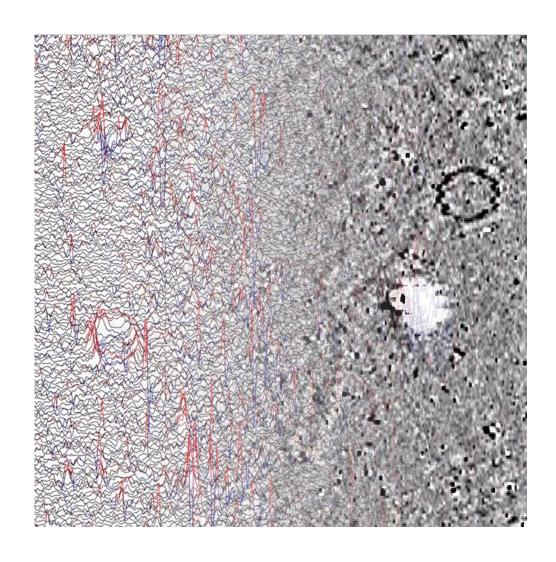


Detailed Gradiometer Survey Report



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### **Detailed Gradiometer Survey Report**

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### **Detailed Gradiometer Survey Report**

#### **Summary**

A detailed gradiometer survey was conducted over land at Parmiter Drive, Wimborne, Dorset (centred on National Grid Reference 402535, 099490). The project was commissioned by Wyatt Homes Ltd with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features to inform a planning application for a proposed residential development to be submitted to East Dorset District Council.

The site comprised an irregular shaped arable field located immediately south of Parmiter Drive, covering an area of 8.2ha. The geophysical survey was undertaken on 6<sup>th</sup> to 9<sup>th</sup> October 2015. The detailed gradiometer survey has demonstrated the presence of a number of anomalies of archaeological interest throughout the area.

The anomalies identified as being of archaeological interest are primarily ditch-like features with some evidence for associated pit features also evident. At least four circular features have been identified throughout the survey area and these have been tentatively interpreted as possible roundhouses. Additionally, a section of Roman road was identified c. 500m east of the site, but has not been identified within the dataset.

Additionally, numerous discrete pits and ditches have been interpreted. Throughout the site other anomalies have been identified and defined as agricultural features, trends, areas of increased magnetic response and isolated ferrous responses, none of which have been classified as of archaeological potential.



### **Detailed Gradiometer Survey Report**

#### **Acknowledgements**

Wessex Archaeology would like to thank Wyatt Homes Ltd. for commissioning the geophysical survey. The assistance of Toby Elliott is gratefully acknowledged in this regard.

The fieldwork was undertaken by Diana Chard and Becky Hall. Garreth Davey processed the data; Alistair Salisbury interpreted the geophysical data and wrote the report. The geophysical work was quality controlled by Garreth Davey and Lucy Learmonth. Illustrations were prepared by Richard Milwain. The project was managed on behalf of Wessex Archaeology by Lucy Learmonth.



### **Detailed Gradiometer Survey Report**

#### 1 INTRODUCTION

#### 1.1 Project background

- 1.1.1 Wessex Archaeology was commissioned by Wyatt Homes Ltd. (hereafter 'the Client') to carry out a geophysical survey over land off land at Parmiter Drive, Wimborne, Dorset (hereafter 'the Site', Figure 1), centred on National Grid Reference (NGR) 402535, 099490. This survey will support a planning application for a proposed residential development to be submitted to East Dorset District Council.
- 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 Site location and topography

- 1.2.1 The Site comprises an irregular parcel of land of 8.2ha located on the south-eastern edge of Wimborne, approximately 0.5km north of Oakley, Dorset.
- 1.2.2 The Site is utilised for arable cultivation and is a single field enclosed on all sides by mature hedgerows. The north of the Site is bounded by residential properties with a commercial unit to the west, a sewage works and the A31 to the south and further agricultural land expanding to the east.
- 1.2.3 The Site is located on a relatively flat area at an elevation of approximately 16-18m above Ordnance Datum (aOD) falling gently towards the River Stour located to the south.
- 1.2.4 Two sets of overhead cables traverse the Site. The first from the north-west to south-east in the north-eastern corner, and from north-north-west to south-south-east across the west of the Site.

#### 1.3 Soils and geology

- 1.3.1 The underlying geology of the Site is mapped as Palaeogene Clay, Silt and Sand of the London Clay Formation, overlain to the north by Quaternary River Terrace Deposits 2, which are comprised of sand and gravel with lenses of silt, clay or peat (British Geological Survey, 2015).
- 1.3.2 The soils underlying the Site are recorded as typical argillic brown soils of the 571z (Hucklesbrook) association to the north with typical cambic gley soils of the 831b (Wallasea 1) association to the south (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.



#### 1.4 Archaeological background

- 1.4.1 The archaeological background was assessed in detail within the "Land at Parmiter Drive, Wimborne, Dorset. Archaeological Desk-Based Assessment" (Wessex Archaeology 2015a). The results from this report and the relevant Dorset Historic Environment Record (DHER) entries are summarised below.
- 1.4.2 Recorded within the Study Area (1km, as defined by the DBA) are one Scheduled Monument, four Grade I listed buildings, one Grade II\* listed building, 24 Grade II listed buildings and four conservation areas. There are no World Heritage Sites, Registered Parks and Gardens or Historic Battlefields identified within the Study Area.
- 1.4.3 The scheduled monument recorded comprises a section of a Roman road, recorded south of Peak Cottage located approximately 0.5 km east of the Site.
- 1.4.4 The Grade I listed buildings comprise a church of late Saxon origin which has been substantially remodelled and extended. The remnants of a medieval manor house, now a School building, a 19<sup>th</sup> century country house and Nineveh Court, a 19<sup>th</sup> century former sculpture gallery.
- 1.4.5 The Grade II\* listed building is recorded as a moated manor house with of 16<sup>th</sup> century origin with multiple later additions and alterations. The remaining 24 Grade II listed buildings are recorded as a variety of structures dating from 17<sup>th</sup>-19<sup>th</sup> century including funerary monuments, houses, bridges, piers, gates and a village hall.

#### Prehistoric

1.4.6 The majority of evidence for prehistoric occupation currently is limited to chance finds of worked flints, flakes and flint tools which tend to be isolated or poorly documented. The potential for prehistoric archaeology is therefore considered to be unknown.

#### Romano-British

- 1.4.7 The scheduled monument consisting of a 120m long section of the east-north-east to west-south-west Roman road is located approximately 500m east of the Site. The road surface is approximately 8m wide and 0.4m higher than the surrounding ground surface. Sections of ditch have been recorded either side, however only the southern ditch is still perceptible
- 1.4.8 The Roman road is thought to have linked the town of Clausentum (located within what is now Southampton) to a fortress at Wimborne. The projected route of the road extends from the scheduled monument from the west-south-west to a crossing point on the River Stour and onwards to a further scheduled monument recorded as "Roman camps, forts and vexillation fortress 240m north of Lake Farm." It is likely that the former road once traversed the central portion of the site and it is possible that the existing west southwest-east southeast aligned boundary marks this former route.
- 1.4.9 Given the potential route of the Roman road and the likelihood of associated structures or features related to this, the potential for Romano-British archaeology is considered to be high.

#### Saxon and medieval

1.4.10 Aside from the listed buildings of the Saxon and medieval period, there is also documentary evidence to show that Canford possessed three deer parks throughout the medieval period. Of these, it is possible that the area of Leye Park May have contained part or all of the Site.



- 1.4.11 Whilst a number of records exist and the area contains several settlements of Saxon or Medieval origin, the lack of direct archaeological evidence means that the potential for surviving archaeological features is moderate.
  - Post-medieval, 19th century and modern
- 1.4.12 With the opening of rail connections in the area during 1847, new suburban and industrial developments began to appear. These included an Iron Works, Saw Mill and Gas Works.
- 1.4.13 Given the landscape, the Site area was largely in use as a riverine meadow throughout much of the post-medieval period. Buried archaeological remains relating to this period are likely to consist largely of water management and agricultural activity.
- 1.4.14 A number of previous excavations and geophysical surveys have also been recorded within the Study area however none of these have recorded significant finds or features with only the occasional pottery sherd recorded.



#### 2 METHODOLOGY

#### 2.1 Introduction

- 2.1.1 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between the 6<sup>th</sup> and 9<sup>th</sup> October 2015.
- 2.1.2 Field conditions at the time of the survey were good, with variable weather conditions during the survey. An overall coverage of 6.8 ha was achieved, the reduction from the overall survey area of 8.2 ha was due to the tree line encroaching from the field boundaries plus artificial obstacles within the Site.
- 2.1.3 The detailed gradiometer survey was conducted in accordance with Historic England guidelines (English Heritage 2008) and the Site specific method statement (Wessex Archaeology 2015b).

#### 2.2 Method

- 2.2.1 Individual survey grid nodes were established at 30 m x 30 m intervals using a Leica Viva RTK GNSS instrument, which is precise to approximately 0.02 m and therefore exceeds Historic England recommendations (2008).
- 2.2.2 The detailed gradiometer survey was conducted using a Bartington Grad601-2 fluxgate gradiometer instrument, which has a vertical separation of 1 m between sensors. Data were collected at 0.25 m intervals along transects spaced 1 m apart with an effective sensitivity of 0.03 nT, in accordance with Historic England guidelines (English Heritage 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 (±5 nT 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 throughout the survey area, 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 detailed gradiometer survey has identified magnetic anomalies of archaeological interest across the Site, along with areas of increased magnetic response and ferrous responses. Results are presented as a series of greyscale plots, XY plots and archaeological interpretations at a scale of 1:2000 (Figures 2 to 4). The data are displayed at -2 nT (white) to +3nT (black) for the greyscale image and ±25 nT at 25 nT per cm for the XY trace plots. 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.
- 3.1.2 Numerous ferrous anomalies are visible throughout the dataset. These are presumed to be modern in provenance and are not referred to unless considered relevant to the archaeological interpretation.
- 3.1.3 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 present than have been identified through geophysical survey.
- 3.1.4 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.

#### 3.2 Gradiometer survey results and interpretation

- 3.2.1 Two distinct circular anomalies are apparent centrally within the northernmost field at **4000** and **4001**. Measuring approximately 12m to 16m in diameter with typical values ranging from +2nT to +6nT. A clear break in the feature on the eastern extent of **4001** and south-eastern extent of **4000** may represent entrances. These may represent drip gullies or small enclosure ditches for domestic structures and/or activity.
- 3.2.2 Further potential circular features lie within the survey boundary at **4002** and **4003**. These are categorised as possible archaeology due to their more indistinct nature. Values range from +0.5nT to +1.5nT give these potential features a more diffuse appearance against the magnetic background. Their shape and size are comparable to the more distinct circular features at **4000** and **4001**.
- 3.2.3 Diffuse areas of anomalies are dispersed across the Site, with particular concentrations at **4004** and **4005**. These are sub-angular and sub-circular anomalies that show no clear trends or relationships with the archaeology present. These anomalies may represent pits.
- 3.2.4 Large positive anomalies are seen at **4006** and **4007**. They are more angular than those seen elsewhere and their extents are less well defined. Similarly they show no relationship with the surrounding archaeology, but may represent clusters of smaller features.
- 3.2.5 A curvilinear ditch-like feature at identified **4008** may be related to historic or modern agricultural activity. The longest orientation is parallel to the alignment of the ploughing that extends along the eastern boundary.



- 3.2.6 A negative linear anomaly identified in a sub-east west orientation at **4009** is indicative of a former field boundary seen in mapping dating back to at least 1929 (Ordnance Survey, 1929).
- 3.2.7 Across the Site, weakly defined linear features can be seen, with examples at 4010 to 4012. These are orientated in an approximately east west direction with similar features perpendicular to those on the eastern extent at 4013. These are interpreted as ploughing or agricultural activity.
- 3.2.8 A swathe of superficial geology at **4014** is visible central to the Site. These anomalies may show a local change in the natural beneath the Site or a change in sediment structure.
- 3.2.9 An electricity pylon is located at **4015**, visible on aerial photography and noted by the field team. The large ferrous 'halo' is indicative of highly ferric objects.
- 3.2.10 There are a number of weakly contrasting and indistinct linear and curvilinear trends present throughout the Site. These have been interpreted as trends of uncertain origin.

#### 3.3 Modern Services

3.3.1 A single modern service has been identified by the geophysical survey, **4016**. It is orientated approximately east to west.



#### 4 CONCLUSION

- 4.1.1 The features of most archaeological interest within the Site are two prominent circular anomalies, one located in the north (4000) and the other located to the south (4001). Given the proximity of the Scheduled Monument described as a Roman road situated 0.5km to the east, these may be of a similar date.
- 4.1.2 The Roman road has not been detected within this dataset. Extrapolating the alignment from the Scheduled Monument data (Wessex Archaeology 2015a), the road should be visible relatively centrally through the northern field, possibly immediately north of **4001**. It should be noted that geological responses are present in this area, and that the current and historical field boundaries are on a similar alignment. It is possible that ploughing activity may therefore have damaged or removed potential archaeological remains, or that the road does not traverse this location.
- 4.1.3 Less well-defined, incomplete circular anomalies are also present within the Site boundary (4002 and 4003). These possibly share a relationship with 4000 and 4001 given their similarity, and may also represent roundhouses.
- 4.1.4 A number of pit-like features can be seen across the entirety of the Site. These are likely to be potential pits or postholes.



#### 5 REFERENCES

#### 5.1 Bibliography

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

Wessex Archaeology, 2015a, Land at Parmiter Drive, Wimborne, Dorset. Archaeological Desk-Based Assessment

Wessex Archaeology, 2015b, Land at Parmiter Drive, Wimborne, Dorset. Written Scheme of Investigation for Geophysical Survey

#### 5.2 Cartographic and documentary sources

1929 Ordnance Survey 6 inch map / 1:10,560 (Sheet XXXIV.NE)

Soil Survey of England and Wales, 1983. Sheet 4, Soils of Eastern 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 Historic England (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 Historic England (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 subdivided 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.

