Archaeological Services
University of Durham

Land south of Freemans Way, Leeming Bar, North Yorkshire

geophysical survey

on behalf of
LNT Construction Ltd

Report 1534
September 2006

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2150 Century Way, Thorpe Park, Leeds, LS15 8ZB

Contents

1. Summary

The project

1.1 This report presents the results of a geophysical survey conducted in advance of a proposed development on land south of Freemans Way, Leeming Bar, North Yorkshire.

1.2 The works were commissioned by LNT Construction Ltd and conducted by Archaeological Services in accordance with a Written Scheme of Investigation (WSI) provided by the Heritage Section of North Yorkshire County Council.

Results

1.3 Evidence of ridge and furrow cultivation, which can date from the medieval period to the late 19th century, has been detected throughout the study area.

1.4 Soil-filled features, possibly ditches, have been detected in the northern part of the area. Some of these may pre-date the ridge and furrow remains.

Recommendations

1.5 Some of these features may warrant further investigation by means of trial trenching.

2. Project background

Location (Figure 1)

2.1 The study area is located at the southern edge of Leeming Bar, north of Bedale Beck and east of the A1 road (centred at NGR: SE 2884 8977). The site occupies an area of approximately 1.2 hectares and is bounded to the north by properties on Freemans Way, to the east by Leeming Lane, to the south by Leeming Garth Manor nursing home and to the west by agricultural land.

Development proposal

2.2 The proposed development comprises the construction of a two-storey building to be used as a residential care home for older people.

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 works have been undertaken in accordance with a Written Scheme of Investigation prepared by the Senior Archaeologist in the Heritage Section of North Yorkshire County Council.

Dates

2.5 The geophysical survey was undertaken on 11th September 2006. This report was prepared between 12th and 14th September 2006.

Personnel

2.6 Survey was conducted by Lorne Elliott (supervisor) and Bryan Atkinson. This report was prepared by Lorne Elliott with illustrations by David Graham. The Project Manager was Duncan Hale.

Archive/OASIS

2.7 The site code is **LBF06**, for **L**eeming **B**ar, **F**reemans Way 20**06**. A copy of the project archive (on one CD) will be transferred to the County HER with a hard copy of this report. Archaeological Services Durham University 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 **archaeol3-18192**.

3. Archaeological and historical background

3.1 The proposed development site lies within an area of potential archaeological significance. The course of Dere Street Roman Road runs through fields to the northeast and southeast of the area. The road crosses Bedale Beck at Leeming Bar and makes a reversed curve, possibly to keep on firm ground (Margary 1973). The road partially survives as a shallow earthwork to the rear of Garth

Cottage and No.12 Leeming Lane. It then crosses Leeming Lane and heads northwest to the rear of properties on the north side of Leeming Lane. The point where Dere Street crosses Bedale Beck has been suggested as a location for a Roman fort, such as at Healam Bridge and Roecliffe to the south. However, due to the close proximity of Leeming Bar to the fort at Catterick, approximately 7 miles to the north, Roman activity is more likely to represent a roadside settlement, or waterside activity.

3.2 Previous geophysical surveys undertaken around Leeming Bar for the A1 Dishforth to Barton Improvement detected widespread evidence for ridge and furrow cultivation, and former rectilinear field systems to the west of the current study area (Archaeological Services 2005 & 2006).

3.3 There is the potential for any surviving remains of the Roman (or any other) period to be disturbed or destroyed by the proposed development.

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area was in use as a grass paddock for horses and was bounded by a combination of wooden post-and-rail fencing and hedges, with mature trees around the perimeter. Large areas of bramble and nettles covered the northern and southern boundaries. Gated access to the site was from the eastern end of Freemans Way.

4.2 The survey area was predominantly level at a mean elevation of *c*.36m OD.

4.3 The soils of the area are of the Wick 1 Association (541r), occurring on glaciofluvial or river terrace drift (Soil Survey of England and Wales 1983). The solid geology of the area is undifferentiated Permian and Triassic sandstone (British Geological Survey 2001).

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 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.

5.3 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.

5.4 Given the anticipated shallowness of the 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 using a Leica TR307 total survey station instrument equipped with a datalogger and *Penmap* software.

5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 fluxgate gradiometers with automatic datalogging facilities. 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 data. The greyscale images 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:

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 0.25m intervals.

Interpretation: anomaly types

5.10 A colour-coded geophysical interpretation plan is provided in Figure 3. Three 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.
negative magnetic	regions of anomalously low or negative magnetic field gradient, which may correspond to features of low magnetic susceptibility such as wall footings and other concentrations of sedimentary rock or voids.
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 series of alternate positive and negative magnetic lineations on an approximate northeast-southwest alignment and spaced at regular intervals was detected across the survey area. This almost certainly reflects former ridge and furrow cultivation, which was evident on the ground in the western part of the area.

5.13 Two weak parallel positive magnetic anomalies, with a northwest-southeast orientation, were detected in the central part of the survey area. An additional short anomaly was also detected perpendicular to the other two. These probably reflect soil filled features such as ditches and appear to pre-date the ridge and furrow.

5.14 A linear positive magnetic anomaly detected in the northern part of the survey on a northeast-southwest alignment may also reflect a soil-filled ditch. This may be associated with two other positive magnetic anomalies to the east, all of which appear to post-date the ridge and furrow.

5.15 A concentration of strong dipolar magnetic anomalies detected in the central part of the survey area represents building rubble scattered on the surface.

5.16 A curvilinear chain of intense dipolar magnetic anomalies in the southeast of the survey may reflect a buried utility or clinker/brick-based path.

5.17 A linear concentration of positive magnetic anomalies was detected on a north-south alignment across the eastern part of the survey area. This corresponds to a former track shown on Ordnance Survey maps.

5.18 A scatter of small discrete dipolar magnetic anomalies across the survey area almost certainly reflects near-surface soil litter of fired and ferrous materials.

6. Conclusions

6.1 A fluxgate gradiometer survey was undertaken on land south of Freemans Way, Leeming Bar, North Yorkshire, in order to assess the potential survival of archaeological features prior to development of a residential care home.

6.2 Evidence of ridge and furrow cultivation, which can date from the medieval period to the late 19th century, was detected throughout the study area.

6.3 Probable ditch features were also detected. Those in the central part of the survey area may pre-date the ridge and furrow while those in the northeast appear to be later features.

6.4 Some of these features may warrant further investigation by means of trial trenching.

7. Sources

Archaeological Services 2005 *A1(T) Dishforth to Barton Improvement, North Yorkshire: geophysical surveys Vols I-III*, unpublished report **1121** for AMEC, Archaeological Services Durham University

Archaeological Services 2006 *A1(T) Dishforth to Barton Improvement, North Yorkshire: Phase 2 geophysical surveys*, unpublished report **1368** for AMEC, Archaeological Services Durham University

British Geological Survey 2001 *Solid Geology Map UK South Sheet* 4th Edition

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

Margary, I D, 1973 *Roman Roads in Britain*

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

Soil Survey of England and Wales 1983 *Soils of Northern England, Sheet 1*

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Figure 1
Location of the site

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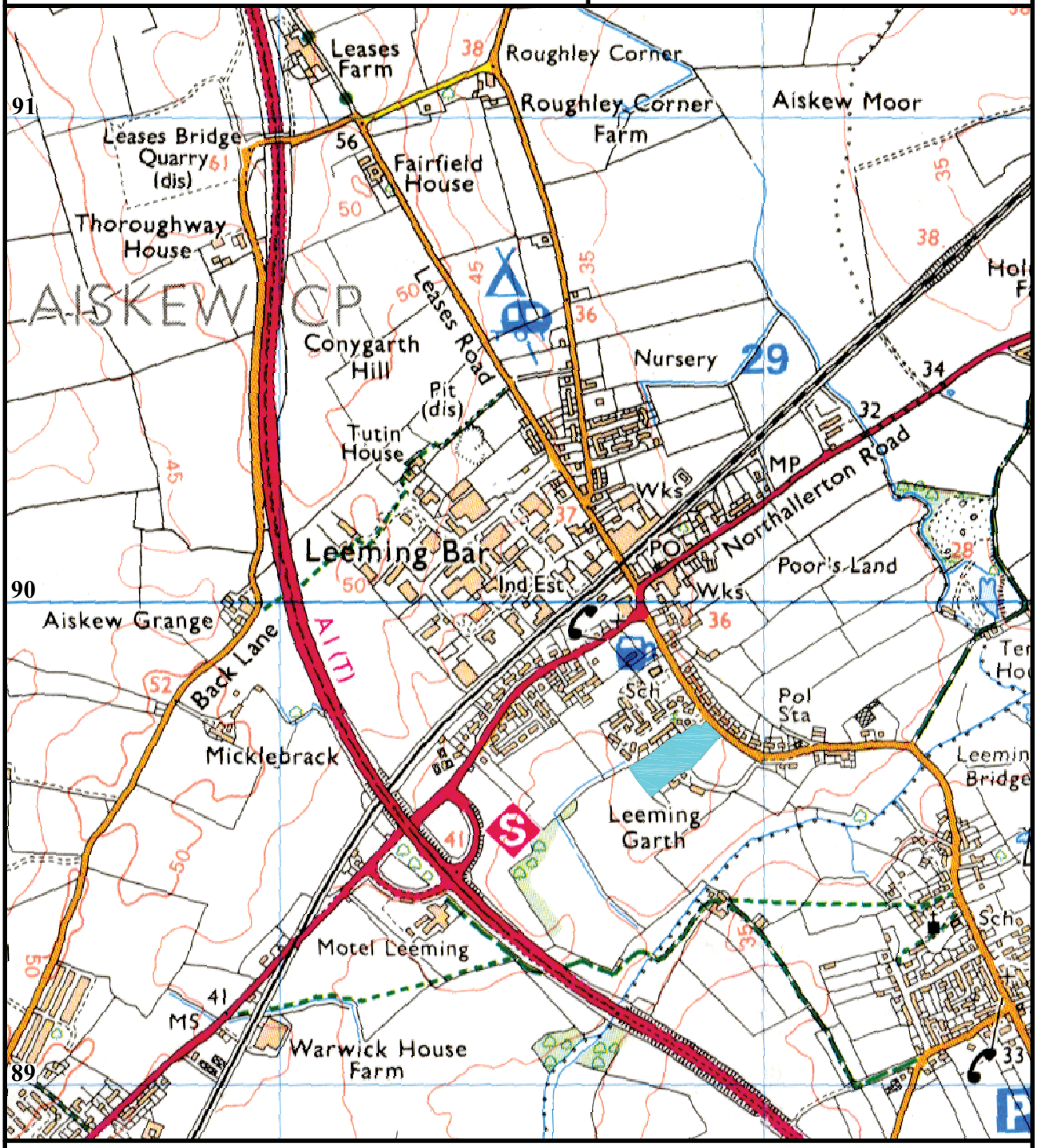

proposed development area

0 500m

scale 1:12 500 - for A4 plot

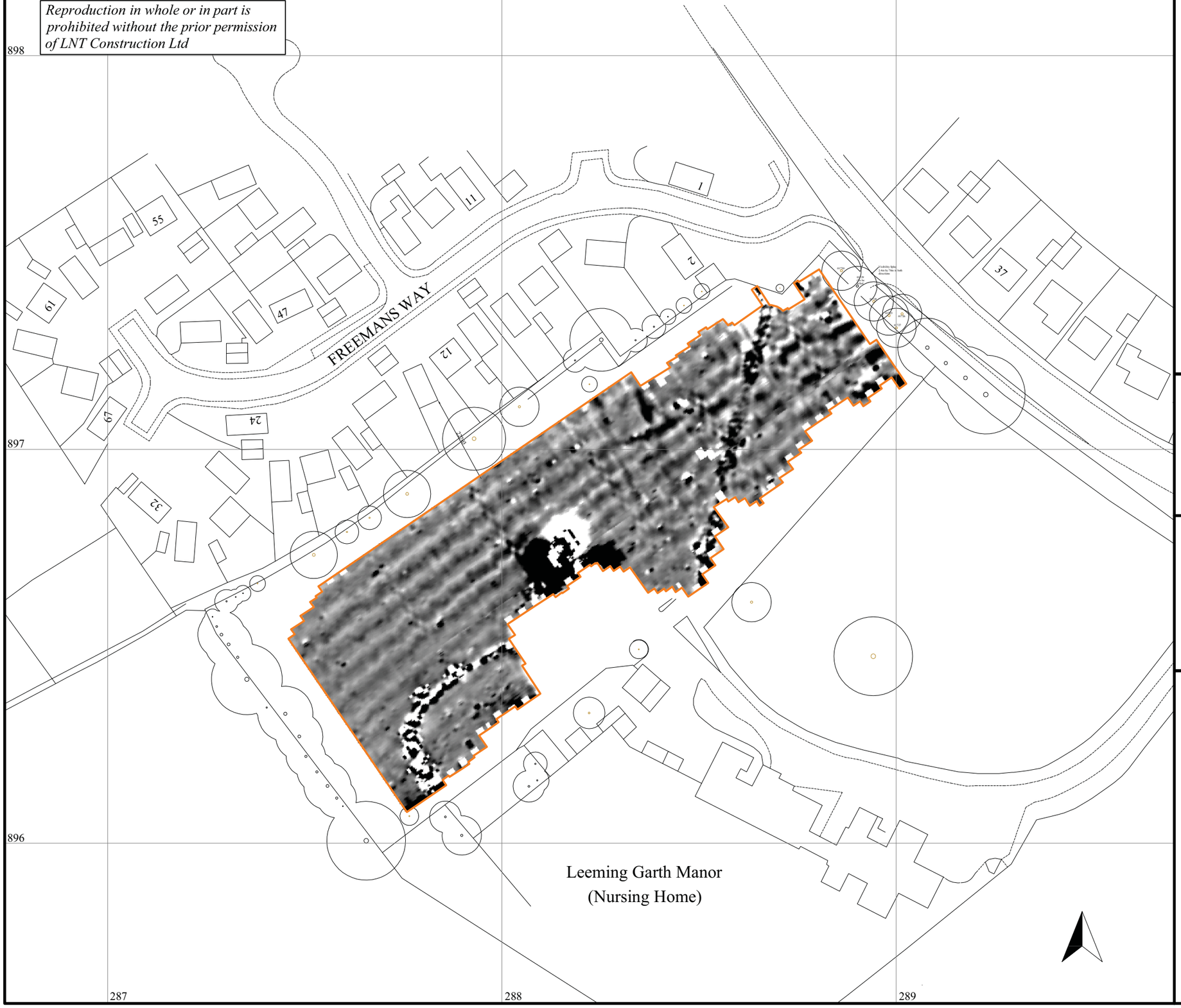

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Figure 2

Geophysical survey

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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

898

897

896

287

288

289

FREEMANS WAY

55

19

47

11

1

2

37

12

67

24

32

Leeming Garth Manor
(Nursing Home)

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Figure 3

Geophysical interpretation

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0 50m

scale 1:1000 - for A3 plot

outline of survey area

positive magnetic anomalies

negative magnetic anomalies

dipolar magnetic anomalies

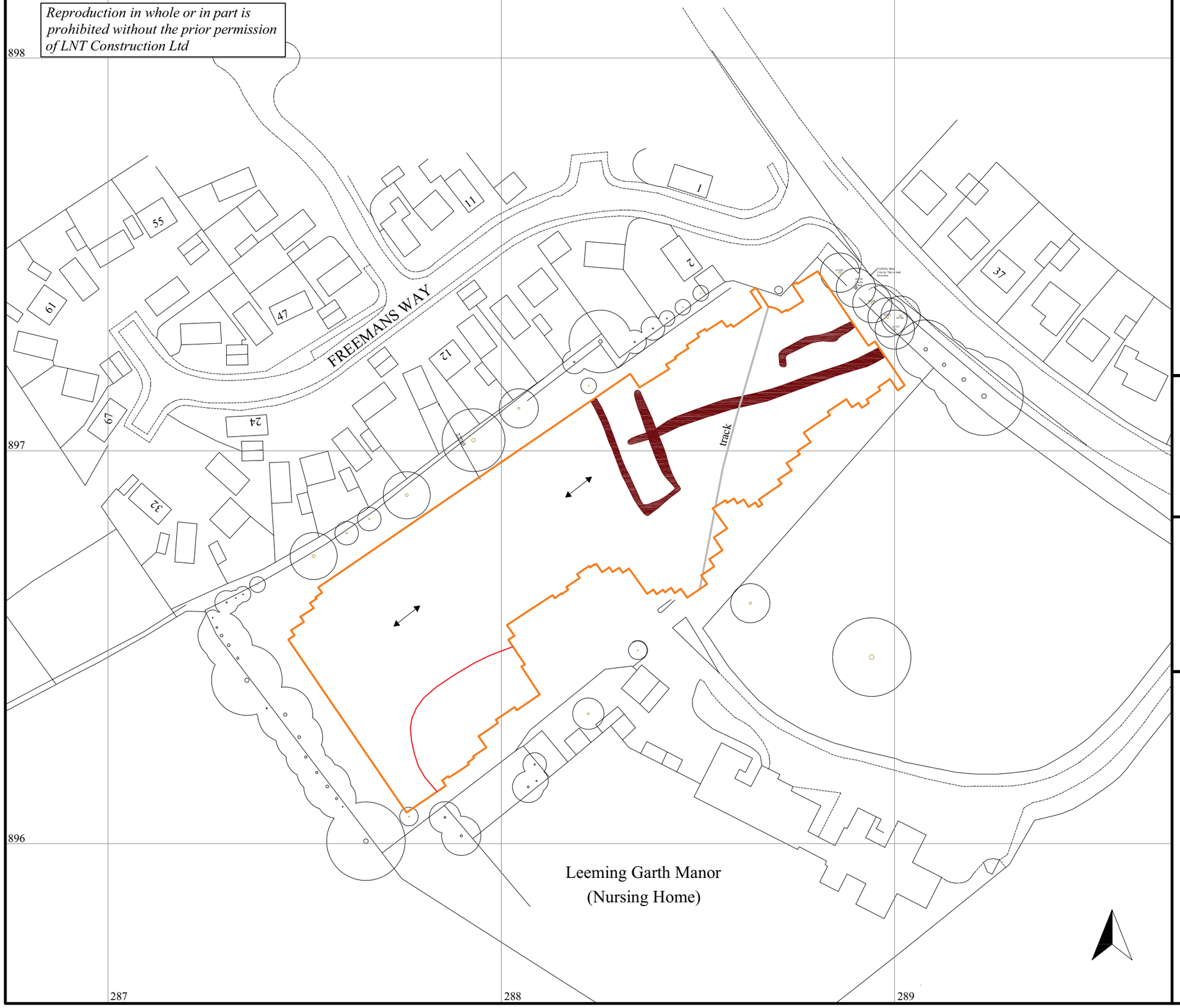

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Figure 4

Archaeological interpretation

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0 50m

scale 1:1000 - for A3 plot

- outline of survey area
- soil-filled features
- ? service / path
- orientation of ridge and furrow
- track

Appendix I: Trace plot of geophysical data

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Geomagnetic data

Trace Plot