Babraham Research Campus
Cambridge

Report on Archaeological Geophysical Survey
2014

Survey commissioned by:

Cambridge Archaeological Unit
Department of Archaeology
Downing Street
Cambridge CB2 3DZ

On behalf of: Babraham Bioscience Technologies

Report by:

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28 January 2014

Babraham Research Campus, Cambridge
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Introduction and Background

This geophysical survey was undertaken as part of an archaeological field evaluation of a proposed development site adjacent to the Babraham Institute near Cambridge.

The survey has been commissioned from Bartlett Clark Consultancy, Specialists in Archaeogeophysics of Oxford, by the Cambridge Archaeological Unit (CAU) on behalf of Babraham Bioscience Technologies. Fieldwork for the survey was done on 9-10 January 2014.

The Site

Background information on the site and survey procedure has previously been included in the Method Statement prepared in advance of the survey, and supplied to CAU on 8 January 2014 [1]. Further notes on site conditions are provided in the report on a geotechnical and environmental ground investigation which has been undertaken at the site in connection with the proposed development [2]. The following comments are summarised in part from these documents.

Location and Topography

The evaluation area is at present open farmland located immediately to the north west of the existing buildings at the Babraham Institute. The area to be investigated is marked by red cross hatching and labelled (Phase 1 Site) on the site plan inset in figure 1. The proposed survey area is centred approximately at NGR 550800, 251000 and is c. 7.5ha in extent. The survey is to be followed by trenching to be undertaken by CAU. A provisional arrangement of the trenching scheme is shown on the inset plan (figure 3iii).

Topsoil has previously been stripped from an area in the south west corner of the site (as enclosed by the bank indicated on figure 1). The ground surface remained sufficiently level for this area to be surveyed on the exposed subsoil.

Geology

The site is on a bedrock mainly of Chalk, but with River Terrace deposits towards the south. Both should usually provide favourable conditions for the magnetic detection of archaeological features.

The geotechnical report [2] mentions that erosion features such as swallow holes and solution cavities, usually infilled with drift deposits, may be present in the chalk. Natural features of this kind may account for some of the (relatively conspicuous) background magnetic variation seen in the survey. Trial pit data (in [2]) confirms that chalk is present from a depth of c. 0.3m. Variations in the depth and composition of the upper surface of the chalk should

therefore be detectable by the survey.

Archaeological background

A previous excavation immediately to the south east of the present evaluation area indicated the presence of a complex system of ditches and enclosures. These appear (as indicated on the CAU site plan; figure 3iii) to be associated with pits or postholes, and other possible settlement features. These findings are located near to the site of a Roman villa previously excavated elsewhere within the research campus.

Cropmarks have been traced from the CAU plan, and are shown (in blue/purple) on the interpreted plan (figure 3i). These suggest that enclosures extend into the south eastern corner of the survey area.

A 19th C map (reproduced from [2]) is shown in figure 3ii. This indicates that the evaluation area was previously subdivided by field boundaries, including a large ditch across the centre of the site. The ditch is also marked on later maps until c. 1980.

Survey Methodology

The site was investigated by means of a recorded magnetometer survey. Readings were collected along transects 1m apart using Bartington 1m fluxgate gradiometers, and are plotted at 25cm intervals along each transect. The results of the survey are presented at 1:2000 scale as a grey scale plot (figure 1), and as a graphical (x-y trace) plot at 1:1250 (figure 2). Comparison of these alternative presentations allows the detected magnetic anomalies to be examined in plan and profile respectively. An interpretation of the findings is shown superimposed on figure 2 (which permits the interpreted outlines to be compared with the underlying data), and is reproduced separately to provide a summary of the findings (figure 3).

The graphical plot in figure 2 shows the magnetometer readings after minimal pre-processing [of the kind mentioned in 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.

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.

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 in red. Background magnetic anomalies which may be of natural or non-archaeological origin are lightly outlined in brown, and stronger (perhaps

recent) disturbances in grey. Possible cultivation effects are in green, and some of the more conspicuous ferrous objects (identifiable as narrow spikes in the graphical plots) are marked in light blue. Pipes are indicated in blue.

Magnetic susceptibility tests

Magnetic susceptibility readings were taken (using a Bartington instrument) at intervals across the survey area, with results as mentioned below. 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**.**

Survey location

The survey grid was set out and tied to the OS grid using a differential GPS system (with VRS correction to give c. 10cm accuracy). 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.

Results

The survey plots show a considerable amount of magnetic activity, but much of it is clearly of recent or non-archaeological origin. We are told that the site was once an orchard, and so disturbances such as former tree holes might add to the background magnetic variation. Fragments of wire or other ferrous debris have also been detected in previous surveys of orchard sites.

Magnetic susceptibility readings taken at the site were relatively high (with readings in a range 22-53 x 10^{-5} SI). This confirms that ground conditions at the site (as is usual on chalk) should be favourable for the magnetic detection of archaeological features, but also indicates that natural variations in soil composition (such as solution hollows in the chalk as mentioned above) could give rise to detectable magnetic anomalies.

Findings visible in the survey plots include strong but rather erratic magnetic disturbances suggesting the presence of an iron pipe and other debris in the former ditch (as shown on historic maps, and labelled A in figure 3i). There is also a second larger pipe alongside and to the north of the former ditch (B).

A broad strip of disturbed readings along the northern edge of the survey at C suggests the ground has been raised or levelled, and that there is a spread of rubble or hardcore next to the modern access road. Similar but less concentrated disturbances (probably indicating rubble and ferrous debris) extend along much of the eastern edge of the site and across the south east corner. Cropmarks here suggest the nearby excavated enclosures extend into this part of the site, but archaeologically relevant magnetic anomalies are difficult to identify beneath the recent disturbances.

The magnetic anomalies outlined in blue at D could represent pipes (or strongly magnetic debris) within one or more former ditches corresponding to a cropmark, and there could be a further linear feature (visible in the grey scale plot) also indicated by a cropmark at E. Other

more distinct linear features could represent ditches or a trackway extending across the site and into the stripped area at F.

Other possible linear features, as well as a number of individual pit-like magnetic anomalies, are marked in red at various locations in the interpretation, but cannot be identified with confidence against the background disturbances. Two possible weak curving linear features are shown in red at G. It is unclear whether these could form part of an incompletely detected ditched enclosure, or are simply part of the overall pattern of background magnetic activity.

A number of variously aligned parallel linear markings in the northern half of the site could indicate cultivation effects, as indicated in green.

Conclusions

Soil conditions at the site appear to be magnetically responsive, but much of the observed magnetic activity relates to past land use or modern disturbances. It is possible that strong recent magnetic anomalies may obscure archaeological features in the south east corner of the site. Cropmarks and some of the magnetic findings (such as features D and E) could indicate a continuation here of the enclosures and other findings previously seen in the adjacent excavation.

The survey findings do not suggest that concentrations of archaeological features or activity extend across the remaining less disturbed parts of the site, although there may be a few additional linear or pit-like features. These could include a possible ditched trackway at F, and perhaps the weak curving ditch-like features at G.

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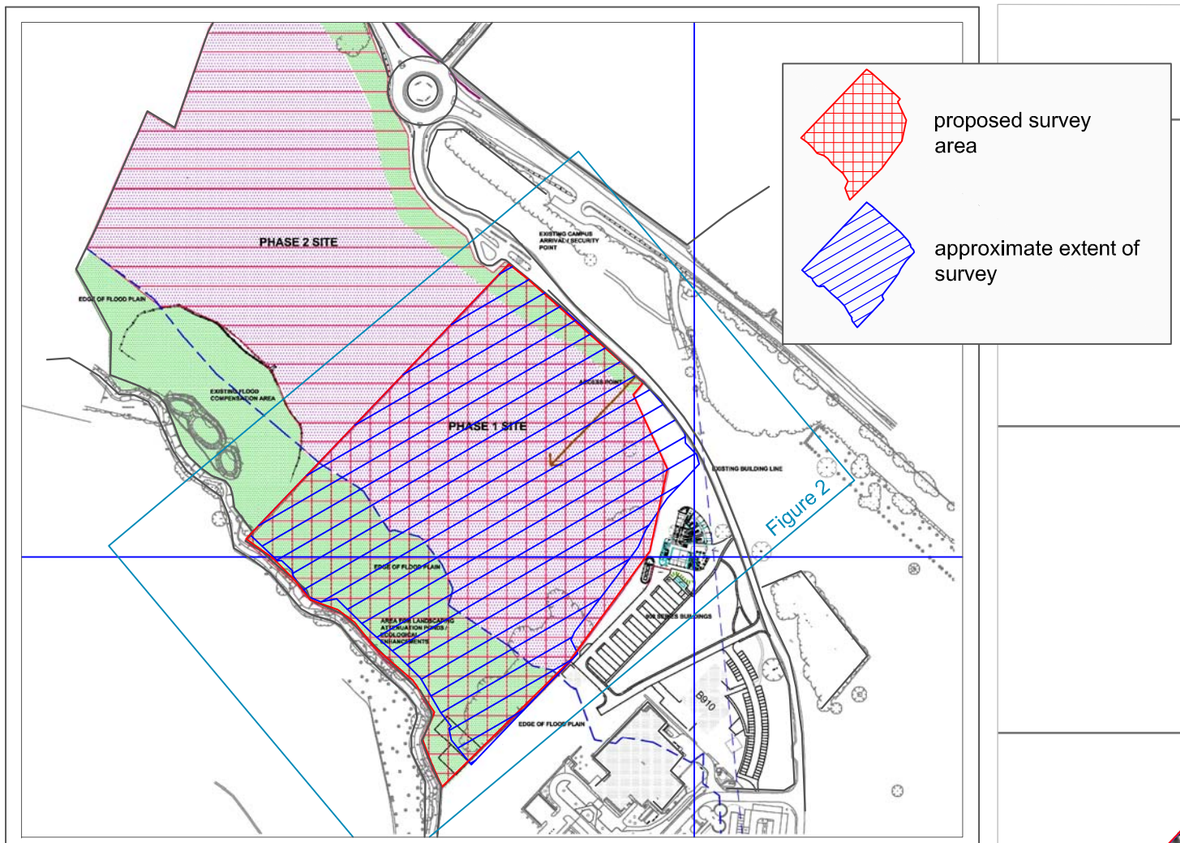
Fieldwork for this survey was carried out by C. Oatley and N. Paveley.

References

[1] *Babraham research Campus, Cambridge. Method Statement for Archaeological Geophysical Survey.* Document submitted to Cambridge Archaeological Unit by Bartlett Clark Consultancy. 8 January 2014.

[2] *Ground Appraisal Report forR+D2 Site, The Babraham Institute, Cambridge.* Report GE9624/AP/Dec13/GIR by Geo-Environmental Services Ltd, 28 Crescent Road, Brighton, East Sussex BN2 3RP.



Survey location 1:5000

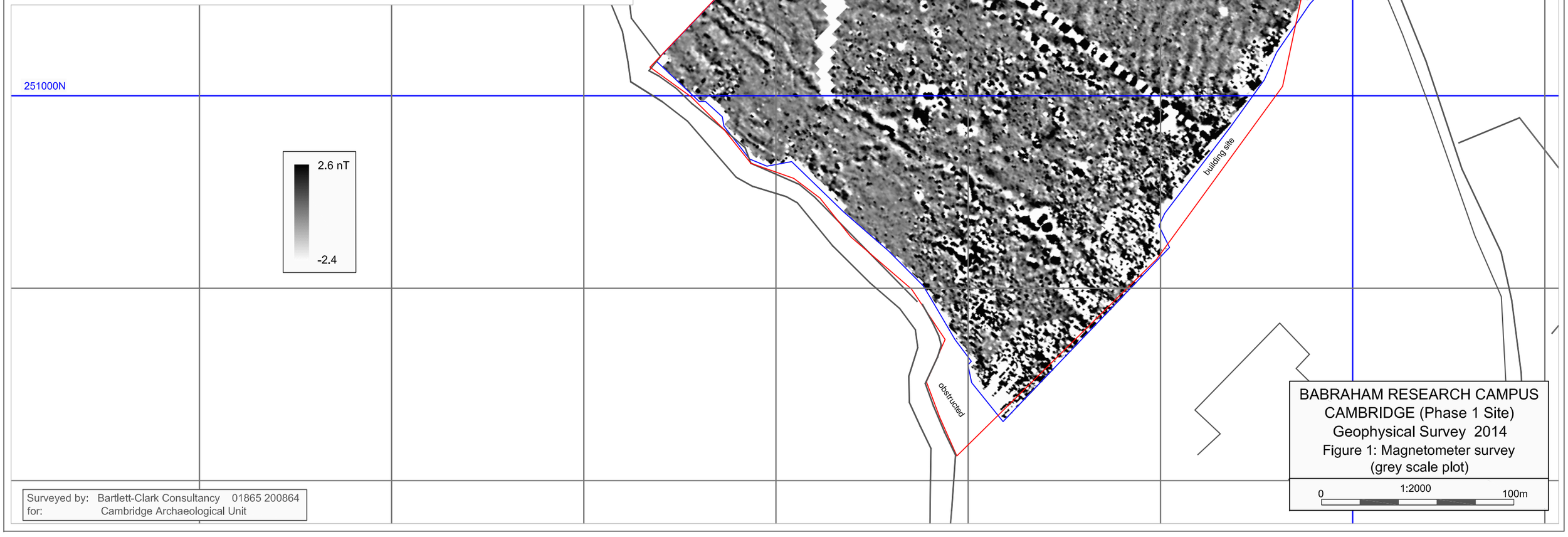


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Figure 1: Magnetometer survey
(grey scale plot)

1:2000
0 100m

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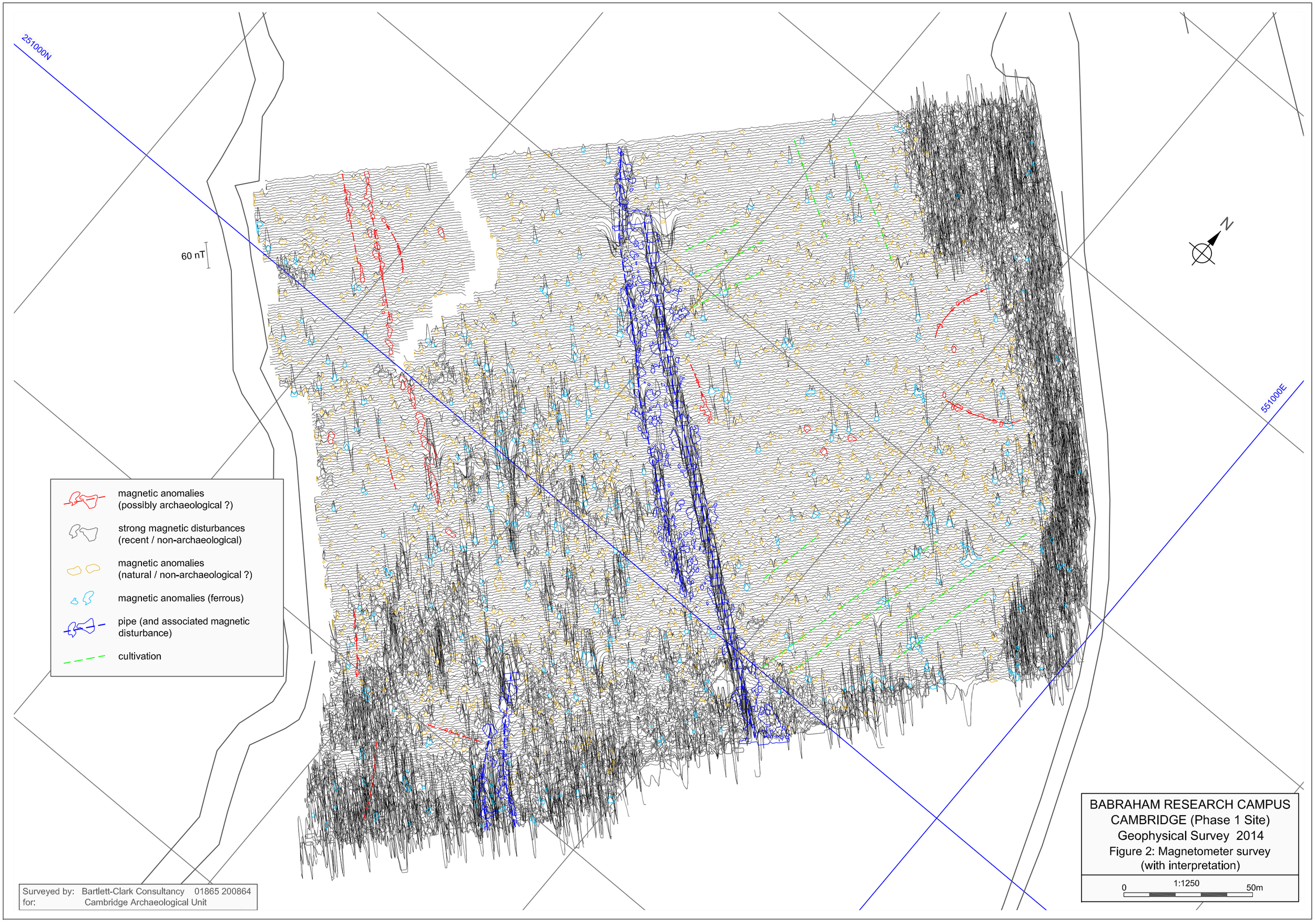
251000N
60 nT
N
551000E
magnetic anomalies
(possibly archaeological ?)
strong magnetic disturbances
(recent / non-archaeological)
magnetic anomalies
(natural / non-archaeological ?)
magnetic anomalies (ferrous)
pipe (and associated magnetic
disturbance)
cultivation
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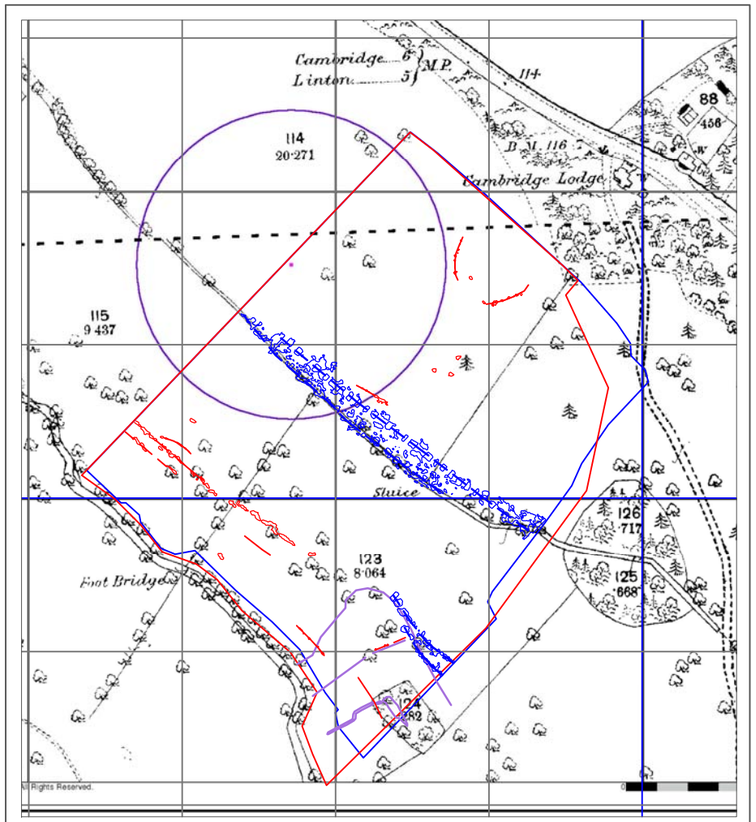
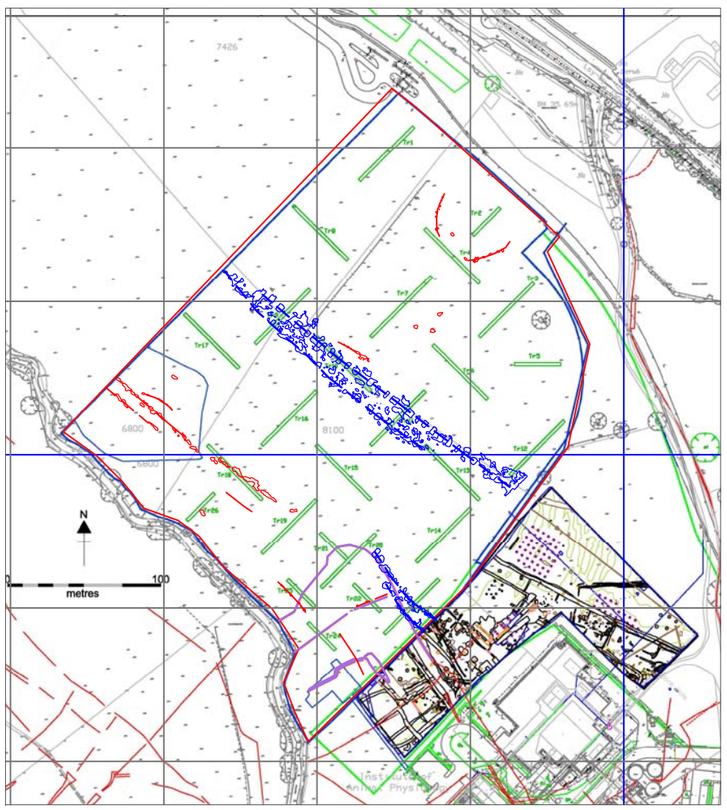
Figure 2: Magnetometer survey
(with interpretation)
0
1:1250
50m



3ii Selected findings + 1886 OS map 1:4000



3iii CAU proposed trenching plan 1:4000

magnetic anomalies (possibly archaeological ?)

strong magnetic disturbances (recent / non-archaeological)

magnetic anomalies (natural / non-archaeological ?)

magnetic anomalies (ferrous)

pipe (and associated magnetic disturbance)

cultivation

cropmarks

551000E

251000N

N

A

B

C

D

E

F

G

3i Magnetometer survey (interpretation)

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Figure 3: Summary of findings

0 1:2000 100m