

ARCHAEOLOGICAL SERVICES

DURHAM UNIVERSITY

on behalf of
Altogether Archaeology



and



Milecastles 32, 41 and 47
Hadrian's Wall
Northumberland

geophysical surveys

report 3883
September 2015

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1. Summary

The project

- 1.1 This report presents the results of a second phase 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 resistance surveys of areas at Milecastles 32, 41 and 47.
- 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 Tentative evidence for former tracks is presented at Milecastle 47. The absence of geophysical evidence for roads or tracks within the surveys at Milecastles 32 and 41 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 relatively small, due to the constraints of the present project, and it is possible that evidence for roads or tracks might survive outside the survey areas.

Milecastle 32

- 1.4 No evidence for probable roads or tracks has been identified within the survey at Milecastle 32. However, two other possible archaeological features have been identified to the north and north-east of the milecastle. A small rectilinear anomaly detected in the centre of the survey area measures approximately 9m square and could reflect a soil-filled feature, perhaps a ditch associated with a small enclosure or structure. A curvilinear magnetic anomaly towards the east end of the survey area could similarly reflect a possible ditch, perhaps a small enclosure.
- 1.5 Existing features also recorded in the data include upstanding ridge and furrow earthworks, an existing bank and the top edge of a ditch, and the Hadrian's Wall footpath.

Milecastle 41

- 1.6 A former stone boundary wall evident on the ground has been detected continuing through Area 1. The wall appears to be constructed from the magnetic rock of the adjacent Great Whin Sill. A possible stone feature just east of the former wall could reflect a former shieling or other small stone structure, approximately 6m in diameter. Since there is no corresponding strong geomagnetic anomaly here it is likely that this feature is made of rock from the underlying Alston Formation. Other weak, narrow linear anomalies in this area could reflect land drains.
- 1.7 Area 2 was located on the sill just north of the milecastle and the geophysical anomalies reflect this: high magnetic values throughout and near-surface bedrock to both east and west. The central part of the area is slightly lower and leads to an existing gate through the field wall. An existing quad-bike route passes through both survey areas, up to the gate. This has not been detected geophysically, but any early track in this area might be expected to follow the same course, on topographic grounds.

- 1.8 The lack of any evidence for a former track at this site is perhaps not surprising, given the difficult and steep terrain, and since an easier route option passes through Caw Gap just 350m to the west.

Milecastle 47

- 1.9 An existing farm track across Area 1 follows the route of a former field boundary shown on early OS maps. However, it is possible that these features follow the course of an earlier route, possibly contemporary with the milecastle, since the existing track fords a stream to the south then traverses upslope to the causeway across the Wall ditch. A similar band of high resistance anomalies detected in the Area 2 could also reflect a former track; this feature also appears oriented towards the causeway.
- 1.10 Former ploughing has been detected in both survey areas.
- 1.11 The majority of other anomalies detected here reflect changes in earth resistance. Whilst some of these appear quite regular in shape it seems unlikely that they reflect stone structures, given their location on the floodplain next to the water course. The weaker and more diffuse resistance anomalies almost certainly reflect natural variation within the sands and gravels.

Recommendations

- 1.12 A further programme of geophysical survey, both to extend previous surveys and to investigate the land north of other milecastles, would enhance our understanding of their function and relationship with Hadrian's Wall.
- 1.13 A programme of trial excavation, targeting both geophysical anomalies and areas immediately north of the milecastles, would further our understanding of the milecastles.

2. Project background

Location (Figure 1)

- 2.1 The survey areas were located at Milecastles 32, 41 and 47 on Hadrian's Wall, Northumberland: a single area of 0.44ha was surveyed to the north of Milecastle 32 (NGR: NY 8456 7099); two areas totalling 0.32ha were surveyed to the north of Milecastle 41 (NGR: NY 7363 6706); and two areas totalling of 0.32ha were surveyed to the north of Milecastle 47 (NGR: NY 6490 6606).
- 2.2 Previous surveys, undertaken for the first phase of this project, were undertaken at Milecastles 29, 34 and 40, NGR: NY 8888 7110; NY 8170 7050; and NY 7457 6758, respectively (Archaeological Services 2014a).

Objective

- 2.3 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: Phase 2.
- 2.4 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.
- 2.5 Specific research aims of the wider project, as stated in the Project Design, 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 contribute to research priorities identified in *Frontiers of Knowledge: a research framework for Hadrian's Wall, part of the Frontiers of the Roman Empire World Heritage Site* (Symonds & Mason 2009):
 - To test a range of accepted facts to ensure we have a reliable picture of basic frontier elements
 - To assist in furthering our understanding of the Milecastles' immediate landscape context
 - To clarify whether Milecastles genuinely functioned as gates between the North and South to contribute further understanding of how people, livestock and goods moved around the area
 - Universal Priority of Communicating Knowledge V: raising awareness and improving public understanding
 - Universal Priority of Communicating Knowledge VI: access to knowledge
 - To address research themes in *An Archaeological Research Framework for Northumberland National Park* (Young *et al.* 2010):
 - 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 6: Early Medieval archaeology
- Research Theme 7: Boundaries in the Landscape
- Research Theme 8: Transport and communication
- Research Theme 11: Detailed area-specific research projects
- To contribute to research priorities identified in *Shared Visions: The North-East Regional Research Framework for the Historic Environment* (Petts & Gerrard 2006):
 - There remain gaps in our understanding of the Roman road network; there may have been an as yet relatively unknown network of minor trackways into which any Milecastle could fit
 - Key research agenda item R.ii: Roads and Communication: this work is closely linked to the development of the earliest military infrastructure of the region, and could shed light on discussions of the function of the Stanegate
- To contribute to research priorities identified in *The Research Strategy for the Roman-Period Historic Environment* (English Heritage 2012):
 - Theme 4.2: a holistic approach to the Roman period landscape; investigating the Milecastles will add to our understanding of how these structures fit in their specific landscape context, including “pre- and post-Roman aspects of the landscape, both as features in their own right but also as elements that can influence (pre-Roman) or be influenced by (post-Roman) features”
 - Theme 5.3: raising awareness of and public engagement with Roman and post-Roman archaeology
- To provide additional information for the Northumberland County Council Historic Environment Record to contribute to future research in the area

Methods statement

- 2.6 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. DH14.445), and national standards and guidance (see para. 5.1 below).
- 2.7 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

- 2.8 A project start-up meeting and initial site visit for this second phase of works was undertaken by Krissy Moore (NNPA) and Duncan Hale (Archaeological Services Durham University) on 11th November 2014. Fieldwork was undertaken on 16th-18th July 2015. This report was prepared for September 2015.

Personnel

- 2.9 Fieldwork was conducted by volunteers from the North Pennines AONB Altogether Archaeology project (Phil Bowyer, Jane Brantom, Niall Deas, Colin Goodfellow, Anna Gray, Derrick Gwynne, Jenny Gwynne, Michael Hall, Brian Johnson, Roy Lawson, Julia Rand and Kate Sheehan-Finn).
- 2.10 Volunteers were trained and supervised by Duncan Hale (Senior Archaeologist, Archaeological Services) and Richie Villis (Senior Project Archaeologist,

Archaeological Services). Geophysical data processing and report preparation was by Richie Villis, with illustrations by Janine Watson (Graphics Technician, Archaeological Services). This report was edited by Duncan Hale (the Project Manager for Archaeological Services).

- 2.11 Overall project management and coordination was provided by Krissy Moore (former NNPA Community Archaeologist) and Chris Jones (Historic Environment Officer for NNPA), assisted by Paul Frodsham (Historic Environment Officer /Altogether Archaeology Project Officer for NP AONB).

Archive/OASIS

- 2.12 The site code is **HWM15**, for **Hadrian's Wall Milecastles Project 2015**. 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 **archaeol3-222750**.

Acknowledgements

- 2.13 The project team is grateful for the assistance of the landowner, Mr Jeremy Dodds, at Milecastle 32; the landowners, The National Trust, and their tenant, Mr Andrew Oliver, at Milecastle 41; and the landowners, Mr Ridley Milburn and Mr Robin Halbert, at Milecastle 47.

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), 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 2014a; Archaeological Services 2014b; 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 UNESCO 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 1st 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 410 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 function of the Milecastles along Hadrian's Wall is not fully understood. It is generally hypothesised that they controlled north-south traffic through the Wall – Milecastles have even been described as “fortified gateways” (Breeze & Dobson 2000: 33) – however no roads approaching them from the north have been identified. Understanding the function of the milecastles, and any roads that may have been associated with them, is critical to our understanding of the intended and actual function of Hadrian's Wall. In the original plan for Hadrian's Wall, the Milecastles appear to have offered the only routes through the wall. However, during construction of the Wall, the decision was made to add the great Wall Forts. We simply do not know how the Milecastles functioned within this revised plan (from 'Project Design').
- 3.6 The known Roman roads north of the Wall include the Devil's Causeway, which branches north-east from Dere Street at Bewclay to Longframlington and Berwick-upon-Tweed, which are then linked further north by a west-east route from High Rochester to Whittingham. South of the Wall are two Roman roads crossing the Tyne-Solway gap. The Stanegate starts at Corbroidge and runs west to Carlisle, and pre-dates the Wall. The Military Way was constructed later, and runs east-west parallel with the Wall from Wallsend to Carlisle (Petts & Gerrard 2006). There does not appear to be evidence for a Roman Road directly approaching the Wall within the National Park from the north. From the south, a section of the Maiden Way appears to head towards Milecastles 46 and 47 but no intersection is known. To the east of the National Park boundary, the Roman Road referred to as the Devil's

Causeway appears to be on course to meet Hadrian's Wall somewhere between Milecastles 20 and 22, but again no intersection is known (from 'Project Design').

- 3.7 Some Milecastles are located on high crags with a sheer drop to the north: this suggests that these Milecastles at least could not have served as portals through the Wall. Other Milecastles opened on to flat ground however we cannot determine the volume of traffic – if any – from soldiers and other travellers passing to or from the north. Welfare (2000) concluded gateways through the wall necessitated provision for crossing the ditch and through field survey identified earth causeways which may have served this purpose, though in some cases the results are inconclusive. Symonds (2005: 72) has suggested that the building schedule of Hadrian's Wall Milecastles may have prioritised the completion of Milecastles in areas where north-south transit would have been easier due to gentler topography (from 'Project Design').
- 3.8 Phase 1 of the current project aimed to test the hypothesis that Milecastles funnelled north-south traffic through Hadrian's Wall by searching for traces of roads to the north and south of three Milecastles (29, 34 and 40) using geophysical survey techniques. The results are summarised below (from Archaeological Services 2014a):
- At Milecastle 29, insubstantial evidence for a metalled surface has been identified to the south of the milecastle; this may result from near-surface limestone. Probable and possible walls and banks have also been identified. The east wall of the Milecastle has been detected and its remains appear to be slightly curved. No structural features have been identified within the Milecastle, though there is almost certainly rubble present.
 - At Milecastle 34, no evidence for a probable road or track has been identified. A large area of rubble or tumble has been identified to the north of the Milecastle; it may obscure any older archaeological features in this area. A circular structure was identified to the south of Milecastle 34.
 - At Milecastle 40, no evidence for a probable road or track has been identified. However, a break in the northern bank, and a possible stone causeway across the ditch, have been detected just to the north-east. These features could be associated with an undetected track here.
 - Geomagnetic and resistance anomalies relating to the local geological background, particularly the Whin Sill, have been identified.
- 3.9 The lack of unambiguous evidence for roads or tracks within these survey areas may indicate that such tracks were not present, or that any tracks were insubstantial dirt roads with no associated drainage ditches. The areas surveyed were small and evidence for tracks may survive outside these areas (from Project Design).
- 3.10 It is probable that each Milecastle has its own story to tell, according to its landscape context and changes in use over the centuries of occupation. The three Milecastles investigated in Phase 1 of this study cannot be considered a representative sample of the 80 Milecastles along the Wall (3.75%) or of the variety of landscape contexts in which the Milecastles are found. Therefore additional survey of a further three Milecastles in different landscape contexts was proposed, to increase the sample size to 7.5% (from 'Project Design').

3.11 The three Milecastles selected for Phase 2 of the geophysical survey programme, for a variety of reasons, are: Milecastle 32 at Carraw; Milecastle 41 at Shield on the Wall; and Milecastle 47 at Chapel House. If the results of these surveys identify anomalies which may relate to roads approaching the Milecastles, a following phase of test excavation will be considered. If no such anomalies are discovered, the results shall be considered alongside those from Phase 1 (from 'Project Design').

- Milecastle 32 Carraw (NY 84567099) (N7818): Milecastle 32 has been extensively robbed for building stone, and survives as a low mutilated platform with a robber trench around. An excavation in 1971 confirmed it was a long-axis milecastle. Its south wall is defined by a terrace and the north wall is overlain by the field wall on the south side of the B6318 road (HER 2014). The field to the north of Milecastle 32 has been ploughed in the past, which at least indicates there's a level approach to the milecastle from this direction. Some ridge-and-furrow is still visible. There may be evidence for a recutting of the Ditch, shown by a change in the character of the Ditch with the earthworks on the west side being much more sharply cut than to the east. The milecastle was excavated in 1972 but no investigation took place north of the gate (Binns 1972 in Welfare 2000: 21).
- Milecastle 41 Shield-on-the-Wall (Melkridge) (N6461): Welfare (2000: 22) describes this as a "craggs" milecastle. It has been crossed by a field wall that follows Hadrian's Wall, and another meets it almost at right angles from the North. Although this is a crags milecastle this field boundary makes it of interest.
- Milecastle 47 Chapel House (NY64906607) (N6024): Excavated in 1935, Milecastle 47 contained traces of large barrack buildings either side of a central courtyard, with an oven in the north-west corner (HER 2014). The milecastle is approached by a "clear and obvious causeway" over a particularly deep and wide section of the Ditch (12m wide by 3.5m deep). The causeway is 18m wide but the west 13m of it may represent more recent infilling. A trackway cuts through the narrow mound of the glacis and curves down the slope to the north-west (Welfare 2000: 22).

3.12 It is important to note here that entirely negative results will still add new evidence to the discussion about the function of the Milecastles. If no evidence of roads or tracks approaching any of the Milecastles is found, such a result would suggest (though not prove) that Milecastles did not serve to funnel north-south traffic through the Wall. This would in itself be a significant contribution to our understanding of Hadrian's Wall (from 'Project Design').

4. Landuse, topography and geology

4.1 All the survey areas were under pasture, with the exception of Area 1 to the north-west of Milecastle 47, which was in hay. See tables below for details of each survey area.

Milecastle 32				
Area	Size (m ²)	Landuse	Topography & notes	NGR (centre)
1	4,400	pasture – cows	N of wall; gentle slope down N to S; upstanding R&F earthworks; tall vegetation; stone wall with barbed wire strand to S; military road to S	NY 84576 71037

Milecastle 41				
Area	Size (m ²)	Landuse	Topography & notes	NGR (centre)
1	2,000	rough pasture/bog	N of wall; flat land between steep slopes; boggy; tall vegetation; collapsed stone wall feature	NY 72958 67131
2	1,200	rough pasture/bog	N of wall; flat land at top of crag; boggy at centre; tall vegetation	NY 73049 67102

Milecastle 47				
Area	Size (m ²)	Landuse	Topography & notes	NGR (centre)
1	1,600	hay meadow	N of wall; flat field; ditch/earth bank & wire fence to S; wire fence to E; tall vegetation; slight earthwork banked track in W	NY 64884 66144
2	1,600	pasture – cows	N of wall; flat field; slight earth bank & ditch to N; wire fence to W	NY 64966 66131

- 4.2 The central part of Hadrian's Wall occupies impressive terrain with topography generally rising from east to west before falling again in the extreme west towards Greenhead and Gilsland. Between Milecastle 32 in the east and Milecastle 47 in the west the wall rises from elevations of approximately 240m to 345m before falling again to around 150m 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 up to 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. Outcropping bedrock was noted near Milecastle 41.
- 4.4 Superficial deposits of Devensian till are recorded across large areas surrounding Milecastle 32; no superficial deposits are recorded in the area around Milecastle 41; glaciofluvial and alluvial deposits of clay, silt, sand and gravel are recorded around Milecastle 47 (BGS 2015).

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 Chartered Institute for Archaeologists (CIfA) *Standard and Guidance for archaeological geophysical survey* (2014); the CIfA 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 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 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 2014b) have demonstrated the feasibility of both geomagnetic and earth electrical resistance techniques over these deposits.

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 Figure 17. 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. Three types of geomagnetic anomaly have been distinguished in the data:

<i>positive magnetic</i>	regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches
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negative magnetic regions of anomalously low or negative magnetic field gradient, which may correspond to features of low magnetic susceptibility such as wall footings and other concentrations of sedimentary rock or voids

dipolar magnetic paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including fences and service pipes) and/or fired structures such as kilns or hearths

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

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

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

Interpretation: features

General comments

5.15 Colour-coded archaeological interpretation plans are provided.

5.16 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 32 (Figures 2-6)

5.18 The survey area was located approximately 20m north of the milecastle, and measured 220m x 20m. It occupied gently sloping ground north of the ditch immediately north of the B6318 road. The area was chosen for survey as an area of potential to capture routes approaching the milecastle from the north. Traces of ridge and furrow cultivation survived as upstanding earthworks across the area.

5.19 A small rectilinear positive magnetic anomaly has been detected in the centre of the survey area measuring approximately 9m square; no corresponding resistance anomaly has been identified. The geomagnetic anomaly may reflect a soil-filled feature such as a ditch. A curvilinear magnetic anomaly towards the east end of the survey area could similarly reflect a possible ditch.

5.20 Broadly north-west/south-east aligned, parallel, alternate positive and negative magnetic and high and low resistance striations have been detected across the area. These correspond to the upstanding ridge and furrow earthworks.



Volunteers conducting earth electrical resistance survey at Milecastle 32

- 5.21 Positive and negative magnetic anomalies and a high resistance anomaly have been detected along the southern edge of the survey. These correspond to an existing bank and the top edge of a ditch.
- 5.22 A broadly north-east/south-west aligned low resistance magnetic anomaly has been detected across the survey area. This corresponds to the Hadrian's Wall Walk public footpath, which was noted on the ground as a strip of mown ground; presumably more of the recent rainfall had reached the ground here compared to the more vegetated areas to either side.
- 5.23 No geophysical evidence for any roads or tracks has been identified in this area.

Milecastle 41 (Figures 7-11)

Area 1

- 5.24 This area was located approximately 100m north-west of the milecastle, on lower and more level ground at the foot of a steep slope. It was intended to identify any road or track approaching from the north. The resistance survey of this area measured 60m by 20m; the geomagnetic survey covered the same area but was extended 20m at each end, giving an area of 100m x 20m.
- 5.25 A north-west/south-east aligned band of small strong magnetic anomalies has been detected across the central part of this area; this corresponds to a broad, linear high resistance anomaly. These anomalies correspond to a band of stone evident on the ground, formerly a stone wall. The high magnetic values associated with this feature indicate that it was constructed with stone from the Great Whin Sill, just upslope. A narrow gap through the stone rubble corresponds to the course of an existing quad-bike track which heads upslope to the wall just east of Milecastle 41. This track has not been identified geophysically.

- 5.26 A small sub-circular high resistance anomaly, measuring 6-7m diameter, has been detected just east of the former boundary wall. This could reflect the remains of a shieling or small pen. Since there is no corresponding strong geomagnetic anomaly here it is likely that this feature is made of rock from the underlying Alston Formation.



Area 1 with existing quad-bike track, to the north-west of Milecastle 41

- 5.27 Occasional discrete dipolar magnetic anomalies correspond to areas of high resistance. These almost certainly reflect further pieces of igneous rock, either derived from the former stone wall or the sill above.
- 5.28 Further, often very weak, geomagnetic and high resistance anomalies have also been detected across the area. These are unlikely to reflect features of archaeological significance, but may reflect anthropogenic features such as drains.
- 5.29 No geophysical evidence for any roads or tracks has been identified in this area.

Area 2

- 5.30 This area measured 60m x 20m and was located immediately north of the Wall, approximately 20m north-east of the milecastle. The survey occupied a relatively flat area on the north edge of the sill, immediately north of a gate through the field wall.
- 5.31 A high concentration of dipolar magnetic anomalies has been detected throughout this area. This reflects the igneous rock of the Great Whin Sill. Areas of very high resistance have also been detected; these anomalies almost certainly reflect near-surface rockhead. Outcropping bedrock was noted to the west and south of the area.



Volunteers conducting earth resistance survey over Area 2, Milecastle 41

- 5.32 The comparatively low resistance values recorded across the central part of the area correspond to slightly lower and damper ground, where more soil is present and there is a slightly greater depth to bedrock. The existing quad-bike route passes along the northern and eastern edges of this lower resistance area to the gate through the field wall. It is possible that a Roman-era track used the same approach to the Wall though no geophysical evidence for such a track has been identified.

Milecastle 47 (Figures 12-16)

Area 1

- 5.33 This western area measured 80m x 20m and was located in a hay field approximately 70m north of the milecastle.
- 5.34 A broadly north-west/south-east aligned band of dipolar magnetic anomalies, with a flanking linear positive magnetic anomaly to the west, has been detected in the west of the area. A broad band of high resistance has also been detected there. This corresponds to a farmer's track which survives as a slightly raised earthwork within the field, then fords the stream to the south before rising up towards the milecastle. The linear positive magnetic anomaly on the west side of the track probably reflects a drain. This feature corresponds to a former field boundary shown on historic OS editions. It is possible that the track and the former boundary respect the course of a much older track that may have been contemporary with the Wall.
- 5.35 Broadly north-south aligned, parallel, weak positive magnetic anomalies have been detected across this area. These almost certainly reflect a former plough regime.
- 5.36 Occasional other high resistance anomalies have been detected which could possibly reflect stone features, although their location on the floodplain next to the stream makes this unlikely. The weaker and more diffuse resistance anomalies probably

reflect variation in the moisture retention of the sands and gravels here, rather than archaeological features.



Geomagnetic survey of Area 2, Milecastle 47

Area 2

- 5.37 This area measured 80m x 20m and was located in a pasture field grazed by cattle approximately 70m north-east of the milecastle.
- 5.38 As in Area 1, very weak positive magnetic striations have been detected in this area, which almost certainly reflect a former plough regime.
- 5.39 A broad high resistance anomaly has been detected in the east of the area, aligned north-east/south-west. Whilst there is no corresponding geomagnetic anomaly, the former ploughing detected in the geomagnetic data is parallel to this feature. It is possible that this broad band reflects a former track, possibly contemporary with the ploughing. No features are shown here on early OS editions, though the feature could pre-date the OS and it appears to be oriented towards the causeway across the Wall ditch.
- 5.40 A band of higher resistance has also been detected along the southern edge of the survey area. This corresponds to a slight raised bank along the side of the stream where higher concentrations of stone and gravel were noted.

6. Conclusions and recommendations

- 6.1 A programme of detailed geophysical survey was targeted over areas north of Milecastles 32, 41 and 47 on Hadrian's Wall. The principal aim of the surveys was to try to identify any traces of possible tracks or roads leading to or from the north sides of the milecastles, and so help understand their function. The surveys were conducted with volunteers from the North Pennines AONB 'Altogether Archaeology' project in partnership with Northumberland National Park Authority.
- 6.2 Tentative evidence for former tracks is presented at Milecastle 47. The absence of geophysical evidence for roads or tracks within the surveys at Milecastles 32 and 41 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 relatively small, due to the constraints of the present project, and it is possible that evidence for roads or tracks might survive outside the survey areas.

Milecastle 32

- 6.3 No evidence for probable roads or tracks has been identified within the survey at Milecastle 32. However, two other possible archaeological features have been identified to the north and north-east of the milecastle. A small rectilinear anomaly detected in the centre of the survey area measures approximately 9m square and could reflect a soil-filled feature, perhaps a ditch associated with a small enclosure or structure. A curvilinear magnetic anomaly towards the east end of the survey area could similarly reflect a possible ditch, perhaps a small enclosure.
- 6.4 Existing features also recorded in the data include upstanding ridge and furrow earthworks, an existing bank and the top edge of a ditch, and the Hadrian's Wall footpath.

Milecastle 41

- 6.5 A former stone boundary wall evident on the ground has been detected continuing through Area 1. The wall appears to be constructed from the magnetic rock of the adjacent Great Whin Sill. A possible stone feature just east of the former wall could reflect a former shieling or other small stone structure, approximately 6m in diameter. Since there is no corresponding strong geomagnetic anomaly here it is likely that this feature is made of rock from the underlying Alston Formation. Other weak, narrow linear anomalies in this area could reflect land drains.
- 6.6 Area 2 was located on the sill just north of the milecastle and the geophysical anomalies reflect this: high magnetic values throughout and near-surface bedrock to both east and west. The central part of the area is slightly lower and leads to an existing gate through the field wall. An existing quad-bike route passes through both survey areas, up to the gate. This has not been detected geophysically, but any early track in this area might be expected to follow the same course, on topographic grounds.
- 6.7 The lack of any evidence for a former track at this site is perhaps not surprising, given the difficult and steep terrain, and since an easier route option passes through Caw Gap just 350m to the west.

Milecastle 47

- 6.8 An existing farm track across Area 1 follows the route of a former field boundary shown on early OS maps. However, it is possible that these features follow the course of an earlier route, possibly contemporary with the milecastle, since the existing track fords a stream to the south then traverses upslope to the causeway across the Wall ditch. A similar band of high resistance anomalies detected in the Area 2 could also reflect a former track; this feature also appears oriented towards the causeway.
- 6.9 Former ploughing has been detected in both survey areas.
- 6.10 The majority of other anomalies detected here reflect changes in earth resistance. Whilst some of these appear quite regular in shape it seems unlikely that they reflect stone structures, given their location on the floodplain next to the water course. The weaker and more diffuse resistance anomalies almost certainly reflect natural variation within the sands and gravels.

Recommendations

- 6.11 A further programme of geophysical survey, both to extend previous surveys and to investigate the land north of other milecastles, would enhance our understanding of their function and relationship with Hadrian's Wall.
- 6.12 A programme of trial excavation, targeting both geophysical anomalies and areas immediately north of the milecastles, would further our understanding of the milecastles.

7. Sources

- Archaeological Services 2014a *Milecastles 29, 34 and 40, Hadrian's Wall, Northumberland: geophysical surveys*. Unpublished report 3493, Archaeological Services Durham University
- Archaeological Services 2014b *Housesteads Roman Fort, Bardon Mill, Northumberland: geophysical survey*. Unpublished report 3475, Archaeological Services Durham University
- Bartlett, A, 1975 *Housesteads: interim report*. Unpublished AML letter report
- Bartlett, A, 1994 *Housesteads: note on AML geophysical survey, 1975*. Unpublished letter report
- Bidwell, P, (ed) 1999 *Hadrian's Wall 1989-1999: A Summary of Recent Excavations and Research prepared for the Twelfth Pilgrimage of Hadrian's Wall*. Carlisle
- Birley, E, 1961 *Research on Hadrian's Wall*. Kendal
- BGS 2014 online *Geology of Britain viewer* available from: <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> accessed 1st September 2015
- Breeze, D, (ed) 2006 *J. Collingwood Bruce's Handbook to the Roman Wall*. 14th edition, Newcastle upon Tyne
- Breeze, D, & Dobson, B, 2000 *Hadrian's Wall*. 4th edition, London
- CIfA 2014 *Standard and Guidance for archaeological geophysical survey*. Chartered Institute for Archaeologists
- David, A, Linford, N, & Linford, P, 2008 *Geophysical Survey in Archaeological Field Evaluation*. English Heritage

- English Heritage 2012 *Research Strategy for the Roman-Period Historic Environment*. English Heritage Thematic Research Strategies available from: <http://www.english-heritage.org.uk/content/imported-docs/p-t/rm-res-strat-1202-v22.pdf> accessed 15th October 2014
- Frodsham, P, 2013 *Hadrian & his Wall*. Newcastle upon Tyne
- Gaffney, C, Gater, J, & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*. ClfA Technical Paper 6, Chartered Institute for Archaeologists
- Hodgson, N, (ed) 2009 *Hadrian's Wall 1989-1999: A Summary of Recent Excavations and Research prepared for the Thirteenth Pilgrimage of Hadrian's Wall*. Kendal
- Petts, D, & Gerrard, C, 2006 *Shared Visions: The North-East Regional Research Framework for the Historic Environment*. Durham
- Schmidt, A, 2013 *Geophysical Data in Archaeology: A Guide to Good Practice*. Archaeology Data Service & Digital Antiquity, Oxbow
- Simpson, FG, 1976 *Watermills and Military Works on Hadrian's Wall: excavations in Northumberland, 1907-1913*. University of Michigan
- Stevens, CE, 1947 Roman Britain in 1946. *J Roman Studies* **37**, 165-182
- Symonds, M, 2005 The Construction Order of the Milecastles on Hadrian's Wall. *Archaeol Aeliana* **34**, 67-81
- Symonds, MFA, & Mason, DJP, 2009 *Frontiers of Knowledge: a research framework for Hadrian's Wall, part of the Frontiers of the Roman Empire World Heritage Site. Volume II: agenda and strategy*. Durham
- Taylor, DJA, & Biggins, JA, 2004 A Geophysical Survey of Housesteads Roman Fort, April 2003. *Archaeol Aeliana* **33**, 51-60
- Welfare, H, 2000 Causeways, at Milecastles, across the Ditch of Hadrian's Wall. *Archaeol Aeliana*, **27**, 13-26
- Wilmott, T, 2009 *Hadrian's Wall: archaeological research by English Heritage 1976-2000*. English Heritage
- Young, R, Frodsham, P, Hedley, I, & Speak, S, 2010 *An Archaeological Research Framework for Northumberland National Park: resource assessment, research agenda and research strategy*.

Appendix: Project Design



Altogether Archaeology

Theme 8 '*North of the Wall*'

Fieldwork module 8b

Hadrian's Wall Milecastles Project: Phase 2

Project Design



Document Control Grid

Title	Altogether Archaeology Fieldwork Module 8 North of the Wall: submodule 8b Hadrian's Wall Milecastles Project: phase 2
Author	Krissy Moore (with Paul Frodsham) Community Archaeologist Northumberland National Park Authority Eastburn South Park Hexham Northumberland NE46 1BS Tel: 01434 611534 E mail: Krissy.Moore@nnpa.org.uk
Derivation	
Origination date	October 2014
Reviser(s)	Krissy Moore
Date of last revision	11 March 2015
Version	4
Status	FINAL
Circulation	
Required action	
File/location	G:\PrC\Edit\Historic Environment\Community Archaeology\Altogether Archaeology\Altogether Archaeology Dec13-Dec14\AA_01_Milecastles Phase 2
Approval (Signature and Date)	Krissy Moore 11 th March 2015

This document has been produced in accordance with the Management of Research Projects in the Historic Environment (MoRPHE) guidelines (English Heritage, 2006).

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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: Milecastle 42, Hadrian's Wall, in the Northumberland National Park.

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 is the second phase of a project to examine land north of (and surrounding) Milecastles on Hadrian's Wall, in an attempt to ascertain whether 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. Phase 1 investigated Milecastles 29, 34 and 40 and found no definite evidence of roads approaching from the north – Phase 2 aims to test whether these results were representative by surveying Milecastles 32, 41 and 47, thereby increasing the sample size to 7.5 % of the 80 Milecastles.

2. Background

2.1 The function of the Milecastles along Hadrian's Wall is not fully understood. It is generally hypothesised that they controlled north-south traffic through the Wall – Milecastles have even been described as "fortified gateways" (Breeze and Dobson 2000: 33) – however no roads approaching them from the north have been identified. Understanding the function of the milecastles, and any roads that may have been associated with them, is critical to our understanding of the intended and actual function of Hadrian's Wall. In the original plan for Hadrian's Wall, the Milecastles appear to have offered the only routes through the wall. However, during construction of the Wall, the decision was made to add the great Wall Forts. We simply do not know how the Milecastles functioned within this revised plan.

2.2 The known Roman roads north of the Wall include the Devil's Causeway, which branches north-east from Dere Street at Bewclay to Longframlington and Berwick-upon-Tweed, which are then linked further north by a west-east route from High Rochester to Whittingham. South of the Wall are two Roman roads crossing the Tyne-Solway gap. The Stanegate starts at Corbroidge and runs west to Carlisle, and predates the Wall. The Military Way was constructed later, and runs east-west parallel with the Wall from Wallsend to Carlisle (Petts & Gerrard 2006). There does not appear to be evidence for a Roman Road directly approaching the Wall within the National Park from the north. From the south, a section of the Maiden Way appears to head towards Milecastles 46 and 47 but no intersection is known (OS Open Source Strategi Data, see Figure 1). To the east of the National Park boundary, the Roman Road referred to as the Devil's Causeway appears to be on course to meet Hadrian's Wall somewhere between Milecastles 20 and 22, but again no intersection is known.

2.3 Some Milecastles are located on high crags with a sheer drop to the north: this suggests that these Milecastles at least could not have served as portals through the Wall. Other Milecastles opened on to flat ground however we cannot determine the volume of traffic – if any – from soldiers and other travellers passing to or from the north. Welfare (2000) concluded gateways through the wall necessitated provision for crossing the ditch and through field survey identified earth causeways which may have served this purpose, though in some cases the results are inconclusive. Symonds (2005: 72) has suggested that the building schedule of Hadrian's Wall Milecastles may have prioritised the completion of Milecastles in areas where north-south transit would have been easier due to gentler topography.

2.4 Phase 1 of this project aimed to test the hypothesis that Milecastles funnelled north-south traffic through Hadrian's Wall by searching for traces of roads to the north and south of three Milecastles (29, 34 and 40) using geophysical survey techniques. The results are summarised below (DUAS 2013):

- At Milecastle 29, insubstantial evidence for a metalled surface has been identified to the south of the milecastle; this may result from near-surface limestone. Probable and possible walls and banks have also been identified. The east wall of the Milecastle has been detected and its remains appear to be slightly curved. No structural features have been identified within the Milecastle, though there is almost certainly rubble present.
- At Milecastle 34, no evidence for a probable road or track has been identified. A large area of rubble or tumble has been identified to the north of the Milecastle; it may obscure any older archaeological features in this area. A circular structure was identified to the south of Milecastle 34.
- At Milecastle 40, no evidence for a probable road or track has been identified. However, a break in the northern bank, and a possible stone causeway across the ditch, have been detected just to the north-east. These features could be associated with an undetected track here.
- Geomagnetic and resistance anomalies relating to the local geological background, particularly the Whin Sill, have been identified.

2.5 The lack of unambiguous evidence for roads or tracks within these survey areas may indicate that such tracks were not present, or that any tracks were insubstantial dirt roads with no associated drainage ditches. The areas surveyed were small and evidence for tracks may survive outside of these areas.

2.6 It is probable that each milecastle has its own story to tell, according to its landscape context and changes in use over the centuries of occupation. The three Milecastles investigated in Phase 1 of this study cannot be considered a representative sample of the 80 Milecastles along the Wall (3.75%) or of the variety of landscape contexts in which the Milecastles are found. Therefore additional survey of a further three Milecastles in different landscape contexts is proposed, to increase the sample size to 7.5%.

2.7 The three Milecastles selected for Phase 2 of the geophysical survey programme, for a variety of reasons, are: Milecastle 32 at Carraw, Milecastle 41 at Shield on the Wall and Milecastle 47 at Chapel House. If the results of this survey identify anomalies which may relate to roads approaching the Milecastles, a following phase of test excavation will be considered. If no such anomalies are discovered, the results shall be considered alongside those from Phase 1.

- Milecastle 32 Carraw (NY 84567099) (N7818): Milecastle 32 has been extensively robbed for building stone, and survives as a low mutilated platform with a robber trench around. An excavation in 1971 confirmed it was a long-axis milecastle. Its south wall is defined by a terrace and the north wall is overlain by the field wall on the south side of the B6318 road (HER 2014). The field to the north of Milecastle 32 has been ploughed in the past, which at least indicates there's a level approach to the milecastle from this direction. Some ridge-and-furrow is still visible. There may be evidence for a recutting of the Ditch, shown by a change in the character of the Ditch with the earthworks on the west side being much more sharply cut than to the east. The milecastle was excavated in 1972 but no investigation took place north of the gate (Binns 1972 in Welfare 2000: 21).
- Milecastle 41 Shield-on-the-Wall (Melkridge) (N6461): Welfare (2000: 22) describes this as a "crags" milecastle. It has been crossed by a field wall that follows Hadrian's Wall, and another meets it almost at right angles from the North. Although this is a crags milecastle this field boundary makes it of interest.
- Milecastle 47 Chapel House (NY64906607) (N6024): Excavated in 1935, Milecastle 47 contained traces of large barrack buildings either site of a central courtyard, with an oven in the northwest corner (HER 2014). The milecastle is approached by a "clear and obvious causeway" over a particularly deep and wide section of the Ditch (12m wide by 3.5m deep). The causeway is 18m wide but the west 13m of it may represent more recent infilling. A trackway cuts through the narrow mound of the glacis and curves down the slope to the northwest (Welfare 2000: 22).

2.8 It is important to note here that entirely negative results will still add new evidence to the discussion about the function of the Milecastles. If no evidence of roads or tracks approaching any of the Milecastles is found, such a result would suggest (though not prove) that Milecastles did not serve to funnel north-south traffic through the Wall. This would in itself be a significant contribution to our understanding of Hadrian's Wall.

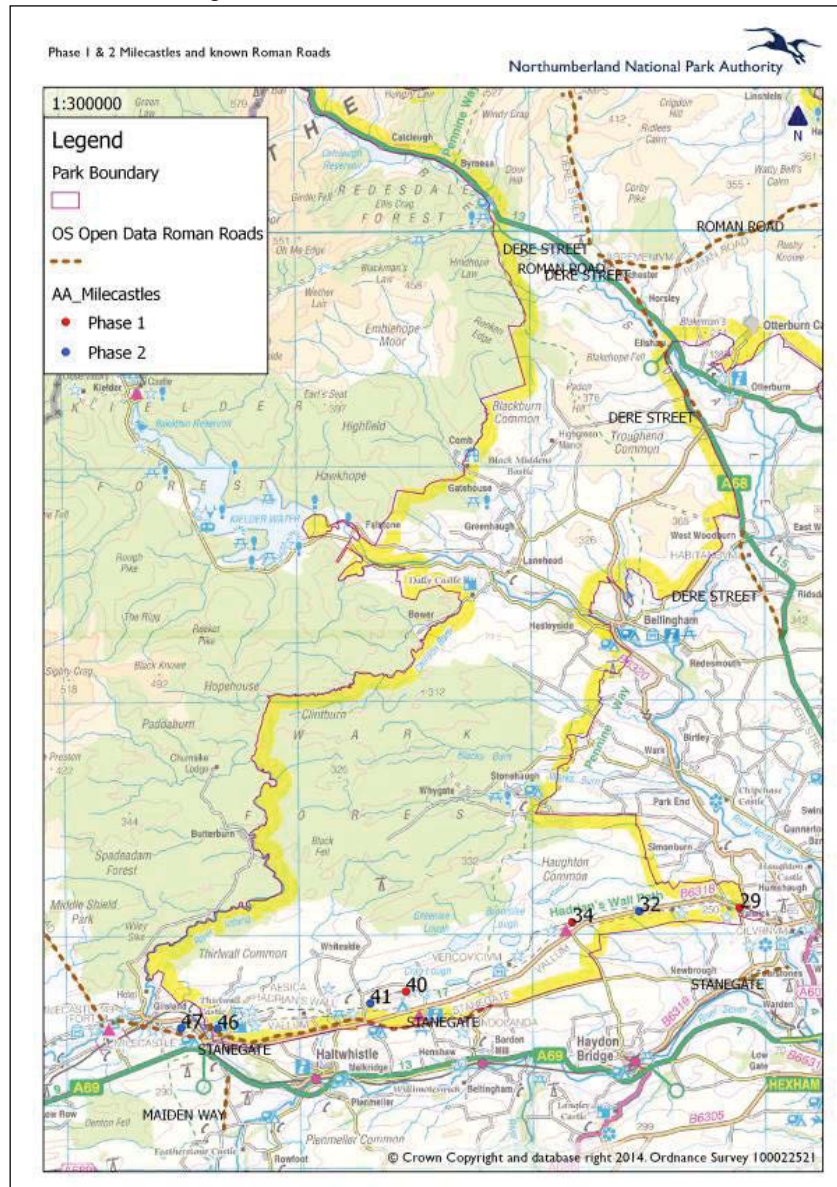


Figure 1: Map of the locations of Phase 1 and Phase 2 Milecastles, relative to known Roman Roads (from OS Open source Strategi data).

3. Research Aims and Objectives

3.1 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.

3.2 Further, the proposed work can contribute to research priorities identified in *Frontiers of Knowledge*, the Hadrian's Wall Research Framework Resource Assessment, and the accompanying Strategy and Agenda (Symonds & Mason 2009a, b). The editors note that "the precise manner in which the Wall structures interacted and the resulting frontier system functioned remains a source of considerable debate.... There is a need to look at variation along the course of the Wall.... It would, in general, be appropriate to test a range of accepted facts to ensure that we have a reliable picture of the basic frontier elements" (Symonds & Mason 2009a: 10).

3.2.1 In particular, *Frontiers...* (Symonds & Mason 2009a) notes that the extramural features of Milecastles have only rarely been investigated. The investigation proposed in this Altogether Archaeology module will assist in furthering our understanding of the Milecastles' immediate landscape context.

3.2.2 *Frontiers...* also notes that "little is known about the mechanisms of moving material into and around the frontier zone" (Symonds & Mason 2009b: 50). Clarifying whether Milecastles genuinely functioned as gates between the North and South would contribute to further understanding of how people, livestock and goods moved around the area.

3.3 The proposed research will also contribute to research priorities identified in the *Northumberland National Park Regional Research Framework* (Young et al. 2004).

3.3.1 The *Framework* (Young et al. 2004) Research Theme 3: Farming through the ages: aims to cross over period boundaries, discovering 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 through the wall?

3.3.2 The *Framework* (Young et al. 2004) also indicates there is further work to be done in Research Theme 6: Early Medieval archaeology – modelling of the Roman/Anglo-Saxon tradition would benefit from further understanding of the presence or absence (and survival) of any Roman roads through Hadrian's Wall. Indeed, the "fate of Hadrian's Wall" is a pressing research question for this region and any further research on the area, such as is being done through the current project, will provide further data for discussion of this topic.

3.3.3 The *Framework* (Young et al. 2004)'s Research Theme 7: Boundaries in the Landscape may also link to the current research, as a possible strand of study is the consideration of the "nature of Hadrian's Wall". Determining whether the Milecastles did moderate north-south traffic would go towards establishing how "porous" the Wall was and what kind of boundary it represented at different times.

3.3.4 Also mentioned is Research Theme 8: Transport and communication (Young et al. 2004). The upkeep of the Roman road system in the Early Medieval period, specifically the fate of Roman roads, is also a research priority to which the current project will be an obvious benefit, for if any roads are identified by the geophysical survey it will raise the question of why they, unlike other Roman roads nearby, were not maintained into latter periods.

3.3.5 The North of the Wall module of Altogether Archaeology, of which the proposed research is part, is suitable for consideration under Research Theme 11 in the *Framework*: Detailed area-specific research projects. Adding to our understanding of all archaeological eras in the area north of Hadrian's Wall is a useful research undertaking.

3.4 Further, the proposed research aims to contribute to research priorities identified in the *Shared Visions: North East Regional Research Framework* (Petts & Gerrard 2006). This *Framework* notes that while the basic Roman road network layout is well understood, there remain gaps, and there may have been an as yet relatively-unknown network of minor trackways, into which any milecastle roads could fit. It also notes that geophysical survey and aerial photography have been of much use in identifying further sites.

3.3.1 The key research frames noted in *Shared Visions* (Petts & Gerrard 2006: 147) include R.ii Roads and Communication, which notes that "the Roman communication network in the region is only superficially understood and a greater understanding of its development is a priority". The research proposed herein is closely linked to the development of the earliest military infrastructure of the region, and could shed light on discussions of the function of the Stanegate (if any southwards roads are located).

3.4 Also relevant is *The Research Strategy for the Roman-Period Historic Environment* (English Heritage 2012). Theme 4.2 of the *Strategy* (English Heritage 2012: 14) identifies the need for a holistic approach to Roman period landscape; investigating the Milecastles will add to our understanding of how these structures fit in to their specific landscape context, including "pre- and post-Roman aspects of the landscape, both as features in their own right but also as elements that can influence (pre-Roman) or be influenced by (post-Roman) features".

3.5 As mentioned in 3.1, involving many volunteers and raising public awareness of the research potential of the area is a key aim of Altogether Archaeology projects. This aim meshes with Theme 5.3 of the *Research Strategy for the Roman-Period Historic Environment* (English Heritage 2012), which identifies the importance of raising awareness of and public engagement with Roman and post-Roman archaeology, and Universal Priorities of Communicating knowledge, raising awareness and improving public understanding (Universal Priority V) and Access to Knowledge (Universal Priority VI) in *Frontiers of Knowledge* (Symonds & Mason 2009b: 31-32).

3.6 Finally, the Northumberland County Council Historic Environment Record values additional research and review of sites recorded in its archives. Exploring the area to the north of the selected Milecastles would provide additional information for the HER archives would contribute to future research in the area.

4. Business Case

4.1 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.
- As outlined in detail in Section 3 (above), the proposed research ties in closely with many important regional research frameworks. In particular it ties in closely with multiple Themes and Priorities in *Frontiers of Knowledge: the Hadrian's Wall Research Agenda and Strategy* (Symonds & Mason 2009b) (see Table 1, below).

Table 1: Relevant Themes and Priorities (after Symonds & Mason 2009b).

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

- Finally, the research will potentially contribute to our knowledge of post-Roman landscape development north of Hadrian's 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.

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

5.1.1 Based on discussions with a range of relevant experts, an additional sample of 3 Milecastles has been identified: Milecastles 32, 41 and 47. 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, building on the findings of Phase 1 of this project. 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 milecastles, and an introduction to geophysical survey techniques. The workshop will include a field inspection of one of the featured milecastles.

5.2 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 presented as the green-shaded areas in Figures 2, 3 and 4 on the following pages. Please note that the areas will be laid out in the field to take local topography into consideration and may differ slightly in placement from the areas illustrated below, however it is expected that the areas will not exceed the following dimensions:

- Milecastle 32: 100m x 20m, to the north of the milecastle
- Milecastles 41 and 47: two areas of 60m x 20 m, to the north of each milecastle

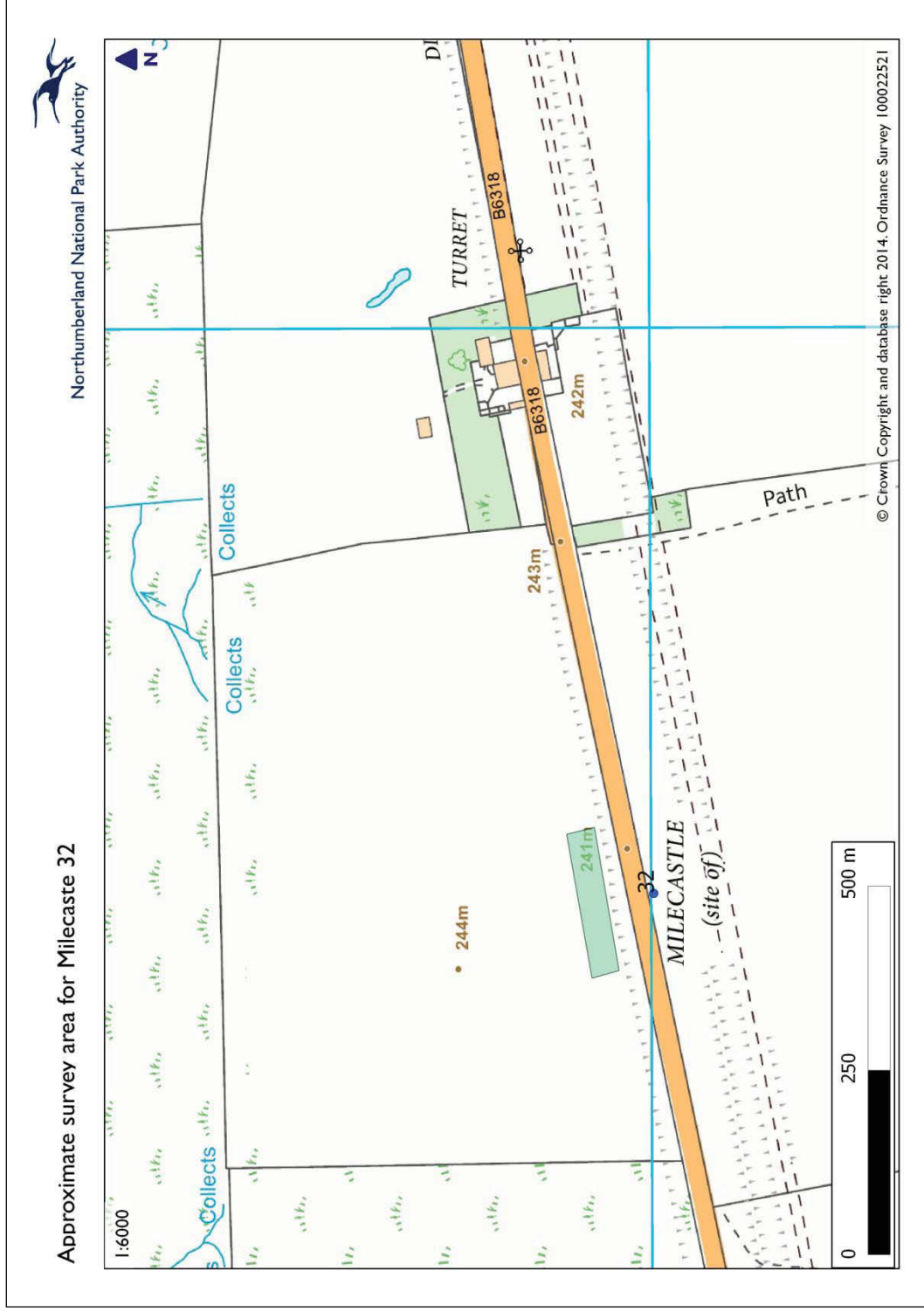


Figure 2: Milecastle 32 provisional approximate location of geophysical survey areas.

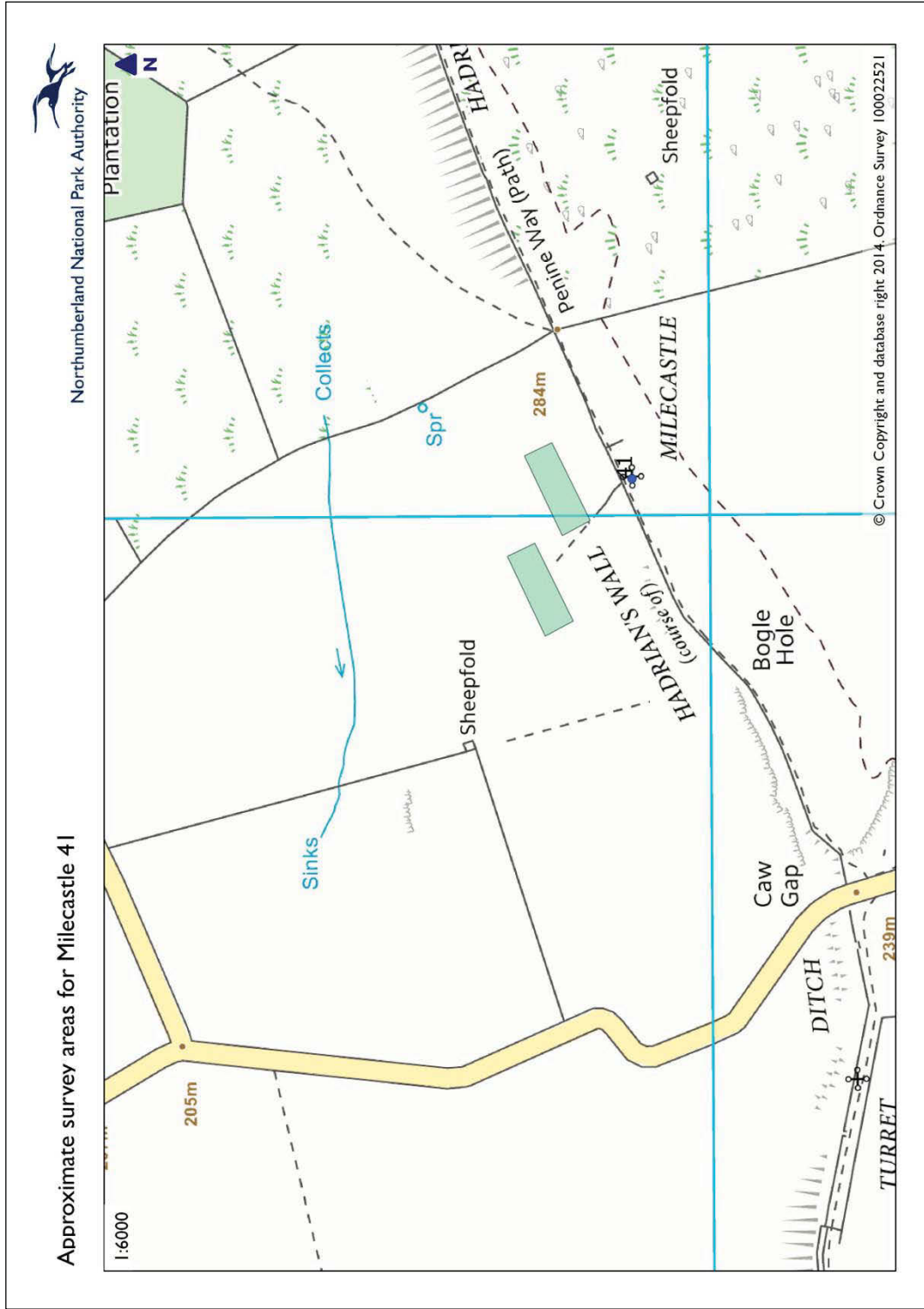


Figure 3: Milecastle 41, provisional approximate location of geophysical survey areas.

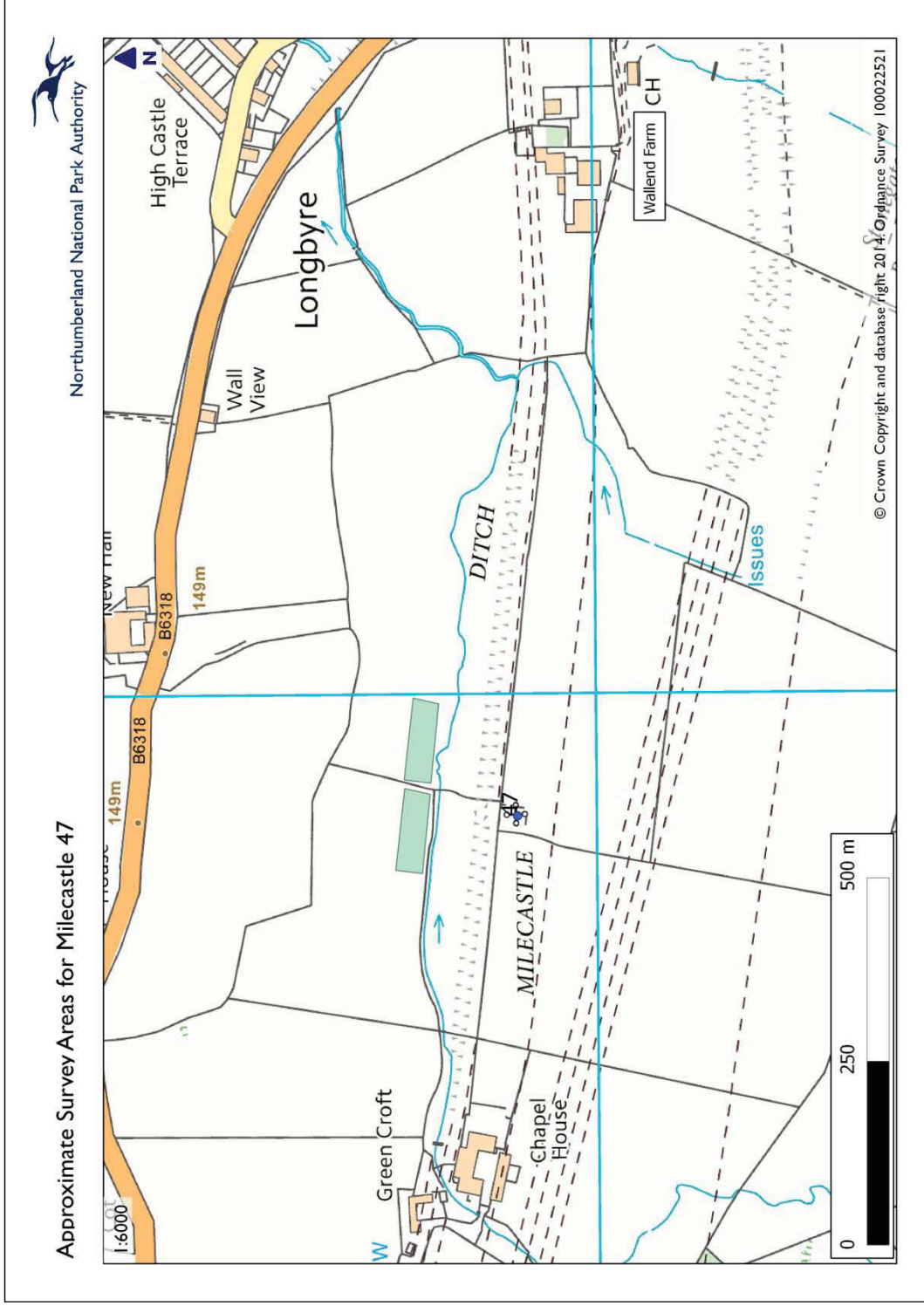


Figure 4: Milecastle 47 provisional approximate location of geophysical survey areas.

Technique selection

5.2.3 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.

- Milecastle 32: underlying geology of limestone, sandstone, siltstone and mudstone
- Milecastle 41: underlying geology of limestone, sandstone, siltstone and mudstone; immediately north of the crags which are formed by the Whin Sill complex
- Milecastle 47: underlying geology of limestone, sandstone, siltstone and mudstone; a band of limestone lies beneath the eastern quarter of the study area (after BGS Geological Formations, BGS 2006[?])

5.2.4 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.

5.2.5 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

5.2.6 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.

5.2.7 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.

5.2.8 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.

5.2.9 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.

5.2.10 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

5.2.11 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:

Reporting

5.2.12 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.

5.2.13 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

5.2.14 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

5.2.15 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.

5.3 Phase 3: Targeted excavation

5.3.1 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.

5.3.2 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 that appear to intersect or to run parallel to each other, to possible pits, and to the terminals of any linear features.

5.3.3 Should it be decided to undertake such excavations, a detailed written scheme of investigation 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 excavation phase, post excavation, reporting and publication (if appropriate), including incorporation of the results of the phase 1 programme.

6. Stages, tasks and timetable

STAGE or Task No.	STAGE/Task	Person(s) responsible	Dates (all 2014)
S 1	PREPARATION		
T 1.1	Preliminary site meetings.	PF/KM	October 2014
T 1.2	Finalising of MORPHE compliant project design and EH approval.	PF/KM/MC	November 2014
T 1.3	Obtain Section 42 licences	PF/KM/MC	November 2014
T 1.4	Produce risk assessment.	PF	November 2014
T 1.5	Put project live on AA sector of AONB website, inviting volunteers to register.	PF	November 2014
T 1.6	Closing date for volunteer registration	PF	November 2014
T 1.7	Agree volunteer participation rota – inform volunteers.	PF	November 2014
T 1.8	Project start-up meeting	Volunteers/PF/KM/ASDU	March 2015
S 2	FIELDWORK		
T 2.1	Site set-up	Volunteers/DH/KM/CJ	15 th July 2015
T 2.2	Three fieldwork days – 16, 17, 18 July 2015	ASDU/Volunteers/CJ/KM	16-18 July 2015
S 3	REPORT, ARCHIVE & PUBLICITY		
T 3.1	Production of report	DH	April 2015
T 3.2	Discussion of follow-up fieldwork & drafting of Project Design(s) as appropriate.	DH/CJ/PF	April 2015
T 3.3	Delivery of follow up fieldwork (as appropriate)	DH/CJ/PF	TBC
T 3.4	Presentation of final report to HEWG	DH/CJ/PF	TBC
T 3.5	Deposition of archive, dissemination of final report to HER & OASIS	DH/CJ/PF	TBC
T 3.6	Link to Project Report placed on AONB & NP websites.	CJ/PF	April 2015
T 3.7	Contribution to <i>Altogether Archaeology</i> end of project conference	CJ/PF	Late September 2015

CJ = Chris Jones (Northumberland National Park Historic Environment Officer)

KM = Krissy Moore (Northumberland National Park Authority Community Archaeologist)

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

7.1 This project primarily on adding detail to our understanding of the function of Milecastles and specifically how they connected (if at all) with the under-researched landscape north of the Wall. The data obtained will further our understanding of Roman and potentially early-medieval land use in the area immediately north of the Stone Wall sections within

Northumberland National Park. Despite a public perception of the Roman period and Hadrian's Wall being well-understood, all of the research frameworks referred to in Section 3 of this document indicate the great potential for future discovery.

7.2 This will link in with other projects including:

- Altogether Archaeology Module 8: North of the Wall. Geophysical survey will complement the other projects within the Northumberland National Park (the prehistoric landscape surveys at Ravensheugh and Standingstones Rigg, the first Phase of the Milecastles geophysics project, and the proposed geophysical survey of the deserted medieval settlement around Bradley Hall in the Bardon Mill area). These surveys all aim to explore the vast under-researched archaeological resource of archaeology in the complex multi-period landscapes north of the wall. Additional geophysical survey of Milecastles will add to the work completed in Phase 1 and allow us to argue more convincingly for a particular interpretation of milecastle function once the results have been analysed.
- The ongoing research aims of *Frontiers of Knowledge: the Hadrian's' Wall Research Framework* (Symonds & Mason 2009a, b), the *Northumberland National Park Regional Research Framework* (Young et al. 2004), *Shared Visions: the North East Regional Research Framework* (Petts & Gerrard 2006) and the *Research Strategy for the Roman-Period Historic Environment* (English Heritage 2012).
- For more detail on project links, see Section 3 of this document.

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:

Krissy Moore (Project manager)	Northumberland National Park Authority Community Archaeologist	Project management/ coordination. Assistance with fieldwork.
Chris Jones	Northumberland National Park Historic Environment Officer	Coordination, supervision, advice, 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	Geophysics Specialist, Durham University Archaeological Services	Direction of project fieldwork, including delivery of volunteer training.
Mike Collins	English Heritage Archaeological Advisor (Hadrian's Wall)	General liaison with English Heritage.
Rob Young	English Heritage North-East Archaeological Advisor	General liaison with English Heritage.
Paget Lazzari	Northumberland National Park Senior Ranger	Advisor regarding farmer and landowner liaison.
David McGlade	Hadrian's Wall National Trail Officer	Advisor regarding farmer and landowner liaison.
Hum Welfare	The Hadrian's Wall Management Plan Committee	To be informed of progress of research
David Mason and Matt Symonds	Hadrian's Wall Archaeological Research Group	To be informed of progress of research
Tony Wilmott	English Heritage	To be informed of progress of research

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 geophysical survey 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 study area are kept by NNPA. All access permissions have been granted. 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

- Breeze, D and B Dobson 2000. *Hadrian's Wall* 4th Edition. London: Penguin Books
- English Heritage 2007. *Understanding the Archaeology of Landscapes: A guide to good recording practice*. [PDF] URL: <<https://www.english-heritage.org.uk/publications/understanding-archaeology-of-landscapes/>> Accessed 8th October 2014
- English Heritage 2008. *Geophysical Survey in Archaeological Field Evaluation*. [PDF] URL: <<http://www.english-heritage.org.uk/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf>> Accessed 8th October 2014
- English Heritage 2011. *Introduction to Heritage Assets: Medieval Settlements* [PDF] URL: <<https://www.english-heritage.org.uk/publications/iha-medieval-settlements/medievalsettlements.pdf>> Accessed 8th October 2014
- English Heritage 2012. *Research Strategy for the Roman-Period Historic Environment*. English Heritage Thematic Research Strategies. [PDF] URL: <<http://www.english-heritage.org.uk/content/imported-docs/p-t/rm-res-strat-1202-v22.pdf>> Accessed 15th October 2015
- Frodsham, P 2004. *Archaeology in Northumberland National Park*. CBA Research Report 136: Council for British Archaeology: York
- Gaffney, C, J Gater and S Ovenden 2002. *IfA Technical Paper No.6, The use of geophysical techniques in archaeological evaluations*. The Institute for Archaeologists.
- Gates, T 2004. *The Hadrian's Wall Landscape from Chesters to Greenhead: An air photographic survey*. Unpublished project report May 2004.
- The Institute for Archaeologists (IfA) 2010. *Draft Standard and Guidance for archaeological geophysical survey* [PDF] URL: <<http://www.archaeologists.net/sites/default/files/node-files/geophysicsSG.pdf>> Accessed 8th October 2014
- Ordnance Survey 2010. *GB Roman Roads: GB Roman Roads extracted from Ordnance Survey Strategi data which is available from OS Open Data. Roman Roads were extracted from the land_use_polyline dataset and merged to create a GB wide dataset* [SHP shapefile] URL: <<http://www.sharegeo.ac.uk/handle/10672/88>> Accessed 20th October 2014
- Petts, D and C Gerrard 2006. *North-East Regional Research Framework (NERRF)*. [PDF] URL: <<http://www.durham.gov.uk/media/1551/Shared-Visions-North-East-Regional-Research-Framework-for-the-Historic-Environment/pdf/SharedVisionsNERegionalResearchFrameworkHistoricEnvironment.pdf>> Accessed 7th October 2014
- Schmidt, A and E Ernenwein 2011. *The Archaeology Data Service Guide to Good Practice: Geophysical Data in Archaeology* (2nd edition) [online] URL: <http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_Toc> Accessed 8th October 2014
- Symonds, M 2005. The Construction Order of the Milecastles on Hadrian's Wall. Pp. 67-81 in *Archaeologia Aeliana*, Fifth Series Volume XXXIV, The Society of Antiquaries of Newcastle Upon Tyne
- Symonds, M and D Mason, eds 2009a. *Frontiers of Knowledge: A research framework for Hadrian's Wall, part of the Frontiers of the Roman Empire World Heritage Site, Volume 1: Resource Assessment* [PDF] URL: <https://www.dur.ac.uk/resources/archaeology/pdfs/research/Vol_1_Resource_Assessment.pdf> Accessed 20th October 2014
- Symonds, M and D Mason, eds 2009b. *Frontiers of Knowledge: A research framework for Hadrian's Wall, part of the Frontiers of the Roman Empire World Heritage Site, Volume 2: Agenda and Strategy* [PDF] URL: <<https://www.dur.ac.uk/resources/archaeology/pdfs/research/Vol.2AgendaStrategy.pdf>> Accessed 20th October 2014
- Welfare, H 2000. Causeways, at Milecastles, across the Ditch of Hadrian's Wall. Pp. 13-26 in *Archaeologia Aeliana*, Fifth Series Volume XXVII, The Society of Antiquaries of Newcastle Upon Tyne
- Woodside, R 1995a. *The National Trust Archaeological Survey Hadrian's Wall Estate Volume I SMR 1200-12357*
- Woodside, R 1995b. *The National Trust Archaeological Survey Hadrian's Wall Estate Volume II Northumbria Region sites and Monuments Record 1:2500 Maps*.
- Young, Robert, Paul Frodsham, Iain Hedley and Steven Speak 2004. *An Archaeological Research Framework for Northumberland National Park: Resource Assessment, Research Agenda and Research Strategy – Section 4, Prehistory* [pdf] URL: <<http://www.northumberlandnationalpark.org.uk/understanding/historyarchaeology/archaeologicalresearchframework>> Accessed 8th October 2014

Appendices

- Appendix 1. Altogether Archaeology Generic Risk Assessment
- Appendix 2. Module 8 Project Specific Risk Assessment
- Appendix 3. Risk Log



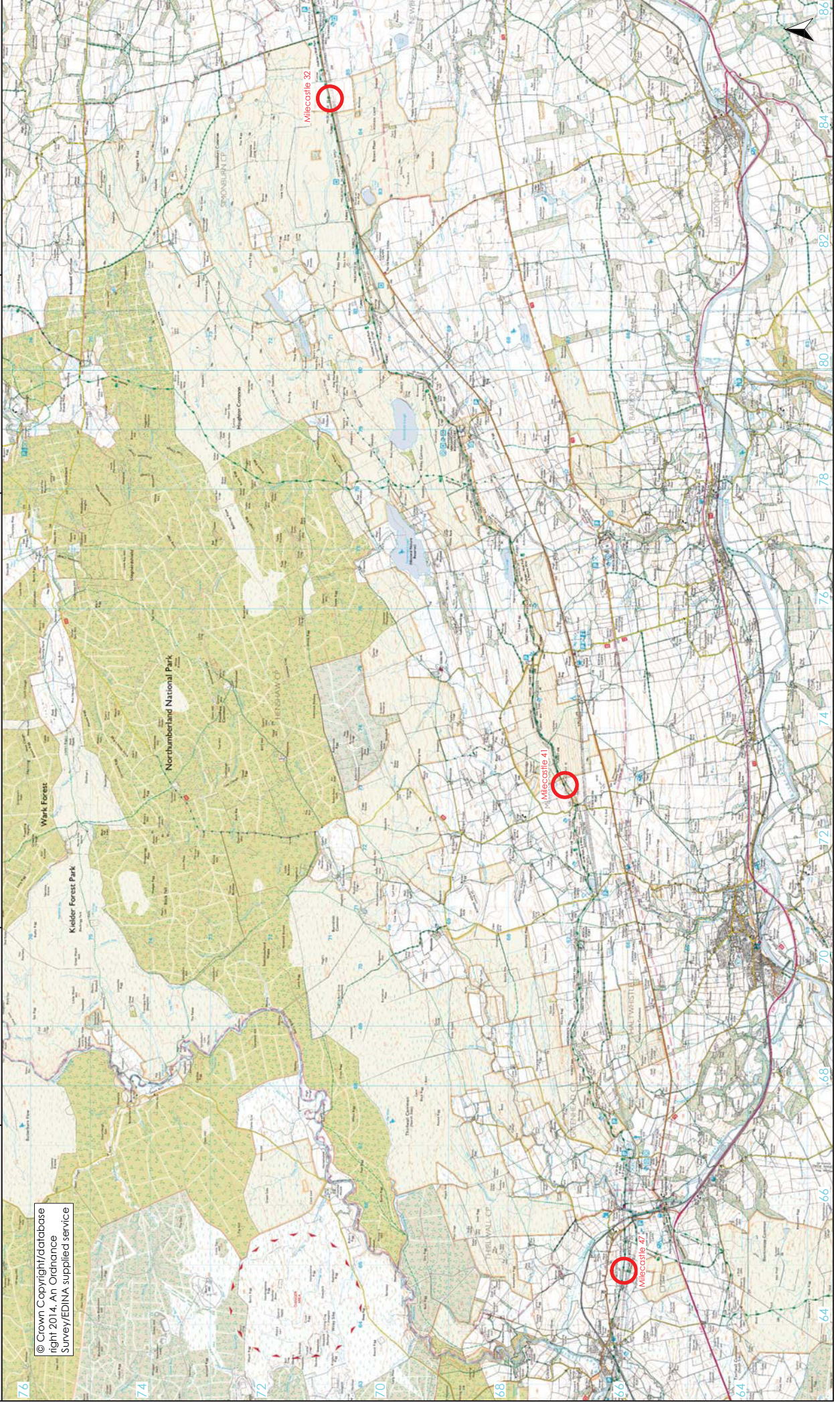
site location



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Milecastles 32, 41 and 47
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Figure 1: Site location

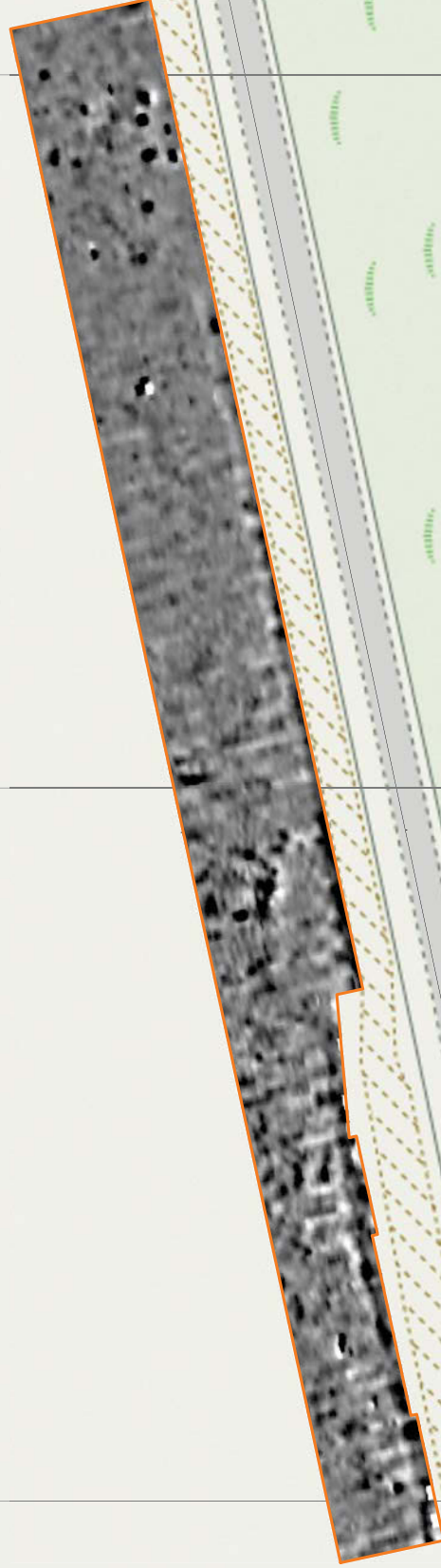


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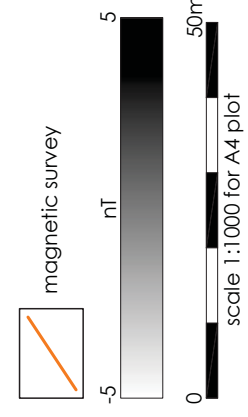
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Figure 2: Milecastle 32: geomagnetic survey



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Milecastle 32



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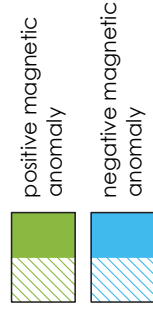
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Figure 3: Milecastle 32:
geomagnetic interpretation

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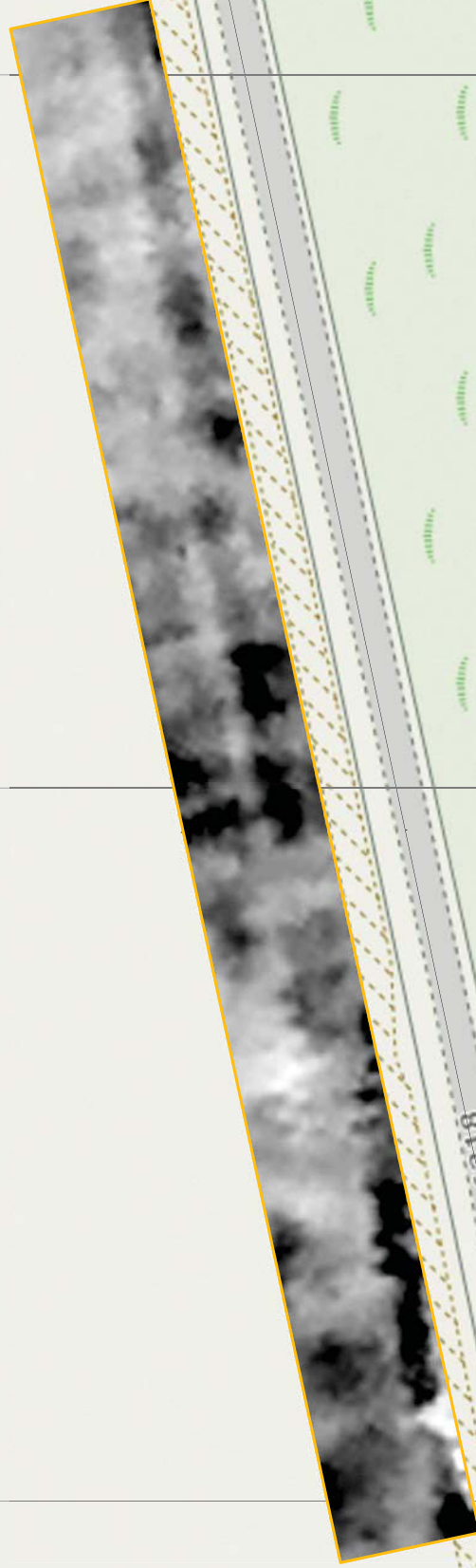


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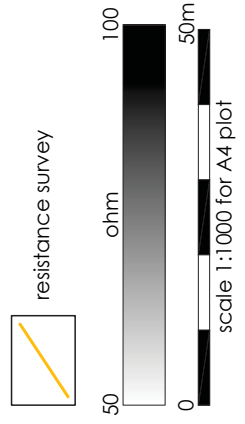
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Northumberland National Park

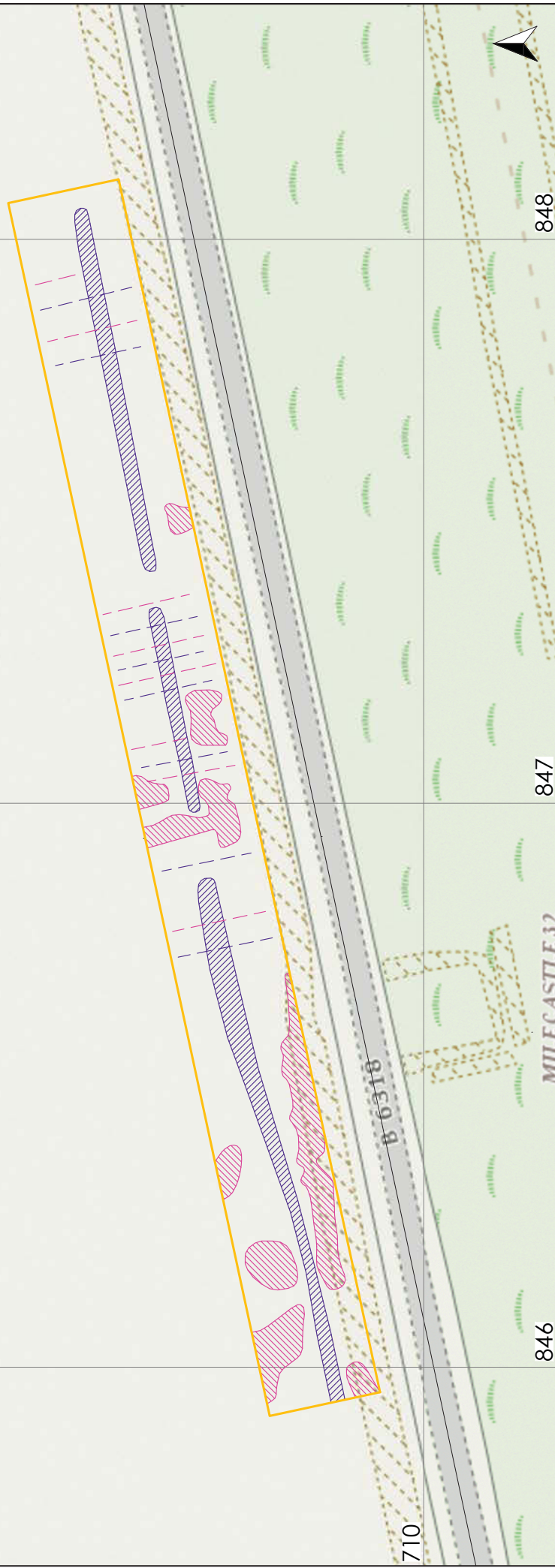
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Figure 4: Milecastle 32: resistance survey



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Figure 5: Milecastle 32: resistance
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resistance survey



high resistance anomaly



low resistance anomaly

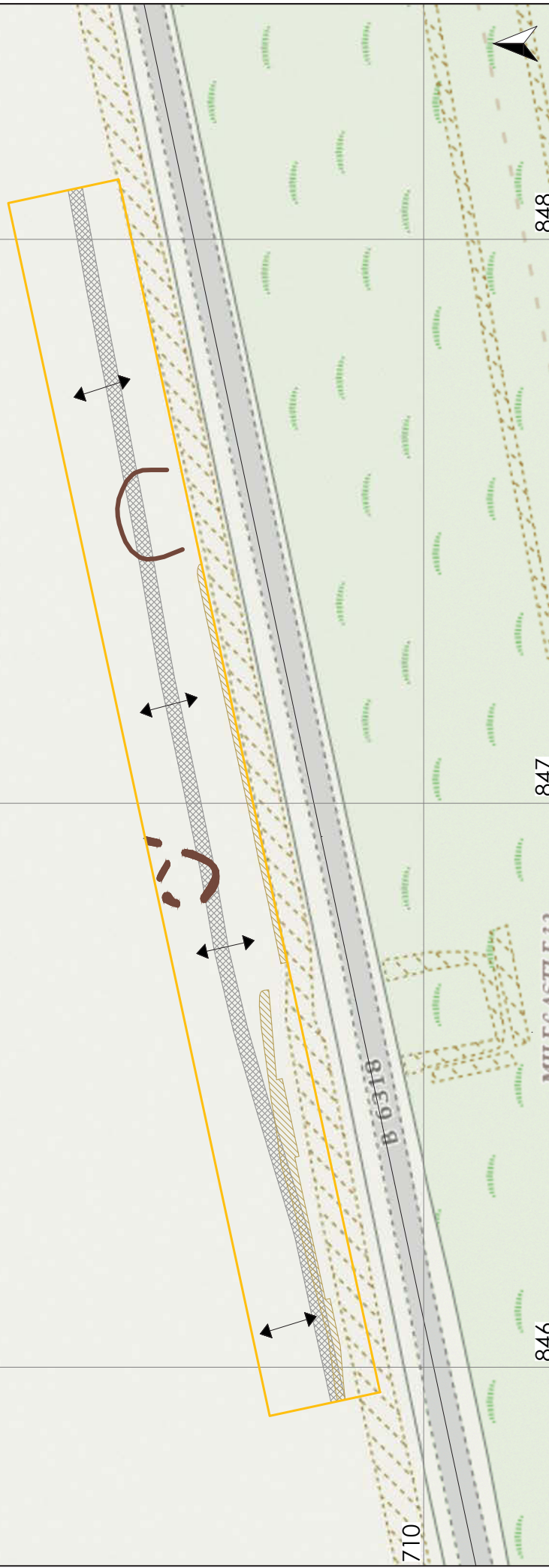


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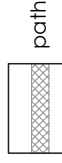
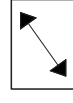
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geophysical surveys
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Figure 6: Milecastle 32:
archaeological interpretation

on behalf of
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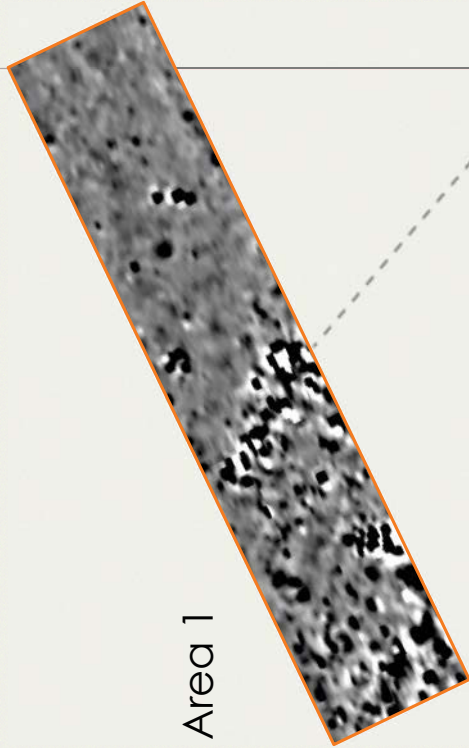


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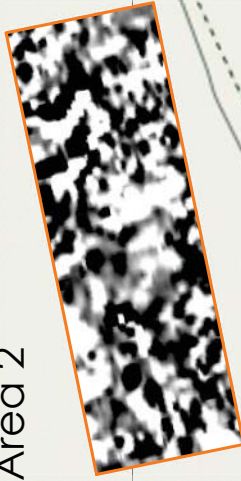
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Area 1



Area 2



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Figure 7: Milecastle 41: geomagnetic survey



magnetic survey

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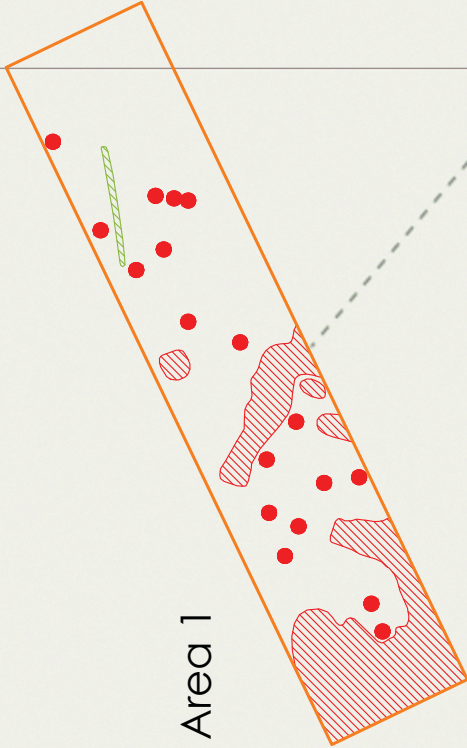
Milecastles 32, 41 and 47
Hadrian's Wall
Northumberland

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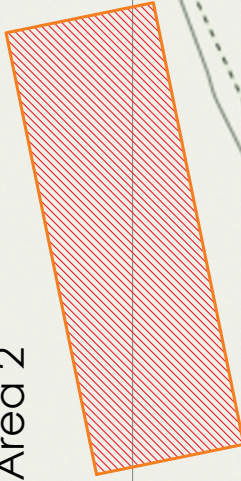
Figure 8: Milecastle 41: geomagnetic interpretation



Area 1



Area 2



MILECASTLE
(sitir of)

729

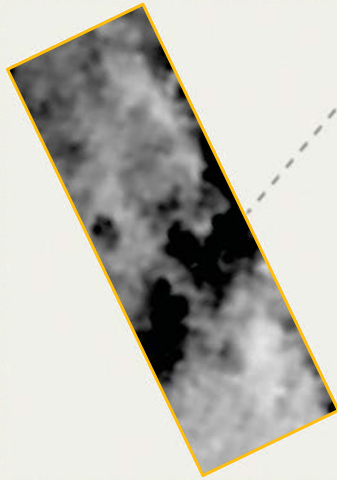
730

731

672

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Area 1



Area 2



671

730

731

MILECASTLE
(site of)



resistance survey

Area 1

40

ohm 90

Area 2

40

ohm 300

672

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Figure 10: Milecastle 41: resistance interpretation



Area 1



Area 2



MILECASTLE
(sitir of)

671

729

730

731

672

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Area 1

Area 2

MILECASTLE
(site of)

671

730

731

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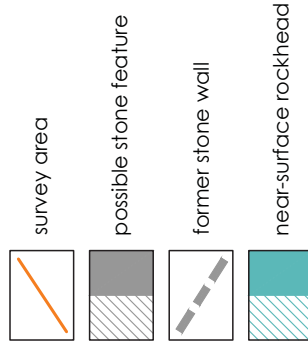


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Figure 11: Milecastle 41:
archaeological interpretation



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662

Area 1

Area 2

661

DITCH

MILECASTLE 47
(site of)

649

650



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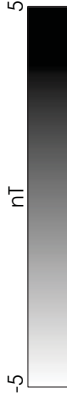
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Figure 12: Milecastle 47:
geomagnetic survey



magnetic survey



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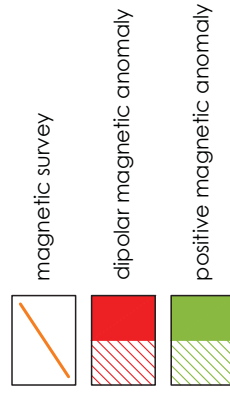


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Figure 13: Milecastle 47:
geomagnetic interpretation



662

Area 1

Area 2

DITCH

661

MILECASTLE 47
(site of)

649

650



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662

Area 1

Area 2

DITCH

661

MILECASTLE 47
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649

650



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Figure 14: Milecastle 47: resistance
survey



resistance survey

Area 1

40

ohm

100

Area 2

35

ohm

75

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662

Area 1

Area 2

DITCH

661

MILECASTLE 47
(site of)

649

650



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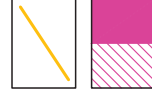


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Figure 15: Milecastle 47: resistance
interpretation



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662

Area 1

Area 2

DITCH

661

MILECASTLE 47
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649

650

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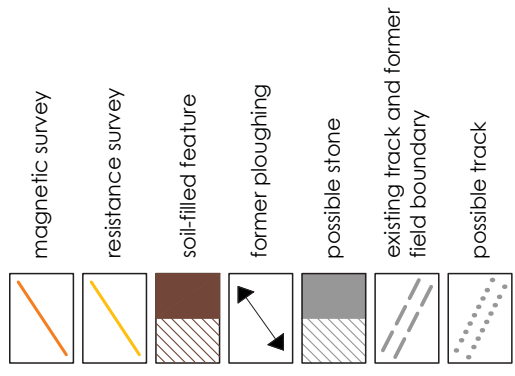
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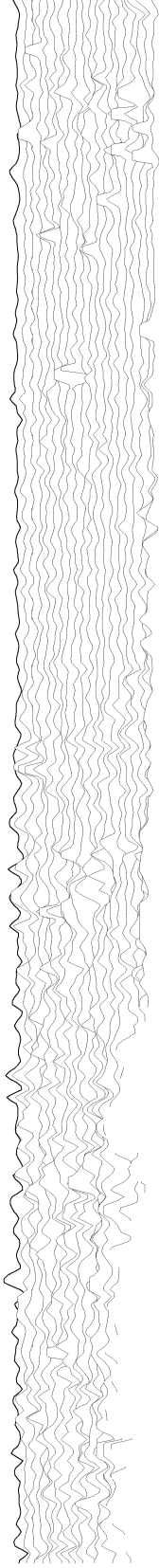
Figure 16: Milecastle 47:
archaeological interpretation



Milecastle 32, magnetic survey



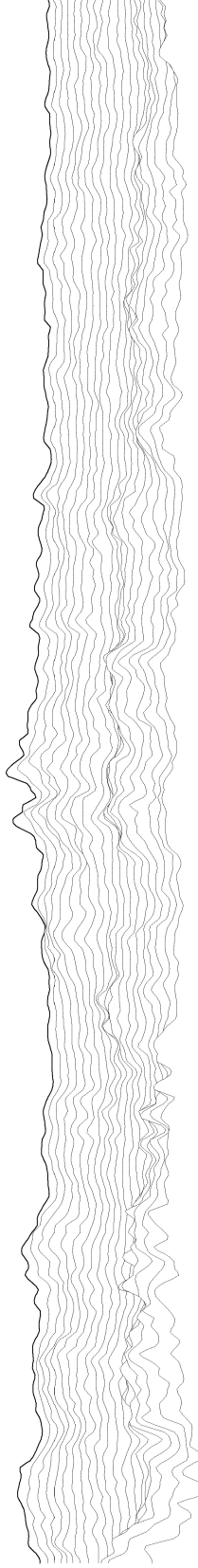
22.00nT/cm



Milecastle 32, resistance survey



86.80ohm/cm



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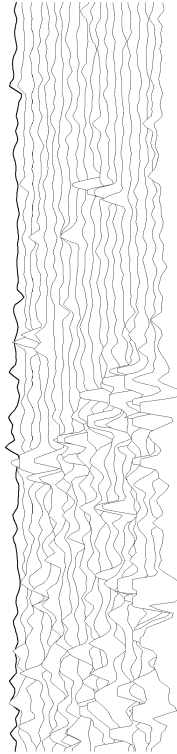
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Figure 17: Milecastle 32, trace plots of
geophysical data



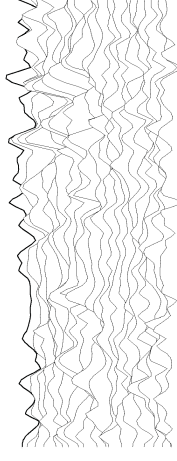
Milecastle 41, Area 1, magnetic survey

35.10nT/cm



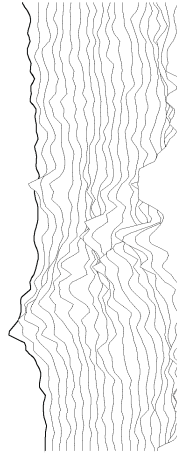
Milecastle 41, Area 2, magnetic survey

403.20nT/cm



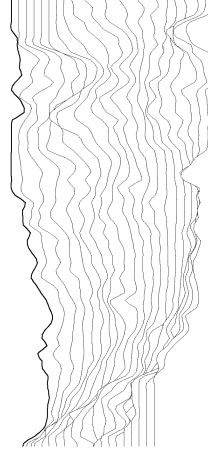
Milecastle 41, Area 1, resistance survey

99.00ohm/cm



Milecastle 41, Area 2, resistance survey

294.90nT/cm



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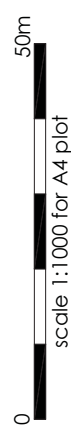
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Figure 18: Milecastle 41, trace plots of
geophysical data

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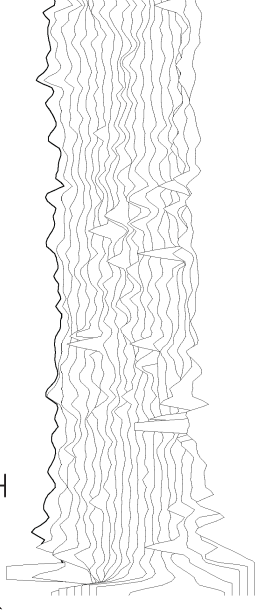
Milecastle 47, Area 1, magnetic survey

14.90nT/cm



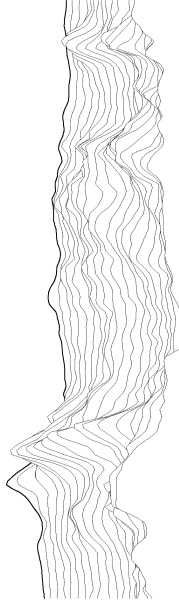
Milecastle 47, Area 2, magnetic survey

8.50nT/cm



Milecastle 47, Area 1, resistance survey

67.00ohm/cm



Milecastle 47, Area 2, resistance survey

51.00ohm/cm

