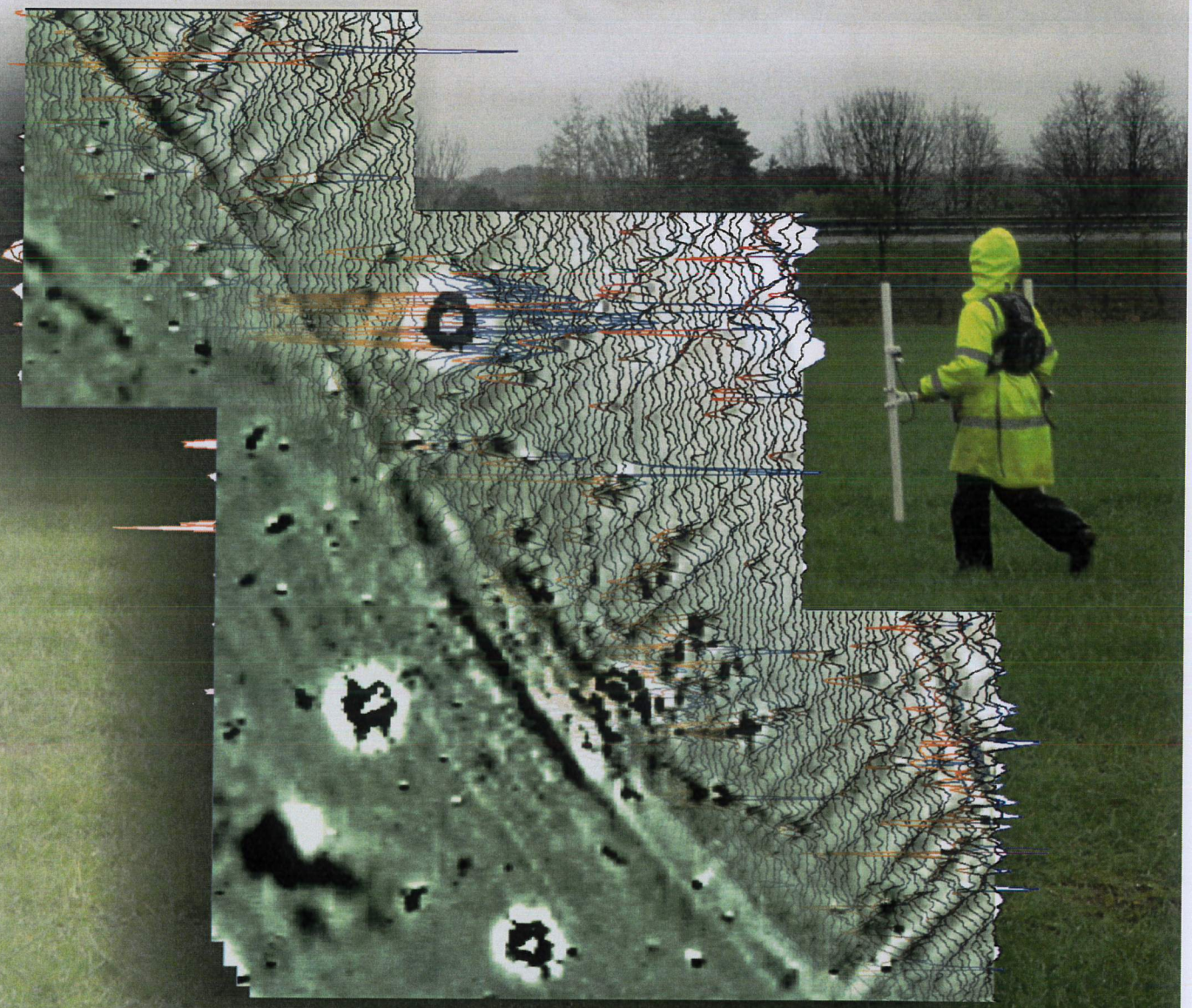
Wessex Archaeology

Land to the West of Southam Road, Banbury, Oxfordshire

Recorded Scanning and Detailed Gradiometer Survey Report



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Wessex Archaeology

LAND TO THE WEST OF SOUTHAM ROAD BANBURY OXFORDSHIRE

Recorded Scanning and Detailed Gradiometer Survey Report

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QUALITY ASSURANCE

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LAND TO THE WEST OF SOUTHAM ROAD BANBURY OXFORDSHIRE

Recorded Scanning and Detailed Gradiometer Survey Report

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LAND TO THE WEST OF SOUTHAM ROAD BANBURY OXFORDSHIRE

Recorded Scanning and Detailed Gradiometer Survey Report

Summary

A recorded scanning and detailed gradiometer survey was conducted over land to the west of Southam Road, near Banbury, Oxfordshire. The project was commissioned by Cantium Developments Ltd. on behalf of their client Hargreaves Management Ltd. with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features on the site ahead of proposed development.

The site comprises two fields approximately 2km north of Banbury, immediately south of Banbury Crematorium. The survey areas occupy a gentle southwest-facing slope and were under arable cultivation at the time of survey. The recorded scanning survey covered approximately 17.9ha; the detailed gradiometer survey covered 5.6ha and has demonstrated the presence of anomalies of definite, probable and possible archaeological interest within the survey areas.

Anomalies consistent with former field boundaries were identified across the site in close proximity to traces of ridge and furrow and other ploughing trends. Given the location of the site immediately west of the Deserted Medieval Village (DMV) at Hardwick Farm, it is likely that phases of the field systems are associated with the DMV.

Several clusters of anomalies appear across the northern portion of the survey area, and are consistent with linear and pit-like anomalies and are of probable or possible archaeological interest. Three anomalies towards the west of the survey area are consistent with burnt or fired features, although it is not clear whether they are modern or historic in origin.

A number of regions of probable changes in the underlying geology have been identified, notably towards the north and south of the site.

LAND TO THE WEST OF SOUTHAM ROAD
BANBURY
OXFORDSHIRE

Recorded Scanning and Detailed Gradiometer Survey Report

Acknowledgements

The geophysical surveys were commissioned on behalf of Hargreaves Management Ltd. and the assistance of Chris Boulter of Cantium Developments Ltd. is gratefully acknowledged in this regard. The assistance of the County Archaeologist, Richard Oram, is also gratefully noted.

The fieldwork was directed by Sarah Mounce and assisted by Michael Hartwell, Martin Huggon and Charlie Hay. Ben Urmston processed and interpreted the geophysical data in addition to writing this report. The geophysical work was quality controlled by Dr. Paul Baggaley. Illustrations were prepared by Kitty Foster. The project was managed on behalf of Wessex Archaeology by Katharine Barber.

LAND TO THE WEST OF SOUTHAM ROAD BANBURY OXFORDSHIRE

Recorded Scanning and Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by Cantium Developments Ltd. on behalf of their client Hargreaves Management Ltd. to carry out geophysical surveys of land to the west of Southam Road, Banbury, Oxfordshire (**Figure 1**), hereafter "the Site" (centred on NGR 445300 243050). The survey forms part of an ongoing programme of archaeological works being undertaken ahead of proposed development.

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.

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

1.2 The Site

1.2.1 The survey area comprises two fields to the west of Southam Road, approximately 2km north of Banbury, Oxfordshire, southwest of the M40 motorway. Recorded scanning survey was undertaken over all accessible parts of the Site, a total of 17.9ha. Detailed gradiometer survey was targeted upon anomalies identified through the results of the recorded scanning survey and other previously known features of archaeological interest.

1.2.2 The Site occupies a gentle southwest-facing incline on the southern flank of Hardwick Hill, sloping from 115m aOD at the northeast to 90m aOD at the southwest. The survey areas were bound to the east by the A423, to the west by a brook, and by field boundaries to the north and south.

1.2.3 A Heritage Assessment has been prepared by Wessex Archaeology (WA 2011), which outlines the known heritage resources at the Site, a major component of which is the Deserted Medieval Village (DMV) at Hardwick Farm.

1.2.4 The soils underlying the Site are likely to be the typical stagnogleys of the 711f (Wickham 2) association (SSEW 1983). Soils in such geological settings have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.

2 METHODOLOGY

2.1 Introduction

2.1.1 The geophysical surveys were conducted using a Bartington Grad601-2 dual fluxgate gradiometer system. The survey was conducted in accordance with EH guidelines (2008).

2.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between 16th and 26th April 2012. Field conditions at the time of the survey were acceptable, with the majority of the survey area under short crop.

2.2 Method

2.2.1 Individual survey grid nodes were established at 20m x 30m intervals for the recorded scanning survey and at 30m x 30m intervals for the detailed gradiometer survey. A Leica Viva RTK GNSS system was used, which is precise to approximately 0.02m and therefore exceeds English Heritage recommendations (2008).

2.2.2 The geophysical surveys were 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 Results from the geophysical surveys are presented as a series of greyscale and XY plots at a scale of 1:2000 (**Figures 2** to **4**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale image 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 5**). 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 Recorded Scanning Survey Results

3.2.1 The results of the recorded scanning survey indicate a generally quiet magnetic background, with a number of regions containing responses of possible archaeological interest.

3.2.2 In the westernmost field, a linear band of anomalies is oriented NW-SE, with further anomalies to the east. Several large ferrous anomalies are also apparent.

3.2.3 In the larger eastern field, anomalies of possible interest appear throughout, largely concentrated to the north and west. A probable former field boundary extends approximately E-W across the centre of the field, with apparent linear anomalies to the north and south of it

3.2.4 Areas for detailed gradiometer survey were positioned to investigate the nature of the responses of possible interest identified within the scanning data, and to sample regions with fewer such responses, considered to be less likely to be of archaeological interest.

3.3 Detailed Gradiometer Survey Results and Interpretation

3.3.1 In the westernmost field, sinuous anomaly **4000** is coincident with a topographic bank and a rectangular region of increased response lies in close proximity to the west. Linear and curvilinear trends relating to ridge and furrow exist to the east and appear to respect **4000**, suggesting that this anomaly forms a ploughing headland or former field boundary.

3.3.2 East of **4000**, a complex of anomalies **4001** is of probable archaeological interest. Although the responses are somewhat ferrous in nature and amorphous in plan, it is possible that they relate to a former structure.

3.3.3 Linear anomalies **4002** oriented approximately NW-SE extend out of the western boundary of the survey area, and are consistent with ditches.

3.3.4 Amorphous anomaly **4003** is strongly magnetised and its response indicates it may be relatively deeply buried. Whilst it may be modern ferrous debris, an archaeological origin cannot be excluded.

3.3.5 Linear anomalies **4004** and **4005** lie along the eastern edge of the survey area. Given that they are oriented parallel with the extant boundary to the east, they are likely to represent a former boundary or ploughing headland.

3.3.6 Large ferrous anomalies **4006**, **4007** and **4008** are similar in character and plan. The origins of these anomalies are unclear, and consequently they have been interpreted as being of possible archaeological interest.

3.3.7 Towards the northwestern extent of the eastern field, a series of linear and discrete anomalies **4009** lies within a region of variable magnetic background, consistent with near-surface changes in the underlying geology or pedology. A somewhat more definite linear anomaly **4010** lies to the east and, although it is aligned parallel with ploughing trends, it is of possible archaeological interest given the increased response.

3.3.8 Strong ploughing trends are seen in the vicinity of **4009** and **4010**, and are consistent with ridge and furrow oriented NW-SE, with further ploughing trends on other alignments.

3.3.9 At the centre of the eastern field, linear ditch **4011** is conspicuous by its well-defined response and approximate E-W orientation. It is possible that it represents part of a field boundary, although this is considered unlikely given the response of **4012** to the south, which comprises a series of linear anomalies interspersed with ferrous responses. **4012** can be traced to the southwest and east, representing a continuation of these boundaries across this part of the site.

3.3.10 To the southwest of **4012**, a magnetised region is consistent with changes in the near-surface geology. Given the strength of the response, it is possible that weaker archaeological features may have been masked, should any such features have been present.

3.3.11 Linear anomalies **4013**, to the north of **4011**, are relatively well-defined although their responses are not definitively archaeological in nature. Given their proximity, it is possible that they are associated with **4011**.

3.3.12 A cluster of pit-like anomalies **4014** coincide with an area of strong trends relating to ridge and furrow. Whilst consistent with pits, their origin cannot be determined conclusively.

3.3.13 Further linear anomalies **4015** are seen towards the northeastern extent of the survey area, which may be of archaeological interest.

3.3.14 At the northernmost extent of the survey, linear anomalies **4016** are coincident with a region of increased magnetic response. Whilst the origin of this region is unclear, the linear anomalies may prove to be of some archaeological interest.

3.3.15 Immediately to the west, linear anomaly **4017** is characteristic of a modern service, although it is not clear what its purpose is.

3.3.16 Towards the southernmost extent of the survey, isolated anomaly **4018** is of possible archaeological interest. It lies at the northern edge of a region of probable variable geology, and its response suggests it may be deeply buried.

3.3.17 Within the eastern survey areas, strong ploughing trends consistent with ridge and furrow are evident. The majority of these are oriented NW-SE, although further ridge and furrow anomalies in the northern part of the survey area are aligned approximately E-W. With at least three separate phases of ploughing visible within the detailed gradiometer data, it is likely that some of the better defined ploughing trends may relate to former boundaries or headlands.

3.3.18 Elsewhere, isolated pit-like anomalies and faint linear and curvilinear trends appear within the dataset. Whilst it is possible that these anomalies are archaeological in origin, it is also conceivable that some are the result of chance alignments within the data or the result of agricultural activity.

4 CONCLUSION

4.1.1 The recorded scanning survey was successful in identifying areas of possible interest to target for detailed gradiometer survey. It is interesting to note that former field boundaries in both fields are well represented in the scanning data, and that regions of possible archaeological activity are relatively obvious.

4.1.2 Detailed gradiometer survey has been successful in detecting a number of anomalies of definite, probable and possible archaeological interest within the Site, in addition to regions of increased magnetic response. Detailed survey has also confirmed the basic interpretation of the recorded scanning data.

4.1.3 The general impression from the results of the detailed gradiometer survey is a widespread network of field systems, indicated by probable field boundaries and the remnants of ridge and furrow and later ploughing. Some of these boundaries are indicated by low earthworks visible at the surface, e.g. **4000**, and other anomalies appear to connect extant boundaries, e.g. **4012**.

4.1.4 Given the proximity of the Site to the DMV at Hardwick Farm, it is likely that elements of these field systems are of a similar date and are probably associated with the former settlement.

4.1.5 Elsewhere, other anomalies are consistent with linear and pit-like features, although little coherency can be determined in the distribution. Clusters of these anomalies can be seen across the northern portion of the survey area, e.g. **4009**, **4010**, **4013**, and **4016**. In particular, anomalies **4016** are unusual in character and may be modern in origin, given their coincidence with widespread increased magnetic response.

4.1.6 Strongly magnetised anomalies **4006** to **4008** are consistent with features with thermoremnant magnetisation, suggesting that they may be burnt or fired. It is difficult to ascribe even a relative date to these anomalies and they may be modern in origin.

5 REFERENCES

English Heritage, 2008. *Geophysical Survey in Archaeological Field Evaluation*. Research and Professional Service Guideline No 1, 2nd edition.

Soil Survey of England and Wales, 1983. *Sheet 6, South East England*. Ordnance Survey, Southampton.

Wessex Archaeology, 2011. *Land to the West of Southam Road, Banbury, Oxfordshire: Heritage Assessment*. Report 79070.01

6 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.

7 APPENDIX 2: GEOPHYSICAL INTERPRETATION

The interpretation methodology used by Wessex Archaeology separates the anomalies into two main categories: archaeological and unidentified responses.

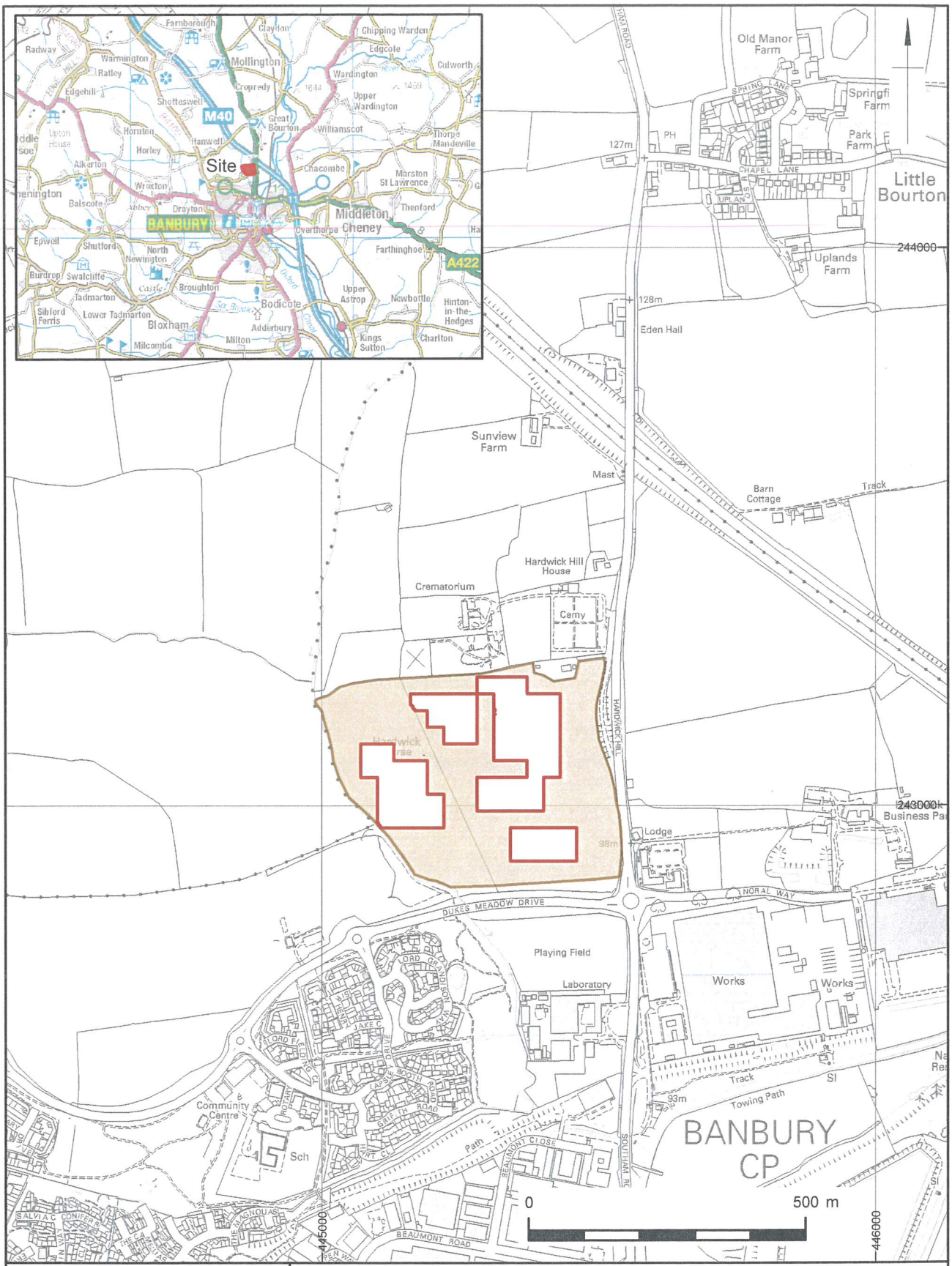
The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided 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 discernable pattern or trend.

The unidentified 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.
- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.

Finally, services such as water pipes are marked where they have been identified.



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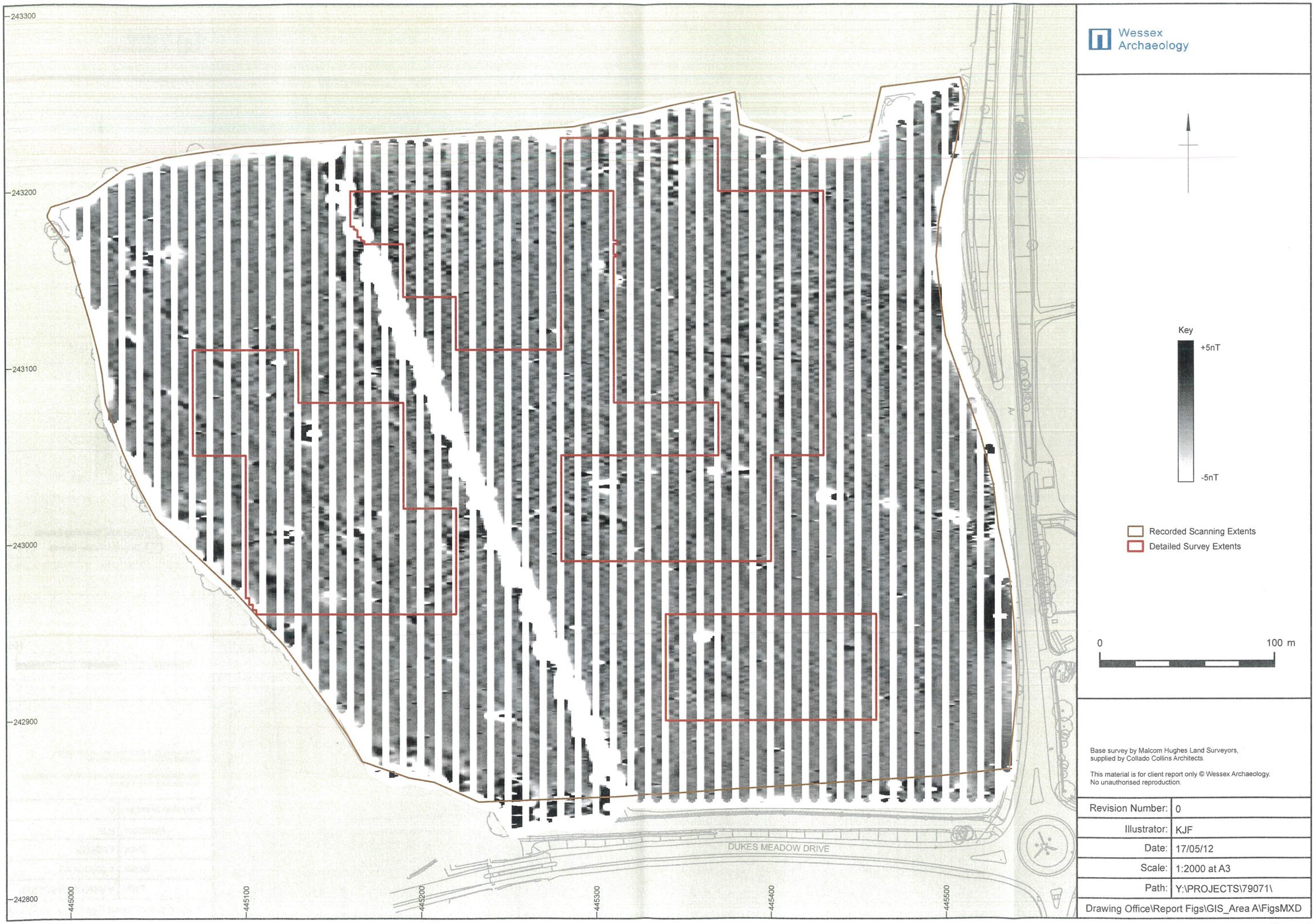
Site location and survey extents

Figure 1



Recorded scanning: greyscale

Figure 2

243300
243200
243100
243000
242900
242800
445000
445100
445200
445300
445400
445500
DUKES MEADOW DRIVE

Wessex Archaeology

Key
+3nT
-2nT

Recorded Scanning Extents
Detailed Survey Extents

0 100 m

Base survey by Malcom Hughes Land Surveyors, supplied by Collado Collins Architects.

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Detailed gradiometer survey: greyscale

Figure 3

Wessex Archaeology

Key

+25nT

-25nT

Recorded Scanning Extents

Detailed Survey Extents

0 100 m

Base survey by Malcom Hughes Land Surveyors, supplied by Collado Collins Architects.

Revision Number:	0
Illustrator:	KJF
Date:	17/05/12
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Detailed gradiometer survey: XY trace

Figure 4

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243300
243200
243100
243000
242900
242800

445000
445100
445200
445300
445400
445500

4000
4001
4002
4003
4004
4005
4006
4007
4008
4009
4010
4011
4012
4013
4014
4015
4016
4017
4018

DUKES MEADOW DRIVE

Recorded Scanning Extents
Detailed Survey Extents
Archaeology
Probable archaeology
Possible archaeology
Increased magnetic response
Ferrous
Superficial geology
Modern service
Trend
Ploughing

0 100 m

Base survey by Malcom Hughes Land Surveyors, supplied by Collado Collins Architects.

Revision Number:	0
Illustrator:	KJF
Date:	17/05/12
Scale:	1:2000 at A3
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Detailed gradiometer survey: interpretation

Figure 5