making sense of heritage

Land off Portway Lane Warminster, Wiltshire

Detailed Gradiometer Survey Report

Ref: 100350.01
July 2013

geoservices

Land off Portway Lane
Warminster, Wiltshire

Detailed Gradiometer Survey Report

Prepared for:
Selwood Housing
Bryer Ash Business Park
Bradford Road
Trowbridge
BA14 8RT

Prepared by:
Wessex Archaeology
Portway House
Old Sarum Park
Salisbury
SP4 6EB

www.wessexarch.co.uk

July 2013

Report Ref. 100350.01

Quality Assurance

Project Code		**Accession Code**		**Client Ref.**	
Planning Application Ref.		**Ordnance Survey (OS) national grid reference (NGR)**	387210 145720		

Version	Status*	Prepared by	Checked and Approved By	Approver's Signature	Date
v01	E	*BCU*	*PAB*		25/06/2013
File:	X:\PROJECTS\100350\Geophysics\Report\100350_Geophysics_Report.Docx				
File:					
File:					
File:					
File:					

* I = Internal Draft; E = External Draft; F = Final

Land off Portway Lane
Warminster, Wiltshire

Detailed Gradiometer Survey Report

Contents

Figures

Land off Portway Lane
Warminster, Wiltshire

Detailed Gradiometer Survey Report

Summary

A detailed gradiometer survey was conducted over land off Portway Lane in Warminster, Wiltshire. The project was commissioned by Selwood Housing with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features on the site ahead of a proposed development.

The site comprises a grassed area within a modern housing development to the north of Portway Lane, approximately 700m north of the centre of Warminster. The site occupies the base of Arn Hill Down, a prominent hill to the north of Warminster, sloping gently downwards towards the river Were to the southwest. The gradiometer survey covered 0.2 ha and has demonstrated the presence of several modern services within the survey area.

Modern services were identified along the perimeters of the survey area oriented parallel with the elements of the housing estate. Whilst it is not possible to determine the function of these services, the responses produced are sufficiently characteristic to indicate their locations.

The dataset shows extensive magnetic disturbance that relates to the modern services and the construction of the modern housing estate; whilst a number of individual ferrous anomalies are visible, no anomalies of archaeological interest were identified. The strength of the magnetic disturbance is sufficient to have masked any weaker anomalies, although the extent of the modern intrusion is likely to have resulted in the truncation of any archaeological features, should any be present.

Land off Portway Lane
Warminster, Wiltshire

Detailed Gradiometer Survey Report

Acknowledgements

The detailed gradiometer survey was commissioned by Selwood Housing. The assistance of Mick Latham is gratefully acknowledged in this regard.

The fieldwork was conducted by Jennifer Smith and Clara Dickinson. 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 Linda Coleman. The project was managed on behalf of Wessex Archaeology by Ben Urmston.

Land off Portway Lane Warminster, Wiltshire

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by Selwood Housing to carry out a geophysical survey of land off Portway Lane in Warminster, Wiltshire (**Figure 1**), hereafter "the Site" (centred on NGR 387210 145720). The survey forms part of an ongoing programme of archaeological works being undertaken ahead of proposed development at 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.

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 The Site

1.2.1 The survey area comprises an area of pasture land within a modern housing development off Portway Lane, some 700m north of the centre of Warminster (**Figure 1**). Detailed gradiometer survey was undertaken over all accessible parts of the Site, a total of 0.2 ha.

1.2.2 The Site occupies the lower slopes of Arn Hill Down, a prominent hill to the north of Warminster. Lying at approximately 115m above Ordnance Datum, it overlooks the shallow valley of the river Were close by to the southwest. The survey area was located a short distance northeast of Portway Lane and was bordered on all sides by modern houses adjacent to Epping Close, Savernake Close and Portway Lane.

1.2.3 The soils underlying the Site are likely to comprise humic rendzinas of the 341 (Icknield) association and grey rendzinas of the 342a (Upton 1) association (SSEW 1983). Soils derived from such geological parent material 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 detailed magnetometer survey was conducted using a Bartington Grad601-2 dual fluxgate gradiometer system. The survey was conducted in accordance with English Heritage guidelines (2008) and the Institute for Archaeologists' standards and guidance (2011).

2.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team on 10th June 2013. Field conditions at the time of the survey were good, with the survey area being under closely mown grass.

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 (±15nT thresholds) applied to correct for any variation between the two Bartington sensors used, deslope to correct for mismatches between adjacent grids 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 number of modern services along with widespread magnetic disturbance. Results are presented as a series of greyscale and XY plots, and archaeological interpretations, at a scale of 1:500 (**Figure 1**). The data are displayed at -20nT (white) to +30nT (black) for the greyscale image and 50nT/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 1**). 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 The dataset is characterised by strong magnetic disturbance throughout, although a number of anomalies can be identified.

3.2.2 In the western portion of the survey area, strong ferrous anomalies **4000** can be seen, which are likely to relate to modern ferrous debris. Similar responses can be seen towards the eastern extent of the survey at **4001**.

3.2.3 An amorphous region of strong ferrous anomalies **4002** is evident towards the northern extent of the survey. This cluster is likely to relate to an extended spread of magnetic debris, although it is possible that it is associated with a modern service.

3.2.4 Responses characteristic of modern services can be seen along each perimeter of the survey area, e.g. **4003**, **4004**, **4005** and **4006** along the northern, western, southern and eastern extents respectively. Whilst the majority of these responses lies outside the

boundaries of the survey area, the magnitude of the anomalies is typical of such services, which are coincident with paving slabs at the surface.

4 CONCLUSION

4.1.1 The detailed gradiometer survey has been successful in detecting anomalies associated with modern services, along with a number of discrete responses likely to be associated with modern magnetic debris.

4.1.2 No anomalies of archaeological interest were identified, although several weak magnetic trends can be seen on varying orientations. Given the levels of noise with the general magnetic background, it is considered likely that these trends are associated with chance alignments in the dataset; it is possible that they relate to buried features although the extents of magnetic disturbance suggest that these would likely be modern in origin.

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 The extent of magnetic disturbance associated with the services and the frequency of ferrous anomalies will have masked the responses from any weaker archaeological features, should any have been present. However, the extents of the magnetic disturbance probably correspond directly with the construction of the surrounding housing estate and it is considered that any surviving archaeological features would have been significantly truncated during the former building works.

5 REFERENCES

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

Institute for Archaeologists, 2011. *Standard and guidance for archaeological geophysical survey*. Professional guidelines, 1st edition

Soil Survey of England and Wales, 1983. *Sheet 5, South West England*. Ordnance Survey, Southampton.

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 two main categories: archaeological and unidentified responses.

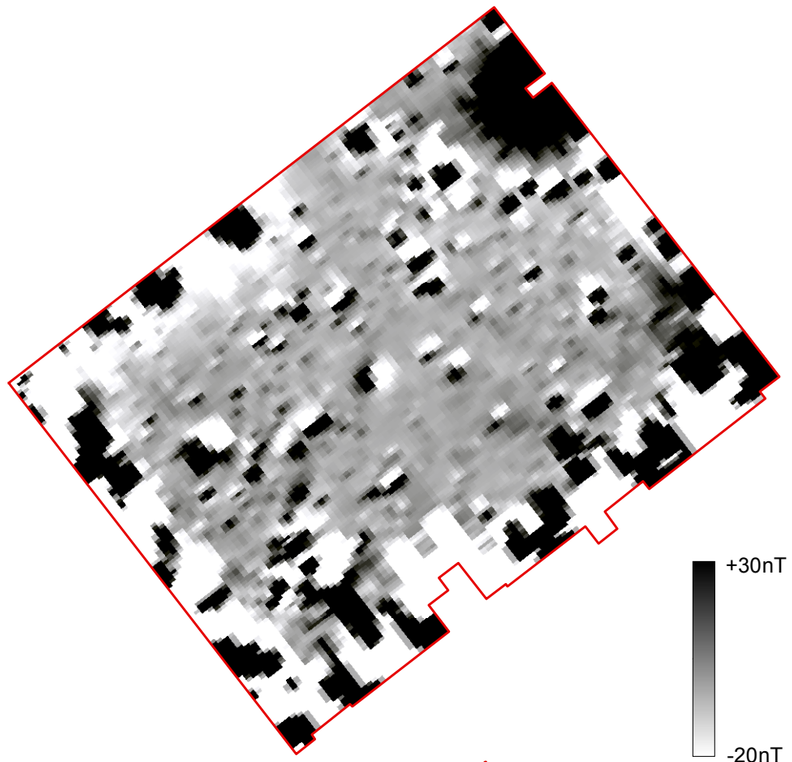
The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided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

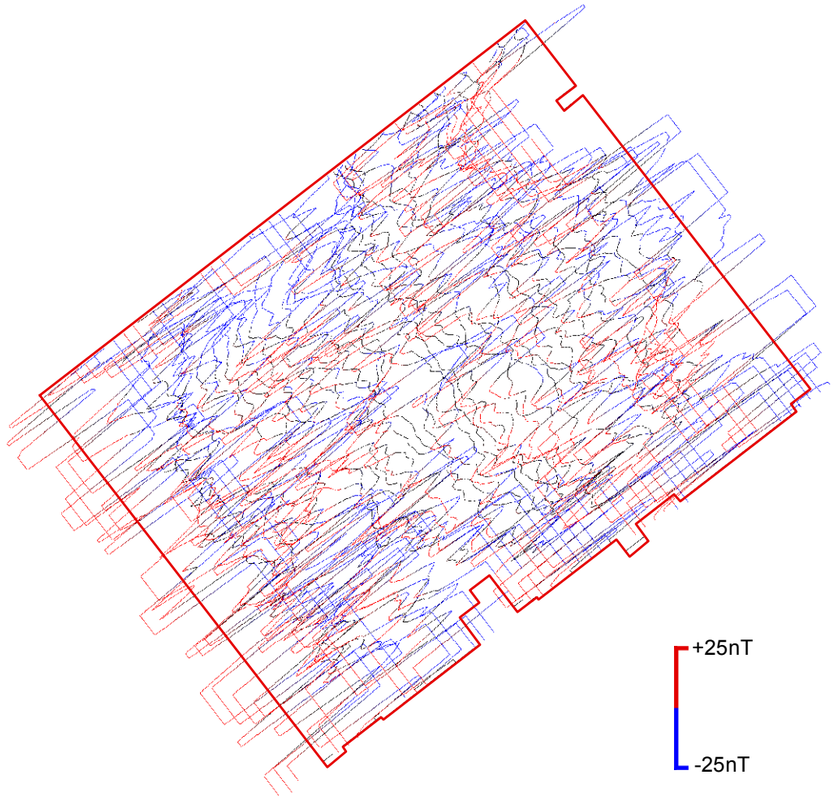
- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Probable archaeology – used for features which give a clear response but which form incomplete patterns.
- Possible archaeology – used for features which give a response but which form no discernible pattern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





Survey Extents
Trend
Modern Service
Ferrous
Increased Magnetic Response

0 50 m

Date:	01/07/13
Revision Number:	0
Scale:	1:500 at A3
Illustrator:	LJC
Path:	X:\PROJECTS\100350\GIS\FigsMXD

Site location with Greyscale, XY Trace and Interpretation

Figure 1

wessex archaeology

salisbury rochester sheffield edinburgh

Wessex Archaeology Ltd registered office Portway House, Old Sarum Park, Salisbury, Wiltshire SP4 6EB
Tel: 01722 326867 Fax: 01722 337562 info@wessexarch.co.uk www.wessexarch.co.uk