Study area	12.6 Hectares
Site coordinates	SE 28866 52750 53.969821596393 -1.559905214454 53 58 11 N 001 33 35 W Point
Height OD / Depth	Min: 158m Max: 181m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Banks Property Ltd
Project design originator	Banks Property Ltd
Project director/manager	A. Trace
Project supervisor	A. Trace

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Banks Property Ltd
Digital Contents	"Survey"
Digital Media available	"Geophysics","Images raster / digital photography","Text"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Castle Hill West, harrogate
Author(s)/Editor(s)	Brunning, E
Date	2019
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	23 September 2019

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