ARCHAEOLOGICAL SERVICES WYAS

# Land at East Priorslee
# Telford
# Shropshire

## Geophysical Survey

Report no. 2617

May 2014

Client: The Environmental Dimension Partnership

# Land at East Priorslee
# Telford
# Shropshire

## Geophysical Survey

*Summary*

*A geophysical (magnetometer) survey covering 5.3 hectares was carried out in two areas on the north-eastern edge of East Priorslee, to provide further information on the archaeological resource and to inform the possible future development of the site. No anomalies of obvious archaeological potential have been identified adjacent to Watling Street Roman Road, although a linear anomaly may indicate a ditch. Further south, no anomalies have been detected in the vicinity of possible archaeological cropmarks although low magnitude anomalies, if present, may be masked within the prevailing elevated magnetic background. Elsewhere, anomalies have been identified which are due to a service pipe, a former pylon base, field drains and a possible former quarry pit or pond. On the basis of the geophysical survey, the archaeological potential of the site is considered to be low to moderate.*

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## Report Information

| | |
|---|---|
| Client: | The Environmental Dimension Partnership |
| Address: | Tithe Barn, Barnsley Park Estate, Barnsley, Cirencester, Gloucestershire, GL7 5EG |
| Report Type: | Geophysical Survey |
| Location: | East Priorslee |
| County: | Shropshire |
| Grid Reference: | SJ 724 108 and SJ 728 101 |
| Period(s) of activity: | Modern |
| Report Number: | 2617 |
| Project Number: | 4238 |
| Site Code: | EPR14 |
| OASIS ID: | archaeol11-180187 |
| Planning Application No.: | Pre-application |
| Museum Accession No.: | n/a |
| Date of fieldwork: | April - May 2014 |
| Date of report: | May 2014 |
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| Fieldwork: | Christopher Sykes BA MSc |
| | Alexander Schmidt BA |
| Report: | David Harrison |
| Illustrations: | David Harrison |
| Photography: | Christopher Sykes |
| Research: | n/a |

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



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# 1 Introduction

Archaeological Services WYAS (ASWYAS) was commissioned by Eddy Stratford of The Environmental Dimension Partnership (the Client), to undertake a geophysical (magnetometer) survey of two predefined areas on land proposed for possible future development at East Priorslee, Telford (see Fig. 1). The work was undertaken following consultation with Hugh Hannaford (Shropshire Council Senior Archaeological Projects Officer), in accordance with guidance contained within the National Planning Policy Framework (2012) and in line with current best practice (Institute for Archaeologists 2013; David *et al.* 2008). The survey was carried out on April 16th and May 13th 2014 to provide additional information on the archaeological resource of the site and inform proposals for possible future development.

**Site location, topography and land-use**

The Proposed Development Area (PDA) is situated east of Priorslee and north-east of Telford, Shropshire (see Fig. 2). It is bound to the north by the A5 Watling Street, to the west by a residential housing estate, by the B5060 Castle Farm Way to the south and south-west and by arable farmland to the east. Two defined areas, Area 1 and Area 2, were targeted by magnetometer survey. Area 1, centred on SJ 724 108, is bound to the north by Watling Street Roman Road. At the time of the survey, the site was under a low cereal crop (see Plate 1). Area 2, centred on SJ 728 101, was positioned so as to target possible archaeological cropmarks visible on aerial photographs. This area was under a high cereal crop at the time of the survey (see Plate 2).

The PDA lies on the southern side of a hill, known as Redhill, with Area 1 located on a south-west facing gradient at 168m above Ordnance Datum (aOD) and Area 2 located on a south-facing gradient at 150m aOD.

**Soils and geology**

The underlying bedrock comprises Aveley Member – mudstone and sandstone with no recorded superficial deposits (British Geological Survey 2014). The soils are classified in the Hodnet association, being characterised as fine and coarse loams with slowly permeable subsoils and slight seasonal waterlogging (Soil Survey of England and Wales 1983).

# 2 Archaeological Background

Whilst no designated heritage assets are recorded within the current survey areas the surrounding landscape is rich in heritage assets predominantly from the Roman period. The A5, which borders the north of Area 1, follows the line of a Roman road known as Watling Street. To the north of the road, and 200m north-east of the survey area is a Roman fort which

is designated as a scheduled monument (SA 188). To the south of the road and due east of the survey area is the Roman settlement/marching camp identified as the posting station of Uxacona, also designated as a scheduled monument (SA 201). Previous geophysical survey (ASWYAS 2006), to the immediate east of the current phase of work, identified a probable enclosure with numerous internal features (see Fig. 2). Prior to survey, therefore, the site was considered to have a moderate to high archaeological potential.

## 3 Aims, Methodology and Presentation

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

Specifically, the objectives of the geophysical survey were:

- to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- to therefore determine the presence/absence and extent of any buried archaeological features; and
- to prepare a report summarising the results of the survey.

**Magnetometer survey**

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble 5800 model). Bartington Grad601 magnetic gradiometers were used during the survey, taking readings at 0.25m intervals on zig-zag traverses 1.0m apart within 30m by 30m grids, so that 3600 readings were recorded in each grid. These readings were stored in the memory of the instrument and later downloaded to computer for processing and interpretation. Geoplot 3 (Geoscan Research) software was used to process and present the data. Further details are given in Appendix 1.

**Reporting**

A general site location plan, incorporating the 1:50000 Ordnance Survey (OS) mapping, is shown in Figure 1. A large scale (1:5000) survey location plan is provided as Figure 2. The processed and minimally processed data, together with interpretation graphics of the survey results are presented in Figures 3 to 8 inclusive, at a scale of 1:1000.

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

The survey methodology, report and any recommendations comply with guidelines outlined by English Heritage (David *et al.* 2008) and by the Institute for Archaeologists (IfA 2013). 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

**Area 1** (see Figs 3, 4 and 5)

Generally, a low level of background magnetic variation has been recorded across Area 1. Several anomalies have been identified within this background. The most obvious anomaly is the broad area of high magnitude magnetic disturbance, **A**, within the centre of the dataset. This anomaly corresponds to the former site of an electricity pylon as depicted on modern OS maps. The magnetic disturbance is probably due to the buried foundations and footings of the former pylon. To the west and south of this anomaly a series of 'speckled' linear anomalies are caused by field drains. The field drains manifest in a 'herring-bone' arrangement which is typical of modern drainage practices. North of the former pylon, **A**, a low magnitude sub-rectangular area of magnetic enhancement, **B**, is thought to be caused by a large in-filled pit, perhaps a former quarry or pond. Elsewhere, several localised areas of magnetic enhancement have been identified. Generally, these are isolated anomalies which form no clear archaeological pattern and they are thought to be due to variations in the composition of the soils from which they derive. However, within the north of the survey area, a vague and fragmentary linear anomaly, **C**, has been ascribed a potential archaeological interpretation given the close proximity to Watling Street Roman Road. It is possible that this anomaly may indicate a soil-filled ditch, although a geological origin is equally plausible.

North/south aligned parallel linear trends are caused by modern ploughing, whilst the remaining anomalies are caused by random ferrous material, either within the plough-soil or forming part of the adjacent field boundaries.

**Area 2** (see Figs 6, 7 and 8)

The background magnetic variation within Area 2 is markedly different to that observed within Area 1 with the data being elevated and containing a plethora of ferrous 'spike' anomalies which give the data a 'speckled' appearance throughout. The reason for this disparity is not clear although it is thought possible that magnetically enhanced material has been imported and spread throughout the topsoil. Any weaker, low magnitude anomalies of archaeological potential, if present, may be masked within this background, although there is

no reason within the data to assume that this is the case. A former field boundary, visible on the first edition OS map, on a north-west/south-east orientation has not been detected by the survey and no anomalies of archaeological potential have been identified.

The high magnitude linear anomaly, **D**, within the east of the survey area is caused by a buried service pipe.

## 5 Conclusions

No anomalies of obvious archaeological potential have been identified in either of the two survey areas. A vague linear anomaly has been ascribed some archaeological potential given its close proximity to Watling Street Roman Road, perhaps being due to a soil-filled ditch, although this interpretation is tentative and a geological cause is possible. No anomalies have been identified which might explain the origins of the cropmarks which are recorded within the east of the proposed development area (Area 2). However, it has been noted that low-magnitude anomalies of archaeological potential, if present, may remain beyond detection within the elevated background response which is recorded in this part of the site. The only other anomalies of note include a possible former quarry pit or pond, field drains and a modern service pipe.

Therefore, based upon the results of the geophysical survey, the archaeological potential of the two survey areas is assessed as being low to moderate.

***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.***

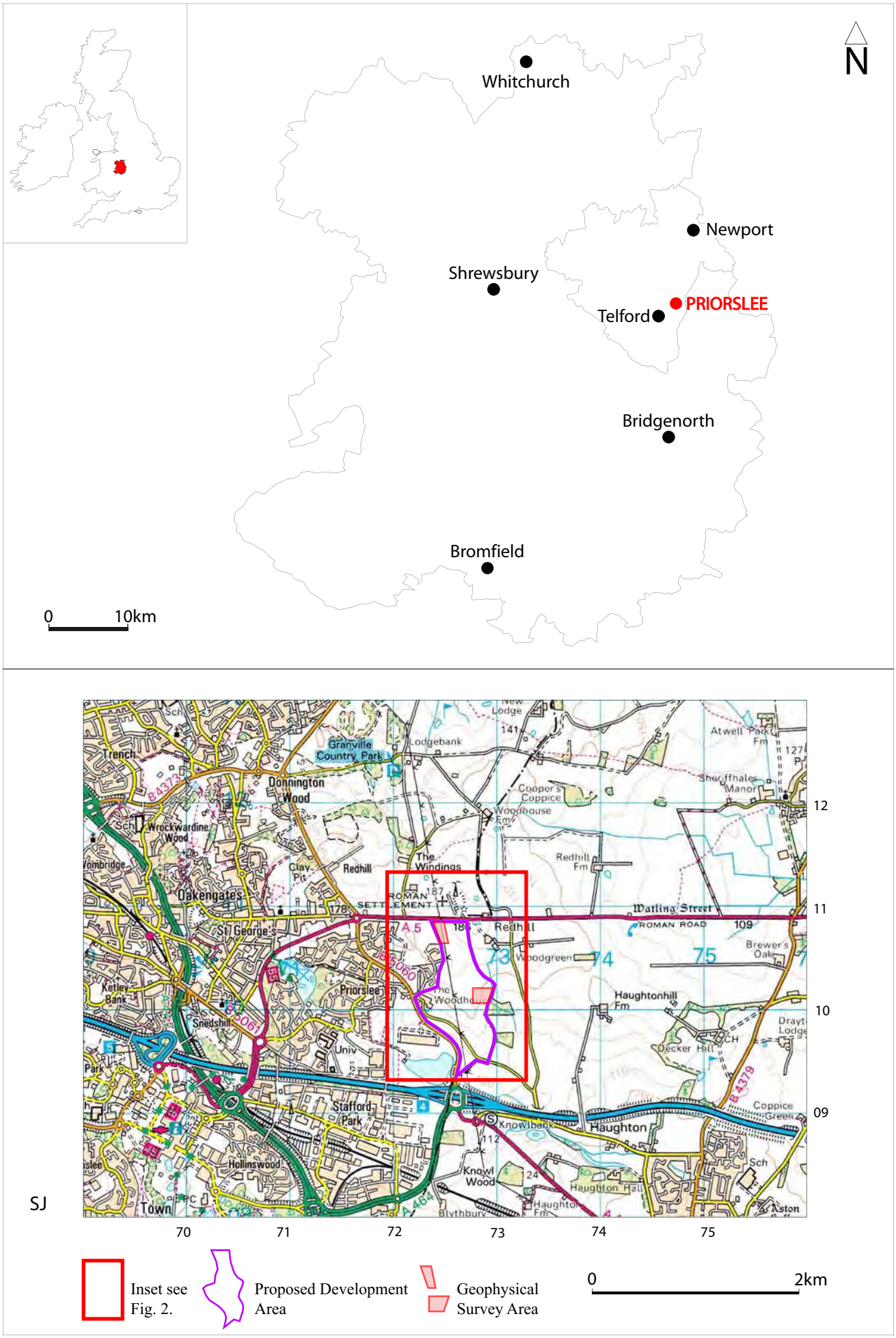




*Fig. 1. Site location*

| | |
|---|---|
| | PROPOSED DEVELOPMENT BOUNDARY |
| | GEOPHYSICAL SURVEY BOUNDARY |
| | PREVIOUS GEOPHYSICAL SURVEY BOUNDARY |
| | SCHEDULED MONUMENT |
| 1 | LOCATION AND DIRECTION OF PLATES |

N

AREA 1
SEE FIGS 3-5

AREA 2
SEE FIGS 6-8

WATLING STREET (A5)

3110 00

3100 00

3720 00

3730 00

2.0
-1.0
nT

0 100m



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*Fig. 2. Survey location showing proposed development area and greyscale magnetometer data (1:5000 @ A3)*

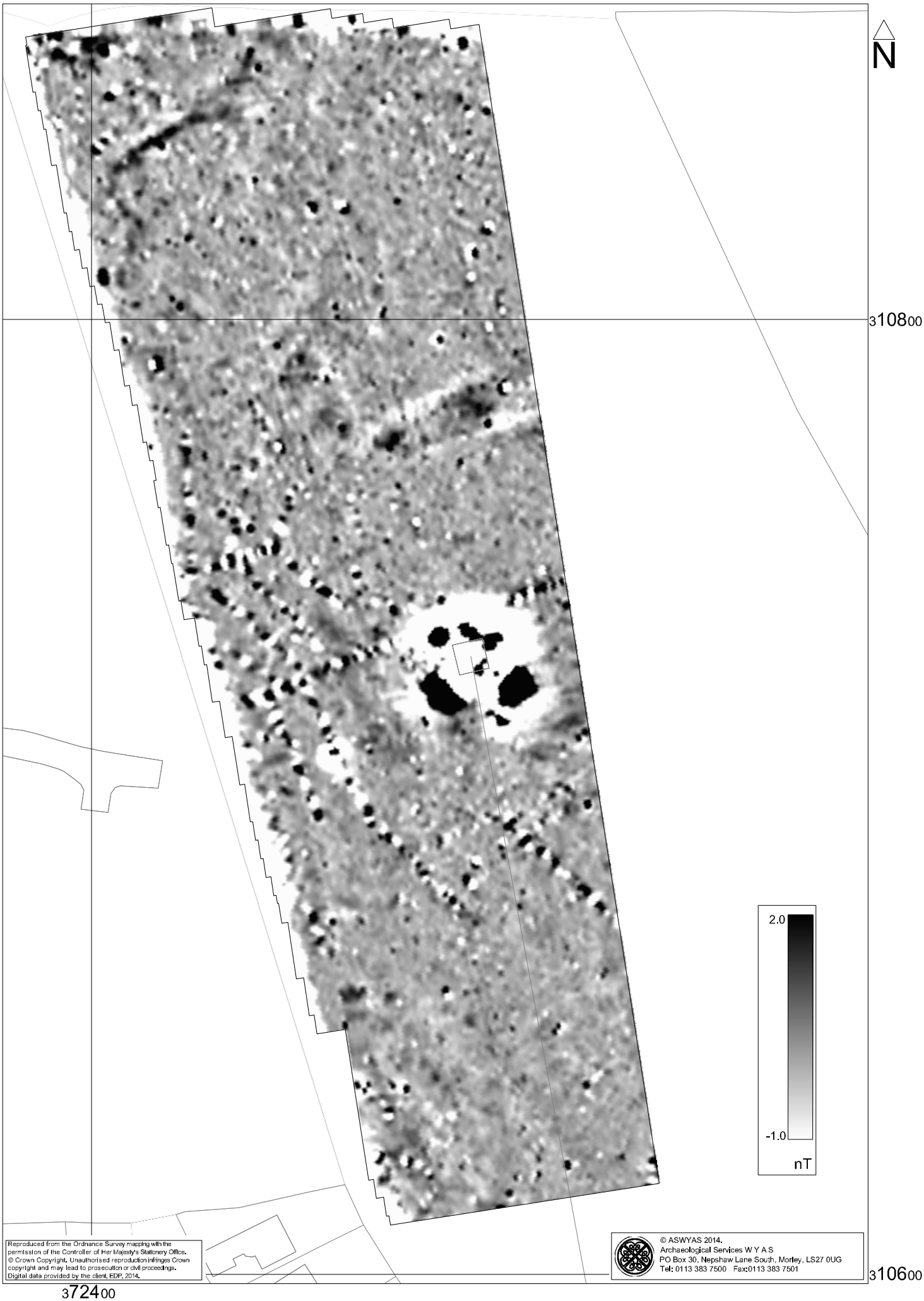


*Fig. 3. Processed greyscale magnetometer data; Area 1 (1:1000 @ A4)*


*Fig. 4. XY trace plot of minimally processed magnetometer data; Area 1 (1:1000 @ A4)*

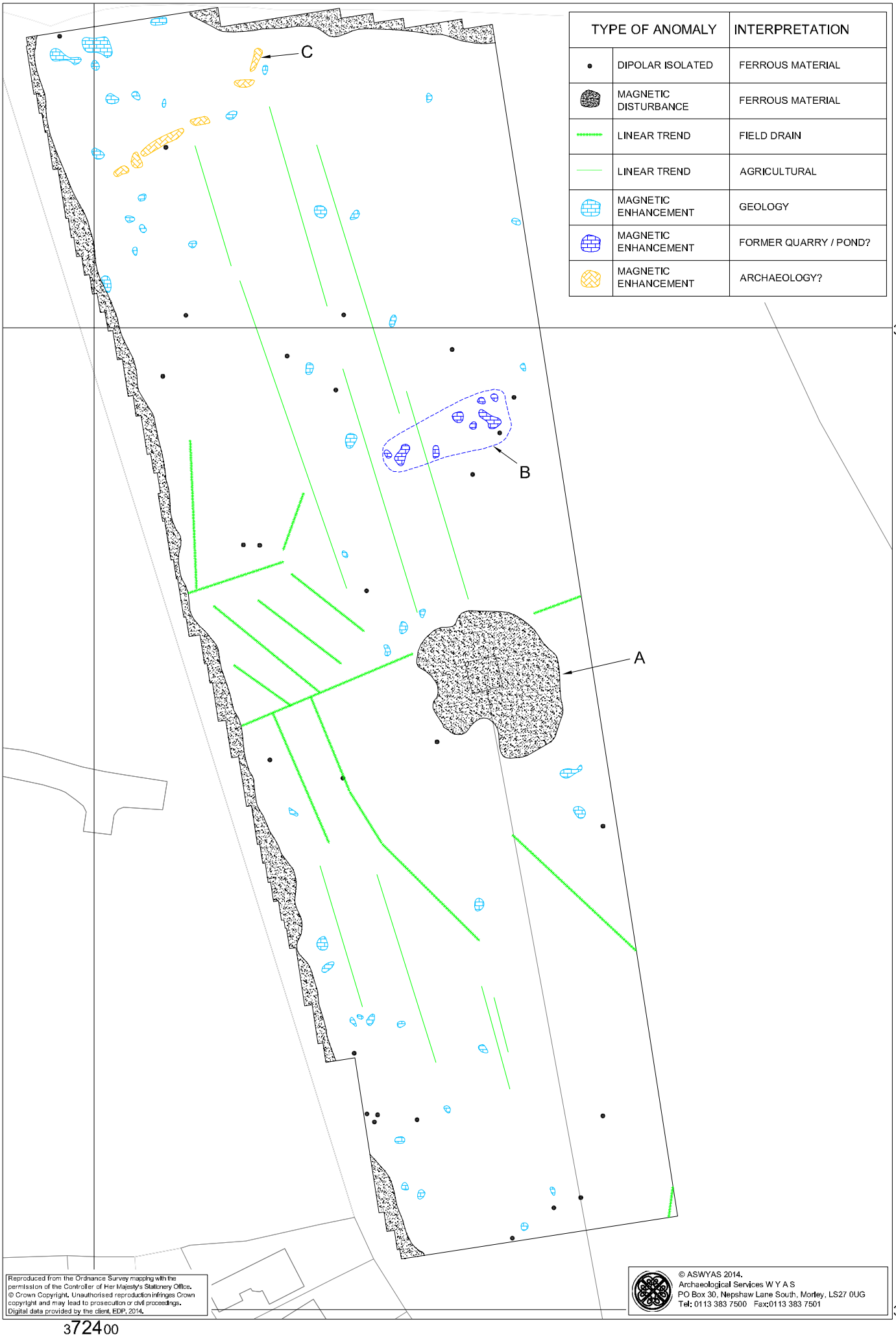


*Fig. 5. Interpretation of magnetometer data; Area 1 (1:1000 @ A4)*

N

3102 00

Issues

Wards
Roughs

2.0

-1.0

nT




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3728 00

3730 00

0 40m

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

N

3102 00

23.9 nT/cm

Issues

Wards
Roughs

3728 00

3730 00

0 40m




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*Fig. 7. XY trace plot of minimally processed magnetometer data; Area 2 (1:1000 @ A3)*

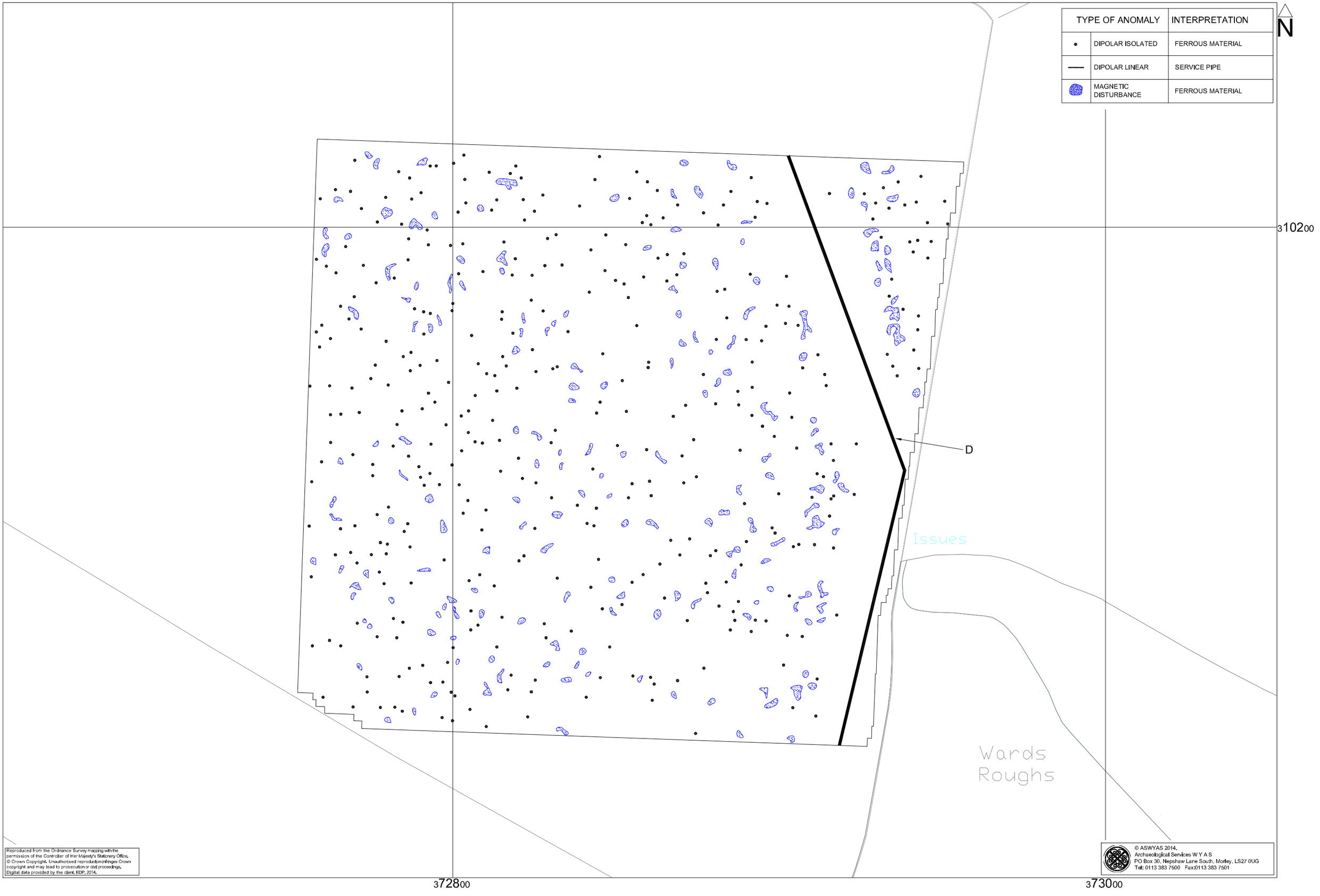


*Fig. 8. Interpretation of magnetometer data; Area 2 (1:1000 @ A3)*

## 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 so that by measuring the magnetic susceptibility of the topsoil, areas where human occupation or settlement has occurred can be identified by virtue of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected. The magnetic susceptibility of a soil can also be enhanced by the application of heat and the fermentation and bacterial effects associated with rubbish decomposition. The area of enhancement is usually quite large, mainly due to the tendency of discard areas to extend beyond the limit of the occupation site itself, and spreading by the plough. An advantage of magnetic susceptibility over magnetometry is that a certain amount of occupational activity will cause the same proportional change in susceptibility, however weakly magnetic is the soil, and so does not depend on the magnetic contrast between the topsoil and deeper layers. Susceptibility survey is therefore able to detect areas of occupation even in the absence of cut features. On the other hand susceptibility survey is more vulnerable to the masking effects of layers of colluvium and alluvium as the technique, using the Bartington system, can generally only measure variation in the first 0.15m of ploughsoil.

### Types of Magnetic Anomaly

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

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

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

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

*Isolated dipolar anomalies (iron spikes)*

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

*Areas of magnetic disturbance*

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

*Linear trend*

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

*Areas of magnetic enhancement/positive isolated anomalies*

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

*Linear and curvilinear anomalies*

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

**Methodology: Magnetic Susceptibility Survey**

There are two methods of measuring the magnetic susceptibility of a soil sample. The first involves the measurement of a given volume of soil, which will include any air and moisture that lies within the sample, and is termed volume specific susceptibility. This method results in a bulk value that it not necessarily fully representative of the constituent components of the sample. For field surveys a Bartington MS2 meter with MS2D field loop is used due to its speed and simplicity. The second technique overcomes this potential problem by taking into account both the volume and mass of a sample and is termed mass specific susceptibility. However, mass specific readings cannot be taken in the field where the bulk properties of a soil are usually unknown and so volume specific readings must be taken. Whilst these values are not fully representative they do allow general comparisons across a site and give a broad indication of susceptibility changes. This is usually enough to assess the susceptibility of a site and evaluate whether enhancement has occurred.

**Methodology: Gradiometer Survey**

There are two main methods of using the fluxgate gradiometer for commercial evaluations. The first of these is referred to as ***magnetic scanning*** and requires the operator to visually identify anomalous responses on the instrument display panel whilst covering the site in widely spaced traverses, typically 10m apart. The instrument logger is not used and there is therefore no data collection. Once anomalous responses are identified they are marked in the field with bamboo canes and approximately located on a base plan. This method is usually employed as a means of selecting areas for detailed survey when only a percentage sample of the whole site is to be subject to detailed survey.

The disadvantages of magnetic scanning are that features that produce weak anomalies (less than 2nT) are unlikely to stand out from the magnetic background and so will be difficult to detect. The coarse sampling interval means that discrete features or linear features that are parallel or broadly oblique to the direction of traverse may not be detected. If linear features are suspected in a site then the traverse direction should be perpendicular (or as close as is possible within the physical constraints of the site) to the orientation of the suspected features. The possible drawbacks mentioned above mean that a ‘negative’ scanning result should be validated by sample detailed magnetic survey (see below).

The second method is referred to as ***detailed survey*** and employs the use of a sample trigger to automatically take readings at predetermined points, typically at 0.25m intervals, on zig-zag traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation. Detailed survey allows the visualisation of weaker anomalies that may not have been detected by magnetic scanning.

During this survey a Bartington Grad601 magnetic gradiometer was used taking readings on the 0.1nT range, at 0.25m intervals on zig-zag traverses 0.5m apart within 30m by 30m

square grids. The instrument was checked for electronic and mechanical drift at a common point and calibrated as necessary. The drift from zero was not logged.

**Data Processing and Presentation**

The detailed gradiometer data has been presented in this report in XY trace and greyscale formats. In the former format the data shown is 'raw' with no processing other than grid biasing having been done. The data in the greyscale images has been interpolated and selectively filtered to remove the effects of drift in instrument calibration and other artificial data constructs and to maximise the clarity and interpretability of the archaeological anomalies.

An XY plot presents the data logged on each traverse as a single line with each successive traverse incremented on the Y-axis to produce a 'stacked' plot. A hidden line algorithm has been employed to block out lines behind major 'spikes' and the data has been clipped. The main advantage of this display option is that the full range of data can be viewed, dependent on the clip, so that the 'shape' of individual anomalies can be discerned and potentially archaeological anomalies differentiated from 'iron spikes'. Geoplot 3 software was used to create the XY trace plots.

Geoplot 3 software was used to interpolate the data so that 3600 readings were obtained for each 30m by 30m grid. The same program was used to produce the greyscale images. All greyscale plots are displayed using a linear incremental scale.

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

The site grid was laid out using a Trimble dual frequency Global Positioning System (GPS) with two Rovers (Trimble 5800 models) working in real-time kinetic mode. The accuracy of such equipment was better than 0.02m. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if co-ordinates are measured off for relocation purposes.

***Archaeological Services WYAS cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.***

## Appendix 3: Geophysical archive

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2000), and graphics files (Adobe Illustrator CS2 and AutoCAD 2008) files; and
- a full copy of the report.

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

## Bibliography

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