Holmwood Park, Ferndown, Dorset

Detailed Gradiometer Survey Report

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Summary

A detailed gradiometer survey was conducted over land at Holmwood Park, Ferndown in Dorset. The project was commissioned by Goadsby Planning & Environment, on behalf of their client Libra Homes, with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features on the site ahead of further development in this area.

The site comprises pastures and set aside land directly to the north of Christchurch Road, 6.5km to the north-west of Bournemouth, Dorset and 2km to the south of the centre of Ferndown, Dorset. The Site occupies a roughly square parcel of gently sloping land, ranging from 10m to 25m above Ordnance Datum (aOD). The gradiometer survey was undertaken over all accessible parts of the site and has demonstrated the presence of anomalies of possible archaeological interest within the survey area, along with regions of increased magnetic response, agricultural drainage, trends and several ferrous regions.

Two bands of anomalies lie at the southernmost extent of the survey area, and are considered to be of possible archaeological interest. They are consistent with the remnants of ditches or parts of enclosures, although it is difficult to determine their function or date.

Clusters of pit-like anomalies have been identified throughout the survey area, and an archaeological interpretation cannot be ruled out entirely; however, such responses may be consistent with natural or agricultural features. Several broad anomalies in the southern portion of the Site are typical of natural features, such as former channels.

Extensive drainage is visible across the survey area, particularly towards the western and southwestern extents of the survey. Extensive magnetic disturbance can be seen in the middle of the Site, which is likely to relate to modern or historic dumped deposits. Trends of varying orientation are visible throughout the survey area, although their origins are largely uncertain.

A number of modern services have also been identified within the western and central parts of the Site.

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The detailed gradiometer survey was commissioned by Goadsby Planning & Environment on behalf of their client Libra Homes and the assistance of Peter Atfield is gratefully acknowledged in this respect. Wessex Archaeology would also like to thank the landowner for granting access to the survey areas.

The fieldwork was undertaken by Alistair Salisbury, Jen Smith and Rachel Williams. Jen Smith processed and interpreted the geophysical data in addition to writing this report. The geophysical work was quality controlled by Ben Urmston. Illustrations were prepared by Karen Nichols. The project was managed on behalf of Wessex Archaeology by Ben Urmston.

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Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology (WA) was commissioned by Goadsby Planning & Environment, on behalf of their client Libra Homes, to carry out a geophysical survey of land at Holmwood Park, Ferndown, Dorset (**Figure 1**), and hereafter "the Site" (centred on NGR 406945 98700). The survey forms part of a programme of archaeological and geophysical works undertaken ahead of further 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 numerous small pasture fields, currently used as horse paddocks, and set-aside land directly to the north of Christchurch Road, 6.5km to the northwest of Bournemouth, Dorset and 2km to the south of the centre of Ferndown, Dorset (**Figure 1**). Detailed gradiometer survey was undertaken over all accessible parts of the Site, which totalled 8.2 ha. Survey was not possible in certain areas of the Site, due to the presence of dense woodland and existing buildings in the northwestern corner of the Site. An access track to Holmwood Park Equestrian Centre bisects the Site, extending NE-SW.

1.2.2 The Site occupies a sub-rectangular parcel of gently sloping land, ranging from 10m to 25m above Ordnance Datum (aOD). The site is bordered by Belle Vue Plantation in the east, A348 Ringwood Road to the west, B3073 Christchurch Road to the south, Longham Business Centre to the northwest and an extant housing estate to the northeast.

1.2.3 The soils underlying the Site are likely to comprise of deep, stoneless, acidic sandy gley-podzolic soils of the 641b (Sollom 2) association to the southwest of the site (SSEW 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through gradiometer 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).

2.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between 20th and 23rd January 2014. Field conditions at the time of the survey were largely suitable, with the exception of areas of inaccessibility where the ground was flooded. Geophysical survey was prevented in some areas due to the presence of obstructions within the field, including trees and dense undergrowth. Horses were present in many of the fields and arrangements were made with the landowner to allow survey to proceed with the minimum of disruption.

2.2 Method

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

2.2.2 The gradiometer 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. In places, further data processing was undertaken to reduce the effect of periodic errors within the data resulting largely from ground conditions.

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 several anomalies of possible archaeological interest across the Site, along with areas of magnetic disturbance and ferrous responses. Results are presented as a series of greyscale and XY plots, and archaeological interpretations, at a scale of 1:2,000 (**Figures 2** to **3**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale images. The XY trace plots are presented at ±25nT at 25nT per cm.

3.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends (**Figures 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 At the western extent of the Site, clusters of linear anomalies **4000** and **4001** are clearly defined from the magnetic background and consistent with the remnants of field drains; parts of their responses are masked by magnetic disturbance but their 'herringbone'

distribution is typical of such drains. These anomalies can be seen extending further to the southeast, where their responses are interrupted by obstacles and the magnetic disturbance associated with modern services **4002** and **4003**.

3.2.2 Towards the southwestern extent of the Site, modern service **4004** is likely to correspond with **4002** to the northeast. Close by to the southeast, cluster of pit-like anomalies **4005** is of possible archaeological interest; these responses lie within a narrow corridor of surveyable land, preventing a more decisive interpretation.

3.2.3 To the northeast of the junction of Christchurch Road and Ringwood Road, further linear anomalies **4006** are consistent with field drains, extending throughout the survey area to the northeast to **4007**, where their responses are masked by region of magnetic disturbance at **4008**; a small cluster of pit-like anomalies can be seen between **4006** and **4007** although their origin is uncertain and it is possible that they are natural or agricultural in origin. The character of **4008** suggests that it is associated with modern or historic dumped material such as demolition debris. A modern service can be seen crossing the northern portion of the survey area within **4008**, aligned with **4003** and **4021**.

3.2.4 Three small survey areas can be seen to the north of **4008**, which are largely dominated by magnetic disturbance; linear anomalies **4009** are consistent with field drains, modern service **4010** is oriented NNE-SSW and linear band of disturbance **4011** may also mark the presence of a service.

3.2.5 At the northernmost extent of the Site, a small region of data **4012** is unaffected by strong magnetic disturbance around the field boundaries, although only a few isolated pit-like anomalies appear and these are of uncertain origin.

3.2.6 Region of disturbance **4013** is relatively extensive and consistent with dumped material. Regions of increased magnetic response **4014** can be seen across the northernmost portions of the Site, although this is dissimilar in character to **4013**; although its origin is uncertain, it is likely to be geological in origin. A loose cluster of pit-like responses **4015** lies close by to the south, although it is possible that these anomalies are natural or agricultural in origin.

3.2.7 The datasets from the fields in the northeastern corner of the Site show similar patterns of magnetic background, with isolated anomalies and trends of possible archaeological interest appearing within quieter windows between magnetic disturbance, e.g. **4016** to **4020**. The fences dividing the paddocks have produced localised noise within the dataset, and the frequent ferrous anomalies are likely to relate to the operation of the equestrian centre. There is little obvious coherency to the distribution of the anomalies, although the clusters at **4016** and **4018** are perhaps slightly more dense.

3.2.8 Modern service **4021** extends eastwards from the access track and is likely to represent a continuation of the service seen at **4008** to the west. Immediately to the southeast, broad linear anomaly **4022** extends E-W and is consistent with a geological feature such as a former channel. Further to the south, a similar anomaly **4023** can be seen that is also in keeping with a former channel; it is possible that **4023** takes a turn towards the southwest at a field boundary, which suggests it may have been canalised.

3.2.9 Better defined anomalies **4024** and **4025** appear as curvilinear bands of positive response across the southeastern extent of the Site. Considered together, these clusters of anomalies are consistent with former ditches or enclosures, although the relatively limited extents within the survey area make a more confident interpretation difficult. Further to the west, linear anomalies **4026** appear to be field drains.

4 CONCLUSION

4.1.1 The detailed gradiometer survey has been successful in detecting several anomalies of possible archaeological interest within the Site, in addition to regions of increased magnetic response, extensive drainage and several modern services.

4.1.2 The anomalies considered to be most likely to be of archaeological interest comprise two series of linear and amorphous responses forming bands within the southernmost extent of the Site. These are consistent with enclosure ditches although their apparently fragmentary nature makes it more difficult to interpret them conclusively.

4.1.3 Isolated pit-like responses can be seen throughout the dataset and the majority of these have been categorised as being of possible archaeological interest as it is not possible to exclude this interpretation entirely. However, it is possible that such responses are the result of natural features, such as tree throws, or near-surface geological changes. Two clusters of such anomalies can be seen to the southwest and northeast of the Site, although little coherency is apparent in their distribution.

4.1.4 Numerous trends have been identified, some of which are consistent with ploughing as they are parallel and regularly spaced. Others are of less certain origin and it is possible that they relate to geological changes or agricultural and pastoral activities. Where these trends coincide with magnetic disturbance, it is possible that they are associated with structure within dumped deposits for instance.

4.1.5 Numerous field drains can be seen, particularly within the western and southwestern portions of the Site. Given the extents of magnetic disturbance, it is difficult to determine whether they comprise different phases of such drainage or whether the network is still intact.

4.1.6 It is beyond the remit of this report to determine the function or status of the modern services identified through the geophysical survey and whilst their locations are likely to be accurate, no attempt has been made to ascertain the physical dimensions or depth of burial. Given the current use of the Site as an equestrian centre, it is possible that some relate to water pipes leading to troughs.

4.1.7 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. However, the detection of ploughing trends and other weak responses suggests that more substantial archaeological features would have produced measurable magnetic anomalies.

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 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)
- Periodic Filter – This function is used to reduce or remove the amplitude of regular, periodic features present in the data. This is most commonly used to correct for operator error during the collection of data;
- Low Pass Filter – The low pass filter can be used to remove small scale, high frequency spatial detail. It is used to supress noise in the data to enhance larger and weaker anomalies;
- Add – The add function simply involves adding or subtracting data values to a selected area of the 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.