

ARCHAEOLOGICAL PROJECT SERVICES



GEOPHYSICAL SURVEY

**CHURCH STREET
BECKINGHAM
NOTTINGHAMSHIRE**

Prepared for
GR33N HOMES
by
Archaeological Project Services

Date: November 2021

APS Report No: 61/21

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Document Control

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Site name	Church Street, Beckingham -Geophysical Survey Report
National Grid Reference	SK 7782 9040
OASIS Record No.	archaeol1-508321

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1. SUMMARY

A detailed magnetic gradiometer survey was undertaken for Gr33n Homes in connection with a proposed residential development on land north of Church Street, Beckingham, Nottinghamshire. The survey area totalled c. 1.2ha.

The site has few magnetic anomalies but is partially masked by the magnetic disturbance caused by clearance and by piles of felled trees, not allowing complete and continual data capture of the full area. The data has shown an indication of possible ridge and furrow activity within the survey area.

2. INTRODUCTION

2.1 Definition of an Evaluation

A Geophysical survey is a non-intrusive method of archaeological evaluation. Evaluation is defined as *'a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site. If such archaeological remains are present Field Evaluation defines their character and extent, quality and preservation, and it enables an assessment of their worth in a local, regional, national or international context as appropriate'* (ClfA 2014a).

2.2 Project Background

Archaeological Project Services (APS) was commissioned by Gr33n Homes to undertake a detailed magnetometer survey totalling some 1.2ha on land to the north of Church Street, Beckingham, Nottinghamshire. This was in advance of a proposed residential development. The work was undertaken in accordance with a method statement prepared by APS. The survey was carried out on the 15th November 2021.

2.3 Topography and Geology

Beckingham is situated 22km east of Worksop, in the administrative district of Bassetlaw in Nottinghamshire (Fig. 1). The site is located at National Grid Reference SK 7782 9040 and lies 100m northwest of All Saints Church in Beckingham (Fig. 2). The total area of the site is 1.2ha, encompassing one field. The site is bounded by Church Street to the south and open fields to the north, with housing to the east and west.

Local soils belong to the whimple 3 association, typically slightly acid loamy and clayey soils with impeded drainage (CSRI, 2021). These soils seal a solid geology of Mercia Mudstone with no recorded superficial deposits (BGS 2021). The site lies at a height of c.15m OD on generally level ground.

2.4 Archaeological Setting

Beckingham has several grade 2 listed buildings (Cox CD, 1994) of medieval origin, including the nearby church, walls and gate and vicarage. The site has been identified as one of several to the north of Beckingham with cropmarks in other fields nearby contain earthworks including ridge and furrow.

The cropmarks are undated and appear to form a trackway aligned east to west with other uninterpreted cropmarks. (TPAT, 1994)

3. GEOPHYSICAL SURVEY

3.1 Methods

A magnetic gradiometry survey was carried out with a Bartington Grad 601-2 fluxgate magnetometer. The fields were divided into 30m² grids using a survey grade GPS and each grid was walked systematically in a zigzag pattern, taking readings every 0.25m in traverses 1m apart.

The layout of the survey area is shown in Figure 3. At the time of the survey the area had been strimmed, so was grassy underfoot. However, three areas of the site were not surveyable as surrounding trees had been felled and piled in these areas of the site, restricting the survey.

The survey was undertaken in accordance with Historic England (2008) and ClfA (2014b) guidelines and codes of conduct. A detailed methodology can be found in Appendix 1.

3.2 Results

The presentation of the data for the site comprises a greyscale print-out of the raw data (Fig. 4; clipped for display but otherwise unprocessed) and the processed data (Fig. 5). Magnetic anomalies have been identified and plotted onto an interpretative drawing (Fig. 6).

Area of bipolar disturbance

There are several areas of bipolar disturbance within the survey, highlighted with blue hatching. These are likely to be due to disturbance in the topsoil, possibly from the recent activity of felling trees and clearing of the area.

Agricultural features

The agricultural regime that can be seen running east-west in the northwest of the site might relate to ridge and furrow activity due to the distance between the anomalies and may, therefore, be of possible medieval origin.

4. DISCUSSION

The survey data has captured some magnetic anomalies, but due to the small nature of the area and the unsurveyed sections, the data is incomplete. However, there do not seem to be any continual anomalies present that would be affected by this discontinuity. It is possible the broader magnetic disturbance identified across much of the survey area could mask weaker magnetic anomalies.

Overall the site appears to have archaeological activity in the form of agricultural ridge and furrow, with some areas of the site having magnetic disturbance that could mask weaker anomalies.

5. ACKNOWLEDGEMENTS

Archaeological Project Services wish to acknowledge Gr33n Homes for commissioning this project. Paul Cope-Faulkner edited this report.

6. PERSONNEL

Project coordinator: Paul Cope-Faulkner
Geophysical Survey: Sean Parker and Ryan Godbold
Survey processing and reporting: Sean Parker
Archiving: Denise Buckley

7. BIBLIOGRAPHY

BGS 2019, *Geology of Britain Viewer*. Available at <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> (accessed 26.11.2021)

CSRI, 2021, available at [Soilscapes soil types viewer - National Soil Resources Institute. Cranfield University \(landis.org.uk\)](http://landis.org.uk) (accessed 26.11.2021)

ClfA, 2014a *Standard and Guidance for Field Evaluation*.

ClfA, 2014b *Standard and Guidance for Geophysical Survey*.

Cox CD, 1994, Air photos

Historic England, 2008 *Geophysical Survey in Archaeological Field Evaluation*.

TPAT, 1994, Village Earthwork Survey I. SNT1359

8. ABBREVIATIONS

AOD Above Ordnance Datum

APS Archaeological Project Services

BGS British Geological Survey

ClfA Chartered Institute for Archaeologists

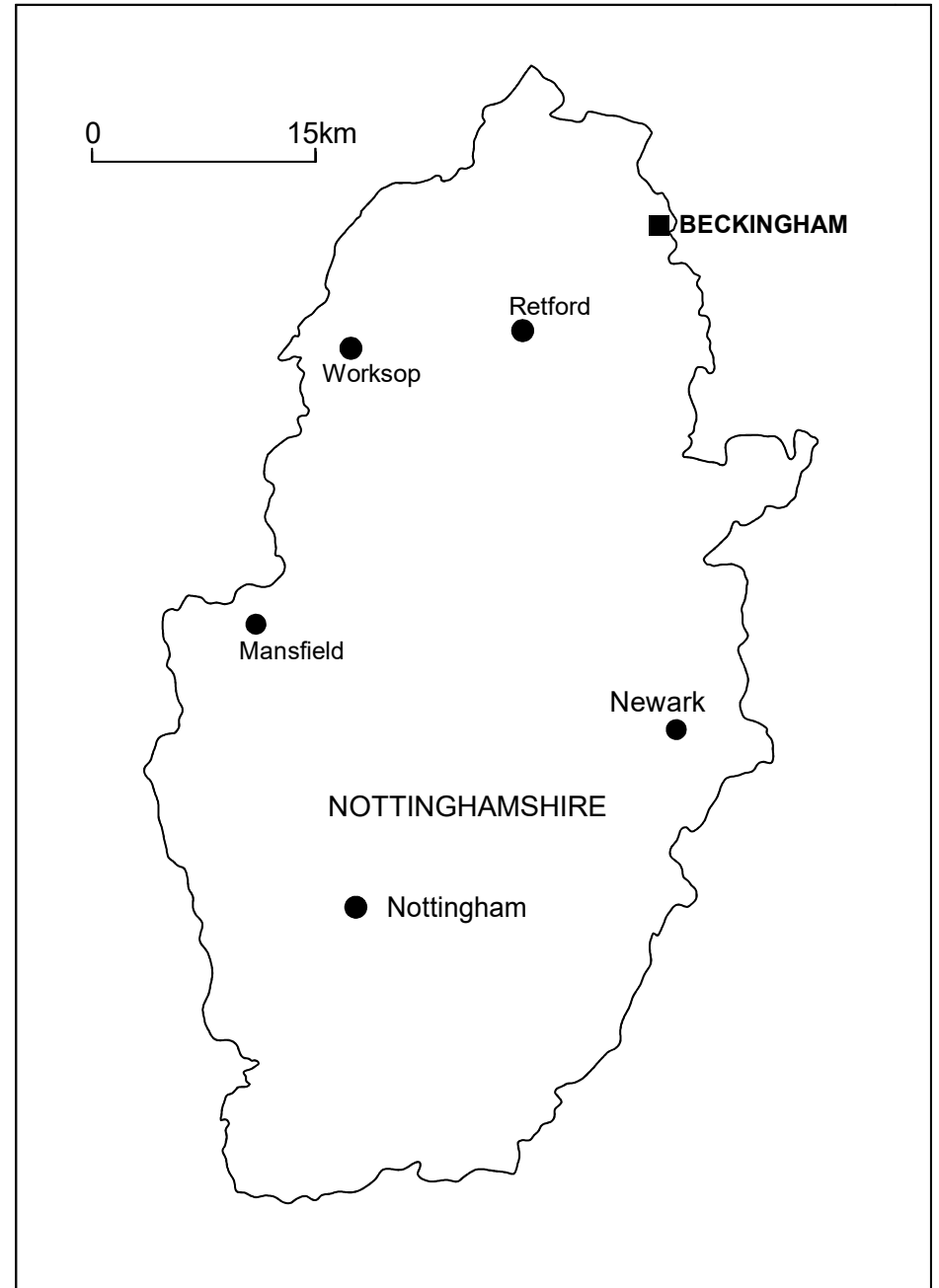
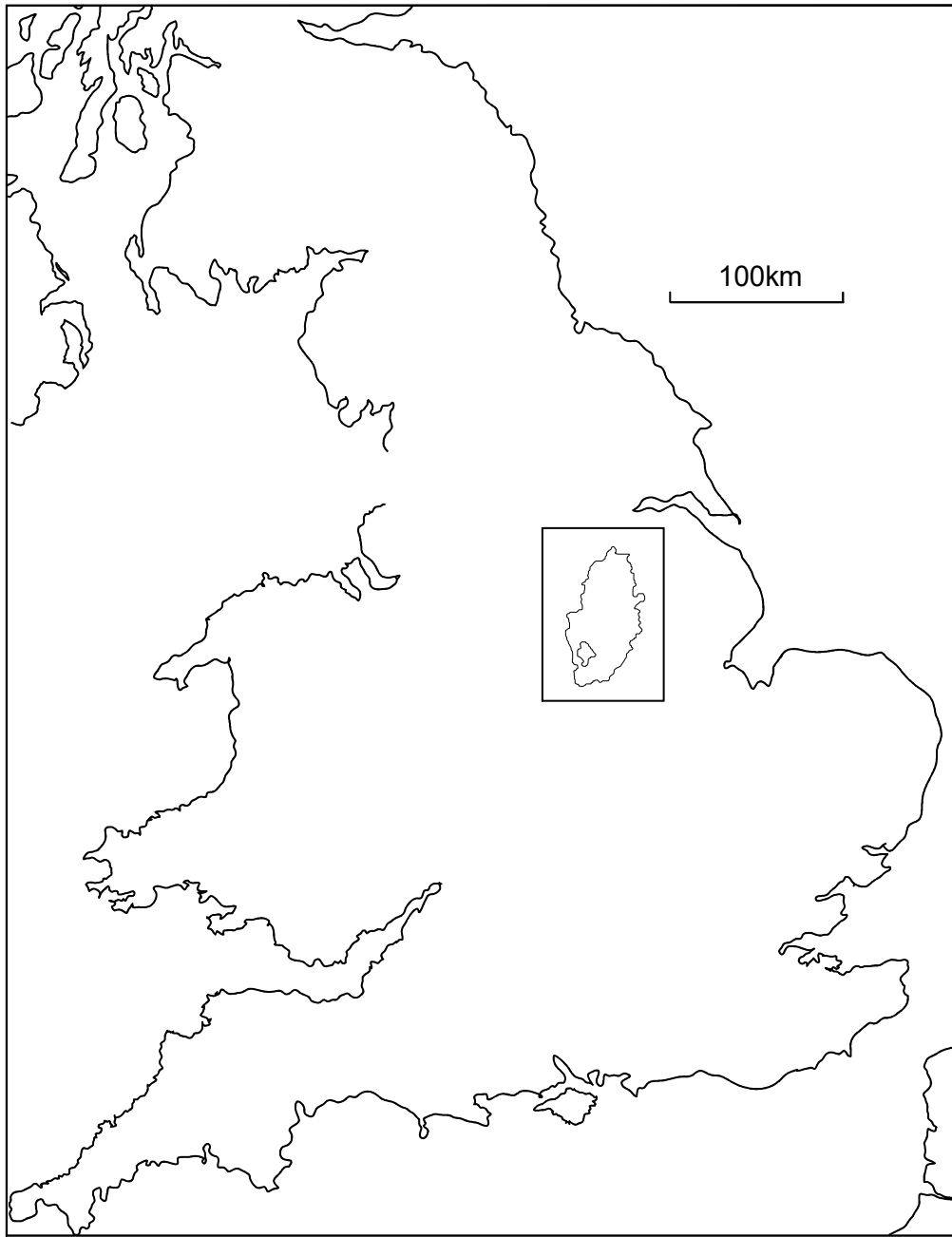
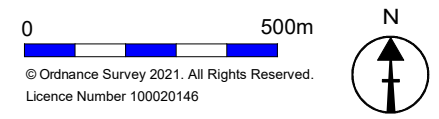


Figure 1 - General location



SK

Survey Area



ARCHAEOLOGICAL PROJECT SERVICES

Project Name: Church Street Beckingham

Scale 1:1500 Drawn by: SP Report No: 61/21

Figure 2 - Survey location plan

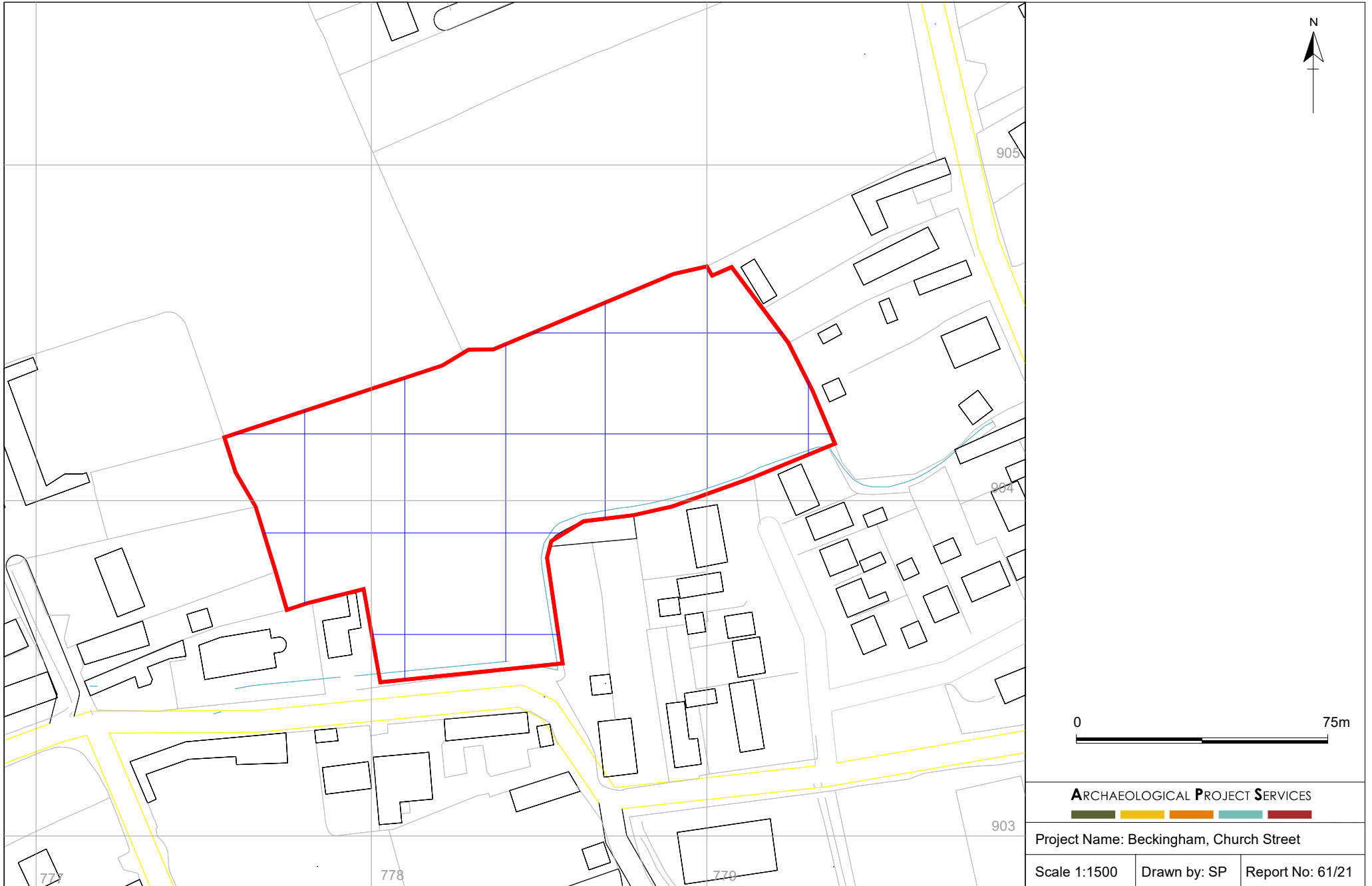


Figure 3: Survey Setout



Figure 4: Raw Greyscale Data



Figure 5: Processed Greyscale Data

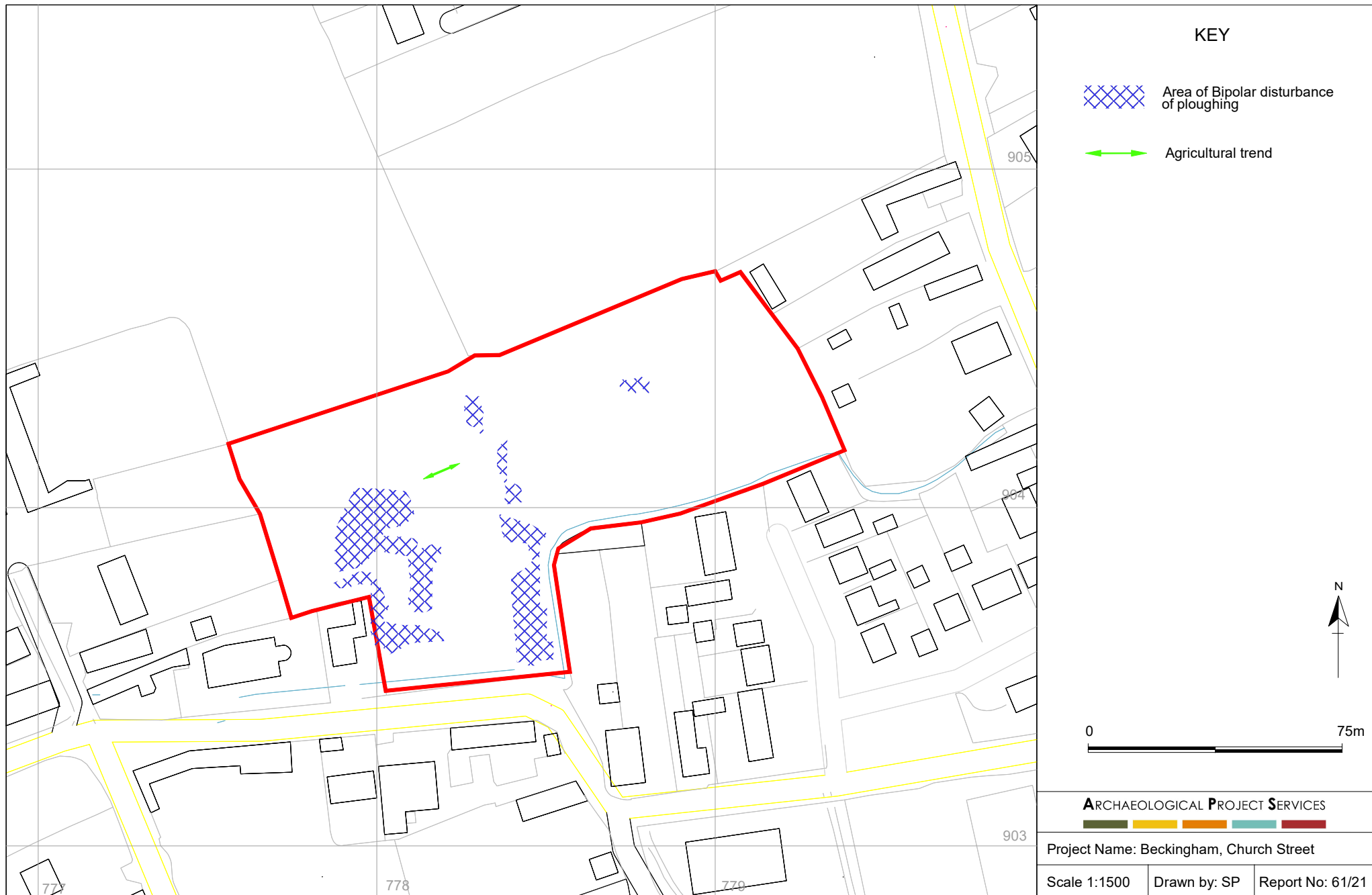


Figure 6: Interpreted Greyscale Data

Appendix 1

TECHNICAL INFORMATION

Principles of magnetometry

Magnetic prospecting is designed to identify concentrations of magnetised iron oxides in the soil. Iron oxides can exist in states of weak or a strong magnetisation (Gaffney and Gater 2003).

Human activities tend to enhance the magnetic properties of iron oxide particles. Where these particles accumulate, such as in cut features like ditches and pits, a weak positive magnetic anomaly is apparent. In cases where very strong heat has been applied, such as furnace and kiln bases, a bipolar magnetic anomaly will be apparent, with one area having a strong positive signature and one area having a strongly negative signature. Where banks have been built up from natural geological material which excludes magnetically enriched sediments, or walls have been made of stone, this may result in a negative anomaly. Modern metallic items and fired bricks cause sharp bipolar spikes. Modern services have a tendency to alternate between positive and negative readings along their length.

It should be noted that not all features will be detectable magnetically and an absence of anomalies does not necessarily indicate absence of archaeological features (Clark 1996).

Bartington Grad 601-2

A gradiometer uses two sensors separated by a fixed distance in order to measure the difference in strength between the earth's magnetic field and the soil. The Bartington Grad 601 uses two fluxgate sensors separated vertically by 1m to take these readings. This reduces natural variations associated with the Earth's magnetic field and deep geology. Changes as small as 0.2 nanoTesla (nT) in an overall field strength of c. 49,000nT can be accurately detected using this instrumentation, although in practice instrument interference and soil noise can limit sensitivity. The instrument has typical penetration of 0.5m-1m, although stronger anomalies can be detected at greater depths. The 601-2 model uses two sets of sensor pairs to take parallel readings 1m apart horizontally.

Methodology

The survey area is divided into grid squares of 30x30m. The grids are set out using a survey grade GPS, accurate to 0.03m. The grids are systematically walked in a zigzag pattern with the gradiometer taking readings every 0.25m along a traverse, and each traverse being separated by 1m. This equates to 3600 sampling points in a full 30m x 30m grid. Readings are automatically recorded on a datalogger which is downloaded at the end of each day. The gradiometer is 'zeroed' at the start of each day and at intervals throughout to ensure consistent results are achieved throughout the survey.

Data Processing

The data is downloaded and processed using TerraSurveyor software (version 3.0.37.25). The raw data is then adjusted to emphasise possible features. At each stage the data is examined as a greyscale image and as a trace plot.

Minimally Processed data

The data is clipped so that the mid-range of readings is most visible. This involves excluding all readings outside of the -10nT to 10nT range.

Processed Data

The following processes are applied to produce the processed greyscale image:

- **Destripe:** Each traverse is flattened with regard to surrounding traverses by setting the median value of the traverse to 0nT. This produces cleaner images, but may cause bleeding where particularly strong signals are present at one end of a traverse.
- **Data Clip:** The data is clipped to provide the most suitable contrast for seeing archaeological features. This excludes readings outside of the -3nT to 3nT range.
- **Gradshade:** This image alteration is designed to remove pixelation and sharp edges and gradual shading between areas giving a more natural appearance,

Data is exported as a JPG image and georeferenced for use in scale plans of the site. Anomalies are then checked against historical maps, and where available, lidar contour data.

References

Clark, A., 1996 *Seeing Beneath the Soil*, London, 2nd edn.

Gaffney C. and Gater, J., 2006 *Revealing the Buried Past: Geophysics for Archaeologists*, The History Press

Appendix 2

GLOSSARY

Cropmark	A mark that is produced by the effect of underlying archaeological or geological features influencing the growth of a particular crop.
Drift	Material that has been eroded, transported or deposited by glaciers (or their melt water). The term 'drift' is commonly used to describe any deposits of Quaternary age.
Geophysical Survey	Essentially non-invasive methods of examining below the ground surface by measuring deviations in the physical properties and characteristics of the earth. Techniques include magnetometry and resistivity survey.
Gleying	Gleying occurs in waterlogged, anaerobic conditions when iron compounds are reduced and either removed from the soil, or segregated out as mottles or concretions in the soil. Marshy wetlands often contain gleyed soils. It can also result in horizons of clay forming at the water line.
Lidar	An aircraft-based method of survey using analysis of pulses of laser light reflected from the surfaces of the ground and buildings. It is cable of identifying subtle differences in topography.
Medieval	The Middle Ages, dating from approximately AD 1066-1500.
Modern	The current period, dating from around AD 1900 to the present time.
Ridge and Furrow	The remains of arable cultivation consisting of raised rounded strips separated by furrows. It is characteristic of open field agriculture.

Appendix 3

THE ARCHIVE

The archive consists of:

- 1 Daily record sheets
- 1 Report text and illustrations
- 1 Digital data

File names	BKCS21.csv
Explanation of codes used in file names	.csv files allow whole composite to be generated and stored easily.
Description of file formats	All files are in csv format where Z= nT reading
List of codes used in files	
Hardware, software and operating systems	TerraSurveyor 3.0.37.25 running under Windows 10
Date of last modification	29/11/2021
Indications of known areas of weakness in data	
Survey Technique	Zigzag
Origin	Starts at A1. X axis progresses east. Y axis progresses south
Grid size	40mx40m
Interval	X=1, Y=0.25m
Dummy Value	2047.5
XYZ Separation	Comma

All primary records are currently kept at:

Heritage Lincolnshire/Archaeological Project Services
The Old School
Cameron Street
Heckington
Sleaford
Lincolnshire
NG34 9RW

Final destination of the archive is:

Bassetlaw Museum
Amcott House
Grove Street
RETFORD
Notts DN22 6LD

OASIS code: archaeol1-508321

Appendix 4

OASIS SUMMARY

OASIS ID (UID)	archaeol1-508321
Project Name	Magnetometry Survey at Church Street, Beckingham
Sitename	Church Street, Beckingham
Activity type	Magnetometry Survey
Project Identifier(s)	Geophysical Survey: Church Street, Beckingham, Nottinghamshire, BKCS21
Planning Id	
Reason For Investigation	Planning: Pre application
Organisation Responsible for work	Archaeological Project Services
Project Dates	15-Sep-2021 - 15-Sep-2021
Location	Church Street, Beckingham NGR : SK 77820 90400 LL : 53.4046923235359, -0.830919500404043 12 Fig : 477820,390400
Administrative Areas	Country : England County : Nottinghamshire District : Bassetlaw Parish : Beckingham
Project Methodology	A magnetic gradiometer survey taking 4 readings every 1m, from traverses 1m apart.
Project Results	The site has few magnetic anomalies but is partially masked by the magnetic disturbance caused by clearance and by piles of felled trees, not allowing complete and continual data capture of the full area. The data has shown an indication of possible ridge and furrow activity within the survey area.
Keywords	
Funder	
HER	Nottinghamshire HER - unRev - STANDARD
Person Responsible for work	
HER Identifiers	
Archives	Digital Archive - to be deposited with Archaeology Data Service Archive;