CARDINGTON AIRFIELD, BEDFORDSHIRE

Archaeological Geophysical Surveys 2012 and 2014

Report by:

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Geophysical Survey 2014

1. Introduction

This report describes geophysical surveys carried out to test for evidence of archaeological features at the site of a proposed drainage pond to be constructed at Cardington Airfield, Bedfordshire.

Two surveys have been undertaken. The first was described in our report dated 20 April 2012 [1]. The proposed location of the pond was subsequently changed, and a second survey has been done to investigate the new site and its immediate surroundings.

Both surveys were commissioned from Bartlett-Clark Consultancy, Specialists in Archaeogeophysics of Oxford, by Archaeologica Ltd. Fieldwork for the first survey was done on 8 March 2012, and for the second on 10 October 2014. The alternative proposed outlines of the pond are indicated in blue on the enclosed site plan (figure 1). The area surveyed in 2012 amounts to 4.55ha, and 4.03 ha in 2014.

Additional nearby areas were also surveyed by Northamptonshire Archaeology in 2011, and the northern survey was subsequently enlarged early in 2012. Grey scale plots reproduced from the 2011 [2] and 2012 [3] Northamptonshire survey reports are reproduced for completeness and comparison alongside the present survey in figure 1.

The present report is based on the report supplied in 2012 [1], and includes most of the previous text. It has been revised and extended to include the 2014 results.

2. Objectives of the Survey

The aim of the geophysical survey was to identify the extent and character of any archaeological remains capable of producing a magnetic response. The magnetometer responds to cut features such as ditches and pits when they are silted with topsoil, which usually has a higher magnetic susceptibility than the underlying natural subsoil. It also detects the thermoremanent magnetism of fired materials, notably baked clay structures such as kilns or hearths, and so responds preferentially to the presence of ancient settlement or industrial remains. It is also strongly affected by ferrous and other debris of recent origin.

3. Topography and Geology

The survey is centred at NGR TL 087467 within an open grassed area of the airfield, and about 500m east of the two large airship sheds. The site is on an underlying bedrock of Oxford Clay, and is located at the southern limit of an area of River Terrace gravel deposits. The ground near the paved trackway (which forms the northern boundary of the 2012 and 2014 surveys) is at an elevation of c. 29m AOD. The ground slopes down

slightly to the north and east, as well as south towards a stream.

Previous magnetometer surveys, both on Oxford Clay and on gravel sites near Bedford, have usually provided favourable conditions for the detection of archaeological features. The general suitability of ground conditions here for a magnetometer survey is confirmed by the positive archaeological findings obtained from the 2011 and 2012 Northamptonshire surveys.

4. Archaeological Background

A full account of the archaeological potential and context of the site is given in the report on a trial trenching evaluation by Albion Archaeology [4], which followed the 2011-12 Northamptonshire surveys. The surveys had each detected clearly defined ditched enclosures and other features (as seen in the plots reproduced in figure 1). The trenching confirmed the archaeological relevance of these findings, and identified a concentration of activity of early-middle Iron Age date, particularly on the slightly elevated ground towards the south of the 2012 survey area. This archaeological site is indicated by a cluster of curvilinear magnetic anomalies. Some additional ditches and pits were present on clay soils elsewhere within the evaluation area. There was little archaeological activity associated with a late Iron Age or Roman rectilinear enclosure (towards the NE of the 2012 Northampton survey plot), but considerable additional activity of this date has been identified in other investigations to the east of the disused railway line.

Traces of medieval cultivation furrows were found to survive intermittently across the evaluation area. These correspond to cultivation strips as shown on a pre-enclosure map of 1794 (reproduced from [4], and inset in figure 4 of this report).

It is additionally mentioned in the 2011 report [2] that various cropmark sites are present near the airfield, and that excavations on the line of a water main revealed enclosures of Iron Age and Roman date just outside the northern boundary of the airfield.

5. Survey Procedure

The same procedures were used for the 2012 and 2014 surveys. The site in each case was investigated by means of a recorded magnetometer survey, supplemented by background magnetic susceptibility readings. Magnetometer readings were collected along transects 1m apart using Bartington 1m fluxgate gradiometers, and are plotted at 25cm intervals along each transect. The survey data is shown at 1:2000 scale as a grey scale plot (in figure 2), and as graphical (x-y trace) plot at 1:1500 (figure 3). Comparison of these alternative presentations allows the detected magnetic anomalies to be examined in plan and profile respectively. An interpretation of the findings is also shown superimposed on figures 3 (which permits the interpreted outlines to be compared with the underlying data). A further interpreted summary of findings is presented in figure 4.

The graphical plot in figure 3 shows the magnetometer readings after minimal pre-processing [of the kind permitted by English Heritage (2008) *Geophysical Survey in Archaeological Field Evaluation* Section 4.8]. This includes adjustment for irregularities in line spacing caused by variations in the instrument zero setting, and truncation of extreme values. Additional weak 2D low pass filtering has been applied to the grey scale

plot to adjust background noise levels.

Colour coding has been used in the interpretation to distinguish different effects. Magnetic anomalies which may show characteristics to be expected from features of potential archaeological interest are outlined (or indicated more schematically by broken lines) in red. Background magnetic anomalies which may be of natural or non-archaeological origin are indicated in light brown. Stronger (and perhaps recent) disturbances are in a darker brown. Possible cultivation effects are indicated by green lines. Some of the more conspicuous ferrous objects (identifiable as narrow spikes in the graphical plots) are marked in light blue.

Magnetic susceptibility tests

The magnetometer survey was supplemented by a background magnetic susceptibility survey based on readings taken at 30m intervals with a Bartington MS2 meter. Susceptibility readings can (sometimes) be used to provide a broad indication of previously occupied or disturbed areas in which burning associated with past human occupation has enhanced the magnetic susceptibility of the topsoil, although the readings are usually affected also by non-archaeological factors, including geology and land use. This information provides an indication of the strength of magnetic response to be expected from the site, and can be of help when interpreting the magnetometer survey**.** Susceptibility readings are shown on a plot inset in figure 4.

Survey location

The survey grid was set out and tied to the OS grid using a Trimble ProXRT GPS system (with VRS correction to give accuracy of c. 0.1m). The plans are therefore geo-referenced, and OS co-ordinates of map locations can be read from the AutoCAD version of the plans, which can be supplied with this report.

6. Results

Both the 2012 and 2014 surveys have produced only minimal evidence for the presence of clearly identifiable archaeological features. These results, which contrast with the clear archaeological findings seen in both of the earlier 2011 and 2012 surveys, appear to reflect variations both in ground conditions, and in the distribution of archaeological features within the evaluation area. Extensive and similar magnetic activity was seen in both the 2012 and 2014 surveys, but this appears to be of mainly recent or natural, rather than archaeological, origin.

2012 survey

It is difficult in both surveys fully to distinguish contributions from natural and other sources because most of the magnetic disturbances visible in the survey plots are strong narrow anomalies (as seen particularly in the graphical plot, figure 3) which could be caused by modern structural debris or rubble, ferrous objects, or naturally magnetic stones in the gravel soil. These sources can perhaps be differentiated in part on the basis of the strength and density of magnetic activity.

An area of comparable strong magnetic activity is visible towards the north and east of the 2011-12 (northern) Northamptonshire survey, and was interpreted as a probable scatter of ferrous debris and ceramic rubble. It is probable that an area of particularly concentrated disturbances at the north of the 2012 pond survey (outlined in brown around A, as labelled on figure 4) could also be interpreted as a scatter of recent debris. It is adjacent to an area of hard standing and rubble which was excluded from the survey coverage (as also labelled on figure 4), and it is possible that more such debris is present within the survey area.

Magnetic disturbances across much of the remainder of the survey form a pattern of parallel NW-SE lines (each made up of concentrated strong anomalies), which is very unusual. Similarly strong disturbances are sometimes detected above near-surface outcrops of glacial gravels containing stones of igneous origin, but that does not fully account for their linear distribution. We suggest, therefore, that the linear effect could be an interaction of geology and former ridge and furrow cultivation. The gravel may remain exposed along the former ridges (as indicated by broken green lines in figure 4), but is buried at depth beneath the silted fill of the furrows. There are also perhaps weak linear background markings which could relate to past cultivation in the 2011 Northampton survey. These align with the 2012 linear pattern, but strong disturbances are lacking, except perhaps in the NE corner of the (southern) Northampton survey. The gravel therefore appears to be present in a localised outcrop affecting mainly the 2012 and 2014 survey areas.

The green broken lines marking the possible cultivation ridges are shown superimposed on the 1794 map (inset in figure 4). They lie mainly within the plot labelled Urchins Furlong, where no visible cultivation ridges are marked, but align well with cultivation markings in plots to each side. [It is often the case that infilled cultivation furrows respond more clearly in a survey than intact ridge and furrow.]

A few magnetic anomalies which could represent silted pits or ditch-like features are indicated in red. The most distinct possible pit is at B, but this (and others) are isolated, and do not suggest the presence of any groups or concentrations of archaeological features. There are some fragmentary ditch-like features, of which the largest is labelled C, at the south of the survey, but these are close to various recent disturbances, including a circle of metal posts and other ferrous debris. Other strong disturbances in the SW corner of the survey (around D) could also be recent.

A further group of strong ferrous magnetic anomalies towards the north of the survey (as indicated in blue at E) could also perhaps indicate a former airfield structure.

2014 survey

The dense background magnetic activity continues from the 2012 survey into the 2014 survey area. This probably in part represents a continuation of the gravel soil thought to be responsible for much of the 2012 magnetic activity. The apparent pattern of linear disturbances which could indicate displacement of the gravel by ridge and furrow cultivation continues into the SE corner of the 2014 survey, and perhaps terminates at a headland (corresponding approximately to a feature on the 1794 map) at F.

The density of magnetic activity intensifies to the north and west of the survey area, where the magnetic anomalies (outlined in brown, as at A in 2012) are likely to represent a spread of rubble and debris in the vicinity of former airfield paving or structures.

This interpretation is supported by variations in the magnetic susceptibility readings taken during the surveys (plot inset in figure 4). The strong enhancement of the readings in parts of the site containing the most concentrated magnetic activity would be consistent with the presence of brick or concrete debris in the topsoil.

Some possible linear markings are visible (in the grey scale plot) within the overall magnetic activity towards the north and west of the 2014 survey area, and are indicted by red lines in the interpretation. (The most distinct are at G and H.) These do not align with features on the 1794 map, and so could perhaps indicate ditches representing traces of an earlier field system. They do not, however, resemble the curving ditched enclosures seen to the north in the 2012 Northamptonshire survey, and are defined mainly by alignments of strong magnetic anomalies. It is likely therefore that (if genuine) they indicate relatively modern drains or cable trenches.

7. Conclusions

Both the 2012 and 2014 surveys have detected considerable magnetic activity, but with only minimal findings of potential archaeological interest. There are strong magnetic disturbances probably indicating remains of airfield structures towards the north, west and south of the survey areas, but there are only a few small and isolated magnetic anomalies (as outlined in red) which show any of the characteristics to be expected from archaeological features. These include possible isolated pits (as at B), and a ditch-like feature (C), as well as rectilinear markings of uncertain (but perhaps recent) origin, as at G, H. Elsewhere in the survey there are disturbances which could be caused by an outcrop of unusually magnetic gravel, perhaps with a superimposed cultivation pattern indicating the former presence of ridge and furrow.

It remains possible that archaeological features have been obscured (or destroyed) by the modern disturbances seen towards the north of the 2012 and 2014 survey areas, but it might equally be the case that substantial archaeological findings are confined to the 2011-2012 Northampton survey areas.

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The fieldwork for the 2012 survey was done by P. Cottrell and F. Prince. The 2014 survey was by P. Cottrell and C. Matthews.

References

[1] *Cardington Airfield, Bedfordshire. Report on Archaeological Geophysical Survey 2012.* Report supplied to Archaeologica Ltd by Bartlett Clark Consultancy; 20 April 2012.

[2] *Archaeological Geophysical Survey at Cardington Airfield, Bedfordshire.* Report 11/112 by John Walford, Northamptonshire Archaeology, April 2011.

[3] *Archaeological Geophysical Survey at Cardington Airfield, Bedfordshire – Phases 1-3; April 2011-April 2012.* Report 12/73 by John Walford, Northamptonshire Archaeology, April 2012.

[4] *Cardington Sheds, Shortstown, Eastcotts; South-East Land Parcel. Intrusive Archaeological Investigation.* Project CS1931; Document 21012/42. Albion Archaeology Ltd 2012.

508000E

509000E

247000N

N

Driving Standards Agency

El Sub Sta

Shed 1

Shed 2

Northamptonshire
surveys
2011-2012

2014

2012

Northamptonshire
survey 2011

Figures 2-3

Figure 4

3.0nT

-2.8

Magnetometer surveys:
2012 (red) and
2014 (green) with outlines
of proposed pond; 2012 and 2014

Previous magnetometer surveys
(Northamptonshire Archaeology,
2011 and 2012)

Pylon

9632

9617

3333

27.3m

27.8m

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Figure 1: Location of magnetometer surveys

0 1:4000 200m

508700E

246700N

N

2014

2012

3.0nT

-2.8

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Figure 2: Magnetometer survey (grey scale plot)

0 1:1500 50m

508700E

246700N

80nT

2014

2012

N

magnetic anomalies (archaeological ?)

magnetically disturbed ground (recent / non-archaeological)

background magnetic activity (mainly natural / non-archaeological ?)

cultivation ?

strong (ferrous) magnetic anomalies

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Figure 3: Magnetometer survey (with interpretation)

1:1500

0 50m

508700E

246700N

N

hard standing and rubbish

Path

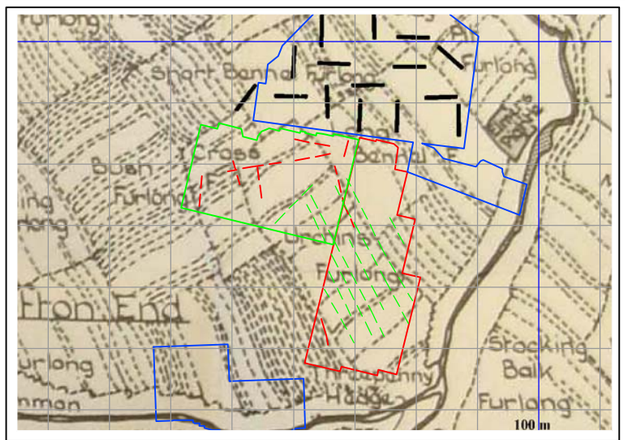
2014

2012

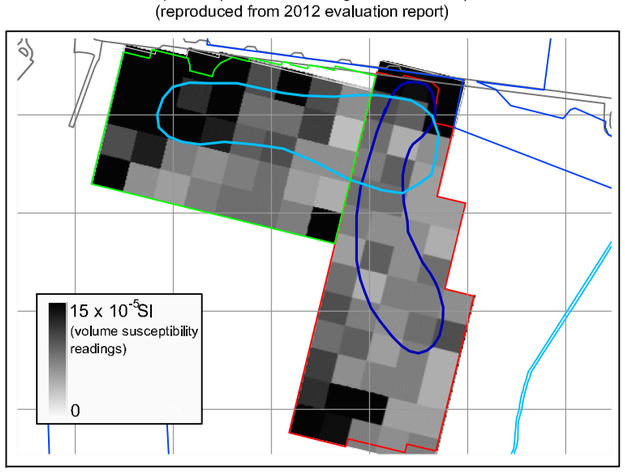
A
B
C
D
E
F
G
H

iron grill and blocks

metal posts in circle



Map 1794 (with selected magnetic anomalies) 1:10000
(reproduced from 2012 evaluation report)



Magnetic susceptibility survey 1:6250

magnetic anomalies (archaeological ?)

magnetically disturbed ground (recent / non-archaeological)

background magnetic activity (mainly natural / non-archaeological ?)

cultivation ?

strong (ferrous) magnetic anomalies

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Figure 4: Summary of findings

0 1:2000 100m