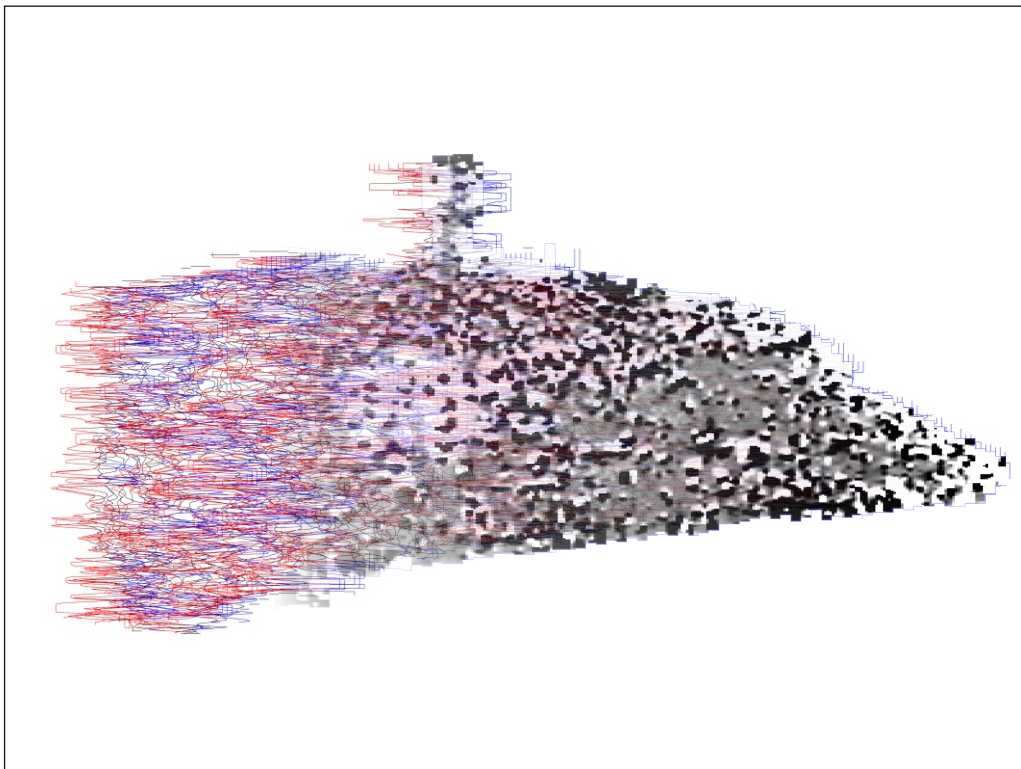




Land at Blendworth Crescent Havant, Hampshire

Detailed Gradiometer Survey Report



Ref: 113051.03
November 2016



**Land at Blendworth Crescent,
Havant, Hampshire**

Detailed Gradiometer Survey Report

Prepared for:

PMC Construction and Development Services Ltd.
106 Queens Road
Portsmouth
Hampshire
PO2 7NE

Prepared by:

Wessex Archaeology
Portway House
Old Sarum Park
Salisbury
Wiltshire
SP4 6EB

www.wessexarch.co.uk

October 2016

WA Report Ref. 113051.03



Quality Assurance

Project Code	113051	Accession Code		Client Ref.	
Planning Application Ref.		Ordnance Survey (OS) national grid reference (NGR)	471405, 107345		

Version	Status*	Prepared by	Checked and Approved By	Approver's Signature	Date
----------------	----------------	--------------------	--------------------------------	-----------------------------	-------------

v01	I	TR	Reviewer		
File:	X:\PROJECTS\113051_Reports\Geophysics\ 113051_Belndworth Crescent_GEO_TR.docx				
	E				
File:					
	F				
File:					

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

DISCLAIMER

THE MATERIAL CONTAINED IN THIS REPORT WAS DESIGNED AS AN INTEGRAL PART OF A REPORT TO AN INDIVIDUAL CLIENT AND WAS PREPARED SOLELY FOR THE BENEFIT OF THAT CLIENT. THE MATERIAL CONTAINED IN THIS REPORT DOES NOT NECESSARILY STAND ON ITS OWN AND IS NOT INTENDED TO NOR SHOULD IT BE RELIED UPON BY ANY THIRD PARTY. TO THE FULLEST EXTENT PERMITTED BY LAW WESSEX ARCHAEOLOGY WILL NOT BE LIABLE BY REASON OF BREACH OF CONTRACT NEGLIGENCE OR OTHERWISE FOR ANY LOSS OR DAMAGE (WHETHER DIRECT INDIRECT OR CONSEQUENTIAL) OCCASIONED TO ANY PERSON ACTING OR OMITTING TO ACT OR REFRAINING FROM ACTING IN RELIANCE UPON THE MATERIAL CONTAINED IN THIS REPORT ARISING FROM OR CONNECTED WITH ANY ERROR OR OMISSION IN THE MATERIAL CONTAINED IN THE REPORT. LOSS OR DAMAGE AS REFERRED TO ABOVE SHALL BE DEEMED TO INCLUDE, BUT IS NOT LIMITED TO, ANY LOSS OF PROFITS OR ANTICIPATED PROFITS DAMAGE TO REPUTATION OR GOODWILL LOSS OF BUSINESS OR ANTICIPATED BUSINESS DAMAGES COSTS EXPENSES INCURRED OR PAYABLE TO ANY THIRD PARTY (IN ALL CASES WHETHER DIRECT INDIRECT OR CONSEQUENTIAL) OR ANY OTHER DIRECT INDIRECT OR CONSEQUENTIAL LOSS OR DAMAGE.



Land at Blendworth Crescent, Havant, Hampshire

Detailed Gradiometer Survey Report

Contents

Summary	ii
Acknowledgements.....	iii
1 INTRODUCTION.....	1
1.1 Project background	1
1.2 The Site.....	1
2 ARCHAEOLOGICAL BACKGROUND	2
2.1 Introduction	2
3 METHODOLOGY.....	3
3.1 Introduction	3
3.2 Aims and objectives	3
3.3 Fieldwork methodology	3
3.4 Data processing	3
4 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION.....	4
4.1 Introduction	4
4.2 Gradiometer survey results and interpretation	4
5 DISCUSSION.....	5
6 REFERENCES.....	6
6.1 Bibliography	6
6.2 Cartographic and documentary sources.....	6
6.3 Online resources	6
7 APPENDICES.....	7
7.1 Appendix 1: Survey Equipment and Data Processing.....	7
7.2 Appendix 2: Geophysical Interpretation	9
7.3 Appendix 3: OASIS form	10

Figures

Figure 1:	Site Location
Figure 2:	Greyscale and XY Trace
Figure 3	Interpretation



Land at Blendworth Crescent, Havant, Hampshire

Detailed Gradiometer Survey Report

Summary

A detailed gradiometer survey was conducted over land at Blendworth Crescent, Havant, Hampshire (centred on NGR 471405, 107354). The project was commissioned by PMC Construction and Development Services Ltd. with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features in support of a planning application for a proposed residential development within the Site.

The site comprises a single field of grassland used as a recreational area, located to the south of Blendworth Crescent, Havant, covering an area of 1.15 ha. The geophysical survey was undertaken on 3rd October 2016. The detailed gradiometer survey has not detected any anomalies of archaeological interest.

The area is dominated by strong magnetic responses caused by mid-late 20th century made ground. This has the potential to mask weaker archaeological anomalies. The survey has identified a former field boundary, former footpaths, and a possible underground service within the Site.



Land at Blendworth Crescent, Havant, Hampshire

Detailed Gradiometer Survey Report

Acknowledgements

Wessex Archaeology would like to thank PMC Construction and Development Services Ltd. for commissioning the geophysical survey. The assistance of Stephen Cripps is gratefully acknowledged in this regard.

The fieldwork was undertaken by Becky Hall and Rok Plesnicar. Tom Richardson processed and interpreted the geophysical data. Tom Richardson wrote the report. The geophysical work was quality controlled by **WHOM** and Lucy Learmonth. Illustrations were prepared by Nancy Dixon. The project was managed on behalf of Wessex Archaeology by Ruth Panes.



Land at Blendworth Crescent, Havant, Hampshire

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by PMC Construction and Development Services Ltd. to carry out a geophysical survey at Blendworth Crescent, Havant, Hampshire (hereafter “the Site”, centred on NGR 471405, 107345) (**Figure 1**). The survey forms part of an ongoing programme of archaeological works being undertaken in support of a planning application for a proposed residential development within the Site.

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

1.2 The Site

1.2.1 The Site is located to the south of Blendworth Crescent, in a predominantly residential area of Havant. Havant is located in the south-east of Hampshire, close to Langstone Harbour and the crossing point to Hayling Island. The town is approximately 13 km from Portsmouth and 14 km from Chichester.

1.2.2 The Site is irregular in plan, and encompasses approximately 1.15 ha of level grassland, which is currently used as a recreation area. A disused, surfaced play area occupies the centre of the Site, and a north-south asphalt pedestrian pathway leads from the Site access off Blendworth Crescent.

1.2.3 The northern and western boundaries of the Site are demarcated by fences, mature trees and vegetation to the rear of residential properties along Blendworth Crescent and Stockheath Lane, respectively. The southern Site boundary is marked by a number of tall mature trees interspersed along a hedge row and fence line, beyond which lies Trosnant Junior School.

1.2.4 The Site is situated within a relatively flat area of land at an elevation of approximately 11-12 m above Ordnance Datum (aOD).

1.2.5 The underlying bedrock geology throughout the Site is mapped as Palaeogene Clay, Silt and Sand of the London Clay Formation, overlain by Quaternary Head deposits of Clay, Silt, Sand and Gravel (British Geological Survey).

1.2.6 The underlying soils are not recorded due to the urban environment of the Site (SSEW SE Sheet 6 1983).



2 ARCHAEOLOGICAL BACKGROUND

2.1 Introduction

- 2.1.1 An Archaeological Desk-Based Assessment (DBA) undertaken by Wessex Archaeology (2016) examined the potential for the survival of buried archaeological remains within the development area and a 1 km Study Area. This DBA used information provided by the Hampshire Archaeology and Historic Buildings Register (HAHBR) and the National Heritage List for England (NHLE). The following background is summarised from the DBA.
- 2.1.2 There are no designated historical assets within the Site.
- 2.1.3 There are no World Heritage Sites, Scheduled Monuments, or Historic Battlefields identified within the Study Area. However, a Grade II* Registered Park and Garden, six Grade II Listed Buildings, and four Conservation Areas are recorded.
- 2.1.4 The DBA identified no recorded evidence of any Palaeolithic to Neolithic, or Saxon activity within the Study Area, with only a small amount of Iron Age and medieval activity recorded. The archaeological potential for these periods is therefore classified as low or unknown as it is possible that the absence of recorded evidence is due of the limited archaeological works undertaken in the vicinity.
- 2.1.5 Evidence of Romano-British activity is recorded in the form of two Roman roads to the east and south of the Site. Although the Site is situated some way from the projected routes of these roads, which likely form the focus of occupation in the area, it is conceivable that contemporary archaeological remains might extend across other parts of the Study Area, including within the Site.
- 2.1.6 Recorded evidence of post-medieval activity suggests that features associated with post-medieval agricultural activity, including former drainage ditches and field boundaries depicted by historic mapping, might be present within the Site. There is also potential for features relating to industrial/manufacturing processes, such as kilns, in the area. It is possible that buried remains associated with post-medieval occupation on the fringes of Stockheath Common might extend into the Site. However, historic mapping from the early-mid 19th century suggests that settlement activity in this area may have been confined along the route of Stockheath Lane, to the west.



3 METHODOLOGY

3.1 Introduction

3.1.1 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team on the 3rd October 2016. Field conditions at the time of the survey were good, being dry throughout the period of survey. An overall coverage of 0.9 ha was achieved, with areas of overgrown vegetation around the boundaries of the field accounting for the 0.2 ha not surveyed.

3.2 Aims and objectives

3.2.1 The aims of the survey comprise the following:

- to conduct a detailed survey covering as much of the specified area as possible, allowing for artificial obstructions;
- to clarify the presence/absence and extent of any buried archaeological remains within the site;
- to determine the general nature of the remains present.

3.3 Fieldwork methodology

3.3.1 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).

3.3.2 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.

3.4 Data processing

3.4.1 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.

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



4 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

4.1 Introduction

- 4.1.1 The detailed gradiometer survey has identified magnetic anomalies across the Site, along with a large amount of ferrous responses. Results are presented as a series of greyscale plots, XY plots and archaeological interpretations at a scale of 1:1000 (**Figures 2 and 3**). The data are displayed at -2 nT (white) to +3 nT (black) for the greyscale image and ± 25 nT at 25 nT per cm for the XY trace plots.
- 4.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends (**Figure 3**). Full definitions of the interpretation terms used in this report are provided in Appendix 2.
- 4.1.3 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.
- 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 present than have been identified through geophysical survey.
- 4.1.5 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.

4.2 Gradiometer survey results and interpretation

- 4.2.1 The survey has not identified any anomalies thought to be of archaeological origin.
- 4.2.2 The Site is dominated by widespread strong ferrous responses. This is related to made ground likely deposited as part of levelling works associated with the adjacent Trosant Junior School in the mid-late 20th century (Ridge Property and Construction Consultants 2015). The ferrous responses become strongest at the centre of the Site, relating to the surfaced playground. This high level of noise from the made ground makes interpretation and characterisation of anomalies difficult as they are often obscured. It is also possible that weak archaeological anomalies may be masked by the overlying magnetic disturbance.
- 4.2.3 A linear anomaly (**4000**) can be seen running west-south-west to east-north-east across the Site, with a shorter (18 m) linear running parallel at its eastern end. This relates to a former field boundary present on the 1842 Havant Parish Tithe map through to 1956 edition Ordnance Survey map.
- 4.2.4 Three linear anomalies (**4001-3**) have been identified as being likely to relate to former footpaths. **4001** runs for 24 m on a west-north-west to east-south-east orientation with a fork at the eastern end. **4002** runs for 65 m on an east to west orientation, whilst **4003** runs 70 m north-east to south-west. **4001** and **4002** can be seen on aerial photography of the area. **4003** is not visible on aerial photography, however it is of a similar magnetic strength (5-20 nT) and appears to originate from the same position as **4001**, suggesting that it is also a former footpath.
- 4.2.5 A further linear anomaly (**4004**) runs 33m north-north-east to south-south-west in the north-west of the Site. This appears to correspond with a feature visible on aerial photography,



similar to those thought to be former footpaths. However, the increased magnetic strength (± 100 nT) of **4004** suggests that it is more likely related to a ferrous underground service, such as a pipe.

- 4.2.6 Two linear trends are visible in the south-west and south-east of the Site. The small, weak nature of these responses prohibits any confident interpretation.

5 DISCUSSION

- 5.1.1 The detailed gradiometer survey has not detected any anomalies thought to be of archaeological interest. Linear anomalies relating to a former field boundary and three footpaths have been identified, as well as the route of a possible service. The majority of the Site is dominated by strong magnetic responses caused by made ground deposited during mid-late 20th century levelling of the area. These strong magnetic responses make interpretation of anomalies within the data difficult and have the potential to mask weaker archaeological anomalies.



6 REFERENCES

6.1 Bibliography

English Heritage 2008 *Geophysical Survey in Archaeological Field Evaluation. Research and Professional Service Guideline No 1*. Swindon (2nd Edition)

Wessex Archaeology 2016 *Land at Blendworth Crescent, Havant, Hampshire: Heritage Statement*. Salisbury, unpublished report, ref. 113050.01

6.2 Cartographic and documentary sources

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

1842 Havant Parish Tithe map and appointment

1867-8 First Edition Ordnance Survey 25 inch map (1:2,500)

1897 Second Edition Ordnance Survey 25 inch map (1:2,500) Sheet 76.7

1909 Third Edition Ordnance Survey 25 inch map (1:2,500) Sheet 76.7

1940 Ordnance Survey 25 inch map (1:2,500) Sheet 76.7

1956-1957 Ordnance Survey 25 inch map (1:2,500)

1971 Ordnance Survey 25 inch map (1:2,500)

6.3 Online resources

British Geological Survey Geology of Britain Viewer (accessed month year)
<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>



7 APPENDICES

7.1 Appendix 1: Survey Equipment and Data Processing

Survey methods and equipment

The magnetic data for this project will be acquired using a non-magnetic cart fitted with 4x Bartington Grad-01-1000L magnetic gradiometers. The instrument has four sensor assemblies fixed horizontally 1 m apart allowing four 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 0.03 nT over a ± 100 nT range, and measurements from each sensor are logged at a rate of 6 hz (intervals of sub 0.25 m). All of the data are stored on a Leica Viva CS35 tablet controller using the data acquisition program MLGrad 601. This also collects readings streamed by a Leica GS14 GNSS receiver, which is fixed to the cart at a measured distance from the sensors.

The use of the non-magnetic cart has several advantages over the use of the Bartington Grad 601-2 fluxgate gradiometer instrument. Perhaps chief amongst these is that it has a higher sample rate resulting in higher resolution dataset. The addition of the GPS receiver also negates the need to establish a survey grid prior to the survey and therefore increases efficiency. Mounting the instrument on the cart also reduces the occurrence of operator error caused by inconsistent walking speeds and variation in traverse position due to varying ground cover and topography.

Wessex Archaeology undertakes two types of magnetic surveys: scanning and detail. When not using the handheld Bartington 601-2 dual magnetic gradiometer, both types depend upon the establishment of an accurate 20 m or 30 m 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 0.02 m 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 0.25 m 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 20 m x 20 m or 30 m x 30 m grids, and data are collected at 0.25 m intervals along traverses spaced 1m apart. These strategies give 1600 or 3600 measurements per 20 m or 30 m 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 0.125 m intervals along traverses spaced up to 0.25 m apart, resulting in a maximum of 28800 readings per 30 m 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 for the non-magnetic cart fitted system may include:

- Smooth – Applying a smooth function removes any small scale spiking or ‘fuzziness’, generally caused by internal system noise. This effectively ‘destripes’ the data and reduces the appearance of dominant anomalous readings.
- Spline interpolation – Gridding the data with splines allows the application of minimum and maximum data values and reduces oscillations for potential fields such as gravity or magnetic.

Typical data and image processing steps for the dual magnetic gradiometer system 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.



7.2 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.
- 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.
- 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.



7.3 Appendix 3: OASIS form

Project Details:

Project name		Land at Blendworth Crescent, Havant, Hampshire			
Type of project		Detailed gradiometer survey			
Project description		A detailed gradiometer survey at Blendworth Crescent, Havant. The survey aimed to establish the presence, or otherwise, and nature of detectable archaeological features to support an outline planning application for the development of the Site. The site comprises a recreation ground located in the north of Havant, covering an area of 1.15 ha. The survey did not detect any anomalies of archaeological interest.			
Project dates		Start: 03-10-2016		End: 03-10-2016	
Previous work		DBA by Wessex Archaeology (Doc Ref no. 113050.01)			
Future work		N/A			
Project Code:	113051	HER event no.	N/A	OASIS form ID:	Not raised as of 06/10/2016
		NMR no.	N/A		
		SM no.	N/A		
Planning Application Ref.		Outline planning application			
Site Status		None			
Land use		Recreation ground			
Monument type		N/A	Period	N/A	

Project Location:

Site Address	Blendworth Crescent, Havant, Hampshire			Postcode	PO9 2BA
County	Hampshire	District	Havant	Parish	N/A
Study Area	1.15 ha	Height OD	11 – 12 m aOD	NGR	471405, 107345

Project Creators:

Name of Organisation	Wessex Archaeology				
Project brief originator	Client		Project design originator		
Project Manager	Ruth Panes		Project Supervisor	Becky Hall	
Sponsor or funding body	PMC Construction and Development Services Ltd.		Type of Sponsor	Developer	

Project Archive and Bibliography:

Physical archive	N/A	Digital Archive	Geophysics, survey and report	Paper Archive	N/A
Report title	Land at Blendworth Crescent, Havant, Hampshire: Detailed Gradiometer Survey Report			Date	06/10/2016



Author	Wessex Archaeology	Description	Unpublished report	Report ref.	113051.03
---------------	-----------------------	--------------------	--------------------	------------------------	-----------



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

