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SHELFORD MANOR, SHELFORD, NOTTINGHAMSHIRE
REPORT ON GEOPHYSICAL SURVEY, NOVEMBER 2007

Neil Linford and Louise Martin

ARCHAEOLOGICAL SCIENCE

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SUMMARY

A geophysical survey was carried out over the scheduled site (SAM No. NT139) to the south of the former Augustinian Priory at Shelford Manor, Shelford, Nottinghamshire, which contains a wealth of crop mark activity identified from the aerial photographic (AP) record. An area of 8.5ha was covered by a caesium magnetometer survey and successfully identified a wide range of anomalies to complement and extend the existing AP evidence. The site would appear to represent a palimpsest of prehistoric and Romano-British enclosures, with the later phase of activity being more fully represented in the geophysical data. This survey was undertaken as part of a collaborative research project to compare different geophysical methods for archaeological and mineral resource evaluation funded through the Aggregate Levy Sustainability Fund.

CONTRIBUTORS

The field work was conducted by Neil Linford, Louise Martin and Andy Payne.

ACKNOWLEDGEMENTS

English Heritage would like to thank Mr Chatterton of Shelford Manor Farm for allowing access to the site and to Mike Raines of the British Geological Survey who provided very welcome assistance in the field.

The cover photograph shows the English Heritage caesium magnetometer array at the Shelford site.

ARCHIVE LOCATION

Fort Cumberland.

DATE OF FIELDWORK AND REPORT

The fieldwork was conducted between the 29th October 2007 and 2nd November 2007 and the report was completed on 16th May 2008.

CONTACT DETAILS

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INTRODUCTION

The complex system of enclosures and pit alignments to the SW of the medieval settlement at Shelford Manor (SAM No. NT139) was first identified through a series of aerial photographs (English Heritage 1994). Whilst some of the activity may be related to the manorial complex the site has been interpreted as a series of Iron Age enclosures, together with elements of a Roman agricultural landscape and a possible trackway running parallel to a linear pit alignment found to the S of the site. The pit alignment is of uncertain date, although a prehistoric origin has been suggested.

The aim of the current survey, conducted with an array of caesium vapour total field magnetometers, was to provide comparative data to assist an ongoing programme of research into the use of a vehicle towed multi-instrument system developed by Leicester University (Hill *et al.* 2004). It is hoped that this research, funded by the Aggregates Levy Sustainability Fund (ALSF) will provide extensive geophysical data sets that may be used for the large scale evaluation of sand and gravel sites (*PN5366 A Whole-site First-assessment Toolkit for combined Mineral Resource and Archaeological assessment in Sand and Gravel Deposits*).

Shelford Manor was chosen as a suitable study area due to the known archaeological potential, indicated by the aerial photographs, and the ongoing research interest shown by the British Geological Survey (BGS) into the geological aspects of the site, including the assessment of potential aggregate deposits. The initial geophysical survey of the site was conducted in September 2007 by Leicester University, using an array of 6 Geometrics G858 total field caesium sensors together with a single Geonics EM38 soil conductivity meter mounted on a vehicle towed sledge. For comparison, a second magnetic data set was collected using the English Heritage caesium magnetometer array to assess the efficacy of the more rapid vehicle towed system for archaeological evaluation. This report provides details of the results from the EH survey prior to the analysis of the two comparative data sets.

The site is centred on SK 670 432 immediately SW of the abandoned Augustinian Priory of Shelford Manor that now serves as a farm and equestrian centre. Whilst the N of the site towards the farm has previously been used as an orchard (OS Historic Mapping County Series: Nottinghamshire 1901 1:10560) it has more recently been under arable production. At the time of the survey the majority of the site was seeded to grass and used for various equestrian events.

The main area of crop mark activity is found on a slightly raised river gravel terrace overlying Mercian Mudstone on the edge of the Trent valley (British Geological Survey 1972). Well drained coarse loamy and sandy soils of the Wick 1 association have developed over the gravel, with the site raised sufficiently above the floodplain to avoid significant deposits of alluvial overburden (Soil Survey of England and Wales 1983). Weather conditions were very good for the time of year remaining warm, dry and sunny throughout the survey.

METHOD

A survey grid was first established over the site using a Trimble kinematic differential global positioning system (GPS) to allow grid lines to be set out for the collection of data

at ~0.1m intervals along parallel EW traverses separated by 0.5m (Figure 1). Variations in the local magnetic field were recorded with an array of four specially modified Scintrex SM4 Smartmag caesium vapour magnetometer sensors mounted on a non-magnetic cart system. The only corrections made to the measured values displayed in the enclosed plots were to zero-mean each instrument traverse to remove the directional sensitivity of the instruments and to 'despike' the data, to curtail the response of near surface ferrous detritus, through the application of a 2m x 2m thresholding median filter (Scollar *et al.* 1990: pp492). Plots of the data are presented as both an X-Y traceplot and a linear greytone, at a scale of 1:1000 in Figures 3 and 4 respectively. A greytone image of the magnetometer results is also presented, superimposed on the base Ordnance Survey map data at a scale of 1:2500 (Figure 2).

The response to individual vehicles passing along the road has also influenced the total field sensors to approximately 30m from the E field boundary. This detrimental effect is limited in spatial extent and generally demonstrates a low frequency negative response superimposed over the data in these areas. The low frequency response was estimated by applying a low-pass Gaussian filter (radius 1m) and subtracted from the original data to improve the visual appearance of the survey results in these areas.

RESULTS

A graphical summary of the anomalies discussed in the following text, superimposed on the base Ordnance Survey map data, is provided in Figure 5.

General response and modern interference

The magnetic response of the site is found to be very good, with anomalies due to the buried enclosure ditches exceeding the background field strength by approximately 10nT.

A considerable degree of recent surface detritus was found over the site and this has led to a wide spread scatter of intense "iron-spike" anomalies throughout the data. An immovable mechanical excavator parked close to the NE corner of the survey area has also produced a degree of magnetic disturbance to the data in the immediate vicinity. Ferrous material is also evident in the fence line bordering the road, although the response due to individual vehicles has been successfully suppressed where this occurs.

Surface cultivation patterns, due mainly to the recent seeding to grass, have also been recorded by the survey and these are most evident as a series of continuous, linear anomalies following an approximate SW to NE alignment. Other modern features visible over the surface of the site have also been replicated in the magnetic data. These include the site of a temporary stabling block, deep vehicle ruts, a line of electric fence stanchions and the limit of the grassed area of the site before it gives way to the ploughed arable field to the S. A series of broad linear anomalies, most likely a ridge and furrow agricultural pattern, runs on a NW to SE alignment across the majority of the survey area. The magnitude of response of these anomalies varies and often appears to be increased in the immediate vicinity of other occupation activity, possibly due to the localised increased of magnetic susceptibility in these areas (cf Cole *et al.* 1995, Fig. 1).

Significant anomalies

Ditch-type anomalies apparently forming three large enclosures [1], [2] and [3] replicate the main detail found in the AP record to the N of the survey area. The largest of these [1] forms a polygonal enclosure with 6 sections of ditch visible in the magnetic data and contains a number of both pit-type and recti-linear anomalies that are also evident from the AP. A further rectangular ditched enclosure apparent on the AP, with dimensions of approximately 15m x 10m, is replicated in the magnetic data [4] but a similar crop mark to the NE is only partially visible in the magnetic data [5] due to ferrous interference from the field boundary. The anomaly at [2] also appears to be polygonal, although the magnetic survey data suggests a more complex structure than the AP with smaller, adjoining enclosures [6] and [7] immediately to the E, containing more internal sub-divisions including an apparently circular anomaly [8] within. In addition, more ancillary activity joining the two enclosures [1] and [2] is evident from the geophysical data.

The large rectangular enclosure at [3], immediately SE of [1], is also more fully represented in the geophysical data with a greater level of complexity over the AP record suggested through additional rectilinear anomalies abutting, and possibly inter-cut with the main ditches. These latter anomalies would appear to include additional large, rectangular extensions [9], [10] and [11], a polygonal enclosure [12] and a partially represented small rectangular enclosure [13] with similar dimensions to [4]. The significance of the high magnitude linear anomaly [14], apparently forming the northern extent of [3] whilst also extending E through enclosure [1], is difficult to fully ascertain. This anomaly may well represent a more substantial track way or boundary apparently respected by [3] suggesting, perhaps, that the polygonal enclosure [1] represents an earlier phase of activity.

To the S of the main enclosures a distribution of small sub-rectangular ditched anomalies [15-18] are found following the approximate orientation of the modern road. The majority of these form small enclosures of approximately 15m x 10m with a main grouping associated with additional linear anomalies [19], which do not appear on any of the aerial photography. Similar smaller anomalies have already been identified at [4] and [13], together with tentative evidence for additional enclosures at [20-22] and a strongly magnetic example at [23] that appears on the AP transcript close to a larger enclosure [24], which is only partially replicated in the geophysical survey.

Comparison with the Aerial Photography

This site has clearly produced a wealth of crop marks that appear within the aerial photographic record, which led to the initial identification and characterisation of the archaeology present. Figure 6 shows an extract of the National Mapping Programme AP transcription information for the site (plotted in green) superimposed over the magnetic survey data. Whilst there is a strong spatial correlation between the two data sets in the vicinity of the main enclosures there is some discrepancy and apparent mis-alignment between geophysical anomalies and corresponding crop marks to the S. Rectification of the AP transcription to the geophysical anomalies (plotted in yellow) partially improves the correlation between the two data sets.

However, it is of interest to note that a number of more subtle geophysical anomalies, such as the partially replicated enclosure [24], correspond directly with crop marks in the repositioned data set. Even the large enclosure shown as a crop mark falling within the NE extent of the geophysical survey can be found to correlate with a tentative, weak rectilinear [25] partially obscured by the intense magnetic "shadow" of machinery parked at the edge of the field.

In general, there is a good correlation between the AP record and the majority of the activity associated with the large, polygonal enclosures. The crop marks correspond well with strong magnetic anomalies, although the series of smaller rectangular enclosures are absent from the AP record with the exception of [4], [13] and [23]. The response to the presumably medieval ridge and furrow, no longer extant as a topographic feature on the surface of the site, is also more apparent as a series of negative linear anomalies within the magnetic data (cf David *et al.* 2003). However, some linear crop marks sharing the same orientation as the ridge and furrow are evident including one replicated as a more pronounced negative magnetic anomaly [26] that may possibly indicate a more significant recent field boundary or track-way.

CONCLUSION

The survey has successfully identified a range of anomalies related to archaeological activity at the site that both complements and extends the extensive aerial photographic record. Whilst any chronology suggested from geophysical data alone should be considered with due caution, the main enclosures at the site are reminiscent of Iron Age / Romano-British activity with what appears to be a later Roman ladder-style settlement following the approximate course of the modern road. A final post-Medieval phase is represented by a pattern of ridge and furrow within the magnetic data, and this suggests that occupation activity associated with Augustinian Priory to the N did not extend into the current survey area.

Some differences in the magnitude of the magnetic response and the correlation of these weaker anomalies with the AP record are evident in the data. This may be indicative of varying environmental conditions and occupation through a period of rising water levels curtailed by the establishment of a seasonal flood plain. Similar results have been reported from an aggregate extraction site in the Thames Valley where prehistoric features produced detectable magnetic anomalies, yet activity from the late Bronze Age onwards was obscured by the establishment of floodplain conditions (Linford 1994; Linford *et al.* 2005).

LIST OF ENCLOSED FIGURES

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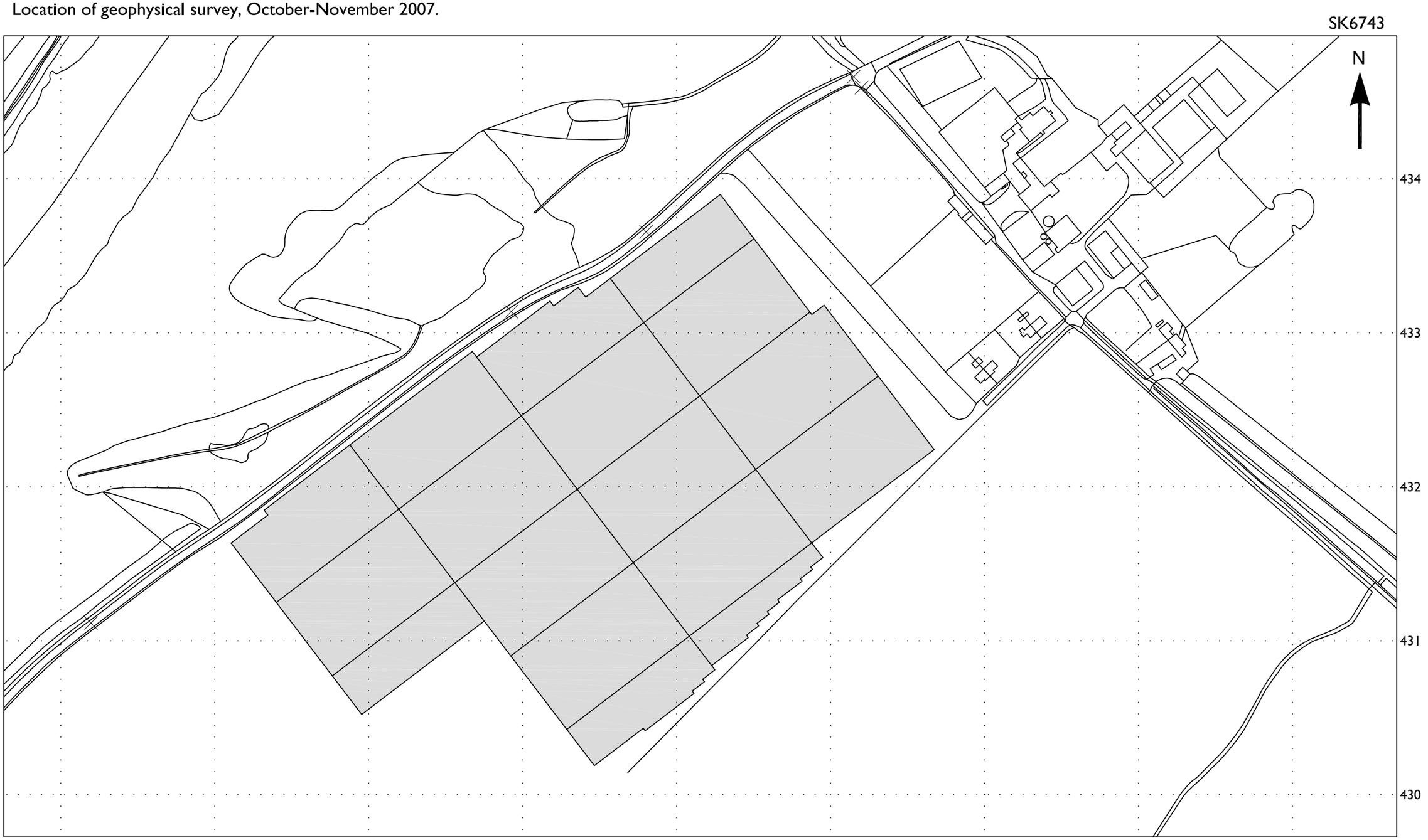
Figure 1

SHELFORD MANOR, NOTTINGHAMSHIRE
Location of geophysical survey, October-November 2007.



0 90m
1:2500

Magnetometer survey

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Figure 2

SHELFORD MANOR, NOTTINGHAMSHIRE
Magnetometer survey, October-November 2007.

0 90m

1:2500

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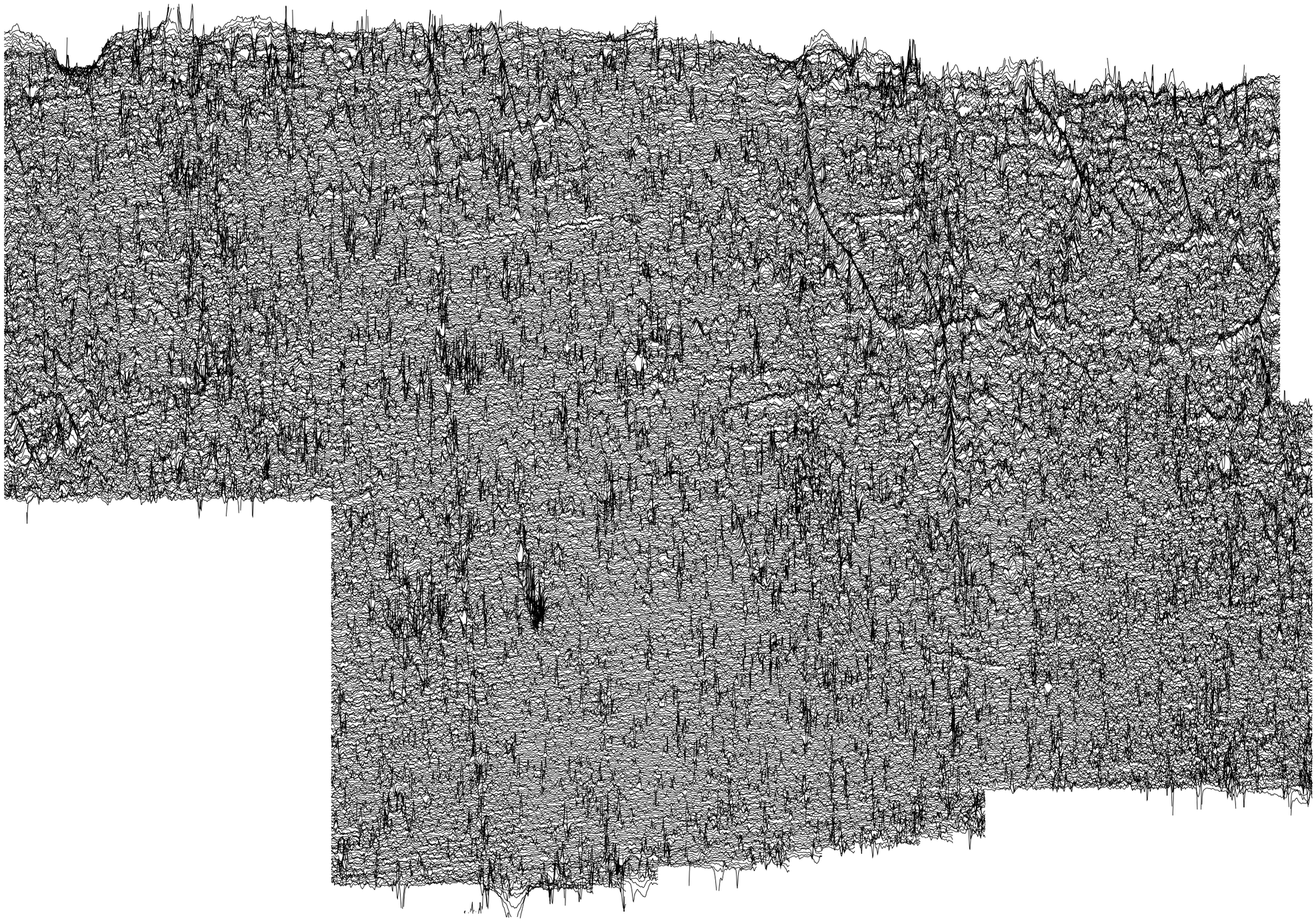
SHELFORD MANOR, NOTTINGHAMSHIRE, Caesium magnetometer survey, October - November 2007.
Trace plot of data with extreme values beyond +/- 25nT truncated.

Figure 3



0 90m

1:1250

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SHELFORD MANOR, NOTTINGHAMSHIRE, Caesium magnetometer survey, October - November 2007.
Trace plot of data with extreme values beyond +/- 25nT truncated.

Figure 4

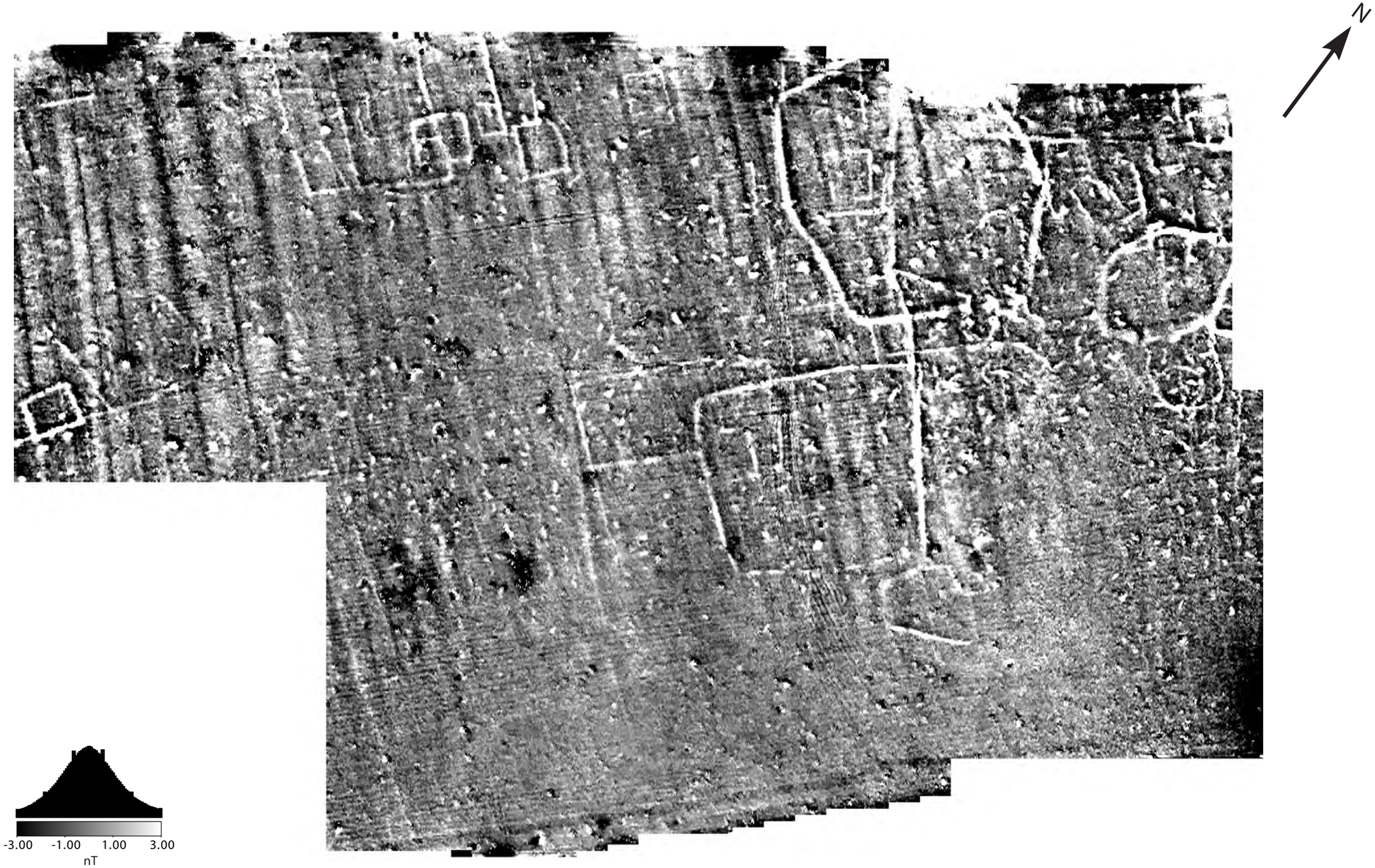

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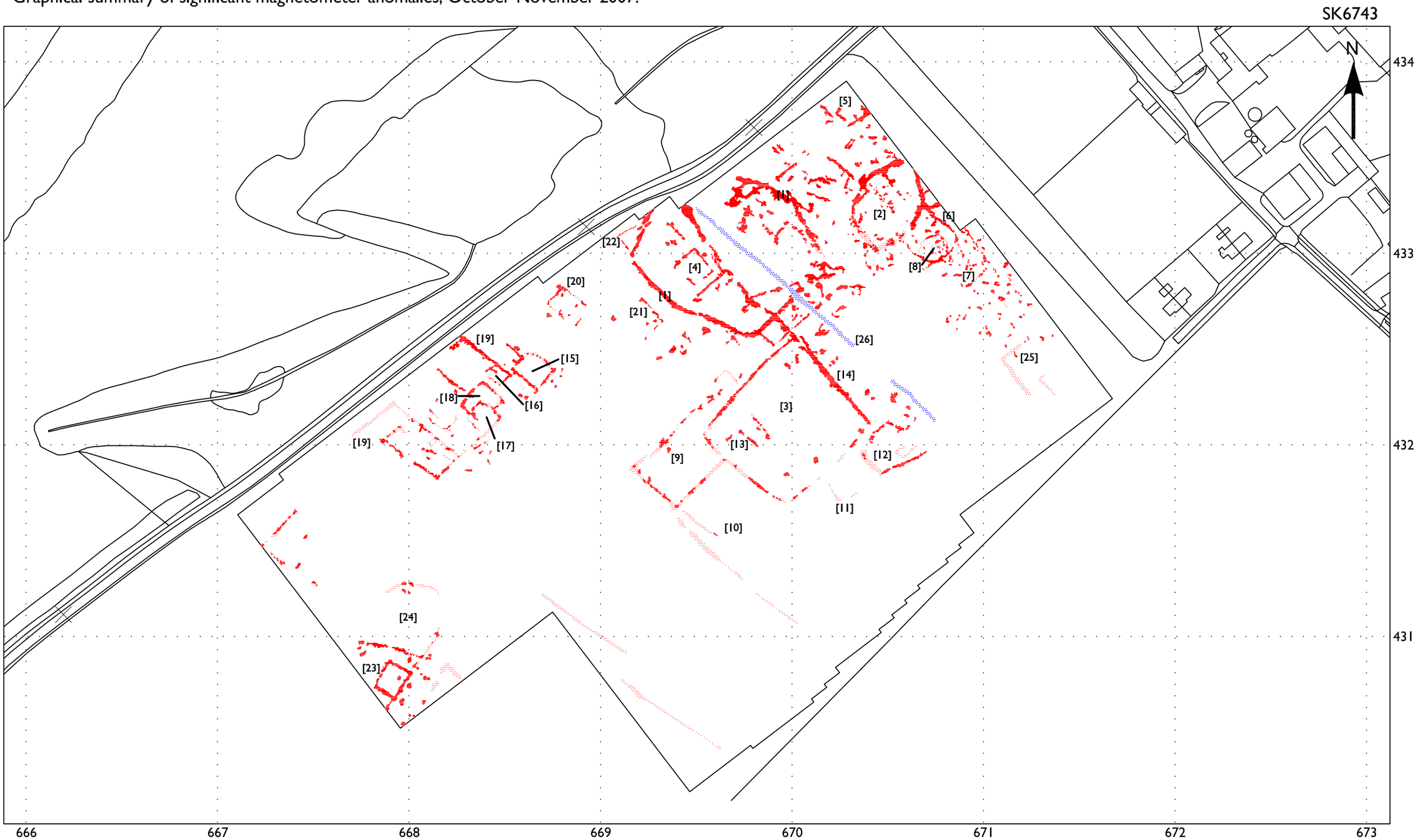
Figure 5

SHELFORD MANOR, NOTTINGHAMSHIRE

Graphical summary of significant magnetometer anomalies, October-November 2007.



strong positive anomaly

weak positive anomaly

negative anomaly (field boundary)

0 60m

1:2000

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Figure 6

SHELFORD MANOR, NOTTINGHAMSHIRE

AP Transcript superimposed over the magnetometer data.

Aerial Photographic record rectified to land marks

Aerial Photographic record rectified to corresponding geophysical anomalies

0 90m

1:2000

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