Historic England

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Mount Grace Priory, East Harlsey, North Yorkshire

Report on Geophysical Surveys, November 2023

Megan Clements and Andrew Payne

Geophysics

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Summary

Magnetometer (0.36ha) and earth resistance (0.4ha) surveys were conducted at Mount Grace Priory, Northallerton, North Yorkshire, at the request of the English Heritage Trust in anticipation of a planning application for a car park extension and to investigate the possible location of the medieval manor of Bordelbi. The surveys have predominantly found evidence of former agricultural activity in the form of ridge and furrow cultivation. Additional anomalies suggestive of a buried service, possible burning or industrial activity and anomalies likely relating to the construction of the current car park have also been identified.

Contributors

The field work was completed by Megan Clements and Andrew Payne with help from Sally Evans (Aerial Survey Manager), Jackie-Ann Judge and Chloe Pearson-Jones (Historic England Archaeological Technician Apprentices).

Acknowledgements

The authors are grateful for the help provided on site by colleagues from the English Heritage Trust. The cover image shows the church of Mount Grace (photo taken by Andrew Payne).

Archive location

Historic England, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth, PO4 9LD.

Date of survey

The earth resistance survey was conducted on the 31st October and the magnetometer survey on the 2nd November 2023. The report was completed on the 20th of November 2023.

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Introduction

Magnetometer and earth resistance surveys were conducted at Mount Grace Priory, Northallerton, North Yorkshire, at the request of the English Heritage Trust in anticipation of a planning application for a car park extension and to investigate the possible location of the medieval manor of Bordelbi. The surveys were intended to provide more information on the area impacted by the car park plans by attempting to identify any surviving structures or features of archaeological significance and improve understanding of the wider landscape context of the Priory. The work was agreed under the Shared Services Agreement and addresses Historic England corporate plan activity “5.2 Work with English Heritage Trust to support the National Collection”.

Mount Grace Priory (National Heritage List for England 1013019) is England's best preserved Carthusian monastery. It is comprised of an area that contains the standing remains of the charterhouse, a fish pond, three well-houses, a moat and the remains of the Priory mill. The Priory was founded in 1398 by the Duke of Surrey on the site of the medieval manor of Bordelbi, and re-founded in 1415 by the Earl of Dorset. During the Reformation the Priory was closed and over the coming centuries changed hands until it was bought by Sir Lowthian Bell in the late 19th century. Sir Lowthian worked to restore the main house, although it later fell into disrepair. Mount Grace Priory came into the Guardianship of the State in 1955, and once no longer occupied by tenants, restoration work began in 1987 and was completed in 2010. Excavations over the last century have produced a range of information on the Carthusian Priory. English Heritage commissioned a geophysical survey from Stratascan in 2011 of three areas within the Priory (Smalley 2011). The geophysical surveys identified anomalies likely related to structural remains within the investigated areas (Coppack and Douglas 2017).

The bedrock geology consists of Redcar Mudstone Formation with Vale of York superficial deposits of clay, sand and gravel (Geological Survey of Great Britain 1998; British Geological Society 2023). The soils are of the STOW association (421a) and are slowly permeable, seasonally wet, slightly acidic but base-rich, loamy and clayey (Soil Survey of England and Wales 1983; Soilscapes 2023).

The field was in use as a pasture field with sheep and had a slight incline to the west. The weather on both days had intermittent spells of light and heavier rain.

Method

Magnetometer Survey

Measurements were recorded over a series of 30m grids (Figure 1), established with a Trimble R8s GNSS, using Bartington Grad 601 dual fluxgate gradiometers. Readings were taken at 0.25 m intervals along parallel traverses separated by 1.0 m. Post-acquisition, the median value of each traverse was subtracted from all measurements on that traverse (Zero Median Traverse) to correct for heading errors and instrument drift. A linear greyscale image of the magnetometer data is presented in Figure 2 superimposed on the OS base mapping. Figure 4 shows a trace plot and linear greyscale image of the minimally processed data.

Earth Resistance Survey

Measurements were recorded over a series of 30m grids (Figure 1), established with a Trimble R8s GNSS, using a Geoscan RM85 earth resistance meter, internal multiplexer, and a PA5 electrode frame in the Twin-Electrode configuration, to allow two separate surveys with electrode separations of 0.5m and 1.0m, to be collected simultaneously. The 0.5m electrode separation coverage was designed to detect near-surface anomalies in the upper 0.5m of the subsurface whilst the 1.0m separation survey allowed anomalies to a depth of about 1-1.25m to be detected. For the 0.5m electrode separation survey readings were taken at a density of 0.5m x 1.0m whilst the 1.0m separation survey were taken at a density of 1.0m x 1.0m.

Extreme values caused by high contact resistance were suppressed using an adaptive thresholding median filter with radius 1m (Scollar *et al.* 1990). The results for the near-surface 0.5m electrode separation survey are depicted as a linear greyscale image in Figure 3 superimposed on the base OS mapping data. Figure 5 shows the processed data from both the 0.5m and 1.0m electrode separation data, presented as trace plots, and linear and equal area greyscale images of the datasets following the application of extreme value noise reduction and a Gaussian low pass filter with a radius of 0.6m and 1.0m for the 0.5m and 1.0m electrode separation surveys respectively.

Results

Magnetometer Survey

A graphical summary of significant magnetic anomalies [**m1**-**m4**] discussed in the following text superimposed on the base OS mapping data is provided in Figure 6.

The magnetometer survey has detected slight positive anomalies [**m1**] in the east of the surveyed area that are indicative of ploughed-out ridge and furrow. In the southwest corner is a large linear ferrous anomaly [**m2**] that correlates with the earth resistance anomaly [**r2**]. This anomaly is likely to be a response to a buried service pipe. Within close proximity to [**m2**] is a strong positive anomaly [**m3**]. The magnetic enhancement of [**m3**] suggests an origin related to either burning or industrial activity. Across the north of the surveyed area is a band of ferrous noise [**m4**] produced due to the wire fence field boundary with the current car park. Several discrete anomalies of positive and negative magnetic signals have also been identified. Those with a positive enhancement are likely to be pits or fired material, while those with a negative signal possibly due to animal ground disturbance. Anomalies indicative of near surface ferrous objects have also been detected across the area.

Earth Resistance Survey

A graphical summary of significant earth resistance anomalies [**r1**-**r6**] discussed in the following text superimposed on the base OS mapping data is provided in Figure 7.

In the earth resistance survey, the ridge and furrow is more clearly resolved. The anomalies appear as a series of broad, parallel, linear high resistance anomalies orientated in a north-south direction [**r1**]. A low resistance anomaly has also been identified in the southwest corner [**r2**]. The response of [**r2**] suggests a ditch, possibly the trench for the buried service [**m2**]. Additional faint low resistance linear anomalies have been detected in the northeast corner of the surveyed area [**r3**]. Along the edge of the northern field boundary are a series of high resistance anomalies [**r4**] which are likely related to the current car park. The adjacent low resistance anomalies [**r5**] and a deeper lying high resistance anomalies [**r6**] detected most clearly in the 1m separation dataset are probably geological in origin.

Conclusions

The magnetometer and earth resistance surveys have predominantly detected past agricultural activity in the form of ploughed-out ridge and furrow. Additionally, a buried service has been identified adjacent to a localised area of potential burning or industrial activity, although this may relate to disturbance caused by excavation of the pipe trench. Anomalies likely to be associated with the construction of the current car park have also been highlighted. No confident evidence of the medieval manor of Bordelbi has been identified.

List of Enclosed Figures

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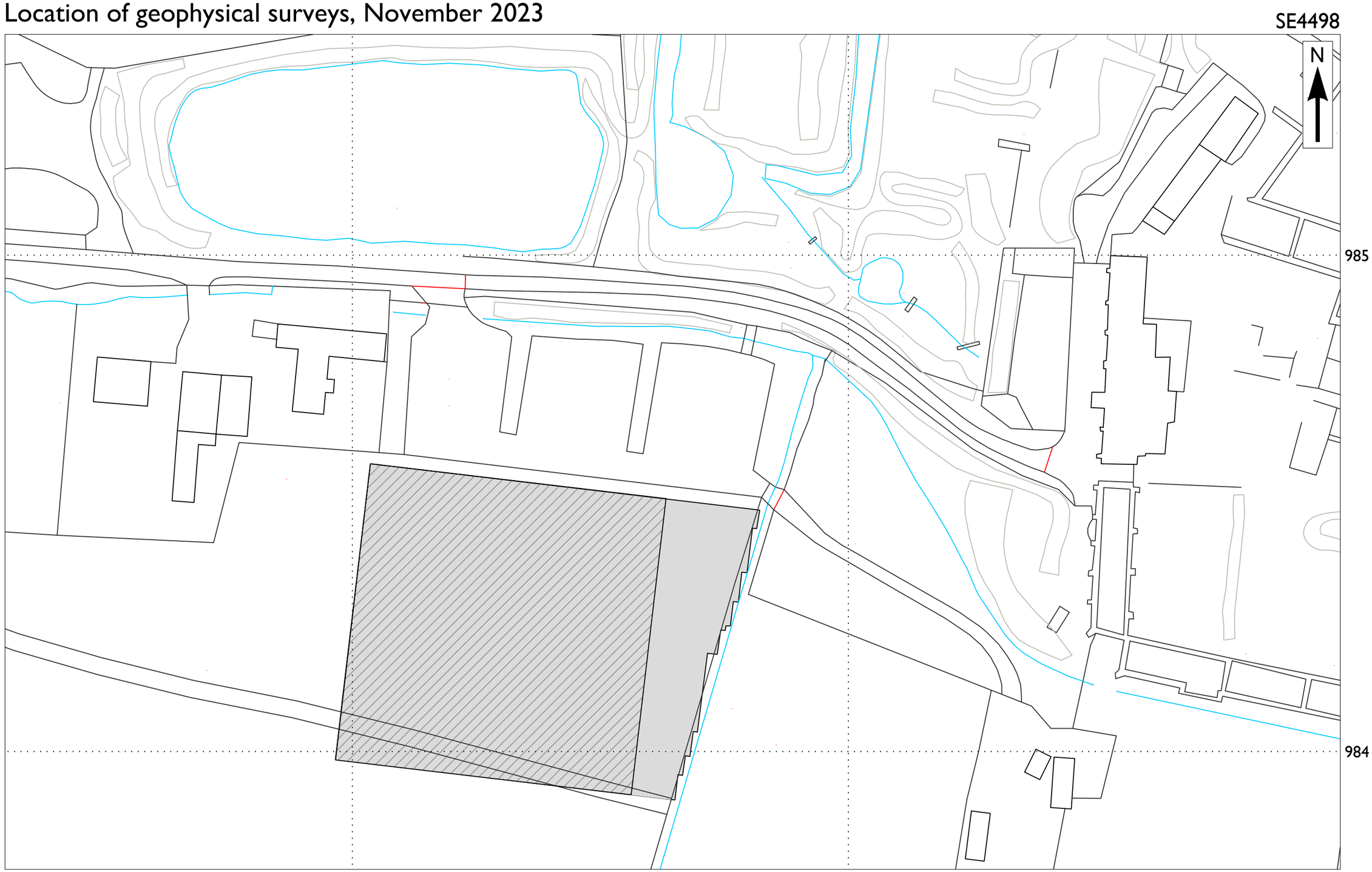
Figure 1

MOUNT GRACE PRIORY, EAST HARLSEY, NORTH YORKSHIRE

Location of geophysical surveys, November 2023



0 60m

1:750

Earth resistance survey

Magnetometer survey

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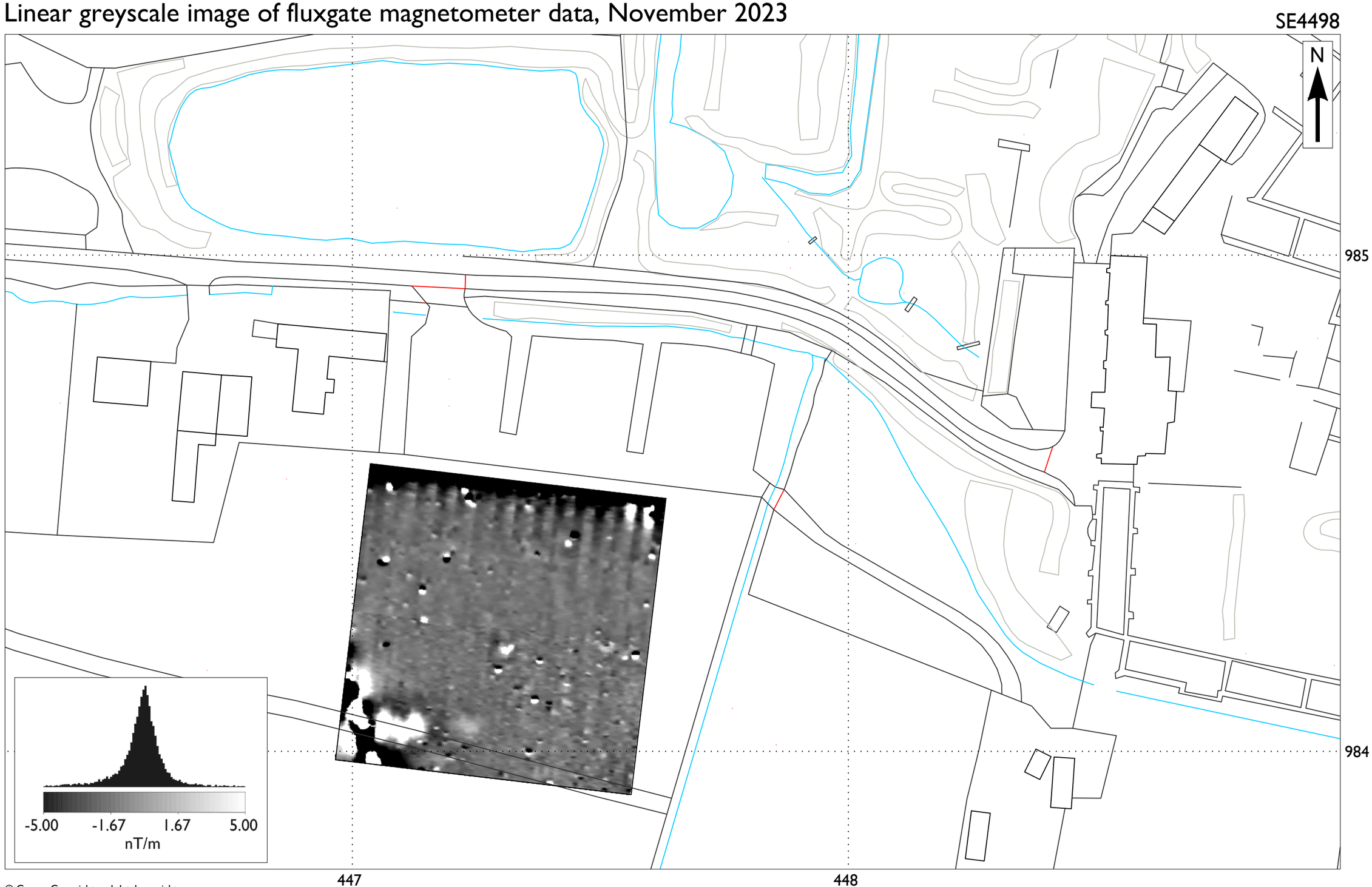
Figure 2

MOUNT GRACE PRIORY, EAST HARLSEY, NORTH YORKSHIRE

Linear greyscale image of fluxgate magnetometer data, November 2023



0 60m

1:750

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Figure 3

MOUNT GRACE PRIORY, EAST HARLSEY, NORTH YORKSHIRE

Linear greyscale image of 0.5m mobile probe of earth resistance data, November 2023

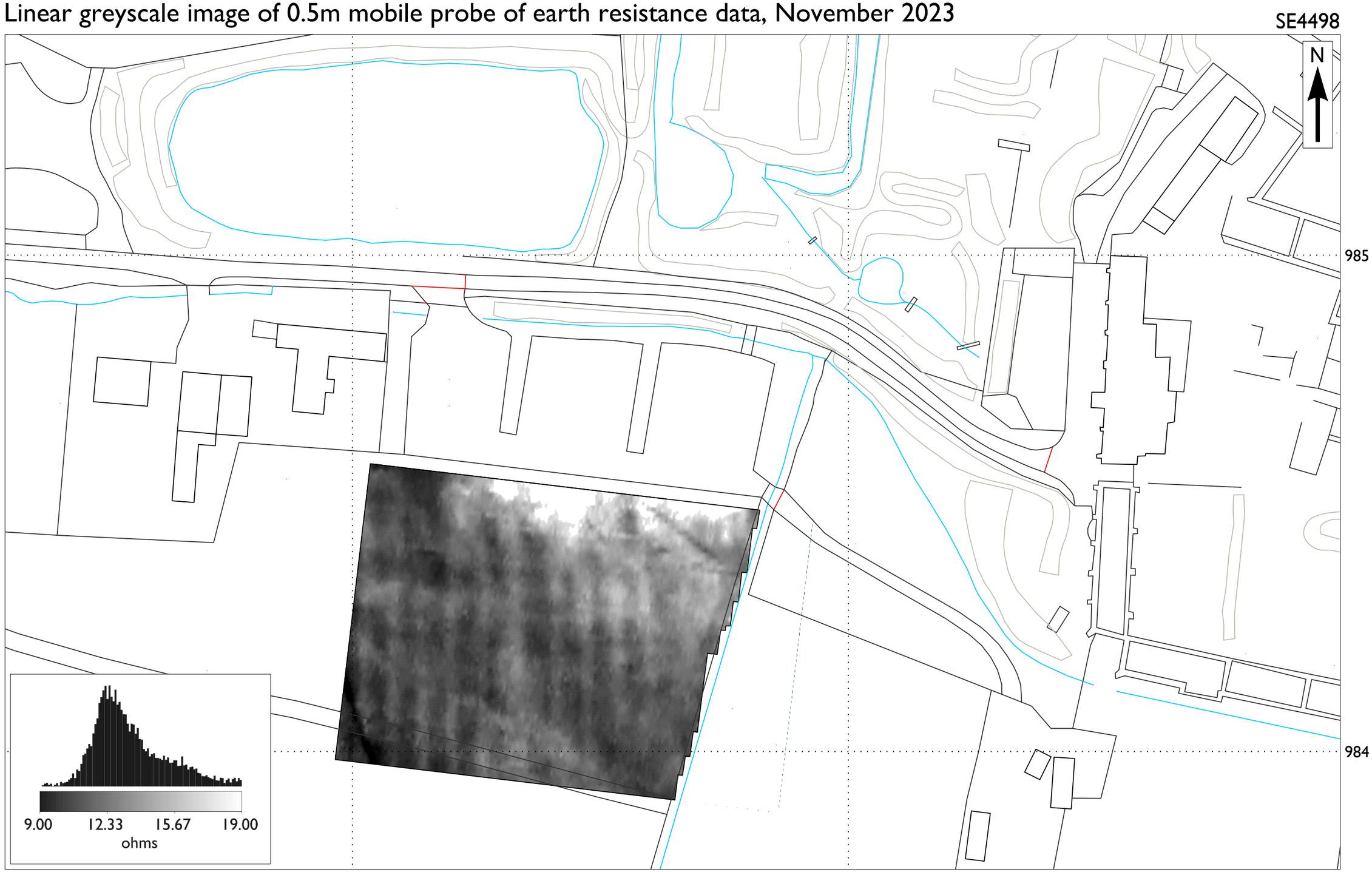

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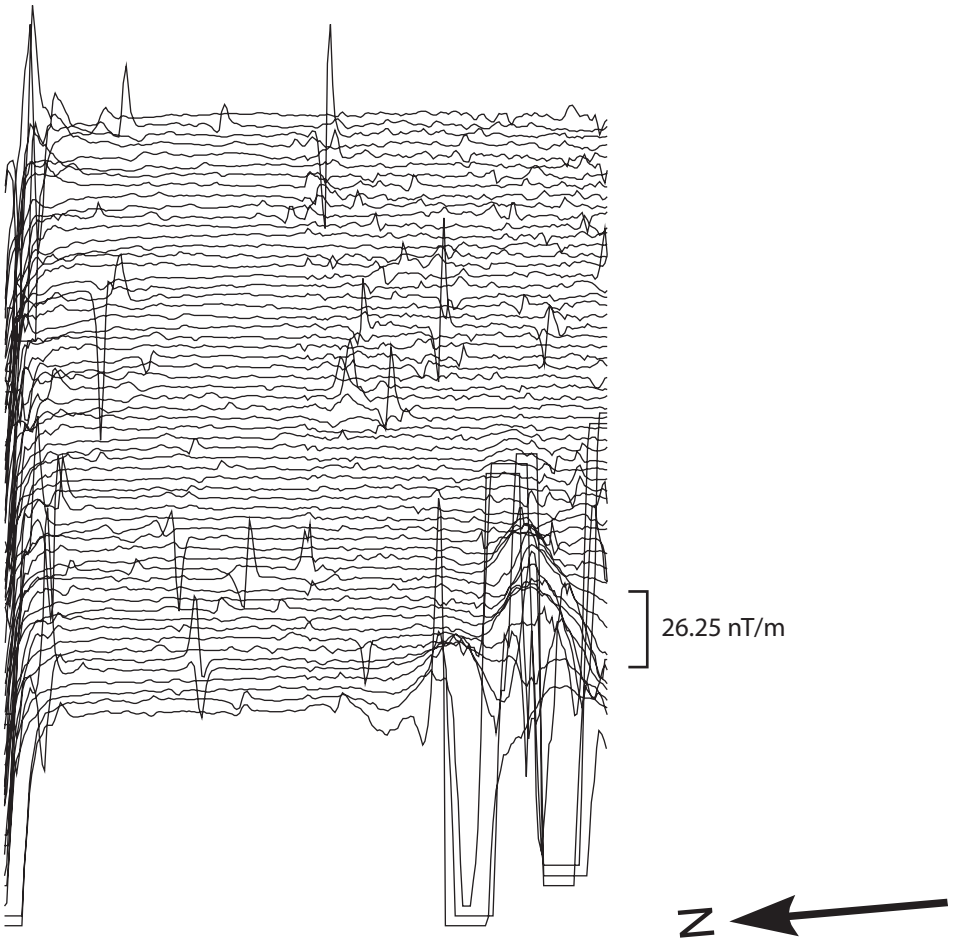
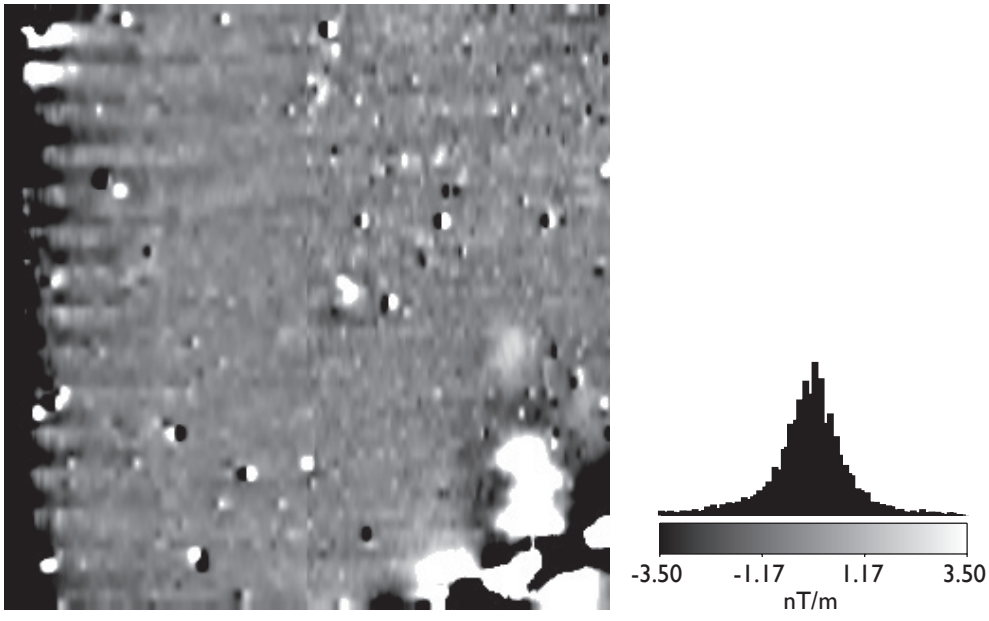
Figure 4

MOUNT GRACE PRIORY, EAST HARLSEY, NORTH YORKSHIRE
Fluxgate magnetometer survey, November 2023

(A) Trace plot of +/-75 nT/m range truncated minimally processed data



(B) Linear greyscale image of minimally processed data



0 60m

1:750

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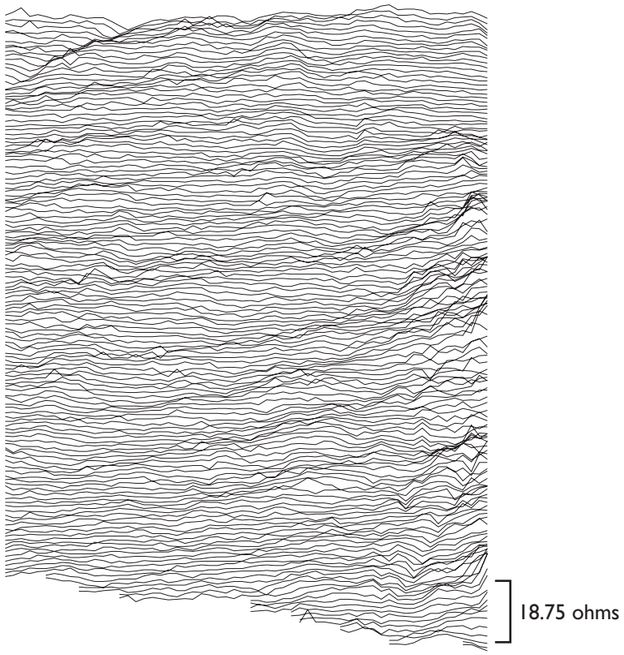
Figure 5

MOUNT GRACE PRIORY, EAST HARLSEY, NORTH YORKSHIRE
Earth resistance survey, November 2023

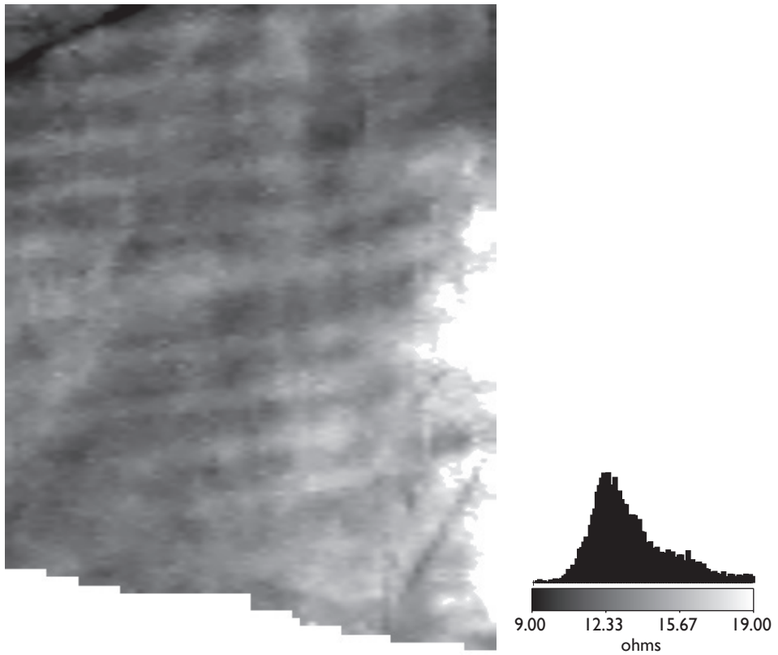
N

0.5m mobile electrode separation data

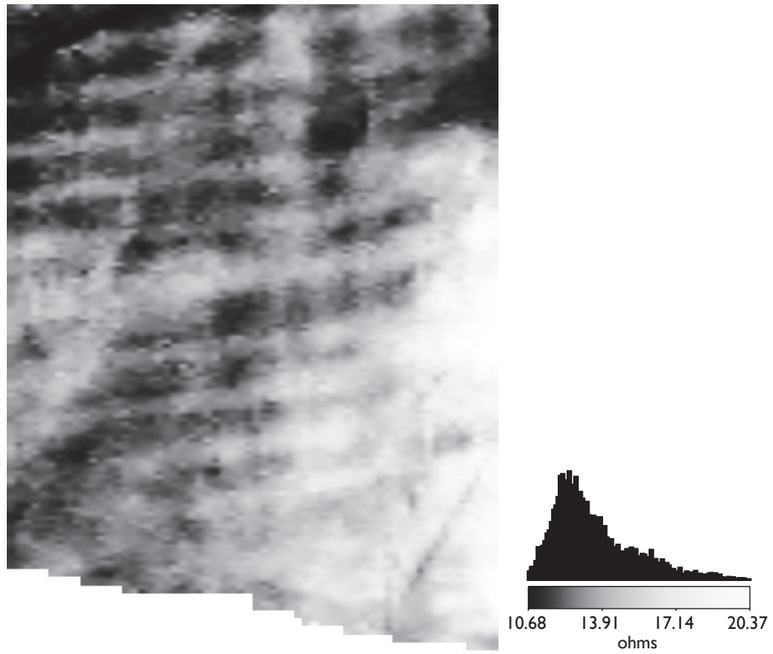
(A) Trace plot of minimally processed data



(B) Linear greyscale image of data after noise removal

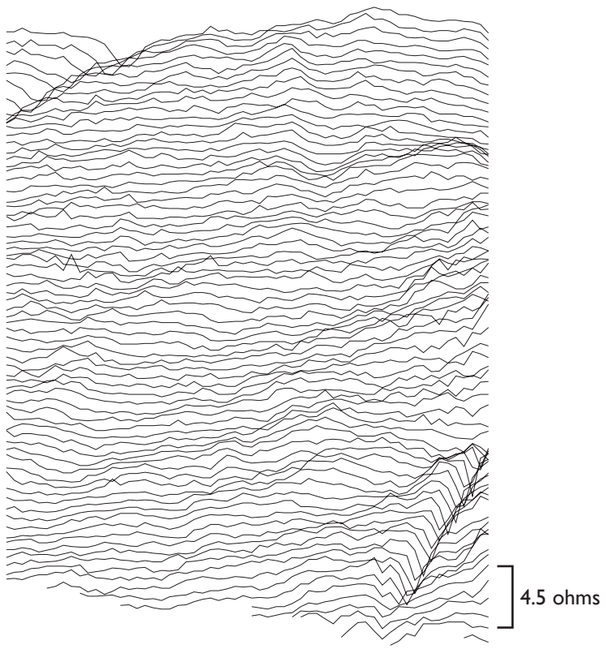


(C) Equal area greyscale image of data after noise removal

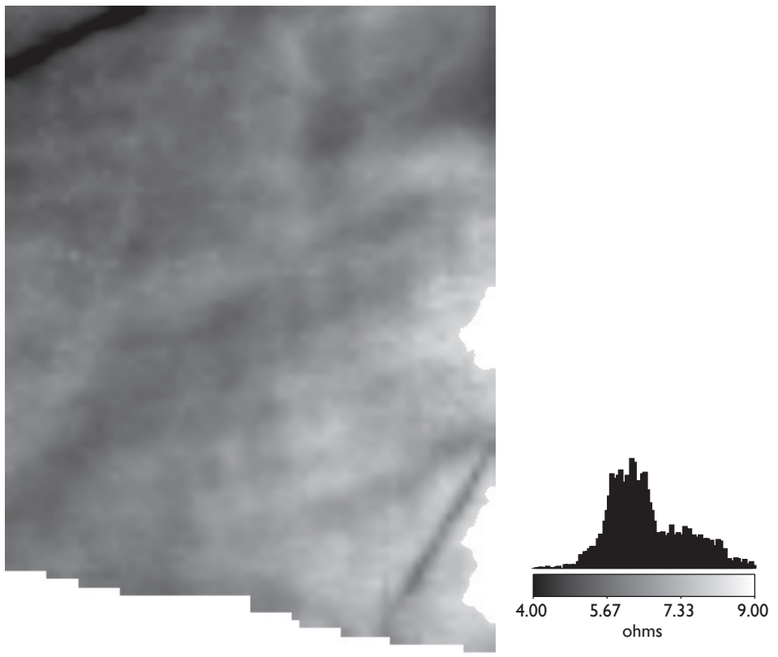


1.0m mobile electrode separation data

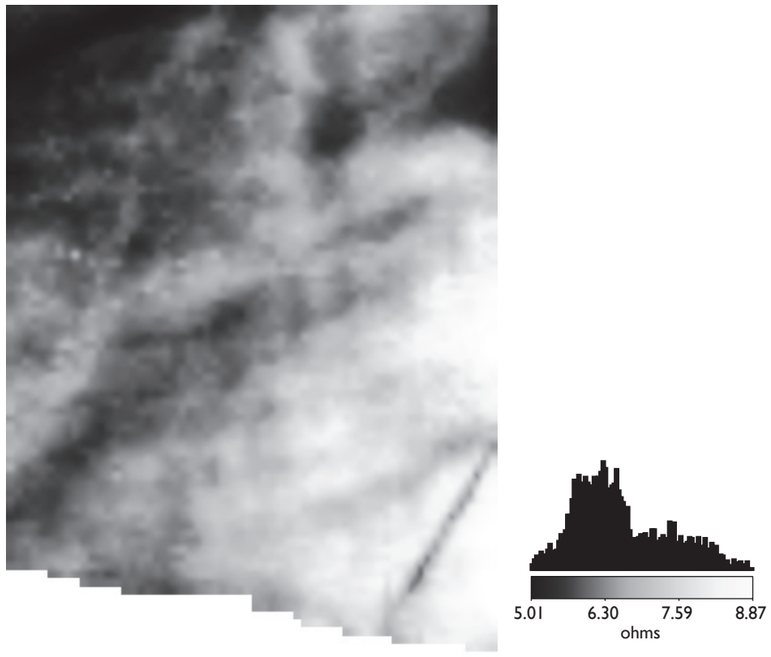
(D) Trace plot of minimally processed data



(E) Linear greyscale image of data after noise removal



(F) Equal area greyscale image of data after noise removal



0 60m

1:750

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Figure 6

MOUNT GRACE PRIORY, EAST HARLSEY, NORTH YORKSHIRE

Graphical summary of significant magnetic anomalies, November 2023

SE4498

N

985

m4

m1

m3

m2

984

447

448

0 60m

1:750

positive magnetic

negative magnetic

strong positive magnetic

raised magnetic

magnetic noise

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Figure 7

MOUNT GRACE PRIORY, EAST HARLSEY, NORTH YORKSHIRE

Graphical summary of significant earth resistance anomalies, November 2023

SE4498

N

985

984

447

448

r6 r4 r4 r5 r5 r3 r6 r6 r6 r6 r1 r2

0 60m

1:750

very high resistance high resistance low resistance

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