



Archaeological Services
University of Durham

East vicus at Longovicium, Lanchester, **County Durham**

geophysical surveys

on behalf of

The Friends of *Longovicium*

Report 2102
October 2008

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1. Summary

The project

- 1.1 This report presents the results of geophysical surveys conducted over the *vicus* area to the east of *Longovicium* Roman Fort at Lanchester in County Durham.
- 1.2 The works were conducted by The Friends of *Longovicium* assisted by personnel from Archaeological Services.

Results

- 1.3 Area 1 clearly showed the continuation of the *vicus* on the eastern side of the fort in the form of a series of possible stone-founded buildings to either side of Dere Street.
- 1.4 The survey within Area 2 shows that the *vicus* does not appear to extend beyond the field boundary between Areas 1 and 2, though there are features in this area which are possibly archaeological in origin.

2. Project background

Location (Figure 1)

- 2.1 The study area was located west of the town of Lanchester and east of the Roman fort of *Longovicium*, County Durham (NGR centre: NZ 1610 4700). The survey area measured 0.5 hectares and is bounded to the north by the B2696 and to the east, west and south by farmland.

Objective

- 2.2 The principal aim of the surveys was to assess the nature and extent of any sub-surface features of potential archaeological significance within the survey area, in particular to determine the eastern extent of the *vicus* on the eastern side of the fort and the alignment of Dere Street Roman road.

Methods statement

- 2.3 The surveys have been undertaken in accordance with instructions from The Friends of *Longovicium* and a licence granted by English Heritage under Section 42 of the Ancient Monuments and Areas Act 1979 (as amended by the National Heritage Act 1983).

Dates

- 2.4 Fieldwork was undertaken on the 1st October 2008. This report was prepared between 13th and 20th October 2008.

Personnel

- 2.5 Fieldwork was conducted by The Friends of *Longovicium*, assisted by Natalie Swann (Supervisor). This report was prepared by Natalie Swann, with illustrations by David Graham, and edited by Duncan Hale, the Project Manager.

Archive/OASIS

- 2.6 The site code is **LEV08**, for **Lanchester East Vicus 2008**. The survey archive will be supplied on CD to the Bowes Museum and the English Heritage Geophysics Team in due course. Archaeological Services University of Durham is registered with the **Online Access to the Index of archaeological investigationS** project (OASIS). The OASIS ID number for this project is **archaeol3-49825**.

3. Archaeological and historical background

- 3.1 The Roman fort of *Longovicium* was built at around AD150 and covers an area of 2.3ha. It was rebuilt around AD230 and again in the early 4th century. The fort was a later addition to a chain of defensive forts along the roman road of Dere Street.
- 3.2 Previous archaeological work has shown that the interior of the fort could have held up to 1000 soldiers and included barracks, granaries and a *praetorium* or commandant's house. Outside the fort it has been shown that there was an

extensive vicus to the north, south and east and along the line of Dere Street, and an aqueduct and a cemetery to the southwest. The locations of previous geophysical surveys are shown in Figure 2.

4. Landuse, topography and geology

- 4.1 At the time of the survey the area comprised three fields of pasture; ridge and furrow cultivation was evident as upstanding earthworks in the northeast field. The western edge of Area 2 was overgrown with nettles and thistles.
- 4.2 The survey area sloped downwards from *c.*170m OD in the west to *c.*160m OD in the east.
- 4.3 The underlying solid geology of the area comprises Pennine Lower Coal Measures, which are overlain by boulder clay.

5. Geophysical survey

Standards

- 5.1 The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in archaeological field evaluation 2nd edition* (David, Linford & Linford 2008); 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, based on previous work, 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 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 20m grid was established across each survey area and tied-in to known, mapped Ordnance Survey points.
- 5.6 Measurements of vertical geomagnetic field gradient were determined using Geoscan FM256 fluxgate gradiometers. A zig-zag traverse scheme was employed and data were logged in 20m 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 1600 sample measurements per 20m grid unit.
- 5.7 Data were downloaded on-site into laptop computers 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 continuous tone greyscale images and trace plots of the raw data. The greyscale images and interpretations are presented in Figures 3-5; the trace plots are provided in Figure 6. 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.
- 5.9 The following basic processing functions have been applied to each dataset:
- | | |
|---------------------------|---|
| <i>zero mean traverse</i> | 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. |
| <i>destagger</i> | corrects for displacement of anomalies caused by alternate zig-zag traverses. |
| <i>interpolate</i> | 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. Three types of geomagnetic anomaly have been distinguished in the data:
- | | |
|--------------------------|---|
| <i>positive magnetic</i> | 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. |
| <i>negative magnetic</i> | 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.

Area 1

- 5.12 Aligned north-south along the length of the survey is a broad band of smooth data which almost certainly represents the Roman road known as Dere Street. The course of this road has previously been identified north of the B2696 (Archaeological Services 2008).
- 5.13 East and west of the road several distinct linear and rectilinear negative magnetic anomalies have been detected. Most of these anomalies are aligned parallel to, or at right angles to, the road and form rectangular enclosures. These negative magnetic anomalies are likely to reflect features such as wall footings or other stone structures and may represent a series of buildings along the line of the Roman road.
- 5.14 There are several other distinct negative magnetic anomalies aligned at a different angle to the road. These may also reflect wall footings or other stone structures distinct from the main roadside buildings.
- 5.15 Within and surrounding the structures there are a number of positive magnetic anomalies. Within the structures it is possible that the large areas of positive magnetic anomalies could reflect floor surfaces. Smaller more discrete anomalies within the structures could reflect hearths and pits or other soil-filled structures.
- 5.16 Outside the structures there are a number of irregularly-shaped positive magnetic anomalies which are likely to reflect soil-filled features such as pits.
- 5.17 There are also a number of linear and rectilinear positive magnetic anomalies. These are likely to reflect ditches and may represent enclosures, possibly of a different date to the roadside structures due to the difference in alignment.
- 5.18 There are also a small number of dipolar magnetic anomalies. These typically reflect ferrous or fired material and could represent hearths.

Area 2

- 5.19 In the northern corner of this area there is a rectangular negative magnetic anomaly which could possibly represent the corner of a building or other structure. West of this feature there is a parallel linear positive magnetic anomaly which is likely to reflect a ditch.

- 5.20 Across the survey area there are a number of positive magnetic anomalies which may reflect soil-filled features such as pits. There are also a number of linear positive magnetic anomalies which may reflect ditches.
- 5.21 A strong dipolar magnetic anomaly on the eastern edge of the survey area may correspond to a well shown on the 3rd edition Ordnance Survey map of 1924.
- 5.22 There are a number of other dipolar magnetic anomalies in this area which may reflect fired or ferrous items beneath the ground such as bricks or could possibly represent hearths or kilns.

6. Conclusions

- 6.1 Geophysical survey was undertaken east of the Roman fort of *Longovicium* to establish the eastern extent of the *vicus*.
- 6.2 Area 1 clearly showed the continuation of the *vicus* on the eastern side of the fort in the form of a number of possible stone buildings to either side of Dere Street.
- 6.3 The survey within Area 2 shows that the *vicus* does not appear to extend beyond the field boundary between Areas 1 and 2, though there are features in this area which are likely to be archaeological in origin.

7. Sources

- Archaeological Services Durham University 2008 *North Vicus at Longovicium, Lanchester, County Durham* unpublished report **1908**, for the Lanchester Partnership, Archaeological Services Durham University
- David, A, Linford, N, & Linford, P, 2008 *Geophysical survey in archaeological field evaluation, 2nd edition*, 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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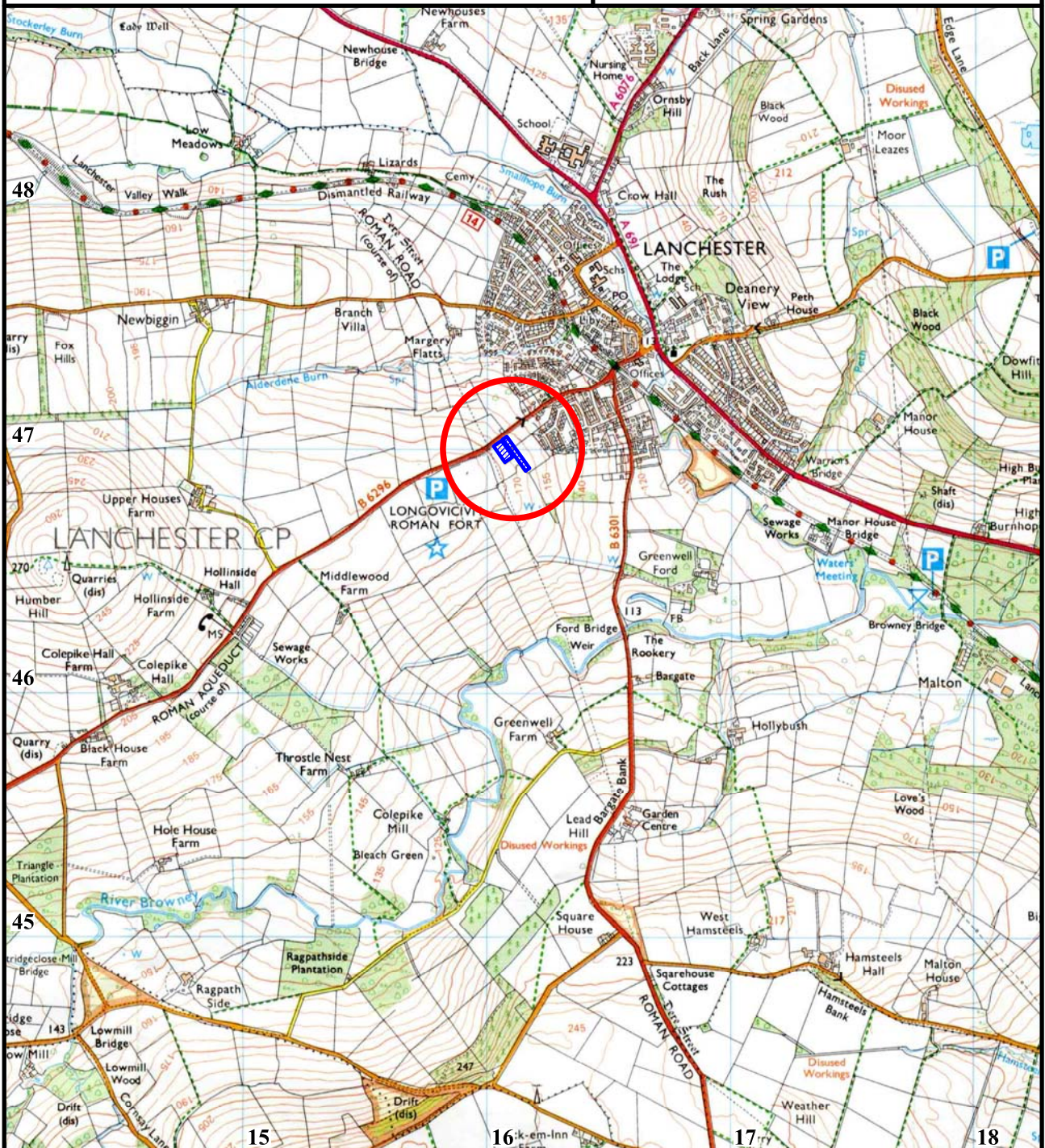
Figure 1

Site location

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location of surveys



scale 1:25 000 - for A4 plot





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Figure 2
Survey areas

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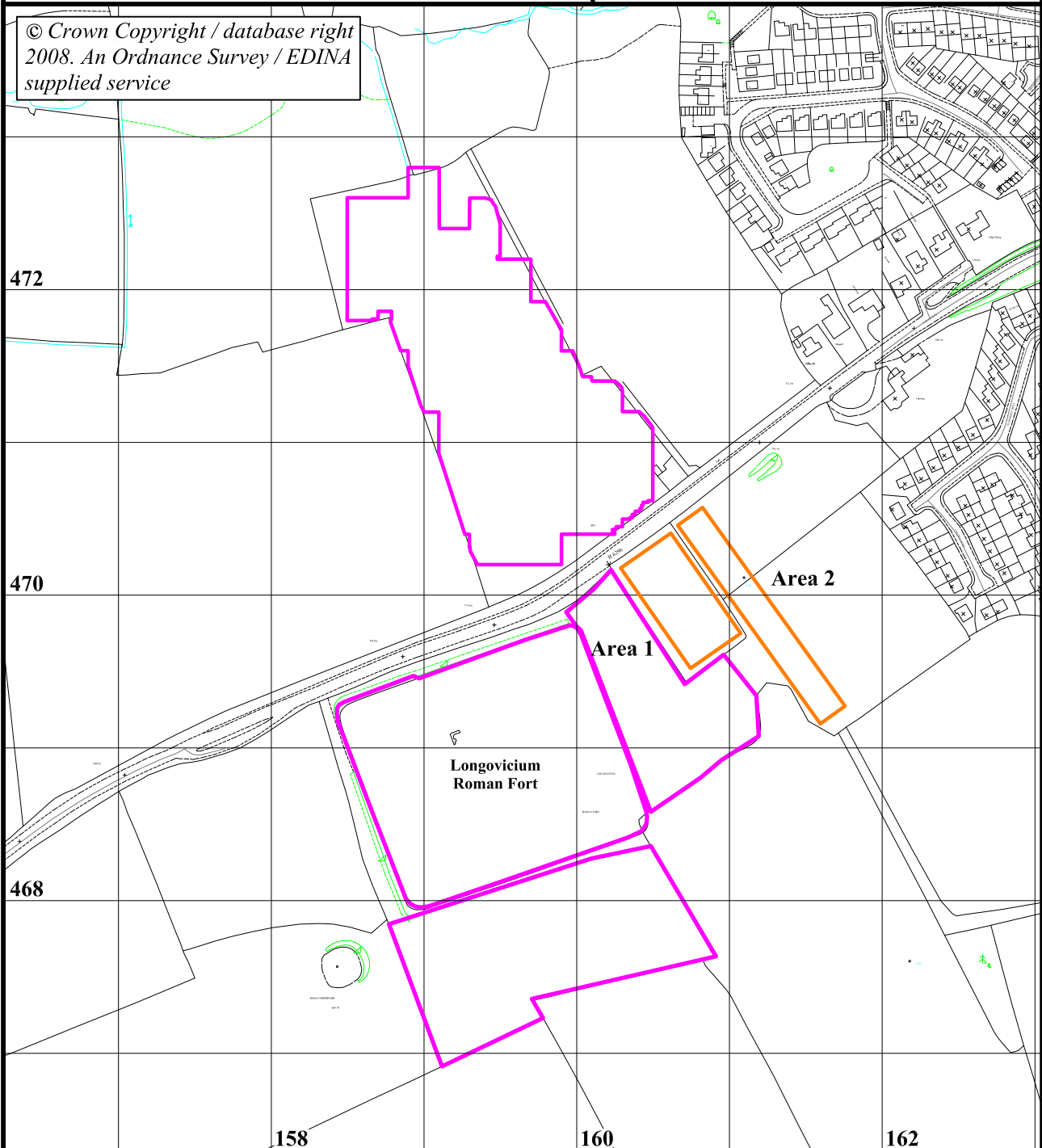
The Friends of *Longovicium*

0 200m



scale 1:4000 - for A4 plot

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survey outline



previous surveys



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Figure 3

Geophysical surveys

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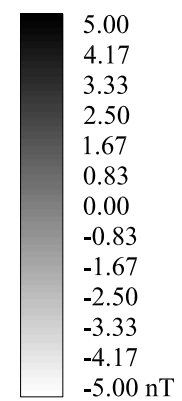
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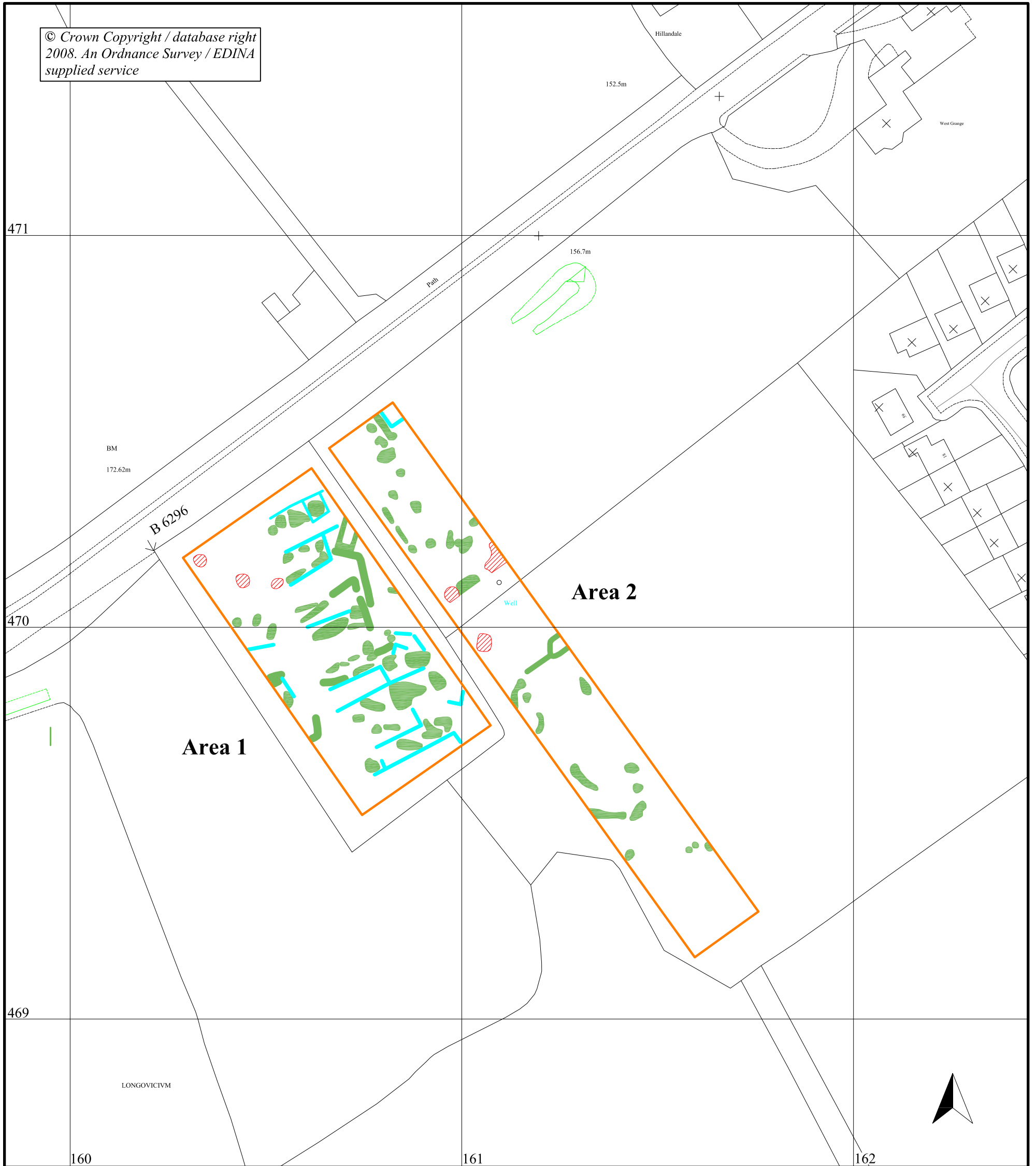
scale 1:1000 - for A3 plot



survey area



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Figure 4





Geophysical interpretation

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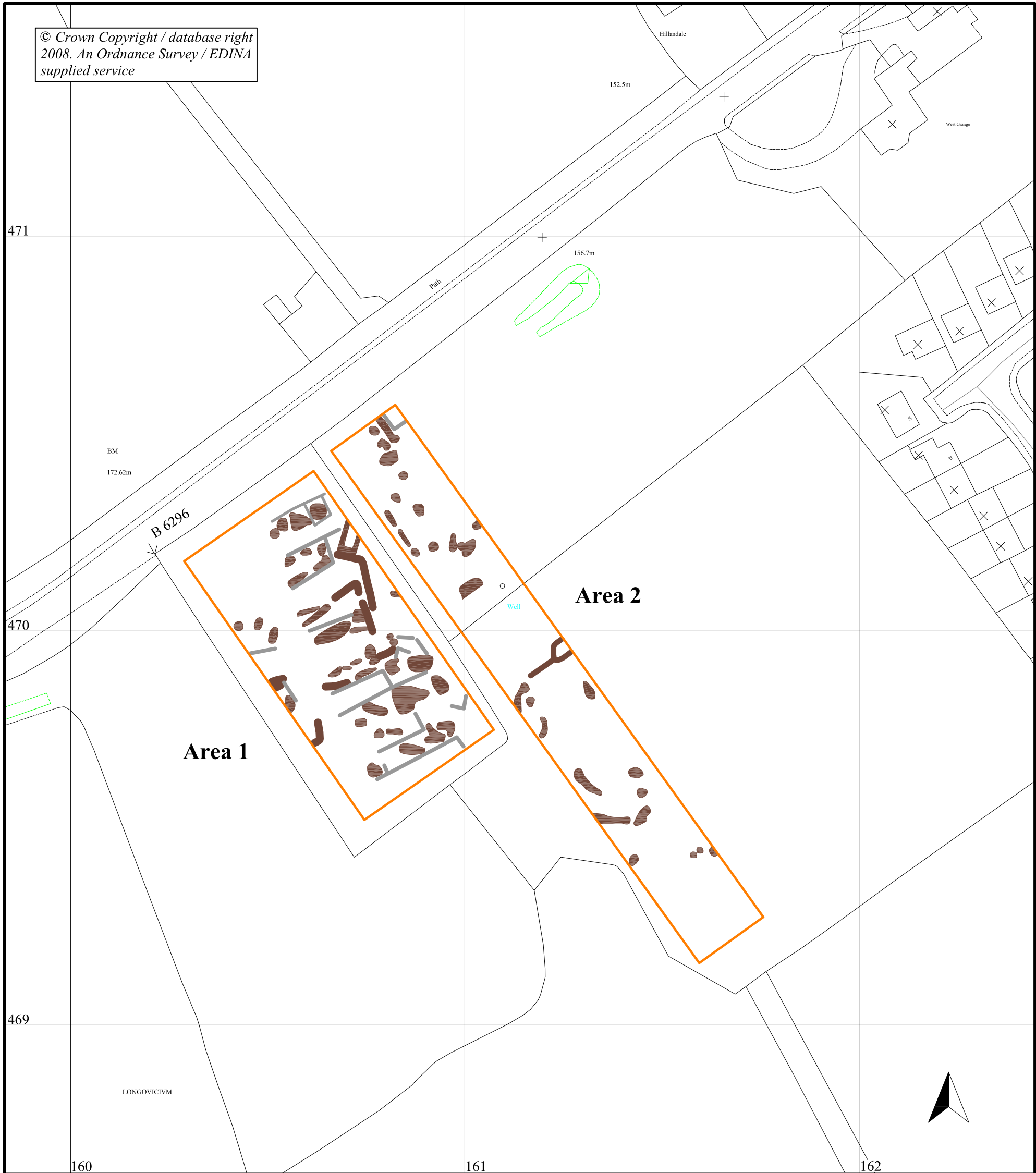
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scale 1:1000 - for A3 plot

-  survey area
-  positive magnetic anomalies
-  negative magnetic anomalies
-  dipolar magnetic anomalies

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
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Figure 5

Archaeological interpretation

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-  survey area
-  soil-filled features
-  stone footings

0 50m

scale 1:1000 - for A3 plot

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Figure 6: Trace plots of geophysical data

