

ARCHAEOLOGICAL SERVICES

DURHAM UNIVERSITY

on behalf of
Altogether Archaeology



and



Milecastles 29, 34 and 40
Hadrian's Wall
Northumberland

geophysical surveys

report 3493
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1. Summary

The project

- 1.1 This report presents the results of geophysical surveys conducted as part of the 'Altogether Archaeology' community project Theme 8 '*North of the Wall*' Fieldwork module 8b '*Hadrian's Wall Milecastles Project*'. The works comprised detailed geomagnetic and earth electrical resistance surveys of areas around Milecastles 29, 34 and 40.
- 1.2 The works were commissioned by the North Pennines AONB Partnership (NP AONB) and Northumberland National Park Authority (NNPA), and supervised by Archaeological Services Durham University.

Results

- 1.3 Insubstantial evidence for a metalled surface has been identified to the south of Milecastle 29, however, the anomalies here may simply reflect near-surface limestone.
- 1.4 No evidence for probable roads or tracks has been identified at Milecastles 34 or 40, although a break in the northern bank and a possible stone causeway across the ditch have been detected just north-east of Milecastle 40, which could have been associated with an undetected track there.
- 1.5 Other anthropogenic features, including probable and possible walls and banks at Milecastle 29 and a circular structure to the south of Milecastle 34 have also been identified.
- 1.6 The east wall of Milecastle 29 has been detected; its remains appear to be slightly curved. No structural features have been identified within Milecastle 29, though there is almost certainly rubble present.
- 1.7 A metal pipe has been detected near Milecastle 29.
- 1.8 A large area of rubble or tumble has been identified to the north of Milecastle 34. This may obscure any older archaeological features in this area.
- 1.9 Geomagnetic and resistance anomalies relating to the local geological background, particularly the Great Whin Sill, have been identified in all of the survey areas.
- 1.10 The general lack of evidence for roads or tracks within the survey areas at these three milecastles could be because such tracks were not present, or because they comprised insubstantial earthen tracks with no associated drainage ditches. The survey areas at each site were small, due to the constraints of the present project, and evidence for roads or tracks might survive outside the survey areas.
- 1.11 A further programme of geophysical survey, both to extend the survey areas at Milecastles 29, 34 and 40, and to investigate the potential of other milecastles, would enhance our understanding of the milecastles' function and relationship with Hadrian's Wall.
- 1.12 A programme of excavation, targeting both geophysical anomalies and apparently blank areas, would also further understanding of the milecastles.

2. Project background

Location (Figure 1)

- 2.1 The survey areas were located at three Milecastles along Hadrian's Wall, Northumberland: five areas totalling 0.4ha were surveyed around Milecastle 29 (NGR: NY 8888 7110); two areas totalling 0.4ha were surveyed to the north and south of Milecastle 34 (NGR: NY 8170 7050); and a single area of 0.4ha was surveyed to the north of Milecastle 40 (NGR: NY 7457 6758).

Objective

- 2.2 The surveys were undertaken as part of the North Pennines AONB Partnership's 'Altogether Archaeology' project, Theme 8 *North of the Wall*, Fieldwork module 8b, Hadrian's Wall Milecastles Project.
- 2.3 The principal aim of the surveys was to assess the nature and extent of any sub-surface features of potential archaeological significance within each survey area.
- 2.4 Specific research aims of the wider project were:
- To undertake geophysical survey to identify any traces of possible tracks or roads leading to/from the selected milecastles from the north
 - To evaluate any anomalies identified in the geophysical survey to determine whether they represent roads, tracks or other features to the north of the milecastles
 - To engage many volunteers in the survey and excavation of these areas as part of the Altogether Archaeology programme and provide high-quality training in archaeological skills and principles
 - In achieving the above, to make a genuine contribution to our understanding of Hadrian's Wall, to communicate the results to a wide audience, and, where appropriate, to suggest further work to build on the results of this project
 - To address research themes in the Northumberland National Park Research Framework:
 - Research Theme 3: Farming through the ages: what were the relationships between native farmers and the Roman military? (If roads are present, might they relate to the transport of agricultural produce or animal droving in one or both directions?)
 - Research Theme 7: Boundaries in the Landscape
 - Research Theme 8: Transport and communication
 - Research Theme 11: Detailed area-specific research projects
 - To address questions in the Northumberland National Park Research Agenda:
 - The Romans beyond Hadrian's Wall. Temporary or Marching Camps, Semi-Permanent Camps and Permanent Fortlets ("these categories of sites have seen virtually no meaningful excavation" p402). Production of a firmer chronology for the origins and development of the temporary camps in the Park. Greater insight into construction techniques and any interior features present. Comparison with other complexes of camps elsewhere in the Empire. Roads could relate to Roman activity beyond Hadrian's Wall. Maybe some of these roads, if discovered, could link to fortlets.
 - Roman roads: Was the road system laid out *de novo* or was it following an early system of route-ways? What was the effect of the construction of the Roman roads on the native population and the social landscape? Is there any

evidence for roads changing the 'grain' of the landscape by encouraging roadside settlement and the rearrangement of other sites to suit the road.

- The Fate of Hadrian's Wall: Upkeep of Roman road system in Early Medieval period; fate of Roman roads; study of field systems to identify early medieval elements.

Methods statement

- 2.5 The surveys have been undertaken in accordance with a Project Design prepared by Krissy Moore of the NNPA and Paul Frodsham of the NP AONB, a methods statement provided by Archaeological Services Durham University (ref. DH14.220), and national standards and guidance (see para. 5.1 below).
- 2.6 Since the survey areas included part of a Scheduled Monument, the geophysical surveys were also undertaken in accordance with a 'Section 42' licence granted by English Heritage under the Ancient Monuments and Archaeological Areas Act 1979 (as amended by the National Heritage Act 1983).

Dates

- 2.7 A project start-up meeting and initial site visit was undertaken by Krissy Moore (NNPA) and Duncan Hale (Archaeological Services Durham University) on 30th May 2014. Fieldwork was undertaken on 8th-10th July 2014. This report was prepared for August 2014.

Personnel

- 2.8 Fieldwork was conducted by volunteers from the North Pennines AONB Altogether Archaeology project (Henry Bowman, John Bowman, Liz Bregazzi, Lorraine Clay, Gabriel Damaszk, Colin Goodfellow, Martin Green, Michael Hall, Freda Lodge, Rob Pearson, Ray Wager, Stuart White, Christopher Wilkinson) and Krissy Moore (NNPA Community Archaeologist).
- 2.9 Volunteers were trained and supervised by Richie Villis and Patricia Voke (Archaeological Services). Geophysical data processing and report preparation was by Richie Villis. This report was edited by Duncan Hale (the Project Manager for Archaeological Services).
- 2.10 Overall project management and coordination is provided by Krissy Moore, NNPA Community Archaeologist, assisted by Paul Frodsham, the Historic Environment Officer/Altogether Archaeology Project Officer for NP AONB.

Archive/OASIS

- 2.11 The site code is **HWM14**, for **Hadrian's Wall Milecastles Project 2014**. 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 **archaeol3-185676**.

Acknowledgements

- 2.12 The project team is grateful for the assistance of the landowners, Alice Elizabeth Kalmia Benson and Phyllis Rosemary Douglas-Menzies, and their tenants, Mr and Mrs Roddam, at Milecastle 29; the landowners, The Strakers, and their tenants, the Murrays, at Milecastle 34; and the landowner, Iona Lawson, at Milecastle 40.

3. Historical and archaeological background

- 3.1 The history and archaeology of Hadrian's Wall and its milecastles is discussed in detail elsewhere (for example, Bidwell 1999; Birley 1961; Breeze 2006; Frodsham 2013; Hodgson 2009; Simpson 1976; Stevens 1947; Wilmott 2009). The following summary is taken from the Scheduled Monument listing available online (<http://list.english-heritage.org.uk>) and the Project Design (Appendix), and is presented here with only minor amendments.
- 3.2 Previous geophysical surveys along Hadrian's Wall have proved the validity of geomagnetic survey when combined with earth electric resistance survey, despite the strong response of the local geology (Archaeological Services 2014; Bartlett 1975 & 1994; Taylor & Biggins 2004).
- 3.3 Hadrian's Wall marks one of the frontiers of the Roman Empire. The international importance of the surviving remains has been recognised through designation as a World Heritage Site. The military importance of the Tyne-Solway route across the Pennines was recognised by the Romans during their early campaigns through northern England and into Scotland in the second half of the first century AD. At this time a military road, the Stanegate, was constructed along with a series of forts. Subsequently the Romans largely withdrew from Scotland and there is evidence that the Tyne-Solway route was being recognised as a frontier by the start of the second century AD. This position was consolidated in the early second century by the construction of a substantial frontier work, Hadrian's Wall, under the orders of the Emperor Hadrian. Hadrian's successor, Antoninus Pius, subsequently attempted to establish the boundary further north, between the Clyde and the Firth of Forth, but by c.AD 160 growing unrest amongst the native populations of northern Britain and pressures elsewhere in the Empire caused a retraction back to the Hadrianic line. Hadrian's Wall was then the frontier of the Roman Empire in Britain until c.AD 400 when the Roman armies withdrew from Britain. Stretching over 70 miles from coast to coast, Hadrian's Wall was a continuous barrier built of stone in the east and, initially, of turf in the west. The stone wall was originally designed to be ten Roman feet wide and sections of this width are termed broad wall. A change of plan shortly after construction began led to a reduction in the width of the Wall to eight Roman feet, such sections being termed narrow wall. Today, stretches of both wall types survive, including some sections of narrow wall built on broad wall foundations. For most of its length a substantial ditch on the northern side provided additional defence. Where the Wall crossed rivers, bridges were constructed to carry it across. Construction of the Wall was organised and executed by legionary soldiers. (From the Scheduled Monument listing available online, <http://list.english-heritage.org.uk>).
- 3.4 From the beginning the barrier was planned to comprise more than just a curtain wall. At regularly spaced intervals of about a mile along its length lay small walled fortlets known as milecastles. These were attached to the southern side of the Wall and most had a gateway through the Wall to the north. Hence they controlled crossing points through the Wall as well as affording space for a small stable garrison. Between the milecastles were two equally spaced towers known as turrets. Together the milecastles and turrets provided bases from which the curtain wall could be watched and patrolled. Both the turrets and milecastles are thought to have been higher than the Wall itself to provide suitable observation points. It is often assumed that a platform existed on the Wall so that troops could actually

patrol along the wall top; it is however far from certain that this was the case. (From the Scheduled Monument listing available online, <http://list.english-heritage.org.uk>).

- 3.5 The relationship between milecastles and the surrounding landscape is not clearly understood. It is generally hypothesised that the milecastles were designed to control traffic from north to south through the Wall, but roads approaching them from the north, or causeways across the Wall ditch, have not been identified. The nature of the milecastles, and the roads that may or may not have passed through them, is critical to our understanding of the ways in which the Wall was originally intended to function, and actually did function following its construction. The original plan for the Wall seems not to have included any forts, the only routes through the structure being provided at the milecastles. However, the original plans for the Wall were never completed, as the decision to add the great Wall forts was made during construction, and it is not known how the milecastles functioned within this revised plan. The location of some, on high crags with a sheer drop to the north, suggests that they can never have been on routeways through the Wall, and while others may have opened onto flat ground, the extent to which they may have been used by soldiers and other traffic passing to or from the north is not known. The evidence for causeways across the Wall ditch immediately north of the milecastles is in most cases inconclusive and no work has been done previously to assess the ground north of the Wall ditch, so it remains uncertain whether or not roads led northwards from the milecastle gates (from Project Design).
- 3.6 This project proposes to undertake geophysical survey, possibly followed by trial trenching, of selected areas to the north of three Hadrian's Wall milecastles, in order to identify whether there are any traces of roads (eg disturbed road surfaces, drainage ditches) to the north. For a range of practical reasons, Milecastles 29, 34 and 40 were selected as preliminary survey sites. These have recently been described by Humphrey Welfare in a review of the potential for milecastles to have had causeways across the north ditch.
- 3.7 It is likely that different milecastles have different stories to tell; some may have had roads through them while others did not, and some may originally have had roads that were later abandoned. Some roads may have approached the milecastles at oblique angles, though given the nature of the Wall it is perhaps more likely that they approached more-or-less at right angles to the north faces of milecastles. Investigation of the land immediately north of the Wall ditch should find some evidence of roads if they ever existed. However, it is worth noting that roads approaching the milecastles could have been offset to some extent, so that traffic approaching the Wall would have crossed the ditch then passed along the berm, directly beneath the Wall's north face, for some distance before entering a milecastle. Such an arrangement would make sense from a defensive point of view, but there is currently no evidence for it; investigation of the berm immediately north of the milecastles might therefore help to establish whether such a system existed (from Project Design).
- 3.8 It is important to note here that entirely negative results, finding no evidence of roads or tracks approaching any of the milecastles, will not be without value, as such a result would suggest (though not prove) that no such routes ever existed and this would in itself be of value to our interpretation of the Wall (from Project Design).

4. Landuse, topography and geology

4.1 The majority of the survey areas were under pasture, with the exception of one small area (Area 3) to the north-east of Milecastle 29, which was in arable use. See tables below for details of each survey area.

Milecastle 29				
Area	Size (m ²)	Landuse	Topography & notes	NGR (centre)
1	1,200	pasture	S of wall; steep slope down from S to N, deep cattle rutting; post & wire fence and stone wall to S and E; military road to S	NY 88864 71080
2	400	pasture	interior of milecastle: including earthworks of former walls; tree at east edge	NY 88883 71099
3	890	arable	N of wall; flat; earthwork/bank along W edge; wire fence at S & W	NY 88909 71145
4	340	pasture	N of wall; flat; wire fence at N; no geomagnetic survey due to proximity of wire fence	NY 88860 71146
5	460	pasture – cows	N of wall; flat; wire fence at S	NY 88863 71156

Milecastle 34				
Area	Size (m ²)	Landuse	Topography & notes	NGR (centre)
1	2,000	pasture/bog – sheep	S of wall; gentle slope down from N to S; outcropping bedrock; boggy to W & S; circular earthwork feature	NY 81709 70454
2	2,000	pasture/bog – sheep	N of wall; slight slope down from S to N; dense ferns at S; boggy at N; wire mesh for ground remediation noted at S	NY 81687 70561

Milecastle 40				
Area	Size (m ²)	Landuse	Topography & notes	NGR (centre)
1	4,000	pasture – sheep	N of wall; steep slope down from S to N; ditch/earth bank at S; outcropping bedrock; stone wall to S; nettles/weeds along wall at S	NY 74614 67610
2	400	pasture	interior of milecastle: unsurveyed due to time restrictions	NY 74570 67575

4.2 The central part of Hadrian's Wall occupies impressive terrain with topography generally rising from east to west. Between Milecastle 29 in the east and Milecastle 40 in the west the wall occupies elevations between approximately 200-320m OD.

4.3 The underlying solid geology of the area comprises complex layered Carboniferous strata including limestone, sandstone, siltstone and mudstone of the Alston Formation and as many as 30 separate Limestone formations. The course of the Wall in this area closely follows the escarpment of the Great Whin Sill, an igneous intrusion of quartz-microgabbro. Superficial deposits of Devensian till are recorded across large areas surrounding Milecastles 29 and 34; no superficial deposits are

recorded in the area around Milecastle 40 (BGS 2014). Outcropping bedrock was noted near each milecastle.

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 & Digital Antiquity *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2013).

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 it was considered likely that cut features such as drainage ditches, pits and postholes might be present, and that other types of feature such as road surfaces, trackways, wall foundations and fired structures (for example kilns and hearths) might also be present.
- 5.4 Given the anticipated nature and depth of targets, two complementary geophysical survey techniques were considered appropriate: geomagnetic and earth electrical resistance survey. The selected geomagnetic technique, fluxgate gradiometry, 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. Given the underlying igneous geology, and the possible presence of wall-footings and tracks, an electrical resistance survey was also considered appropriate. 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.
- 5.5 Despite the strong magnetic background variation caused by the underlying Great Whin Sill, previous geophysical surveys (Bartlett 1975; Taylor & Biggins 2004; Archaeological Services 2014) have demonstrated the feasibility of both geomagnetic and earth electrical resistance techniques.

Field methods

- 5.6 A 20m grid was established across each survey area and related to the Ordnance Survey National Grid 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 and MPX15 multiplexers with 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 17-19. In the greyscale images, positive magnetic and high resistance anomalies are displayed as dark grey, while negative magnetic and low resistance anomalies are displayed as light grey. Palette bars relate the greyscale intensities to anomaly values in nanoTesla/ohm, as appropriate.
- 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>de-stagger</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>de-spike</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. Two 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>dipolar magnetic</i>	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:

<i>high resistance</i>	regions of anomalously high resistance, which may reflect foundations, tracks, paths and other concentrations of stone or brick rubble
<i>low resistance</i>	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 interpretations are provided.
- 5.16 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.
- 5.17 Small, discrete dipolar magnetic anomalies have been detected in all of the survey areas. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments, and in most cases have little or no archaeological significance. 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.

Milecastle 29 (Figures 2-6)

Area 1

- 5.18 Area 1 was located approximately 6m south of the milecastle and measured 60m x 20m. It occupied sloping ground towards the B6318 road. The area was chosen for survey as an area of potential to capture routes approaching the milecastle from the south.



Resistance survey. Hadrian's Wall is visible to rear left, northern ditch to right.

- 5.19 Two regions of high resistance have been detected in the centre of the survey area, on the correct alignment for a potential road from the south. It is possible that these anomalies reflect the remains of metalled or cobbled road surfaces. No supporting evidence for this has been detected in the geomagnetic data and it is likely that these anomalies reflect natural features, such as near-surface sedimentary rock.
- 5.20 A broadly north-west/south-east aligned diffuse high resistance anomaly has been detected along the southern edge of the area. This may reflect an anthropogenic feature, such as the remains of a former wall or a continuation of the bank which is upstanding to the east.
- 5.21 A high resistance anomaly has been detected at the north edge of the area. This broadly corresponds to an earthwork feature noted on the ground.
- 5.22 Large and strong dipolar magnetic anomalies detected in the south-east corner of the area correspond to the adjacent drystone wall and metal fence. Very strong dipolar magnetic anomalies detected in the centre of the southern edge of the area and in the south-western corner reflect the proximity of metal road signs.

Area 2

- 5.23 Area 2 measured 20m x 20m and covered the interior of the milecastle itself. The area was chosen to try and identify internal divisions and paths which may link to external roads.
- 5.24 A linear, strong high resistance anomaly with corresponding strong positive magnetic anomalies has been detected along the eastern edge of the area. This almost certainly reflects the east wall of the milecastle. The strength of the magnetic anomaly is probably due to the use of the local igneous rock as the building material.
- 5.25 A number of dipolar magnetic and high resistance anomalies have been detected in the interior of the milecastle. There does not appear to be a clear structural form to these and it is considered likely that they reflect tumble and/or demolition rubble rather than structural features.

Area 3

- 5.26 This area was 40m x 20m and located to the north of the ditch, approximately 30m north-east of the milecastle. It was considered likely that a possible approach road might have been present in this area.
- 5.27 A broadly east/west aligned positive magnetic and high resistance anomaly has been detected across the centre of this area. This is likely to reflect the remains of an anthropogenic feature, such as a wall. Previous geophysical surveys along Hadrian's Wall have noted that earth banks and dykes used to create enclosure systems have produced a magnetic anomaly similar to ditches, but with a much stronger response (Archaeological Services 2014; Taylor & Biggins 2004). In this instance, however, the complementary nature of the resistance data supports the interpretation as a probable stone feature.
- 5.28 A broadly north/south aligned high resistance anomaly, flanked by low resistance, and a corresponding positive magnetic anomaly have been detected along the western edge of the area. These correspond to a low earthwork feature noted on the ground, probably a former field boundary.
- 5.29 No evidence for possible roads or tracks has been identified in this area.

Areas 4 & 5

- 5.30 These areas were located approximately 25m north-west of the milecastle and were originally intended to be surveyed as a single 40m x 20m area; a metal fence bisected the area so two surveys were undertaken. It was decided to not survey Area 4 geomagnetically due the narrow width of the area in relation to the anticipated magnetic effect of the metal fence.
- 5.31 A broadly north-west/south-east aligned low resistance anomaly has been detected across both areas. This corresponds to a very strong dipolar magnetic anomaly and almost certainly reflects a metal service pipe.
- 5.32 No evidence of possible roads or tracks has been identified in either area.

Milecastle 34 (Figures 7-11)

Area 1

- 5.33 This area measured 100m x 20m and was located approximately 30m south of the milecastle, immediately south of the military way. It was intended to identify any road or track approaching from the south that may merge with or cross the military way.



Volunteers receiving introduction to gradiometer survey

- 5.34 A large concentration of dipolar magnetic anomalies has been detected across this area. This almost certainly reflects the Great Whin Sill and is most heavily concentrated in the east of the area. A large area of very high resistance has also been detected in the east of the area; these anomalies probably reflect shallower soil depths and bedrock. Outcropping bedrock was noted to the east and north of the area. The comparatively low resistance detected in the west of the area corresponds to waterlogged ground.
- 5.35 A roughly circular high resistance anomaly has been detected in the centre of the area. This corresponds to an earthwork feature, and may reflect a former stone-founded enclosure wall or building. A possible entrance has been detected in the south-west of the feature.
- 5.36 No evidence for any roads or tracks approaching from the south has been identified in this area.

Area 2

- 5.37 This area measured 100m x 20m and was located at the foot of a steep slope approximately 40m north of the Wall. A possible zig-zag path has been noted traversing up the slope and it was intended to investigate any possible roads or tracks in relation to this.

- 5.38 This area is characterized by a large concentration of small dipolar magnetic anomalies. These broadly correspond to a region of high resistance, and almost certainly reflect igneous stone or rubble. It is probable that this reflects tumble or loose rock that has been washed down the hillside. Metal webbing, used in remediation works on the hillside, was noted in the south-west of the survey area.
- 5.39 No evidence for any possible roads or tracks has been identified in this area.

Milecastle 40 (Figures 12-16)

- 5.40 A single area measuring 100m x 40m was surveyed, occupying the steep slope immediately north of the Wall. The interior of the milecastle was also intended for survey but time constraints prevented this.



Introduction to resistance survey

- 5.41 The geomagnetic survey in this area is characterised by strong dipolar magnetic anomalies. These almost certainly reflect the thermoremanent magnetism of the rocks derived from the Great Whin Sill. A broadly north-west/south-east strong dipolar magnetic anomaly detected in the east of the area almost certainly reflects the near-exposed edge of the sill.
- 5.42 Two broadly east/west aligned high resistance anomalies have been detected along the southern edge of the area. These correspond to broad bands of dipolar magnetic anomalies. These almost certainly reflect the ditch and parts of banks which survive as earthworks north of the Wall.
- 5.43 A rectilinear high resistance anomaly has been detected in the east of the survey. It is possible that this reflects an anthropogenic feature, such as deliberately placed stone in the base of the ditch to create a causeway. No evidence of roads or tracks leading to or from this point has been identified, although there also appears to be a break in the northern bank at this point.
- 5.44 Although the high resistance anomalies along the western edge of the area, directly north of Milecastle 40, could possibly reflect a man-made surface, it is considered more likely that they reflect near-surface bedrock.

6. Conclusions

- 6.1 A programme of detailed geophysical survey was undertaken over selected areas at Milecastles 29, 34 and 40 on Hadrian's Wall. The surveys were conducted with volunteers through the North Pennines AONB 'Altogether Archaeology' project in partnership with Northumberland National Park Authority.
- 6.2 Insubstantial evidence for a metalled or cobbled surface has been identified to the south of Milecastle 29, however, the anomalies here may simply reflect near-surface limestone.
- 6.3 No evidence for probable roads or tracks has been identified at Milecastles 34 or 40, although a break in the northern bank and a possible stone access route across the ditch have been detected just north-east of Milecastle 40, which could have been associated with an undetected track there.
- 6.4 Other anthropogenic features, including probable and possible walls and banks at Milecastle 29 and a circular structure to the south of Milecastle 34 have also been identified.
- 6.5 The east wall of Milecastle 29 has been detected; its remains appear to be slightly curved. No structural features have been identified within Milecastle 29, though there is almost certainly rubble present.
- 6.6 A metal pipe has been detected near Milecastle 29.
- 6.7 A large area of rubble or tumble from the steep bank has been identified to the north of Milecastle 34. This may obscure any older archaeological features in this area.
- 6.8 Geomagnetic and resistance anomalies relating to the local geological background, particularly the Great Whin Sill, have been identified in all of the survey areas.
- 6.9 The general lack of evidence for roads or tracks within the survey areas at these three milecastles could be because such tracks were not present, or because they comprised insubstantial earthen tracks with no associated drainage ditches. The survey areas at each site were small, due to the constraints of the present project, and evidence for roads or tracks might survive outside the survey areas.
- 6.10 A further programme of geophysical survey, both to extend the surveys at Milecastles 29, 34 and 40, and to investigate the potential of other milecastles, would broaden our understanding of the milecastles' use and relationship with Hadrian's Wall.
- 6.11 A programme of excavation, targeting both geophysical anomalies and apparently blank areas, would enhance our understanding of the milecastles.

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Appendix: Project Design



Altogether Archaeology
Theme 8 *'North of the Wall'*
Fieldwork module 8b
Hadrian's Wall Milecastles Project
Project Design



Document Control Grid

Title	Altogether Archaeology Fieldwork Module 8 North of the Wall: submodule 8b Hadrian's Wall Milecastles Project.
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Appendices (bound as separate documents)

Appendix 1. Altogether Archaeology Generic Risk Assessment

Appendix 2. Module 8 Project Specific Risk Assessment

Appendix 3. Risk Log

Cover Illustration: Castle Nick Milecastle (Milecastle 39). Hadrian's Wall.

1. General Introduction

1.1 Altogether Archaeology, largely funded by the Heritage Lottery Fund, is the North Pennines AONB Partnership's community archaeology project. Some project work, including this module, is being delivered in partnership with the Northumberland National Park Authority. The project enables volunteers to undertake practical archaeological projects with appropriate professional supervision and training. As well as raising the capacity of local groups to undertake research, the project makes a genuine contribution to our understanding of the local historic environment, thus contributing to future landscape management.

1.2 Over an initial 18 month period ending in December 2011, the project attracted 400 volunteers and completed a range of fieldwork modules including survey and excavation of prehistoric, Roman, mediaeval and post-medieval sites, and the survey of complex multi-period archaeological landscapes. Details of work completed during the pilot phase can be found on the North Pennines AONB website.

1.3 The current Altogether Archaeology programme runs from September 2012 – September 2015. It involves a range of professional and academic partners, and participation is open to all. Work is arranged according to ten themes, ranging from Early Farmers to 20th-Century Industrial Archaeology. Further information, including details of how to register as a volunteer, are available on the AONB website.

1.4 As part of the Altogether Archaeology project, Northumberland National Park Authority has provided funding to enable volunteers to undertake practical archaeological projects within the National Park. The aim of the project is to provide appropriate professional supervision and training in order to build the capacity of local groups to actively research little studied or poorly understood elements of the archaeology of the National Park.

1.5 The programme of field survey proposed in this project design is being delivered as part of Altogether Archaeology, Module 8 "North of the Wall", which includes all of the fieldwork within the National Park.

1.6 This particular project will examine land immediately north of three milecastles on Hadrian's Wall in the attempt to ascertain whether or not they were originally approached by roads or tracks. The milecastles are traditionally assumed to have been provided as gateways through the Wall, but some of them are located in places (for example on high crags) which could not ever have been north-south routeways.

2. Background

2.1 The relationship between Milecastles and the surrounding landscape is not clearly understood. It is generally hypothesised that the milecastles were designed to control traffic from north to south through the Wall, but roads approaching them from the north, or causeways across the Wall ditch, have not been identified. The nature of the milecastles, and the roads that may or may not have passed through them, is critical to our understanding of the ways in which the Wall was originally intended to function, and actually did function following its construction. The original plan for the Wall seems not to have included any forts, the only routes through structure being provided at the milecastles. However, the original plans for the Wall were never completed, as the decision to add the great Wall forts was made during construction, and we simply do not know how the milecastles functioned within this revised plan. The location of some, on high crags with a sheer drop to the north, suggests that they can never have been on routeways through the Wall, and while others may have opened onto flat ground, we simply don't know the extent to which they may have been used by soldiers and other traffic passing to or from the north. The evidence for causeways across the Wall ditch immediately north of the milecastles is in most cases inconclusive (see Table 1, below) and no work has been done previously to assess the ground north of the Wall ditch, so we don't know whether or not roads led northwards from the milecastle gates.

2.2 This project proposes to undertake geophysical survey, possibly followed by trial trenching, of selected areas to north of three Hadrian's Wall Milecastles, in order to identify whether there are any traces of roads (eg disturbed road surfaces, drainage ditches) to the north. For a range of practical reasons, Milecastles 29, 34 and 40 have been proposed as preliminary survey sites. These have recently been described by Humphrey Welfare in a review of the potential for milecastles to have had causeways across the north ditch (see Table 01). Geophysical survey and excavation at the ends of these possible causeway sites would provide a useful test of this hypothesis.

2.3 It is of course highly likely that different milecastles have different stories to tell; some may have had roads through them while others did not, and some may originally have had roads that were later abandoned. Some roads may have approached the milecastles at oblique angles, though given the nature of the Wall it is perhaps more likely that they approached more-or-less at right angles to north faces of the milecastles; either way, investigation of the land immediately north of the Wall ditch should find some evidence of roads if they ever existed. However, it is worth noting that roads approaching the milecastles could have been offset to some extent, so that traffic approaching the Wall would have crossed the ditch then passed along the berm, directly beneath the Wall's north face, for some distance before entering a milecastle. Such an arrangement would make sense from a 'defensive' point of view, but there is currently no evidence for it; investigation of the berm immediately north of the milecastles might help to establish whether such a system may ever have existed.

2.4 It is important to note here that entirely negative results, finding no evidence of roads or tracks approaching any of the milecastles, will not be without value, as such a result would suggest (though not prove) that no such routes ever existed and this would in itself be of value to our interpretation of the Wall.

Milecastle	<i>Causeways at Milecastles (summarised from Welfare 2000).</i>
29 Tower Tye NY 88887109	<p>“The hillside slopes gently from E to W; the base of the Ditch rises appreciably on the axis of the milecastle, suggesting that there may be some damming on the E (upper) side. This could represent the remains of a causeway, much silted up. ... Axial to the milecastle is a bulge in the N-facing scarp of the Ditch. This seems to be composed largely of rubble and is probably derived from the collapse of the milecastle (rather than from its robbing). Superficially this bulge looks like part of a causeway – and indeed it may be so – even though there is nothing comparable surviving on the N side. ... There is a causeway across the Vallum opposite to this milecastle.” (Welfare 2000: 20-21). [An] appropriate gap in the glacis may be identified in the earthworks opposite the position of the North gate of milecastle ... 29 (Tower Tye.... Elsewhere ploughing has frequently destroyed any surface traces that might have been indicative (Welfare, 2000. Page 16).</p>
34 Grindon NY 81707049	<p>“Here the Ditch is extremely well preserved ... There would have been no real need for a causeway here as the Ditch only continues for about 30m farther to the W; access to the N from the gate of the milecastle would have been readily possible along the berm for this short distance. Although the ditch has clearly been driven across the face of the milecastle there is a marked discontinuity in the level of the base of the Ditch at this point.... These observations suggest that a causeway here has been cut away” (Welfare 2000: 21).</p>
40 Winshields NY 74576757	<p>“In effect this milecastle opens onto the crags. Its position is just at the point where the Ditch ends in this sector. The ditch was only dug to its usual profile as far as a point about 70m to the E (Simpson 1976, 86). Thereafter, to the W, its N crest is marked only by a low bank – almost a marker bank , rather than a significant stretch of Ditch – several metres below the level of the milecastle gate. This slight bank continues beyond and across the axis of the milecastle gate whereas the vestigial S scarp does end at the axis, possible suggesting the former presence (or the intended presence) of a causeway. Egress from this gate would have been possible, and would have been useful as there is no other way of getting to the N face of the Wall to the W where the natural slopes drop steeply almost immediately below the northern face of the modern field-wall on the line of the Wall” (Welfare 2000: 22).</p>

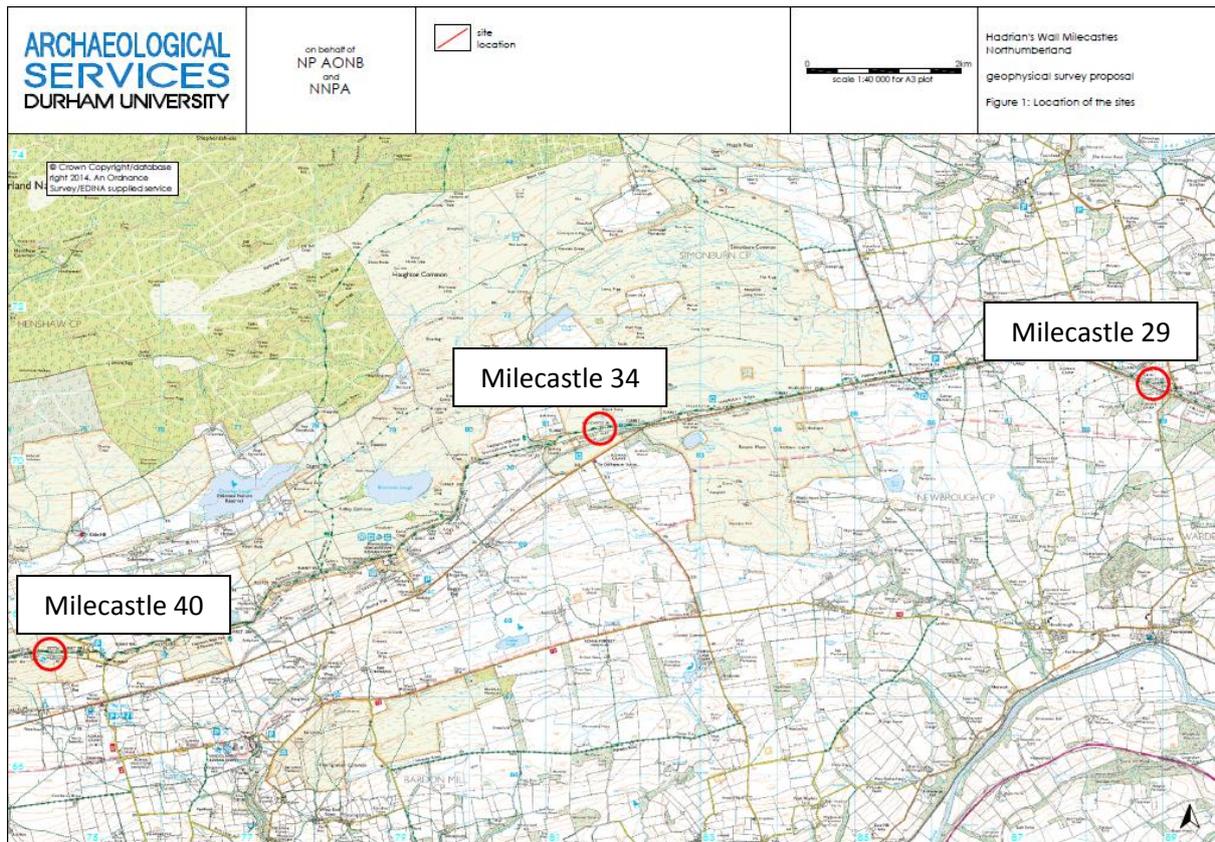


Figure 1: Map showing locations of the three milecastles to be studied by this project.

3. Research Aims and Objectives

The proposed research has the following aims and objectives:

- To undertake geophysical survey to identify any traces of possible tracks or roads leading to/from the selected milecastles from the north
- To evaluate any identified anomalies identified in the geophysical survey to determine whether they represent roads, tracks or other features to the north of the milecastles.
- To engage many volunteers in the survey and excavation of these areas as part of the Altogether Archaeology programme and provide high-quality training in archaeological skills and principles
- In achieving the above, to make a genuine contribution to our understanding of Hadrian's Wall, to communicate the results to a wide audience, and where appropriate to suggest further work to build on the results of this project.
- To address research themes in the Northumberland National Park Regional Research Framework:

- Research Theme 3: Farming through the ages: *what were the relationships between native farmers and the Roman military? (If roads are present, might they relate to the transport of agricultural produce or animal droving in one or both directions?)*.
- Research Theme 7: Boundaries in the Landscape.
- Research Theme 8: Transport and communication.
- Research Theme 11: Detailed area-specific research projects.
- To address questions in the Northumberland National Park Research Agenda:
 - The Romans beyond Hadrian's Wall./ Temporary or Marching Camps, Semi-Permanent Camps and Permanent Fortlets ("these categories of sites have seen virtually no meaningful excavation" (p402). Production of a firmer chronology for the origins and development of the temporary camps in the Park. Greater insight into construction techniques and any interior features present. Comparison with other complexes of camps elsewhere in the Empire. **Roads could relate to Roman activity beyond Hadrian's Wall. Maybe some of these roads, if discovered, could link to fortlets. This could be a future strand of enquiry – but it can also be removed as its relevance is dependent on the results of this phase of the investigations..**
 - Roman roads: Was the road system laid out *de novo* or was it following an early system of route-ways? What was the effect of the construction of the Roman roads on the 'native' population and the 'social' landscape? Is there any evidence for roads changing the "grain" of the landscape by encouraging roadside settlement and the rearrangement of other sites to suit the road, as has been seen by Taylor on the Wolds of East Yorkshire (Taylor 2001). P404-5.
 - The Fate of Hadrian's Wall: Upkeep of Roman road system in Early Medieval period = fate of Roman roads. Study of field systems to identify early medieval elements?

4. Business Case

This project should be undertaken now for the following reasons:

It meets the aims of the NNPA's partnership with the Altogether Archaeology project in providing volunteer engagement opportunities north of Hadrian's Wall

It has the potential to substantially increase our knowledge of the purpose of Milecastles by testing whether there are actually roads linking with them in the north. **CHECK LINK WITH HW WALL RESEARCH AGENDA....**

There is not yet consensus on the function(s) of the Wall (Symonds & Mason 2014?: 9) – this survey would provide additional information on the Walls function (or otherwise) as a barrier to North – South traffic. Geophysical survey is highlighted in the Research Agenda as a useful tool in providing more information on this topic (Symonds & Mason 2014?: 42).

The Hadrian’s Wall Resource Assessment notes that “the fundamental question of whether civilians were permitted to pass through the milecastle gates remains unresolved” (Symonds 2014?: 46). Welfare’s (2000) topographic survey argues for the presence of causeways at some Milecastles; identification of roads or their absence would strengthen the case for/against causeways and southbound traffic from north of the Wall, particularly as the sample for this study includes both Milecastles with definite causeways and Milecastles unlikely to have causeways.

The Milecastles all lie on the Stone Wall; these are known to have been initially constructed to the Broad gauge – “the building schedule may have been influenced by a a desire to complete first those Milecastles in areas where the topography facilitated unregulated north-south transit across the Wall line (Symonds 2005:72) in (Symonds 2014?: 46). Identifying the presence/absence of roads leading to Milecastles in areas of suitable topography would clarify whether there were transport links (embodied by roads) to influence the building schedule, linking to research Theme 7.10 Transport Networks & Ports.

Geophysical survey at milecastle 73 identified extramural timber buildings (Biggins, Hall and Taylor 2004e in Symonds 2014?: 46). It is possible that the geophysical survey proposed in this project may identify extramural buildings instead of/in addition to any road remains, and thereby add further detail on extramural settlement around Milecastles as another indicator of the nature of Wall / North relations.

The community engagement and outreach aspects of the Altogether Archaeology model are closely related to the Hadrian’s Wall Research Agenda and Strategy Item V: “communicating knowledge, raising awareness and improving public understanding”, and Strategy Item VI “promotion of general access to knowledge about Hadrian’s Wall amongst all of those individuals and groups with an interest in both the World Heritage Site as designated and the physical monument itself ... [to] produce information at a level where it is accessible by both academic and non academic ‘researchers” (Symonds & Mason 2014?: 46).

Relevant Themes and Priorities in the Hadrian’s Wall Research Agenda and Strategy (after Symonds & Mason 2014?).

Themes and Priorities	Outcome
A) Raising profile, creating cohesion	3) Increased archaeological activity 4) Contributions to any Hadrian’s Wall publications 5) Community involvement

	6) Increased awareness at regional, national and international levels of research on Hadrian's Wall
B) Non-invasive survey	1) Increased awareness of extent, survival, complexity and management requirements of sites and course of the Wall 2) Ability to maximise impact of future interventions
P) Conceptualising the frontier	5) Further progress on understanding the purpose of Hadrian's Wall
Q) Manning the Wall	1) Evidence for the degree and nature of extramural activity at milecastles

It will potentially contribute to our knowledge of post-Roman landscape development north of Hadrians' Wall, which is an under-researched area

5. Methods Statement

The Aims and Objectives of this project will be achieved in three main phases:

- Phase 1. Preparation, desk-based assessment and start-up meeting.
- Phase 2. Geophysical survey.
- Phase 3. Small-scale excavation.

Phase 1: Preparation, desk-based assessment, and start-up meeting.

5.1.1 Based on discussions with a range of relevant experts, a sample of 6 Milecastles has been identified: Milecastles 29, 34 and 40. A review will be made of the available archaeological research literature to guide our interpretations and familiarise us with the current understanding of these Milecastles. This work will be done by Krissy Moore, and an overview of each milecastle will be presented at the project start-up meeting. A full bibliography will be attached to the reports, so that project volunteers can study sites in further detail should they wish to do so.

5.1.2 These Milecastles will be subjected to a desk-based assessment including map regression analysis to identify any past major land use impacts and GIS-based review of known sites on the HER and the National Mapping Programme database. The Milecastles are in a variety of topographic and

geological locations and have undergone different levels of post-Roman land-use, all factors which will influence the efficacy of geophysical survey.

5.1.3 The preparation phase will include visits to all three milecastles, where the exact survey areas will be agreed on the ground. As these areas will be partially within scheduled ancient monuments, it will be necessary for the Project Manager to obtain Section 42 licences under the terms of the Ancient Monuments and Archaeological Areas Act 1979 (as amended). These licences will be obtained at the earliest opportunity, as far as possible in advance of the commencement of fieldwork.

5.1.4 Prior to the commencement of fieldwork, there will be a start-up workshop to be attended by all participants. This will provide volunteers with an introduction to Hadrian's Wall and in particular to current understanding of the role of milecastles within the Wall complex. It will also include a summary of the desk-based assessment for each of the three featured milecastles, and an introduction to geophysical survey techniques. The workshop will include a field inspection of one of the featured milecastles.

Phase 2: Geophysical survey

5.2.1 Fieldwork will be undertaken by Altogether Archaeology volunteers, under professional supervision from experts from Archaeological Services Durham University, who will provide all necessary equipment. Each survey will be run as a training workshop, with techniques and methodology fully explained to all participants, all of whom will have the chance to participate in all aspects of the work. Decisions as to exactly how each survey is structured, and how many volunteers participate in each, will be made when we know how many volunteers wish to take part.

5.2.2 The exact location and size of the different survey areas will vary according to local topography, but the approximate areas to be covered are shown in Figures 2, 3 and 4. The proposed geophysical survey areas are shaded in orange and potential extended survey areas are outlined in red.

Milecastle 29 – Figure 2: The interior of the milecastle, two 20m x 40m areas to its north and one 20m x 60m area to the south, offered the greatest potential for geophysical survey (shaded in orange). Based on feedback from geophysical surveyor Duncan Hale of Durham University, the areas may be extended to include more space around the milecastle and to survey completely up to fence lines (areas outlined in red). The area to the south of the milecastle will cross the Hadrian's Wall Trail and this needs to be considered in the risk assessment. Survey to the north and south has potential to capture routes towards the milecastle from both north and south of the Wall. Survey of the interior has potential to identify internal divisions and paths which may link to external roads.

Milecastle 34 – Figure 3: A 20m x 100m area north of the milecastle, at the foot of the steep north bank of the vallum, offers potential for geophysical survey (shaded in orange). There is an indication of a zig-zagging path up the slope of the vallum leading up from the level area at the foot of the bank. Geophysical survey may identify any road or path related to this path. The Military Way runs

east to west directly south of milecastle 34. Survey of a 20m x 100m level area on the south side of the Military Way offers potential for catching any paths merging with the military way from the south (shaded in orange). The interior of the milecastle is unsuitable for survey as several trees are growing within it. Following feedback from geophysical surveyor Duncan Hale, the areas have been amended to include the area surrounding the milecastle, and the northern survey area has been moved north so as to capture the level ground on the north of the bank, thereby avoiding the slope (outlined in red).

Milecastle 40 – Figure 4: The steeply sloped terrain north of the milecastle shows clear signs of a ramp having been constructed to fill the ditch and lead up to the entrance to the milecastle. A large area 40m x 100m area has been selected for survey in order to capture both the level area prior to the obvious ramp and the ramp itself (shaded in orange). The interior of the milecastle also offers potential for survey as it is relatively unobstructed (shaded in orange). Based on feedback from the geophysical surveyor Duncan Hale, if time/resources permit, the area surrounding Milecastle 40 will also be surveyed.

The proposed geophysical survey areas are presented in Figures 2, 3 and 4 on the following pages.



Figure 2: Milecastle 29 provisional approximate location of geophysical survey areas

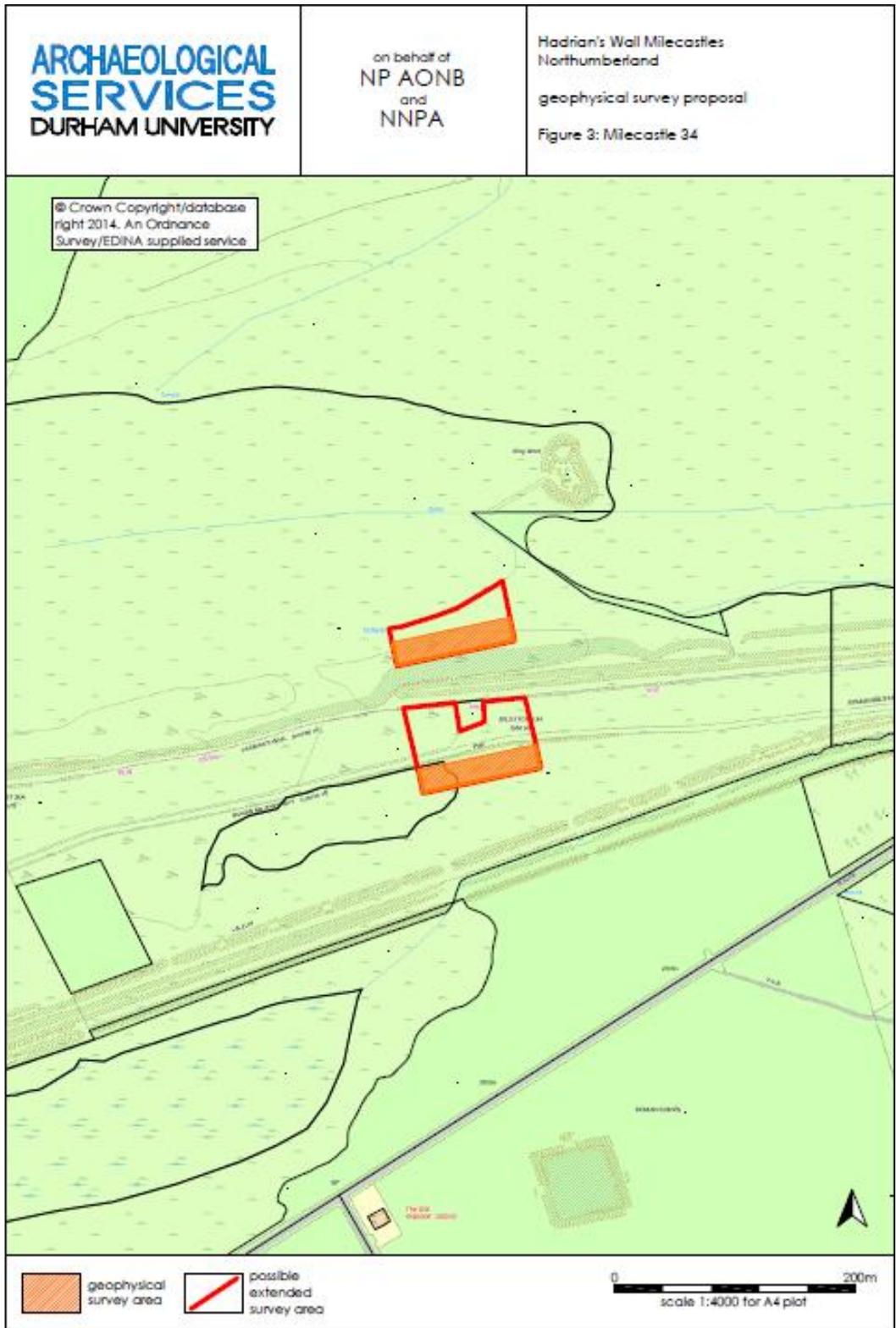


Figure 3: Milecastle 34 provisional approximate location of geophysical survey areas

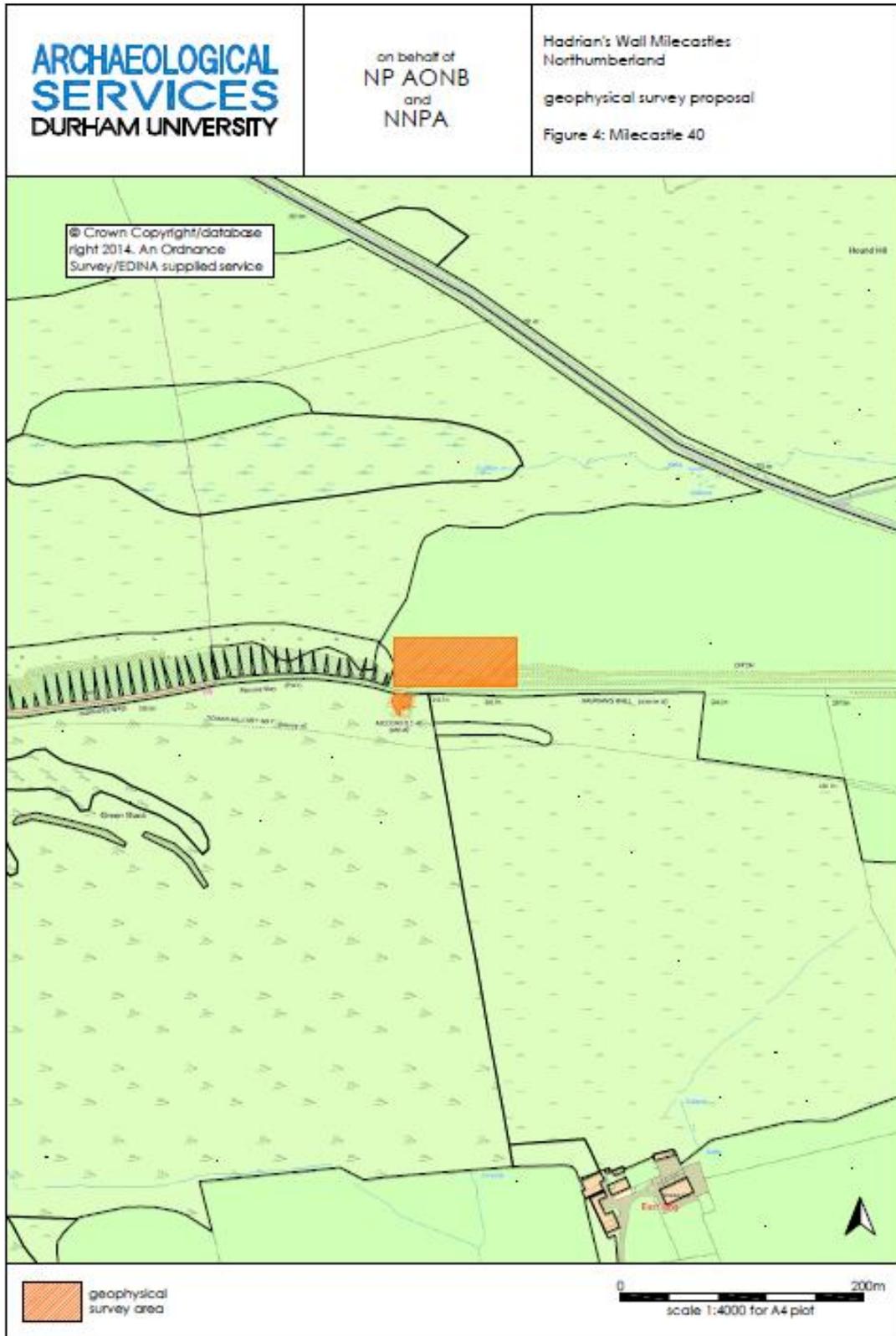


Figure 4: Milecastle 40 provisional approximate location of geophysical survey areas

5.2.3 Technique selection

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.

In this instance, it is possible that both built and cut features (for example road surfaces, ditches and pits) might be present. Given the anticipated nature and depth of targets it is proposed that two complementary techniques are used: geomagnetic survey (fluxgate gradiometry) and earth electrical resistance survey.

Fluxgate gradiometry involves the use of hand-held magnetometers to detect and record anomalies in the vertical component of the Earth's magnetic field which are caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect, for example, ferrous, stone, brick and soil-filled features. Electrical resistance survey is ideal for detecting stone features such as walls, paths and culverts, but can also detect soil-filled features, depending on ground conditions at the time of survey. 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.

Fieldwork

5.2.4 A 20m survey grid will be established and tied-in to known mapped Ordnance Survey points using a Leica GS15 global navigation satellite system (GNSS) with real time kinematic corrections (RTK), typically providing accuracy of 10mm.

5.2.5 The field techniques involved in collection of the geophysical data will be taught to the local community volunteers who will then aid in the collection of data.

5.2.6 Measurements of vertical geomagnetic field gradient will be determined using Bartington Grad601-2 dual fluxgate gradiometers. A zig-zag traverse scheme will be employed and data logged in 20m grid units. The sample interval will be set to 0.25m and the traverse interval to 1m, thus providing 1600 measurements per 20m grid unit.

5.2.7 Measurements of earth electrical resistance will be determined using Geoscan RM15D Advanced resistance meters with twin probe arrays and MPX15 multiplexers. A zig-zag traverse scheme will be employed and data logged in 20m grid units. The sample interval will be set to 1m and the traverse interval to 1m thus providing 400 sample measurements per 20m grid unit.

5.2.8 Data will be downloaded on-site into laptop computers for verification, initial processing and storage and subsequently transferred to a desktop computer for further processing, interpretation

and archiving. Geoplot software will be used to process and interpolate the data to form arrays of regularly-spaced values at 0.25m x 0.25m intervals and to produce continuous-tone greyscale images and trace plots of the raw (unfiltered) data, as appropriate.

Research

5.2.9 Research objectives are built into archaeological projects, as a result of the English Heritage national policy framework and its objectives, as outlined within Exploring Our Past (English Heritage 1991), Frameworks for our Past (English Heritage 1996), the Research Agenda (English Heritage 1997), and the Policy Statement on implementation (1999). Archaeological Services will complete works within the research priorities set out in North-East Regional Research Framework (NERRF). The specific research objectives which this project has the potential to address include:

- need to add something here.....

Reporting

5.2.10 The greyscales will be presented by importing the images directly into digital plans of the areas at the largest available scale. Palette bars relating the greyscale/trace intensities to anomaly values in nanoTesla and Ohms will be included with each image. Other types of plots may also be provided, if they aid presentation or interpretation. Colour-coded geophysical and archaeological interpretation plans will be provided. The survey report will also include a detailed discussion and interpretation, explaining the likely nature of the anomalies, along with their implications. Modern services and other potential hazards will be clearly distinguished.

5.2.11 The report will be based on the following format:

1. Executive summary
 - 1.1 The project
 - 1.2 Results
 - 1.3 Recommendations
2. Project background
 - 2.1 Location
 - 2.2 Development proposal
 - 2.3 Objective
 - 2.4 Specification summary
 - 2.5 Dates
 - 2.6 Personnel
 - 2.7 Acknowledgements

2.8 Archive

3. Archaeological and historical background
 4. Landuse, topography and geology
 5. Geophysical survey
 - 5.1 Technique selection
 - 5.2 Field methods
 - 5.3 Data processing
 - 5.4 Interpretation: anomaly types
 - 5.5 Interpretation: features
 6. Discussion, including recommendations for further work (see below)
 7. References
- Appendix I: Trace plots of geomagnetic data

5.2.12 At the end of fieldwork a full report will be prepared suitable for use by the North Pennines AONB Partnership and NNPA. The report will be provided in pdf format; bound copies can be supplied as required. One hard copy and a digital version of the report will also be supplied both the County HER office and English Heritage. An OASIS form will also be submitted. A report will be made available via the AONB and NPA websites.

Archive

5.2.13 A survey archive will be produced on CD containing copies of the report, raw data files and metadata. This will be lodged with client for deposition with the project archive in due course.

Phase 3: Targeted excavation

5.2.14 If no geophysical anomalies which may correlate to roads are identified, the report produced for Phase 3 will stand as the final output for the project and no further fieldwork will take place. However, if geophysical anomalies which may correlate to roads are identified, the geophysical survey report will serve as an Interim Report, and will contain recommendations for a programme of small-scale targeted test excavations.

5.2.15 Depending on the results of the geophysics, exploratory excavations may be arranged at one or more of the survey sites. Geophysical anomalies will be evaluated through a programme of test-pitting. It is anticipated that particular attention will be paid to the relationships between any anomalies which appear to intersect or to run parallel to each other, to possible pits, and to the terminals of any linear features.

5.2.16 Should it be decided to undertake such excavations, comprehensive Project Designs will be produced and agreed with the Advisory Team prior to the commencement of fieldwork. A

commercial archaeology unit will be contracted to deliver the test excavation phase and subsequent report.

5.2.17 The excavation results and interpretation will inform a second reporting and presentation/results-sharing phase where these results will be compared with the original geophysical survey results and interpretations amended as appropriate.

6. Stages, tasks and timetable

STAGE or Task No.	STAGE/Task	Person(s) responsible	Dates (all 2014)
DRAFT	DRAFT	DRAFT	DRAFT
S 1	PREPARATION		
T 1.1	Preliminary site meetings.	PF/KM	2 April
T 1.2	Finalising of MORPHE compliant project design and EH approval.	PF/KM/MC/RV	June 2014
T 1.3	Obtain Section 42 licences	PF/KM/RV	June 2014
T 1.4	Produce risk assessment.	PF	June 2014
T 1.5	Put project live on AA sector of AONB website, inviting volunteers to register.	PF	June 2014
T 1.6	Closing date for volunteer registration	PF	3 rd July
T 1.7	Agree volunteer participation rota – inform volunteers.	PF	4 th July
T 1.8	Project start-up meeting	Volunteers/PF/KM/DH.	5 th July
S 2	FIELDWORK		
T 2.1	Site set-up	Volunteers/DH/KM	8 th July
T 2.2	Three fieldwork days	All	8 th – 9 th – 10 th July
S 3	REPORT, ARCHIVE & PUBLICITY		
T 3.1	Production of report	DH/KM	August 2014
T 3.2	Discussion of follow-up fieldwork & drafting of Project Design(s) as appropriate.	DH/KM/PF	August 2014
T 3.3	Delivery of follow up fieldwork (as	DH/KM/PF	Autumn

	appropriate)		
T 3.4	Presentation of final report to HEWG	DH/KM/PF	
T 3.5	Deposition of archive, dissemination of final report to HER & OASIS	DH/KM/PF	
T 3.6	Link to Project Report placed on AONB & NP websites.	KM/PF	
T 3.7	Contribution to <i>Altogether Archaeology</i> annual public conference.	KM/PF	

KM = Krissy Moore (Northumberland National Park Authority)

PF = Paul Frodsham (North Pennines AONB Partnership)

DH = Duncan Hale (Archaeological Services Durham University)

MC = Mike Collins (English Heritage)

RY = Rob Young (English Heritage)

7. Project scope and links with other projects

This project must primarily focus on the interaction of the Hadrian’s Wall Milecastles with the landscape to the north of the wall, in order to avoid conflict with other Roman-heritage oriented organisations along the Hadrian’s Wall corridor. **STILL TO DO THIS BIT – JUST BRIEF REFS TO OTHER HW PROJECTS, REST OF AA, OTHER STUFF....**

8. Project team structure and communications

8.1 In accordance with standard Altogether Archaeology practice, this project will be overseen by a Project Team, as follows:

POSSIBLY 1 OR 2 OTHERS TO BE ADDED TO THIS GROUP?		
Krissy Moore (Project manager)	Northumberland National Park Authority Community Archaeologist	Project management/ coordination. Assistance with fieldwork.

Paul Frodsham	North Pennines AONB Partnership Historic Environment Officer and Altogether Archaeology Project Manager	Project management/ coordination. Assistance with fieldwork.
Duncan Hale	Archaeological Services Durham University	Direction of project fieldwork, including delivery of volunteer training.
Mike Collins	Archaeological Advisor (Hadrian's Wall) English Heritage.	General liaison with English Heritage.
Rob Young	Archaeological Advisor, English Heritage North-East.	General liaison with English Heritage.
Paget Lazzari	Senior Ranger Northumberland National Park	Advisor regarding farmer and landowner liaison.

8.2 Overall project management will be by Krissy Moore, assisted by Paul Frodsham and if appropriate also by other members of the North Pennines AONB Historic Environment Working Group (HEWG). The HEWG is the designated advisory group for the whole of the *Altogether Archaeology* project; it includes the Northumberland Archaeologist and English Heritage North-East Region Inspector of Ancient Monuments. Paul Frodsham will be responsible for co-ordinating volunteer involvement in the project. Krissy Moore will be responsible for preparatory work including liaison with the landowners and the provision of site facilities. The project is being delivered in partnership with the Department of Archaeology at Durham University. Various members of staff and students may become involved, but the key partner at the university is Duncan Hale.

8.3 Fieldwork will be undertaken by Altogether Archaeology volunteers with training and supervision provided by professional staff from Archaeological Services, who have extensive experience working on comparable projects with volunteers. Paul Frodsham and Krissy Moore will produce a risk assessment, and will be responsible for health and safety on site throughout fieldwork.

8.4 The *Altogether Archaeology* project has a pool of some 500 volunteers, of whom about 50 are expected to participate actively in this module. Although there must be some flexibility with regard to volunteer involvement, it is expected that the project will be structured with three groups (one for each milecastle) of up to a dozen volunteers. Paul Frodsham will draw up a rota showing

which volunteers expect to be on site each day, with fieldwork planned accordingly. Some volunteers are more experienced than others, but all will receive an appropriate level of training and supervision.

8.5 Paul Frodsham maintains the Altogether Archaeology volunteer database, and information about the project will generally be disseminated by email or telephone using contact details contained within this database. For ease of communication, any local people wishing to take part in the St Botolph's project who have not registered with the Altogether Archaeology project will be asked to do so, at least temporarily. All communication with volunteers will then be via the Altogether Archaeology volunteer database.

8.6 Paul Frodsham, Krissy Moore, Duncan Hale and other project staff will be in daily contact during the fieldwork phase, and will communicate as necessary by email, telephone and face to face meetings as necessary during project planning and post-excavation phases.

8.7 The North Pennines AONB Historic Environment Working Group (the advisory group for the Altogether Archaeology project) meets quarterly. A draft report on the results of this project will be presented by PF for discussion at the first meeting following completion of the project.

9. Land ownership and access

Contact details for the various owners and tenants of the farms wherein lie Milecastles 29, 34 and 40 are kept by NNPA. All owners and tenant farmers have granted permission for the work to go ahead on their land. Copies of final reports will be provided to tenant farmers and landowners.

10. Health & Safety and Insurance

10.1 Full consideration will be given to matters of health and safety throughout this project. All work will be undertaken in accordance with the 1974 Health and Safety Act and its subsequent amendments, the 2007 Construction Design and Management Regulations, and the Standing Conference of Archaeological Unit Managers (SCAUM) Health and Safety Manual (2007). Work will also take place under the terms of the Durham University Health and Safety Policy and Code of Practice for Safety in Fieldwork.

10.2 A full Risk Assessment will be undertaken to assess all real and potential hazards prior to the commencement of fieldwork. A comprehensive health and safety induction will be given to all volunteers at project start-up, and all will be required to read a written statement on health and safety which will be kept on site and which all volunteers partaking in the project will be required to

sign, stating that they have read and understood it and that they will abide by its terms. A generic Risk Assessment for Altogether Archaeology fieldwork is included herewith as Appendix 1, and a specific Risk Assessment for this module forms Appendix 2.

10.3 At least one qualified First-Aider and appropriate first aid supplies will be present on site at all times while fieldwork is in progress. Staff members will be supplied with appropriate safety clothing and equipment, and advice as to appropriate clothing and equipment will be provided to volunteers.

10.4 All aspects of the Altogether Archaeology project are covered by Durham County Council's comprehensive insurance policy. In addition, Archaeological Services staff are covered by their own insurance provided by Durham University.

References

English Heritage 2008. Geophysical Survey in Archaeological Field Evaluation.

Frodsham, P. 2013. Hadrian & his Wall. Newcastle upon Tyne: Northern Heritage Publications.

Welfare, H. 2000. Causeways, at Milecastles, across the Ditch of Hadrian's Wall. Pp. 13-26 in *Archaeological Aeliana*, Fifth Series Volume XXVII, The Society of Antiquaries of Newcastle Upon Tyne.

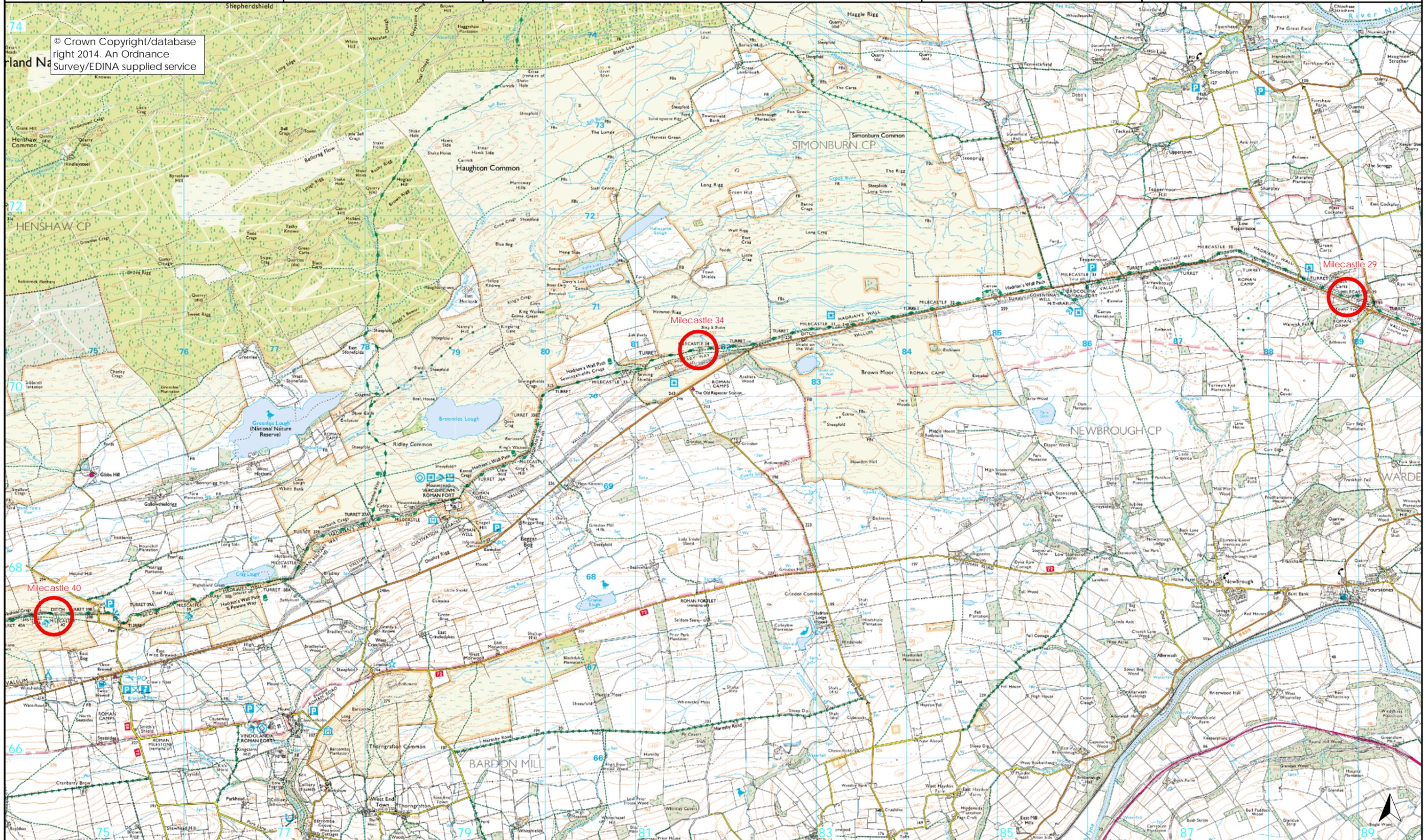
ADD IN: Geophysical survey in archaeological field evaluation (David, Linford & Linford 2008); the Institute for Archaeologists (IfA) Draft Standard and Guidance for archaeological geophysical survey (2010); the IfA Technical Paper No.6, The use of geophysical techniques in archaeological evaluations (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service Guide to Good Practice: Geophysical Data in Archaeology (draft 2nd edition, Schmidt & Ernenwein 2010).

Appendices

Appendix 1. Altogether Archaeology Generic Risk Assessment

Appendix 2. Module 8 Project Specific Risk Assessment

Appendix 3. Risk Log



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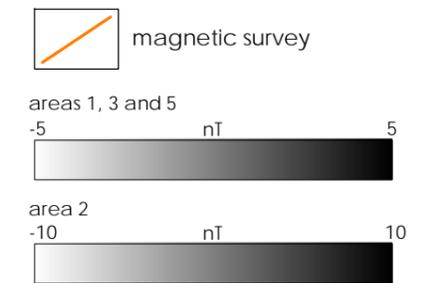
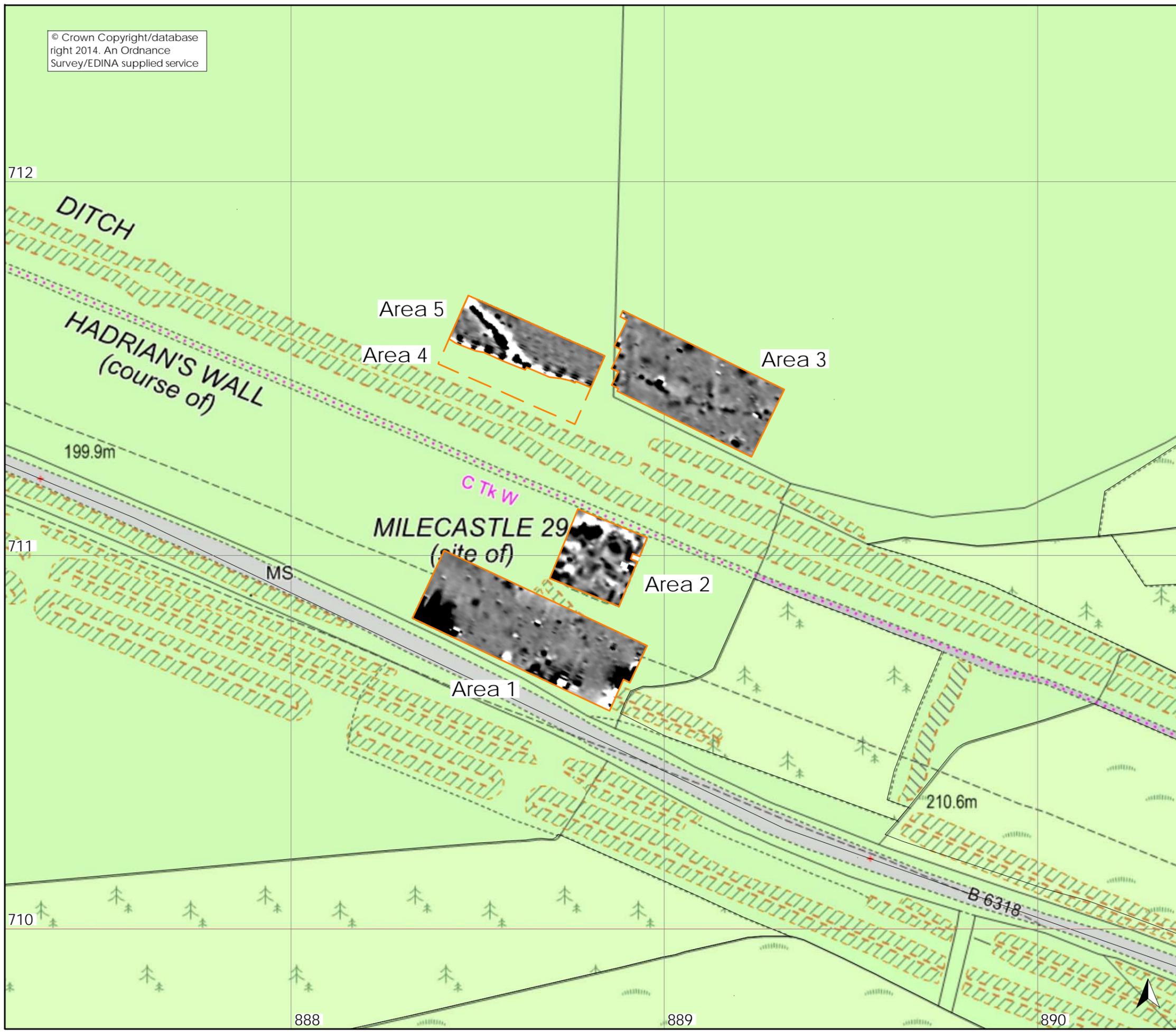
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Figure 2: Milecastle 29: geomagnetic survey



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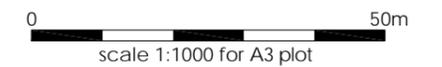
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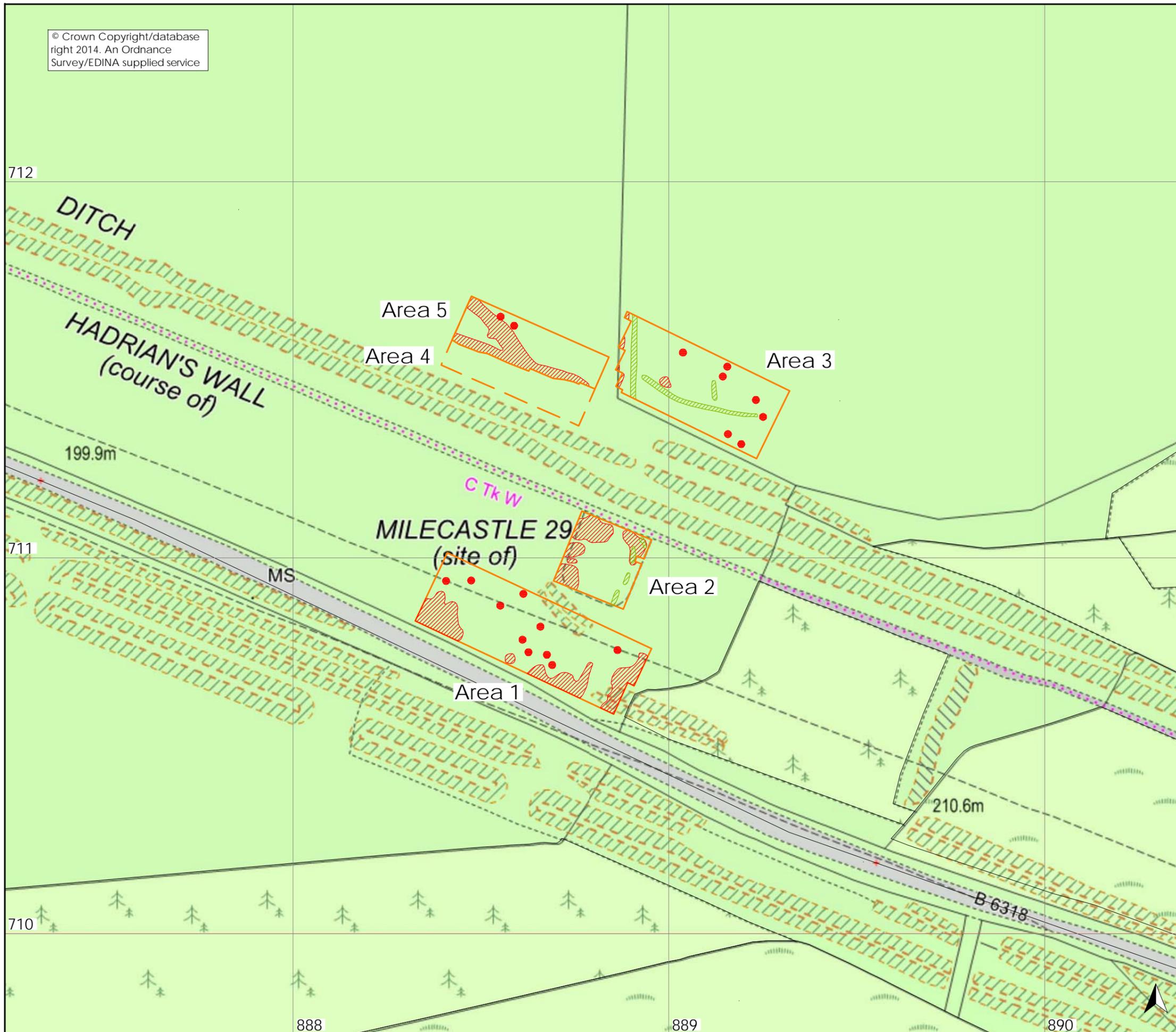
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Figure 3: Milecastle 29: geophysical interpretation of geomagnetic data



- magnetic survey
- dipolar magnetic anomaly
- positive magnetic anomaly



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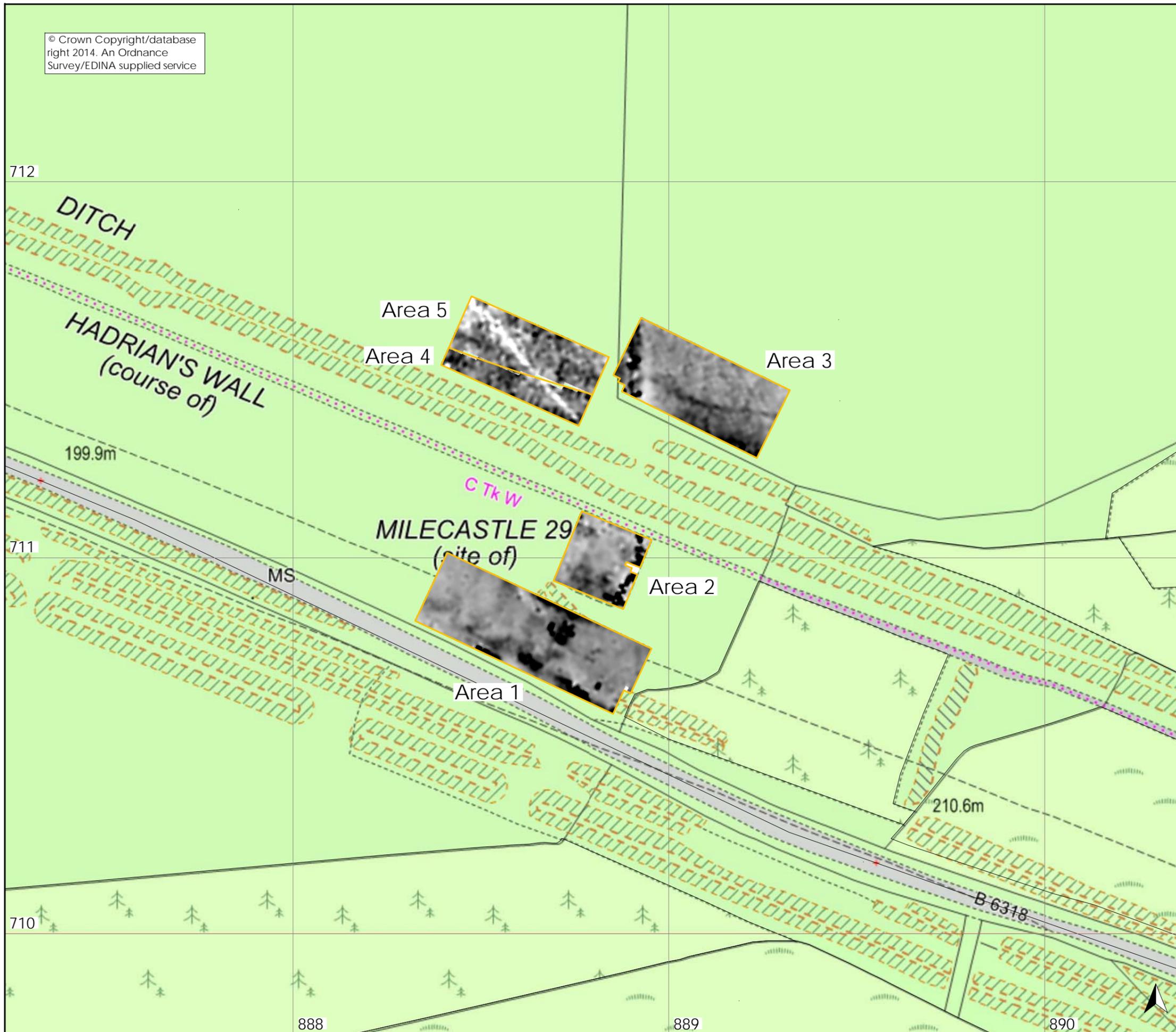
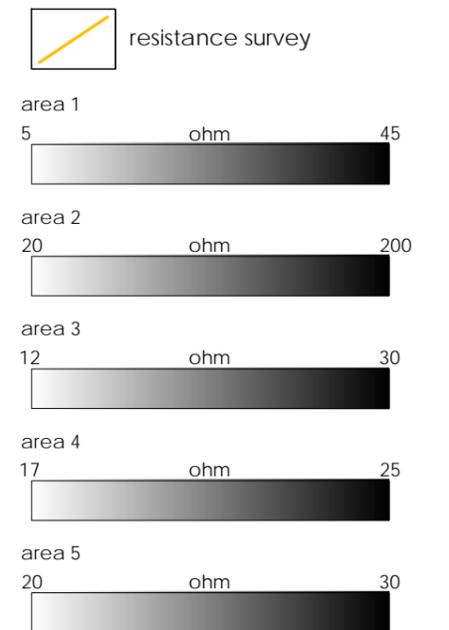
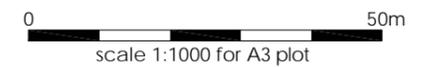
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Figure 4: Milecastle 29: resistance survey



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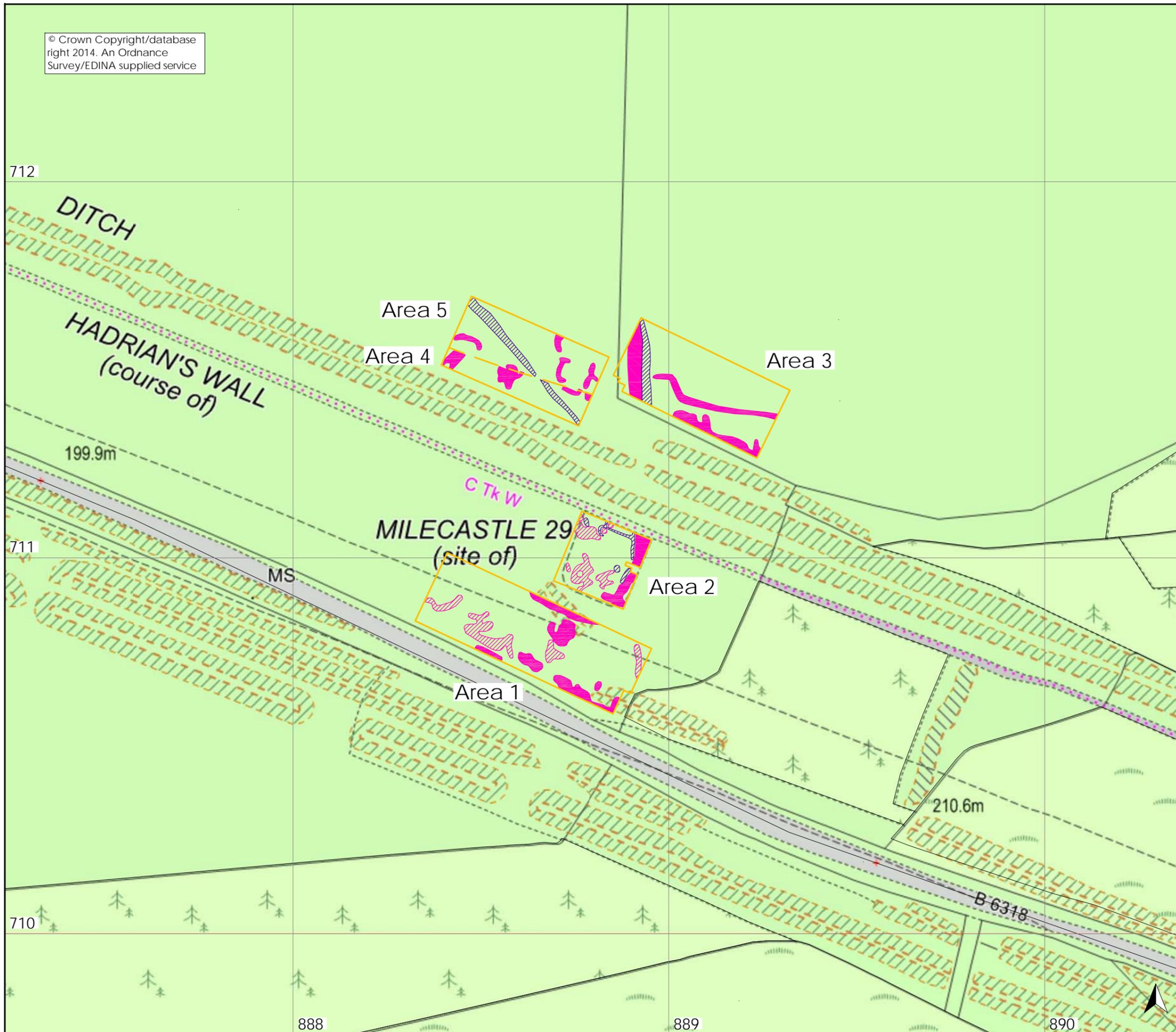
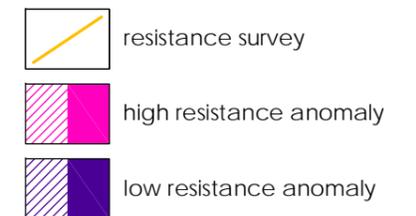
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Figure 5: Milecastle 29: geophysical interpretation of resistance data



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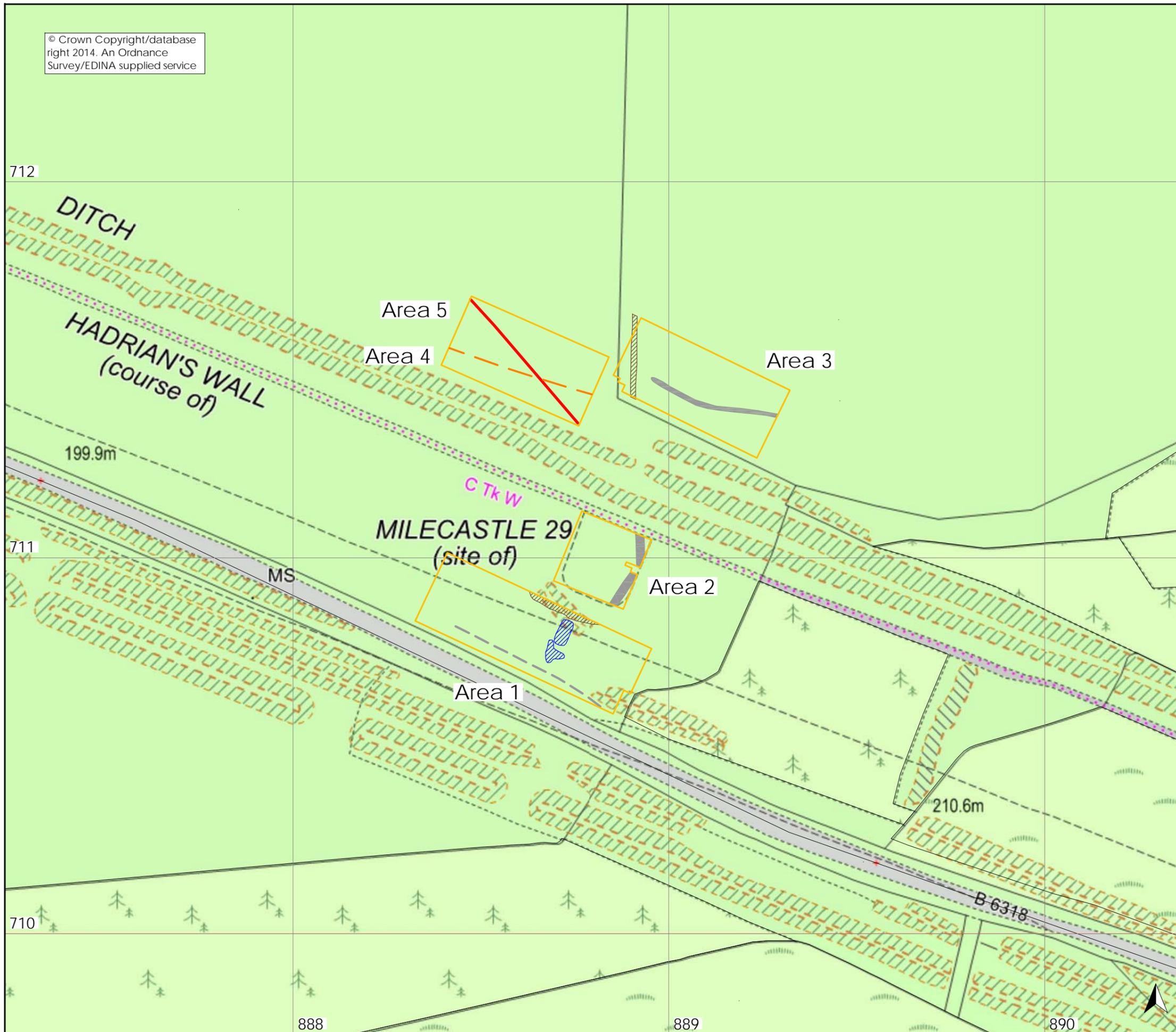
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Figure 6: Milecastle 29: archaeological interpretation



- survey area
- earthwork
- wall/wall footings
- possible surfaces
- possible former wall/bank
- service pipe



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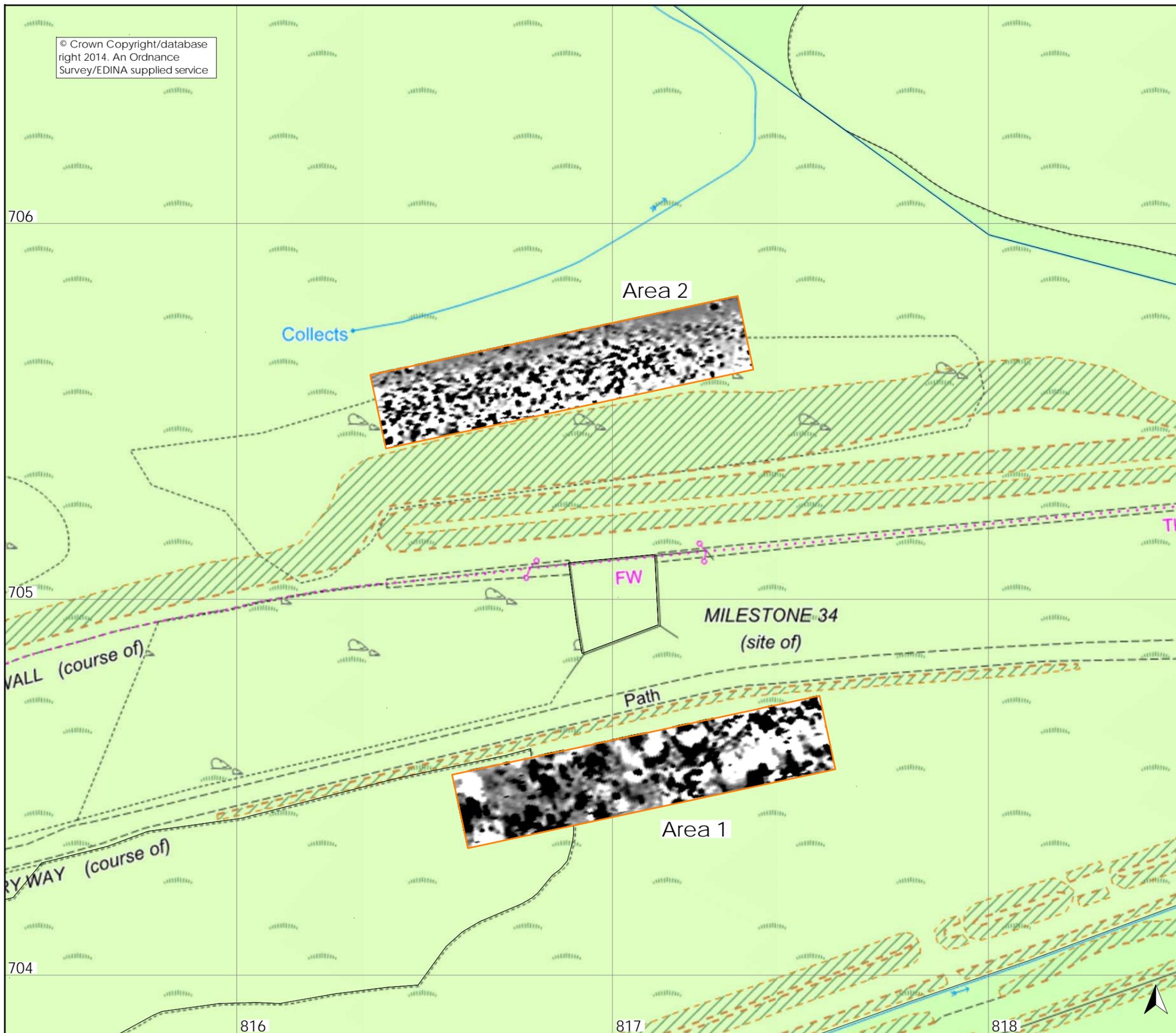
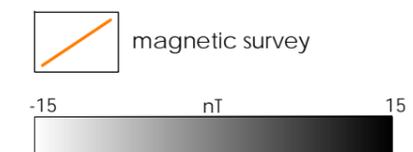
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Figure 7: Milecastle 34: geomagnetic survey



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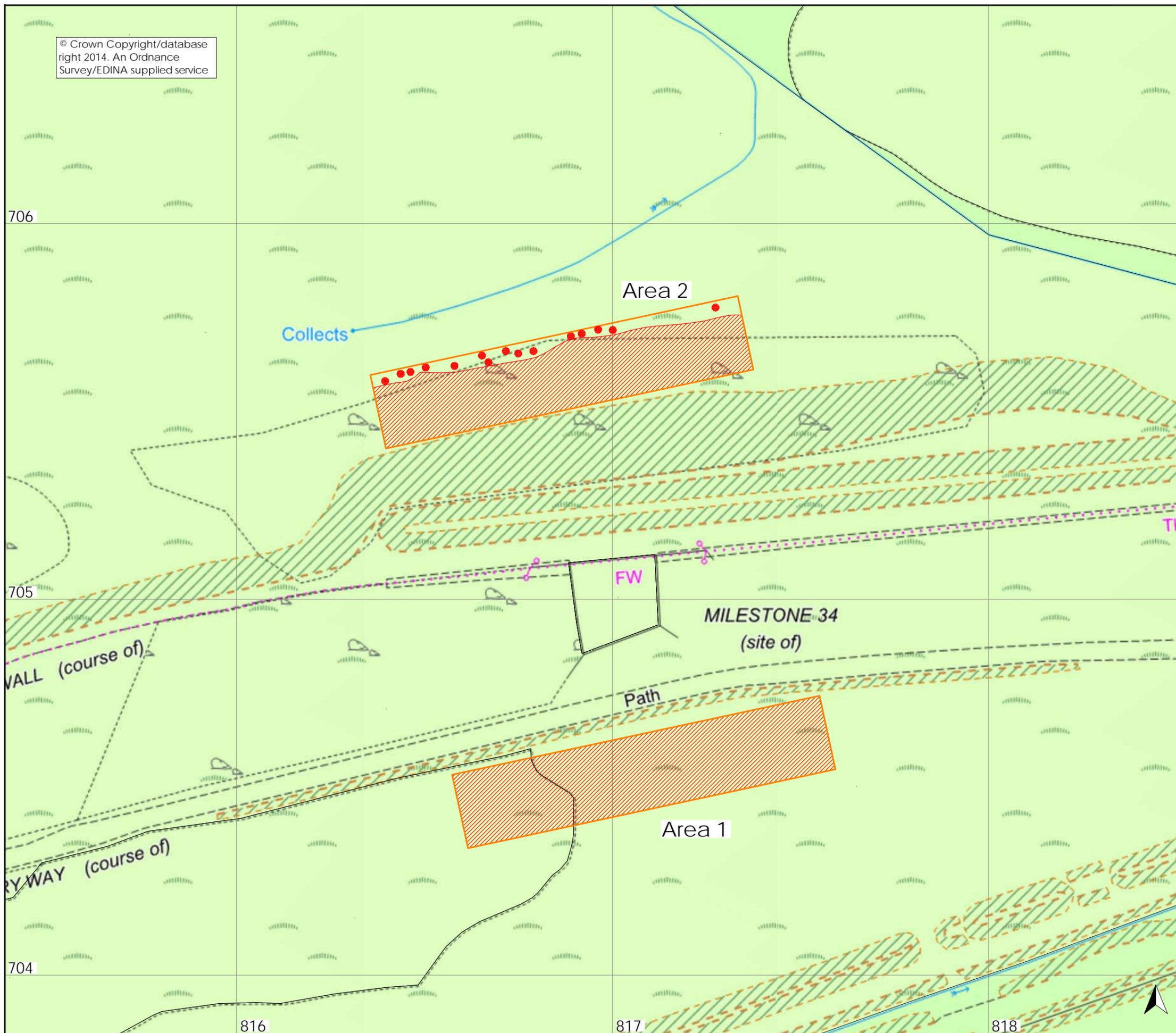
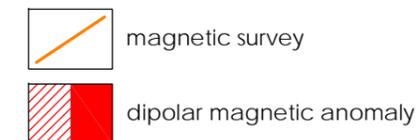
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Figure 8: Milecastle 34: geophysical interpretation of geomagnetic data



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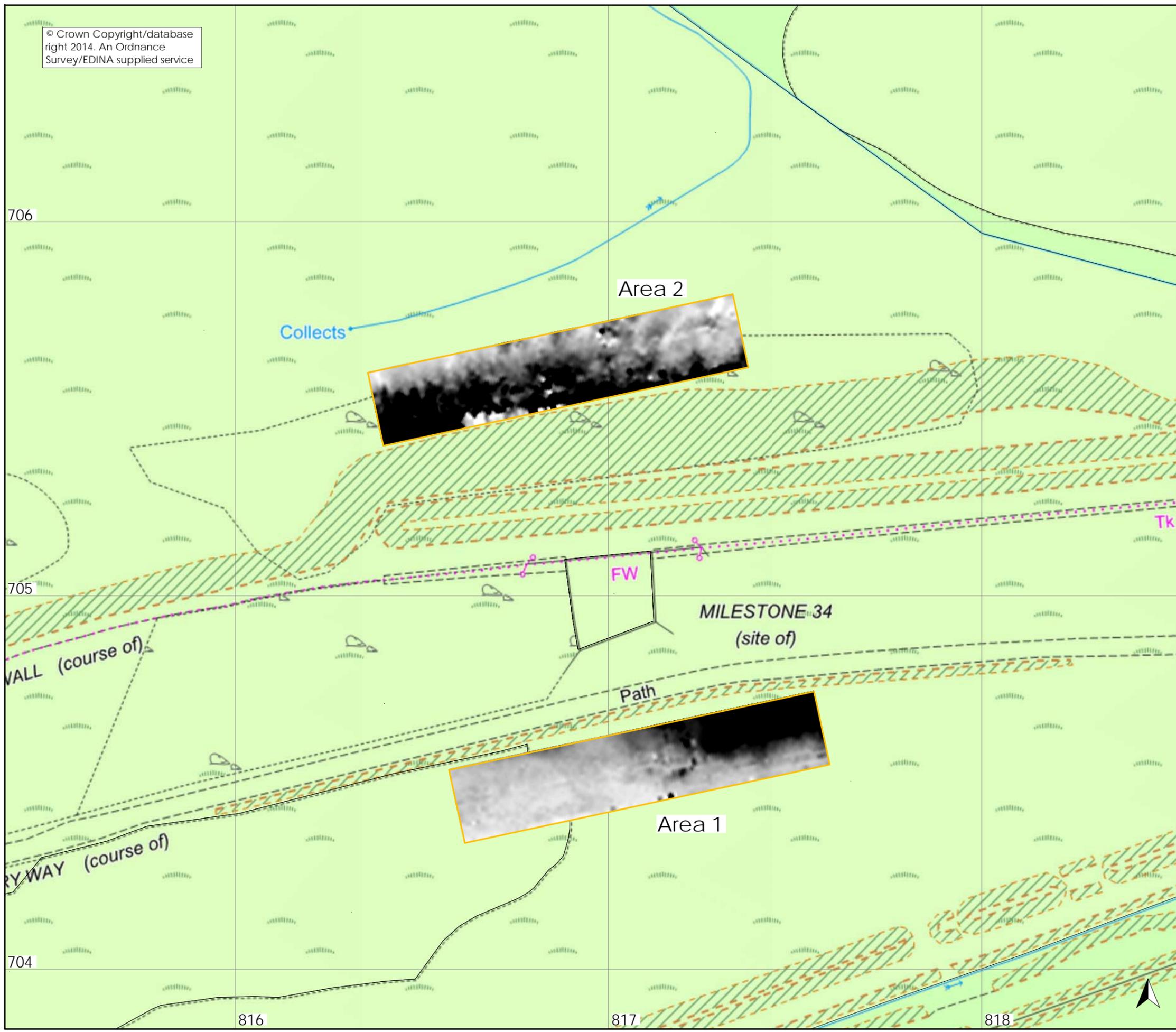
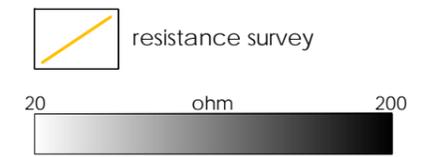
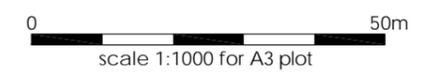
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Figure 9: Milecastle 34: resistance survey



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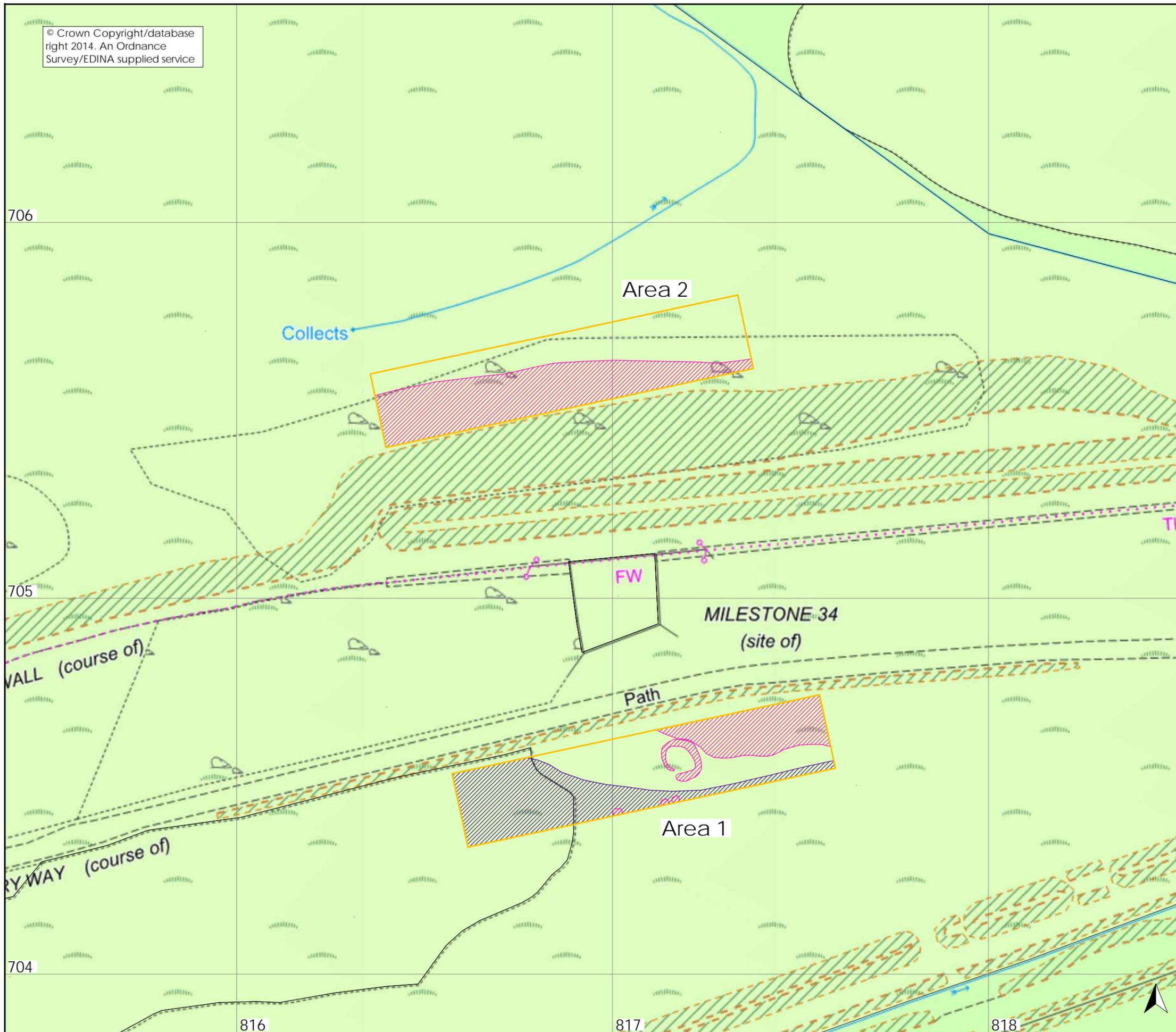
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Figure 10: Milecastle 34: geophysical interpretation of resistance data



- resistance survey
- high resistance anomaly
- low resistance anomaly



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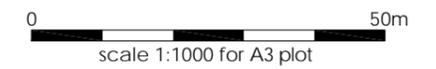
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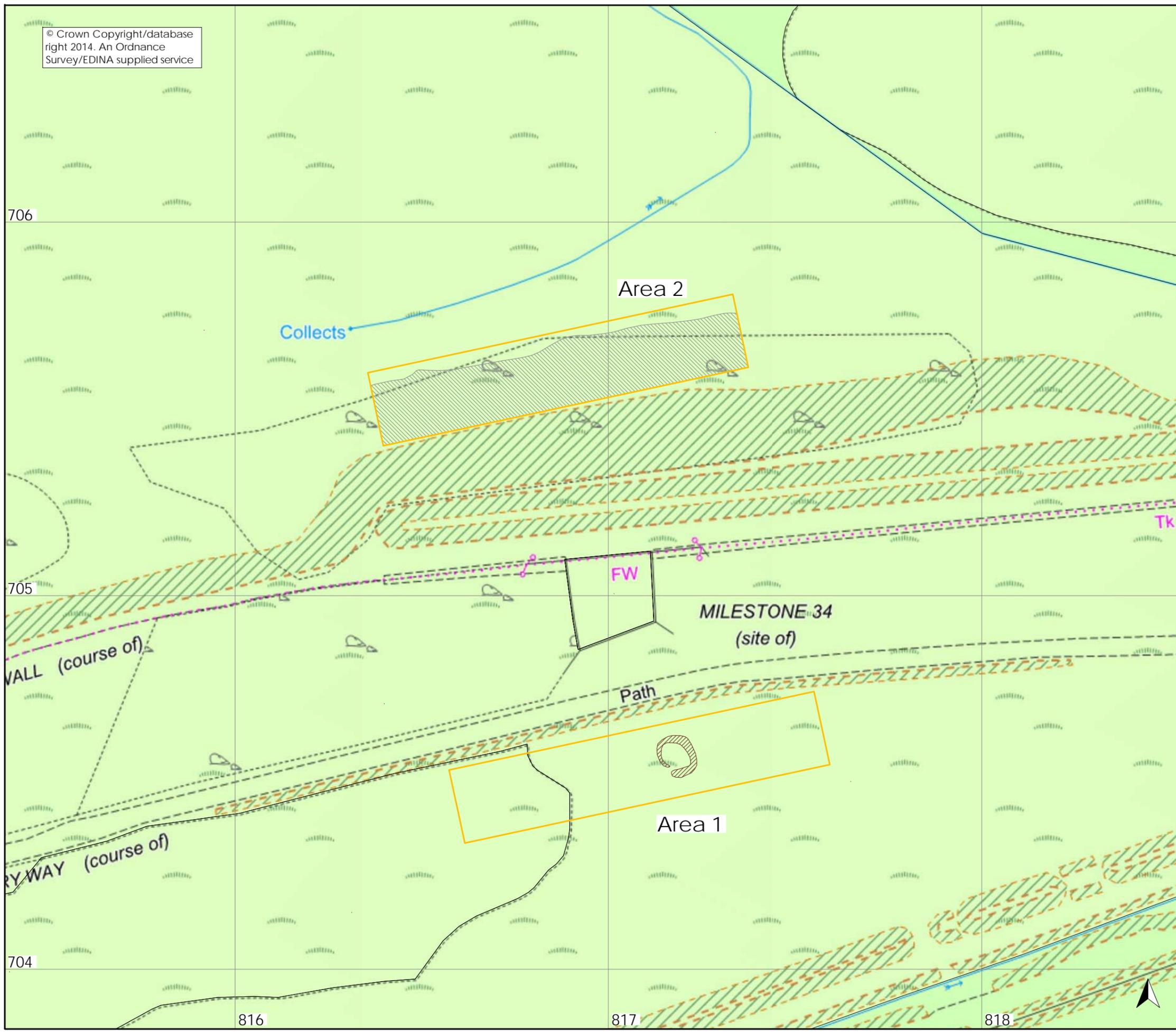
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Figure 11: Milecastle 34: archaeological interpretation



- survey area
- earthwork
- rubble



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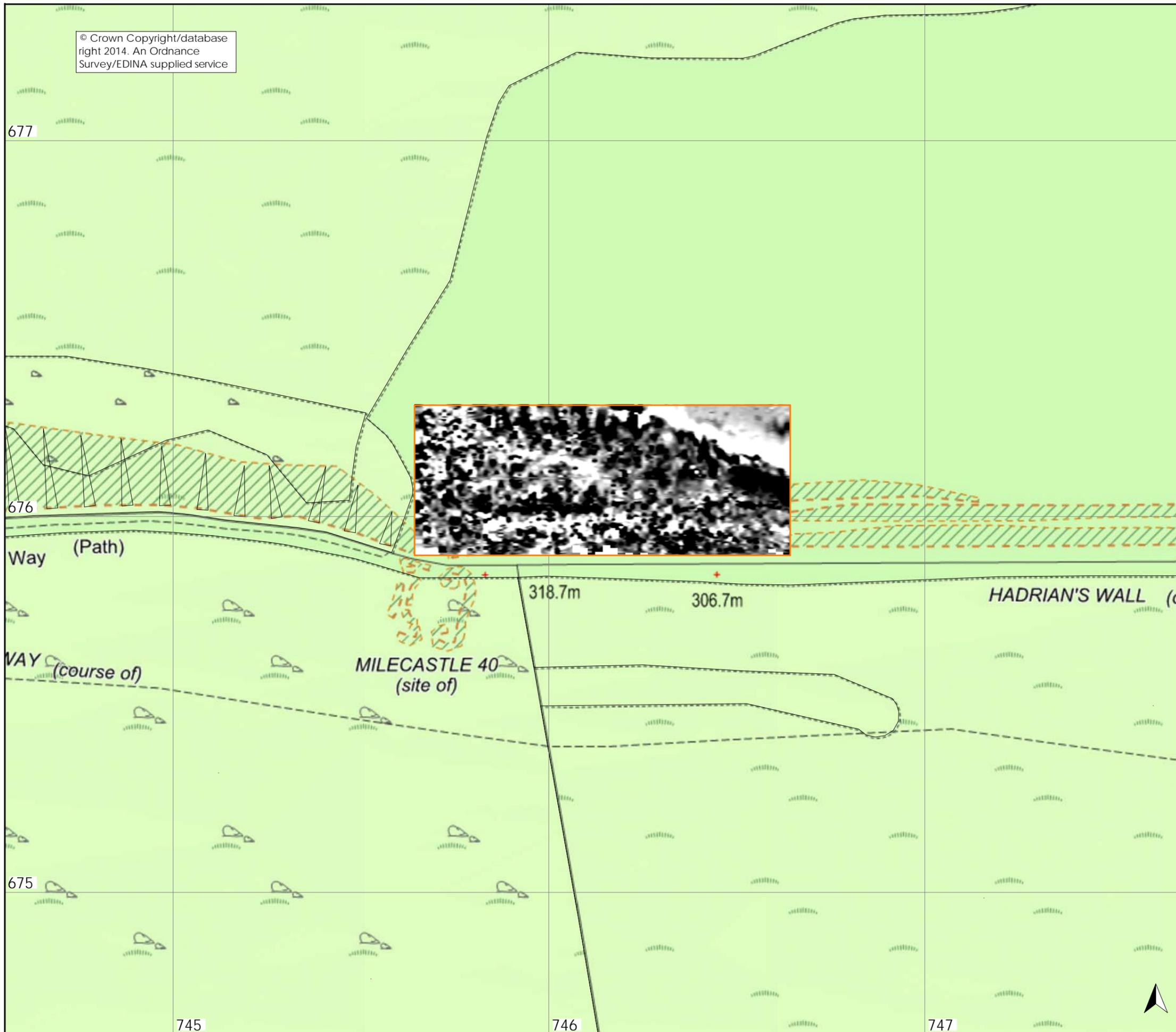
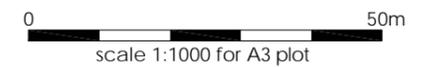
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Figure 12: Milecastle 40: geomagnetic survey



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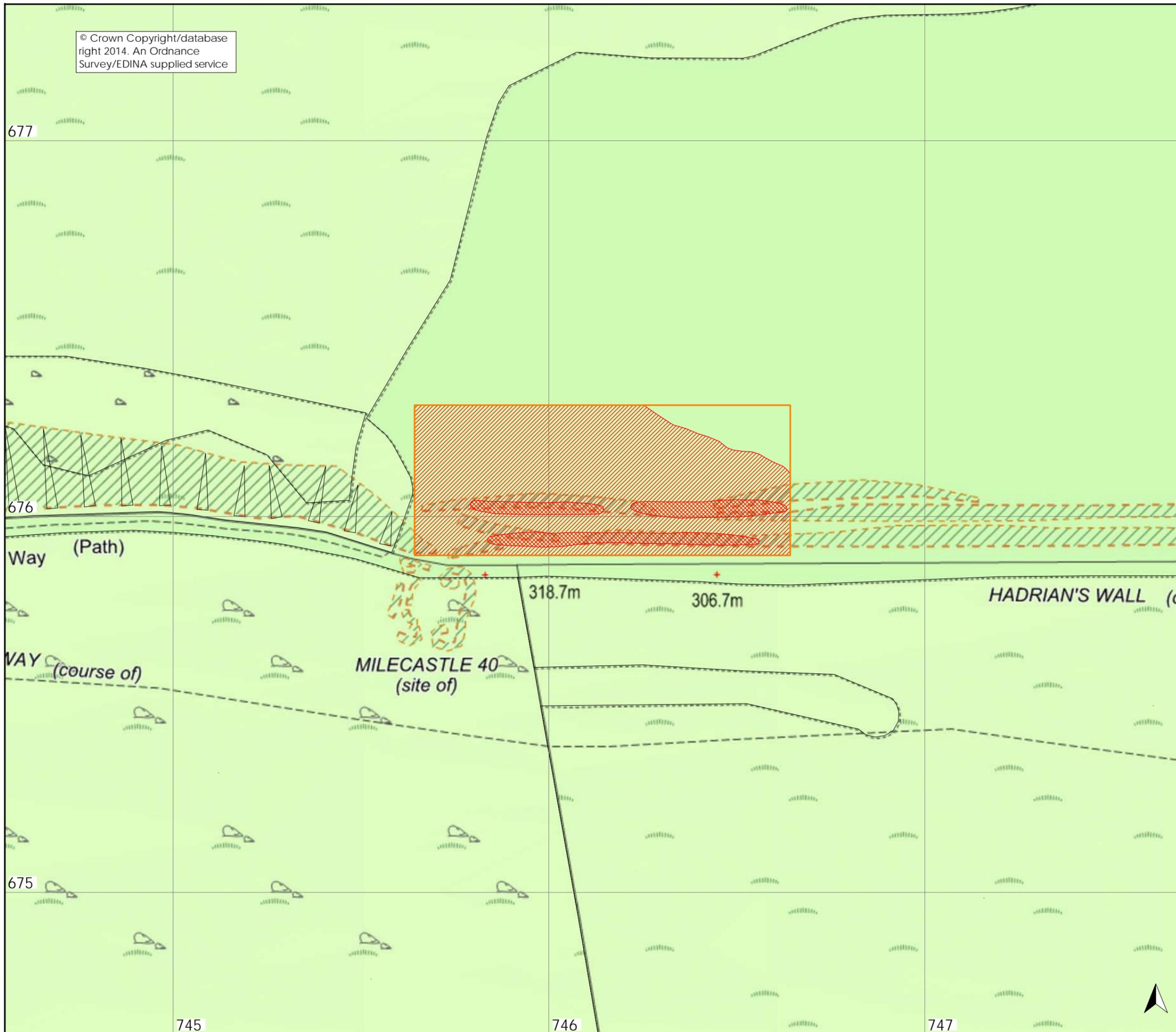
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Figure 13: Milecastle 40: geophysical interpretation of geomagnetic data



-  magnetic survey
-  dipolar magnetic anomaly



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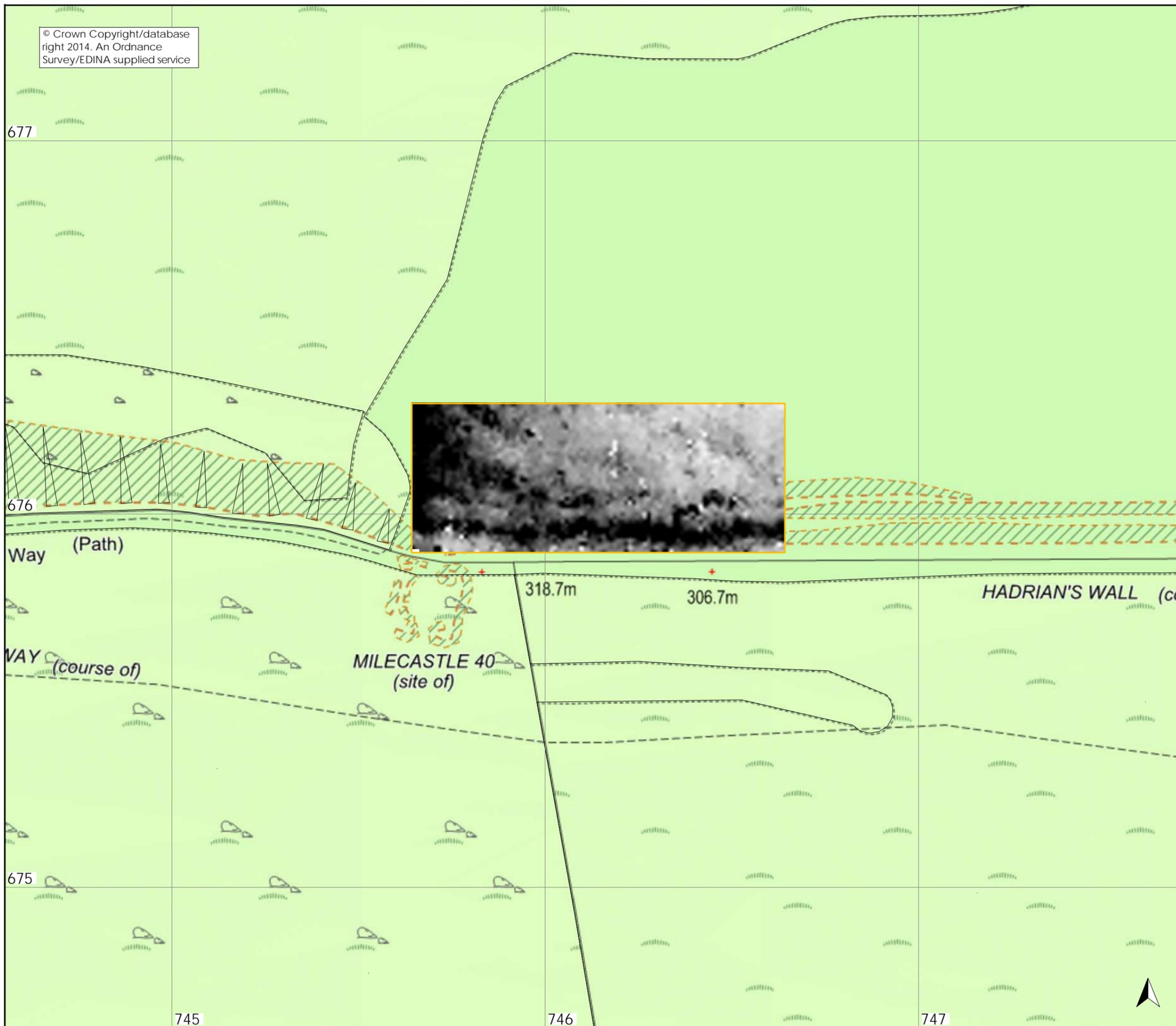
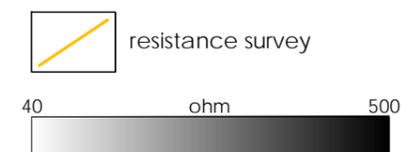
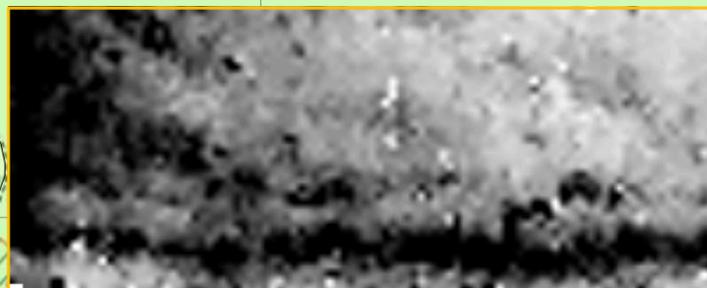
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Figure 14: Milecastle 40: resistance survey



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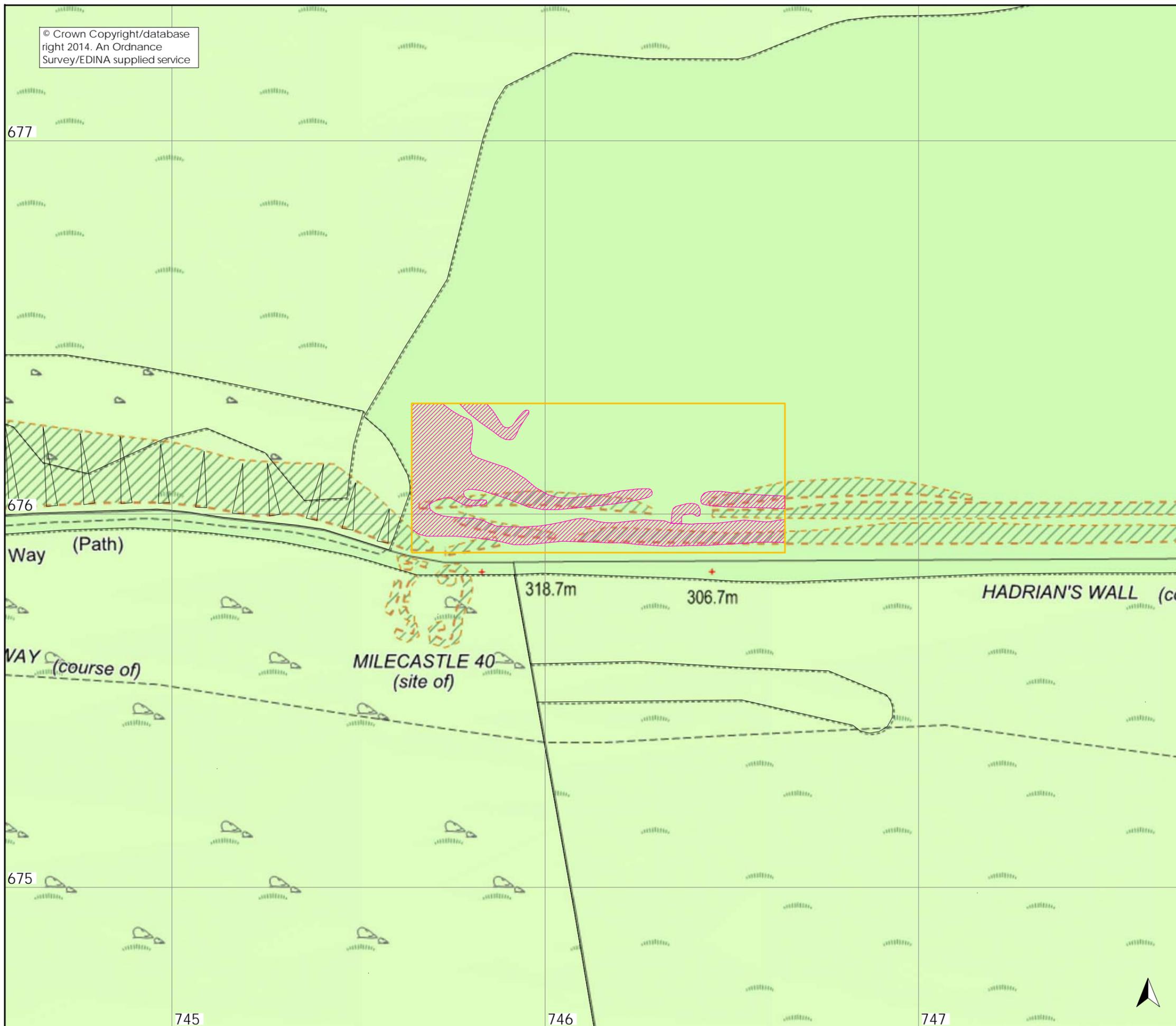
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Figure 15: Milecastle 40: geophysical interpretation of resistance data



-  resistance survey
-  high resistance anomaly



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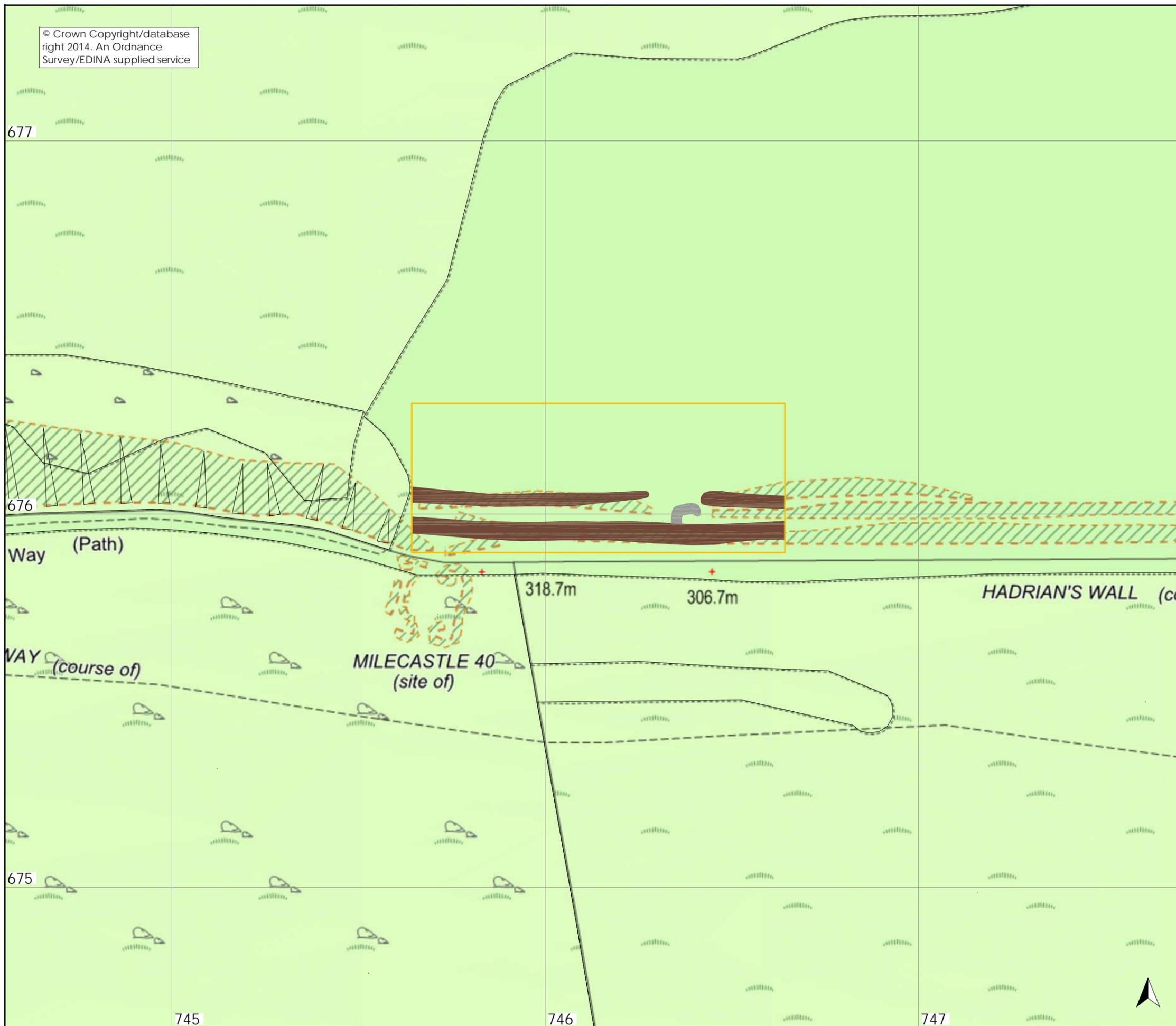
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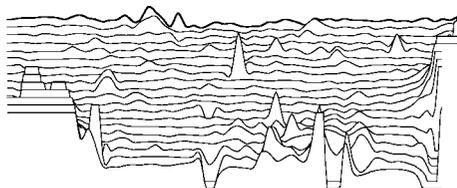
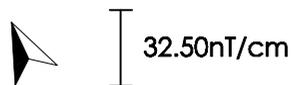
Figure 16: Milecastle 40: archaeological interpretation



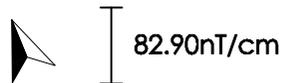
-  survey area
-  earthwork
-  stone



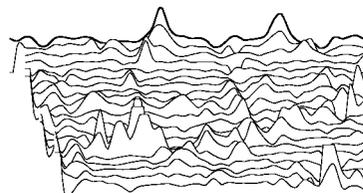
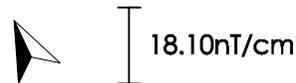
Area 1: geomagnetic data



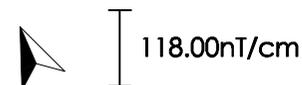
Area 2: geomagnetic data



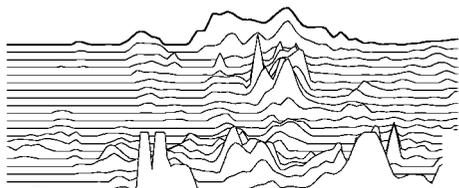
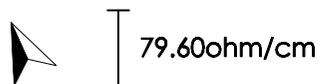
Area 3: geomagnetic data



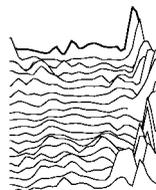
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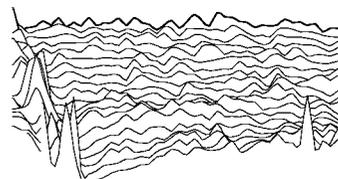
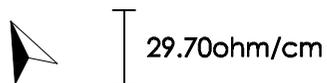
Area 1: resistance data



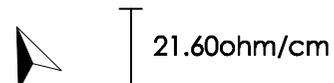
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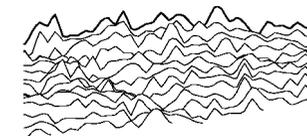
Area 3: resistance data



Area 4: resistance data



Area 5: resistance data



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NORTH PENNINES Area of Outstanding Natural Beauty
Northumberland National Park

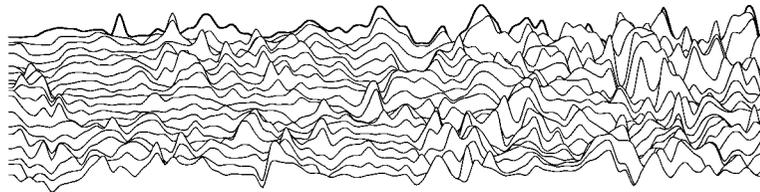
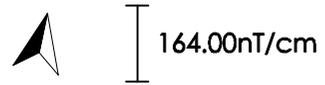
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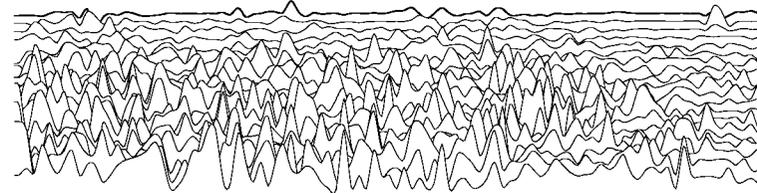
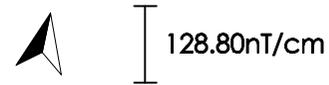
Figure 17: Milecastle 29: trace plots of geophysical data



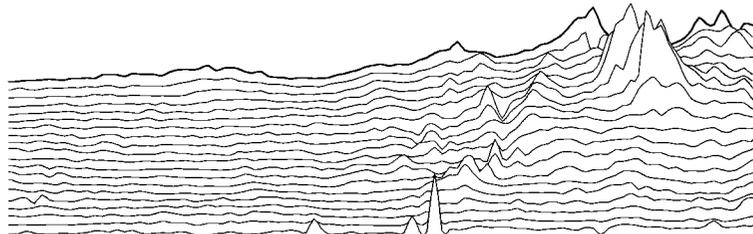
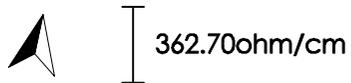
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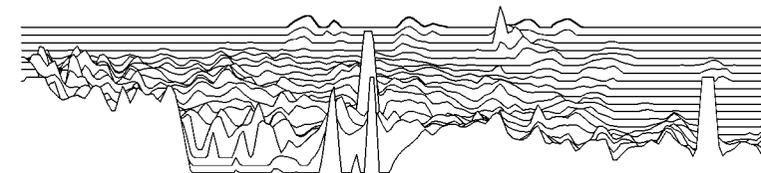
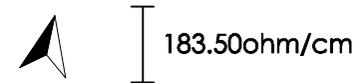
Area 2: geomagnetic data



Area 1: resistance data



Area 2: resistance data



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Northumberland National Park

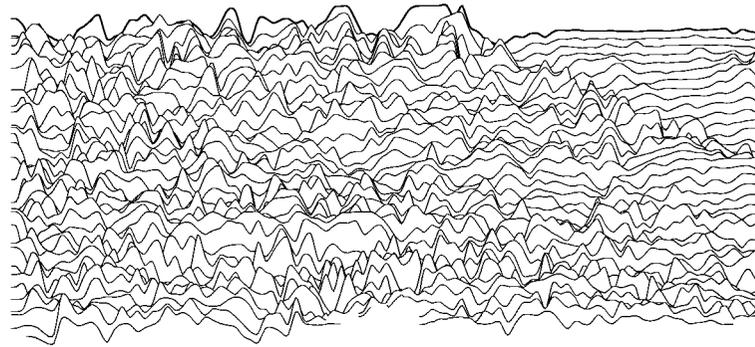
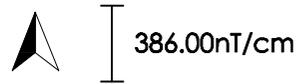
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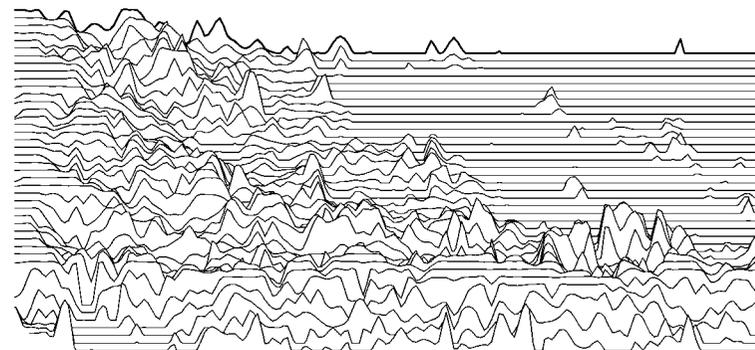
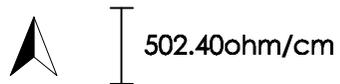
Figure 18: Milecastle 34: trace plots of
geophysical data



Geomagnetic data



Resistance data



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Figure 19: Milecastle 40: trace plots of
geophysical data

