ARCHAEOLOGICAL EVALUATION REPORT:

GEOPHYSICAL SURVEY BY MAGNETOMETRY ON LAND OFF SALHOUSE ROAD, RACKHEATH, NORFOLK

Planning Reference: 20111272
NGR: TG 2897 1305
AAL Site Code: RASR 11
HES Reference: CNF 43723
HER Reference: ENF 127758
Oasis ID: allenarc1-112017

Report prepared for David Futter Associates Ltd

By
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Contents

List of Figures

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Cover image: View of site taken from north corner looking south-west

Executive Summary

- A geophysical survey by magnetometer was undertaken on land off Salhouse Road in Rackheath, Norfolk, to support a planning application for a proposed residential development by David Futter Associates Ltd.

- The site is situated in area of some archaeological interest, with cropmarks of possible later prehistoric or medieval date identified nearby, as well as a range of metal detecting finds of Iron Age to post-medieval date.

- The survey has revealed some remains likely to be of archaeological interest, including an L-shaped ditch, a number of probable former field boundaries, an area of possible pitting and a potential roundhouse. A number of possible field drains were also located by the survey.

- There are some dipolar responses in the magnetic data which are likely to have been caused by modern ferrous detritus or other highly fired material on or close to the surface. The presence of the railway line to the east of the site has also caused some disturbance to the results.

1.0 Introduction

1.1 A geophysical survey using magnetometry was undertaken by Allen Archaeology on land off Salhouse Road in Rackheath, Norfolk on behalf of David Futter Associates Ltd to support a planning application for a proposed residential development.

1.2 The site works and reporting conform to current national guidelines, as set out in the Institute for Archaeologists '*Draft standard and guidance for archaeological geophysical survey*' (IfA 2010). Regional guidance and research frameworks were also followed, namely *'Research and Archaeology: A Framework for the Eastern Counties'* (Glazebrook 1997 and Brown and Glazebrook 2000). A brief for the works was prepared by the Planning Archaeologist at Norfolk Historic Environment Service (Albone 2011) and a specification based on this document was prepared by this company (Allen 2011).

1.3 The site is archaeologically sensitive, lying in an area of archaeological interest and potential.

2.0 Site Location and Description

2.1 Rackheath is situated approximately 6.8km north-east of central Norwich in the Broadlands District of Norfolk. The site is c.1.28km south-east of Rackheath, in New Rackheath, and comprises a sub-rectangular arable field of c.2.6 hectares to the north of Salhouse Road and to the north-west of an existing railway line. The site is centred on NGR TG 2897 1305.

2.2 The local geology comprises a bedrock geology of Crag Group Sand and Gravel with the superficial geology identified as Happisburgh Glacigenic Formation Sand and Gravel (http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html). The current ground cover comprises natural vegetation; clover, thistles and grass, following the farming of sugar beet in the past.

3.0 Planning Background

3.1 A planning application has been submitted for a residential development on the site (Planning Reference 20111272). The purpose of the current works is to provide detailed information that will determine the nature and extent of the potential archaeological resource within the proposed development area, and will allow the formulation of an appropriate trial trenching strategy to be undertaken as a subsequent stage of investigation.

3.2 The combination of the information from the geophysical survey and the trial trenching will allow the Planning Archaeologist at Norfolk Historic Environment Service to make an informed decision as to whether further archaeological investigations will be required following the determination of a planning application for the proposed development. This is in line with the recommendations of Planning Policy Statement 5 (Department for Communities and Local Government 2010).

4.0 Archaeological and Historical Background

4.1 The site lies immediately to the south of an extensive linear complex of enclosure crop marks that may follow the route of a former medieval road called Ravensgate Way (Albone 2011, Norfolk Historic Environment Record (hereafter NHER) Reference 50729). The morphology of the enclosures however means that an earlier prehistoric or Romano-British date cannot be discounted.

4.2 In addition, metal detecting of the area has recovered a significant number of artefacts dating from the Iron Age to the post-medieval periods (NHER reference 40112). These include an Iron Age/Romano-British terret ring and medieval dagger.

4.3 A Neolithic chipped and polished flint axe has been found immediately to the south of the site (NHER reference 8168).

5.0 Methodology

5.0.1 The geophysical survey consisted of a detailed gradiometer survey of the whole proposed development area that is available for survey, totalling approximately 2.6 hectares.

5.0.2 The fieldwork was carried out by a team of two experienced geophysicists from AAL over a period of two working days. The site was divided into 30m by 30m grids, established on site with reference to local fixed boundaries and accurately tied into the National Grid using Ordnance Survey base mapping.

5.0.3 The survey was carried out using a Bartington Grad601-2 Dual Fluxgate Gradiometer with an onboard automatic DL601 data logger. This instrument is a highly stable magnetometer which utilises two vertically aligned fluxgates, one positioned 1m above the other. This arrangement is then duplicated and separated by a 1m cross bar. The 1m vertical spacing of the fluxgates provides for deeper anomaly detection capabilities than 0.5m spaced fluxgates. The dual arrangement allows for rapid assessment of the archaeological potential of the site. Data storage from the two fluxgate pairs is automatically combined into one file and stored using the onboard data logger.

5.0.4 Data collection was undertaken in a zigzag traverse pattern, using a sample interval of 0.25m and a traverse interval of 1m.

5.0.5 The fieldwork and reporting were carried out in accordance with the procedures in 'Geophysical Survey in Archaeological Field Evaluation' (English Heritage 2008) and 'The Use of Geophysical Techniques in Archaeological Evaluations: IFA Paper 6' (Gaffney et. al. 2002).

5.0.6 At the completion of the survey the first grid was re-surveyed to demonstrate the repeatability of the results.

5.1 Summary of Survey Parameters

5.1.1 Fluxgate Magnetometer

Instrument:	Bartington Grad601-2 Dual Fluxgate Gradiometer
Sample interval:	0.25m
Traverse interval:	1.00m
Traverse separation:	1.00m
Traverse method:	Zigzag
Resolution:	0.1 nT
Processing software:	ArchaeoSurveyor 2.5
Surface conditions:	Overgrown pasture
Area surveyed:	2.6 ha
Date surveyed:	Thursday 6th and Friday 7th October 2011
Surveyor	Robert Evershed
Survey assistants:	Bill Baker
Data interpretation:	Robert Evershed, Dave Hibbitt and Mark Allen

5.2 Data Collection and Processing

5.2.1 The grids were marked out using tapes from the southernmost corner of the site. The collection of magnetic data using a north – south traverse pattern is preferable for a magnetic survey, as enhancements to the magnetic field caused by buried features is mapped increasingly stronger the closer the traverse direction can get to a magnetic north – south direction (Breiner 1999, 41). On this occasion magnetic data was collected on a north-west to south-east alignment due to the orientation of the survey grids. Data was collected by making successive parallel traverses across each grid in a zigzag pattern. Several key points of the survey grids were tied in to known/fixed features and these are recorded in the surveyor's site notes.

5.2.2 The data collected from the survey has been analysed using the current version of ArchaeoSurveyor 2. The resulting dataset plots are presented with positive nT/m values as black and negative nT/m values as white.

The data sets have been subjected to processing using the following filters:

- De-stripe (also known as Zero Mean Traverse or ZMT)
- Clipping

5.2.3 The de-stripe process is used to equalise underlying differences between grids or traverses. Differences are most often caused by directional effects inherent to magnetic surveying instruments, instrument drift, instrument orientation (for example off-axis surveying or heading errors) and delays between surveying adjacent grids. The de-stripe process is used with care however as it can sometimes have an adverse effect on linear features that run parallel to the orientation of the process.

5.2.4 The clipping process is used to remove extreme data point values which can mask fine detail in the data set. Excluding these values allows the details to show through.

5.2.5 Plots of the data are presented in processed linear greyscale (smoothed) with any corrections to the measured values or filtering processes noted, and as separate simplified graphical interpretations of the main anomalies detected.

5.2.6 Once the survey of the site had been completed, the first grid was then surveyed again to show repeatability of results.

6.0 Magnetometer Survey Results (Figures 2 – 6)

6.1 For the purposes of interpreting the anomalies, the survey data has been processed to values of -3 to 3nT/m (Figure 2). This enhances faint anomalies that may otherwise not be visible in the data; however it also includes all ferrous and other magnetically enhanced material within the study area, making the resulting greyscale image particularly 'noisy'. The survey results revealed a number of anomalies across the data set, and these are discussed in turn and noted as numbers in square brackets on Figure 3.

6.2 The surface conditions were not particularly conducive to surveying, especially over the south-west half of the site where the set-aside field was quite overgrown, potentially adding a large amount of background noise and disrupting the survey. It was possible to survey the field to get meaningful results from the data however.

6.3 Of interest is the positive magnetic linear anomaly [1], running from the north-west edge of the survey area. This anomaly may be representative of an L-shaped ditch which has become filled with magnetically enhanced material. The nT/m values range from -40 nT/m to 10 nT/m add weight to this hypothesis.

6.4 The linear and curvilinear positive magnetic responses [2] – [4] are shown as dotted lines due to their ephemeral nature. Each of these anomalies demonstrate a peak magnetic signature of around 3 nT/m, making them only slightly discernible against the overall background noise. These may be of potential archaeological significance, such as former boundaries, although their ephemeral nature means that any interpretation at this stage is with limited confidence.

6.5 A C-shaped negative anomaly was noted in the dataset towards the north-east end of the survey. Anomaly [5] has a diameter of c.9.4m and a magnetic signature around -1 nT/m. The form is suggestive of a roundhouse with an entrance facing to the east; however an earth-filled ring gully would normally have a positive magnetic identity. On this occasion the negative nature of this anomaly is perhaps suggestive of a stony fill or soil which may be demonstrating a weaker magnetic susceptibility than the surrounding soils/geology.

6.6 The linear and curvilinear negative magnetic anomalies [6] – [10] may be representative of field drains, with their negative magnetic signature of between -2 nT/m and -1 nT/m perhaps indicative of a stony fill associated with the drains. It is not inconceivable that these linear anomalies are of archaeological significance however, representing former ditches, although the former is the most likely.

6.7 The linear anomalies [11] and [12] are potentially the response to field drains based on their characteristic form.

6.8 The amorphous areas [13] and [14] are likely to represent subtle variations in the natural geology of the site, and are therefore not of archaeological significance.

6.9 The amorphous magnetic area [15] may be the result of anthropogenic activity as it appears to show numerous pit-like anomalies with values of around 4 nT/m to 6 nT/m. It is however also possible that natural variation in the geology of the area could be responsible for these readings.

6.10 The area of extraneous magnetic interference [16] running around the south and east borders of the site are caused by accumulations of ferrous material along the field boundary, and the boundary fencing itself. The close proximity of a railway immediately to the east of the survey has also caused considerable extraneous interference. Such intense interference has the potential to mask out more ephemeral archaeological features in these areas.

6.11 Scattered randomly throughout the site are a number of strong and weak dipolar responses (the stronger of these being identified by yellow circles). The characteristic dipole response of pairs of positive and negative 'spikes' suggests near-surface ferrous metal or other highly fired material.

6.12 Once the survey had been completed the first grid was re-surveyed on the second day to demonstrate the repeatability of the results. Figure 6 shows that the results were uniform across the two days of the survey.

7.0 Discussion and Conclusions

7.1 The site conditions proved relatively receptive to geophysical surveying. The areas of varying magnetic response along the southern and eastern site borders are related to fence and tree-lined boundaries. The proximity of the railway line to the east of the survey area resulted in a great deal of magnetic noise affecting the area close to the survey edge. The affect of the railway line diminished greatly as the surveying moved away from the field boundary however. The overgrowth of vegetation, mainly in the south-western half of the survey, may account for some added magnetic noise in that area.

7.2 The L-shaped positive anomaly [1] is likely to represent a former ditch that may be associated with the cropmark enclosures known to exist to the north of the survey. Linear and curvilinear anomalies [2] – [4] may be of archaeological origin, although they have provided quite weak responses. An area of potential human activity [15], including the possible roundhouse feature [5], are located towards the north end of the study area and again may be associated the cropmark remains to the north of the site.

7.3 Faint traces of probable land drains were noted within the site, anomalies [6] – [12].

7.4 The duplicate survey of the first grid indicated good repeatability of the results over the two days that the fieldwork took place.

8.0 Effectiveness of Methodology

8.1 The non-intrusive evaluation methodology employed was appropriate to the scale of the site to be surveyed. Magnetometry surveying was the prospection technique best suited to the identification of archaeological remains on the site. Other techniques would have required justification and may have proved too time consuming or cost-prohibitive.

8.2 The site appears to have remained fallow for a considerable period of time allowing the growth of vegetation (including clover, grass and thistles), to reach a height of up to 1m in places. This caused some disruption to the survey as a steady standard pace is required for accurate surveying, whilst the Bartington Gradiometer needs to remain level and at a set height from the ground. Nevertheless it was possible to obtain meaningful data from the survey.

9.0 Acknowledgements

9.1 Allen Archaeology would like to thank David Futter Associates Ltd for this commission.

10.0 References

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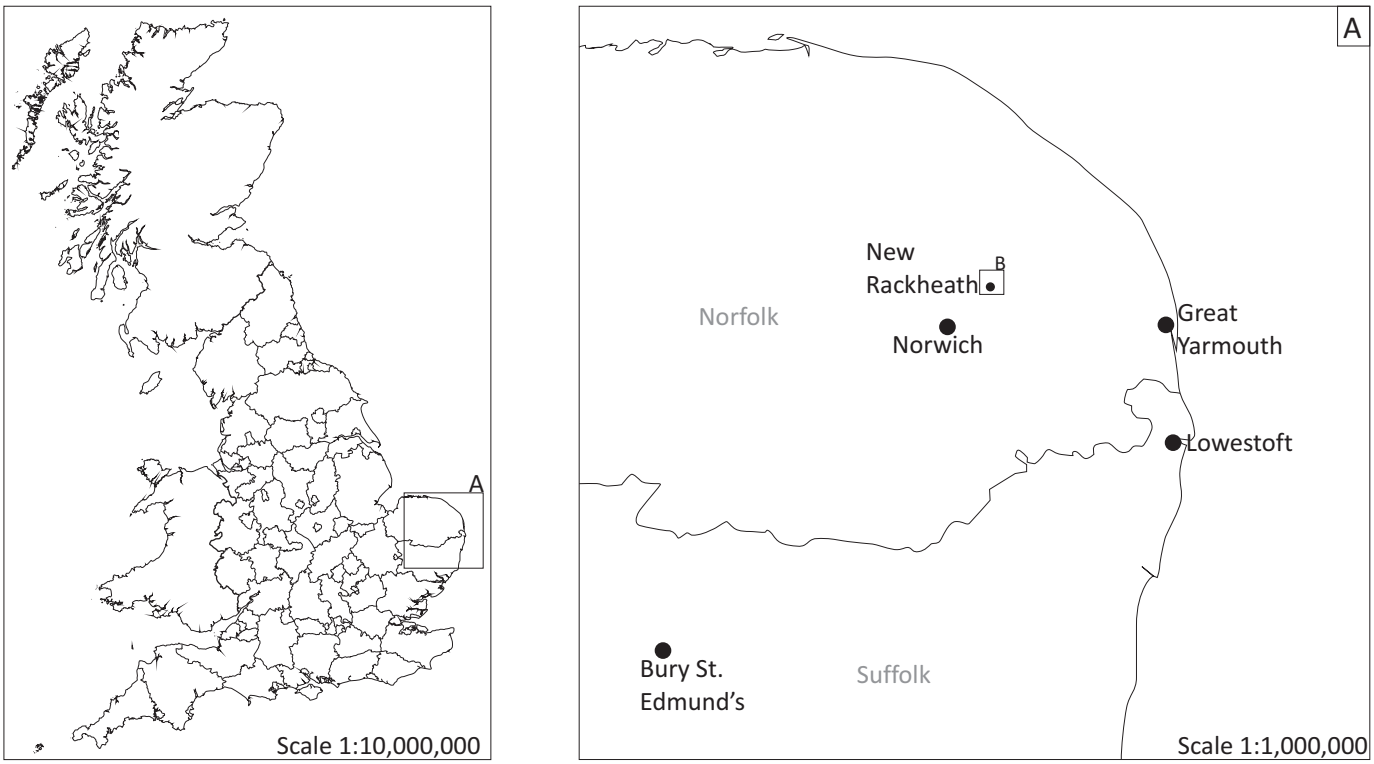

Figure 1: Site location at scale 1:25,000, with the site outlined in red

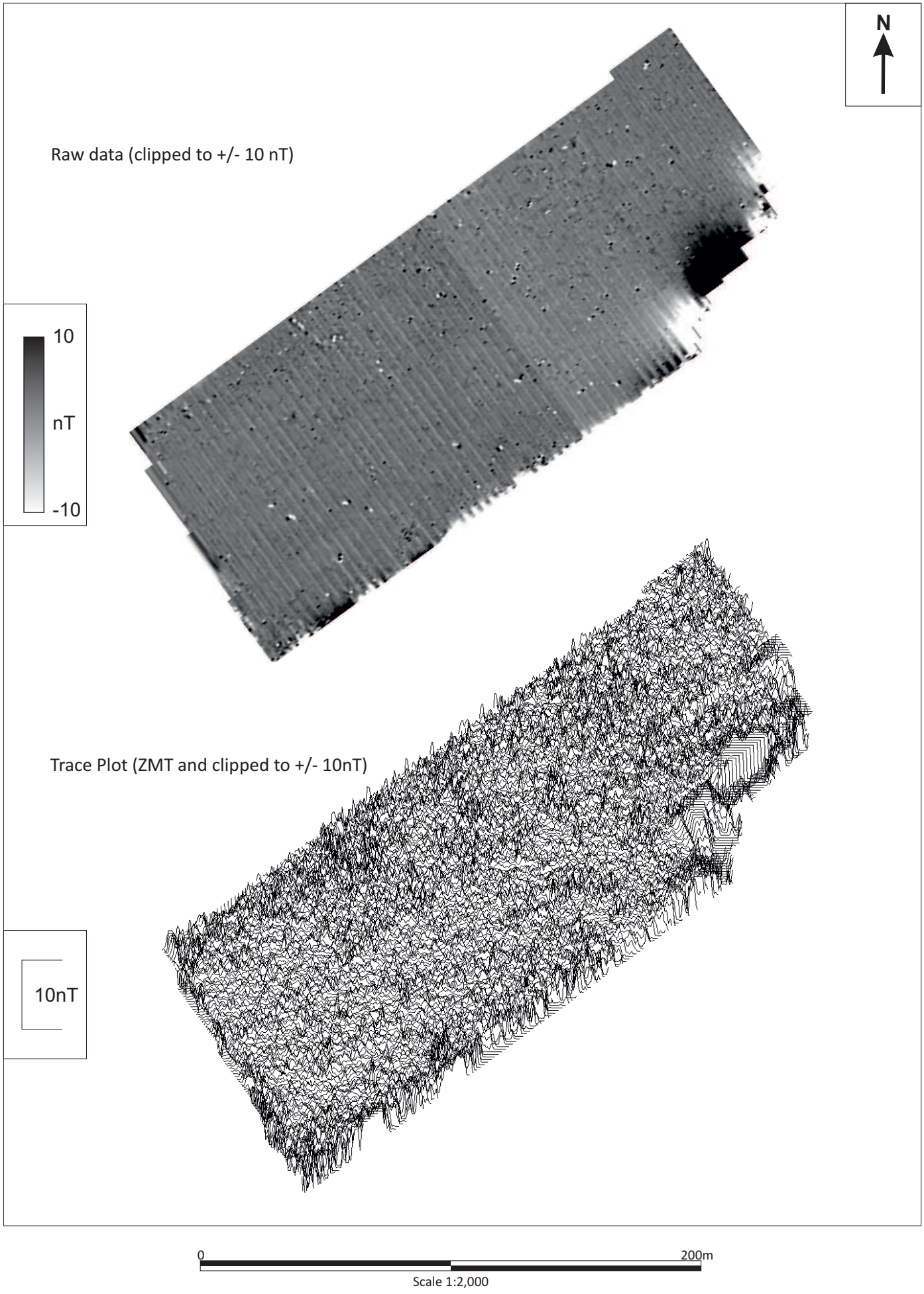

Figure 2: Greyscale raw data and processed trace plot, both at scale 1:2,000

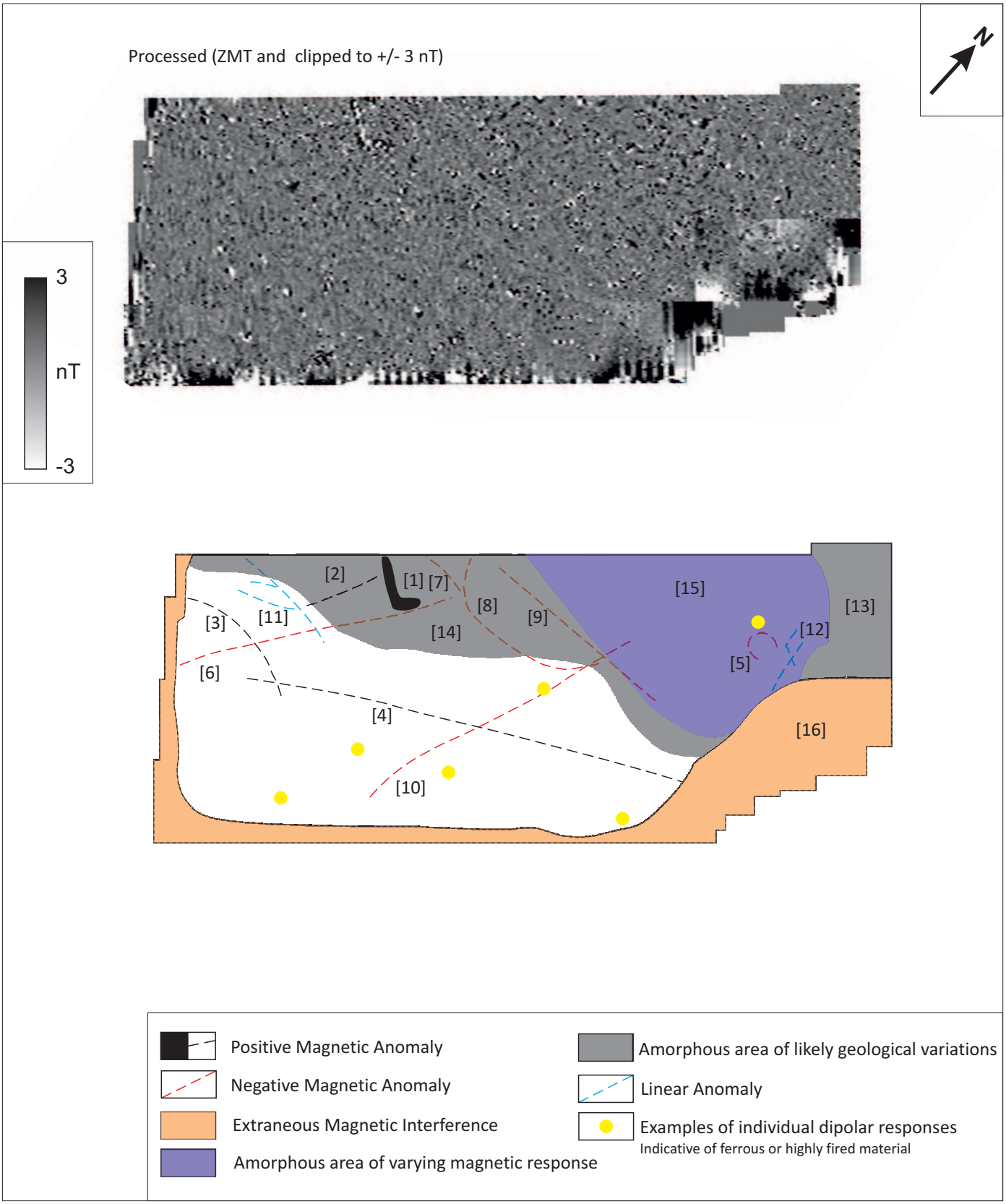

Figure 3: Processed greyscale plot of survey area with interpretation, both at scale 1:2,000

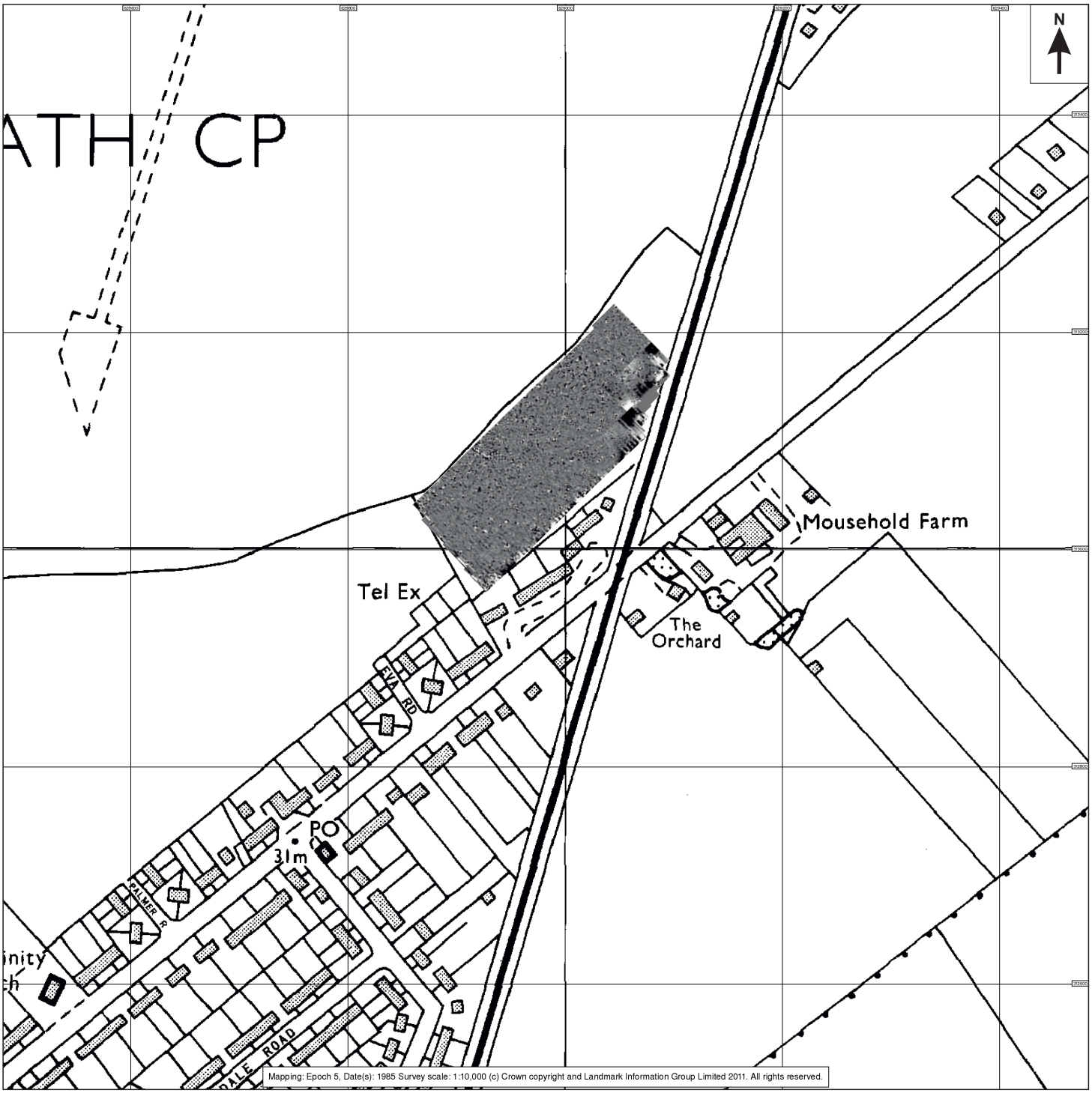

Figure 4: Processed greyscale plot located in real space at scale 1:5,000

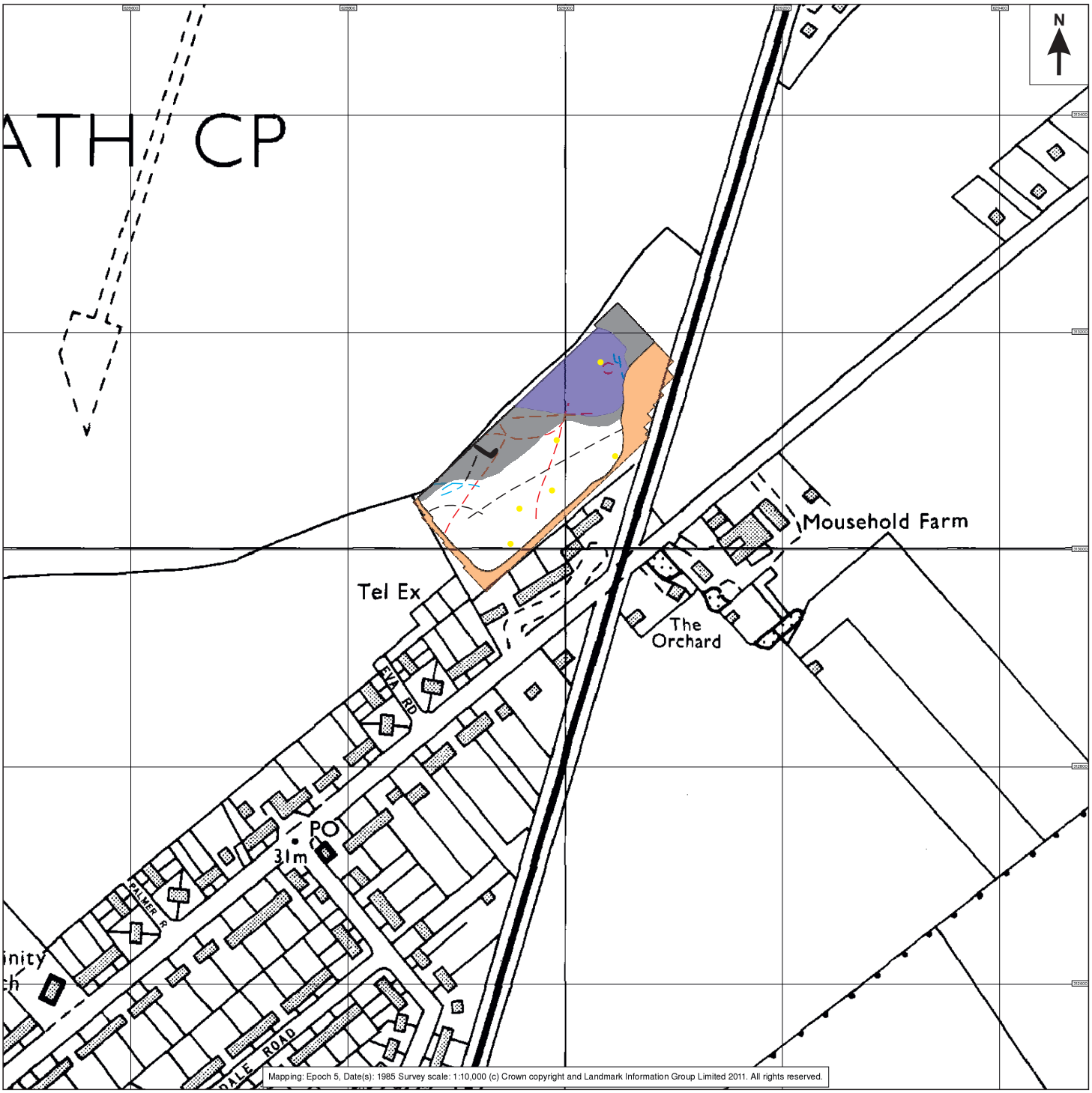

Figure 5: Interpretative plot in real space at scale 1:5,000

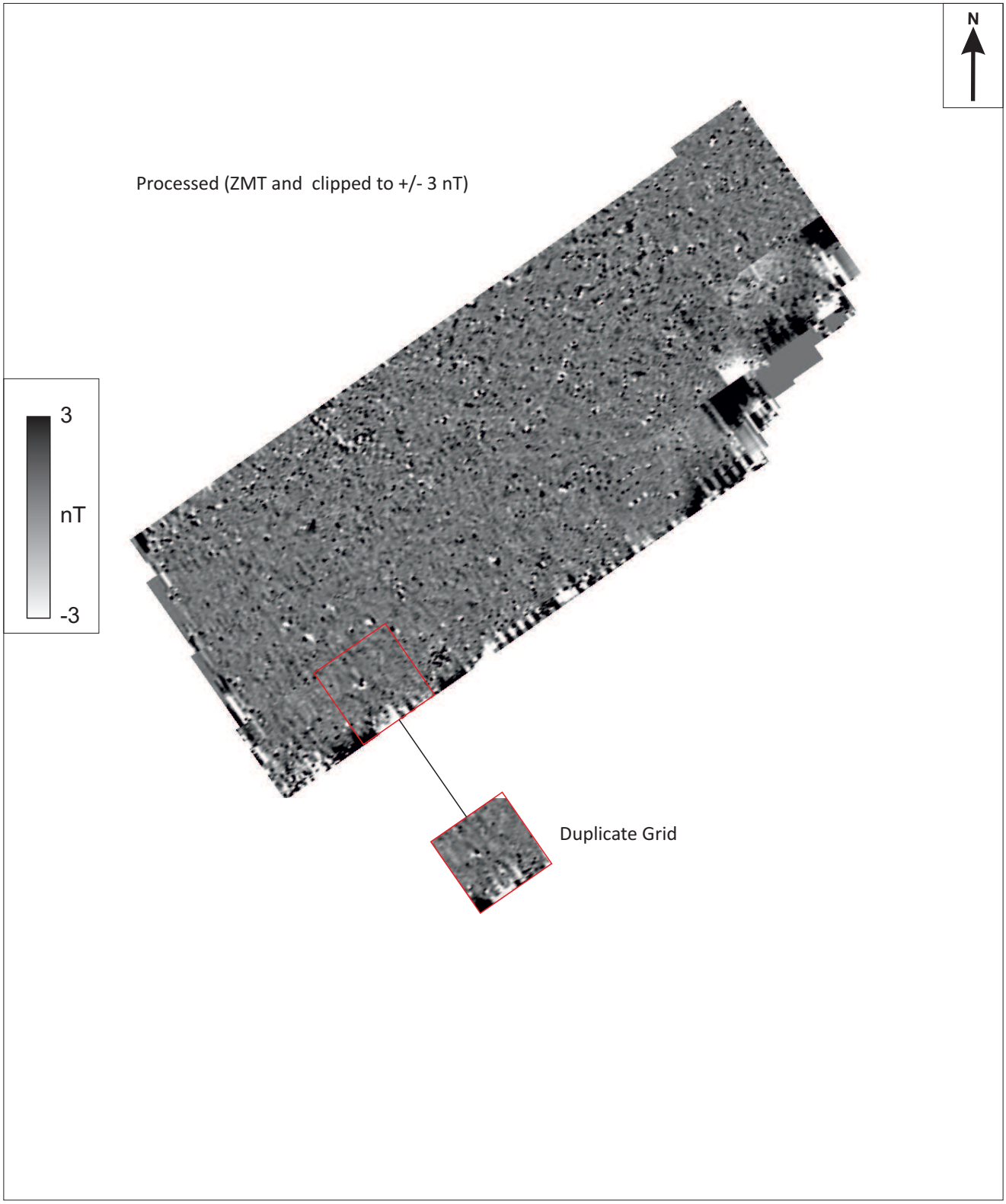

Figure 6: Processed greyscale plot and duplicate grid at scale 1:2,000

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