

# BORDON GARRISON REDEVELOPMENT, HAMPSHIRE, AREA 2, SUB-PRIORITY 2 (BUDDS LANE PLAYING FIELD)

GEOPHYSICAL SURVEY PLANNING REF. 55587/001

commissioned by Wood on behalf of The Whitehill and Bordon Regeneration Company Limited

February 2018





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PROJECT INFO: HA Project Code RISO17 / NGR SU 7925 3581 / Parish Whitehill / Local Authority East Hampshire / OASIS Ref. headland5-306983

PROJECT TEAM: Project Manager Alistair Webb / Author David Harrison / Fieldwork Krasimir Dyulgerski, Ross Bishop / Graphics Beata Wieczorek-Oleksy, Caroline Norrman, David Harrison, Mano Kapazoglou

Approved by Alistair Webb







## **PROJECT SUMMARY**

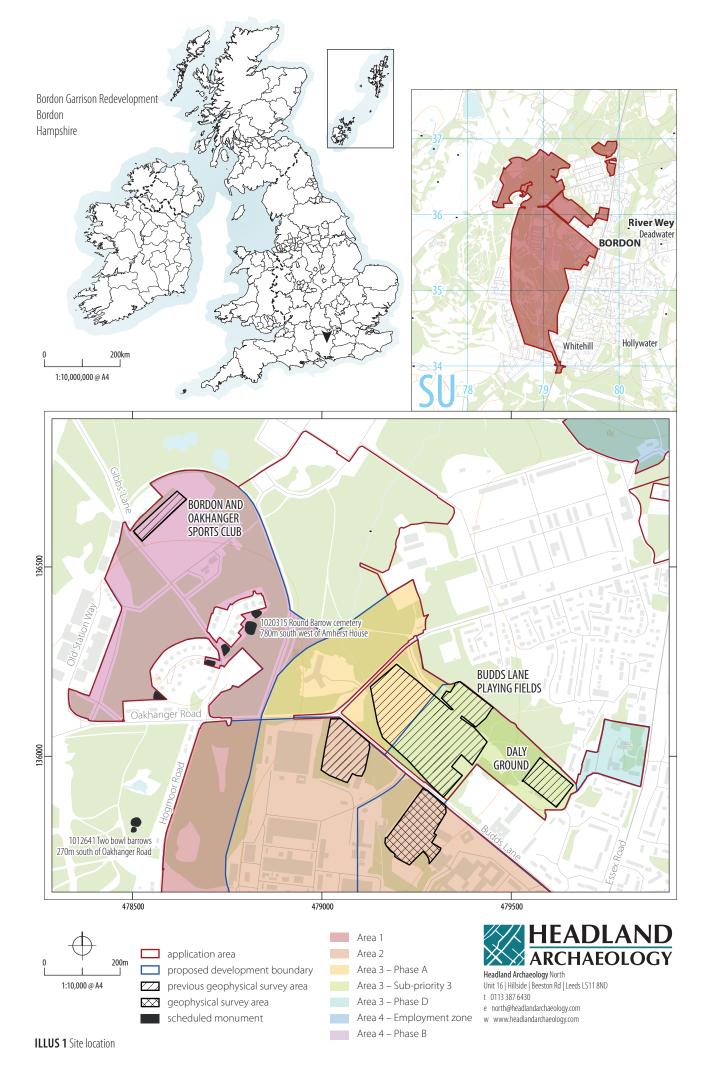
Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey of an area covering 1.4 hectares, in advance of the proposed redevelopment of Area 2, Sub-Priority 2 (Budds Lane Playing Field), part of the former Bordon Garrison site in Hampshire. The survey has identified a variable magnetic background characterised by frequent high magnitude anomalies which are caused by perimeter fencing, goalposts, lamp-posts, buried pipes and ferrous contamination of the upper soil horizons. Against this background, it would be difficult to identify any weaker responses from archaeological deposits, if present. No anomalies of possible archaeological potential have been identified by the geophysical survey and, on this basis, the archaeological potential of this area is assessed as very low.

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# BORDON GARRISON REDEVELOPMENT, HAMPSHIRE, AREA 2, SUB-PRIORITY 2 (BUDDS LANE PLAYING FIELD)

# GEOPHYSICAL SURVEY

## **1** INTRODUCTION

Headland Archaeology was commissioned by Wood (the Client) on behalf of The Whitehill and Bordon Regeneration Company Limited (the Developer) to undertake a geophysical (magnetometer) survey at Bordon Garrison, Hampshire (see Illus 1). The survey will inform forthcoming archaeological strategy in advance of the proposed redevelopment of the site and the adjoining land into residential and commercial units, transport links and open space (East Hampshire District Council Planning Ref. 55587/001). This report covers the survey of Area 2, Sub-Priority 2 (Budds Lane Playing Field) and is the fourth of a series of surveys being undertaken on the former military site (see Harrison and Bishop 2016, Harrison 2016 and Webb 2016).

The work was undertaken in accordance with a Written Scheme of Investigation (Harrison 2016) which was submitted to Hampshire County Council's Historic Environment Team, with guidance contained within the National Planning Policy Framework (DCLG 2012) and in line with current best practice (English Heritage 2008).

The survey was carried out on December 20th, 2017 in order to provide information on the archaeological potential of Area 2, Sub-Priority 2 (Budds Lane Playing Field).

## 1.1 SITE LOCATION, LAND-USE AND TOPOGRAPHY

The Application Boundary comprises former Ministry of Defence land on the western side of the A325 between Bordon and Whitehill, Hampshire, centred on NGR SU 790 352. It is subdivided into several Proposed Development Areas (PDA's; see Illus 1). This report is concerned with Area 2; Sub-Priority 2 (Budds Lane Playing Field) only. The survey area is centred at NGR SU 7925 3581 and comprised an area of short grass most recently in use as a rugby ground, part of the Budds Lane sports facility (see Illus 2 and Illus 3). It is bounded by Budds Lane to the north with former garrison facilities on all other sides. Two small areas at the south-west and the south-east of the rugby ground were fenced off and unsuitable for survey. The site was flat at approximately 78m above Ordnance Datum.

#### 1.2 GEOLOGY AND SOILS

The underlying bedrock comprises sandstone of the Folkestone Formation. No superficial deposits are recorded (NERC 2016).

The soils are classified in the Soilscape 14 association, characterised as freely draining very acid sandy and loamy soils (Cranfield University 2018). However, it is worth considering that, owing to recent land use (both military and sports/recreational) there is likely to be some disparity between this classification and the actual condition of the soils across the PDA.

# 2 ARCHAEOLOGICAL BACKGROUND

No known archaeological remains are recorded within the geophysical survey areas. However, a Heritage Statement (AMEC 2014) for the wider PDA concluded that:

'...there is a strong likelihood that sub-surface archaeological remains will be present within some of the application areas but not in all. Heritage assets potentially affected include Mesolithic artefact scatters and working floors, Bronze Age ritual and funerary remains and 20th century military remains, including extant structures.'



ILLUS 2 Survey area, looking north-west

There is significant evidence for Bronze Age funerary remains 650m north-west of the survey area where a round barrow cemetery (Scheduled Monument 1020315; see Illus 1) comprising five prehistoric burial mounds is recorded. In addition, a further twenty burial mounds (including another five scheduled monuments) are recorded within 2km of the application area.

#### 3 AIMS, METHODOLOGY AND PRESENTATION

The main aim of the geophysical survey was to identify and assess the nature and extent of any anomalies which may relate to sub-surface features or deposits of archaeological interest within the footprint of the PDA. The survey also aimed to identify any areas of disturbance or activity which may have affected the archaeological evaluation and establish the suitability of site conditions (geology, soils etc.) and any variability within the site as evidence from the responses encountered during the survey.

The general archaeological objective of the geophysical survey was to produce a full report to include the analysis and interpretation of the survey, and to include commentary on the perceived effectiveness of the survey in response to ground conditions. This will inform decisions regarding the nature and scope of any further scheme of archaeological works that may be required.

#### 3.1 MAGNETOMETER SURVEY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. A feature such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the earth's magnetic field. In mapping these slight variations, detailed plans of sites can be obtained as buried features often produce reasonably characteristic anomaly shapes and strengths (Gaffney & Gater 2003). Further information on soil magnetism and the interpretation of magnetic anomalies is provided in Appendix 1.

The survey was undertaken using four Bartington Grad601 sensors mounted at 1m intervals (1m traverse interval) onto a rigid carrying frame. The system was programmed to take readings at a frequency of 10Hz (allowing for a 10-15cm sample interval) on roaming traverses (swaths) 4m apart. These readings were stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system was linked to a Trimble R8s Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for each data point.

MLGrad601 and MultiGrad601 (Geomar Software Inc.) software was used to collect and export the data. Terrasurveyor V3.0.32.4 (DWConsulting) software was used to process and present the data.



ILLUS 3 Survey area, looking north

## 3.2 REPORTING

A general site location plan is shown in Illus 1 at a scale of 1:10,000. Illus 2 and Illus 3 are general site condition photographs. Illus 4 shows the greyscale data in relation to the data from the adjacent surveys at scale 1:2000. The processed data in greyscale and XY trace format, together with an interpretation graphic, are presented at a scale of 1:1,250 in Illus 5, 6 and 7.

Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the site archive. Data processing details are presented in Appendix 4. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 5.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Harrison 2016) and guidelines outlined by Historic England (English Heritage 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations from Ordnance Survey mapping are reproduced with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

The illustrations in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All illustrations are presented to most suitably display and interpret the data from this site based on the experience and knowledge of management and reporting staff.

# 4 RESULTS AND DISCUSSION

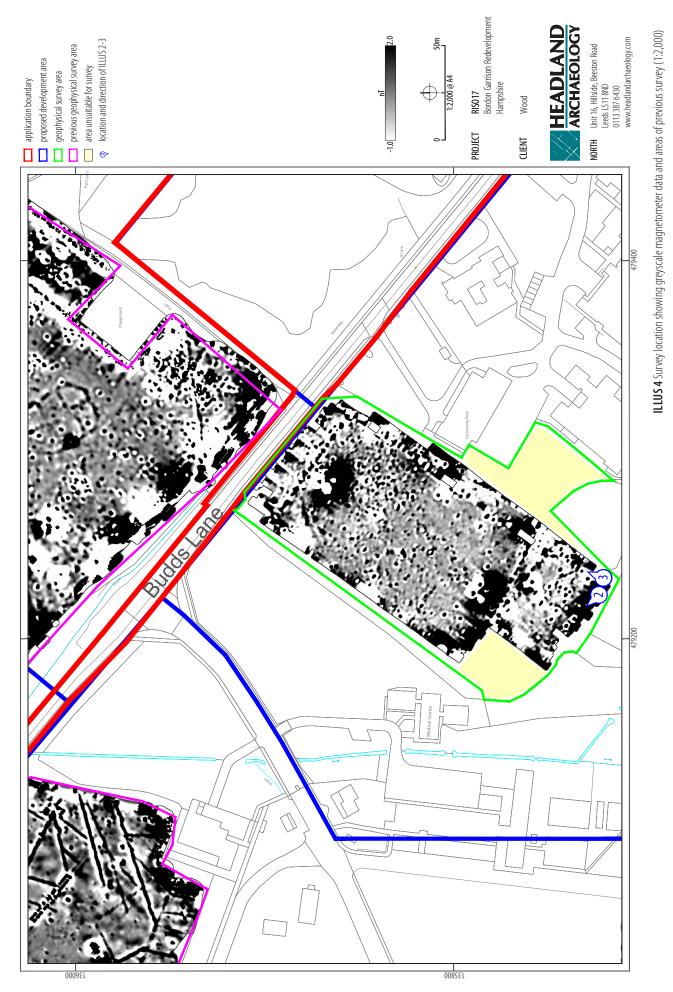
The magnetic dataset is dominated by high magnitude anomalies and broad areas of magnetic disturbance making a confident assessment of the background magnetic contrast difficult. The larger high magnitude anomalies can be confidently attributed to ferrous objects visible on the ground surface such as the rubgy goal-posts in the centre of the survey area (GP, see Illus 5) and the broad areas of disturbance at the edges of the survey area which are caused by ferrous perimeter fencing. Three dipolar linear anomalies (SP1–3, see Illus 5) locate buried service pipes. Two vague linear anomalies in the west of the survey area are of uncertain origin but may locate drains. Elsewhere the dataset contains numerous discrete areas of magnetic enhancement which are likely to be due to modern landscaping/filling/levelling of the site for recreational use.

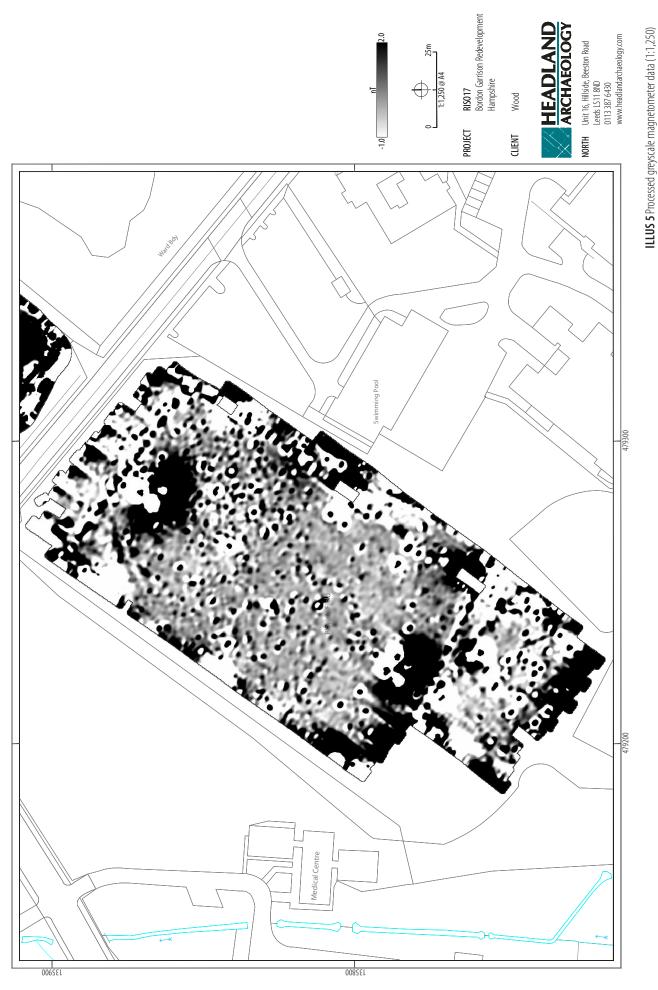
# 5 CONCLUSION

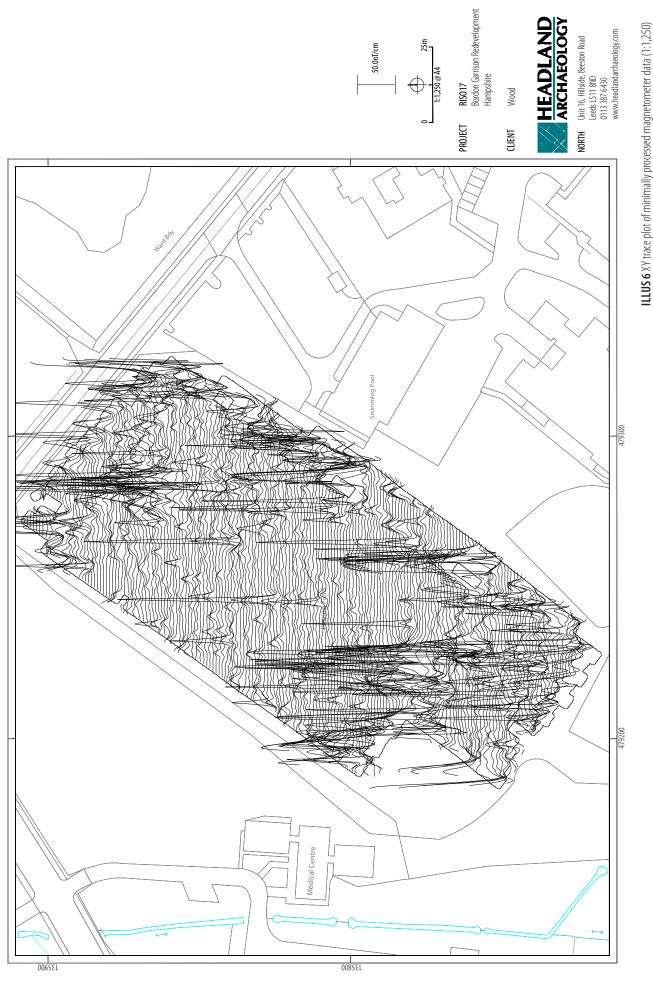
The geophysical survey has identified anomalies consistent with the most recent usage of the site as a sports pitch. All other anomalies reflect modern activity. No anomalies of possible archaeological origin have been identified and therefore the archaeological potential of this site is assessed as very low.

#### 6 **REFERENCES**

- AMEC Environment and Infrastructure 2014 *Bordon Garrison Redevelopment, Heritage Statement* [unpublished client document] Ref DIO/HPA/DOC/20
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- Natural Environment Research Council (NERC) 2018 *British Geological Survey* <u>http://www.bgs.ac.uk/</u> accessed 8 January 2018
- Webb A 2016 *Bordon Garrison Redevelopment, Hampshire, Area 2 (TTA); Geophysical Survey* [unpublished client document] Headland Archaeology, Ref RISO/02









# 7 APPENDICES

## APPENDIX 1 MAGNETOMETER SURVEY

#### Magnetic susceptibility and soil magnetism

Iron makes up about 6% of the earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haematite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms so that by measuring the magnetic susceptibility of the topsoil, areas where, human occupation or settlement has occurred, can be identified by virtue of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected.

The magnetic susceptibility of a soil can also be enhanced by the application of heat. This effect can lead to the detection of features such as hearths, kilns or areas of burning.

#### Types of magnetic anomaly

In the majority of instances, anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However, some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can, therefore, remove the feature causing the anomaly. The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

**Isolated dipolar anomalies (iron spikes)** These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

**Areas of magnetic disturbance** These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

**Linear trend** This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response (sometimes only visible on an XY trace plot) on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often, therefore, be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

### APPENDIX 2 SURVEY LOCATION INFORMATION

An initial survey base station was established using a Trimble VRS differential Global Positioning System (dGPS). The magnetometer data were georeferenced using a Trimble RTK differential Global Positioning System (Trimble R8s model).

Temporary sight markers were laid out using a Trimble VRS differential Global Positioning System (Trimble R8s model) to guide the operator and ensure full coverage. The accuracy of this dGPS equipment is better than 0.01m.

The survey data were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if coordinates are measured off hard copies of the mapping rather than using the digital coordinates.

Headland Archaeology cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

### APPENDIX 3 GEOPHYSICAL SURVEY ARCHIVE

The geophysical archive comprises an archive disk containing the raw data in XYZ format, a raster image of each greyscale plot with associate world file, and a PDF of the report.

The project will be archived in-house in accordance with recent good practice guidelines (<u>http://guides.archaeologydataservice.</u> <u>ac.uk/g2gp/Geophysics\_3</u>). The data will be stored in an indexed archive and migrated to new formats when necessary.

### APPENDIX 4 DATA PROCESSING

The gradiometer data has been presented in this report in processed greyscale and minimally processed XY trace plot format.

Data collected using RTK GPS-based methods cannot be produced without minimal processing of the data. The minimally processed data has been interpolated to project the data onto a regular grid and de-striped to correct for slight variations in instrument calibration drift and any other artificial data.

A high pass filter has been applied to the greyscale plots to remove low frequency anomalies (relating to survey tracks and modern agricultural features) in order to maximise the clarity and interpretability of the archaeological anomalies.

The data has also been clipped to remove extreme values and to improve data contrast.

# APPENDIX 5 OASIS DATA COLLECTION FORM: ENGLAND

# OASIS ID: headland5-306983

Project details

Project details	
Project name	Bordon Garrison Redevelopment, Hampshire; Area 2, Sub-Priority 2 (Budds Lane Playing Field)
Short description of the project	Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey of an area covering 1.4 hectares, in advance of the proposed redevelopment of Area 2, Sub-Priority 2 (Budds Lane Playing Field), part of the former Bordon Garrison site in Hampshire. The survey has identified a variable magnetic background characterised by frequent high magnitude anomalies which are caused by perimeter fencing, goal-posts, lamp-posts, buried pipes and ferrous contamination of the upper soil horizons. Against this background it would be difficult to identify any weaker responses from archaeological deposits, if present. No anomalies of possible archaeological potential have been identified by the geophysical survey and, on this basis, the archaeological potential of this area is assessed as very low.
Project dates	Start: 20-12-2017 End: 20-12-2017
Previous/future work	Yes / Yes
Any associated project reference codes	RISO17 - Contracting Unit No.
Type of project	Field evaluation
Site status	None
Current Land use	Other 14 - Recreational usage
Monument type	N/A None
Monument type	N/A None
Significant Finds	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	After outline determination (eg. As a reserved matter)
Solid geology (other)	Folkstone Formation
Drift geology (other)	None
Techniques	Magnetometry
Project location	
Country	England
Site location	HAMPSHIRE EAST HAMPSHIRE WHITEHILL Bordon Garrison Redevelopment, Hampshire; Area 2, Sub-Priority 2 (Budds Lane Playing Field)
Postcode	GU35 9HQ
Study area	1.4 Hectares
Site coordinates	SU 7925 3581 51.115563511301 -0.867654309286 51 06 56 N 000 52 03 W Point
Project creators	
Name of Organisation	Headland Archaeology
Project brief originator	AMECFW
Project design originator	Headland Archaeology
Project director/manager	Webb, A.
Project supervisor	Bishop, R
Type of sponsor/funding body	Developer
Project archives	

#### BORDON GARRISON REDEVELOPMENT, HAMPSHIRE, AREA 2, SUB-PRIORITY 2 (BUDDS LANE PLAYING FIELD) RISO17

Physical Archive Exists?	No
Digital Archive recipient	In house
Digital Contents	"Survey"
Digital Media available	"Geophysics","Survey"
Paper Archive Exists?	No
Project bibliography 1	
Publication type	Grey literature (unpublished document/manuscript)
Title	Bordon Garrison Redevelopment, Hampshire; Area 2, Sub-Priority 2 (Budds Lane Playing Field); Geophysical Survey
Author(s)/Editor(s)	Harrison, D.
Date	2017
Issuer or publisher	Headland Archaeology
Place of issue or publication	Leeds
Description	A4 comb-bound report
Entered by	David Harrison (david.harrison@headlandarchaeology.com)
Entered on	23 January 2018





Headland Archaeology South & East Building 68C | Wrest Park | Silsoe | Bedfordshire MK45 4HS t 01525 861 578 e southandeast@headlandarchaeology.com Headland Archaeology Midlands & West Unit 1 | Clearview Court | Twyford Rd | Hereford HR2 6JR t 01432 364 901 e midlandsandwest@headlandarchaeology.com Headland Archaeology North Unit 16 | Hillside | Beeston Rd | Leeds LS11 8ND t 0113 387 6430 e north@headlandarchaeology.com Headland Archaeology Scotland 13 Jane Street | Edinburgh EH6 SHE t 0131 467 7705 e scotland@headlandarchaeology.com

www.headlandarchaeology.com