

**T H A M E S      V A L L E Y**

**ARCHAEOLOGICAL**

**S E R V I C E S**

**Great Hartwell Farm, Hartwell Lane,  
Barlaston, Staffordshire**

**Geophysical Survey (Magnetic)**

**by Kyle Beaverstock**

**Site Code: GHB21/245**

**(SJ 9175 3899)**

**Great Hartwell Farm, Hartwell Lane,  
Barlaston, Staffordshire**

**Geophysical Survey (Magnetic) Report**

**For**

**Mr. Simon Bailey**

by Kyle Beaverstock

Thames Valley Archaeological Services Ltd

Site Code GHB 21/245

**January 2022**

## Summary

**Site name:** Great Hartwell Farm, Hartwell Lane, Barlaston, Staffordshire

**Grid reference:** SJ 9175 3899

**Site activity:** Magnetometer survey

**Date and duration of project:** 18<sup>th</sup> January 2022

**Project coordinator:** Tim Dawson

**Site supervisor:** Kyle Beaverstock

**Site code:** GHB21/245

**Summary of results:** The undeveloped areas within the moated site were successfully surveyed. However, few anomalies of archaeological interest were identified with much interference from metallic debris. The edge of an infilled section of the moat was recorded.

**Location of archive:** The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

*This report may be copied for bona fide research or planning purposes without the explicit permission of the copyright holder. All TVAS unpublished fieldwork reports are available on our website: [www.tvas.co.uk/reports/reports.asp](http://www.tvas.co.uk/reports/reports.asp).*

Report edited/checked by: Steve Ford ✓ 04.02.22 Tim Dawson ✓ 04.02.22
--------------------------------------------------------------------------

# Great Hartwell Farm, Hartwell Lane, Barlaston, Staffordshire A Geophysical Survey (Magnetic)

by Kyle Beaverstock

Report 21/245

## Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Hartwell Lane, Barlaston, Staffordshire (SJ 9175 3899) (Fig. 1). The work was commissioned by Mr. Simon Bailey of Great Hartwell Farm, Hartwell Lane, Barlaston, Staffordshire, ST15 8TL as advised by Ms Helen Martin-Bacon of Avalon Heritage. Planning permission is to be sought for the construction of a new garage on a scheduled monument, a well preserved Medieval moated site. This is in accordance with the *National Planning Policy Framework* (NPPF 2019), and the District's policies on archaeology. The fieldwork was undertaken by Kyle Beaverstock and the site code is GHB21/245.

The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

## Location, topography and geology

The site is located on the southern outskirts of Stoke-on-Trent, east of Barlaston and west of Meirheath on the south side of Hartwell Road. The survey area is bounded by a moat along its outer edge and farm buildings along its inner edge. The 'platform' area in the south is relatively flat while the area to the south and west with a slight slope in the small area to the north. The underlying geology is stated as Till above Keele Formation (BGS 1994).

## Site history and archaeological background

The archaeological background to the site has been presented in a heritage statement (AH2021). In summary the site composites a moated hunting lodge, farm or manor of medieval date. It was first documented in 1282AD held by the Chetwynds of Kibblestone with a chapel constructed in 1282AD. More detail is presented in c. 1370AD when it is recorded as containing a house (hall) kitchen, bakehouse, gatehouse with stable gatehouse a second gatehouse(?) and a building outside of the moat. This description suggests that the site is a high status manorial complex. It is not know if occupation of the site pre-dates the moat. The current buildings dating from the 18<sup>th</sup>/19<sup>th</sup> century are of more modest status in keeping with post-medieval use of the site as a farmstead typical of the period.

## **Methodology**

### Sample interval

Data collection involved the traversing of the survey area along straight and parallel lines using two cart-mounted Bartington Grad601-2 fluxgate gradiometers. Even coverage was achieved with the use of regularly spaced markers at the ends of traverses and the real-time positional trace plot. Readings were taken at 0.25m intervals along traverses 1m apart, providing an appropriate methodology balancing cost and time with resolution. Traverses were walked at an alternating zig-zag pattern along a south-west to north-east orientation across the survey area. There were no significant obstructions in the survey area, conditions were dry and bright.

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. Under normal operating conditions it can be expected to identify buried features >0.5m in diameter. Features which can be detected include disturbed soil, such as the fill of a ditch, structures that have been heated to high temperatures (magnetic thermoremnance) and objects made from ferro-magnetic materials. The strength of the magnetic field is measured in nano Tesla (nT), equivalent to  $10^{-9}$  Tesla, the SI unit of magnetic flux density.

### Equipment

The purpose of the survey was to identify geophysical anomalies that may be archaeological in origin in order to inform a targeted archaeological investigation of the site prior to development. The survey and report generally follow the recommendations and standards set out by both European Archaeological Council (EAC 2015) and the Chartered Institute *for* Archaeologists (2002, 2014).

Magnetometry was chosen as a survey method as it offers the most rapid ground coverage and responds to a wide range of anomalies caused by past human activity. These properties make it ideal for the fast yet detailed surveying of an area.

The detailed magnetometry survey was carried out using two dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometers mounted upon a Bartington non-magnetic cart. A two-wheeled lightweight structure pushed by hand, the cart consisted a bank of four vertically-mounted Bartington Grad601-2 magnetic sensor tubes at 1m apart and a Trimble Geo 7x centimetre edition GPS. Readings were collected by two Bartington Grad601-2 loggers and collated using MLgrad601 software on a Linx 12x64 tablet running Windows 10 mounted at the rear of the cart. This enables readings to be taken of both the general background magnetic field

and any localised anomalies with the difference being plotted as either positive or negative buried features. All sensors are calibrated to cancel out the local magnetic field and react only to anomalies above or below this base line. On this basis, strong magnetic anomalies such as burnt features (kilns and hearths) will give a high response as will buried ferrous objects. More subtle anomalies such as pits and ditches can be seen from their infilling soils containing higher proportions of humic material, rich in ferrous oxides, compared to the undisturbed subsoil. This will stand out in relation to the background magnetic readings and appear in plan following the course of a linear feature or within a discrete area.

The Trimble Geo7x centimetre edition GPS system with centimetre real-time accuracy was used to tie the cart traverses into the Ordnance Survey national grid. This unit offers both real-time correction and post-survey processing; enabling a high level of accuracy to be obtained both in the field and in the final post-processed data.

Data gathered in the field was processed using the TerraSurveyor software package. This allows the survey data to be collated and manipulated to enhance the visibility of anomalies, particularly those likely to be of archaeological origin. The table below lists the processes applied to this survey, full survey and data information is recorded in Appendix 1.

<b>Process</b>	<b>Effect</b>
Clip from -8.80 to 8.84 nT	Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.
De-stripe: median, all sensors	Removes the striping effect caused by differences in sensor calibration, enhancing the visibility of potential archaeological anomalies.
De-spike: threshold 1, window size 3×3	Compresses outlying magnetic points caused by interference of metal objects within the survey area.
De-stagger: all grids, both by -1 intervals	Cancels out effects of site's topography on irregularities in the traverse speed.

The raw data plot is presented as a greyscale plot shown in relation to the site (Fig. 2) with the processed data then presented as a second figure (Fig. 3), followed by a third plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 4). Anomalies are shown as colour-coded lines, points and polygons.

The greyscale plot of the processed data is exported from TerraSurveyor in a georeferenced portable network graphics (.PNG) format, a raster image format chosen for its lossless data compression and support for transparent pixels, enabling it to easily be overlaid onto an existing site plan. The data plot is combined with grid and site plans in QGIS 2.18.15 and exported again in .PNG format in order to present them in figure templates in Adobe InDesign CS5.5, creating .INDD file formats. Once the figures are finalised they are exported in .PDF format for inclusion within the finished report.

## **Results**

A few anomalies were detected by the geophysical survey, however there was significant interference from surrounding structures including corrugated iron buildings, fencing and buried services. These account for the majority of the anomalous readings. A small section of the moated ditch was also surveyed and shows a positive linear anomaly in this area.

## **Conclusion**

There was significant interference from ferrous structures and objects in the topsoil which may be masking features of archaeological origin. The only feature identified with any confidence was the edge of the in-filled moated ditch in the north could be discerned with this probably due to the backfill containing ferrous debris causing a high amplitude sporadic signal. In the south, manholes for buried services were seen and account for some of the magnetic spikes in this area. Although there are some positive and negative signals elsewhere, these do not conform to a clear pattern interpretable as of archaeological origin..

## **References**

- AH 2021, Heritage Statement for a Scheduled Monument, Great Hartwell Farm, Hartwell Lane, Avalon Heritage, report AH613/14/08/21V1, Dilhorne
- BGS, 1994, *British Geological Survey*, 1:50,000, Sheet 123, Solid and Drift Edition, Keyworth
- CI/A, 2014, 'Standard and Guidance for archaeological geophysical survey', Reading
- EAC, 2015, *EAC Guidelines for the use of Geophysics in Archaeology: Questions to Ask and Points to Consider*, EAC Guidelines 2, Namur
- IFA, 2002, 'The Use of Geophysical Techniques in Archaeological Evaluation', IFA Paper No. 6, Reading
- NPPF, 2019, *National Planning Policy Framework (revised)*, Ministry for Housing, Communities and Local Government, London

## Appendix 1. Survey and data information

### Programme:

Name: TerraSurveyor  
Version: 3.0.37.29

### Raw data

Instrument Type: MLgrad Import  
Units:  
UTM Zone: 30  
Survey corner coordinates (X/Y):  
Northwest corner: 391730.574584238, 339038.756759648 m  
Southeast corner: 391785.954584238, 338963.616759648 m  
Direction of 1st Traverse: 90 deg  
Collection Method: Parallel  
Sensors: 1  
Dummy Value: 32702

### Dimensions

Survey Size (meters): 55.4 m x 75.1 m  
X&Y Interval: 0.13 m  
Source GPS Points: Active: 5871, Recorded: 5871

### Stats

Max: 96.50  
Min: -99.90  
Std Dev: 28.17  
Mean: -1.16  
Median: -0.98  
Composite Area: 0.41613 ha  
Surveyed Area: 0.15127 ha

### Processed data

Stats  
Max: 8.00  
Min: -8.00  
Std Dev: 4.58  
Mean: -0.10  
Median: -0.03

### GPS based Proce8

- 1 Base Layer.
- 2 Unit Conversion Layer (Lat/Long to UTM).
- 3 DeStripe Median Traverse:
- 4 Clip from -8.00 to 8.00
- 5 DeStagger by: 50.00cm, Shift Positions
- 6 DeStagger by: 50.00cm, Shift Positions
- 7 DeStagger by: 20.00cm, Shift Positions
- 8 DeStagger by: 20.00cm, Shift Positions

### Programme:

Name: TerraSurveyor  
Version: 3.0.37.29

### Raw data

Instrument Type: MLgrad Import  
Units:  
UTM Zone: 30  
Survey corner coordinates (X/Y):  
Northwest corner: 391730.574584238, 339038.756759648 m  
Southeast corner: 391785.954584238, 338963.616759648 m  
Direction of 1st Traverse: 90 deg  
Collection Method: Parallel  
Sensors: 1  
Dummy Value: 32702

### Dimensions

Survey Size (meters): 55.4 m x 75.1 m  
X&Y Interval: 0.13 m  
Source GPS Points: Active: 5871, Recorded: 5871

### Stats

Max: 96.50  
Min: -99.90  
Std Dev: 28.17  
Mean: -1.16  
Median: -0.98  
Composite Area: 0.41613 ha  
Surveyed Area: 0.15127 ha

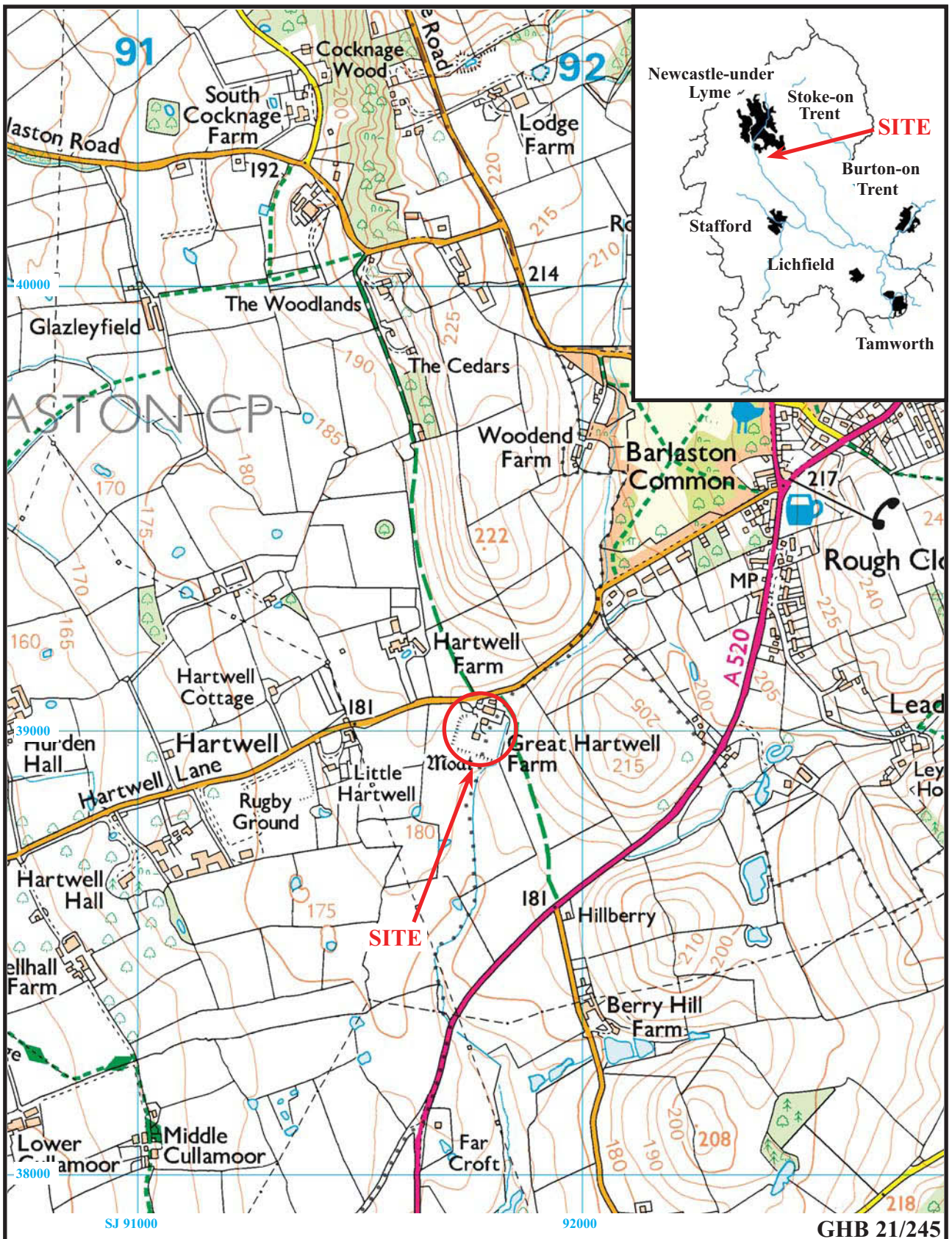
### Processed data

Stats  
Max: 8.00  
Min: -8.00  
Std Dev: 4.58  
Mean: -0.10  
Median: -0.03

### GPS based Proce8

- 1 Base Layer.
- 2 Unit Conversion Layer (Lat/Long to UTM).
- 3 DeStripe Median Traverse:
- 4 Clip from -8.00 to 8.00
- 5 DeStagger by: 50.00cm, Shift Positions
- 6 DeStagger by: 50.00cm, Shift Positions
- 7 DeStagger by: 20.00cm, Shift Positions
- 8 DeStagger by: 20.00cm, Shift Positions





**Great Hartwell Farm, Hartwell Lane,  
Barlastone, Staffordshire, 2022  
Geophysical Survey (Magnetic)**

Figure 1. Location of site within Hartwell and Staffordshire.

Reproduced under licence from Ordnance Survey Explorer Digital mapping at 1:12500  
Crown Copyright reserved





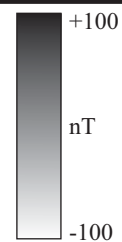
SJ 91700

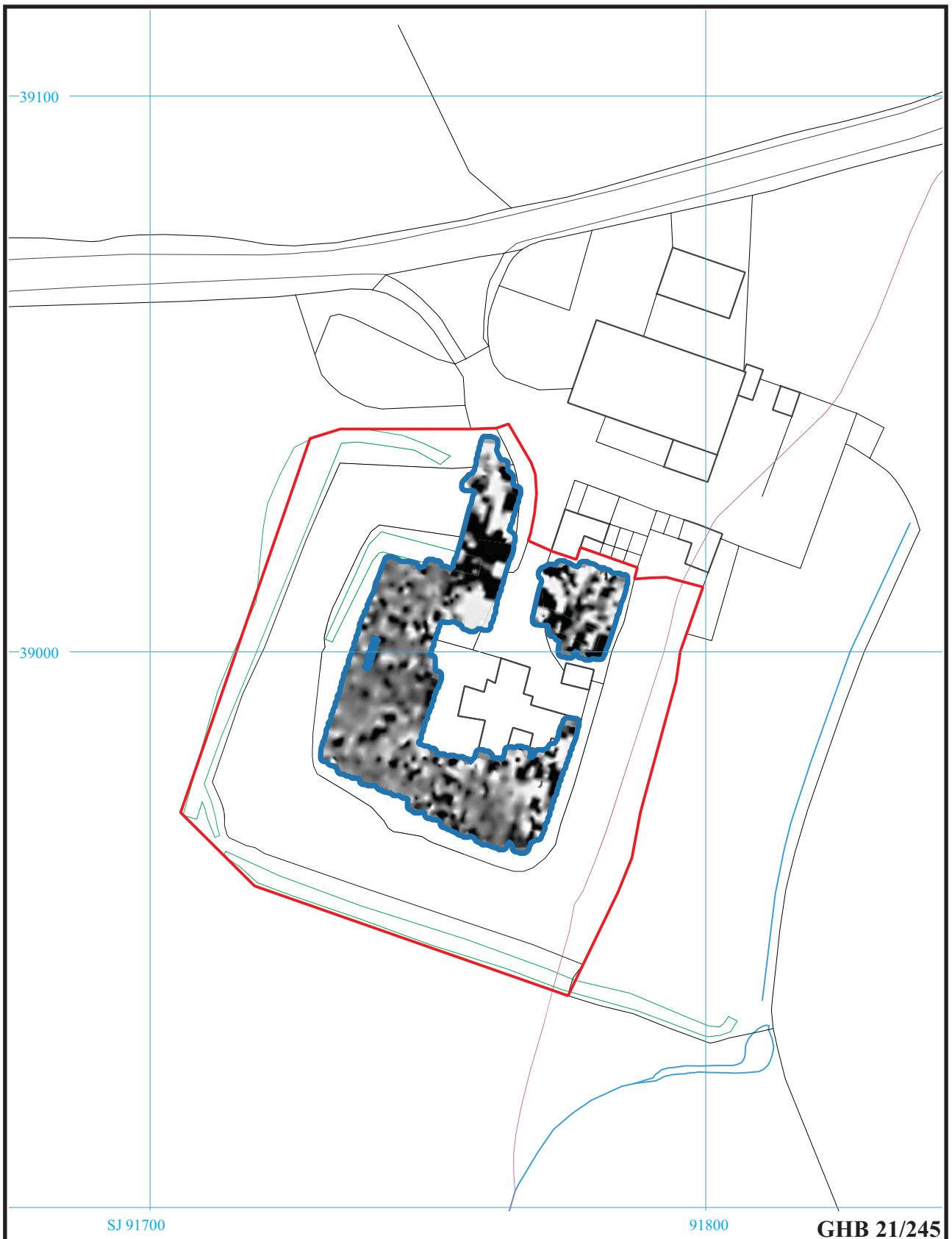
91800

GHB 21/245



**Great Hartwell Farm, Hartwell Lane,  
Barlastone, Staffordshire, 2022  
Geophysical Survey (Magnetic)**  
Figure 2. Plot of raw gradiometer data.

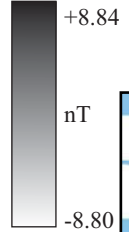




GHB 21/245



**Great Hartwell Farm, Hartwell Lane,  
Barlastone, Staffordshire, 2022  
Geophysical Survey (Magnetic)**  
Figure 3. Plot of processed gradiometer data.





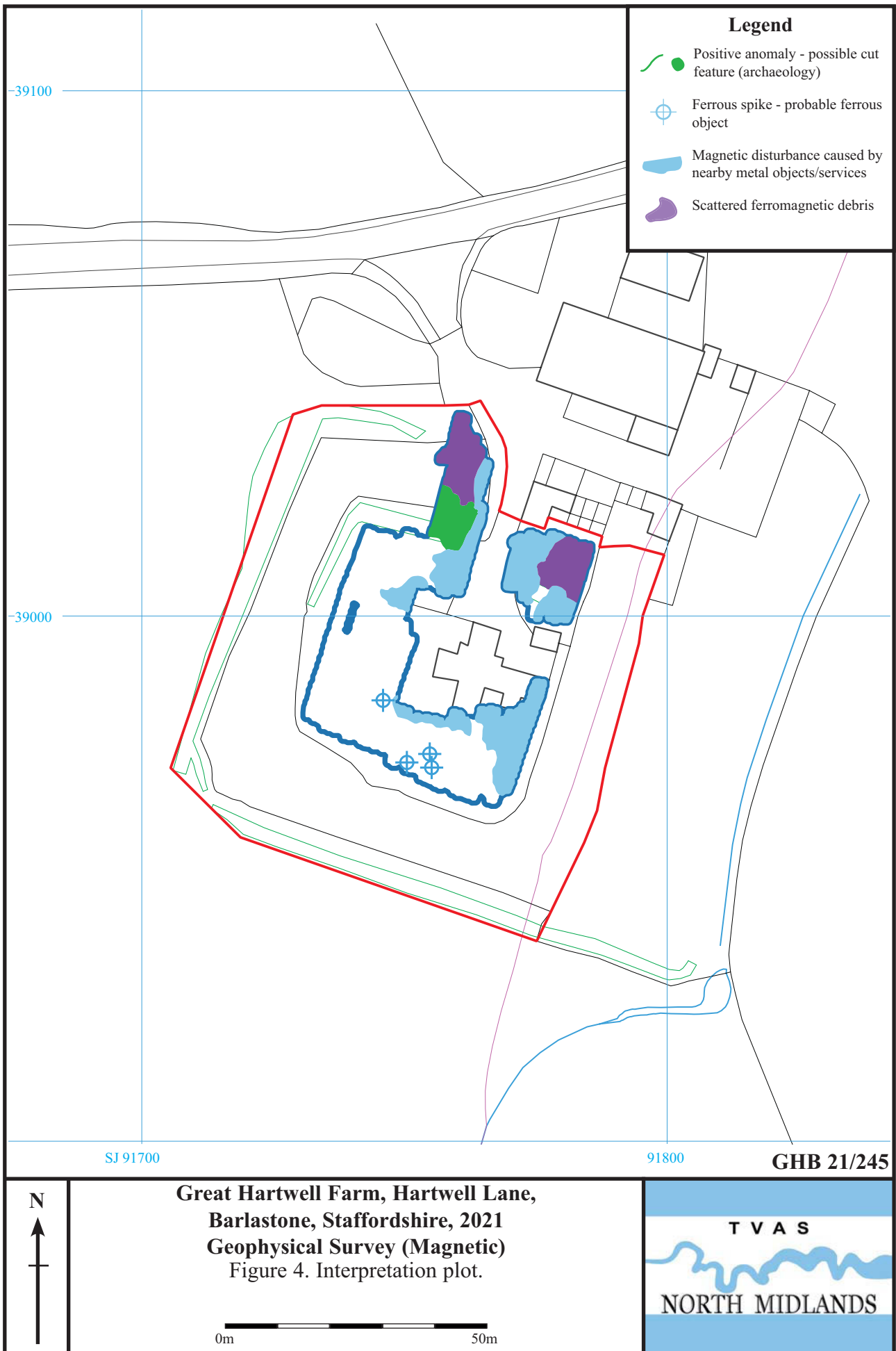




Plate 1. North-eastern area looking south-east.



Plate 2. Moated ditch looking west.



Plate 3. Man hole covers in southern part of survey area.



Plate 4. Southern part of survey area looking east.

GHB 21/245

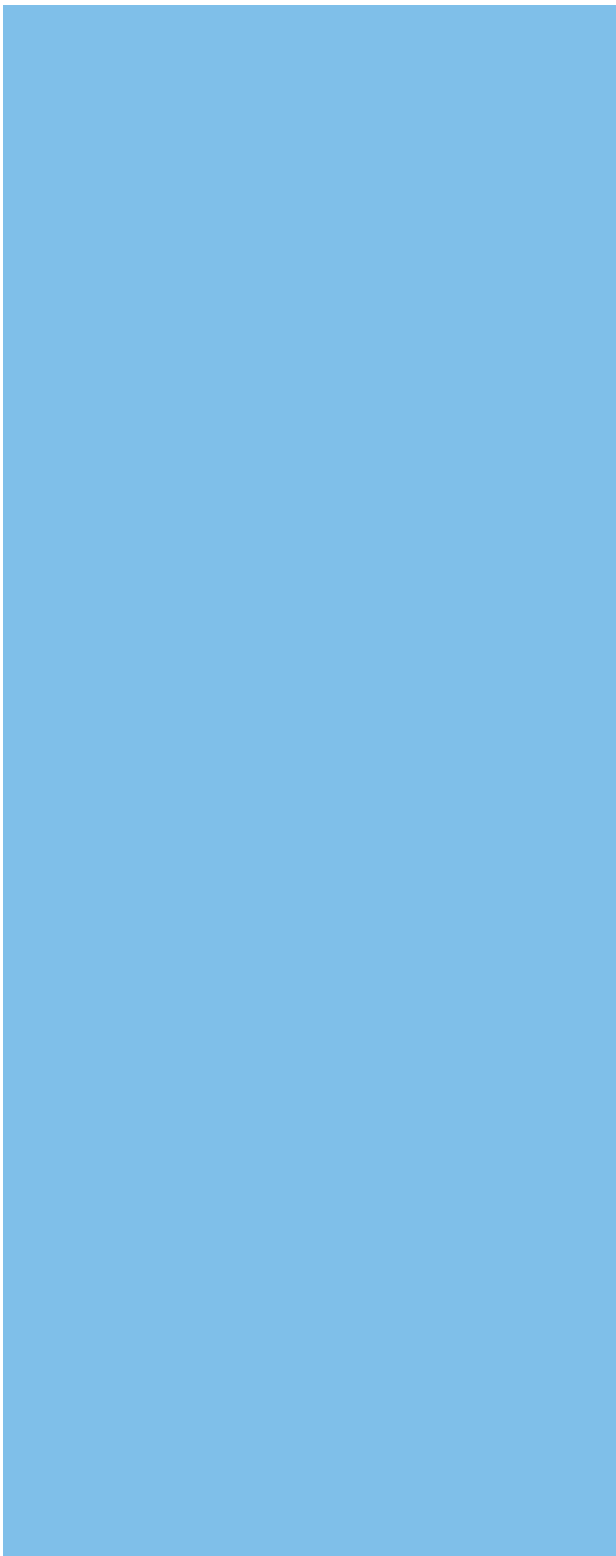
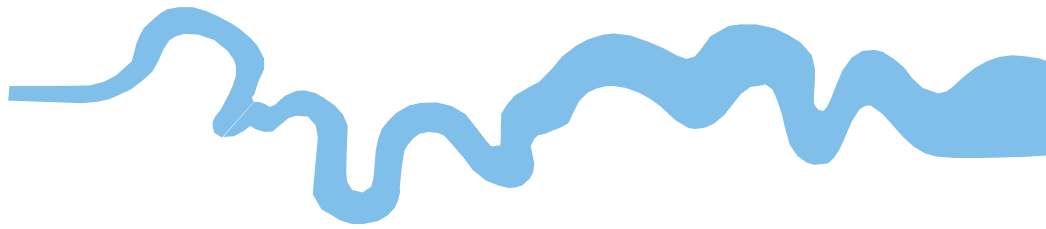
**Great Hartwell Farm, Hartwell Lane,  
Barlastone, Staffordshire, 2021  
Geophysical Survey (magnetic)  
Plates 1 to 4.**

**T V A S**  
  
**NORTH MIDLANDS**

## TIME CHART

	Calendar Years
Modern _____	AD 1901
Victorian _____	AD 1837
Post Medieval _____	AD 1500
Medieval _____	AD 1066
Saxon _____	AD 410
Roman _____	AD 43 AD 0 BC
Iron Age _____	750 BC
Bronze Age: Late _____	1300 BC
Bronze Age: Middle _____	1700 BC
Bronze Age: Early _____	2100 BC
Neolithic: Late .....	3300 BC
Neolithic: Early .....	4300 BC
Mesolithic: Late .....	6000 BC
Mesolithic: Early .....	10000 BC
Palaeolithic: Upper .....	30000 BC
Palaeolithic: Middle .....	70000 BC
Palaeolithic: Lower .....	2,000,000 BC





**Thames Valley Archaeological Services Ltd,  
47-49 De Beauvoir Road,  
Reading RG1 5NR**

**Tel: 0118 9260552  
Email: [tvas@tvas.co.uk](mailto:tvas@tvas.co.uk)  
Web: [www.tvas.co.uk](http://www.tvas.co.uk)**

***Offices in:  
Brighton, Taunton, Stoke-on-Trent and Ennis (Ireland)***