

**HAZEL GAP SOLAR FARM,
CARBURTON, NOTTINGHAMSHIRE**
**Archaeological Geophysical Survey
2014**

Report by:

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on behalf of:

Solar Century

18 December 2014

HAZEL GAP SOLAR FARM, CARBURTON, NOTTINGHAMSHIRE

Geophysical Survey 2014

Abstract

This geophysical survey was undertaken as part of an archaeological field evaluation in advance of a planning application for a proposed solar power development at a site between Norton and Carburton, Nottinghamshire.

Cropmarks at the site suggest the presence of traces of a field system of Iron Age or Roman date in the northern part of the development area, but with no evidence for associated settlement remains. Findings from the survey (with the exception of pipes and drains) are limited to a small number of weak and uncertain linear features which do not correlate with the cropmarks. The survey also provides no evidence for the presence of a settlement site, or any other identifiable concentration of archaeological features.

1. Introduction

The survey was commissioned from Bartlett Clark Consultancy, Specialists in Archaeogeophysics of Oxford, by Archaeologica Ltd on behalf of Solar Century. Fieldwork for the survey was done on 2-10 October 2014. A data plot showing the survey findings has previously been supplied to the client, and is now included for the record in this report.

The location and condition of the site are described in the Heritage Assessment Report (DBA) previously prepared by Archaeologica Ltd [1]. This information was summarised also in the Method Statement prepared in advance of the project [2]. The following notes are reproduced in part from these documents.

The site consists of two fields of grassland west of Carburton and east of Norton in Bassetlaw District, Nottinghamshire. It is centred approximately at NGR SK 595718. The fields are irregular in shape and bounded by hedges with a road to the north and the A616 to the south. The total area of the two fields (as shaded in red on the location plan inset in figure 1) is 47ha. The survey (as indicated by a stepped red outline in figure 1) enclosed the development area within the fields, as indicated by blue cross hatching. The area surveyed amounts to 32.8ha.

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 development is to occupy two grassed fields within an area of woodland. The larger (eastern) field is currently subdivided by a fence. (This has been noted on the survey plans, but is not shown on the background mapping.) The surrounding landscape is undulating and heavily wooded, but sparsely settled. The elevation within the site rises from the north to the south and west, before dropping again towards the south.

The site is on a bedrock of Early Triassic Sandstone of the Nottingham Castle Sandstone Formation. This is a loose textured and well-drained sandstone and conglomerate formation which develops topsoil of limited agricultural potential. The site appears to be free of drift deposits.

Soils on Triassic sandstone are not generally highly responsive to a magnetometer survey, although positive archaeological findings may be obtained. Magnetic susceptibility readings taken from soil samples collected at the site were consistent with the geological context. The readings were relatively low (in a range $4 - 16 \times 10^{-8}$ SI/kg, with a mean of 10.0). It is probable therefore (as may also be the case in other geological circumstances) that ditches or earthwork features which are remote from ancient settlement or industrial sites (and so lack magnetically enhanced fill of the kind usually found at such locations) might not respond reliably to the survey. A magnetometer survey should, however, provide evidence for the presence or otherwise of any occupation features which may be associated with the cropmarks at the site, and perhaps also of ground disturbances relating to more recent land use or activities.

4. Archaeological Background

The main source of evidence for the archaeological potential of the site is a system of cropmarks which were analysed in the 1980s and plotted in the 1990s (as referenced in the DBA). These include enclosures and linear features which are recorded in the northern part of the development site, and which extend widely in the surrounding area.

This extensive cropmark landscape of field boundaries, trackways and settlements is described as substantially of Roman date, but perhaps with late Iron Age origins. The landscape is characterised by rectilinear ('brickwork') fields of 1-2ha, which were possibly used mainly as sheep pasture. These are interspersed with smaller enclosure clusters likely to be farmsteads (although none are recorded within the present site).

The region subsequently became relatively unpopulated in Saxon and Medieval periods, and was dominated by woodland. This gave way to temporary enclosures and some arable cultivation in the post-Medieval period.

Carburton Forge Dam and Carburton Dam form part of a 17th-18th C industrial landscape. There appears to be no record of industrial activity within the proposed development

area, but industrial remains should be detectable in the survey if any are present.

5. Survey Procedure

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 survey data is shown at 1:2000 scale as a grey scale plot (figures 2-4), and as a graphical (x-y trace) plot at 1:1500 (figures 5-8). 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 5-8 (which permits the interpreted outlines to be compared with the underlying data). A further interpreted summary of findings is presented in figures 9-10.

The graphical plots in figures 5-8 show 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. The interpretation is intended to categorize most of the identifiable magnetic anomalies, but cannot reproduce the detail of the grey scale plots.

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. A number of selected larger (but still possibly natural) magnetic anomalies are outlined in light green. Stronger (and perhaps recent) disturbances are in grey. Iron pipes are indicated in blue, and probable land drains in blue/purple. Some of the more conspicuous ferrous objects (identifiable as narrow spikes in the graphical plots) are marked in light blue.

Survey location

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

6. Results

Findings from the survey (other than features and disturbances of clearly recent origin) are limited to a small number of indistinct or fragmentary linear markings. These could perhaps in part be of archaeological origin, but other explanations are equally plausible.

These findings are seen against an unusually variable magnetic background which is indicated by numerous small magnetic anomalies visible particularly in the grey scale plot. Some of the larger of these magnetic anomalies are seen (in the graphical plots 5-

8) to be represented by rounded profiles of a kind which could (in a suitable context) be interpreted as silted pits, as are commonly seen at ancient settlement sites. These features are marked in the interpretation by light green outlines (against a background of smaller and probably natural disturbances outlined in light brown). There is some variation in the distribution of these pit-like features in different parts of the site, but they remain present throughout, and there are no distinct clusters or groups which show any pattern or structure in their plan. It is probable therefore that the magnetic anomalies (as outlined both in green and brown) are mainly of natural or geological origin. They perhaps relate to minor irregularities in the depth of soil cover, or to variations in the composition of the underlying conglomerate bedrock.

A few possible linear alignments which are visible in the grey scale plot are marked in red in figures 9-10. They include parallel north - south linear features (labelled A and B) in the smaller (western) field, together with very weak and uncertain curving features (C and D). It is possible that A and B could be cultivation effects, but C and D could well represent no more than random background variations in the data.

The only comparable feature which is readily visible in the larger eastern field is a broad and weak linear marking at E. This is some distance to the south of, and does not align with, the cropmarks (shown in brown). The feature at E is rather too wide and indistinct to represent a former ditch, but could perhaps be an eroded earth bank, or perhaps a topographic effect (as might be caused by soil deposition at a break of slope).

Other findings as marked include strong linear disturbances characteristic of iron water pipes at F and G, and various linear sequences of small magnetic anomalies which may be caused by sections of clay pipe. These are marked as possible drains.

The iron pipe at F follows the line of a former boundary shown on a map of 1797 (figure 7 in [1]). Later maps indicate a track at this location. The historic maps in [1] do not otherwise show any changes to the field layout (except for a north-south subdivision of the eastern field in a map of 1920).

7. Conclusions

It is mentioned in the DBA [1] that the cropmarks at the site could represent late Iron Age or Roman livestock enclosures, but any associated settlement activity may be located elsewhere. The survey findings are consistent with these limited possibilities. The cropmark ditches are not features of a kind which would respond well to a magnetometer survey on weakly magnetic sandstone-based soil, and there are no other findings which would suggest the presence of settlement remains, or any other features which might be more readily detectable than the ditches. [This conclusion is consistent also with an observed lack of surface finds. The site is under grass, but contains numerous molehills. No artefacts or items of archaeological debris were seen in the exposed earth during the course of the survey.]

The possible linear features (A – E) which are marked in the survey plans could perhaps in part indicate fragments of former ditches or enclosures, but the evidence suggests they are more likely to represent minor topographic variations or cultivation effects.

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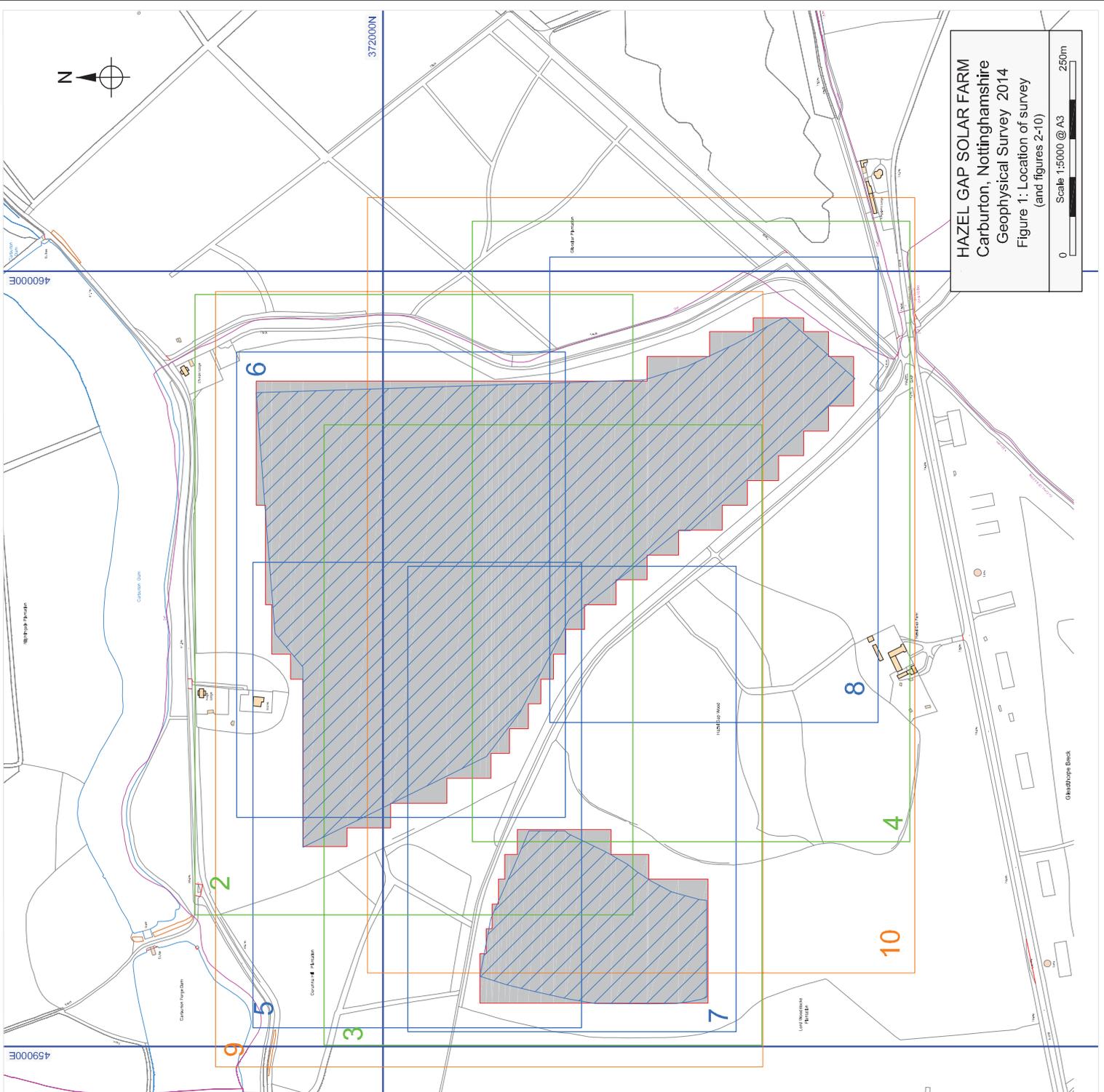
bcc123@ntlworld.com

18 December 2014

The fieldwork for this project was done by P. Heykoop and R. Organ.

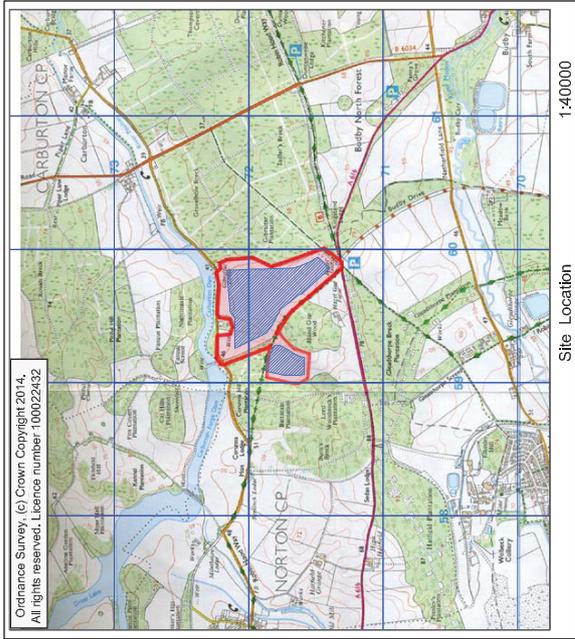
References

- [1] *Heritage Assessment Including Archaeological Desktop at Hazel Gap Solar Farm, Norton, Bassetlaw, Nottinghamshire.* Report AC 3224 by I M G Lisboa on behalf of Solar Century Ltd. July 2014.
- [2] *Hazel Gap Solar farm, Carburton, Nottinghamshire. Method Statement for Archaeological Geophysical Survey.* Document submitted to Archaeologica Ltd by Bartlett Clark Consultancy. 1 October 2014.



HAZEL GAP SOLAR FARM
 Carburton, Nottinghamshire
 Geophysical Survey 2014
 Figure 1: Location of survey
 (and figures 2-10)

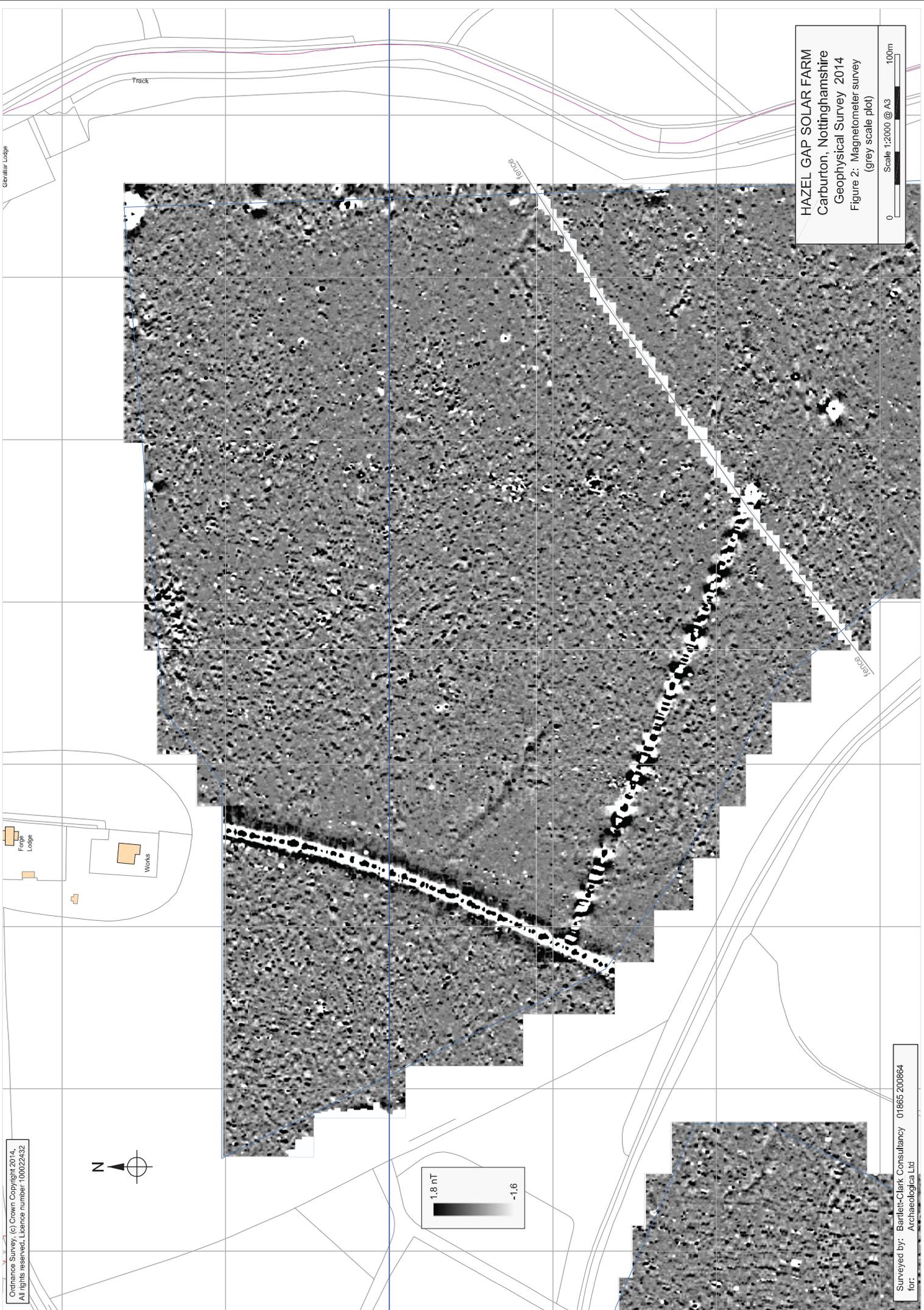
Scale 1:5000 @ A3
 0 250m



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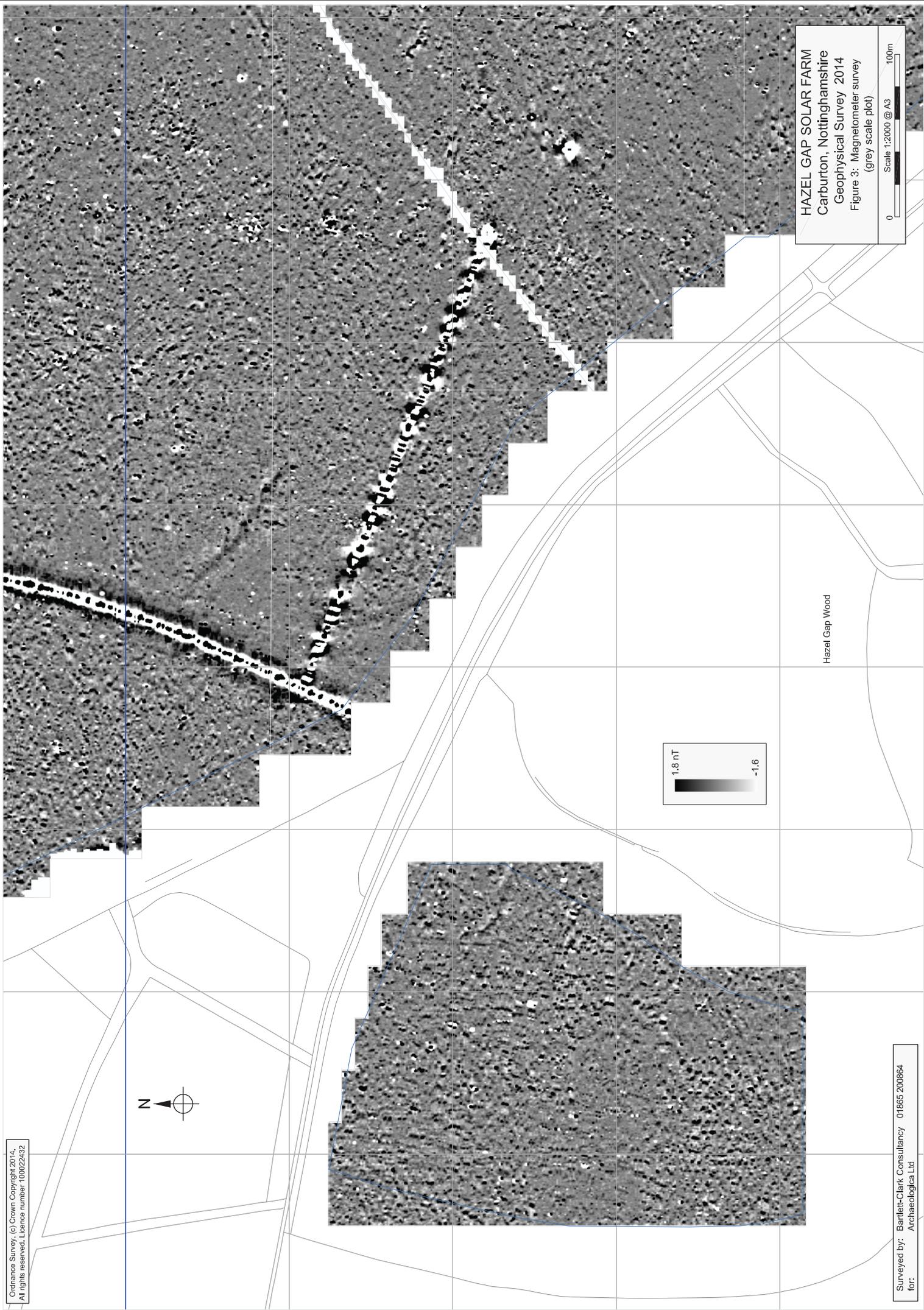


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Figure 2: Magnetometer survey
(grey scale plot)

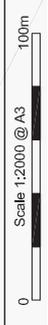


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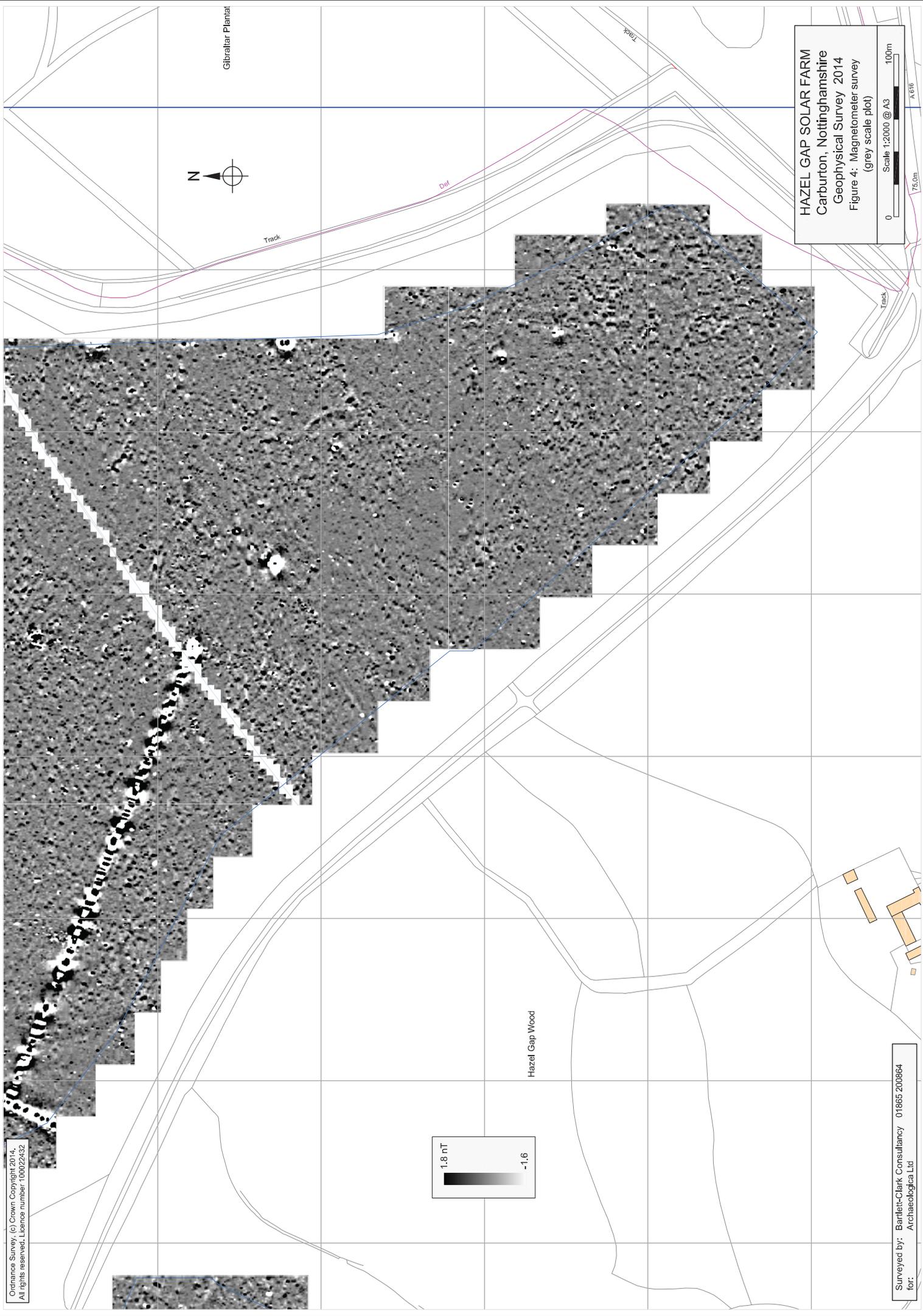


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Figure 3: Magnetometer survey
(grey scale plot)



Hazel Gap Wood

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Figure 4: Magnetometer survey
(grey scale plot)

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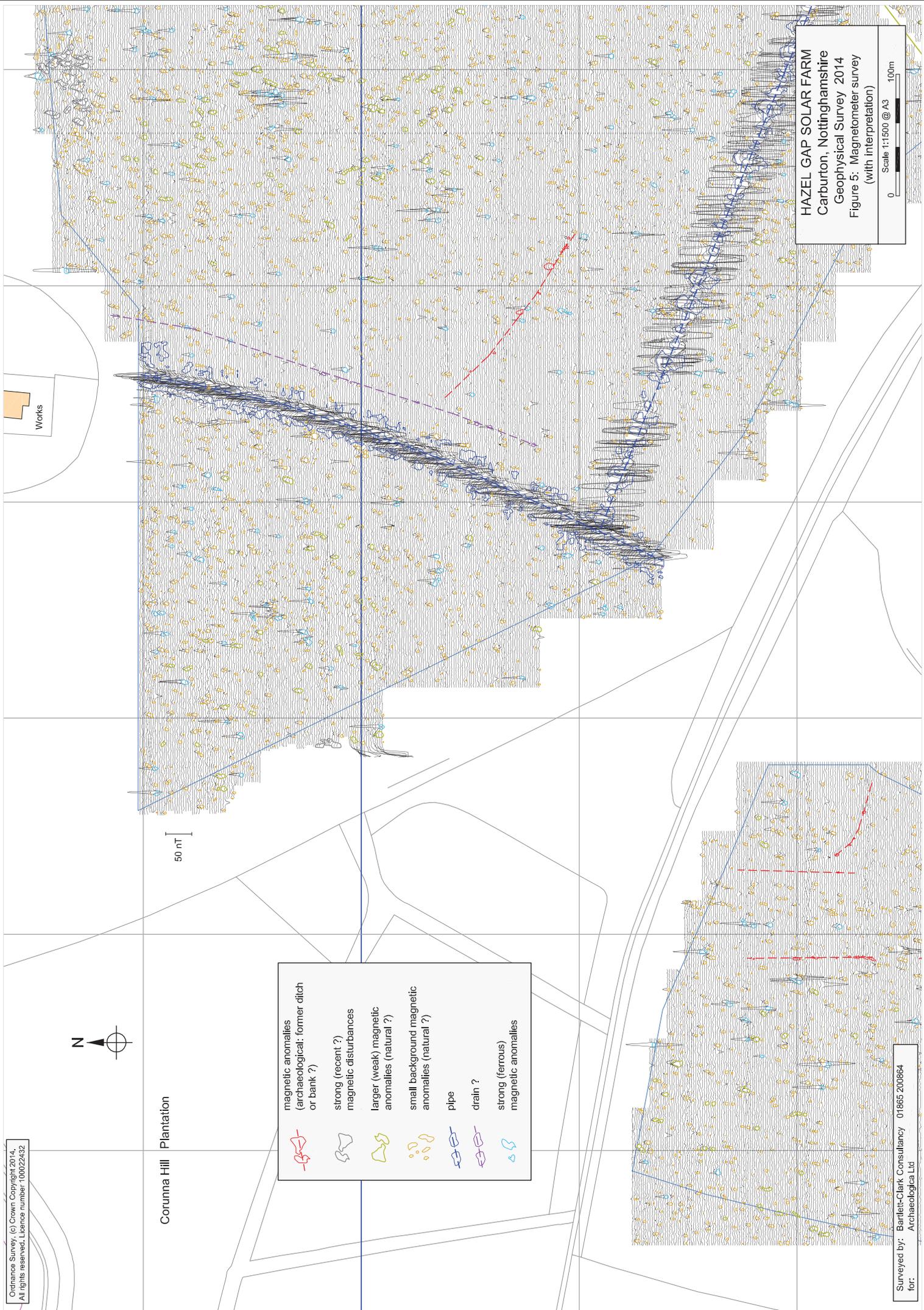
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Corunna Hill Plantation

50 m

	magnetic anomalies (archaeological: former ditch or bank ?)
	strong (recent ?) magnetic disturbances
	larger (weak) magnetic anomalies (natural ?)
	small background magnetic anomalies (natural ?)
	pipe
	drain ?
	strong (ferrous) magnetic anomalies



HAZEL GAP SOLAR FARM
 Carburton, Nottinghamshire
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 Figure 5: Magnetometer survey
 (with interpretation)

Scale 1:1500 @ A3
 0 100m



50 nT

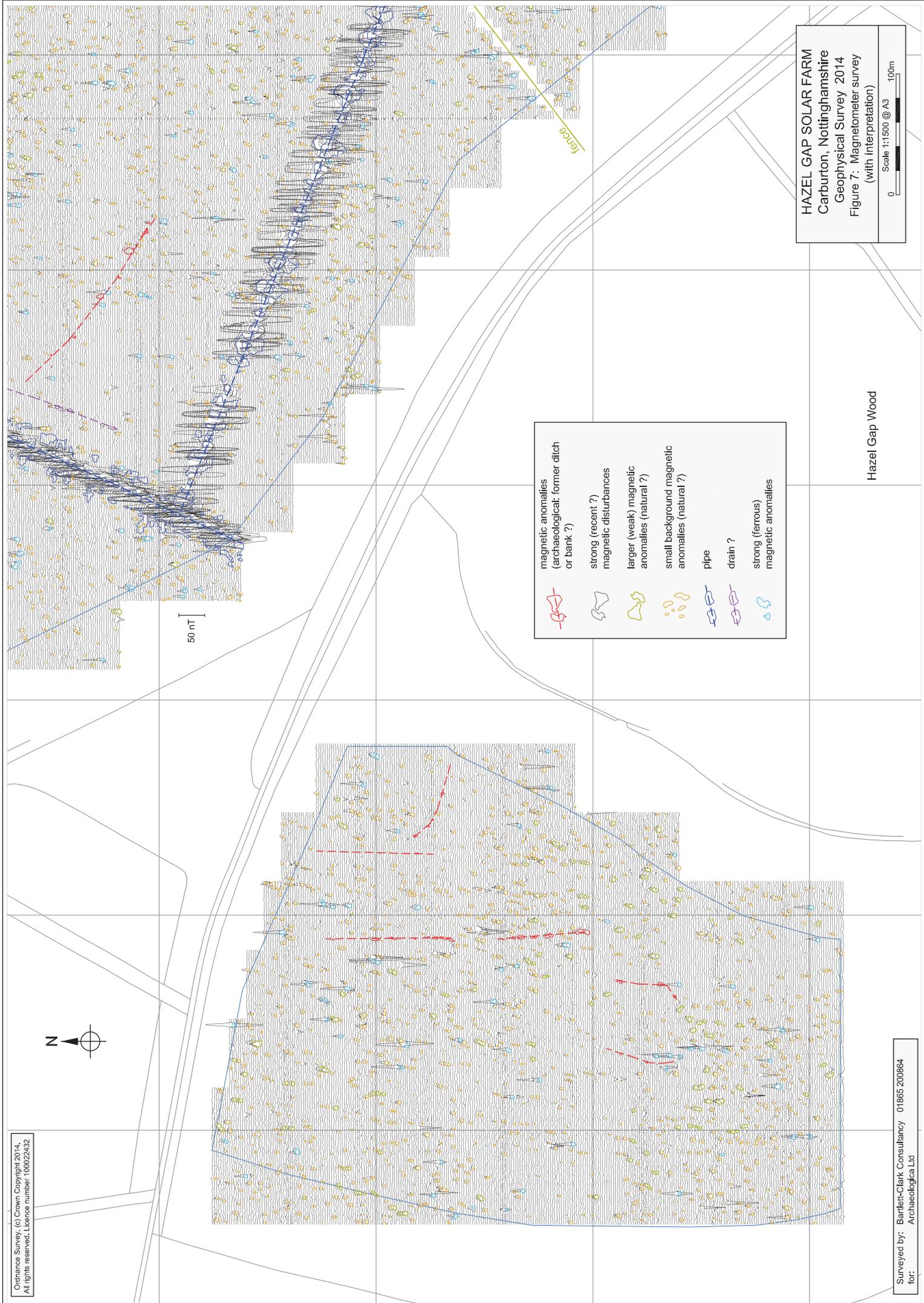
Works

fence

-  magnetic anomalies
(archaeological: former ditch
or bank ?)
-  strong (recent ?)
magnetic disturbances
-  larger (weak) magnetic
anomalies (natural ?)
-  small background magnetic
anomalies (natural ?)
-  pipe
-  drain ?
-  strong (ferrous)
magnetic anomalies

HAZEL GAP SOLAR FARM
Carburton, Nottinghamshire
Geophysical Survey 2014
Figure 6: Magnetometer survey
(with interpretation)

Scale 1:1500 @ A3
0 100m



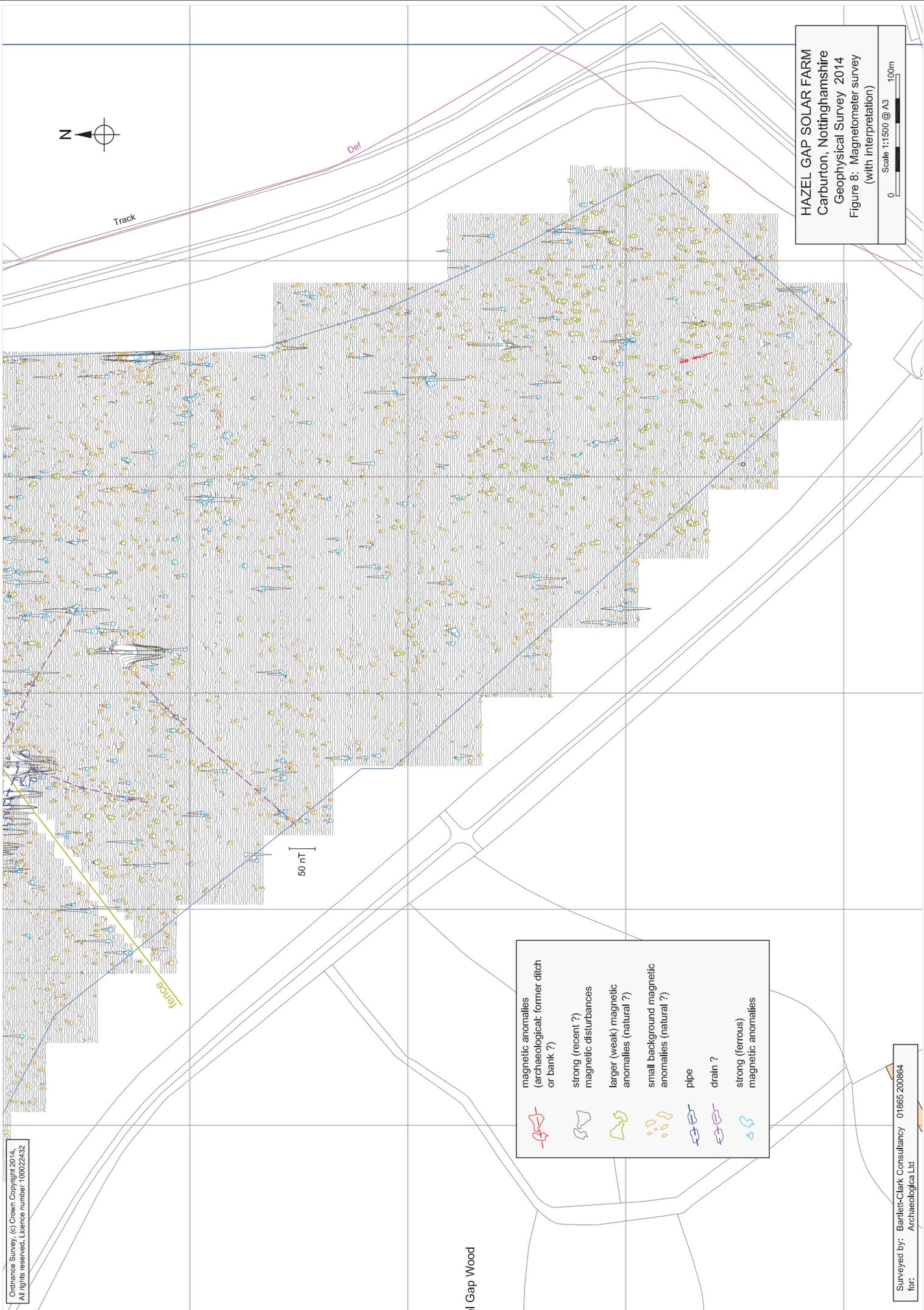
50 nT

	magnetic anomalies (archaeological: former ditch or bank ?)
	strong (recent ?) magnetic disturbances
	larger (weak) magnetic anomalies (natural ?)
	small background magnetic anomalies (natural ?)
	pipe
	drain ?
	strong (ferrous) magnetic anomalies

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Carburton, Nottinghamshire
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Figure 7: Magnetometer survey
(with interpretation)

Scale 1:1500 @ A3

Hazel Gap Wood



HAZEL GAP SOLAR FARM
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 Figure 8: Magnetometer survey
 (with interpretation)

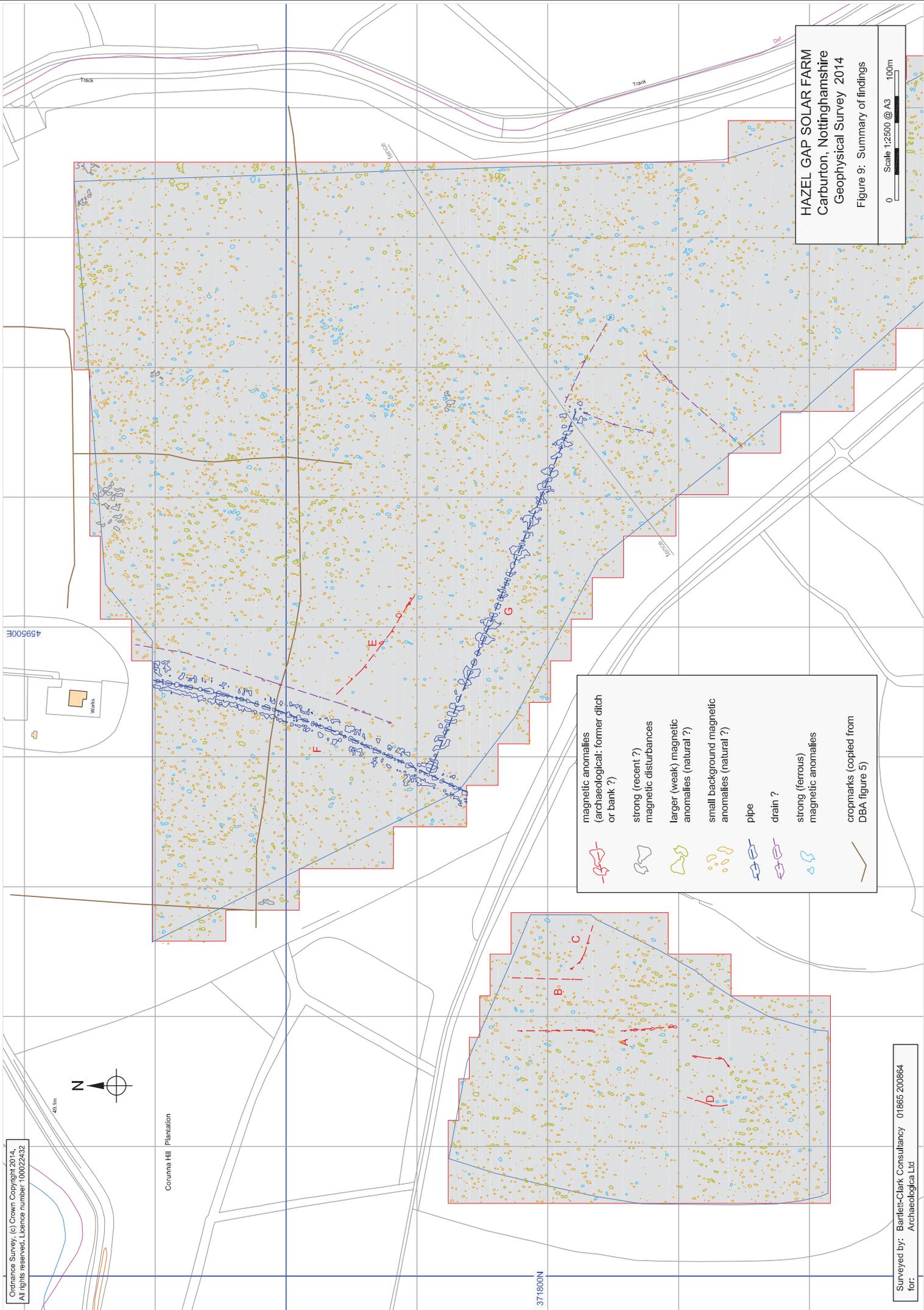
Scale 1:1500 @ A3
 0 100m

	magnetic anomalies (archaeological: former ditch or bank ?)
	strong (recent ?) magnetic disturbances
	larger (weak) magnetic anomalies (natural ?)
	small background magnetic anomalies (natural ?)
	pipe
	drain ?
	strong (ferrous) magnetic anomalies

Gap Wood



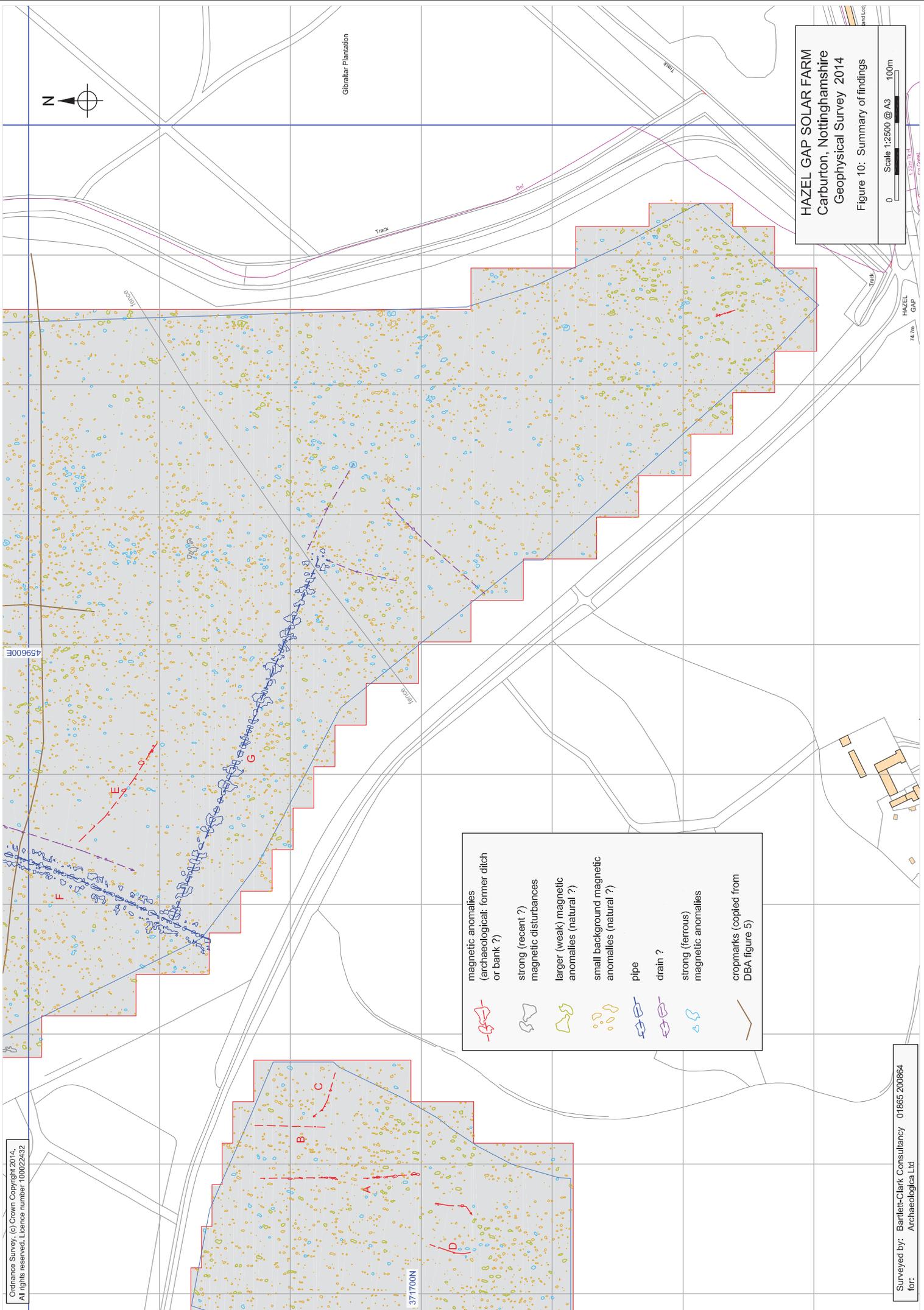
Corunna Hill Plantation



	magnetic anomalies (archaeological: former ditch or bank ?)
	strong (recent ?) magnetic disturbances
	larger (weak) magnetic anomalies (natural ?)
	small background magnetic anomalies (natural ?)
	pipe
	drain ?
	strong (ferrous) magnetic anomalies
	cropmarks (copied from DBA figure 5)

HAZEL GAP SOLAR FARM
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Figure 9: Summary of findings

0 100m
Scale 1:2500 @ A3



HAZEL GAP SOLAR FARM
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 Figure 10: Summary of findings

- magnetic anomalies (archaeological: former ditch or bank ?)
- strong (recent ?) magnetic disturbances
- larger (weak) magnetic anomalies (natural ?)
- small background magnetic anomalies (natural ?)
- pipe
- drain ?
- strong (ferrous) magnetic anomalies
- cropmarks (copied from DBA figure 5)