

Holystone, Harbottle, Northumberland

geophysical surveys

on behalf of

Holystone History Group

and

Northumberland National Park Authority

Report 1365
December 2005

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1. Summary

The project

- 1.1 This report presents the results of geophysical surveys conducted at Cocklaw Bush and Haremoor Law in Holystone, Northumberland. The works comprised geomagnetic and electrical resistance surveying to test for the presence of a Roman road near the Lady's Well.
- 1.2 The works were commissioned by the Northumberland National Park Authority on behalf of the Holystone History Group and were conducted by members of the Group and Archaeological Services personnel.

Results

- 1.3 Ridge and furrow remains with an associated headland and possible trackway were identified in the Cocklaw Bush field to the south-west of the well. These features are presumed to be of medieval origin.
- 1.4 The remains of up to ten possible ring-ditches were also identified beneath the ridge and furrow, in a raised part of the field. It is suggested that these could possibly represent the remains of ring-ditches, possibly associated with barrows or round-houses. Similar Bronze Age features of both types are known nearby.
- 1.5 At Haremoor Law, to the north-east of the well, weak anomalies were detected which could possibly reflect the poorly-preserved remains of a road with flanking ditches. The alignment of the anomalies, if not the location, corresponds to that of the presumed course of the Roman road, however, the interpretation remains tentative.

2. Project background

Location (Figures 1 & 2)

- 2.1 The study area comprised fields to the south-west and north-east of the Lady's Well in Holystone, Northumberland (NGR: NT 9526 0290). Holystone is situated on the south side of the River Coquet, south-east of Harbottle. The northern part of Cocklaw Bush field, to the south-west of Lady's Well, was surveyed using fluxgate gradiometry, with a smaller area also surveyed using an electrical resistance technique. A resistance survey was also undertaken in Haremoor Law to the north-east of the well.

Objective

- 2.2 The aims of the project were twofold: 1) to determine the course of the High Rochester to Bridge of Aln Roman road in the vicinity of Lady's Well, and 2) to provide members of the Holystone History Group with the opportunity to conduct geophysical surveys.

Dates

- 2.3 Fieldwork was undertaken on 12th and 13th November 2005. This report was prepared between 23rd November and 6th December 2005.

Personnel

- 2.4 Fieldwork was conducted by the Holystone History Group (Simon Bickmore, Kevin & Janet Fenwicke-Clennell, Jan Frazer, John & Sue MacLean, Julian & Gill Philipson, Alec & Carol Plater, Dave Robinson) assisted by Graeme Attwood, Duncan Hale and Sam Roberts of Archaeological Services. This report was prepared by Duncan Hale with illustrations by Martin Railton. The Project Manager was Duncan Hale.

Archive/OASIS

- 2.5 The site codes were **HCB05** for **Holystone Cocklaw Bush 2005** and **HML05** for **Haremoor Law 2005**. The paper and data archive is currently held by Archaeological Services Durham University. Archaeological Services is registered with the **Online Access to the Index of archaeological investigationS** project (OASIS). The OASIS ID number for this project is **archaeol3-11833**.

Acknowledgements

- 2.6 Archaeological Services is grateful to the landowners, farmers and National Park Authority in facilitating this research, and for the hospitality provided by the Holystone History Group.

3. Archaeological and historical background

- 3.1 The Lady's Well is statutorily protected as both a Scheduled Ancient Monument and a Grade I Listed Building. The well comprises a stone-lined water tank of possible Roman origin, fed by a natural spring. It is reputed that Paulinus, an early Christian missionary from Italy and, later, Bishop of York,

baptized 3000 converts here on Easter Day AD 627, including the Northumbrian King Edwin. The site is sometimes referred to as St Paulinus' Well and has also been known as St Ninian's Well, suggesting that the sixth-century Bishop of Whithorn had previously visited the well. In the mid-12th century there was an Augustinian convent at Holystone and the nuns are believed to have repaired and maintained the well, which may be how the name Lady's Well originated.

- 3.2 The course of the Roman road from *Bremenium* (High Rochester) to Bridge of Aln is presumed to pass adjacent to the well. One of the principal aims of this survey was to test for the presence of the road here.



Lady's Well, looking to the north-east

4. Landuse, topography and geology

- 4.1 At the time of survey Cocklaw Bush comprised undulating pasture with a pronounced rise in the central northern part of the field and a stream issuing from the well in the east of the field. Harelaw Moor, to the north-east of the well, also comprised pasture on a gentle south-east-facing slope.
- 4.2 Both survey areas occupied land at between 130-145m OD.
- 4.3 The underlying solid geology of the area comprises sandstone of the Carboniferous Limestone Series, overlain by glacial drift deposits. An igneous intrusion is located just to the north of the village, some rock from which was noted in a manure heap in Cocklaw Bush.

5. Geophysical survey

Standards

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

Technique selection

- 5.2 Geophysical surveying enables the relatively rapid and non-invasive identification of potential archaeological features 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 a road foundation might survive on the site, and that other types of feature such as roadside ditches and pits might also be present. Given the anticipated shallowness of targets and the non-igneous geological environment of the study area two complementary techniques were considered appropriate: fluxgate gradiometry (a geomagnetic technique) and electrical resistance survey. Fluxgate gradiometry involves the use of hand-held magnetometers to detect and record minute anomalies in the vertical component (i.e. gradient) of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features. Resistivity survey relies on the relative inability of materials to conduct an electrical current and primarily maps the volume concentration of ground moisture which varies according to lithology, porosity and time of year. Since resistance is linked to moisture content and porosity, rocky features such as road foundations will give relatively high resistance responses while soil-filled cut features, which retain moisture, will provide relatively low responses.

Field methods

- 5.4 A 20m grid was established across each study area and tied-in to known, mapped Ordnance Survey points.
- 5.5 Measurements of vertical geomagnetic field gradient were determined in Cocklaw Bush field using Bartington Grad601 dual fluxgate gradiometers with automatic datalogging facilities. 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. Geoscan FM36 and FM256 fluxgate gradiometers were also used by members of the Holystone History Group for training purposes.

- 5.6 Measurements of electrical resistance were determined in both fields using a Geoscan RM15D resistance meter with automatic logging of the data. A zig-zag traverse scheme was employed and data were logged in 20m grid units. The instrument sensitivity was set to 0.1ohms, the sample interval to 0.5m and the traverse interval to 1.0m, thus providing 800 sample measurements per 20m grid unit.



Dave Robinson conducting electrical resistance survey

- 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 continuous tone greyscale images and trace plots of the raw data. The greyscale images and interpretations are presented in Figures 3-6; the trace plots are provided in Appendix I. In the greyscale images, positive magnetic/high resistance anomalies are displayed as dark grey and negative magnetic/low resistance anomalies as light grey. A palette bar relates the greyscale intensities to anomaly values in nanoTesla/Ohms.
- 5.9 The following basic processing functions have been applied to the geomagnetic data:

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.

De-stagger – 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 from 1.0 x 0.25m intervals to 0.25 x 0.25m intervals.

- 5.10 The following basic processing functions have been applied to the resistance data collected in both fields:

Despike – locates and suppresses random spikes in data due to poor contact resistance.

Interpolate – to increase the number of data points in a survey; to match sample and traverse intervals. In this instance the resistance data have been interpolated from 1.0 x 0.5m intervals to 0.25 x 0.25m intervals.

Interpretation: anomaly types

- 5.11 A colour-coded geophysical interpretation plan is provided in Figure 5. 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 road or 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.

- 5.12 Two types of resistance anomaly have been distinguished in the data:

high resistance regions of anomalously high resistance, which may reflect foundations, tracks, paths and other concentrations of stone or brick rubble.

low resistance regions of anomalously low resistance, which may be associated with soil-filled features such as pits and ditches.

Interpretation: features at Cocklaw Bush

- 5.13 A colour-coded archaeological interpretation plan is provided in Figure 6.
- 5.14 The most prominent features of the geomagnetic survey comprise alternate positive and negative magnetic lineations aligned north-west/south-east. The anomalies are evenly spaced at c.5m intervals and correspond to upstanding ridge and furrow earthworks of likely medieval origin. Some of these furrows were also detected as low resistance anomalies in the resistivity survey. Parallel positive magnetic anomalies along the northern limit of the ridge and furrow appear to represent a headland and possible former trackway.
- 5.15 Several very weak arcuate positive magnetic anomalies have been detected in the central, higher, part of the survey area. The anomalies almost certainly reflect soil-filled features, potentially the remains of ring-ditches beneath the medieval plough features. The rings vary in size, between 12m and 16m in diameter, and could have been associated with round barrows or round-houses. A number of presumed Bronze Age barrows have been identified in the fields immediately south of Holystone village, some of which are labelled 'The Five Barrows' on Ordnance Survey maps. Similarly, unenclosed Bronze Age settlements are also known in the area, such as Kidlandlee, on Clennel Street, recently excavated by Archaeological Services (forthcoming).
- 5.16 Occasional discrete positive magnetic anomalies detected elsewhere in the survey are likely to reflect soil-filled features.
- 5.17 The majority of other anomalies detected here have recent origins. Large intense dipolar magnetic anomalies in the north-east of the area reflect the remains of a steel wire fence, a ferrous pipe and corrugated metal sheet. A cluster of small dipolar anomalies in the centre of the survey correspond to igneous rocks noted within a manure heap; the heap was also recorded as a low resistance anomaly. A large dipolar anomaly in the south central part of the survey area corresponds to a cattle feeder. Other small dipolar anomalies almost certainly reflect near-surface ferrous litter, such as fence wire and horseshoes.
- 5.18 Neither survey technique has detected evidence for either road remains or associated ditches in the area of the presumed route of the Roman road.

Interpretation: features at Harelaw Moor

- 5.19 The Holystone History Group also conducted 2000sqm of electrical resistance survey at Haremoor Law to the north-east of the well. Broad variations in resistance were detected across the survey area; most of these are likely to reflect local geological variation such as depth to rockhead and topsoil thickness. However, of potential significance could be a broad band of relatively high resistance in the southern part of the survey area. The band

measures c.6m in width and is aligned broadly north-east/south-west; areas of relatively low resistance have been detected to either side of the high resistance feature. It is possible that these anomalies could reflect the truncated remains of a road and associated ditches.

6. Conclusions

- 6.1 Geomagnetic and electrical resistance surveys were undertaken over the presumed course of the High Rochester to Bridge of Aln Roman road as it passes the Lady's Well at Holystone near Harbottle, Northumberland.
- 6.2 Ridge and furrow remains with an associated headland and possible trackway were identified in the Cocklaw Bush field to the south-west of the well. These features are presumed to be of medieval origin.
- 6.3 The remains of up to ten possible ring-ditches were also identified beneath the ridge and furrow, in a raised part of the field. It is suggested that these may represent the remains of ring-ditches, possibly associated with barrows or round-houses. Similar Bronze Age features of both types are known nearby.
- 6.4 At Haremoor Law, to the north-east of the well, weak anomalies were detected which could possibly reflect the poorly-preserved remains of a road with flanking ditches. The alignment of the anomalies, if not the location, corresponds to that of the presumed course of the Roman road, however, the interpretation remains tentative.

7. Sources

Archaeological Services forthcoming *Excavation at Kidlandlee, Clennel Street, near Alwinton, Northumberland*, unpublished report

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

English Heritage 1995 *Geophysical survey in archaeological field evaluation*, EH Research and Professional Services Guideline No.1, London

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www.earlybritishkingdoms.com

www.keystothepast.info

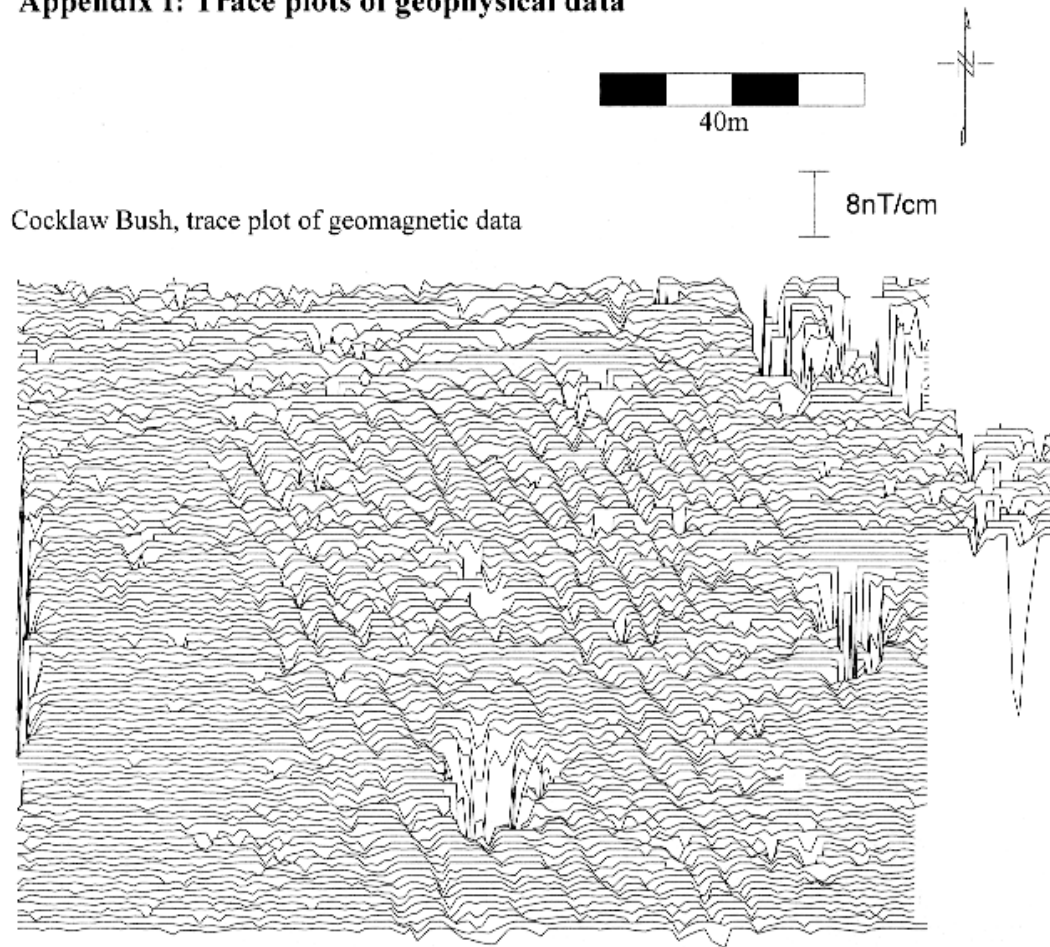
www.megalithic.co.uk

www.thenortheast.fsnet.co.uk

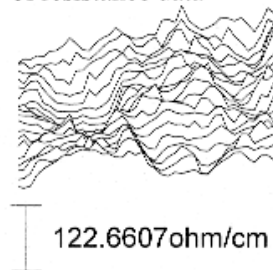
www.visit-rothbury.co.uk

Appendix I: Trace plots of geophysical data

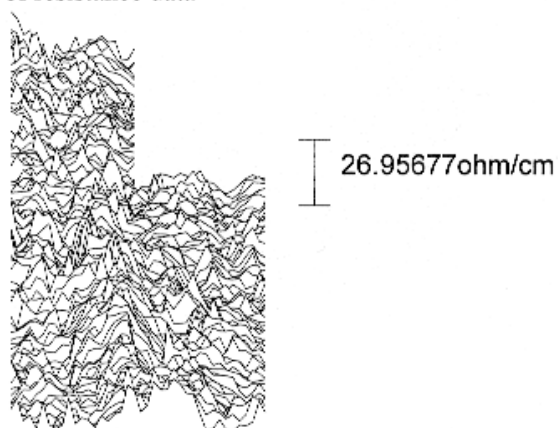
Appendix I: Trace plots of geophysical data



Cocklaw Bush, trace plot of resistance data



Haremoor Law, trace plot of resistance data





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Figure 1

Location plan

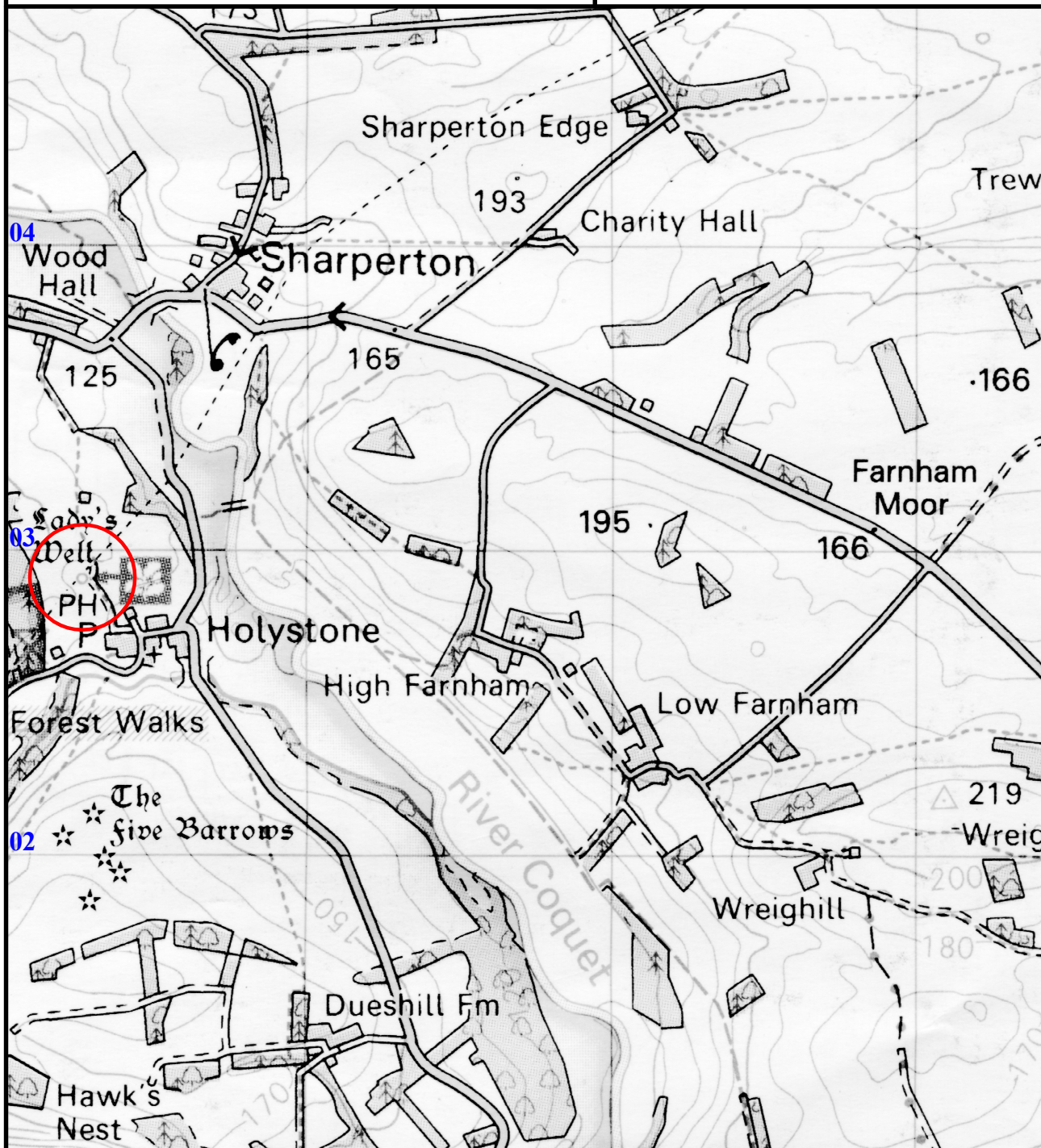
on behalf of

Holystone History Group

and

**Northumberland National
Park Authority**

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location of study area

0

1km



scale 1:20 000 - for A4 plot





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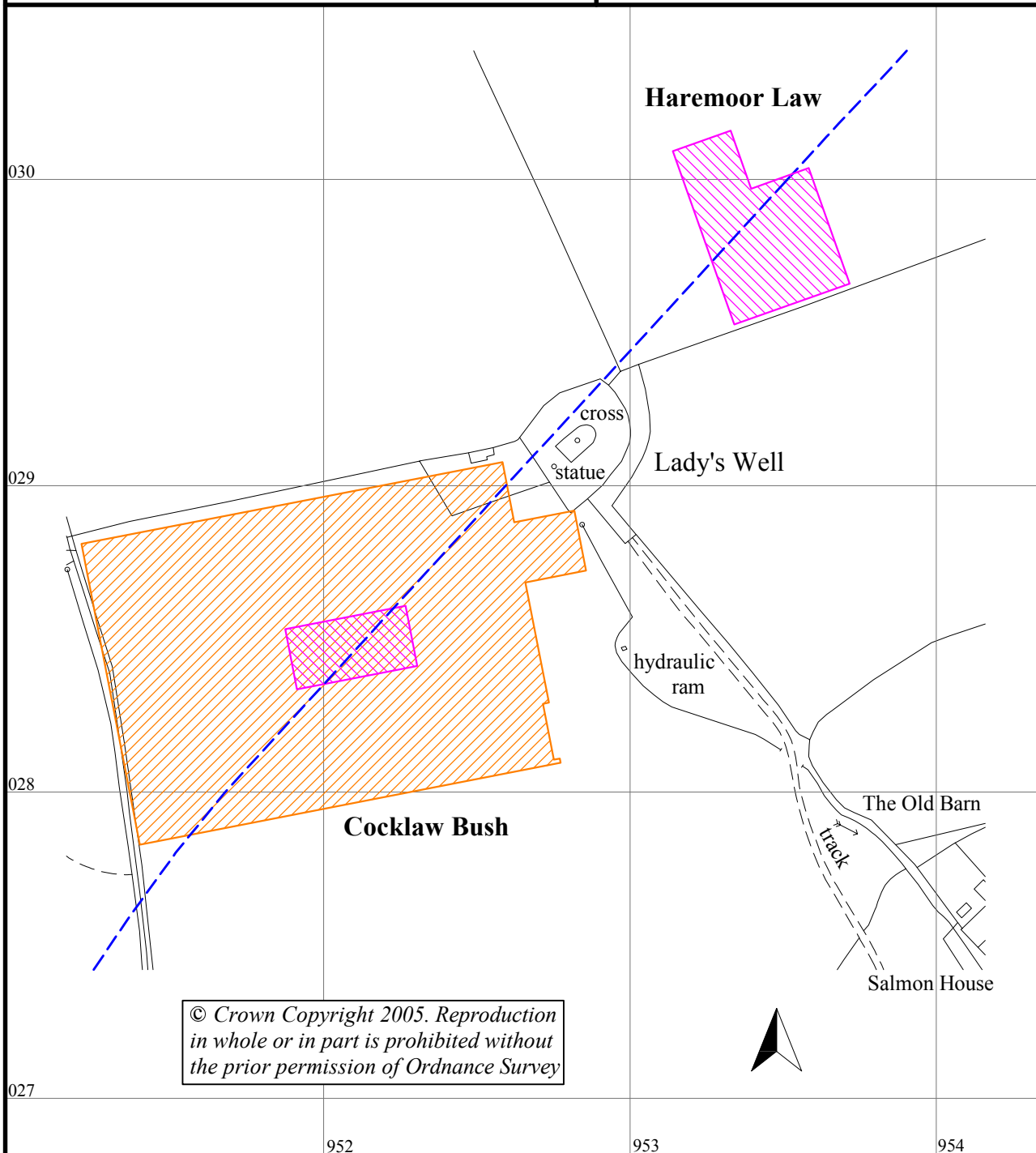
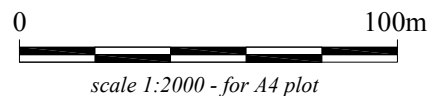
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Figure 2

Locations of geophysical surveys

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geomagnetic
survey area



electrical resistance
survey area



presumed course of
Roman road

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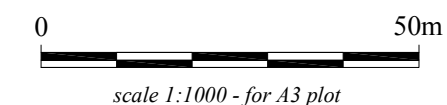


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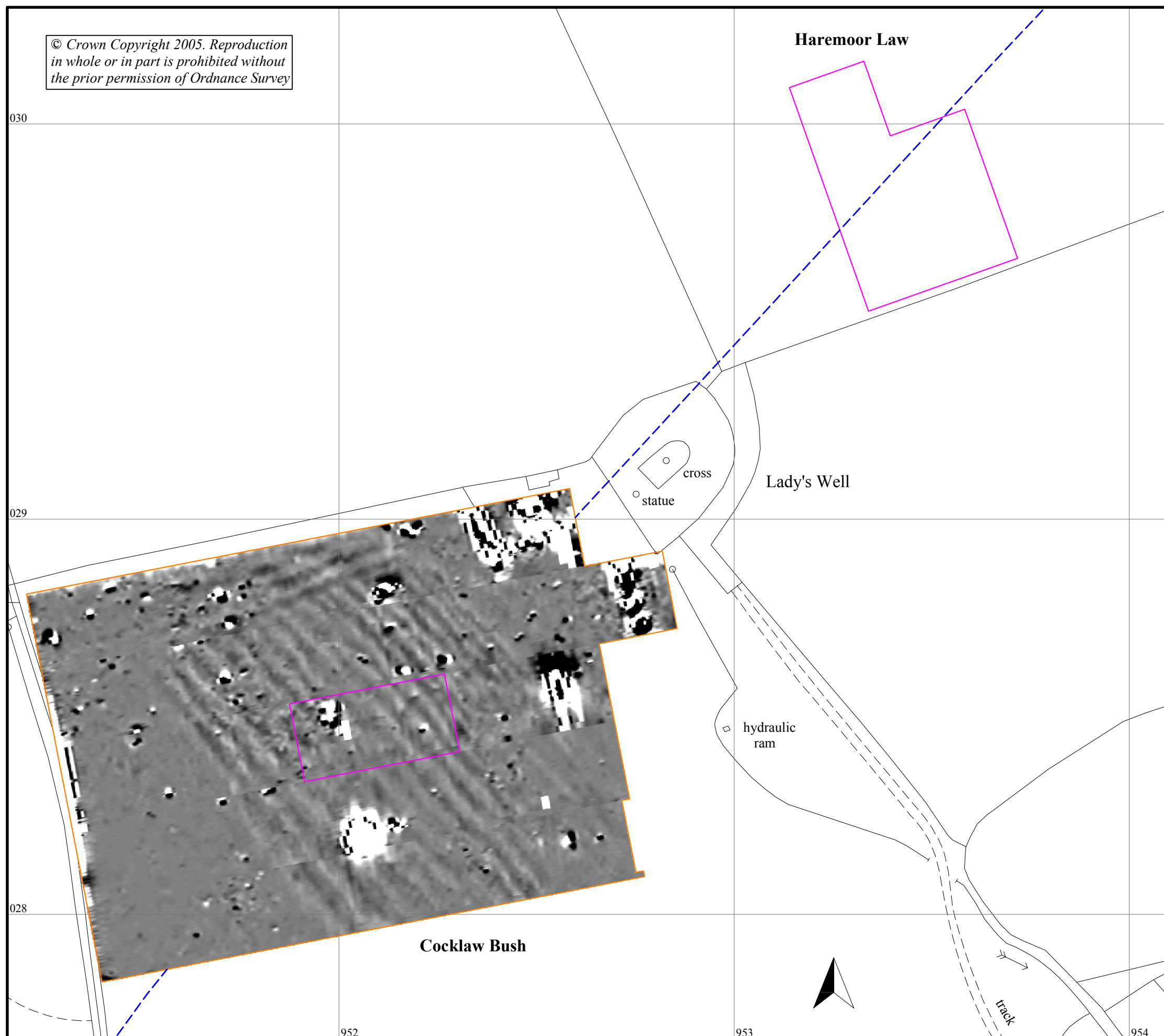
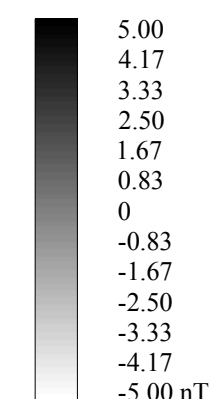
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Figure 3

Geomagnetic survey of Cocklaw Bush

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- presumed course of Roman road
- outline of geomagnetic survey area
- outline of electrical resistance survey area



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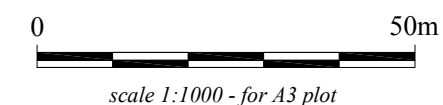


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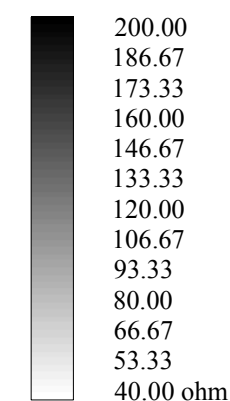
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Figure 4

*Electrical resistance surveys of
Cocklaw Bush and Haremoor Law*

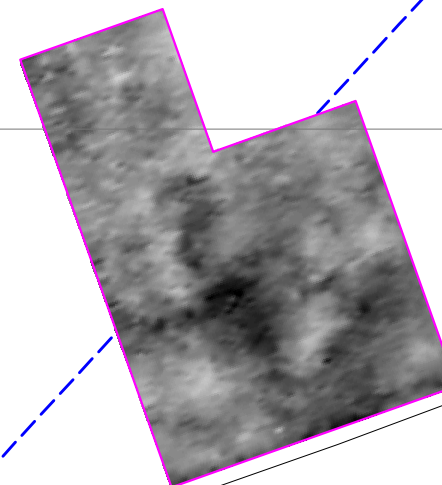
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- presumed course of Roman road
- outline of geomagnetic survey area
- outline of electrical resistance survey area



Haremoor Law



Lady's Well

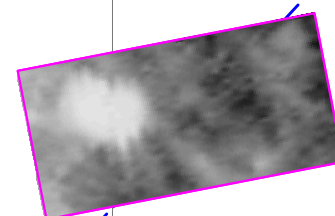
cross
statue

hydraulic
ram



track

Cocklaw Bush



030

029

028

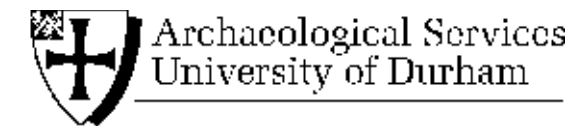
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Haremoor Law

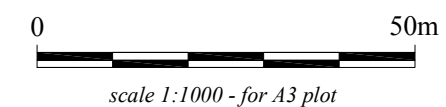


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Figure 5

Geophysical interpretation

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- presumed course of Roman road
- outline of geomagnetic survey area
- outline of electrical resistance survey area
- positive magnetic anomalies
- negative magnetic anomalies
- dipolar magnetic anomalies
- area of high resistance
- area of low resistance

Lady's Well

hydraulic
ram

track

Cocklaw Bush



030

029

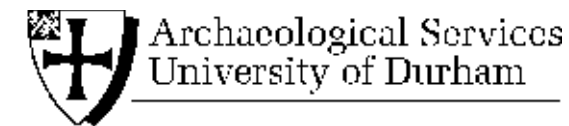
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Figure 6

Archaeological interpretation

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0 50m
scale 1:1000 - for A3 plot

- presumed course of Roman road
- outline of geomagnetic survey area
- outline of electrical resistance survey area
- soil-filled features
- service pipe
- orientation of ridge and furrow
- stone/rubble

Haremoor Law

Lady's Well

cross
statue

hydraulic
ram

Cocklaw Bush

track

