Geophysical Survey of land at Milken Lane, Ashover, Derbyshire

View looking north-east

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EXECUTIVE SUMMARY

This report presents the results of a geophysical survey undertaken on land at Milken Lane, Ashover, Derbyshire. A geophysical survey was carried out in March 2017 in a single field which was under pasture. The ground conditions were suitable for geophysical survey and the instrument chosen was a Bartington Grad 601 dual sensor fluxgate gradiometer.

The results of the geophysical survey are considered to be accurate and reliable and only minimal processing of the raw data was necessary. The results have not revealed any definite evidence of significant buried archaeological remains within the PDA but have revealed a number of anomalies of possible archaeological origin and the objectives of the survey have been achieved.

Out of the two clearly defined linear anomalies that were recorded in the results, one can be interpreted as the remains of the south-eastern field boundary in its former location as depicted on the 1816 Poor Rate map (Burpoe 2017). The second linear anomaly cannot be interpreted with any certainty based on cartographic evidence contained in the accompanying Historic map regression (Burpoe 2017).The origin of the anomaly can only be tested by invasive investigation, although it is most likely to also represent an historic field boundary. Three notable positive discrete anomalies which were recorded towards the north of the field should also be tested by field evaluation to determine their origin as they have the characteristics of archaeological cut features, which could be significant, but are located on or close to a lead mining vein and may therefore be associated with more recent mining activity.

Further anomalies recorded by the geophysical survey are considered to have only low potential to be archaeologically significant. They are likely to indicate possible ridge and furrow cultivation remains, disturbance associated with mining activity and disturbance and remnants associated with the removal of trees and field boundaries and general agricultural land use. The status of these features can only be established by field evaluation.

1.0 INTRODUCTION

1.1 Background

1.1.1 Archaeological Research Services Ltd was commissioned by Planning and Design Practice Ltd to undertake a geophysical survey on land at Milken Lane, Ashover, Derbyshire. The geophysical survey has been undertaken to accompany a planning application for a residential housing development NED/17/00200/OL .

1.1.2 This report presents the results of the geophysical survey. The objective of the geophysical survey was to identify any anomalies of archaeological origin within the proposed development area (PDA) in order to identify and record the presence/absence, location, nature and extent of any surviving below-ground archaeological remains.

1.2 Location, Topography and Geology

1.2.1 The proposed development area (hereafter PDA) includes a single field, which narrows towards the south-west, and an access track and in total comprises an area of 0.98ha (Fig. 1). The field rises gently from an elevation of *c.* 189m aOD in the south-west to an elevation of *c.* 195m aOD in the north. The field is bounded by: a farm track along the south-eastern boundary, separated from the field by a hedgerow and post and wire fence; fencing and walls to gardens of the Black Swan public house and residential properties along the south-western and north-western boundaries and is unbounded along the northern boundary.

1.2.2 The underlying solid geology consists of Mudstone, Siltstone and Sandstone of the Bowland Shale Formation – a Sedimentary Bedrock formed approximately 313 to 335 million years ago in the Carboniferous Period. This is overlain by superficial Head deposits (British Geological Survey 2017).

1.2.3 The underlying solid geology within the southernmost party of the PDA comprises mudstone of the Widmerpool Formation, formed approximately 326 to 335 million years ago in the Carboniferous Period when the local environment was previously dominated by sub-aqueous slopes. This is overlain by superficial deposits of head (British Geological Survey 2017).

1.2.4 The soils of the PDA are classified as belonging to the Bardsey Soil Association (713a), which are cambic stagnogley soils (SSEW 1983). These soils form over Carboniferous mudstone with interbedded sandstone, and are characterised as ‘Slowly permeable seasonally waterlogged loamy over clayey and fine silty soils over soft rock. Some well drained coarse loamy soils over harder rock (CU 2017).

2.0 ARCHAEOLOGICAL BACKGROUND

2.1 The detailed archaeological background is contained within the accompanying Historic Map Regression of land at Milken Lane, Ashover, Derbyshire (Burpoe 2017).

3.0 METHODOLOGY

3.1 Magnetometry is a non-intrusive scientific prospecting technique that is the preferred geophysical technique used to determine the presence or absence of buried archaeological features when site and geological conditions are favourable. It is an efficient and effective method for locating anomalies corresponding with archaeological features. The instrument chosen for this survey was a Bartington Grad 601 dual sensor fluxgate gradiometer which can detect weak changes in the Earth's magnetic field caused by buried features.

3.2 All fieldwork and reporting was undertaken following Historic England and Chartered Institute for Archaeologists (CIfA) standards and guidance (Gaffney *et al*. 2008; CIfA 2013; 2014).

3.3 The 30m by 30m survey grids were located to cover the entire field and aligned as shown in Figure 2. In total 13 survey grids, including partial grids, were set out and accurately positioned using a Leica Zeno 10 GNSS field controller with GS05 antenna cap which was connected to Leica Smartnet to receive corrections resulting in an accuracy of typically 0.6m or better. Each grid was then surveyed at 1m traverse intervals with the sampling at 0.25m (4 readings per metre) intervals. The survey was carried out in 'zigzag' mode with each alternate traverse walked in opposite directions. The range of the instrument was set at 100nT (0.01nT resolution).

3.4 The geophysical survey was conducted on 20th March in heavy rain. At the time of the survey the field was under pasture which was waterlogged in places but suitable for survey. The survey was unobstructed in the available areas but as the PDA narrowed towards the south it became unsuitable for survey and was omitted.

3.5 Prior to commencing the survey the gradiometer was balanced and calibrated to the local conditions and this was repeated regularly throughout each day. At the end of each day the data was downloaded into a computer, checked and archived on the ARS Ltd server. The data was downloaded using Bartington Instruments' *Grad 601 Communication Application.*

4.0 GEOPHYSICAL SURVEY RESULTS

4.1 Introduction

4.1.1 The data was minimally processed using Geoplot software. The data was "clipped" (clipping parameters selected on the mean and standard deviation data values), "de-staggered" and the striping that can often appear in gradiometer data was removed

by utilising the "zero mean traverse" function with thresholds applied. Finally the data was interpolated. To enhance the visibility of subtle features the data was viewed under a number of different clip plotting parameters.

4.1.2 Occasionally processing the data to compensate for directional sensitivity or to remove iron spikes caused by miscellaneous ferrous objects can also inadvertently disguise anomalies that may be of archaeological origin, particularly long linear features in the direction of the traverses. To take account of this the data has been analysed in a number of different formats and at each stage of processing.

4.1.3 The data analysis is presented graphically in Figures 3 to 5. A greyscale shade plot of the processed gradiometer data is presented in Figure 3 and an interpretative plan in Figure 4. A Trace plot of the processed gradiometer data is presented in Figure 5.

4.2 Anomalies

4.2.1 The geophysical survey results have revealed two very clear linear anomalies on slightly different alignments. Linear anomaly 1 is predominantly positive in polarity but with an accompanying negative component and is aligned with respect to the extant south-eastern field boundary. The anomaly was detected intermittently, which suggests the feature has suffered a degree of truncation and the anomaly also terminates abruptly at the southern end. The anomaly respects the approximate location of a former field boundary depicted on the 1816 *Poor Rate Survey and Valuation of the Manor of Ashover* (Burpoe 2017, Figs. 3 and 6) and it is therefore most likely that the anomaly indicates the course of, and possible surviving buried remannts of, the former field boundary and disturbance associated with its removal.

4.2.2 Linear anomaly 2 is aligned north-north-east/ south-south-west and like anomaly 1 was detected intermittently, although is almost entirely positive in polarity and probably indicates a slightly narrower feature. Anomaly 2 terminates abruptly at the northern end although it is not possible to determine the status of the at the southern end as it continues beyond the edge of the surveyed area. The anomaly does not respect the alignment or location of any features identified on the available mapping as far back as 1779 (Burpoe 2017) and is therefore of unknown origin, although the anomaly could represent an historic field boundary which pre-dates 1779. This anomaly should be tested by field evaluation.

4.2.3 Three substantial positive discrete anomalies were recorded in an approximate linear arrangement towards the north of the PDA (3 to 5). The anomalies have the characteristics of archaeological cut features although whether this is of archaeological significance can only be determined if the anomalies are tested by field evaluation. The anomalies are located on or close to the edge of the Rhodes Vein where it is depicted on the 19th Century *Mines and Veins of Lead Ore in the Lordship of Ashover* map (Burpoe 2017, Figs. 4 and 6) and therefore it should also be considered that the anomalies could represent features associated with historic lead

mining; possibly shafts. It is considered that there is low potential for these features to be entirely natural in origin.

4.2.4 Towards the south of the PDA a series of dipolar anomalies a in a clear linear arrangement respect the location and alignment of a former field boundary as depicted on the 1962 OS map (Burpoe 2017). It can be stated with some confidence that anomaly 6 represents disturbance associated with the removal of the modern field boundary and is not archaeologically significant.

4.2.5 In the north/ north-west of the survey area a series of extremely weak linear anomalies were recorded with predominantly positive polarity (7 to 11) but with a single similar anomaly of apparently negative polarity (12). The anomalies are so weak it is almost impossible to delimit them but they may provide a subtle hint of ridge and furrow cultivation. Alternatively anomalies 7 to 10 extend across the full width of the PDA and are on the same alignment as the Rhodes Vein as depicted on the 19th Century *Mines and Veins of Lead Ore in the Lordship of Ashover* map (Burpoe 2017, Figs 4 and 6), and so it is possible they are in some way related to lead mining activity.

4.2.6 A reasonably large number of fairly substantial dipolar anomalies were recorded across the PDA in an apparently random distribution. It is most likely that the anomalies are a result of disturbance associated with the removal of field boundaries, lead mining and general agricultural activity, tree bowls and ordinary ferrous litter associated with the agricultural land-use. Anomalies of this type are unlikely to be archaeologically significant. Dipolar anomalies 13 and 14 do correspond, in terms of location, to possible structures (Burpoe 2017, Fig 6) which are most likely to be fairly ordinary farm buildings or stock shelters. The anomalies could indicate that some building remains survive, or more likely disturbance associated with their removal, but this is speculative and unlikely to be archaeologically significant and can only be tested by field evaluation.

4.2.7 A small number of small positive discrete anomalies were recorded in an apparently random distribution, although there is a suggestion of a small cluster (15) to the north-east of anomaly 14. Anomalies of this type are most likely to be natural or agricultural in origin but the possibility that they represent archaeological cut features such as pits or larger post holes cannot be discounted, and it would be worthwhile sample testing these anomalies as part of a phase of field evaluation. Localised areas of weak magnetic enhancement are of unknown origin, but there is no evidence to suggest that they are likely to be archaeologically significant and are more likely to be natural or a result of agricultural disturbance.

5.0 DISCUSSION AND CONCLUSIONS

5.1 The results of the geophysical survey are considered to be accurate and reliable and only minimal processing of the raw data was necessary. The results have not

revealed any definite evidence of significant buried archaeological remains within the PDA but have revealed a number of anomalies of possible archaeological origin and the objectives of the survey have been achieved.

5.2 Out of the two clearly defined linear anomalies that were recorded in the results, one can be interpreted as the remains of the south-eastern field boundary in its former location as depicted on the 1816 Poor Rate map (Burpoe 2017). The second linear anomaly cannot be interpreted with any certainty based on cartographic evidence contained in the accompanying Historic map regression (Burpoe 2017).The origin of the anomaly can only be confirmed by invasive investigation, although it is considered most likely to also represent an historic field boundary. Three notable positive discrete anomalies which were recorded towards the north of the field should also be tested by field evaluation to determine their origin as they have the characteristics of archaeological cut features, which could be significant, but are located on or close to a lead mining vein and may therefore be associated with mining activity.

5.3 Further anomalies recorded by the geophysical survey are considered to be of low archaeological significance, if indeed they are archaeological, and are likely to indicate traces of possible ridge and furrow cultivation remains, disturbance associated with past mining activity and disturbance and remnants associated with the removal of trees and field boundaries and general agricultural land use.

6.0 PUBLICITY, CONFIDENTIALITY AND COPYRIGHT

6.1 Any publicity will be handled by the client.

6.2 Archaeological Research Services Ltd will retain the copyright of all documentary and photographic material under the Copyright, Designs and Patent Act (1988).

7.0 STATEMENT OF INDEMNITY

7.1 All statements and opinions contained within this report arising from the works undertaken are offered in good faith and compiled according to professional standards. No responsibility can be accepted by the author/s of the report for any errors of fact or opinion resulting from data supplied by any third party, or for loss or other consequence arising from decisions or actions made upon the basis of facts or opinions expressed in any such report(s), howsoever such facts and opinions may have been derived.

8.0 ACKNOWLEDGEMENTS

8.1 Archaeological Research Services Ltd would like to thank all those involved in the project for their help and assistance. In particular we would like to thank Scott O'Dell of Planning and Design Practice Ltd for commissioning the survey. We would also like

to thank Steve Baker, Derby and Derbyshire Development Control Archaeologist, for his help and advice.

9.0 REFERENCES

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Appendix 1: Figures

Archaeological Research Services Ltd Angel House Portland Square Bakewell Derbyshire DE45 1HB Site Code: Ashover Milken Lane Date: March 2017 Drawn:RD Scale: As shown	**Figure 1** Site Location Key: Site location Red line boundary (RLB) North East Derbyshire District	Copyright/Licencing: This drawing © A.R.S. Ltd Ordnance Survey © Crown Copyright 2014. All rights reserved. Licence No. 100022432.

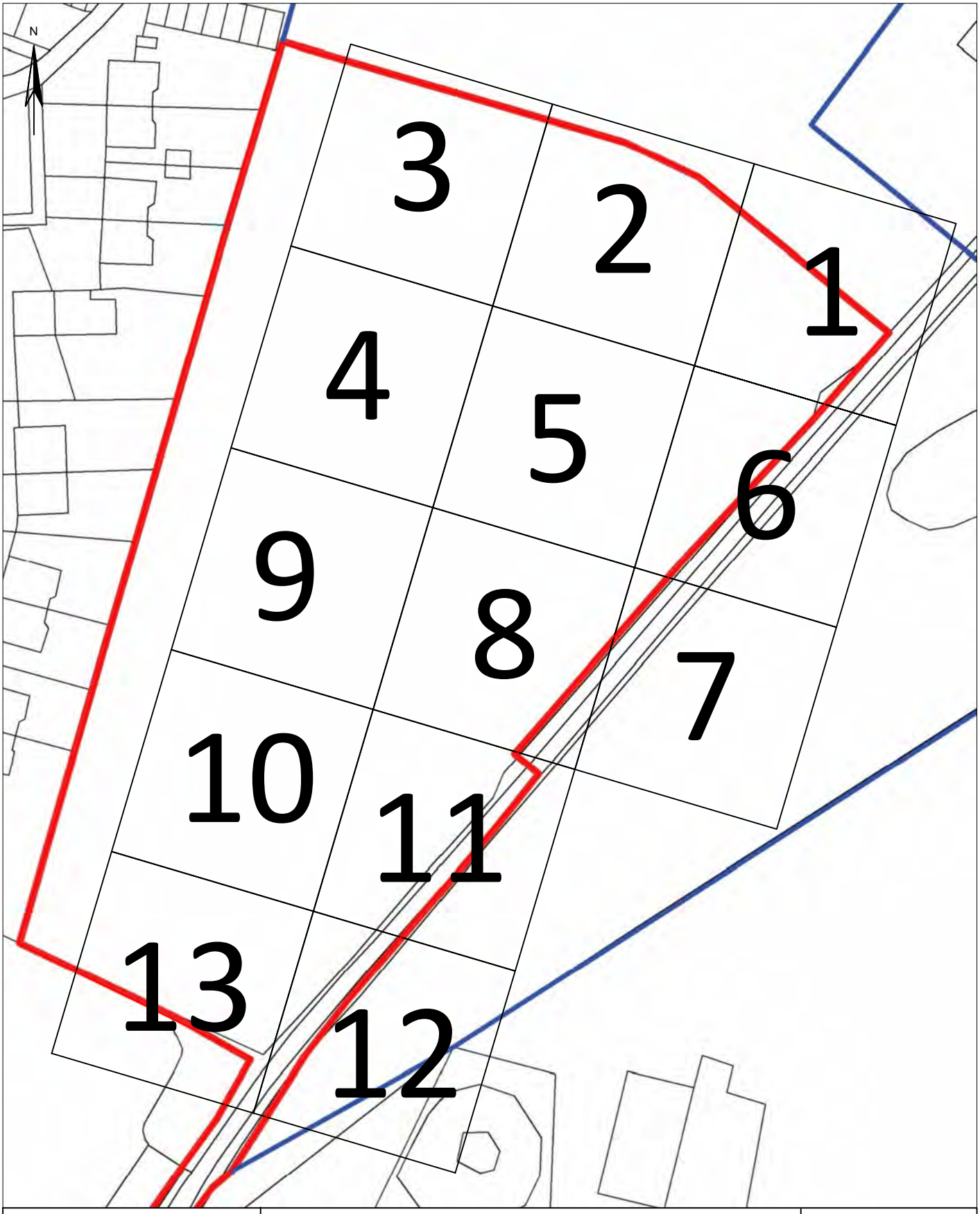

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Figure 2
Location of survey grids

Key:
PDA
1 30m x 30m survey grid

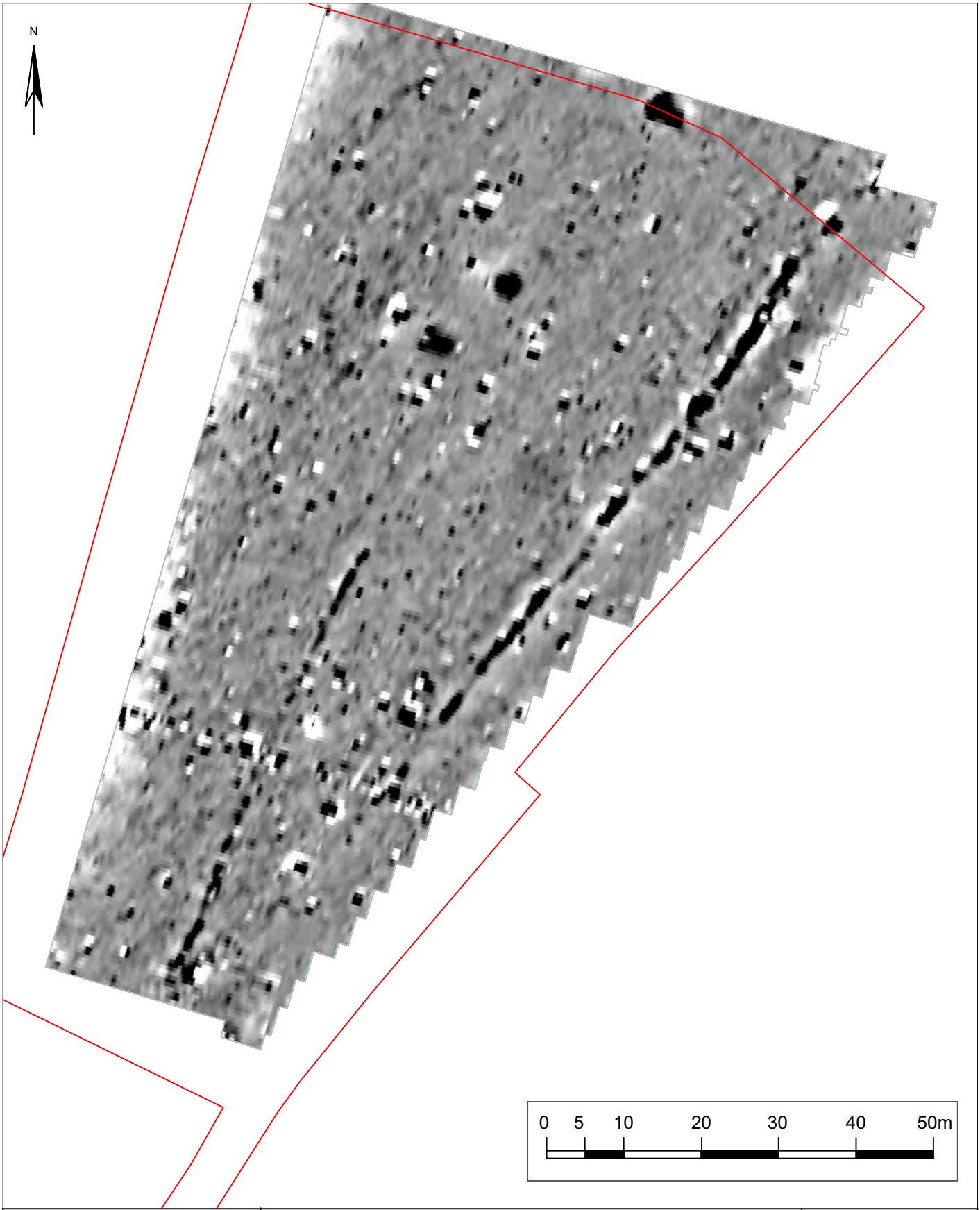

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Figure 3
Greyscale shade plot of processed gradiometer data

Key: PDA Plotting parameters

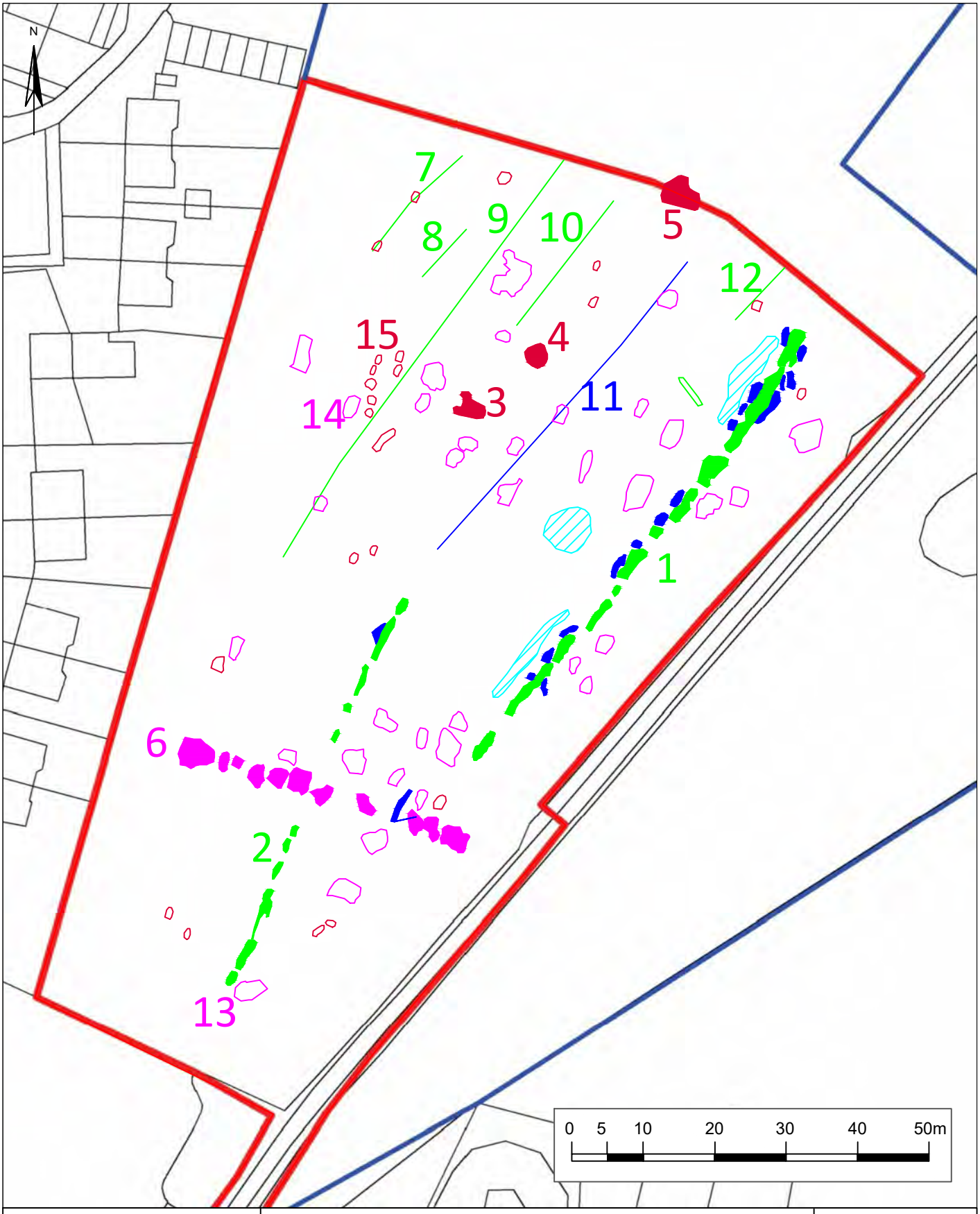

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Figure 4
Interpretative Plan

Key:
- PDA
- Positive linear anomaly
- Negative linear anomaly
- Positive discrete anomaly - probable archaeology
- Dipolar anomaly - field boundary
- Dipolar anomaly - disturbance
- Positive discrete anomaly - possible archaeology
- Weak magnetic enhancement

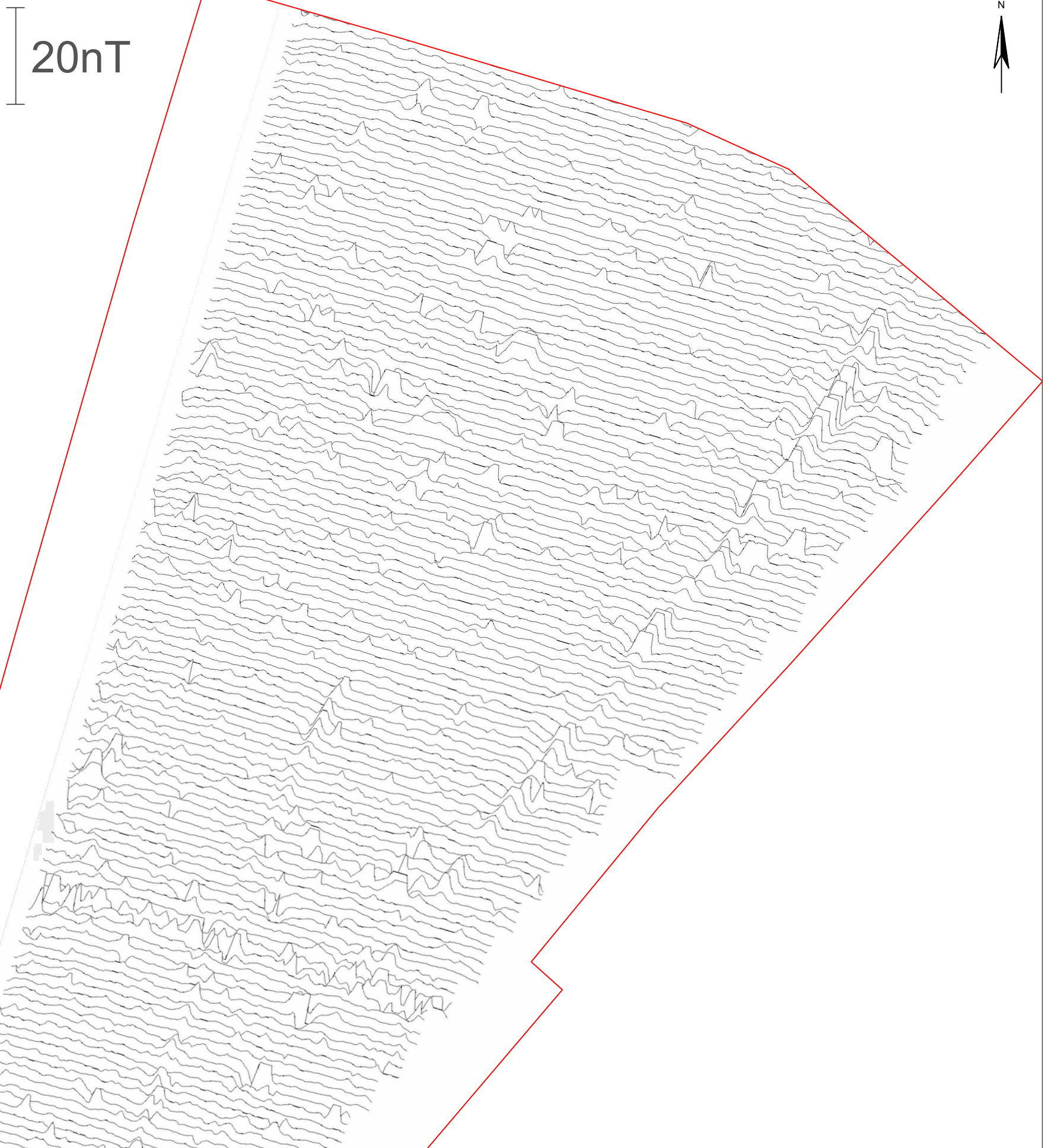

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Figure 5
Trace plot

Site Code: Ashover Milken Lane
Drawing Ref: Figure 5
Date: April 2017
Drawn: RD
Scale: As shown