WYAS Archaeological Services

Land off Summerdale Road
Cudworth
South Yorkshire

Geophysical Survey

Report no. 2999
July 2017

Client: Prospect Archaeology

REGISTERED ORGANISATION CIfA

West Yorkshire Joint Services

Land at Summerdale Road, Cudworth, South Yorkshire

Geophysical Survey

Summary

A geophysical (magnetometer) survey, covering approximately 2.5 hectares was undertaken on arable land to the south of Summerdale Road, Cudworth, South Yorkshire. This was part of a programme of archaeological works in advance of a roadway as part of the first phase of works. No anomalies associated with archaeological remains were detected. Multiple linear trends associated with agriculture have been located within the survey area, comprising of a probable former field boundary public footpaths and ridge and furrow from an undetermined data. Magnetic disturbance along the northern limits of the dataset are primarily due to metal fencing. The survey has detected multiple clusters of low magnitude anomalies that have been interpreted as geological in origin. Therefore the archaeological potential of the survey area is deemed to be low.

WYAS
Archaeological Services

Report Information

Client:	Prospect Archaeology Ltd.
Address:	Prospect House, Garden Lane, Sherburn-in-Elmet, Leeds, North Yorkshire, LS25 6AT
Report Type:	Geophysical Survey
Location:	Cudworth
County:	South Yorkshire
Grid Reference:	SE385 082
Period(s) of activity:	Prehistoric/ Iron Age/ Modern
Report Number:	2999
Project Number:	6770
Site Code:	CUD17
OASIS ID:	archaeol11-291614
Date of fieldwork:	July 2017
Date of report:	July 2017
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Authorisation for distribution: ----------

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1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by Prospect Archaeology Ltd, on behalf of their client Barratt Homes & David Wilson Homes, to undertake a geophysical (magnetometer) survey on land to the south of Summerdale Road, Cudworth 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 the 17th July 2017 to provide additional information on the archaeological resource of the Proposed Development Area (PDA).

Site location, topography and land-use

The PDA consists of 3 areas totaling approximately 2.5ha of arable land located to the northeast of Barnsley, South Yorkshire. Of this, approximately 0.3 hectares to the southeast of the scheme was unsurveyable, due to overgrown vegetation and established hedgerows between area 3 and Carrs Lane.

The site is enclosed by residential properties associated with Summerdale Road to the north and Carrs Lane to the east. It is also bounded by a dismantled railway to the west and additional arable fields to the south. The survey area is approximately 6.4km to the northeast of Barnsley. The survey area is centred at SE 385 082. The topography of the site was flat with a height above Ordnance Datum (aOD) of approximately 53m.

Soils and geology

The underlying bedrock geology of the site belongs to the Glass Houghton Rock formation, with no superficial deposits recorded (BGS 2017). The overlying soils belong to the Rivington 1 association (514f) described as typical brown earths (SSEW 1983).

2 Archaeological Background

Analysis of the Pastscape record shows that there is archaeological activity within a 1km of the survey area (SE 37940746), most notably from the Mesolithic period (www.pastscape.org.uk 2017). Monument 52409, 1 mile to the southwest of the village, is an area of occupation dating to between 10,000 and 4,000BC. A number of flint impliments have been found, predominantly to the south which relate to a possible Mesolithic flint working site (Wymer, 1977). Additionally, a late prehistoric field system has been identified in cropmarks via aerial photography (Monument 1025447), in an adjoining southern field to monument 52409. The field system also comprises of a possible enclosure and trackway.

Possible Iron/ Roman age field systems are also visible as cropmarks on aerial photographs to the northwest of site. Encompassing a series of ditched boundaries forming small rectilinear fields. The feature were first seen on Historic England (formerly English Heritage) Reconnaissance aerial photographs taken 11th July 2013.

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 5800 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.

Reporting

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 1:3000. 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 1:1500.

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). All figures reproduced from Ordnance Survey mapping are with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

The figures in this report have been produced following analysis of the data in 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 to 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. Large ferrous responses along the northern limit of the survey area are due to metal fencing within the field boundaries.

Agricultural anomalies

Multiple magnetic linear trends in the data are likely to represent anomalies associated with agricultural activity. A stronger anomaly located in area 1 which traverses the survey area runs parallel to Carrs Lane, is likely to represent a former field boundary depicted on historic mapping for the area. Identified linear trends are visible throughout areas 2 and 3. These trends are most likely to represent former ridge and furrow from an undetermined date. The two weaker anomaly to the southeast of the scheme in area 3 are more likely to represent a public footpath.

Geological anomalies

The survey has detected multiple clusters of low magnitude anomalies that have been interpreted as geological in origin. It is thought that the responses have been detected because of the variation in the composition and depth of the soils and deposits of superficial material in which they derive. The anomalies are present throughout the survey area with no apparent trends present.

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.

5 Conclusions

No anomalies of archaeological interest have been detected in the magnetic survey. Linear responses associated with a former field boundary and other agricultural activities have been recorded.

The remaining anomalies are of a modern ferrous and geological nature in the forms of responses associated with metal fencing and changes in subsurface geochemistry. Therefore the archaeological potential of the site is deemed to be low.

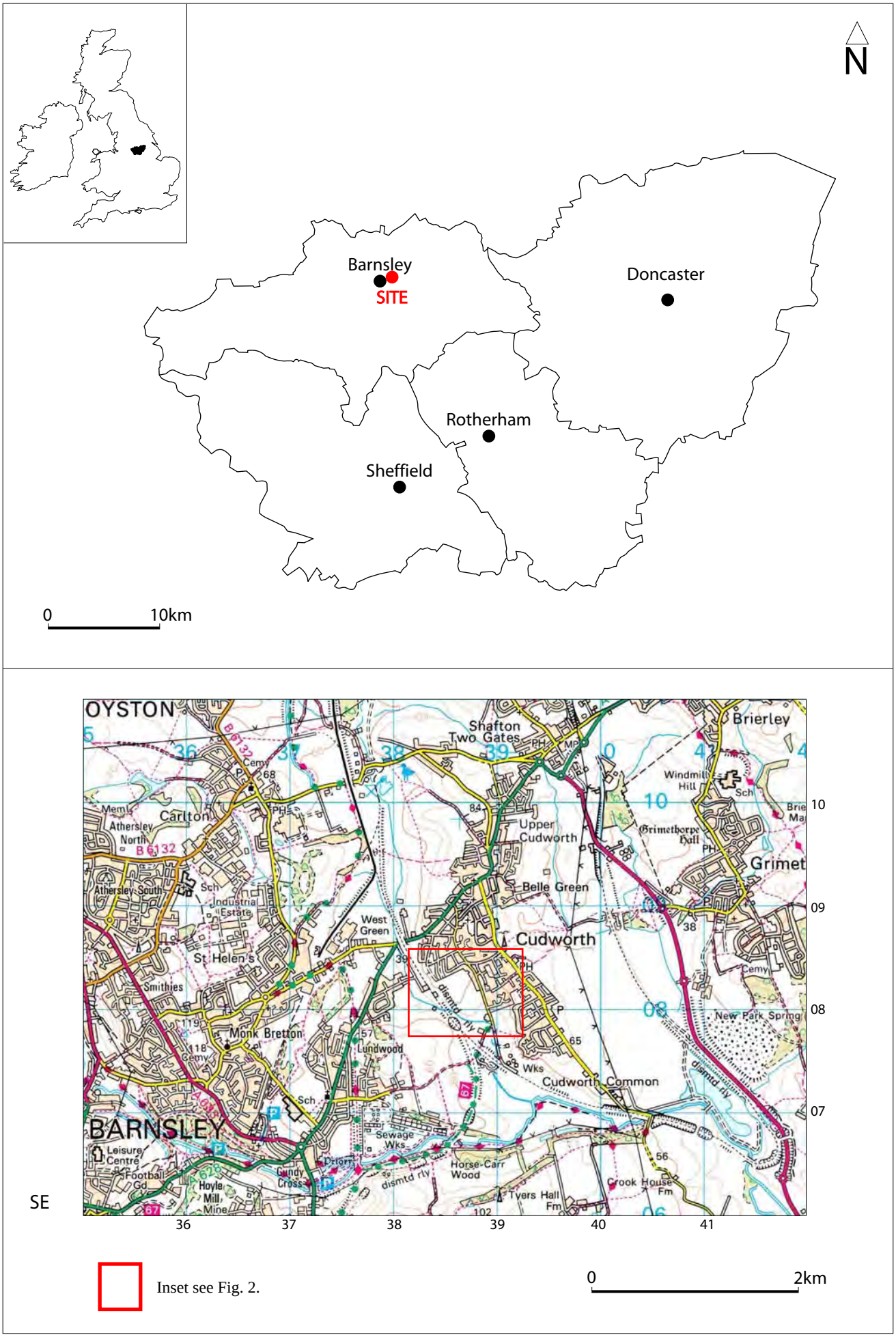


Fig. 1. Site location

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PROJECT ID: CUD17	
	SURVEY BOUNDARY
1	LOCATION AND DIRECTION OF PLATES
	UNSURVEYABLE AREA

AREA 1

AREA 2

AREA 3

1

2

3

4

2.0

-1.0

nT

N

408400

408200

408000

407800

438200

438400

438600

438800

439000

0 100m

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Tel: 0113 383 7500

Fig. 2. Survey location showing greyscale magnetometer data (1:3000 @ A3)

PROJECT ID: CUD17

N

2.0

-1.0

nT

4082000

4080000

4384000

4386000

4388000

0 50m

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Fig. 3. Processed greyscale magnetometer data (1:1500 @ A3)

PROJECT ID: CUD17

20.0 nT/cm

N

4082**00**

4080**00**

4384**00**

4386**00**

4388**00**

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0 50m

Fig. 4. XY trace plot of magnetometer data (1:1500 @ A3)

PROJECT ID: CUD17

TYPE OF ANOMALY	INTERPRETATION
DIPOLAR ISOLATED	FERROUS MATERIAL
MAGNETIC DISTURBANCE	FERROUS MATERIAL
LINEAR TREND	FORMER FIELD BOUNDARY
LINEAR TREND	PUBLIC FOOTPATH
LINEAR TREND	RIDGE AND FURROW
LINEAR TREND	GEOLOGY

N

4082**00**

4080**00**

4384**00**

4386**00**

4388**00**

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Tel: 0113 383 7500

0 50m

Fig. 5. Survey location showing greyscale magnetometer data (1:1500 @ A3)



Plate 1. General overview of Area 1, facing southeast



Plate 2. General overview of Area 2, facing northeast



Plate 3. General overview of Area 3, facing northeast



Plate 4. Unsurveyable Area 4, facing north

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 CS6 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 South Yorkshire Historic Environment Record).

Appendix 4: Oasis form

OASIS DATA COLLECTION FORM: England

List of Projects | Manage Projects | Search Projects | New project | Change your details | HER coverage | Change country | Log out

Printable version

OASIS ID: archaeol11-291614

Project details

Project name	Land at Summerdale Road, Cudworth
Short description of the project	A geophysical (magnetometer) survey, covering approximately 2.5 hectares was undertaken on arable land to the south of Summerdale Road, Cudworth, South Yorkshire. This was part of a programme of archaeological works in advance of a roadway as part of the first phase of works. No anomalies associated with archaeological remains were detected. Multiple linear trends associated with agriculture have been located within the survey area, comprising of a probable former field boundary public footpaths and ridge and furrow from an undetermined data. Magnetic disturbance along the northern limits of the dataset are primarily due to metal fencing. The survey has detected multiple clusters of low magnitude anomalies that have been interpreted as geological in origin. Therefore the archaeological potential of the survey area is deemed to be low.
Project dates	Start: 17-07-2017 End: 17-07-2017
Previous/future work	Not known / Not known
Any associated project reference codes	CUD17 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 3 - Operations to a depth more than 0.25m
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	Urban residential (e.g. flats, houses, etc.)
Prompt	Planning condition
Position in the planning process	Not known / Not recorded
Solid geology	Unknown
Drift geology	Unknown

Techniques	Magnetometry

Project location

Country	England
Site location	SOUTH YORKSHIRE BARNSLEY CUDWORTH Land at Summerdale Rad
Postcode	S72 8DX
Study area	2 Hectares
Site coordinates	SE 438619 408236 53.861569451902 -1.333000568637 53 51 41 N 001 19 58 W Point
Height OD / Depth	Min: 53m Max: 53m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Prospect Archaeology Ltd
Project design originator	ASWYAS
Project director/manager	E. Brunning
Project supervisor	R. Goulding
Type of sponsor/funding body	Landowner

Project archives

Physical Archive Exists?	No
Digital Archive recipient	ASWYAS
Digital Archive ID	CUD17
Digital Contents	"none"
Digital Media available	"Geophysics","Images raster / digital photography","Survey"
Digital Archive notes	N/A
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Land at Summerdale Road
Author(s)/Editor (s)	Trace, A.
Date	2017

Issuer or publisher	ASWYAS
Place of issue or publication	Leeds

Entered by	Christopher Sykes (christopher.sykes@aswyas.com)
Entered on	31 July 2017

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