Archaeological Services
University of Durham

Land at Greatham, Hartlepool, Teesside

geophysical survey

on behalf of
Tees Valley Archaeology

Report 1633
March 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

Land at Greatham, Hartlepool, Teesside

geophysical survey

Report 1633

March 2007

Archaeological Services Durham University

on behalf of

Tees Valley Archaeology

16 College Square, Stokesley, North Yorkshire, TS9 5DL

Contents

1. Summary

The project

1.1 This report presents the results of a geophysical survey conducted in advance of proposed development at Station Road, Greatham. The works comprised a magnetometer survey.

1.2 The works were commissioned by Tees Valley Archaeology and conducted by Archaeological Services in accordance with a Written Scheme of Investigation provided by Archaeological Services.

Results

1.3 Anomalies which may reflect the presence of soil-filled features such as pits and ditches have been identified towards the centre of the survey area.

1.4 No other features of likely archaeological significance have been identified within the survey.

2. Project background

Location (Figure 1)

2.1 The study area is located at Greatham, Hartlepool, Teesside (NGR: NZ 4949 2747). The survey area was approximately 1ha and was bounded on all sides by hedgerows.

Development proposal

2.2 The site is under consideration for a residential development.

Objective

2.3 The principal aim of the survey 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 a Brief provided by Tees Archaeology.

Dates

2.5 Fieldwork was undertaken on the 19th February 2007. This report was prepared between 2nd and 7th March 2007.

Personnel

2.6 Fieldwork was conducted by Graeme Attwood (Supervisor) and Edward Davies. This report was prepared by Graeme Attwood with illustrations by David Graham. The Project Manager was Duncan Hale.

Archive/OASIS

2.7 The site code is **GSR07**, for **G**reatham **S**tation **R**oad 20**07**. The survey archive will be supplied on CD to client for deposition with the project archive. 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**-24779.

3. Archaeological and historical background

3.1 Greatham was the administrative head of an Anglo-Saxon estate held by the monastery at Hartlepool. The form the settlement took is unknown, though the presence of Saxon sculptured stones (SMR 1270) preserved at the Church of St. John the Baptist (SMR 0645), suggest that this may have formed the centre.

3.2 The proposed development lies within the medieval village of Greatham (SMR 0602). Architectural elements of the church of St. John the Baptist (SMR 0645) date to the 12th century. A hospital was founded in Greatham in 1272 (SMR 0643).

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised an area of scrub land which had at times been used for flytipping.

4.2 The survey area was predominantly level at a mean elevation of *c*.20m OD.

4.3 The underlying solid geology of the area comprises Permian and Triassic sandstones, which are overlain by bolder clay and morainic drift.

5. Geophysical survey

Standards

5.1 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

5.2 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 resistance, 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.

5.3 In this instance, it was considered likely that cut features, such as ditches and pits, could 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.

5.4 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

5.5 A 30m grid was established across the survey area and tied-in to known, mapped Ordnance Survey points Trimble Pathfinder Pro XRS global positioning system (GPS) with subsequent RINEX calibration.

5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 fluxgate gradiometers. A zig-zag traverse scheme was employed and data were logged in 30m grid units. 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.

5.7 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

5.8 Geoplot v.3 software was used to process the geophysical data and to produce both a continuous tone greyscale image and a trace plot of the raw (unfiltered) data. The greyscale image and interpretations are presented in Figures 2-4; the trace plot is provided in Appendix I. In the greyscale image, 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.

5.9 The following basic processing functions have been applied to the data dataset:

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.
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

5.10 A colour-coded geophysical interpretation plan is provided. 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

5.11 A colour-coded archaeological interpretation plan is provided in Figure 4.

5.12 A chain of dipolar magnetic anomalies orientated northeast-southwest was detected and reflects the presence of a service pipe.

5.13 Several small positive magnetic anomalies have been identified across the survey area; these could represent the remains of soil-filled features, possibly pits.

5.14 A linear positive magnetic anomaly was detected orientated northwest-southeast. This may reflect the presence of a soil-filled feature, possibly a ditch.

5.15 The only other anomalies detected here are small, discrete dipolar magnetic anomalies. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments.

6. Conclusions

6.1 A geomagnetic survey has been carried out on land at Greatham, Hartlepool.

6.2 Anomalies which may reflect the presence soil-filled features such as pits and ditches have been identified towards the centre of the survey area.

6.3 No other features of likely archaeological significance have been identified within the surveys.

7. Sources

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

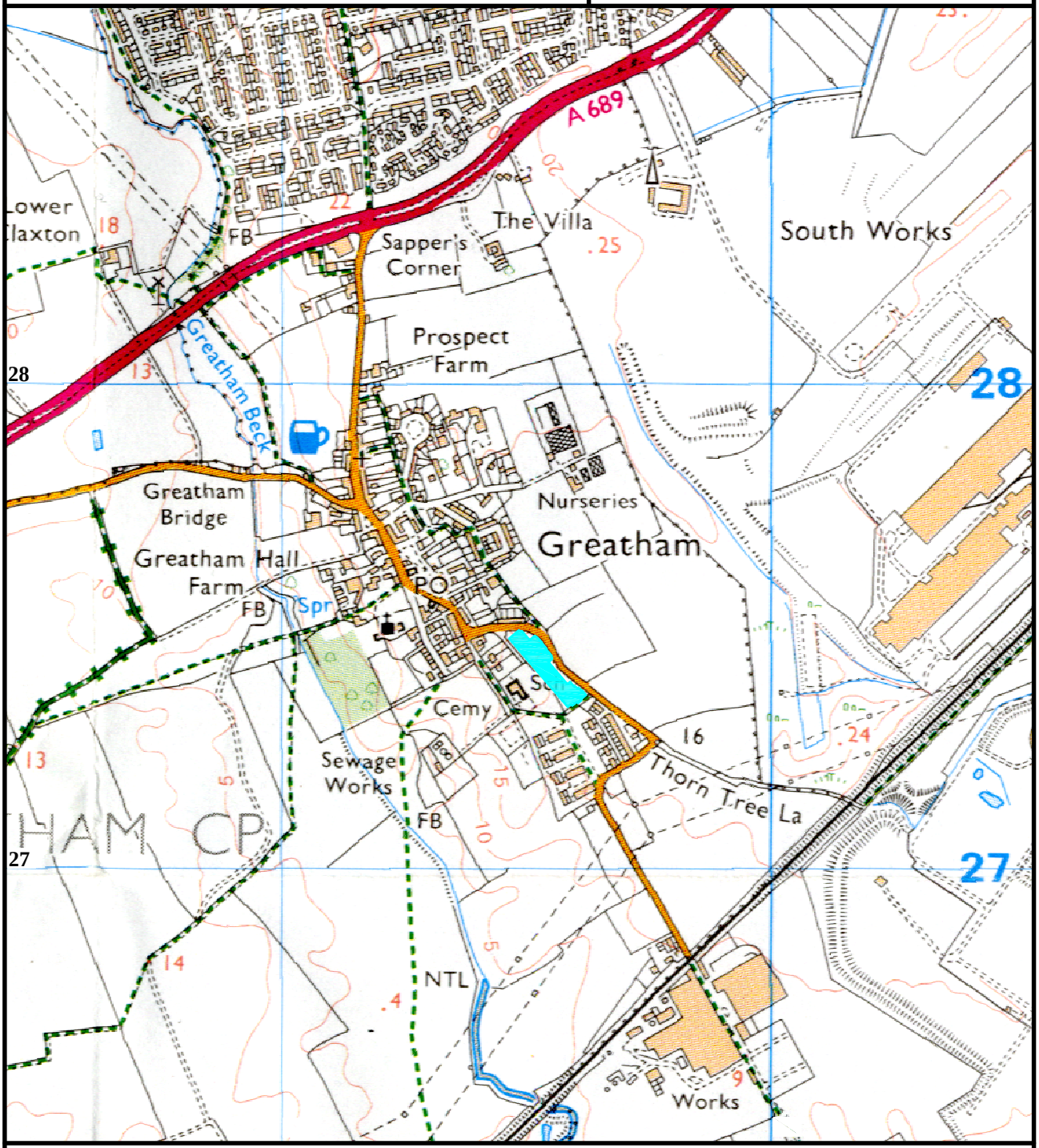
Archaeological Services
University of Durham

Land at Greatham, Hartlepool, Teesside

geophysical survey

Report 1633
Figure 1
Extract from 306

on behalf of
Tees Valley Archaeology

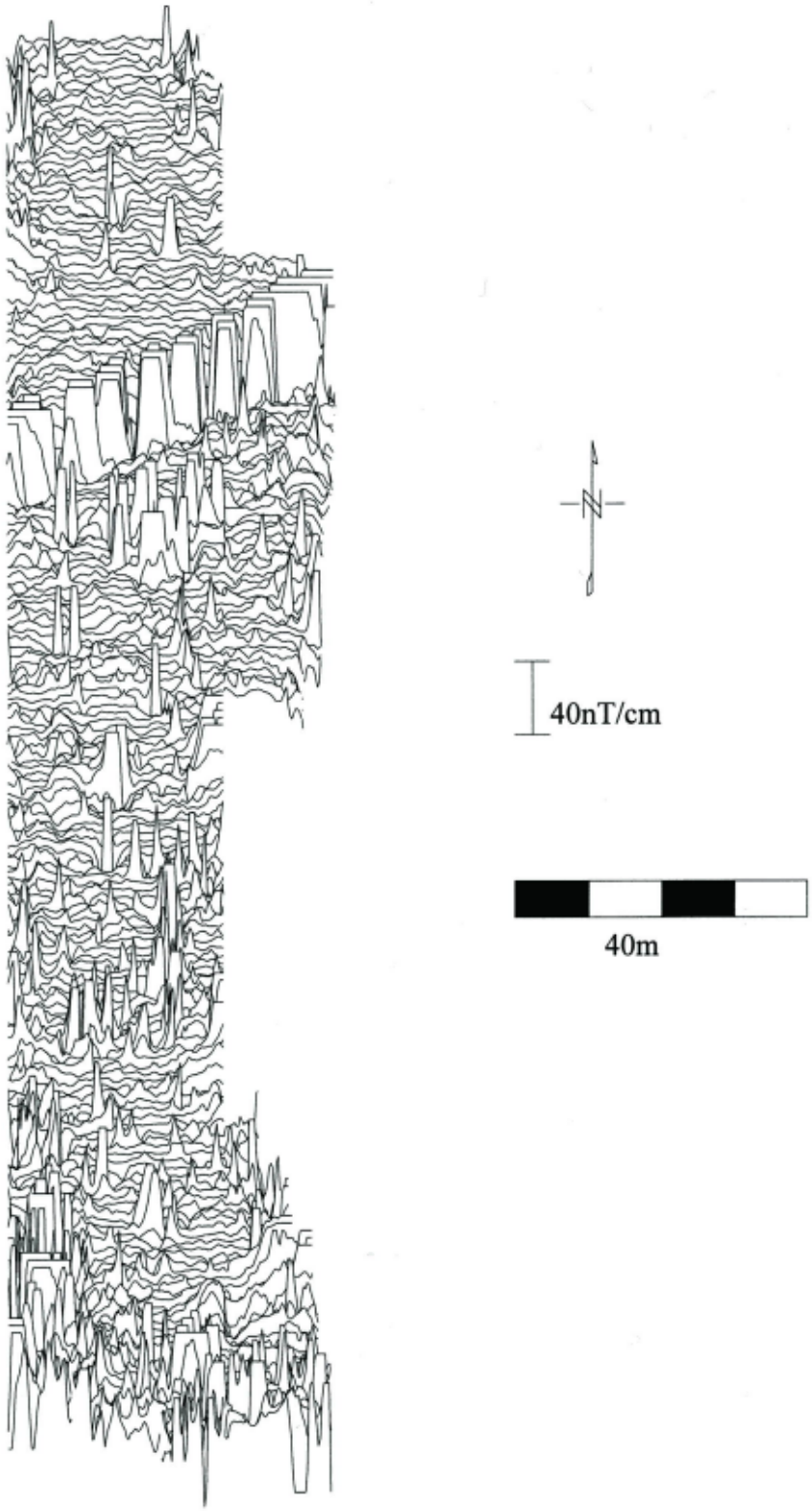


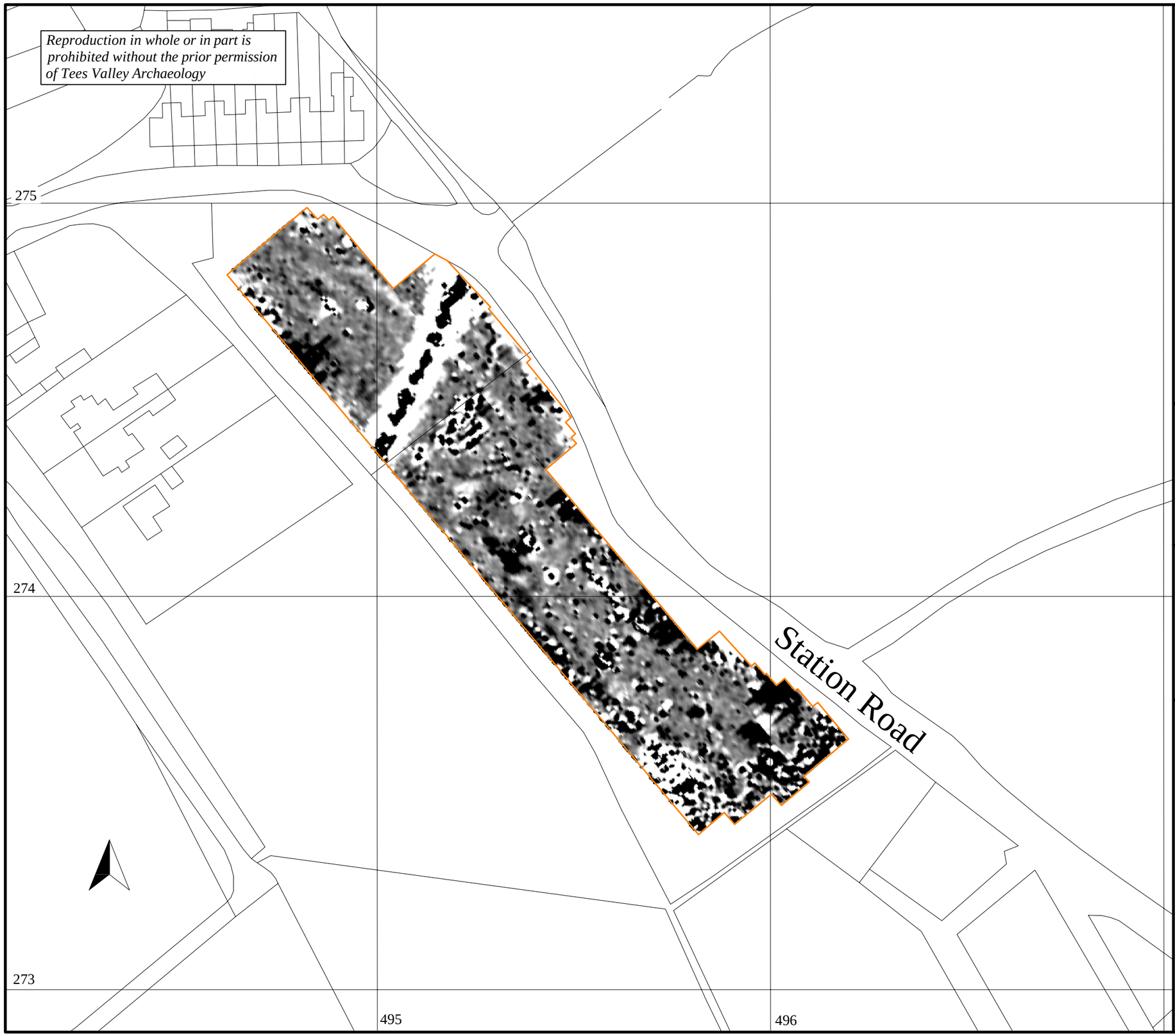
survey area

0 500m

scale 1:12 500 - for A4 plot

Appendix I: Trace plot of geophysical data





Archaeological Services
University of Durham

Land at Greatham, Hartlepool, Teesside

geophysical survey

Report 1633

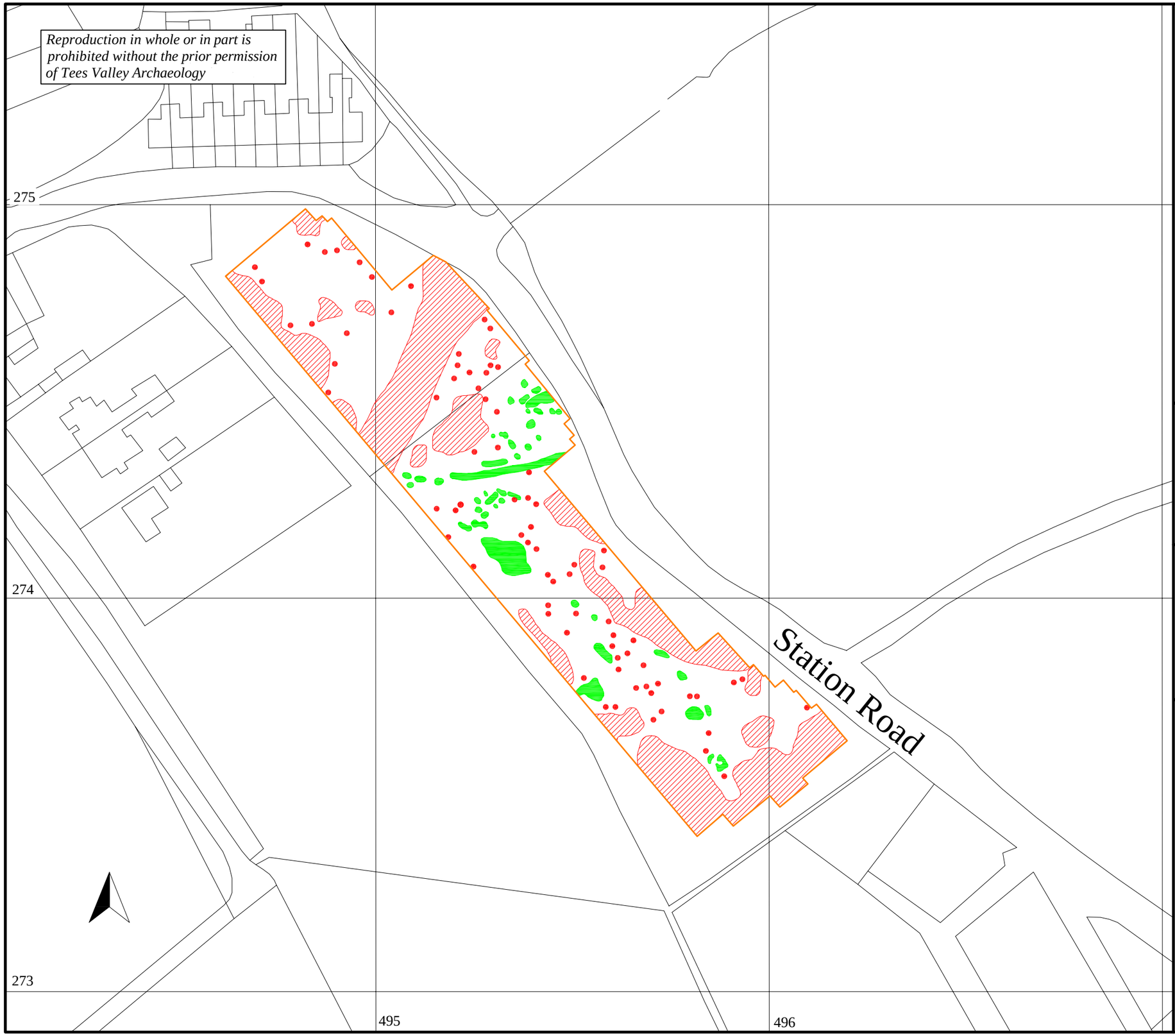
Figure 2
Geophysical survey

on behalf of
Tees Valley Archaeology

0 50m
scale 1:1000 - for A3 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



Archaeological Services
University of Durham

Land at Greatham, Hartlepool, Teesside

geophysical survey

Report 1633

Figure 3

Geophysical interpretation

on behalf of
Tees Valley Archaeology

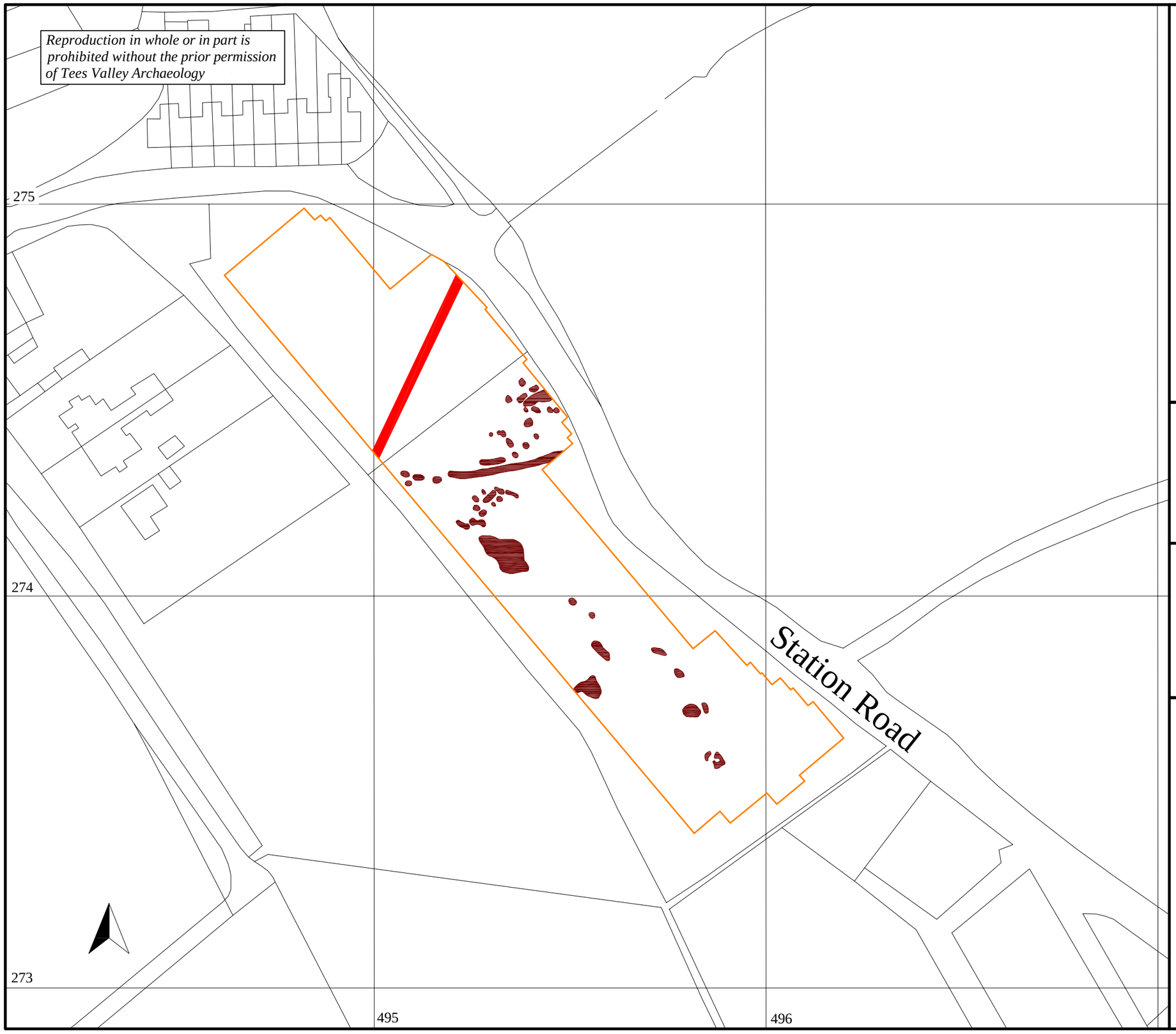
0 50m

scale 1:1000 - for A3 plot

outline of survey area

positive magnetic anomalies

dipolar magnetic anomalies



Archaeological Services
University of Durham

Land at Greatham, Hartlepool, Teesside

geophysical survey

Report 1633

Figure 4

Archaeological interpretation

on behalf of
Tees Valley Archaeology

0 50m

scale 1:1000 - for A3 plot

outline of survey area

soil-filled features

service pipe