

# Archaeological Geophysical Survey Report



May 2014

Client: Middleton Aggregates

OASIS No: oxfordar3-180235

NGR: TF 964183

**EAST BILNEY, NORFOLK  
EXTENSION TO QUARRY**

**Report on Archaeological Geophysical Survey  
2014**

**Survey commissioned by:**

**Oxford Archaeology East  
15 Trafalgar Way  
Bar Hill  
Cambridge  
CB23 8SQ**

**on behalf of:**

**Middleton Aggregates**

**Report by:**

**A.D.H. Bartlett**

**Bartlett-Clark Consultancy  
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**29 May 2014**

**Norfolk CC reference: ENF134076**

# EAST BILNEY, NORFOLK: EXTENSION TO QUARRY

## Archaeological Geophysical Survey

### Introduction

This report describes a geophysical survey which has been undertaken as part of an archaeological evaluation of the site of a proposed extension to a quarry at east Bilney, Norfolk.

The survey was commissioned on behalf of Middleton Aggregates from Bartlett Clark Consultancy (BCC), Specialists in Archaeogeophysics of Oxford, by Oxford Archaeology East. Fieldwork for the survey was done on 1-7 May 2014.

### The Site

Notes on the condition and character of the site were previously included in the Method Statement prepared in advance of the survey [1]. The following comments are reproduced in part from this document.

#### *Location*

The site is located on arable land (at NGR TF 964183) adjacent to the B1146 Fakenham Road about 1km SE of East Bilney village, and 7km north of Dereham.

The application area is indicated by a red outline on the site location plan inset in figure 1, and amounts to c. 18.3ha. The proposed extraction area is indicated by a green outline on the same location plan, and amounts to c. 15.4ha. The survey coverage (indicated by blue cross hatching) encloses the green outline, and amounts to 17.6ha.

#### *Geology and topography*

The site occupies level farmland at an elevation of about 50m AOD. It is on glacial sand and gravel soils (Briton's Lane Sand and Gravel member) above a chalk bedrock. Glacial gravels vary in the quality of their magnetic response. There will sometimes be an increase in the background noise level of the survey if naturally magnetic stones in the gravel are exposed at the ground surface (and it is noted here on the BGS website that the Briton's Lane gravel contains far-travelled erratics), but this does not usually exclude the possibility of identifying archaeological features, and surveys on gravel sites have often produced clear archaeological findings.

Magnetic susceptibility measurements on soil samples collected at the site gave notably high readings between 58-83 ( $\times 10^{-8}$  SI/kg). These values are well within a range for which magnetometer surveying should be able to detect archaeological features, although there is a possibility (given the high values) that minor or superficial soil displacements could give rise

to detectable magnetic anomalies.

### *Archaeological background*

The archaeological potential of the site is indicated by findings from previous investigations at the existing extension site to the north of School Road. These (as mentioned in an email copied to us from Norfolk Historic Environment Service) include ‘a prehistoric burial mound, with somewhere in the region of 70 early medieval secondary burials around it, together with a few early medieval sunken featured buildings. Part of the proposed development area is within a field named on the tithe apportionment as Deadman’s Close. While it is possible that this may relate to suicide burials at either the Halfpenny Lane /School Road or Field Lane/Fakenham Road crossroads, the field is not adjacent to either, and so may relate to bones being disturbed by ploughing (and thereby indicating a second ring ditch site).’

There is therefore a possibility of large cut features such as ring ditches (potentially detectable by magnetometer surveying), and other archaeological findings within the application area.

### **Survey methodology**

The survey followed procedures as described in the standard brief for magnetometer surveys issued by Norfolk County Council [2].

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 (figure 1), and as graphical (x-y trace) plots at 1:1250 (figures 2-4). 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 2-4 (which permits the interpreted outlines to be compared with the underlying data). A further interpreted summary of findings is presented in figure 5.

The graphical plots in figures 2-4 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.

Figure 6 is included in the report to meet additional specific requirements stated in the generic brief for magnetometer surveys, as issued by Norfolk Historic Environment Service [2]. These figures show the magnetometer data without the conventional correction to the zero level in each transect, which is the usual initial step in data processing. The brief also requires a data block to be re-surveyed at the end of each day of fieldwork. The re-surveyed sample blocks are shown alongside the main survey in figure 6.

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 grey. Possible cultivation effects are indicated by green lines, and a possible land drain in blue/purple. Some of the more conspicuous ferrous objects (identifiable as narrow spikes in the graphical plots) are marked in light blue.

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.

### *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.

## **Results**

The survey has detected magnetic disturbances which may derive from a number of superimposed sources, some of which appear to be of archaeological relevance.

The magnetically responsive nature of the topsoil (as was indicated by the magnetic susceptibility readings mentioned above) means that cultivation markings are visible across much of the survey area. These are visible in the grey scale plot as a N-S pattern in the direction indicated by broken green lines in the interpretation (figure 5). Two open and extant deep furrows are visible on the ground, and give rise to negative magnetic anomalies which are marked by brown (rather than green) lines in the interpretation. These align with other cultivation effects, and so are probably of recent origin.

The modern cultivation pattern is intersected by broader and sometimes more irregular linear disturbances (which are indicated in figure 5 in red). The curving linear feature which extends across the site from north to south at A (as labelled in figure 5) is likely to be a former field boundary. The weaker marking alongside it at B could perhaps relate to a former cultivation pattern aligned with A. A further linear feature at C could represent an irregularly infilled ditch indicating another former field boundary.

It is unclear whether the same explanation could apply to the additional N-S linear features visible in the NE corner of the survey (as at D). These cut through the recent cultivation pattern, but do not form extended or continuous boundaries as seen at A and C. They could (as perhaps at B) indicate an earlier cultivation pattern, or traces of a former field system.

A number of more clearly defined magnetic anomalies are visible towards the north of the site. A strong linear feature at E aligns with a northern continuation of C, and these together could form the sides of a ditched enclosure, perhaps with a less distinct secondary enclosure

at F. The dense group of magnetic anomalies (around G) to the east of the linear features is difficult to interpret in detail, but appears to represent a concentration of settlement remains. Soil magnetic enhancement associated with a settlement would account for the strong magnetic response from some of the ditches in this part of the site. It is possible that some of the more rectilinear of the magnetic anomalies near G could represent sunken featured buildings of the kind previously identified to the north.

Other findings indicated in the interpretation include clusters of small magnetic anomalies as outlined towards the west of the site at H. These do not form an interpretable plan, and could represent a natural outcrop of gravel in the topsoil. Similar disturbances are seen towards the southern boundary of the site. Other (broad or weak) magnetic anomalies (as also outlined in light brown) could be naturally silted hollows. A few more distinct pit-like features are indicated in red, but they are widely dispersed, and do not suggest the presence of any concentrations of archaeological features (except in the vicinity of the findings labelled E, F, G at the north of the site).

The survey has not provided any evidence for the presence of ring ditches (which are often clearly identifiable in a survey of this kind).

## **Conclusions**

The survey has detected one or more ditched enclosures, and a group of magnetic disturbances of a kind which appears to indicate an ancient settlement site towards the north of the survey area. These findings could (on the evidence of a previous evaluation at the existing extension site) represent a settlement of early medieval (or earlier) date.

Findings elsewhere in the survey include linear features probably indicating former field boundaries, or possible traces of a field system. There is also evidence of recent cultivation effects, and various natural or non-archaeological disturbances have been detected.

## **Report by:**

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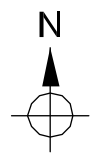
29 May 2014

Fieldwork for the survey was done by N. Paveley and P. Heykoop.

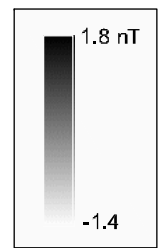
## References

- [1] *East Bilney, Norfolk: Extension to Quarry.Method Statement for Archaeological Geophysical Survey.* Document prepared by Bartlett Clark Consultancy for Oxford Archaeology East, 23 April 2014.
  
- [2] *Generic Brief for Archaeological Evaluation by Magnetometer Survey.* Document issued by Norfolk County Council Historic Environment Service, 7/12/2012.

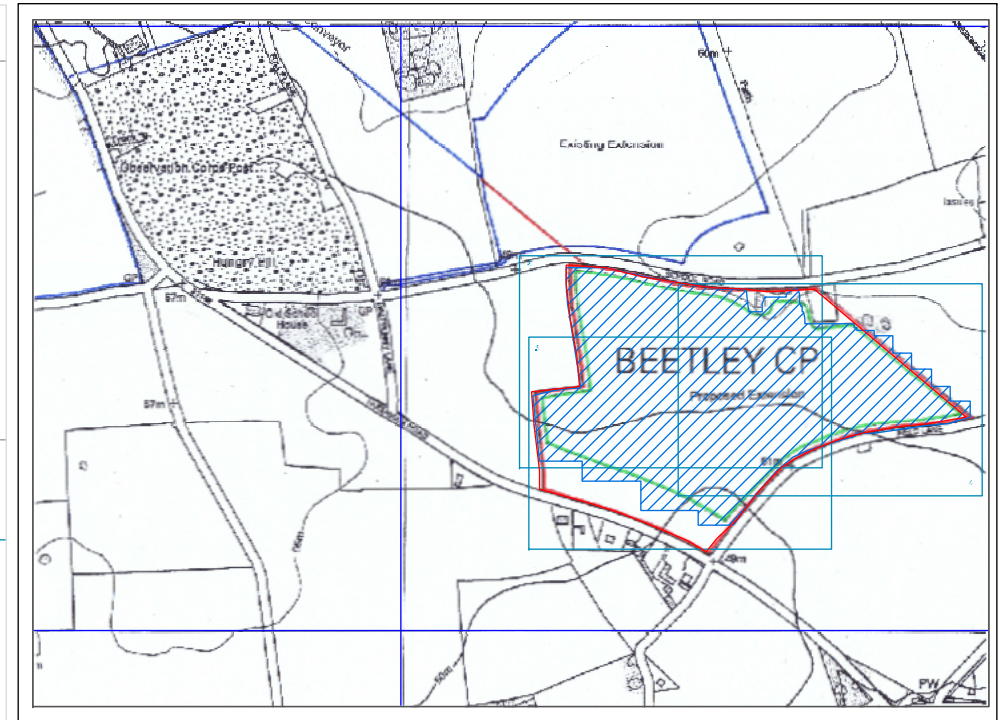
Background mapping based on site plan  
by Stephen M. Daw Ltd



596500E



2

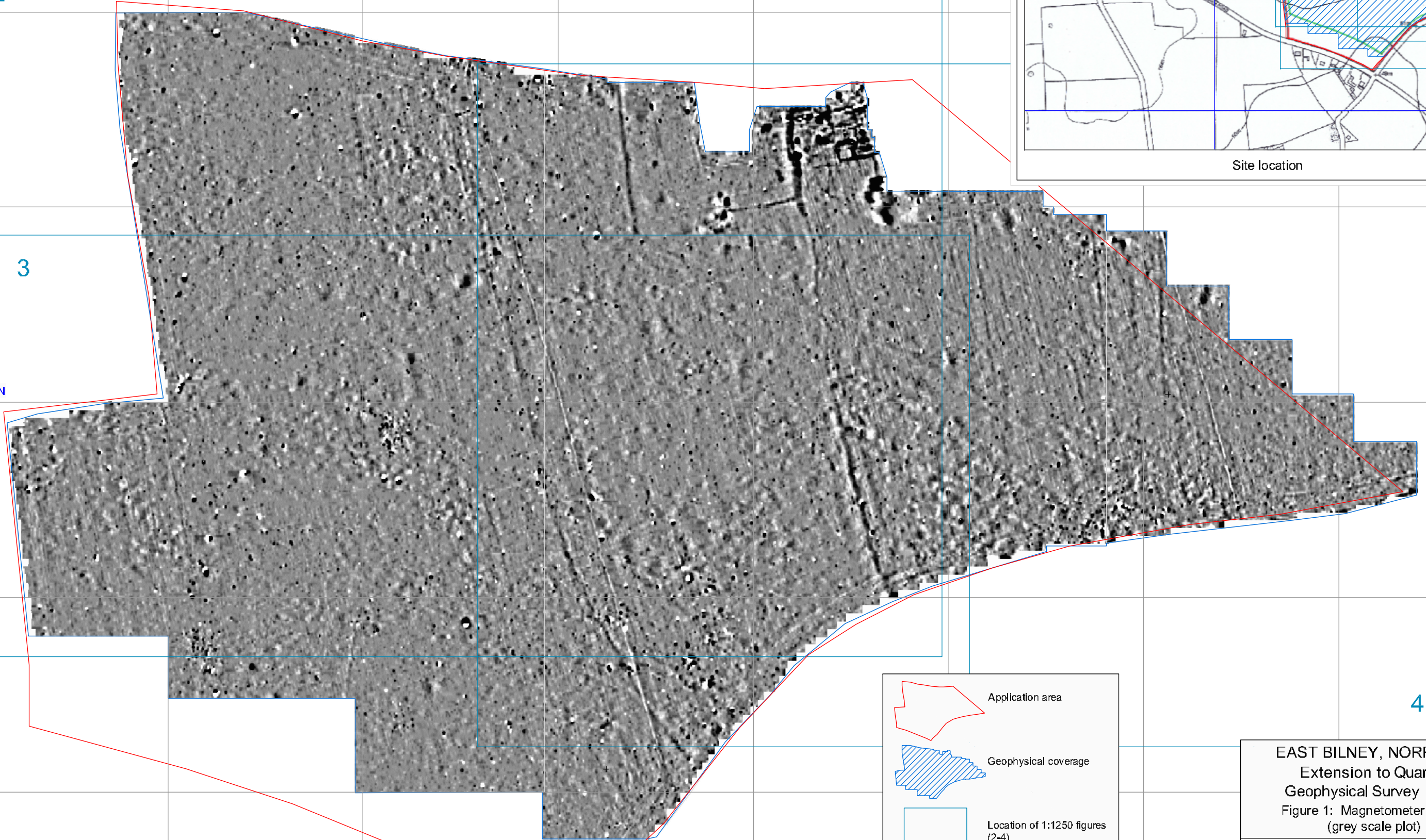


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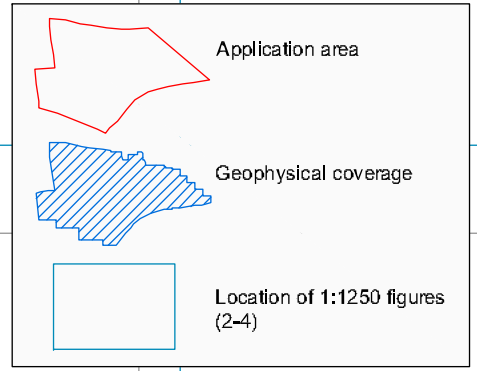
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3

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4

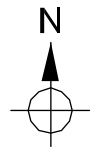


**EAST BILNEY, NORFOLK**  
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**Geophysical Survey 2014**  
**Figure 1: Magnetometer survey**  
**(grey scale plot)**








0      Scale 1:2000 @ A3      100m

Surveyed by: Bartlett-Clark Consultancy 01865 200864  
for: Oxford Archaeology East





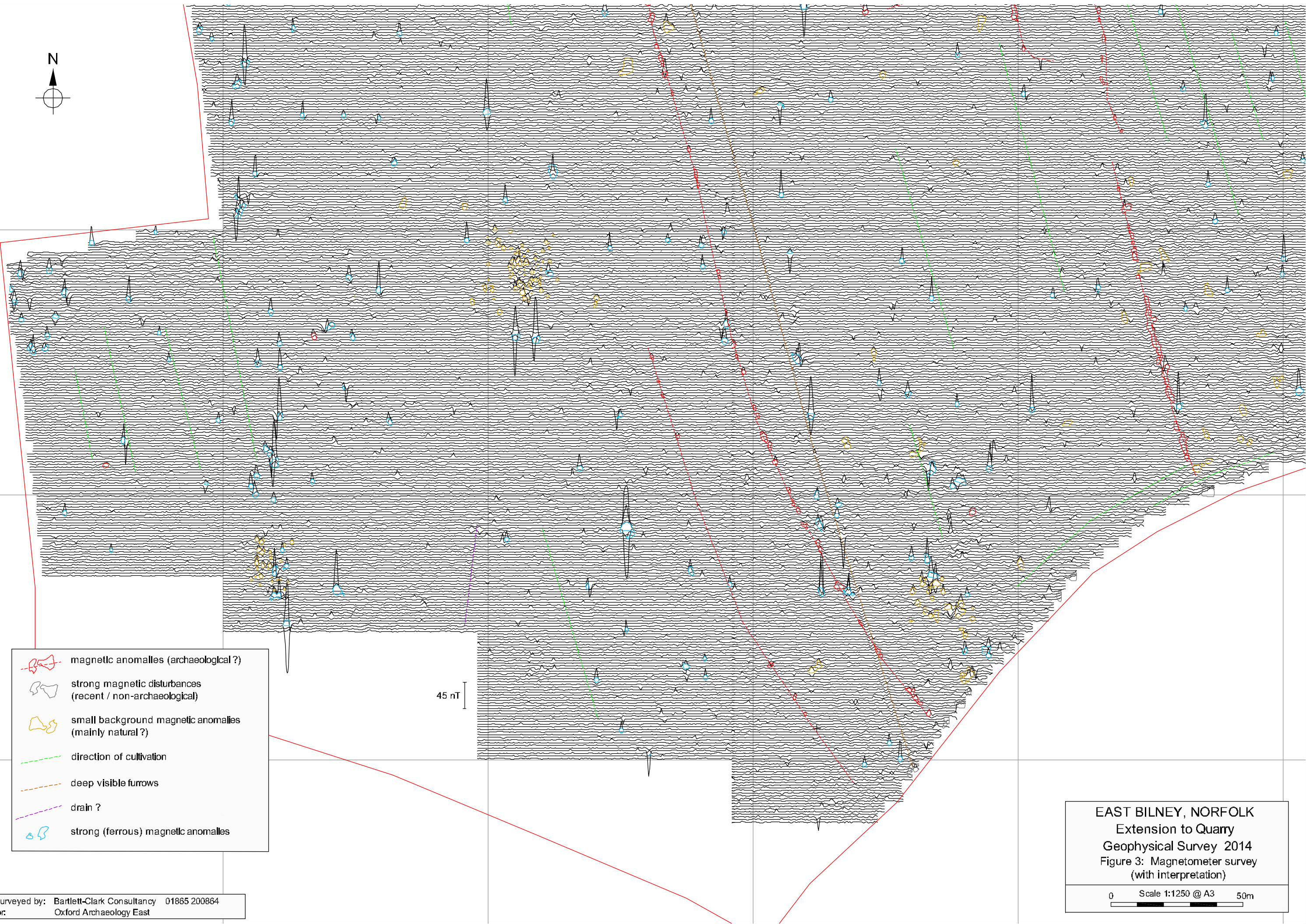
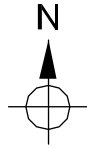
45 nT








-  magnetic anomalies (archaeological ?)
-  strong magnetic disturbances (recent / non-archaeological)
-  small background magnetic anomalies (mainly natural ?)
-  direction of cultivation
-  deep visible furrows
-  drain ?
-  strong (ferrous) magnetic anomalies

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Figure 2: Magnetometer survey  
(with interpretation)

0 Scale 1:1250 @ A3 50m

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for: Oxford Archaeology East



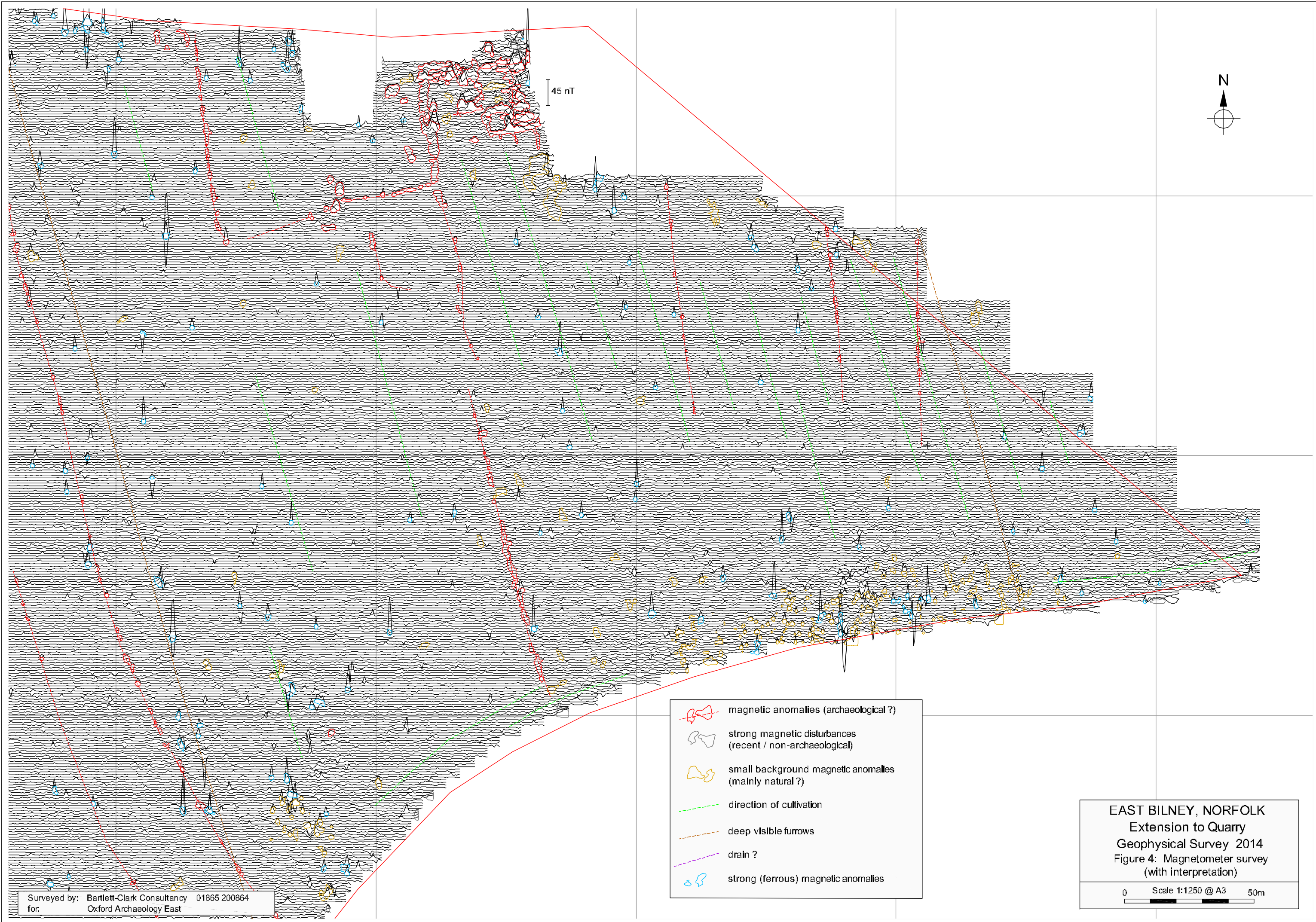
-  magnetic anomalies (archaeological ?)
-  strong magnetic disturbances (recent / non-archaeological)
-  small background magnetic anomalies (mainly natural ?)
-  direction of cultivation
-  deep visible furrows
-  drain ?
-  strong (ferrous) magnetic anomalies

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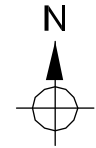
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Figure 3: Magnetometer survey  
(with interpretation)

0 Scale 1:1250 @ A3 50m



45 nT

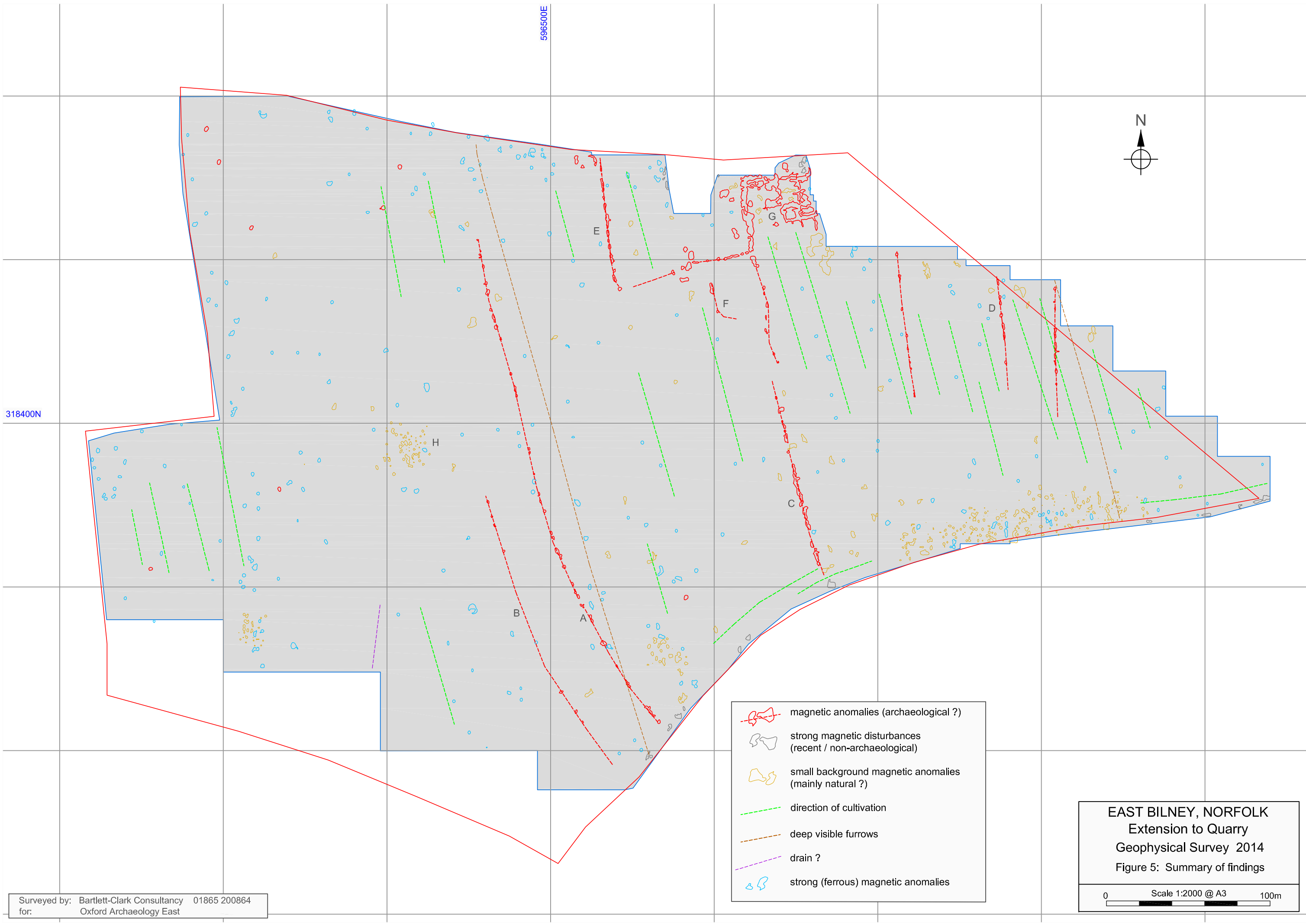


-  magnetic anomalies (archaeological ?)
-  strong magnetic disturbances (recent / non-archaeological)
-  small background magnetic anomalies (mainly natural ?)
-  direction of cultivation
-  deep visible furrows
-  drain ?
-  strong (ferrous) magnetic anomalies

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 Figure 4: Magnetometer survey  
 (with interpretation)

0 Scale 1:1250 @ A3 50m








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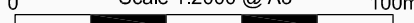
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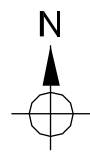
-  magnetic anomalies (archaeological ?)
-  strong magnetic disturbances (recent / non-archaeological)
-  small background magnetic anomalies (mainly natural ?)
-  direction of cultivation
-  deep visible furrows
-  drain ?
-  strong (ferrous) magnetic anomalies

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 Figure 5: Summary of findings

0      Scale 1:2000 @ A3      100m



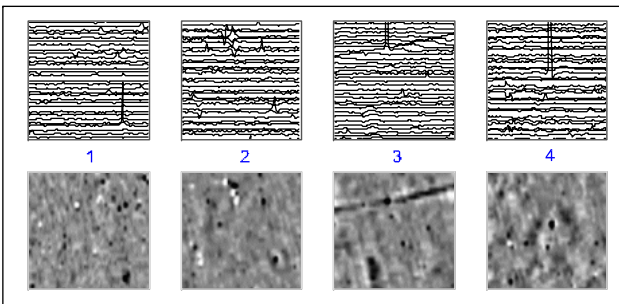
Surveyed by: Bartlett-Clark Consultancy 01865 200864  
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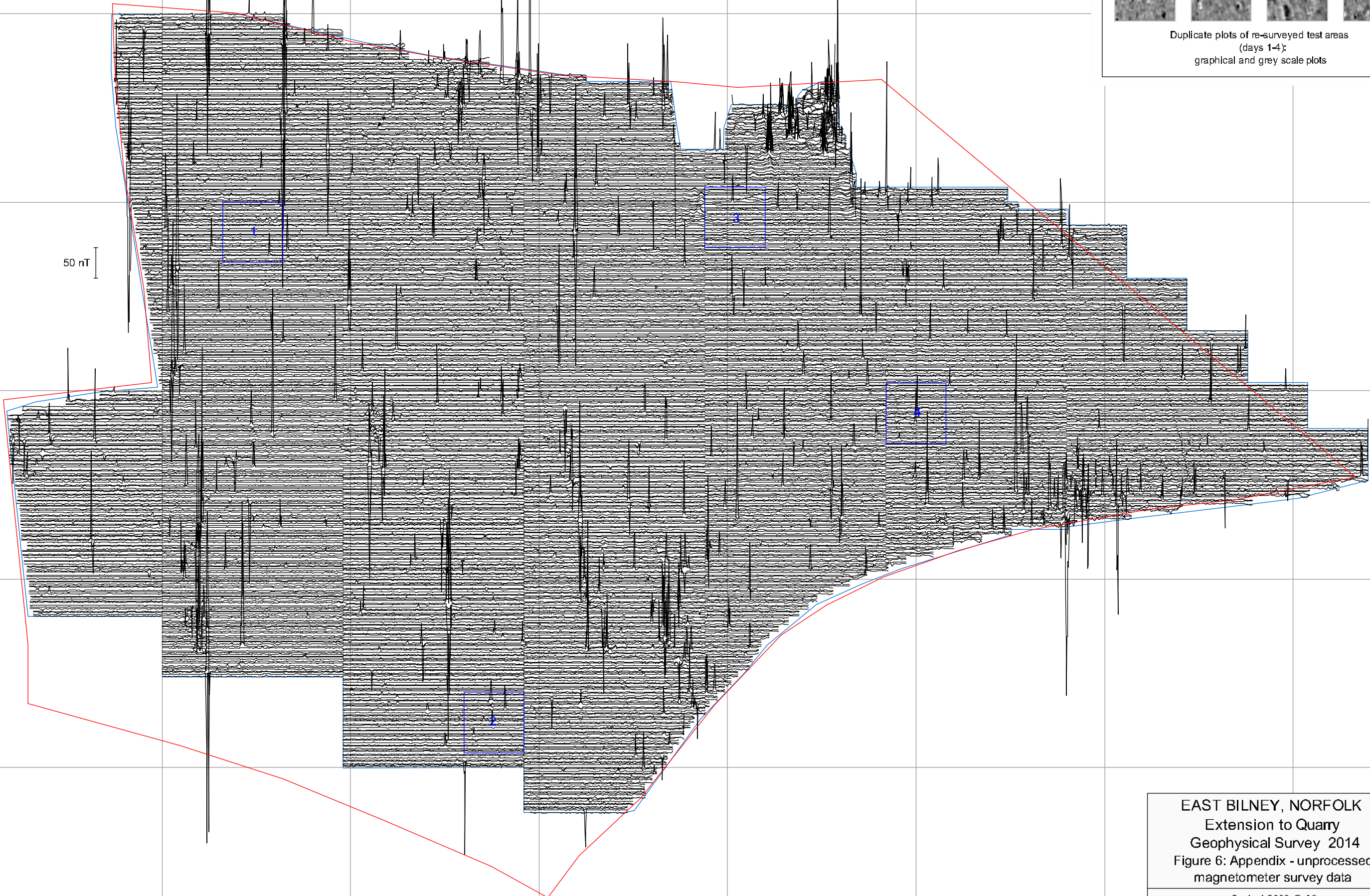
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50 nT



Duplicate plots of re-surveyed test areas (days 1-4): graphical and grey scale plots



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Figure 6: Appendix - unprocessed magnetometer survey data

0      Scale 1:2000 @ A3      100m

## APPENDIX E. OASIS REPORT FORM

All fields are required unless they are not applicable.

### Project Details

OASIS Number	<input type="text" value="oxfordar3-180235"/>			
Project Name	<input type="text" value="East Bilney Quarry Extension, Norfolk"/>			
Project Dates (fieldwork)	Start	<input type="text" value="01-05-2104"/>	Finish	<input type="text" value="07-05-2104"/>
Previous Work (by OA East)	<input type="text" value="No"/>	Future Work	<input type="text" value="Unknown"/>	

### Project Reference Codes

Site Code	<input type="text" value="XNFEBQ14"/>	Planning App. No.	<input type="text"/>
HER No.	<input type="text" value="ENF137076"/>	Related HER/OASIS No.	<input type="text"/>

### Type of Project/Techniques Used

Prompt	<input type="text" value="Planning condition"/>
Development Type	<input type="text" value="Mineral Extraction"/>

### Please select all techniques used:

<input type="checkbox"/> Aerial Photography - interpretation	<input type="checkbox"/> Grab-Sampling	<input type="checkbox"/> Remote Operated Vehicle Survey
<input type="checkbox"/> Aerial Photography - new	<input type="checkbox"/> Gravity-Core	<input type="checkbox"/> Sample Trenches
<input type="checkbox"/> Annotated Sketch	<input type="checkbox"/> Laser Scanning	<input type="checkbox"/> Survey/Recording Of Fabric/Structure
<input type="checkbox"/> Augering	<input type="checkbox"/> Measured Survey	<input type="checkbox"/> Targeted Trenches
<input type="checkbox"/> Dendrochronological Survey	<input type="checkbox"/> Metal Detectors	<input type="checkbox"/> Test Pits
<input type="checkbox"/> Documentary Search	<input type="checkbox"/> Phosphate Survey	<input type="checkbox"/> Topographic Survey
<input type="checkbox"/> Environmental Sampling	<input type="checkbox"/> Photogrammetric Survey	<input type="checkbox"/> Vibro-core
<input type="checkbox"/> Fieldwalking	<input type="checkbox"/> Photographic Survey	<input type="checkbox"/> Visual Inspection (Initial Site Visit)
<input checked="" type="checkbox"/> Geophysical Survey	<input type="checkbox"/> Rectified Photography	

### Monument Types/Significant Finds & Their Periods

List feature types using the [NMR Monument Type Thesaurus](#) and significant finds using the [MDA Object type Thesaurus](#) together with their respective periods. If no features/finds were found, please state "none".

Monument	Period	Object	Period
<input type="text" value="Ditches"/>	<input type="text" value="Uncertain"/>	<input type="text"/>	<input type="text" value="Select period..."/>
<input type="text"/>	<input type="text" value="Select period..."/>	<input type="text"/>	<input type="text" value="Select period..."/>
<input type="text"/>	<input type="text" value="Select period..."/>	<input type="text"/>	<input type="text" value="Select period..."/>

### Project Location

County	Norfolk	Site Address (including postcode if possible)
District	Norh Norfolk	East Bilney Quarry East Bilney Norfolk NR20 4ET
Parish	East Bilney	
HER	Norfolk	
Study Area	18.5	National Grid Reference TF 964183

### Project Originators

Organisation	OA EAST
Project Brief Originator	Norfolk County Council
Project Design Originator	Bartlett Clark
Project Manager	Paul Spoerry
Supervisor	A. D. H. Bartlett

### Project Archives

Physical Archive	Digital Archive	Paper Archive
None	OA East	OA East
None	XNFEBQ14	XNFEBQ14

### Archive Contents/Media

	Physical Contents	Digital Contents	Paper Contents
Animal Bones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ceramics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Environmental	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Glass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Human Bones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Digital Media	Paper Media
<input type="checkbox"/> Database	<input type="checkbox"/> Aerial Photos
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<input type="checkbox"/> Moving Image	<input type="checkbox"/> Manuscript
<input type="checkbox"/> Spreadsheets	<input type="checkbox"/> Map
<input type="checkbox"/> Survey	<input type="checkbox"/> Matrices
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	<input type="checkbox"/> Research/Notes
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	<input type="checkbox"/> Plans
	<input checked="" type="checkbox"/> Report
	<input type="checkbox"/> Sections
	<input type="checkbox"/> Survey



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