Archaeological Services
University of Durham

Land at Black Swan Bridge, East Rounton, North Yorkshire

geophysical surveys

on behalf of
Scott Wilson

Report 1650
April 2007

Archaeological Services
Durham University
South Road
Durham DH1 3LE
Tel: 0191 334 1121
Fax: 0191 334 1126
archaeological.services@durham.ac.uk
www.durham.ac.uk/archaeological.services

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46 The Calls, Leeds, LS2 7EY

Contents

1. Summary

The project

1.1 This report presents the results of geophysical surveys conducted in advance of proposed road junction improvement by the Black Swan public house, near East Rounton, North Yorkshire. The works comprised gradiometer surveys of five areas totalling approximately 2ha.

1.2 The works were commissioned by Scott Wilson.

Results

1.3 Traces of former ridge and furrow cultivation were detected in both small survey areas to the west of the A19, together with one possible ditch feature.

1.4 A possible former field boundary was detected to the east of the A19. A number of weaker anomalies here could reflect the truncated remains of other soil-filed features.

2. Project background

Location (Figure 1)

2.1 The study area is located at the junction of the A19 trunk road and Trenholme Lane, immediately north of the Black Swan public house to the east of East Rounton in North Yorkshire (NGR centre: NZ 442 038). The surveys were undertaken in two fields, to either side of the A19(T) (Figure 2).

Development proposal

2.2 The proposal is to create a grade separated junction between the A19 and Trenholme Lane. This will involve the construction of a bridge with sliproads and embankments.

Objective

2.3 The principal aim of the surveys was to assess the nature and extent of any sub-surface features of potential archaeological significance within the proposed development area, so that an informed decision may be made regarding the nature and scope of any further scheme of archaeological works that may be required in advance of development.

Methods statement

2.4 The surveys have been undertaken in accordance with instructions supplied by Scott Wilson.

Dates

2.5 Fieldwork was undertaken on the 20th March 2007. This report was prepared between the 21st March and 5th April 2007.

Personnel

2.6 Fieldwork was conducted by Lorne Elliott (supervisor) and Richie Villis. This report was prepared by Duncan Hale with illustrations by David Graham. The Project Manager was Duncan Hale.

Archive/OASIS

2.7 The site code is **ERY07**, for **E**ast **R**ounton, North **Y**orkshire 20**07**. The survey archive is currently held by Archaeological Services Durham University and will be transferred to Scott Wilson in due course. Archaeological Services is registered with the **O**nline **A**cces**S** to the **I**ndex of archaeological investigation**S** project (OASIS). The OASIS ID number for this project is **archaeol3-26040**.

3. Landuse, topography and geology

3.1 At the time of survey the proposed development area comprised two arable fields with young cereal crops, which were covered with snow.

3.2 The fields occupied a gentle south-facing slope with a mean elevation of approximately 70m OD.

3.3 The underlying solid geology of the area comprises Triassic Mudstones, which are overlain by boulder clay.

4. Geophysical survey

Standards

4.1 The surveys and reporting were conducted in accordance with English Heritage Research and Professional Services Guideline No.1, *Geophysical survey in archaeological field evaluation* (David 1995); the Institute of Field Archaeologists Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2001).

Technique selection

4.2 Geophysical surveying enables the relatively rapid and non-invasive identification of potential archaeological features within landscapes and can involve a variety of complementary techniques such as magnetometry, electrical resistivity, ground-penetrating radar and electromagnetic survey. Some techniques are more suitable than others in particular situations, depending on a variety of site-specific factors including the nature of likely targets; depth of likely targets; ground conditions; proximity of buildings, fences or services and the local geology and drift.

4.3 In this instance, it was considered likely that cut features, such as ditches and pits, would be present on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) might also be present.

4.4 Given the anticipated shallowness of targets and the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting each of the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record minute anomalies in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

Field methods

4.5 Five survey areas covering a total of 1.94ha were set out and their coordinates recorded by means of a Trimble Pathfinder Pro XRS global positioning system (GPS) with real-time RINEX calibration (Figure 2). Areas 1 and 2, to the west of the A19, were surveyed using a 30m grid; Areas 3, 4 and 5 to the east were surveyed using a 20m grid.

4.6 Measurements of vertical geomagnetic field gradient were determined using a Bartington Grad601-2 fluxgate gradiometer with automatic datalogging facilities. A zig-zag traverse scheme was employed. The instrument sensitivity

was set to 0.1nT, the sample interval to 0.25m and the traverse interval to 1.0m, thus providing 3600 sample measurements per 30m grid unit and 1600 sample measurements per 20m grid unit.

4.7 Data were downloaded on-site into a laptop computer for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

Data processing

4.8 Geoplot v.3 software was used to process the geophysical data and to produce both continuous tone greyscale images and trace plots of the raw data. The greyscale images and interpretations are presented in Figures 2-4; the trace plots are provided in Appendix I. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. A palette bar relates the greyscale intensities to anomaly values in nanoTesla.

4.9 The following basic processing functions have been applied to each dataset:

Clip	clips, or limits data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic.
Zero mean traverse	sets the background mean of each traverse within a grid to zero; for removing striping effects in the traverse direction and removing grid edge discontinuities.
Despike	locates and suppresses random iron spikes in gradiometer data.
Destagger	corrects for displacement of anomalies caused by alternate zig-zag traverses.
Interpolate	increases the number of data points in a survey to match sample and traverse intervals. In this instance the gradiometer data have been interpolated to 0.25 x 0.25m intervals.

Interpretation: anomaly types

4.10 A colour-coded geophysical interpretation plan of the surveys is provided in Figure 3. Two types of geomagnetic anomaly have been distinguished in the data:

positive magnetic	regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches.

dipolar magnetic paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including fences and service pipes) and/or fired structures such as kilns or hearths.

Interpretation: features

4.11 A colour-coded archaeological interpretation plan of the surveys is provided in Figure 4.

4.12 Except where stated otherwise in the text below, positive magnetic anomalies are taken to reflect relatively high magnetic susceptibility materials, typically sediments in cut archaeological features (such as furrows, ditches or pits) whose magnetic susceptibility has been enhanced by decomposed organic matter or by burning.

4.13 Small, discrete dipolar magnetic anomalies have been detected in all of the survey areas. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments, and in most cases have little or no archaeological significance. A sample of these is shown on the geophysical interpretation plans, however, they have been omitted from the archaeological interpretation plans and the following discussion.

Areas 1 and 2

4.14 Weak and diffuse parallel positive magnetic anomalies were detected across both areas, aligned broadly north-east/south-west. These anomalies almost certainly reflect traces of former ridge and furrow cultivation.

4.15 A positive magnetic lineation in the western part of Area 2 may reflect a former headland associated with the ploughing, or a soil-filled ditch.

Area 3

4.16 A series of very weak parallel positive magnetic lineations were detected aligned broadly north-west/south-east in this area. The anomalies are narrow and regularly spaced at 6-7m intervals, and are likely to reflect land drains.

4.17 A number of weak and irregular anomalies were also detected in this area; these are likely to reflect local geological variation, though it is possible they could reflect the remains of severely truncated ditch features.

Areas 4 and 5

4.18 A number of positive magnetic anomalies detected here almost certainly reflect soil-filled features. The most prominent of these traverses both areas and may represent a former field boundary. The majority of other anomalies are very weak but could reflect former ditch features. One feature in Area 4 appears to comprise a series of discrete anomalies, possibly indicating a line of small pits or postholes.

5. Conclusions

5.1 Geophysical surveys have been carried out on land to both sides of the A19(T) near the Black Swan public house, East Rounton, North Yorkshire.

5.2 Traces of former ridge and furrow cultivation have been detected in both small survey areas to the west of the A19, together with one possible ditch feature.

5.3 A possible former field boundary has been detected to the east of the A19. A number of weaker anomalies here could reflect the truncated remains of other soil-filed features.

6. References

David, A, 1995 *Geophysical survey in archaeological field evaluation,* Research and Professional Services Guideline **1**, English Heritage

Gaffney, C, Gater, J & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*, Technical Paper **6**, Institute of Field Archaeologists

Schmidt, A, 2001 *Geophysical Data in Archaeology: A Guide to Good Practice*, Archaeology Data Service, Arts and Humanities Data Service

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Figure 1
Location of the site

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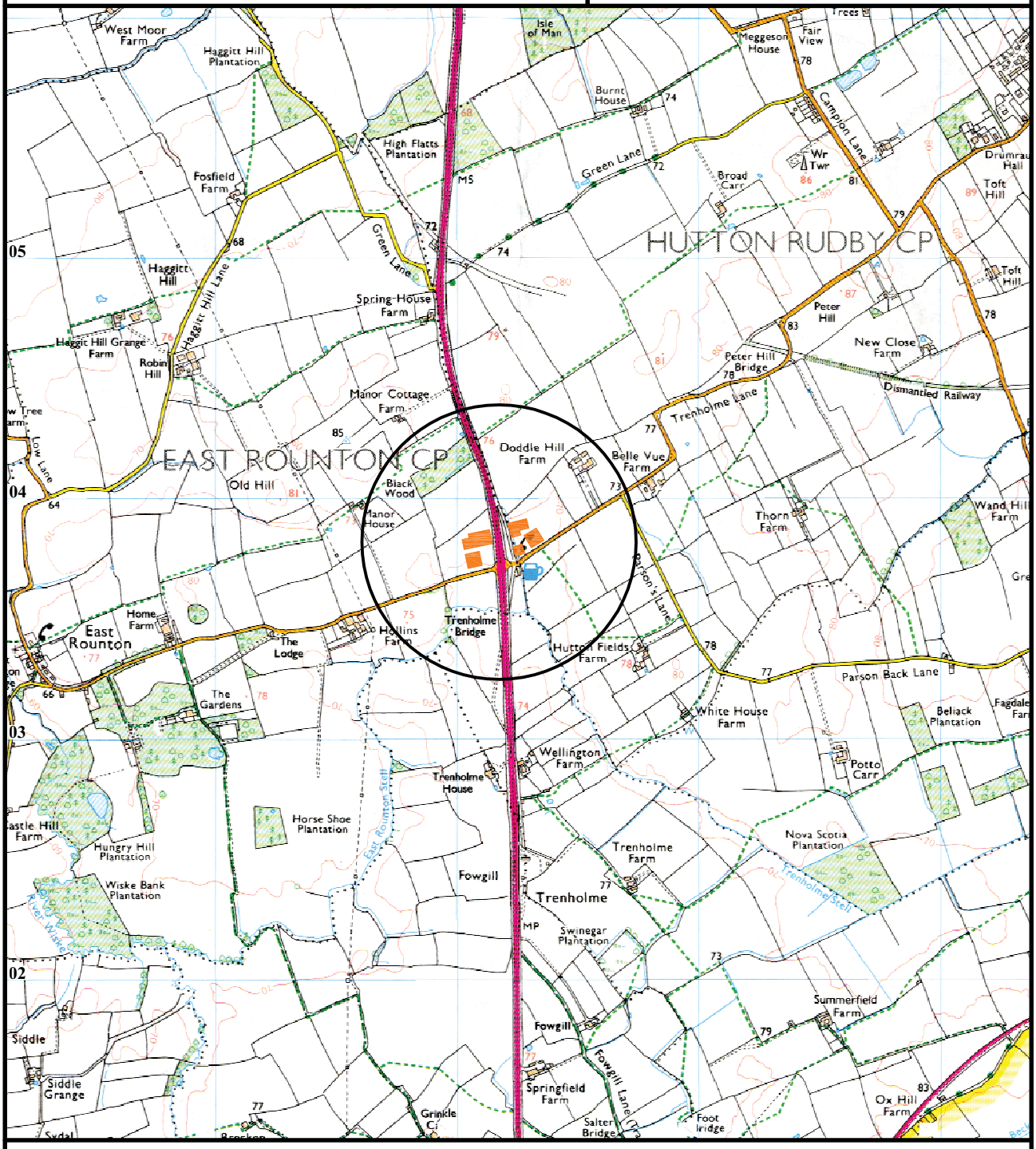

location of surveys

0 1km

scale 1:25 000 - for A4 plot

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S2: E444038.44 N503769.32
S3: E444034.33 N503788.77
S4: E444139.56 N503872.00
S5: E444292.12 N503917.15
S6: E444230.05 N503838.74
S7: E444281.90 N503847.35
S8: E444364.18 N503826.98
S9: E444273.80 N503811.23
S10: E444246.99 N503761.42

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0 50m
scale 1:1000 - for A2 plot

outline of survey area

10.41
8.68
6.94
5.21
3.47
1.74
0
-1.74
-3.47
-5.21
-6.94
-8.68
-10.41 nT

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Figure 2

Areas 1-5, geophysical surveys

S1: E444109.43 N503722.98

S2: E444038.44 N503769.32

S3: E444034.33 N503788.77

S4: E444139.56 N503872.00

S5: E444292.12 N503917.15

S6: E444230.05 N503838.74

S7: E444281.90 N503847.35

S8: E444364.18 N503826.98

S9: E444273.80 N503811.23

S10: E444246.99 N503761.42

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0 50m

scale 1:1000 - for A2 plot

outline of survey area

positive magnetic anomalies

negative magnetic anomalies

dipolar magnetic anomalies

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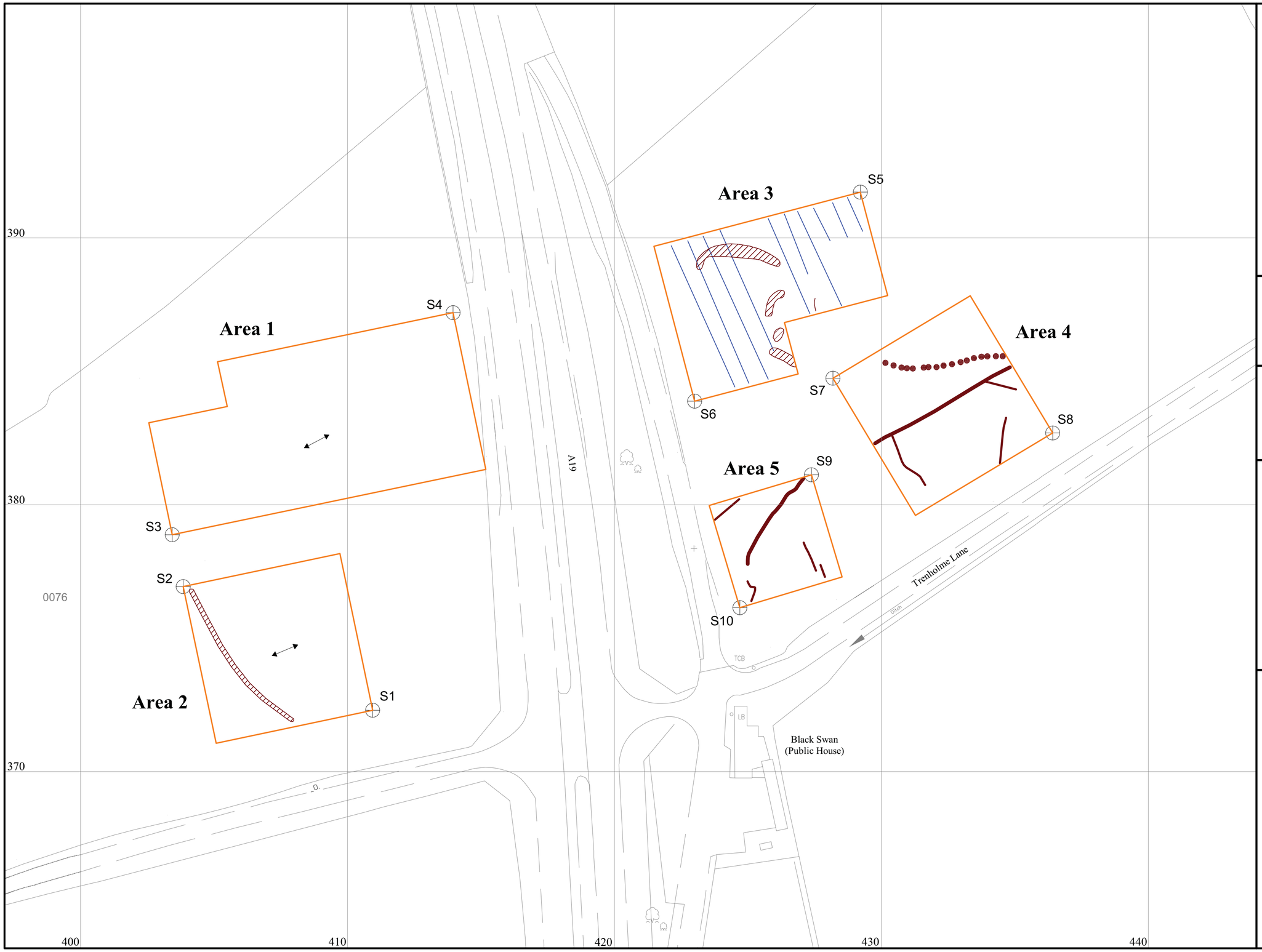
Figure 3

Areas 1-5, geophysical interpretations



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S7: E444281.90 N503847.35

S8: E444364.18 N503826.98

S9: E444273.80 N503811.23

S10: E444246.99 N503761.42

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0 50m

scale 1:1000 - for A2 plot

outline of survey area

soil-filled features

land drain

orientation of ridge and furrow

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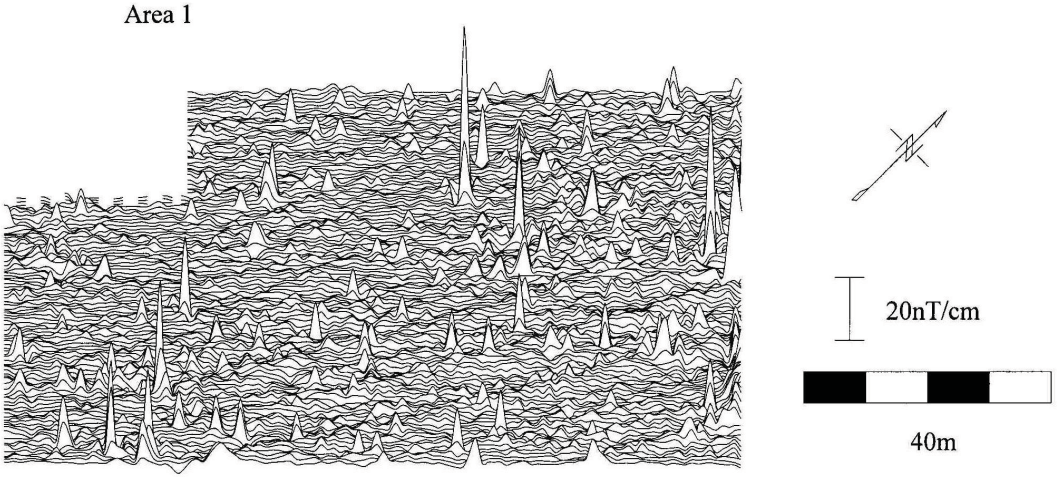
Figure 4

Areas 1-5, archaeological interpretations

Appendix I: Trace plots of geophysical data

Area 1



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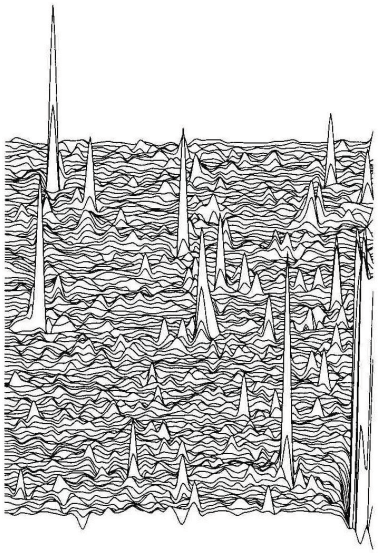

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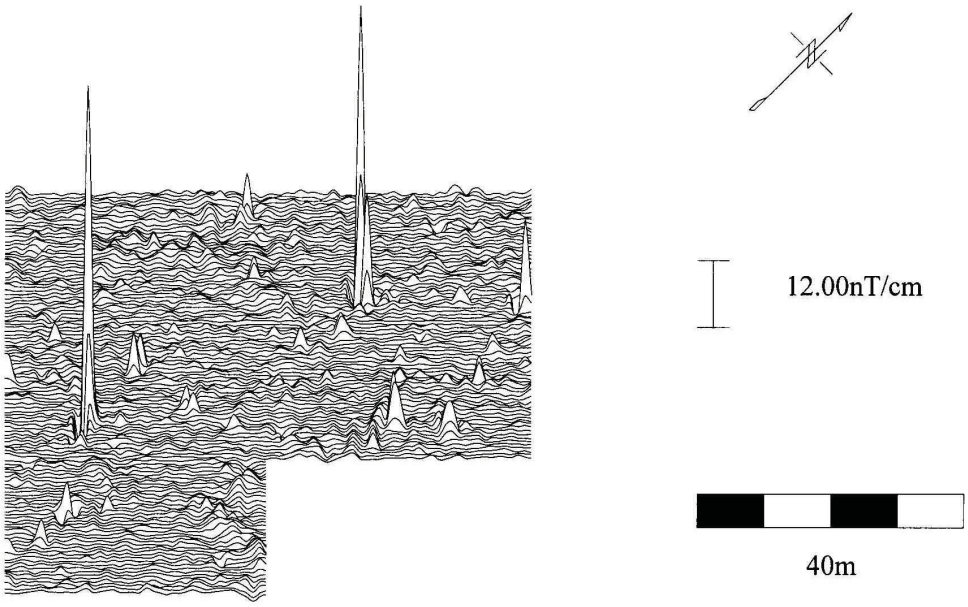

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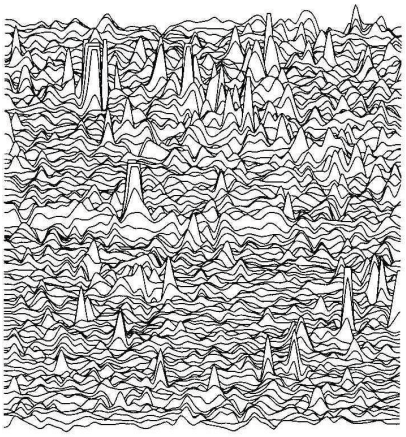

Area 5