WYAS Archaeological Services

Sandbeck Lane
Wetherby
West Yorkshire

Geophysical Survey

Report no. 3035
May 2017

Client: Prospect Archaeology Ltd

Sandbeck Lane, Wetherby, West Yorkshire

Geophysical Survey

Summary

A geophysical (magnetometer) survey, covering approximately 1 hectare was undertaken on pastoral land to the north of Sandbeck Lane, Wetherby in advance of housing development. The survey has detected ridge and furrow cultivation, and a possible former boundary ditch and pond. The majority of responses were of a modern origin associated with the current housing development. Therefore, based on this survey, the archaeological potential of the site is deemed to be low.

WYAS
Archaeological Services

Report Information

Client:	Prospect Archaeology Ltd.
Address:	Prospect House, Garden Lane, Leeds, LS25 6AT
Report Type:	Geophysical Survey
Location:	Wetherby
County:	West Yorkshire
Grid Reference:	SE 409 495
Period(s) of activity:	medieval
Report Number:	3035
Project Number:	6685
Site Code:	SBL17
OASIS ID:	archaeol11-299869
Date of fieldwork:	April 2017
Date of report:	May 2017
Project Management:	Emma Brunning BSc MCIfA
Fieldwork:	Emma Brunning
Report:	Emma Brunning
Illustrations:	Emma Brunning
Photography:	Emma Brunning

Authorisation for distribution: ----------

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1 Introduction

Archaeological Services WYAS (ASWYAS) was commissioned by Prospect Archaeology Ltd, to undertake a geophysical (magnetometer) survey on land at Sandbeck Lane, Wetherby to inform on proposed development. Guidance contained within the National Planning Policy Framework (DCLG 2012) was followed, in line with current best practice (CIfA 2014; David *et al*. 2008). The survey was carried out on 21st April 2017 to provide additional information on the archaeological resource of the Proposed Development Area (PDA).

Site location, topography and land-use

The PDA is located to the north of Wetherby, approximately 18km to the northeast of Leeds and 12km to the southeast of Harrogate. It is bound on its southern side by Sandbeck Lane, its eastern side by the A1(M) and on the western side by a current housing development (see Fig. 1). The survey area is centred at SE 409 495 and consisted of grazing pasture. The topography of the site was slightly undulating with a height above Ordnance Datum (aOD) of approximately 24m.

Soils and geology

The study site lies on the Edlington formation, comprising mudstone. Superficial deposits have been recorded as the Vale of York formation – clay, sand and gravels and as Glaciolacustrine deposits, Devension – clay and silt (BGS 2017). Soils of the area are slightly acid loamy and clayey with impeded drainage (Cranfield University 2017).

2 Archaeological Background

Within 500m of the site further medieval and/or post medieval ridge and furrow (Monument No. 1570433 and 1398008) and field boundaries (1570409) have been recorded on Pastscape as cropmarks on air photos (HE 2017). Just to the southeast of the survey area lies the possible site of a Bronze Age round barrow (55165).

3 Aims and Methodology

The main aim of the geophysical survey was to provide sufficient information to enable an assessment to be made of the impact of the development on potential sub-surface archaeological remains and for further evaluation or mitigation proposals, if appropriate, to be recommended. To achieve this aim, a magnetometer survey covering all amenable parts of the PDA was undertaken (see Fig. 2).

The general objectives of the geophysical survey were:

- to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- to therefore determine the presence/absence and extent of any buried archaeological features; and
- to prepare a report summarising the results of the survey.

Magnetometer survey

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble R6 model). The survey was undertaken using Bartington Grad601 magnetic gradiometers. These were employed taking readings at 0.25m intervals on zig-zag traverses 1.0m apart within 30m by 30m grids, so that 3600 readings were recorded in each grid. These readings were stored in the memory of the instrument and later downloaded to computer for processing and interpretation. Geoplot 3 (Geoscan Research) software was used to process and present the data. Further details are given in Appendix 1.

Presentation

A general site location plan, incorporating the 1:50000 Ordnance Survey (OS) mapping, is shown in Figure 1. Figure 2 displays processed magnetometer data at a scale of 1:1000. The processed and minimally processed data, together with an interpretation of the survey results are presented in Figures 3 to 5 inclusive at a scale of 1:1000.

Technical information on the equipment used, data processing and survey methodologies are given in Appendix 1. Technical information on locating the survey area is provided in Appendix 2. Appendix 3 describes the composition and location of the archive. A copy of the completed OASIS form is included in Appendix 4.

The survey methodology, report and any recommendations comply with guidelines outlined by English Heritage (David *et al.* 2008) and by the Chartered Institute for Archaeologists (CIfA 2014).

Disclaimers

The figures 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 figures are presented to most suitably display and interpret the data from this site based on the experience and knowledge of Archaeological Services staff.

4 Results and Discussion (see Figures 3-5)

Ferrous anomalies

Ferrous anomalies, as individual 'spikes', or as large discrete areas are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris or material is common on rural sites, often being present as a consequence of manuring or tipping/infilling. There is no obvious pattern or clustering to their distribution in this survey to suggest anything other than a random background scatter of ferrous debris in the plough-soil.

Magnetic disturbance along the western boundary of the site is due to the site compound and Heras fencing, further fencing ran along the southern boundary. Magnetic disturbance along the eastern boundary is due to smaller metal fencing. A service pipe has also been detected bisecting the survey area on a southwest to northeast alignment.

Two areas of magnetic disturbance (**1**) correspond to boreholes and a similar response (**2**) locates a manhole cover. A further area of disturbance (**3**) corresponded to a dip in the ground and also corresponds to a former pond shown on mapping dating from 1891 (OM 2017).

Agricultural anomalies

Ridge and furrow cultivation has been detected on a northwest to southeast alignment and reflects part of the wider medieval landscape which is known through cropmarks (ASWYAS 2010. A linear trend which limits the ridge and furrow in the north is likely to be associated with a headland.

A further linear agricultural trend (**4**) in the south of the data may be associated with a former field boundary which pre-dates any available mapping, however, it must also be noted that the manhole cover is located along this linear response and may also be indicative of a drain.

5 Conclusions

The geophysical survey has identified no anomalies of archaeological interest apart from medieval ridge and furrow cultivation. There is the potential for a former field boundary in the south of the survey area. The majority of the anomalies are of a modern date, including responses from Heras fencing, bore holes and a service pipe. Therefore, the archaeological potential of this site is low.

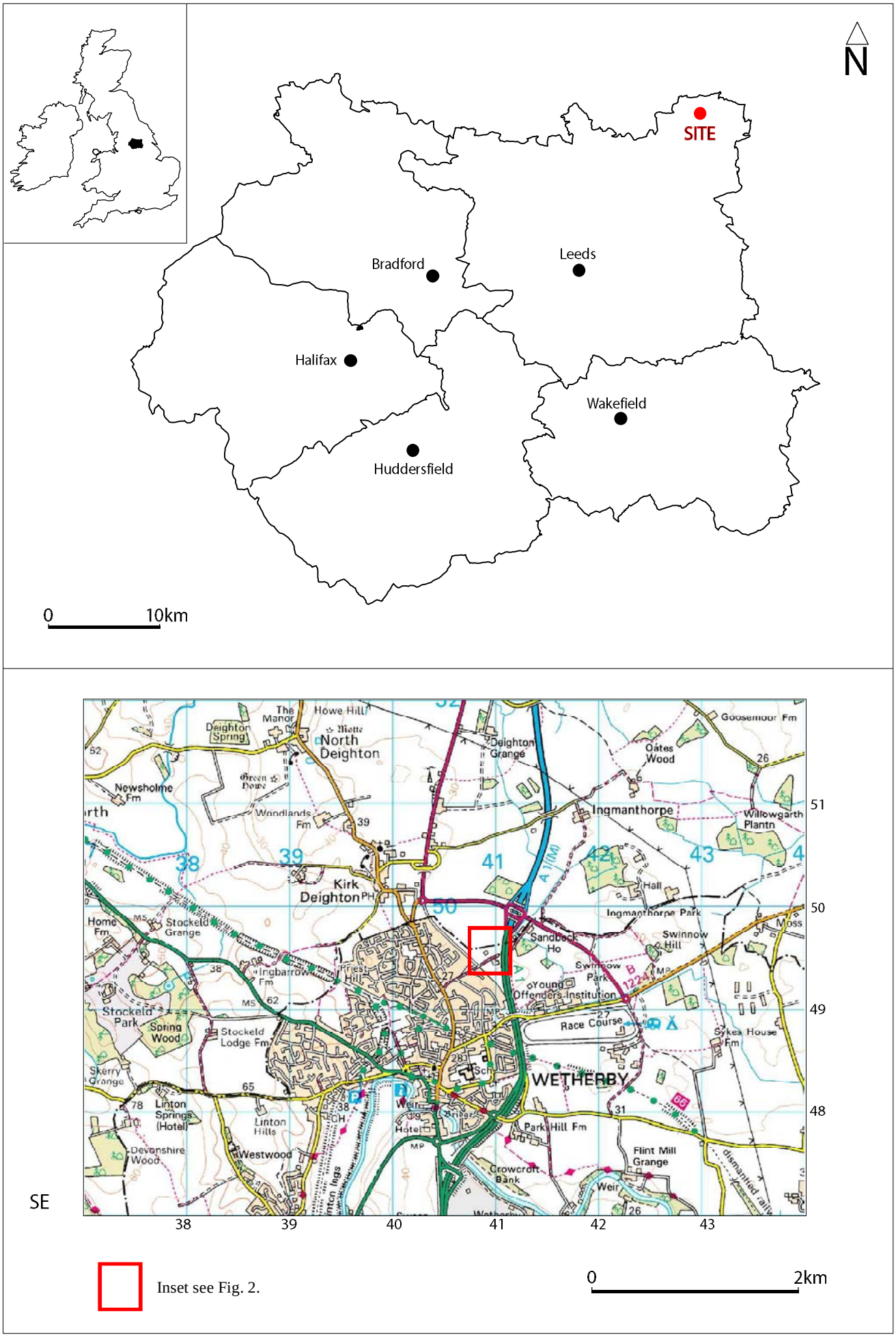

Fig. 1. Site location

PROJECT ID: 6685_SBL17

1 LOCATION AND DIRECTION OF PLATES

Drain

FB

1.22m RH

Def

new fence

Compound

Track

N

449600

410000

SANDBECK LANE

2.0

-1.0

nT

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Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 383 7500 Fax:0113 383 7501

0 50m

Fig. 4. Processed greyscale magnetometer data (1:1000 @ A3)

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Tel: 0113 383 7500 Fax:0113 383 7501

Fig. 3. Processed greyscale magnetometer data (1:1000 @ A3)

PROJECT ID: 6685_SBL17

Drain

FB

1.22m RH

Def

new fence

Compound

Dam Bldg

Track

N

449600

SANDBECK LANE

20.0 nT/cm

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Tel: 0113 383 7500 Fax:0113 383 7501

441000

Fig. 4. XY trace plot of minimally processed magnetometer data (1:1000 @ A3)

0 50m

PROJECT ID: 6685_SBL17

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
——	DIPOLAR LINEAR	SERVICE PIPE
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
– – –	LINEAR TREND	RIDGE AND FURROW
——	LINEAR TREND	AGRICULTURAL

N

449600

Drain

FB

1.22m RH

Def

new fence

Compound

ecnd ven

3

1

2

4

1

4

SANDBECK LANE

410000

Archaeological Services W Y A S
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 383 7500 Fax:0113 383 7501

0 50m

Fig. 5. Interpretation of magnetometer data (1:1000 @ A3)

Plate 1. General view of site, looking southeast

Plate 2. General view of site, looking northwest

Plate 3. General view of site, looking south

Appendix 1: Magnetic survey - technical information

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 haemetite. 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. Areas of human occupation or settlement can then be identified by measuring the magnetic susceptibility of the topsoil because 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 and the fermentation and bacterial effects associated with rubbish decomposition. The area of enhancement is usually quite large, mainly due to the tendency of discard areas to extend beyond the limit of the occupation site itself, and spreading by the plough.

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 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.

Methodology: Gradiometer Survey

The main method of using the fluxgate gradiometer for commercial evaluations is referred to as ***detailed survey*** and requires the surveyor to walk at an even pace carrying the instrument within a grid system. A sample trigger automatically takes readings at predetermined points, typically at 0.25m intervals, on traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation.

During this survey a Bartington Grad601 magnetic gradiometer was used taking readings on the 0.1nT range, at 0.25m intervals on zig-zag traverses 0.5m apart within 30m by 30m square grids. The instrument was checked for electronic and mechanical drift at a common point and calibrated as necessary. The drift from zero was not logged.

The gradiometer data have been presented in this report in processed greyscale format. The data in the greyscale images have been interpolated and selectively filtered to remove the effects of drift in instrument calibration and other artificial data constructs and to maximise the clarity and interpretability of the archaeological anomalies.

The results and subsequent interpretation of data from geophysical surveys should not be treated as an absolute representation of the underlying archaeological and non-archaeological remains. Confirmation of the presence or absence of archaeological remains can only be achieved by direct investigation of sub-surface deposits.

Appendix 2: Survey location information

An initial survey station was established using a Trimble VRS differential Global Positioning System (Trimble R6 model). The data was geo-referenced using the geo-referenced survey station with a Trimble RTK differential Global Positioning System (Trimble R6 model). The accuracy of this equipment is better than 0.01m. The survey grids 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 co-ordinates are measured off hard copies of the mapping rather than using the digital co-ordinates.

Archaeological Services WYAS cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

Appendix 3: Geophysical archive

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2000), and graphics files (Adobe Illustrator CS2 and AutoCAD 2008) files; and
- a full copy of the report.

At present the archive is held by Archaeological Services WYAS although it is anticipated that it may eventually be lodged with the Archaeology Data Service (ADS). Brief details may also be forwarded for inclusion on the English Heritage Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the West Yorkshire Historic Environment Record).

Appendix 4: Oasis form

OASIS DATA COLLECTION FORM: England

OASIS ID: archaeol11-299869

Project details

Project name	Sandbeck Lane, Wetherby
Short description of the project	A geophysical (magnetometer) survey, covering approximately 1 hectare was undertaken on pastoral land to the north of Sandbeck Lane, Wetherby in advance of housing development. The survey has detected ridge and furrow cultivation, and a possible former boundary ditch and pond. The majority of responses were of a modern origin associated with the current housing development. Therefore, based on this survey, the archaeological potential of the site is deemed to be low.
Project dates	Start: 21-04-2017 End: 21-04-2017
Previous/future work	No / Not known
Any associated project reference codes	6685 - Sitecode
Type of project	Field evaluation
Monument type	NONE None
Significant Finds	RIDGE AND FURROW Medieval
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Pre-application
Solid geology (other)	Mudstone
Drift geology	SAND AND GRAVEL OF UNCERTAIN AGE OR ORIGIN
Techniques	Magnetometry

Project location

Country	England
Site location	WEST YORKSHIRE LEEDS WETHERBY Sandbeck Lane, Wetherby
Study area	1 Hectares

Site coordinates	SE 409 495 53.939797687858 -1.37687919434 53 56 23 N 001 22 36 W Point
Height OD / Depth	Min: 24m Max: 24m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Prospect Archaeology Ltd
Project design originator	Prospect Archaeology Ltd
Project director/manager	E Brunning
Project supervisor	E Brunning

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Prospect Archaeology
Digital Contents	"Survey"
Digital Media available	"Geophysics","Images raster / digital photography","Text"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Sandbeck Lane, Wetherby
Author(s)/Editor(s)	Brunning, E.
Date	2017
Issuer or publisher	ASWYAS
Place of issue or publication	Leeds
Description	A4 report with A4 and A3 figures

Entered by	Emma Brunning (emma.brunning@aswyas.com)
Entered on	2 November 2017

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