

ARCHAEOLOGICAL  
SERVICES  
DURHAM UNIVERSITY

on behalf of



ENGLISH HERITAGE

Gossipgate, Harbut Lodge and  
Bridge End Farm  
Alston  
Cumbria

geophysical survey

report 2882  
May 2012

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## **1. Summary**

### **The project**

- 1.1 This report presents the results of geophysical surveys conducted at three possible prehistoric settlement sites within a 1km radius of Alston, Cumbria, as part of a wider landscape study being undertaken by English Heritage.
- 1.2 The works were commissioned by English Heritage and conducted by Archaeological Services Durham University.

### **Results**

- 1.3 At each site, areas of anomalies have been detected which broadly correspond to features recorded in earlier, detailed earthwork surveys and LiDAR imagery.
- 1.4 The majority of geomagnetic anomalies detected at each site are small and intense, typically occurring in narrow bands or broad areas, reflecting possible stone wall footings and rubble spreads respectively. Other occasional, weak geomagnetic anomalies at each site could reflect the remains of ditches or gullies.
- 1.5 Both geophysical techniques were particularly useful at Gossipgate, where several probable wall footings, enclosures, building platforms, yard surfaces and tracks were identified. These generally correspond well with the results of the earlier detailed topographic survey. Some of the anomalies in both the geomagnetic and resistance data are particularly well-defined. A number of other probable features were also detected, for which there is no extant surface expression.
- 1.6 At Harbut Lodge a potential enclosure and a number of other possible structural remains and areas of rubble were identified. Soil-filled ditches and traces of former ploughing were also recorded.
- 1.7 Further probable enclosures, building platforms and areas of rubble were identified at Bridge End Farm.
- 1.8 Since many of the geophysical anomalies at Harbut Lodge and Bridge End Farm appear to reflect broad spreads of stone rubble, the individual features and details of those sites have not been readily identifiable.
- 1.9 Ferrous pipes and land drains were also identified at Gossipgate. Former ploughing was detected at Harbut Lodge.

## 2. Project background

### Location (Figure 1)

- 2.1 The survey areas were located over three possible prehistoric settlement sites within open farmland near the town of Alston in the North Pennines, Cumbria. The first site was located at Gossipgate, to the north-east of the town and north of the River Nent (NGR centre: NY 7236 4701). The Harbut Lodge site was located to the north-west of Alston (NGR centre: NY 7123 4746) on the river terrace west of the South Tyme. The final site was located at Bridge End Farm, just south-west of Alston, east of the A686 road and west of the River South Tyme (NGR centre: NY 7141 4584). Further site information is provided in Section 4, below.

### Objective

- 2.2 The principal aim of the surveys was to complement the detailed earthwork analysis which had already taken place, in order to achieve the best possible understanding of these potential archaeological sites by non-invasive means.

### Methods statement

- 2.3 The surveys have been undertaken in accordance with an invitation to tender document, prepared by English Heritage (EH), and in line with national standards and guidance (para. 5.1 below).

### Dates

- 2.4 Fieldwork was undertaken between 20th and 22nd March 2012. This report was prepared for 31st May 2012.

### Personnel

- 2.5 Fieldwork was conducted by Duncan Hale and Natalie Swann (Supervisor). The geophysical data were processed by Duncan Hale. This report was prepared by Natalie Swann and Duncan Hale (the Project Manager) with illustrations by David Graham and Tony Liddell.

### Archive/OASIS

- 2.6 The site code is **ANP12**, for **Alston North Pennines 2012**. The survey archive will be supplied on CD to the client for deposition with the project archive in due course. Archaeological Services Durham University is registered with the **Online AccesS** to the **Index of archaeological investigationS** project (**OASIS**). The OASIS ID number for this project is **archaeol3-125076**.

## 3. Historical and archaeological background

- 3.1 The geophysical surveys covered three potential prehistoric settlement sites which were recently identified through the English Heritage 'Miner-Farmer' landscapes project, a multi-disciplinary five-year landscape survey investigating the Miner-Farmer landscapes of the North Pennines AONB; some project results are now available in EH Research Department Reports.
- 3.2 Since the present study sites were previously unknown, there is little evidence about their archaeological or historical background. However, recent aerial (LiDAR) and topographic surveys undertaken for the Miner-Farmer project have given some indicators as to the nature of the sites.



- 3.3 Gossipgate appears to comprise a dense cluster of building platforms, potentially Romano-British in date, set alongside an historic routeway on a well-drained limestone bench on the north side of the River Nent Valley.
- 3.4 From the air the site at Harbut Lodge appears to be an arrangement of concentric enclosures, with the innermost circle enclosing building platforms and yards.
- 3.5 At Bridge End Farm the aerial survey identified several scooped hut platforms within a circular enclosure.

**4. The survey areas: landuse, topography and geology**

4.1 Survey area information is summarised in the table below. LiDAR images are shown for each area.

Site	NGR	landuse	geomagnetic survey area (ha)	resistance survey area (ha)
Gossipgate	NY 7236 4701	pasture	3.4	1
Harbut Lodge	NY 7123 4746	pasture	2.4	
Bridge End Farm	NY 7141 4584	pasture	0.4	
Total			6.2	1

**Gossipgate**

4.2 The Gossipgate site spanned five fields of pasture. Five areas of geomagnetic survey and two areas of earth electrical resistance survey were undertaken here. The north end of Area 1 sloped steeply from 340m OD to 320m OD. Areas 3, 4 and 8 sloped gently from 355m OD in the north to 340m OD in the south.



Gossipgate geomagnetic survey areas (© English Heritage)



Gossipgate resistance survey area (© English Heritage)

- 4.3 The underlying solid geology at Gossipgate is predominantly Viséan-Namurian limestone, sandstone, siltstone and mudstone of the Alston Formation with bands of Viséan limestone of the Three Yard Limestone Member and the Four Fathom Limestone Member. These are overlain by drift geology of Devensian till.

#### **Harbut Lodge**

- 4.4 Three geomagnetic surveys were undertaken in three fields of pasture on the first main river terrace east of the River South Tyne. The land sloped gently down from approximately 280m OD at the Lodge to 270m OD at the South Tyne. There was a very large manure heap in the south-west of the site, the western part of Area 5.



Harbut Lodge geomagnetic survey area (© English Heritage)

- 4.5 The underlying solid geology comprises Visean limestone of the Five Yard Limestone Member, overlain by drift geology of Devensian till.

#### **Bridge End Farm**

- 4.6 One geomagnetic survey was undertaken covering of 0.4ha pasture. This pasture field was predominantly level with a mean elevation of approximately 283m OD.



Bridge End Farm geomagnetic survey area (© English Heritage)

- 4.7 The underlying geology of this area comprises Visean limestone of the Scar Limestone Member, overlain by drift geology of Devensian till.

## **5. Geophysical survey Standards**

- 5.1 The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in archaeological field evaluation* (David, Linford & Linford 2008); the Institute for Archaeologists (IfA) *Standard and Guidance for archaeological geophysical survey* (2011); the IfA Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service *Guide to Good Practice: Geophysical Data in Archaeology* (Schmidt & Ernenwein 2011).

### **Technique selection**

- 5.2 Geophysical survey enables the relatively rapid and non-invasive identification of sub-surface features of potential archaeological significance and can involve a suite of complementary techniques such as magnetometry, earth electrical resistance, ground-penetrating radar, electromagnetic survey and topsoil magnetic susceptibility survey. Some techniques are more suitable than others in particular situations, depending on 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 the presence of earthworks at all three sites, it was considered likely that both cut and built features would be present. These features might include, for example, ditches and pits, trackways, wall foundations and fired structures such as kilns and hearths.
- 5.4 Given the anticipated shallowness of targets and the non-igneous geological environment of the study areas a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record 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.
- 5.5 Given the likely presence of building platforms and other structural remains at Gossipgate an electrical resistance survey was considered appropriate to complement the results of the magnetometer survey. Earth electrical resistance survey can be particularly useful for mapping stone and brick features. When a small electrical current is injected through the earth it encounters resistance which can be measured. Since resistance is linked to moisture content and porosity, stone and brick features will give relatively high resistance values while soil-filled features, which retain more moisture, will provide relatively low resistance values.

#### **Field methods**

- 5.6 A 20m grid was established across each survey area and related to known, mapped Ordnance Survey points using a Leica GS15 global navigation satellite system (GNSS) with real-time kinematic (RTK) corrections typically providing 10mm accuracy.
- 5.7 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 dual fluxgate gradiometers. A zig-zag traverse scheme was employed and data were logged in 20m grid units. The instrument sensitivity was nominally 0.03nT, the sample interval was 0.25m and the traverse interval was 1m, thus providing 1,600 sample measurements per 20m grid unit.
- 5.8 Measurements of earth electrical resistance were determined using Geoscan RM15D Advanced resistance meters with MPX15 multiplexers and a mobile twin probe separation of 0.5m. A zig-zag traverse scheme was employed and data were logged in 20m grid units. The instrument sensitivity was 0.1ohm, the sample interval was 1m and the traverse interval was 1m, thus providing 400 sample measurements per 20m grid unit.
- 5.9 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**

- 5.10 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 (minimally processed) data. The greyscale images and interpretations are presented in Figures 2-16; the trace plots are provided in Figures 17-18. In the greyscale images, positive magnetic/high resistance anomalies are displayed as dark grey and negative

magnetic/low resistance anomalies as light grey. Palette bars relate the greyscale intensities to anomaly values in nanoTesla/ohm.

5.11 The following basic processing functions have been applied to the geomagnetic data:

<i>clip</i>	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
<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 geomagnetic 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 data have been interpolated to 0.25m x 0.25m intervals

5.12 The following basic processing functions have been applied to the resistance data:

<i>clip</i>	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
<i>add</i>	adds or subtracts a positive or negative constant value to defined blocks of data; used to reduce discontinuity at grid edges
<i>despike</i>	locates and suppresses spikes in data due to poor contact resistance
<i>interpolate</i>	increases the number of data points in a survey to match sample and traverse intervals; in this instance the data have been interpolated to 0.25m x 0.25m intervals

#### **Interpretation: anomaly types**

5.13 Colour-coded geophysical interpretation plans are 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

5.14 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**

#### **General comments**

5.15 Colour-coded archaeological interpretation plans are provided.

5.16 In general there is a very close correlation between the mapped earthwork features and the geophysical anomalies (Figures 3, 6, 10 and 14) especially at the Gossipgate site. However, the surveys have detected several features for which there is no longer any surface expression, particularly in the northern part of the Gossipgate site, as discussed below.

5.17 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 ditches or pits) whose magnetic susceptibility has been enhanced by decomposed organic matter or by burning.

5.18 Large dipolar magnetic anomalies detected on field boundaries typically reflect steel gates and gateposts unless stated otherwise in the text below.

5.19 Small, discrete dipolar magnetic anomalies have been detected in all of the survey areas. In most cases these anomalies are densely concentrated and appear to reflect the remains of stone features or rubble spreads. However, some of these anomalies will almost certainly reflect individual stones or items of near-surface ferrous or fired debris, such as horseshoes and brick fragments. In most cases these individual, discrete anomalies will have little or no archaeological significance. Therefore, 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.

#### **Gossipgate (Figures 2-8)**

##### **Areas 1 and 2**

5.20 Due to the complexity of anomalies at Gossipgate feature numbers [#] have been included on the archaeological interpretation drawing and in the text below.

5.21 Concentrations of dipolar and positive magnetic anomalies have been detected across these surveys. On the east edge of the Area 1 and west edge of Area 2 these anomalies appear to form a circular enclosure [1] of approximately 30m diameter, with possible internal divisions.

- 5.22 North of the enclosure a semi-circular concentration of anomalies appear to form a small structure [2] approximately 10m in diameter, which could reflect a hut platform. Immediately south-west of this is a small square concentration of dipolar magnetic anomalies could reflect further structural remains.
- 5.23 In the west of the area an arcuate concentration of small positive and dipolar magnetic anomalies was detected, probably reflecting the remains of a larger enclosure or boundary feature [3]. A second curvilinear anomaly branches off this, possibly forming an internal division.
- 5.24 Both within and outside the larger enclosure further concentrations of dipolar and positive magnetic anomalies were detected which may reflect the remains of structural features or concentrations of stone rubble.
- 5.25 The chain of intense dipolar magnetic anomalies aligned north-east/south-west near the northern limit of the survey area reflects a ferrous pipe.
- 5.26 Weak, narrow positive magnetic anomalies have been detected aligned north-east/south-west across this survey area; these anomalies are likely to reflect recent shallow ploughing to improve the pasture.
- 5.27 Very weak and narrow positive magnetic anomalies in the east of Area 2 could possibly reflect the remains of soil-filled gullies.

#### **Areas 3, 4 and 8**

- 5.28 Concentrations of dipolar and positive magnetic anomalies, probably reflecting the remains of stone features and areas of rubble, have been detected across these survey areas. In most cases the magnetic anomalies broadly correspond to areas of high resistance which would also indicate concentrations of stone. Some of the anomalies recorded by both survey techniques are particularly well-defined, especially in the central part, Area 4, and these almost certainly reflect wall footings.
- 5.29 In the north-east edge of Area 3 concentrations of both dipolar magnetic and high resistance anomalies were detected which are likely to reflect linear and curvilinear stone features. These features appear to form a large enclosure [4] up to 35m in diameter which continues across the existing field wall into Area 4. The enclosure appears to have a number of internal divisions.
- 5.30 West of this enclosure a small rectangular high resistance anomaly [5] was detected, measuring approximately 10m across, which could reflect wall footings.
- 5.31 North-west of these feature, on the north edge of Area 3, the resistance survey detected a number of high resistance anomalies which do not have a corresponding earthwork [6]. These anomalies are similar to those further south and east and again are likely to reflect concentrations of stone forming enclosures and building platforms. The northernmost anomaly appears to be a continuation of the enclosure wall around [4].
- 5.32 South of [6] a rectangular high resistance anomaly was detected [7], which is likely to reflect a building or rectangular enclosure. Directly east and south of this is a possible stone spread.

- 5.33 Directly south of these features an open-ended sub-rectangular anomaly [8] was detected in the resistance data which may reflect the remains of another structure or building platform approximately 10m in diameter.
- 5.34 A large sub-rectangular enclosure [9] approximately 25m long was detected in the resistance data, partly truncated by a ferrous pipe.
- 5.35 On the eastern edge of Area 3 a number of linear and curvilinear stone features have been detected that form another probable sub-circular enclosure [10] approximately 20m in diameter, extending into Area 4.
- 5.36 South of the features described above a broad band of smooth, low resistance data was detected aligned approximately east-west across Areas 3 and 4, bordered by linear high resistance anomalies. This feature is almost certainly a track through the settlement, defined by earth and stone banks. A branch of this probable track turns north in Area 4; this is particularly clear in the resistance data.
- 5.37 South of the track further linear and rectilinear enclosures have been detected which are again likely to reflect the remains of wall footings, building platforms or other structures. Two probable sub-circular enclosures [11] approximately 25m in diameter were recorded truncated by the existing field wall in the south-east corner of Area 3 and the western edge of Area 4.
- 5.38 East of these enclosures, in Area 4, a small sub-rectangular stone feature was detected [12], measuring approximately 6m wide. Further linear and rectilinear features were recorded north and east of this.
- 5.39 To the north of the track, in the centre of Area 4, at least three further enclosures have been detected with anomalies amongst them that may reflect stone yard surfaces [13] and compacted earth floors.
- 5.40 Similar concentrations of anomalies have been detected elsewhere in Areas 3 and 4, within which individual features cannot be identified. It is likely that these anomalies also reflect areas of stone rubble or yard surfaces.
- 5.41 At the south end of Area 4 parts of two possible rectangular enclosures have been detected [15]. East of this a linear anomaly was detected which may reflect a continuation of [15] and which corresponds to an existing stone and earth bank. This linear anomaly also appears to continue into Area 8.
- 5.42 A strong, well-defined, circular magnetic anomaly in Area 8, approximately 10m in diameter, may reflect wall-footings.
- 5.43 In the south of Area 4 and in Area 8 a few weak linear positive magnetic anomalies aligned north-east/south-west are likely to reflect soil-filled ditches and may represent defensive or boundary features along the edges of the settlement.
- 5.44 A weak curvilinear positive magnetic anomaly has been detected aligned approximately north-east/south-west in the western part of Area 3. In the north-east of the area a number of other weak curvilinear and linear positive magnetic anomalies have also been detected. These anomalies may reflect soil-filled ditches and may represent boundary features and smaller gullies.



- 5.45 Several parallel positive and negative magnetic anomalies have been detected across much of Area 3, aligned approximately north-south, which almost certainly reflect land drains.
- 5.46 The intense chain of dipolar magnetic anomalies and its corresponding linear low resistance anomalies in Area 3 reflect ferrous pipes associated with a water trough in the field and a reservoir on its southern edge.

**Harbut Lodge** (Figures 9-12)  
**Areas 5, 6 and 7**

- 5.47 As at Gossipgate, concentrations of small dipolar and positive magnetic anomalies have been detected across these survey areas. In this instance the anomalies occupy an oval area which broadly corresponds to the area of low earthworks here. The anomalies are likely to reflect concentrations of stone, representing structural features and rubble.
- 5.48 Some of these small anomalies appear to form a sub-circular enclosure that lies either side of the field boundary between Areas 5 and 6. Surrounding this anomaly are a number of other potential structural remains or spreads of rubble, though these are poorly-defined.
- 5.49 Adjacent to the probable enclosure in Area 5 is a concentration of intense dipolar magnetic anomalies which may reflect an area of intense burning or a large pit containing ferrous or fired debris.
- 5.50 A similar, larger, concentration of intense dipolar magnetic anomalies was detected near the western edge of Area 5. These anomalies are within an extensive manure heap and are likely to reflect modern ferrous or fired debris. The dipolar anomaly on the edge of the survey area reflects a water trough.
- 5.51 Occasional, weak linear positive magnetic anomalies have been detected in these surveys which could possibly reflect soil-filled ditches or gullies.
- 5.52 Two series of very weak, parallel, positive magnetic anomalies were detected aligned approximately east-west in Area 5 and north-south in Area 7; these anomalies are likely to reflect former ploughing of these areas for improved pasture.

**Bridge End Farm** (Figures 13-16)  
**Area 9**

- 5.53 The results of the survey at Bridge End Farm are similar to those from the previous areas. Again large concentrations of dipolar and positive magnetic anomalies were detected which may reflect stone features or concentrations of rubble.
- 5.54 In this case the anomalies appear to reflect a sub-circular enclosure at the centre of the survey area surrounded by a number of other anomalies which may reflect further enclosures and hut platforms. The high density of small intense anomalies in this area makes the definition of individual features difficult and may suggest high concentrations of rubble are present.

- 5.55 Two small areas in the north of the survey are relatively clear of anomalies, whilst they are surrounded by broad areas of small anomalies. These areas broadly correspond to the internal areas of structures recorded by both ground survey and LiDAR.
- 5.56 The curvilinear positive magnetic anomalies near the east and south sides of the survey area reflect the top of a steep bank, with the concentrations of dipolar anomalies east and south of them almost certainly reflecting stone within the bank.
- 5.57 Occasional other weak positive magnetic anomalies were detected here, which could possibly reflect soil-filled ditches or gullies.

## **6. Conclusions**

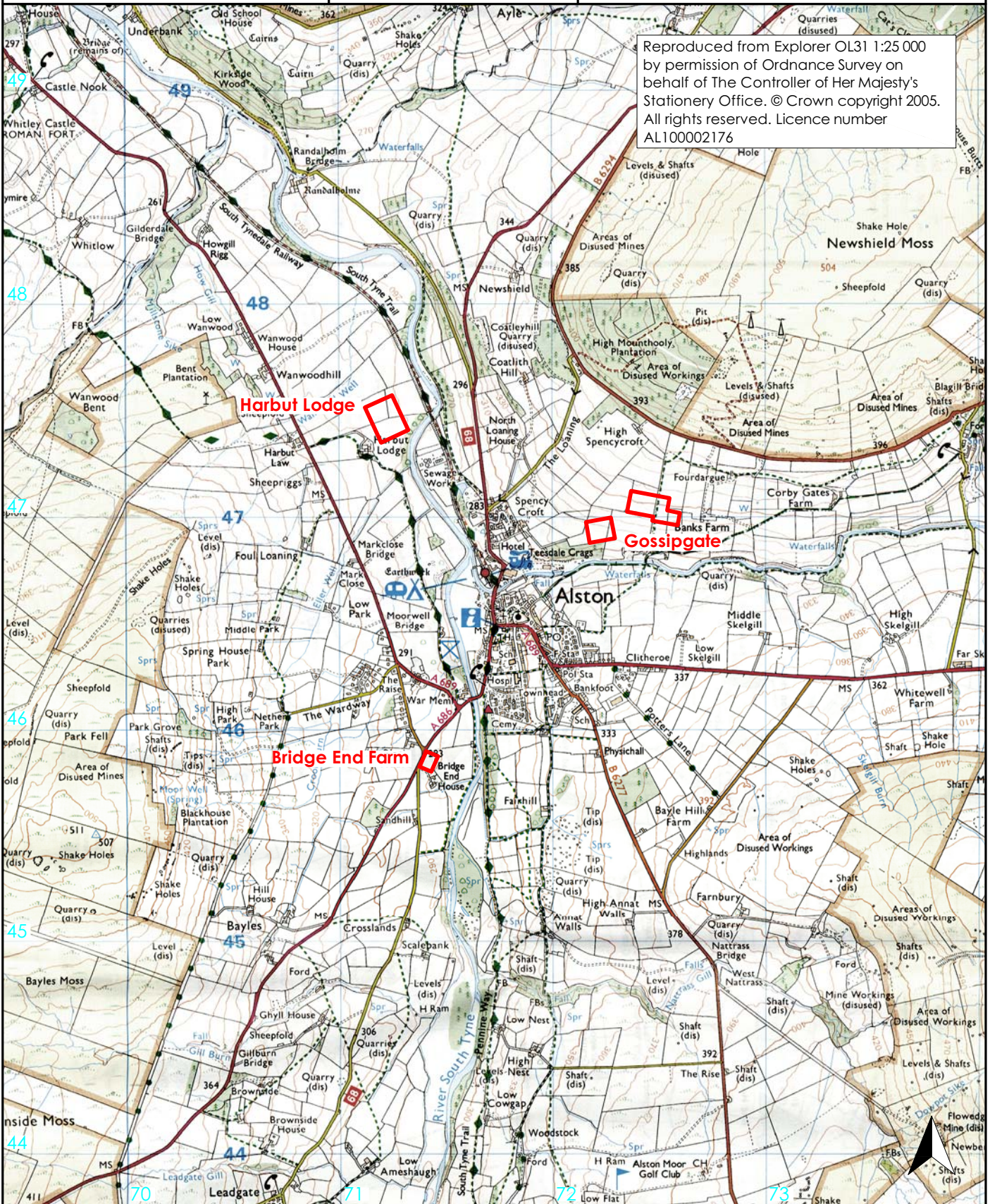
- 6.1 Geomagnetic surveys have been undertaken at three possible prehistoric settlement sites near Alston in the North Pennines. Electrical resistance survey was also undertaken at one of the sites. In each case, areas of anomalies have been detected which broadly correspond to features recorded in earlier, detailed earthwork surveys and LiDAR imagery.
- 6.2 The majority of geomagnetic anomalies detected at each site are small and intense, typically occurring in narrow bands or broad areas, reflecting possible stone wall footings and rubble spreads respectively. Other occasional, weak geomagnetic anomalies at each site could reflect the remains of ditches or gullies.
- 6.3 Both geophysical techniques were particularly useful at Gossipgate, where several probable wall footings, enclosures, building platforms, yard surfaces and tracks were identified. These generally correspond well with the results of the earlier detailed topographic survey. Some of the anomalies in both the geomagnetic and resistance data are particularly well-defined. A number of other probable features were also detected, for which there is no extant surface expression.
- 6.4 At Harbut Lodge a potential enclosure and a number of other possible structural remains and areas of rubble were identified. Soil-filled ditches and traces of former ploughing were also recorded.
- 6.5 Further probable enclosures, building platforms and areas of rubble were identified at Bridge End Farm.
- 6.6 Since many of the geophysical anomalies at Harbut Lodge and Bridge End Farm appear to reflect broad spreads of stone rubble, the individual features and details of those sites have not been readily identifiable.
- 6.7 Ferrous pipes and land drains were also identified at Gossipgate. Former ploughing was detected at Harbut Lodge.

## 7. Sources

- David, A, Linford, N, & Linford, P, 2008 *Geophysical Survey in Archaeological Field Evaluation*. English Heritage
- Gaffney, C, Gater, J, & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*. Technical Paper 6, Institute of Field Archaeologists
- IfA 2011 *Standard and Guidance for archaeological geophysical survey*. Institute for Archaeologists
- Schmidt, A, & Ernenwein, E, 2011 *Guide to Good Practice: Geophysical Data in Archaeology*. Archaeology Data Service



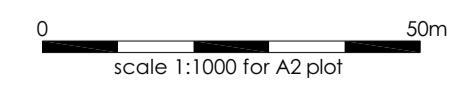
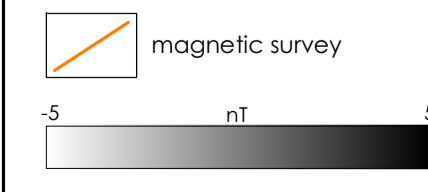
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 survey areas

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scale 1:25 000 for A4 plot





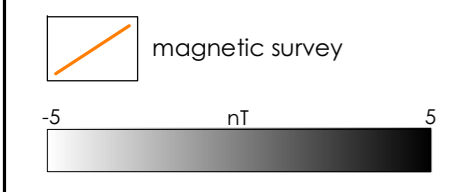
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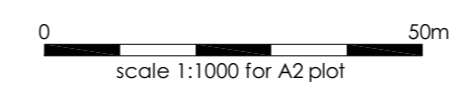
Gossipgate, Harbut Lodge and Bridge End Farm, Alston, Cumbria  
 geophysical survey report 2882  
 Figure 2: Gossipgate geomagnetic survey results







English Heritage earthwork survey



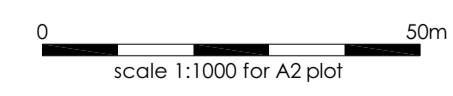
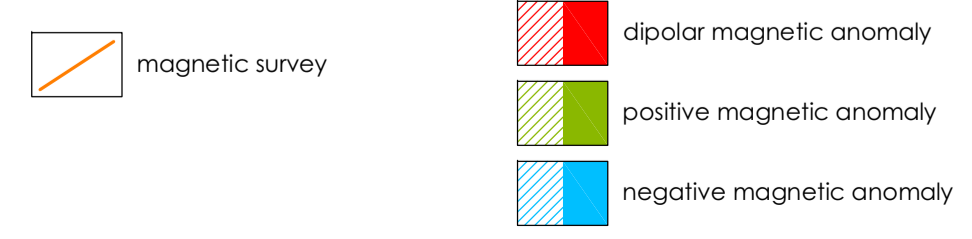
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Gossipgate, Harbut Lodge and Bridge End Farm, Alston, Cumbria  
geophysical survey report 2882  
Figure 3: Gossipgate geomagnetic survey results with English Heritage earthwork survey overlain





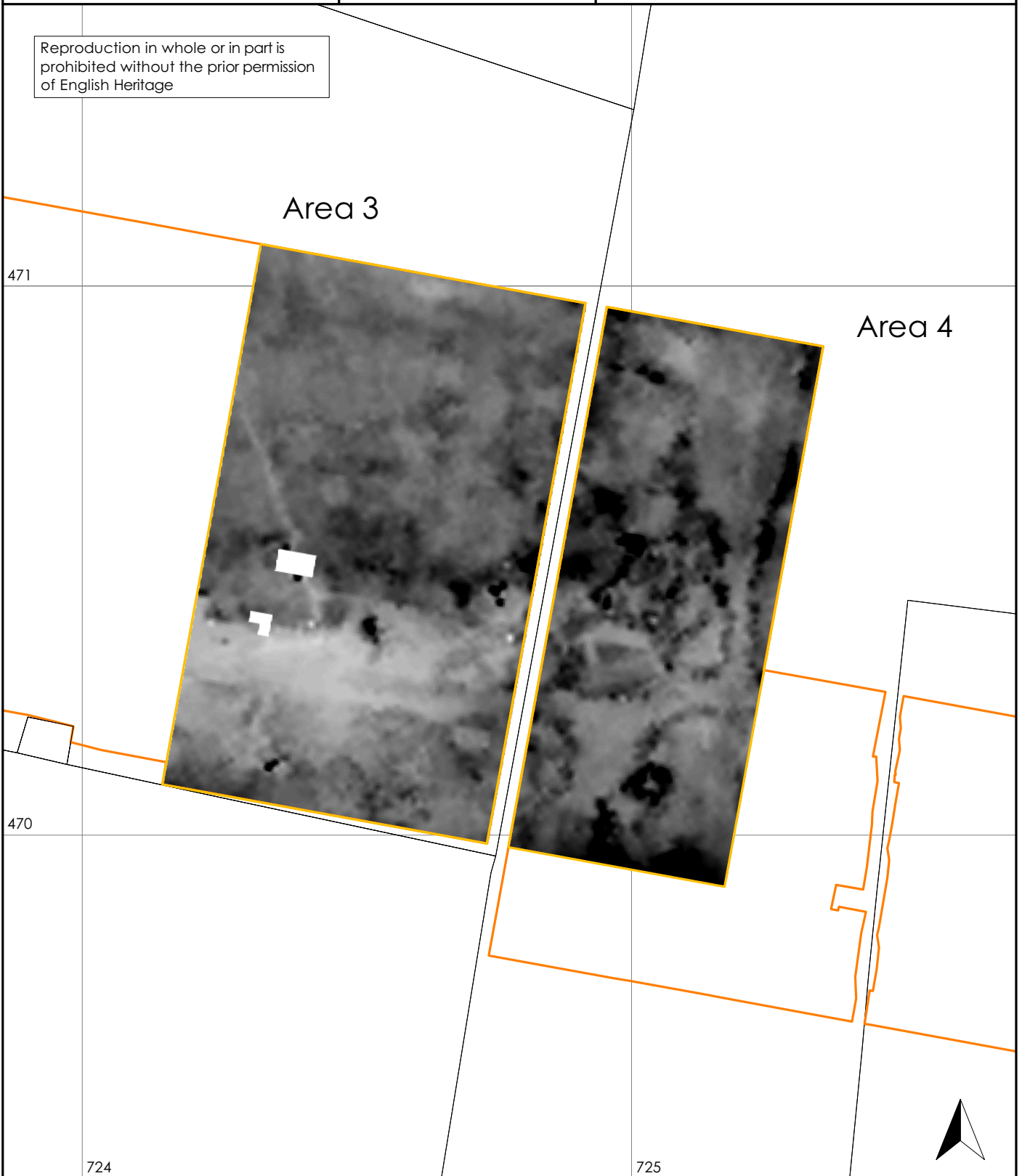


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Figure 4: Gossipgate geophysical interpretation of magnetic survey

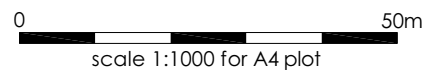
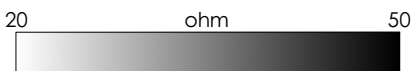
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resistance survey

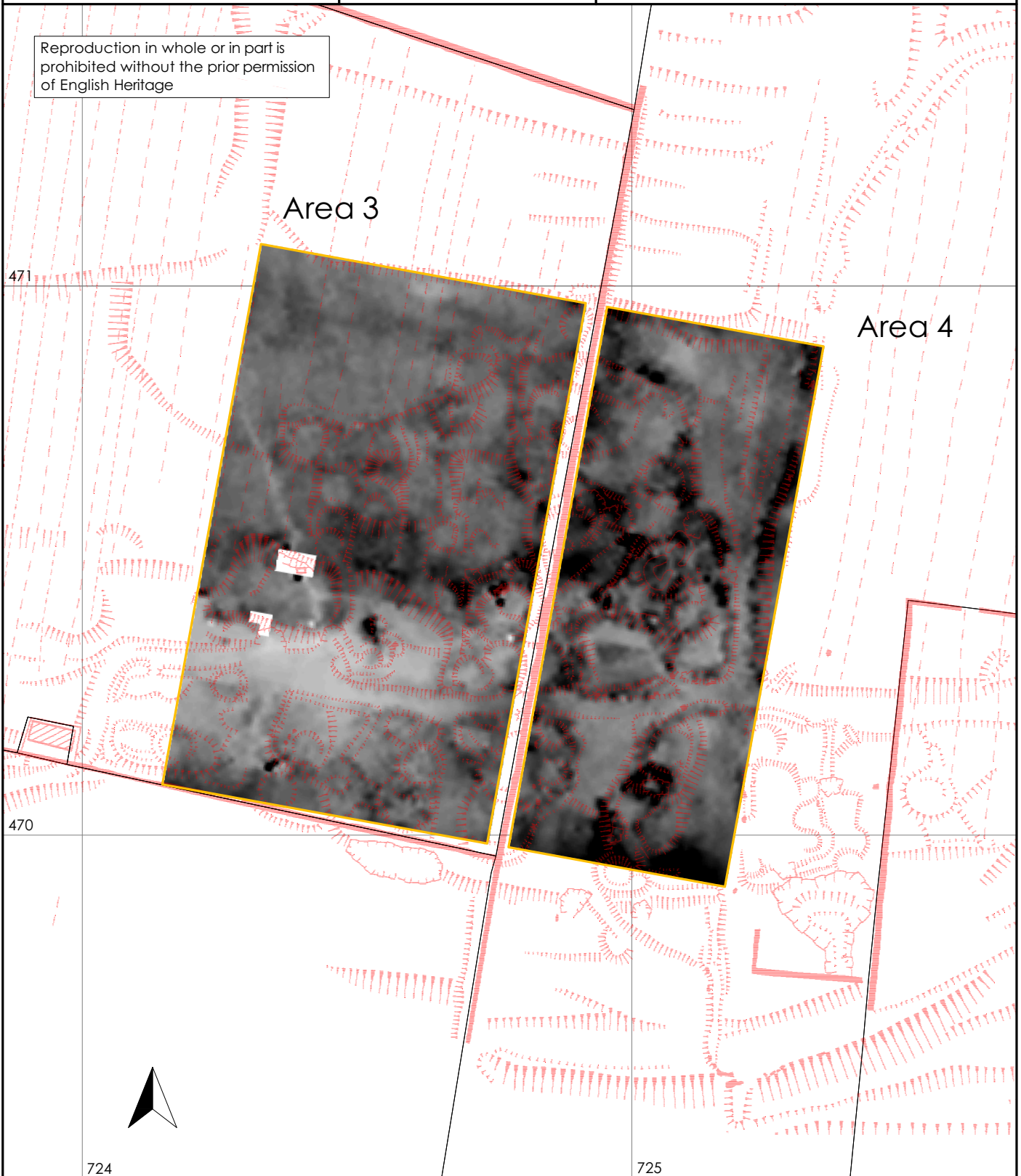


magnetic survey





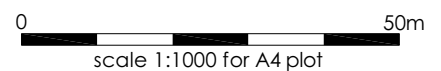
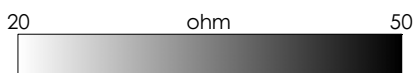
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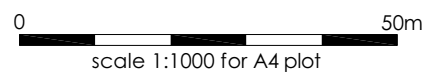
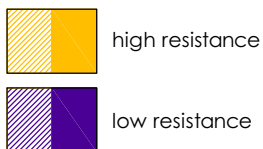
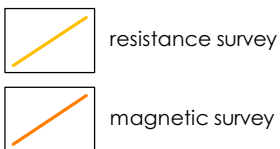
resistance survey



English Heritage earthwork survey

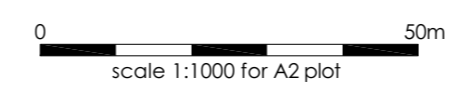


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	magnetic survey		soil-filled feature		land drain		feature number
	resistance survey		stone/structural feature		track		trough
			stone rubble/compact earth		service pipe		



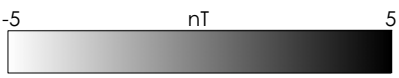
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Gossipgate, Harbut Lodge and Bridge End Farm,  
Alston, Cumbria  
geophysical survey  
report 2882  
Figure 8: Gossipgate archaeological  
interpretation of geophysical surveys



magnetic survey

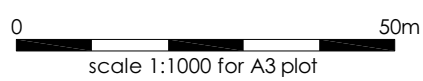


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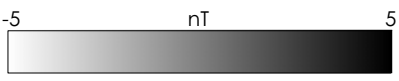
Gossipgate, Harbut Lodge and Bridge End Farm,  
Alston, Cumbria

geophysical survey  
report 2882

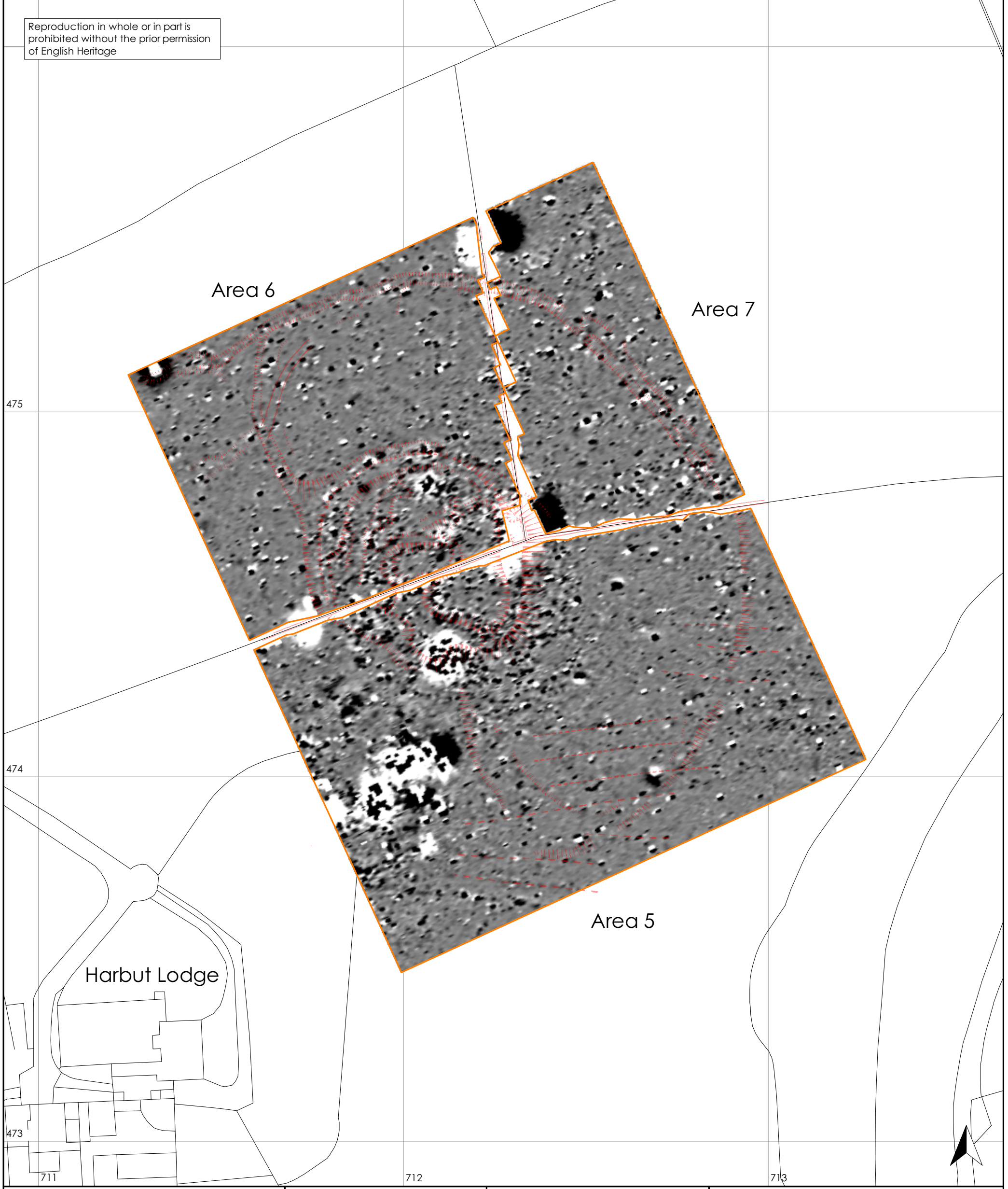
Figure 9: Harbut Lodge geomagnetic survey  
results

magnetic survey

English Heritage earthwork survey

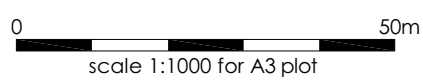


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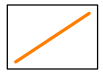
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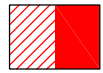


Gossipgate, Harbut Lodge and Bridge End Farm,  
Alston, Cumbria  
geophysical survey  
report 2882  
Figure 10: Harbut Lodge geomagnetic survey  
results with English Heritage earthwork survey  
overlain





magnetic survey

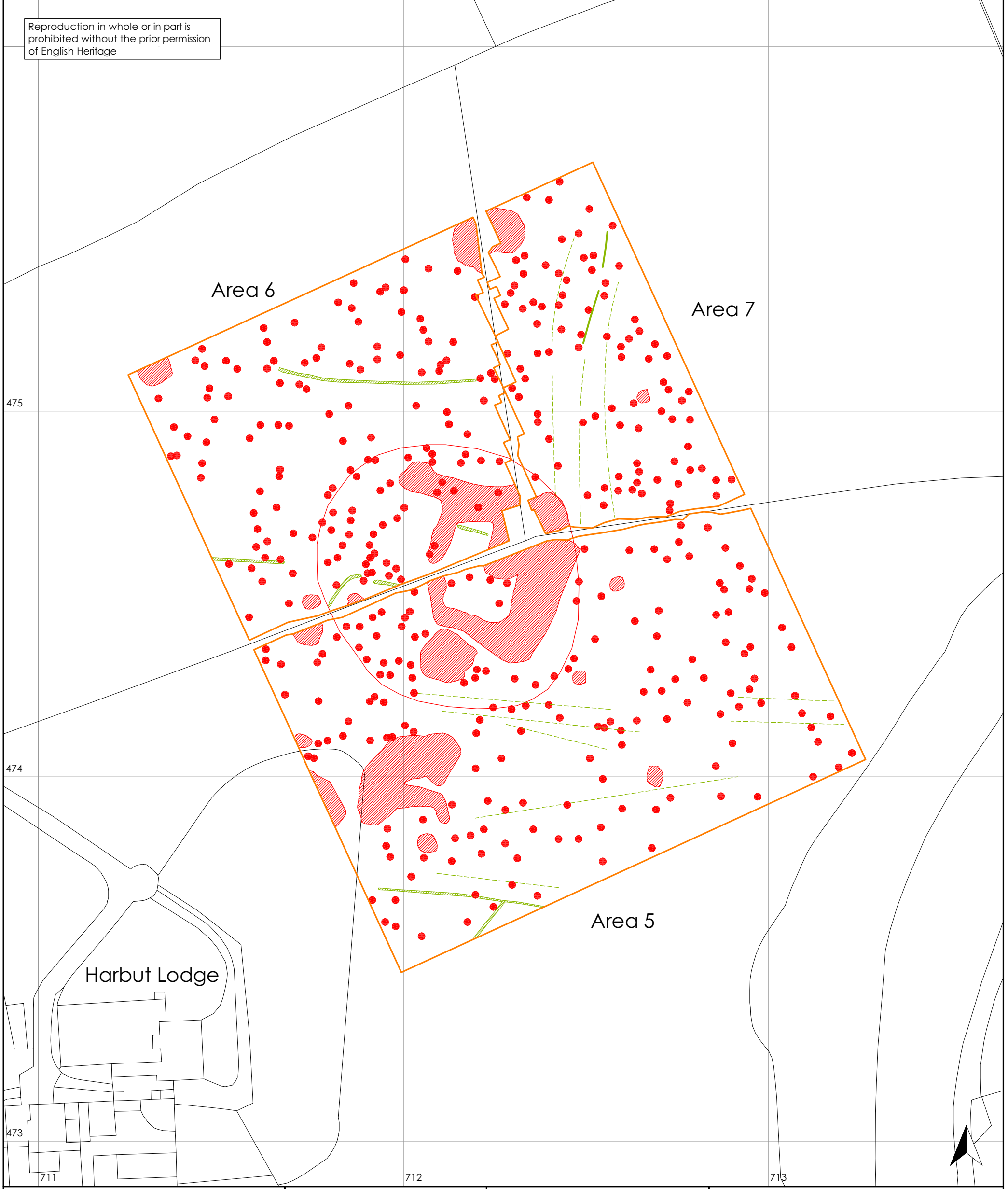


dipolar magnetic anomaly



positive magnetic anomaly

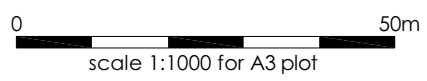
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Harbut Lodge

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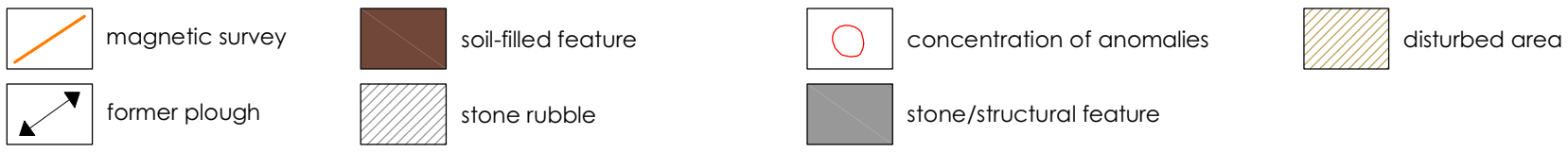
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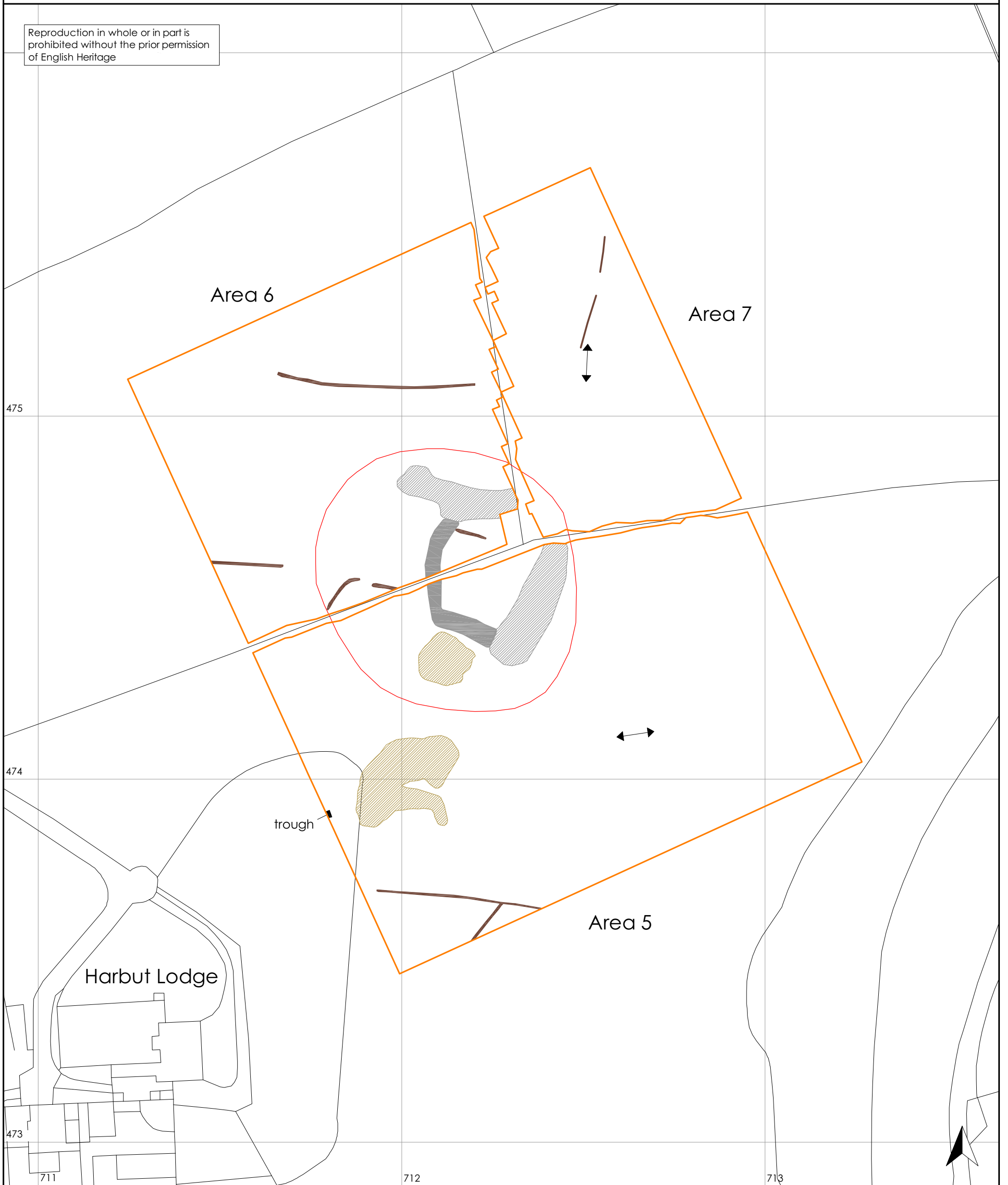
Gossipgate, Harbut Lodge and Bridge End Farm,  
Alston, Cumbria

geophysical survey  
report 2882

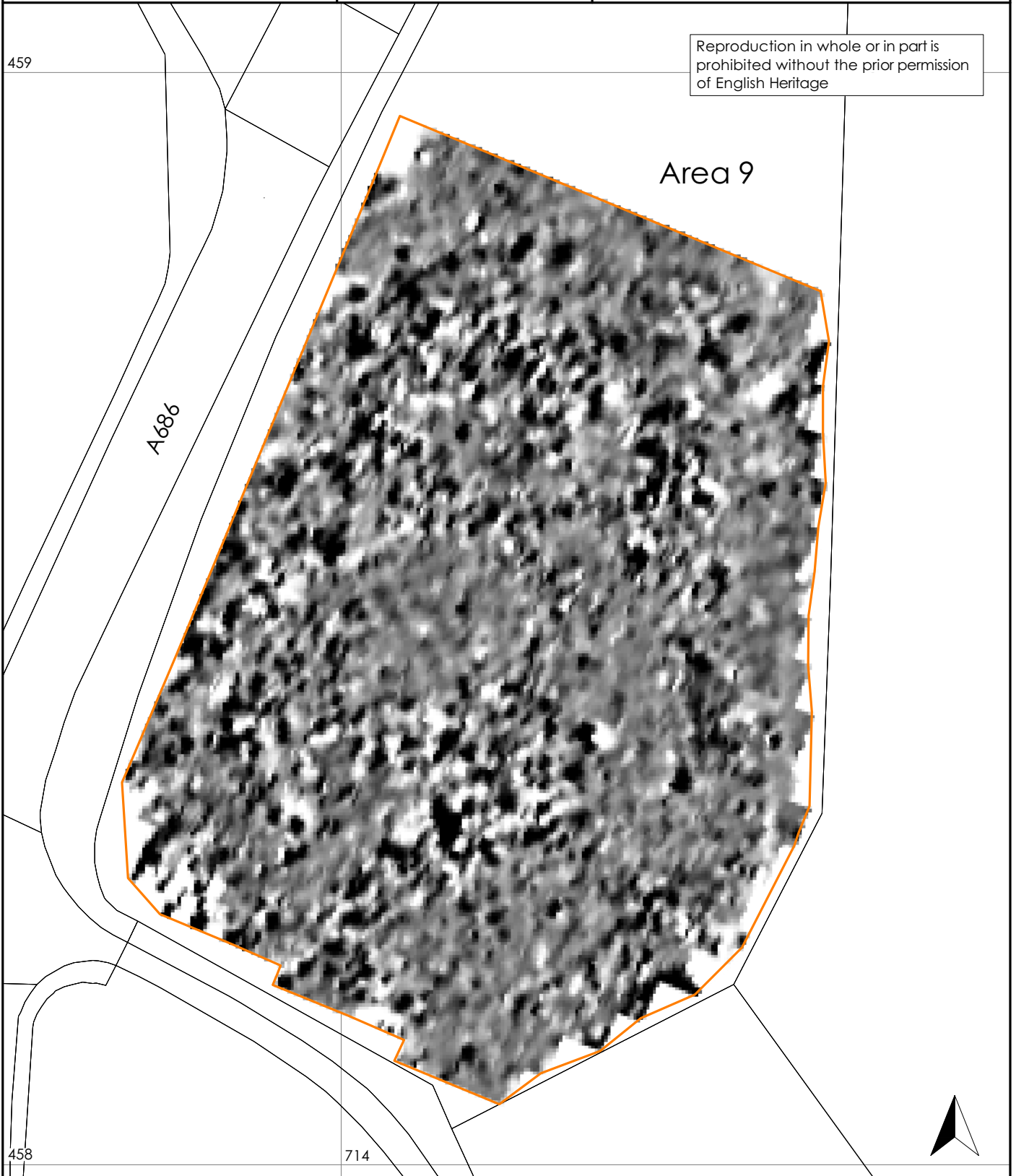
Figure 11: Harbut Lodge geophysical  
interpretation



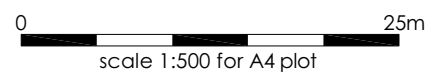
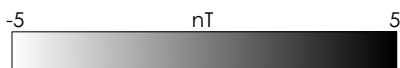
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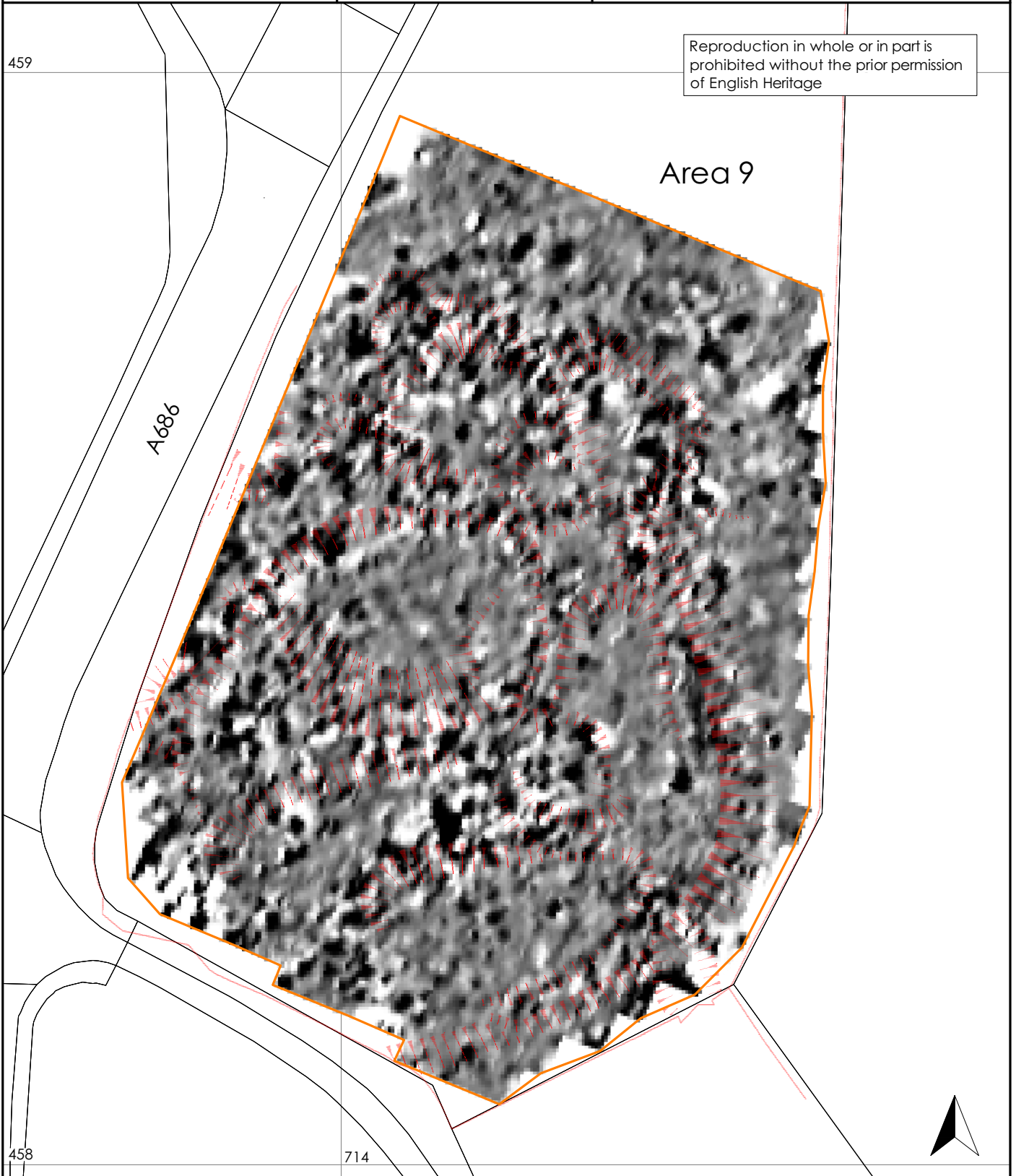


 magnetic survey





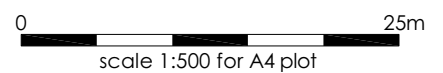
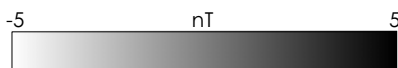
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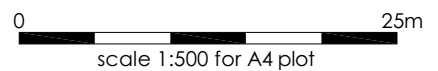
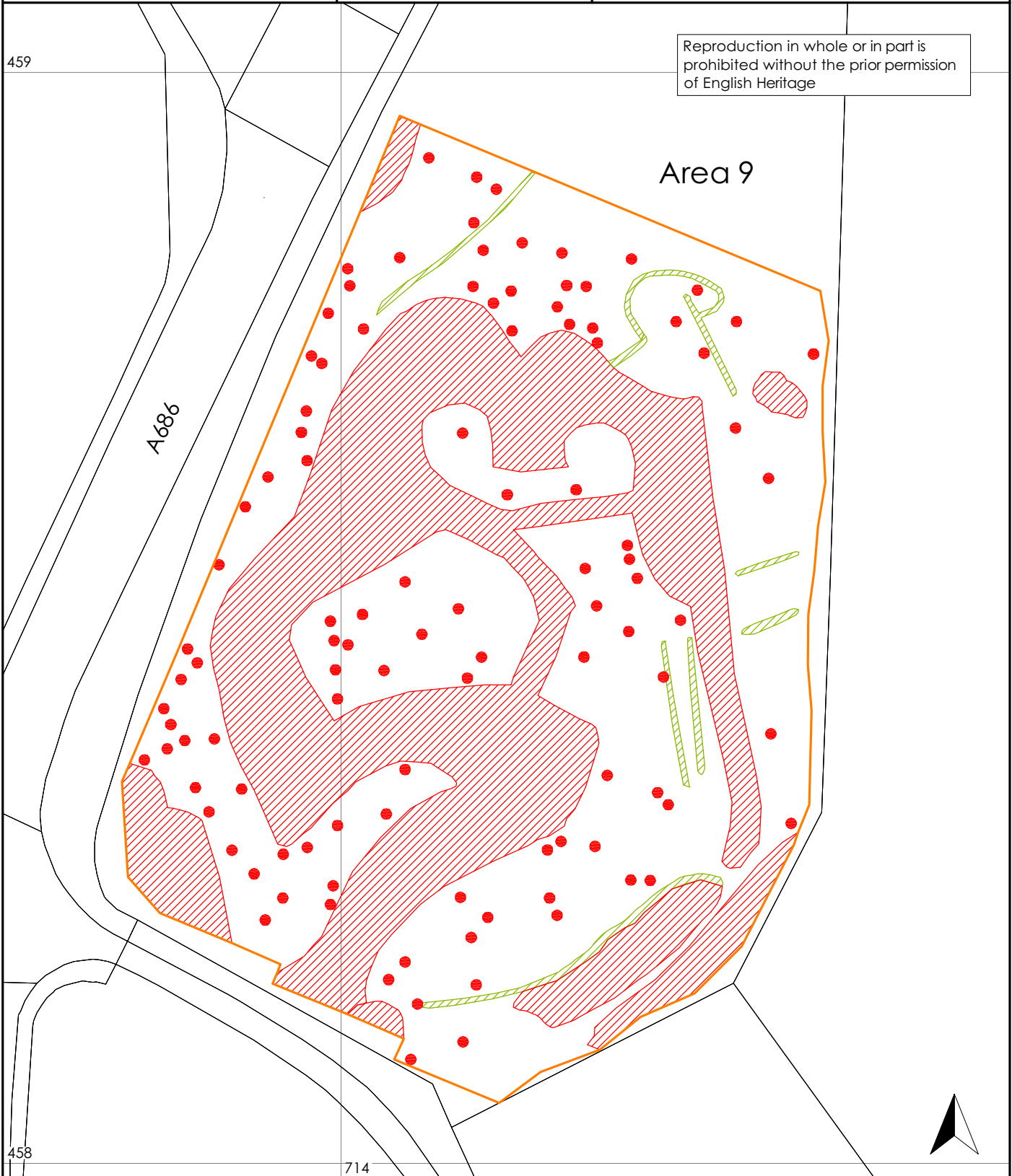
magnetic survey



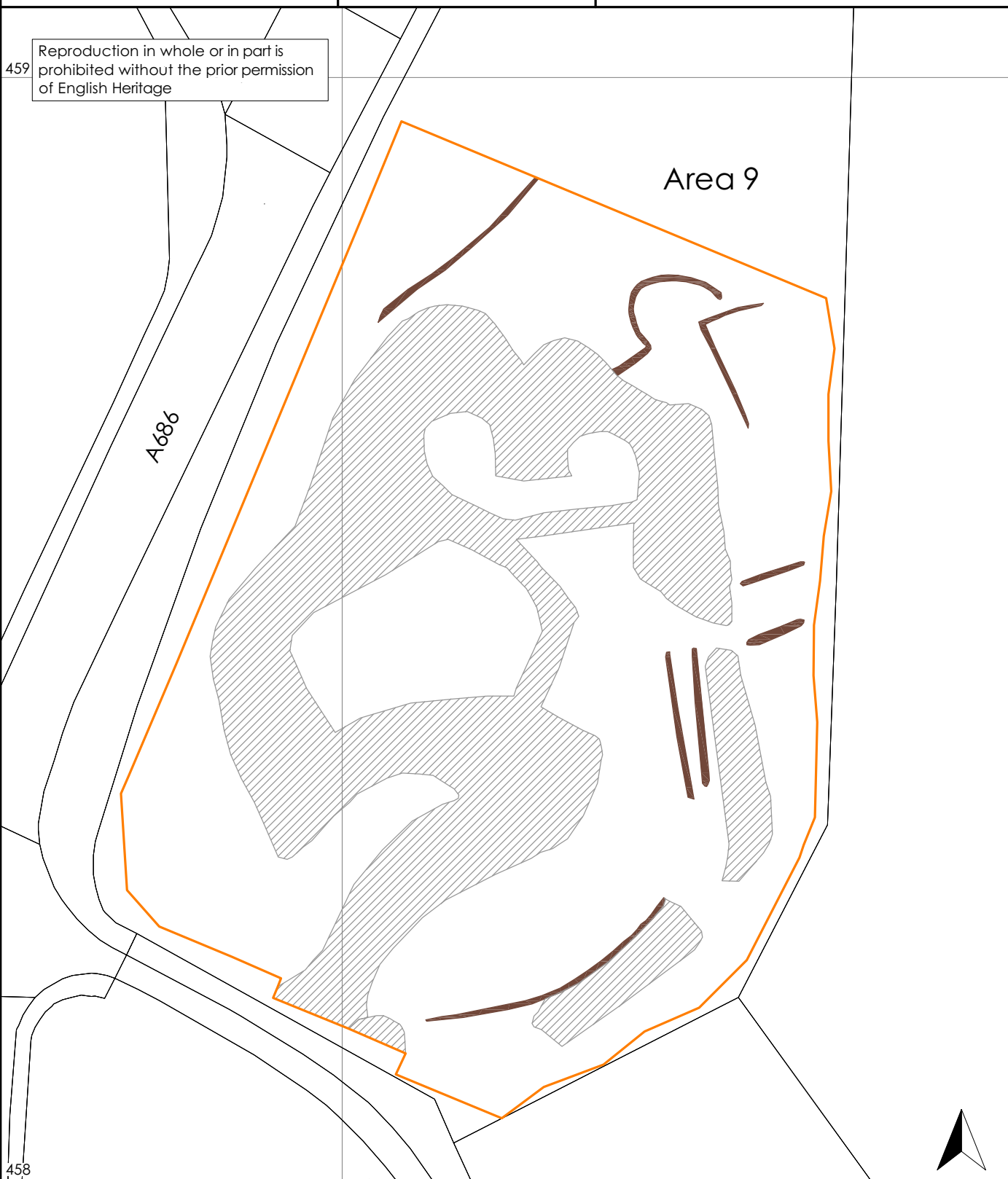
English Heritage earthwork survey



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458

714

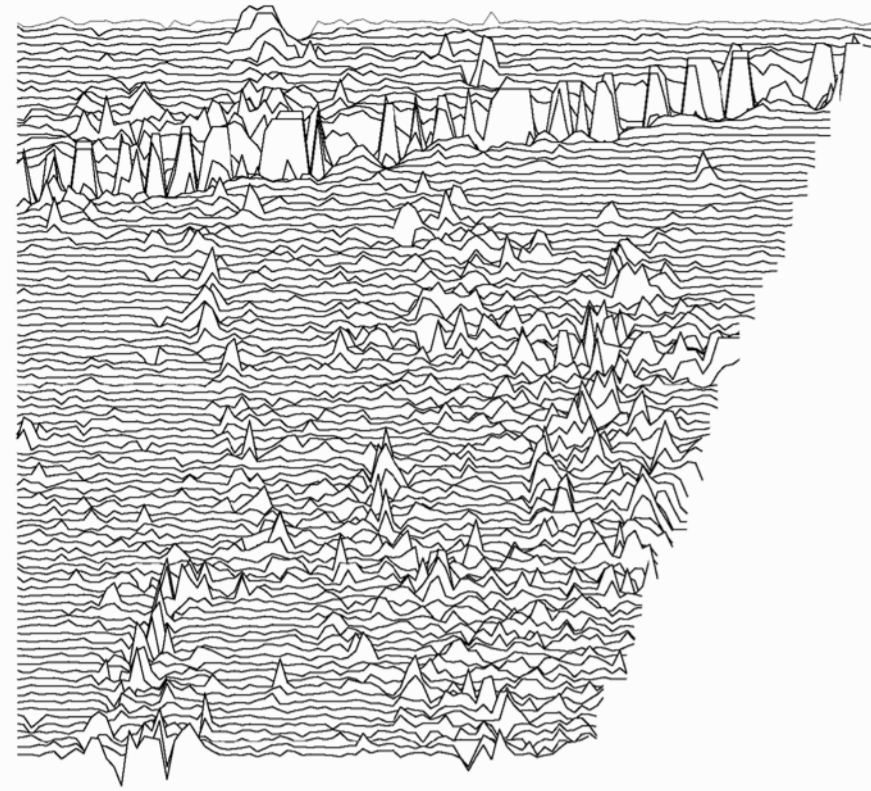
-  magnetic survey
-  stone/rubble
-  soil filled feature

0 25m  
scale 1:500 for A4 plot



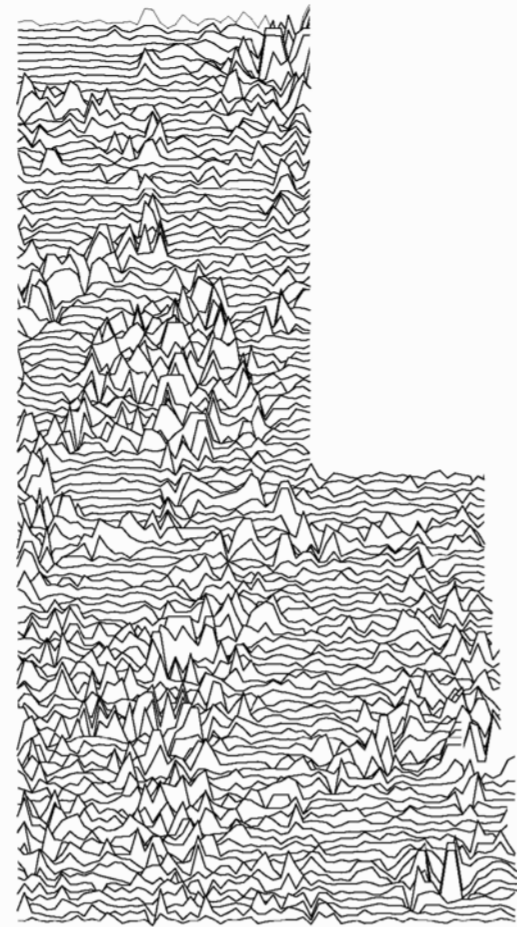
Area 1

24.00nT/cm



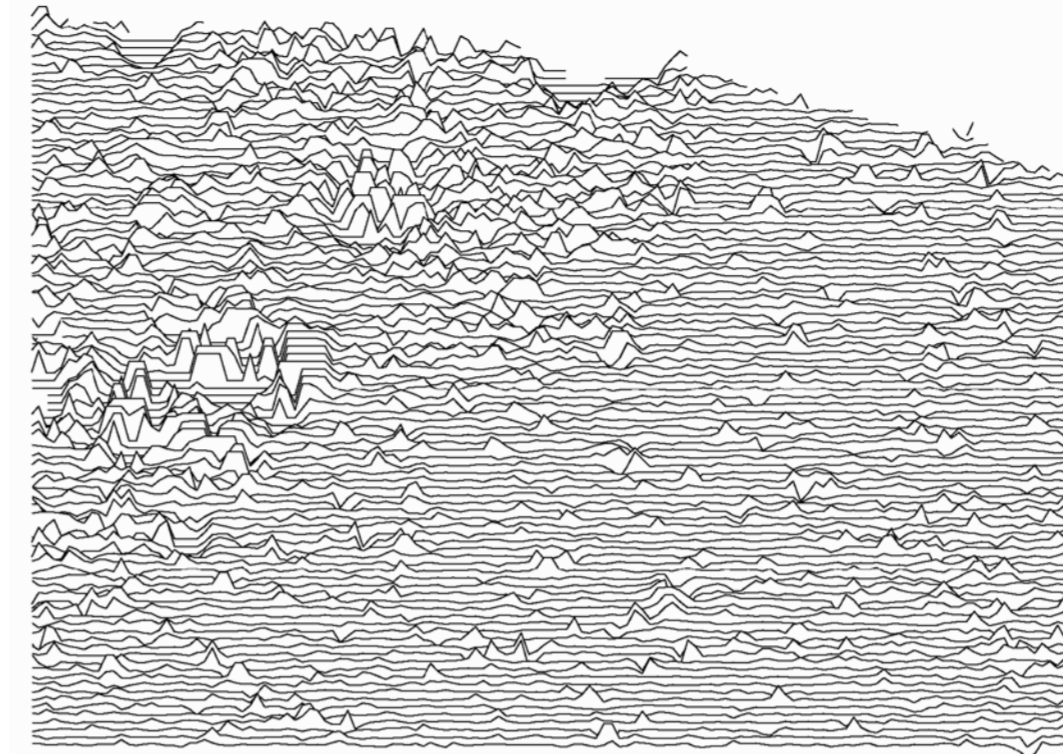
Area 4

16.00nT/cm



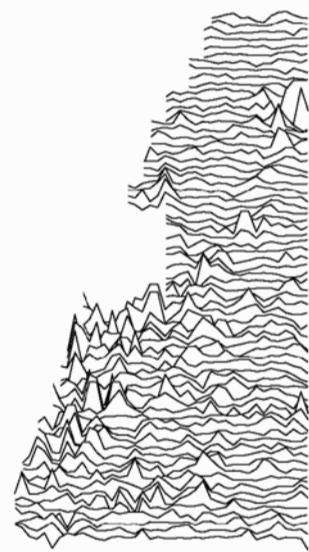
Area 5

28.00nT/cm



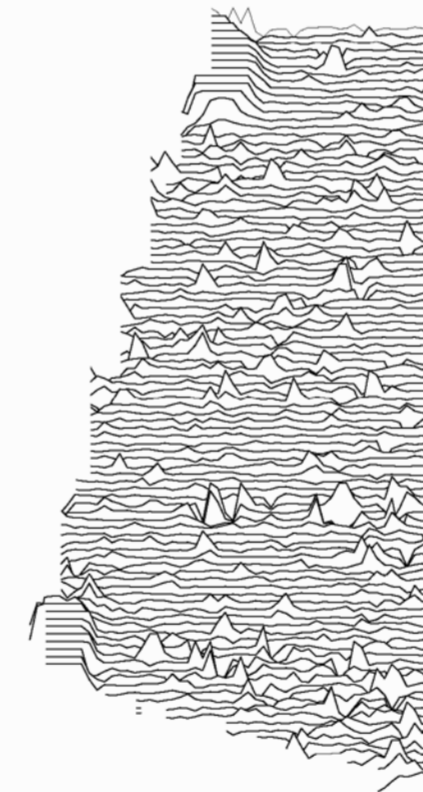
Area 2

20.00nT/cm



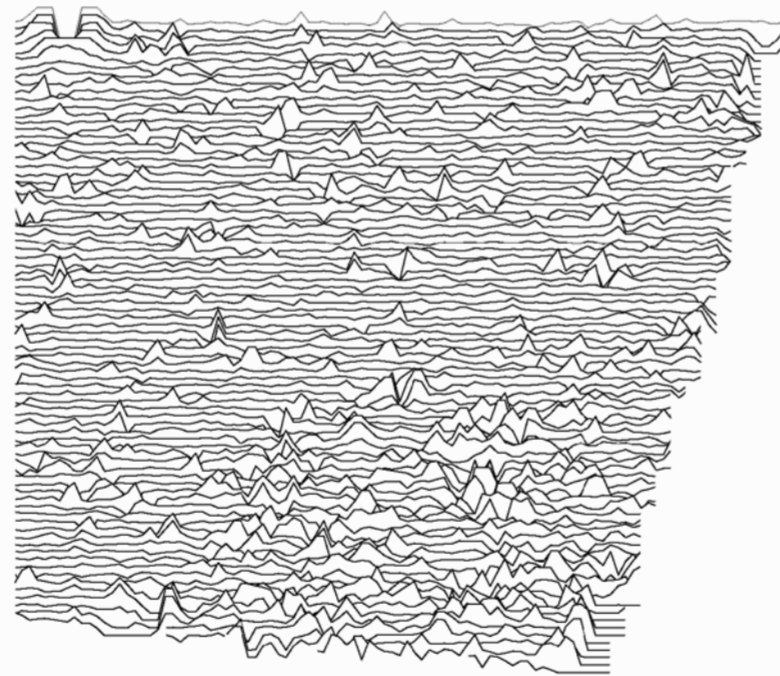
Area 7

20.00nT/cm



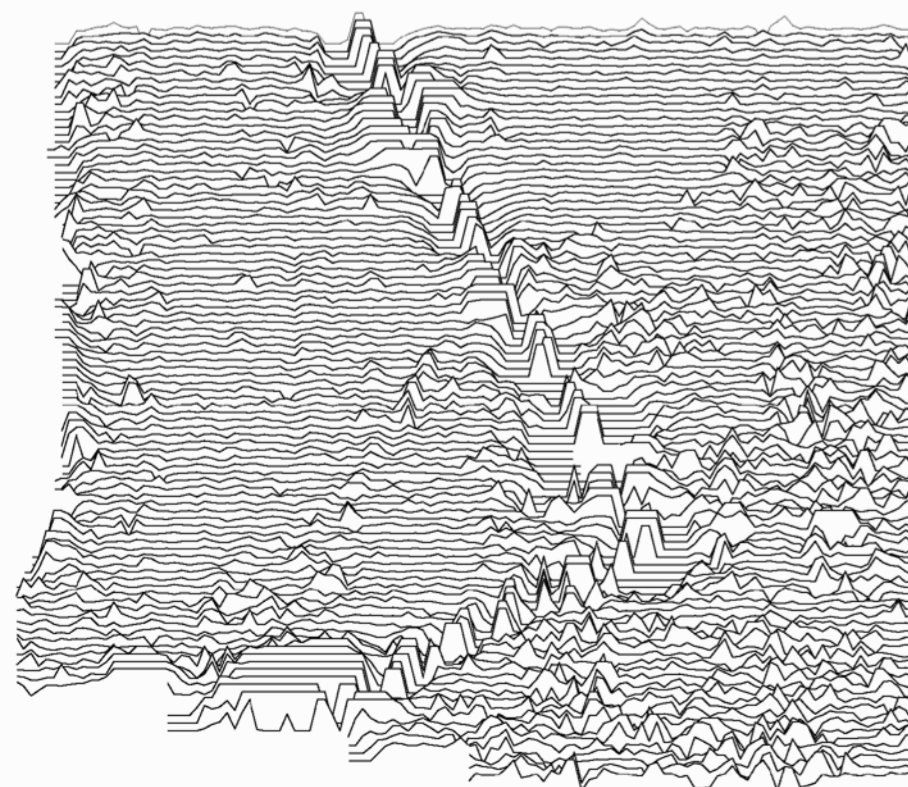
Area 6

24.00nT/cm



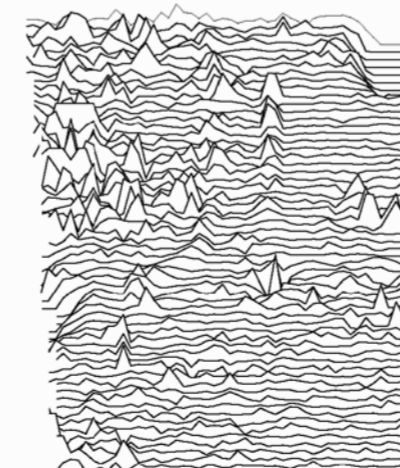
Area 3

24.00nT/cm



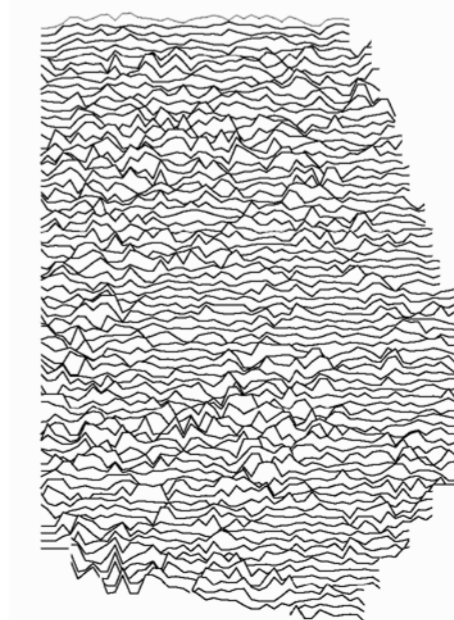
Area 8

16.00nT/cm



Area 9

40.00nT/cm



0 50m  
scale 1:1000 for A2 plot

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Figure 17: Trace plots of geomagnetic data



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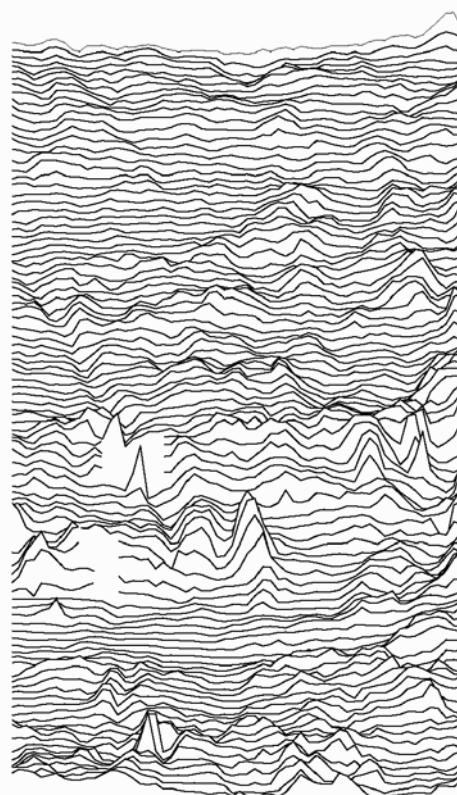
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Figure 18: Trace plots of resistance  
data

0 50m  
scale 1:1000 for A4 plot

Area 3

76.30ohm/cm



Area 4

126.60ohm/cm

