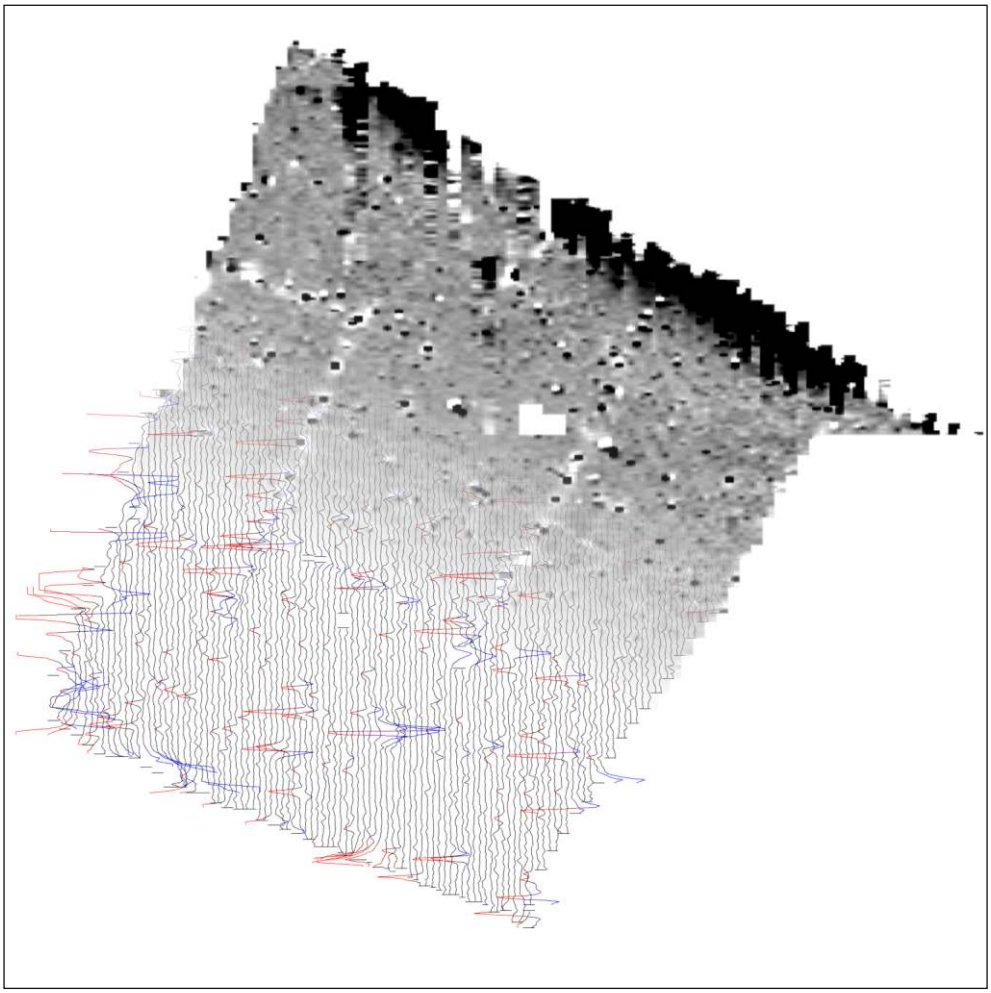
making sense of heritage

Land at Foreman Road Ash, Surrey

Detailed Gradiometer Survey Report



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geoservices

Land at Foreman Road
Ash, Surrey

Detailed Gradiometer Survey Report

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Summary

A detailed gradiometer survey was conducted over land at Foreman Road, Ash, Surrey, (NGR 490109 150635) with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features on the site ahead of proposed residential development. The project was commissioned by Persimmon Homes Southern.

The survey area consists of a single large field subdivided into many smaller paddocks; it is used for pasture. The gradiometer survey was undertaken between 2nd and 3rd October 2014 using a Bartington Grad 601-2 magnetometer, and has demonstrated the presence of several anomalies of possible archaeological interest along with a large amount of ferrous, agricultural activity in the form of ploughing, some trends of uncertain origin and a modern service.

The site is heavily disturbed by numerous field subdivisions and a large amount of ferrous material. Apart from some small sub-oval pits or possible short sections of ditch, very few anomalies of archaeological potential have been identified in these areas; the anomalies identified are of uncertain origin and they have been interpreted as being of possible archaeological interest, however, it is possible that they relate to agricultural activity or geological processes.

Land at Foreman Road
Ash, Surrey

Detailed Gradiometer Survey Report

Acknowledgements

The detailed gradiometer survey was commissioned by Persimmons Homes Southern. The assistance of Mark Hendy is gratefully acknowledged in this regard.

The fieldwork was undertaken by Rachel Chester and Alistair Salisbury. Ben Urmston processed the geophysical data which was interpreted by Genevieve Shaw. The report was written by Genevieve Shaw. The geophysical work was quality controlled by Dr. Paul Baggaley, and Ben Urmston. Illustrations were prepared by Richard Milwain. The project was managed on behalf of Wessex Archaeology by Sue Farr.

Land at Foreman Road
Ash, Surrey

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology (WA) was commissioned by Persimmon Homes Southern to carry out a geophysical survey on land at Foreman Road, Ash, Surrey (**Figure 1**), hereafter "the Site" (centred on NGR 490109, 150635). The survey forms part of an ongoing programme of archaeological works being undertaken in support of a detailed planning application for the residential development of the Site.

1.1.2 The aim of the geophysical survey was to establish the presence/absence, extent and character of detectable archaeological remains within the survey area. The survey was commissioned as the Site is within an area of known archaeological potential with a medieval moated manor site immediately to the south.

1.1.3 This report presents a brief description of the methodology followed, the detailed survey results and the archaeological interpretation of the geophysical data.

1.2 Site location and topography

1.2.1 The survey area measures approximately 3.8 hectares and consists of a single large field which has been subdivided into smaller paddocks using wooden and electric fencing. The area is currently used for grazing (**Figure 1**).

1.2.2 The Site is bounded to the north-east by a railway line, to the east by a water channel or leat that supplies the moat at Manor Farm, to the south by a current field boundary and to the west by Foreman Road. Wooden and metal/electric fencing separates the Site into 12 smaller areas.

1.2.3 The topography is generally level at an elevation of approximately 81m above Ordnance Datum (aOD). The Site encompasses 3.8ha, of which a total of 3.45ha was surveyable; this reduced area was due to the presence of internal field boundaries.

1.3 Soils and geology

1.3.1 The bedrock geology under the Site is recorded as the London Clay formation, though in the very north-west corner of the Site is a small area mapped as Bagshot Formation. There are no superficial deposits recorded at the Site (BGS).

1.3.2 The soils underlying most of the Site are likely to be typical stagnogley soils of the 711g (Wickham 3) association (SSEW 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts suitable for the detection of archaeological remains through magnetometer survey.

1.4 Archaeological background

1.4.1 There are no designated or recorded archaeological sites within the proposed development area. In the immediate vicinity to the south of the development area are four Grade II Listed Buildings comprising the medieval moated site of Ash Manor with an associated oast house, stable and barn to the south-east and Ashe Grange to the south-west. The Site appears on Ordnance Survey mapping as one enclosed field with no internal boundaries or buildings within it (Ordnance Survey 1871-1886).

1.4.2 Ash Manor is a medieval moated manor house dating to the early 16th century with a later part of the house dating to 1657 (NMR No: SU 95 SW 18). The 16th century structure is timber framed and the house stands on a moated site. The moat itself is a single wide ditch enclosure surrounding a rectangular platform or 'island' on three sides with the entrance to the west side. It is not clear whether the moat completely surrounded the platform but was later filled in and altered; moats not fully surrounding the 'island' are much rarer (CBA 1978). The moat is fed by a leat or water channel which borders and defines the eastern side of the proposed development area. To the east and south are two ponds, the larger of which to the south has a further water channel/drain running west to the listed building of Ashe Grange.

1.4.3 Associated with Ash Manor are a timber framed former barn dating to the 17th century and a brick-built oast house and stable of late 18th century date (NMR No: SU 95 SW 17).

2 METHODOLOGY

2.1 Introduction

2.1.1 The detailed magnetometer survey was conducted using a Bartington Grad 601-2 dual fluxgate gradiometer system. The survey was conducted in accordance with English Heritage guidelines (English Heritage 2008).

2.1.2 The geophysical survey was undertaken by WA's in-house geophysics team between 2nd and 3rd October 2014. Field conditions at the time of the survey were reasonable, although the fragmented nature of the Site made survey more complex.

2.2 Method

2.2.1 Individual survey grid nodes were established at 30m x 30m intervals using a Leica Viva RTK GNSS instrument, which is precise to approximately 0.02m and therefore exceeds English Heritage recommendations (2008).

2.2.2 The magnetometer survey was conducted using a Bartington Grad601-2 fluxgate gradiometer instrument, which has a vertical separation of 1m between sensors. Data were collected at 0.25m intervals along transects spaced 1m apart with an effective sensitivity of 0.03nT, in accordance with EH guidelines (2008). Data were collected in the zigzag method.

2.2.3 Data from the survey was subject to minimal data correction processes. These comprise a zero mean traverse function (±5nT thresholds) applied to correct for any variation between the two Bartington sensors used, and a de-step function to account for variations in traverse position due to varying ground cover and topography. These two steps were applied to all survey areas, with no interpolation applied.

2.2.4 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

3 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

3.1 Introduction

3.1.1 The gradiometer survey has been successful in identifying a few anomalies of possible archaeological interest across the Site, along with one modern service. Results are presented as a series of greyscale and XY plots, with corresponding archaeological interpretations, at a scale of 1:1000 (**Figures 2** to **4**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale and ±25nT at 25nT per cm for the XY trace plots.

3.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends (**Figure 4**). Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.

3.1.3 Numerous ferrous anomalies are visible throughout the detailed survey dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.

3.2 Gradiometer survey results and interpretation

3.2.1 There are no anomalies of definite archaeological or probable archaeological interest, although several weak, irregular shaped positive anomalies have been identified, which have been characterised as of possible archaeological interest. They are possibly the remains of cut features such as sections of ditches or pits, and are located at **4000**, **4001**, **4002** and to the west of **4003** (**Figure 4**).

3.2.2 There are several weak, ephemeral linear trends across the Site, such as at **4003**, which could possibly be archaeological in origin but cannot be characterised further due to their lack of contrast with the magnetic background. Remaining anomalies are in the form of ploughing trends visible across the Site, especially at **4004** and **4005**, and predominantly orientated north-west to south-east, which are probably post-medieval or modern in origin.

3.2.3 The Site is subdivided into numerous small rectangular enclosures delineated by wire and wooden fencing that can be seen clearly as they have been surveyed as separate areas. The largest area, containing **4001**, **4002** and **4007**, has numerous ferrous anomalies in linear orientations that subdivide the area into rectangular enclosures; these internal subdivisions are likely to be modern in origin.

3.2.4 There are large concentrations of ferrous especially to the north of the Site at **4001**, **4005** and **4006** in response to the railway line which forms the northern boundary of the Site, and similar densities were noted towards the farm buildings to the south. This is likely to relate to spreads of modern debris.

3.2.5 Whilst ploughing trends are visible in some of the enclosures that have lower concentrations of ferrous, in other areas any weaker responses of archaeological potential will be masked by the much stronger ferrous response.

3.3 Gradiometer survey results and interpretation: modern services

3.3.1 One modern service has been identified at **4006** in the northeast corner of the Site, and probably continues beyond the Site boundary.

3.3.2 It is not clear from the geophysical data whether the services identified are in active use. It should also be noted that gradiometer survey may not detect all services present on Site. This report and accompanying illustrations should not be used as the sole source for

service locations and appropriate equipment (e.g. CAT and Genny) should be used to confirm the location of buried services before any trenches are opened on Site.

4 CONCLUSION

4.1.1 The detailed gradiometer survey has been successful in detecting some anomalies of possible archaeology as well as identifying ploughing and agricultural trends, a large amount of magnetic disturbance and one modern service.

4.1.2 The anomalies of possible archaeological interest are not concentrated in any one area but are spread across the Site; they take the form of sub-oval or irregular shaped positive anomalies and are very weak. Examples are at **4000** – **4002** and to the west of **4003**. Internal subdivisions have been identified in the largest area surveyed containing **4001**, **4002** and **4007**; these are thought to be modern in origin as they are oriented in the same direction as the current internal subdivisions. Several weak, linear and curvilinear trends and ploughing trends were also noted.

4.1.3 The relative dimensions of the modern services identified by the gradiometer survey are indicative of the strength of their magnetic response, which is dependent upon the materials used in their construction and the backfill of the service trenches. The physical dimensions of the services indicated may therefore differ from their magnetic extents in plan; it is assumed that the centreline of services is coincident with the centreline of their anomalies, however. Similarly, it is difficult to estimate the depth of burial of the services through gradiometer survey.

4.1.4 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It may therefore be the case that more archaeological features may be encountered than have been identified through geophysical survey. Few anomalies of archaeological potential have been identified due to the strong magnetic response from modern services, wire fencing and areas of ferrous debris. The archaeological potential in these areas is considered low with few archaeological features surviving.

5 REFERENCES

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5.2 Cartographic sources

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APPENDIX 1: SURVEY EQUIPMENT AND DATA PROCESSING

Survey Methods and Equipment

The magnetic data for this project was acquired using a Bartington 601-2 dual magnetic gradiometer system. This instrument has two sensor assemblies fixed horizontally 1m apart allowing two traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1m separation, and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of 0.03nT over a ±100nT range, and measurements from each sensor are logged at intervals of 0.25m. All of the data are stored on an integrated data logger for subsequent post-processing and analysis.

Wessex Archaeology undertakes two types of magnetic surveys: scanning and detail. Both types depend upon the establishment of an accurate 20m or 30m site grid, which is achieved using a Leica Viva RTK GNSS instrument and then extended using tapes. The Leica Viva system receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by English Heritage (2008) for geophysical surveys.

Scanning surveys consist of recording data at 0.25m intervals along transects spaced 10m apart, acquiring a minimum of 80 data points per transect. Due to the relatively coarse transect interval, scanning surveys should only be expected to detect extended regions of archaeological anomalies, when there is a greater likelihood of distinguishing such responses from the background magnetic field.

The detailed surveys consist of 20m x 20m or 30m x 30m grids, and data are collected at 0.25m intervals along traverses spaced 1m apart. These strategies give 1600 or 3600 measurements per 20m or 30m grid respectively, and are the recommended methodologies for archaeological surveys of this type (EH, 2008).

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.125m intervals along traverses spaced up to 0.25m apart, resulting in a maximum of 28800 readings per 30m grid, exceeding that recommended by English Heritage (2008) for characterisation surveys.

Post-Processing

The magnetic data collected during the detail survey are downloaded from the Bartington system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

As the scanning data are not as closely distributed as with detailed survey, they are georeferenced using the GPS information and interpolated to highlight similar anomalies in adjacent transects. Directional trends may be removed before interpolation to produce more easily understood images.

Typical data and image processing steps may include:

- Destripe – Applying a zero mean traverse in order to remove differences caused by directional effects inherent in the magnetometer;
- Destagger – Shifting each traverse longitudinally by a number of readings. This corrects for operator errors and is used to enhance linear features;
- Despike – Filtering isolated data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings (generally only used for earth resistance data)

Typical displays of the data used during processing and analysis:

- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies.
- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.

APPENDIX 2: GEOPHYSICAL INTERPRETATION

The interpretation methodology used by Wessex Archaeology separates the anomalies into four main categories: archaeological, modern, agricultural and uncertain origin/geological.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Probable archaeology – used for features which give a clear response but which form incomplete patterns.
- Possible archaeology – used for features which give a response but which form no discernible pattern or trend.

The modern category is used for anomalies that are presumed to be relatively modern in date:

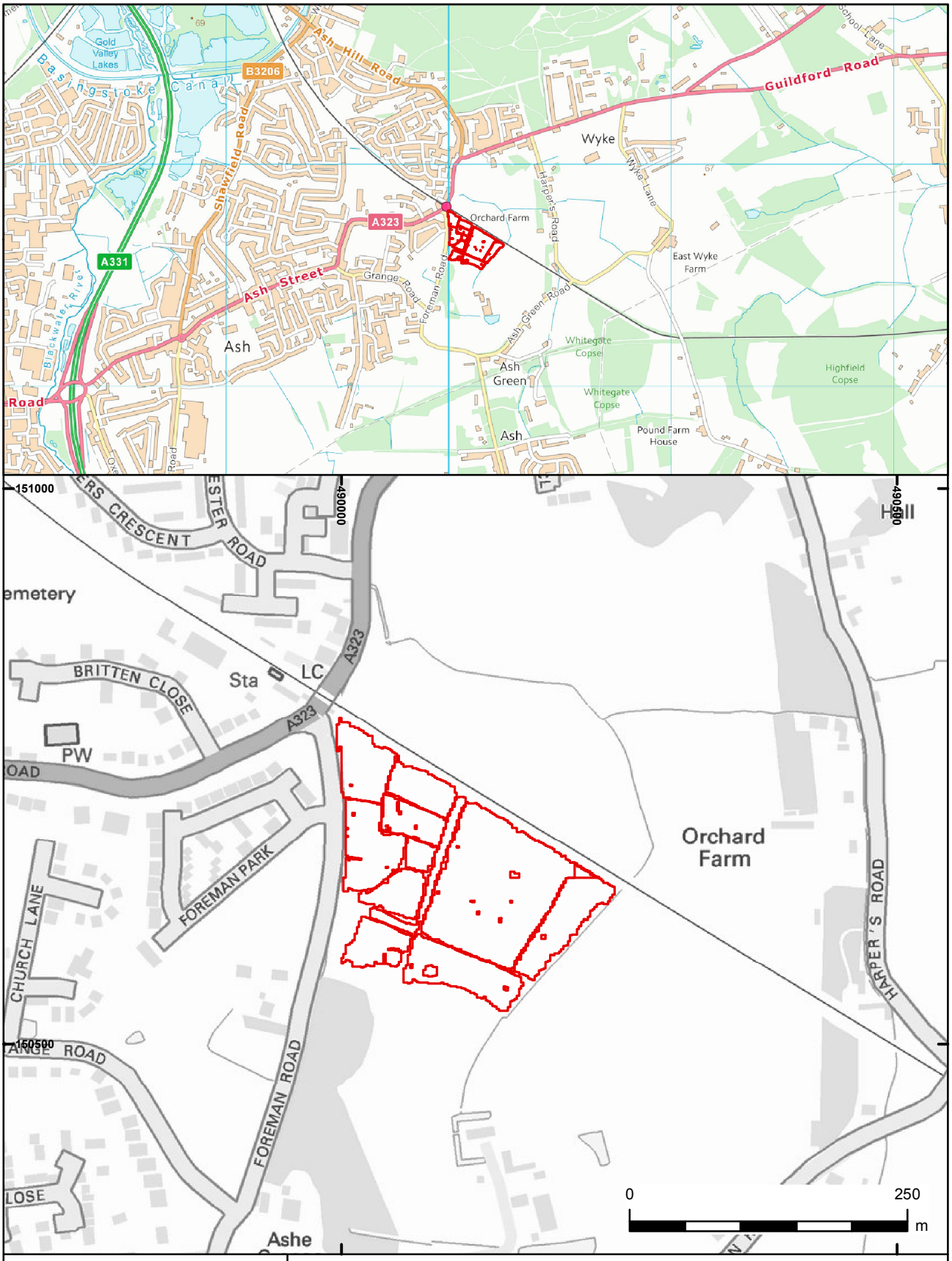
- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be observed.

The agricultural category is used for the following:

- Former field boundaries – used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Agricultural ditches – used for ditch sections that are aligned parallel to existing boundaries and former field boundaries that are not considered to be of archaeological significance.
- Ridge and furrow – used for broad and diffuse linear anomalies that are considered to indicate areas of former ridge and furrow.
- Ploughing – used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage – used to define the course of ceramic field drains that are visible in the data as a series of repeating bipolar (black and white) responses.

The uncertain origin/geological category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Superficial geology – used for diffuse edged spreads considered to relate to shallow geological deposits. They can be distinguished as areas of positive, negative or broad bipolar (positive and negative) anomalies.



Survey Extents

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Path:	X:\PROJECTS\105750\GIS\FigsMXD\105750_Fig01.mxd		

Site location and survey extents

Figure 1

Survey Extents

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Greyscale

Figure 2

490000

490200

150800

150600

+25nT

-25nT

0 50 m

Survey Extents

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Scale:	1:1250 at A3	Illustrator:	RAM
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XY trace

Figure 3

Date:	24/10/14	Revision Number:	0
Scale:	1:1250 at A3	Illustrator:	RAM
Path:	X:\PROJECTS\105750\GIS\FigsMXD\105750_Fig04.mxd		

Interpretation

Figure 4

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