

ITINERA

THE JOURNAL OF THE
ROMAN ROADS RESEARCH ASSOCIATION

VOLUME II, 2022



Published by the Roman Roads Research Association



Published by the Roman Roads Research Association
Ellerbeck Cottage, Ellerbeck, Northallerton, North Yorkshire, UK. DL6 2RY
A charity registered in England and Wales No. 1163854

ISSN 2635-1579 (print)
ISSN 2635-1578 (online pdf)
ISBN 978-1-8383918-1-2

All individual contributions to *Itinera* remain copyright of the author(s). The PDF versions of any article that has been publicly released on our website or elsewhere (but not as early release copies to our membership) may be freely copied and distributed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](https://creativecommons.org/licenses/by-nc-nd/4.0/), however you may not adapt or alter the work, and may not reproduce individual illustrations and photographs without the author's prior consent, since they often contain additional copyright licensing. The paper copy of this journal remains © RRRA and individual authors.

The Roman Roads Research Association is not responsible for any statement made, or opinion expressed, in *Itinera*. Individual authors are solely responsible for the content of their articles

Typeset in Gentium Basic and Cinzel by the Roman Roads Research Association
licensed under the SIL Open Font License, Version 1.1

© the Roman Roads Research Association 2022

CONTENTS

v About the Association

vi Editorial

ARTICLES

- 1 - 50 JOHN POULTER, The Identification of Long-Distance Roman Alignments in Britain, and their Possible Purposes
- 51 - 66 ROBERT ENTWISTLE, Long-Distance Alignments and Client Kingdoms in the Conquest Settlement
- 67 - 114 DAVID RATLEDGE, The Roman Roads of Norfolk - a Lidar Reappraisal
- 115 - 120 CRAIG PARKINSON, RR72a: Survey and Excavation of the Roman Road at Worston Lancashire
- 121 - 150 DAVE ARMSTRONG, Hadrian's Wall Link Roads
- 151 - 180 BEV KNOTT, Bandits and Roman Trade
- 181 - 218 ISAAC MORENO GALLO, Roman Roads: Status Quo and Future Prospects
- 219 - 240 ROB WALLACE, Roman Roads: Discoveries on the Culver Archaeological Project: 2005-2021
- 241 - 302 MIKE HAKEN, The Stainmore road: from late Iron Age Routeway to engineered Roman Road

ROMAN ROADS IN 2021

- 303 - 332 Roman Roads in 2021 - recent Roman roads research and fieldwork
- 333 - 338 Newly Allocated Margary Road Numbers

REVIEWS

- 339 - 344 MARTIN BELL, *Making One's Way in the World: The Footprints and Trackways of Prehistoric People*. (By Dave Fell, Northern Archaeological Associates)
- 345 - 348 DAVE ARMSTRONG, *The Hadrian's Wall Military Way, a Frontier Road Explored*. (By John Poulter)

PEOPLE AND OFFICERS



EDITORIAL COMMITTEE

Rob Entwistle (Hon. Editor)
Dave Armstrong
Dr. Mike C. Bishop
Chester Forster
Mike Haken

ADVISORY PANEL

Paul Bidwell
Paul Booth
John Poulter
David Ratledge
Dr. Pete Wilson

The Roman Roads Research Association also wishes to acknowledge the contributions of all the other individuals who have volunteered their time and expertise in the preparation, production and distribution of this volume, without whom it would not have been possible:

<i>David Brear</i>	<i>Tyrone Hopes</i>	<i>Paul Morris</i>	<i>Matt Sparkes</i>
<i>Neil Buckley</i>	<i>Ian Jardine</i>	<i>Simon Pratt</i>	<i>Alan Taylor</i>
<i>Hannah Collingridge</i>	<i>David Lakin</i>	<i>Eric Rose</i>	<i>Richard Whalley</i>
<i>Malcolm Fare</i>	<i>Geoff Lunn</i>	<i>Amber Roy</i>	<i>Paul Wilkinson</i>
<i>Dave Haywood</i>	<i>Tim Lunt</i>	<i>Paul Seddon</i>	<i>Gary Whitaker</i>
<i>Ian Heritage</i>	<i>James Lyall</i>	<i>Paul Smith</i>	<i>Sally Woodlock</i>

CONTACT ROMAN ROADS RESEARCH ASSOCIATION

If you are interested in Roman roads or would like to know more contact us via our web site <https://romanroads.org/> or by mail to one of the below;

<i>Mike Haken</i> (Chairman)	mike@romanroads.org
<i>Dave Armstrong</i> (Membership Sec. & Newsletter Editor)	dave.armstrong@romanroads.org
<i>Rob Entwistle</i> (Itinera Editor)	itinera@romanroads.org
<i>Rebecca L. Ellis</i> (Finds Officer & Social Media)	reb.ellis@romanroads.org

ABOUT THE ASSOCIATION

The RRRA was formed in 2015 as a registered charity to bring together disparate individuals who were researching Roman roads, and to coordinate a nationwide programme of consistent and high quality research, promoting the study of Roman roads and Roman heritage throughout the former Roman province of *Britannia*. Over the last couple of decades, it has often been a race against time to discover and record what we can of the 60% of the Roman road network about which we are still uncertain, since modern agricultural methods and urban development have been steadily removing surviving features from the landscape. Fortunately, new technologies such as lidar and geophysical survey have helped enormously and enabled researchers to identify the remains of hundreds of miles of previously unknown Roman roads, along with associated Roman sites, and we continue to work to fill the many gaps. Research is only half the story though, we also have to ensure that the results of our work are readily available. We aim to:

1. bring together all known information on Roman roads in Britain, summarised in a freely accessible online interactive gazetteer, hoped to be complete by 2026.
2. identify key sites where important questions remain, and organise fieldwork necessary to answer those questions. 200 Ha of geophysical survey have been completed, with a further 400 Ha already planned, and several future excavations are currently at the planning stage.
3. encourage the involvement of as many people as possible in our activities. We care passionately about community archaeology, and will always encourage local people to get involved in our work, without any charge (unlike some organisations, we will never do this!).
4. make resources available to researchers and other groups, organise events to keep people up to date with research including online talks & seminars.
5. ensure that all our published work is Open Access, including our quarterly newsletter and *Itinera* (following a brief one year members only embargo).

Membership is open to everyone, and our four hundred and seventy or so members come from a wide variety of backgrounds, ranging from those with just a general interest in our Roman heritage to professional archaeologists from both the public and commercial sectors, alongside seasoned Roman roads researchers. The Romans tended to apply their technology uniformly across the empire, this is especially so for Roman road layout and construction. Consequently we do not just restrict our interest to *Britannia* and our membership now includes many international members. Joining the RRRA gives you the knowledge that your modest subscription (just £14 a year for a single adult) is helping to support our important work. You might even get a warm and fuzzy glow.

EDITORIAL

ROBERT ENTWISTLE



The publishing of *Itinera* Volume II is no less an important moment than that of Volume I: it demonstrates that our journal has arrived definitively as a point of reference for all transport-related aspects of Roman archaeology – and that this has been possible in a year dominated by Pandemic-related lockdowns. As in Volume I, you will find a range of authoritative and stimulating papers aiming to develop the study and understanding of everything to do with Roman roads and transport, for academics and the informed public alike.

In this volume you will find some contributors familiar to you from the last volume, and other important new ones. We are delighted to have a welcome extension of focus to other regions of the Roman empire, drawing us beyond a comfortable local perspective. We publish a lively paper (translated by Mike Bishop) from the Spanish academic and presenter Isaac Moreno Gallo, who has, single-handedly, done much to develop an informed awareness of Roman roads in his native country. A man of trenchant views, he champions a rational and rigorous approach not always evident in the past. The perspective he provides has much in common with that of the UK, while being stimulatingly distinct. *Itinera* would be most pleased to host other papers from international contributors, developing an understanding of roads and transport systems across the empire.

Once again, we have an impressive range to the topics covered in our journal. The international theme is continued by Bev Knott who considers an aspect of transport that may be new to many: the likely extent and impact of brigandage and banditry on the roads across the empire. Closer to home we have a major paper from David Ratledge, who has become Britain's leading interpreter of Lidar in terms of Roman roads. He demonstrates the remarkable degree to which he has been able to extend knowledge of Norfolk's Roman roads, filling in gaps on the map. At the other end of the country, our Chairman, Mike Haken, explores what Lidar is able to reveal for the Stainmore Pass. He investigates how this might develop understanding of a murky but much-debated topic, the relation of some Roman roads to Iron-Age predecessors.

Of course, roads are not only a topic of study in their own right but help us develop understanding of other areas of archaeology and history. Thus Dave Armstrong, who recently published a book on the Hadrian's Wall Military Way, contributes a paper that is likely to become a work of reference in its own right. It explores and sets out the sum of present knowledge on the network of link roads connecting the Wall to other aspects of Roman infrastructure in the North, a topic little examined in the past.

Yet another topic is tackled by John Poulter in a paper recording how Roman Long-distance Alignments came to be suspected, recognised and understood, with worked examples from

across the country. A further paper investigates how such matters could potentially elucidate aspects of the Claudian Invasion. Finally, and returning us to basics, we have accounts of road excavations from different ends of the country: the Culver Archaeology Project in East Sussex, and an excavation supported by NAA (Northern Archaeological Associates) in Lancashire.

Our section 'Roman Roads in 2021' is inevitably impacted by a year in which Covid 19 has limited much fieldwork, including the work of many local societies. Fortunately, through our valued local correspondents, we can see that not all the work of investigation ceased.

A new enterprise this year is our introduction of Book Reviews, a feature we hope to continue and develop in years to come. We are most grateful to Dave Fell and John Poulter for their contributions on this occasion.

We should not forget that the RRRRA is a charity supported only by its own expanding membership. The dedicated band that makes the production of this journal possible to the highest professional standards, has done so through generous donation of time and expertise, whether they be experienced archaeological professionals or knowledgeable enthusiasts contributing specialist skills, understanding and commitment. This is the group that make up our Editorial Committee and Advisory Panel (listed at the front of this volume), and our wider network of supporters and contributors.

Ultimately, of course, we are dependent upon our authors for demonstrating the health and range of this aspect of Roman archaeology. Our 'Notes for Contributors' are readily available on the *Itinera* section of the RRRRA website, and we encourage all, professional or otherwise, to submit their papers to us. All contributions will be peer reviewed, and we take great pleasure in publishing all that can pass that test. We look forward to your contributions for our next volume.

Robert Entwistle

Hon Editor, *Itinera*

itinera@romanroads.org





THE STAINMORE ROAD: FROM LATE IRON AGE ROUTEWAY TO ENGINEERED ROMAN ROAD

BY MIKE HAKEN

mike@romanroads.org

ABSTRACT

It is well established that many Roman roads followed the general course of prehistoric trackways, and RR82, the modern A66 over the North Pennines, is one such example. Firm archaeological evidence for this phenomenon has, however, only been found in a handful of places, the best known being Sharpstone Hill in Shropshire, and even then evidence has been restricted to a short stretch of road. This paper presents compelling evidence that RR82 did indeed follow the general course of a prehistoric routeway, and goes on to analyse how the Roman surveyors (mensores) may have utilised it. The conclusions reached throw considerable light on the order of survey, planning, and construction that took place along the road corridor in the early stages of the Roman military occupation of northern Britain.

INTRODUCTION

The A66 trans-Pennine road from Scotch Corner in the Vale of Mowbray (North Yorkshire), over the high moors of the Stainmore Pass and into the lowlands of the Vale of Eden near Penrith (Cumbria), is one of the best known roads in northern Britain. The weather over its highest section is notorious, and it is often the first (and last) in England to be closed due to treacherous winter weather. However, few of the thousands of drivers who use it daily are aware its route is based upon a Roman road (RR82), which was just as important throughout the Roman period as its modern successor is today, arguably more so. Fewer still will be aware that it may already have been a major routeway when the Romans arrived (e.g. Entwistle 2019, 91; Fell 2020, 17) and indeed has probably been in continuous use since the Neolithic period. More recently, it was important enough to be marked as “Staynesmore” on the 14th century Gough Map of Great Britain, one of just 600 placenames marked (Bodleian Libraries 2021).

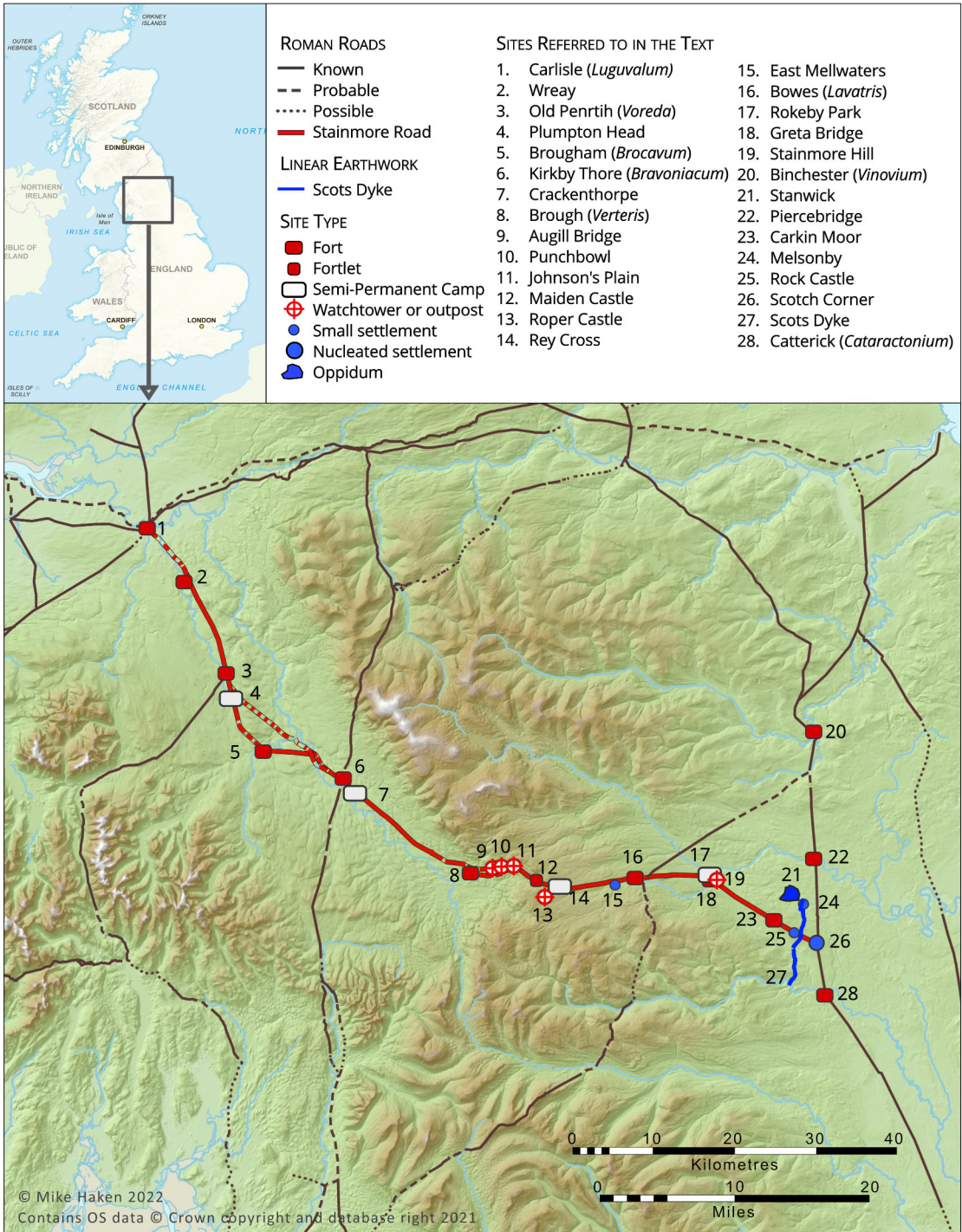


Fig. 1 Location map, showing the relationship of the Stainmore road to the known Roman road network and major sites referred to in the text

Traditionally, the Roman Stainmore road (RR82) was thought to meet the western main road (RR7) at Brougham (*Brocavum*) near Penrith (Margary 1973, 433-6) and is still marked as such on most modern maps of Roman roads (Ordnance Survey, 2016). This has led to the notion that in the early AD70s a Roman battle group led by the governor, Petilius Cerialis, swept west from Scotch Corner along the Stainmore road to Brougham, where he met Legio XX Valeria Victrix led by Agricola who had moved up the western edge of the Pennines along the route of RR7 (e.g. Salway 1981, 136; Mattingley 2007, 115). However, this perception that the Stainmore road merely linked the main south to north roads either side of the Pennines was undermined by Hugh Toller's work, which clearly demonstrated that RR7 does not head to Brougham at all (Toller 2014). Rather, it meets the Stainmore road (RR82) at Kirkby Thore (*Bravoniacum*) and possibly crosses it to become the Maiden Way (RR83) (see fig. 1), a possibility sadly ignored by some recent accounts of the Maiden Way (e.g. Frodsham 2019, 62). It has also been suggested that both RR82 & RR83 utilise the same long distance planning alignment from Crosby Ravensworth Fell as far as the fort at Whitley Castle (Poulter 2014, 62-3). The impact of this work on the Stainmore road is to strongly suggest that the Stainmore road and the Brougham (*Brocavum*) to Carlisle (*Luguvalium*) road (RR7e) should really be regarded as one and the same, an idea further supported by David Ratledge's discovery of a 'new' road (RR82aa(x)) between Kirkby Thore and Plumpton Head (*Voreda*) which bypasses Brougham altogether (Ratledge 2018) and which may be the original route. It certainly adds weight to the idea that this was the Roman perception. This paper will therefore use the terms 'Stainmore road' or 'Stainmore route' to refer to the entire route (RR82, RR82aa(x) and RR7e) from Scotch Corner to Carlisle.

Whilst 19th century and early 20th century writers (e.g. Pearson 1936, 79-80) tended to attribute the entire suppression/conquest of the Brigantes in the north Pennines to the governor Agricola (AD77-84), modern scholars generally ascribe the earliest Roman sites along this route to the earlier governorship of Petilius Cerialis (AD71-4) (e.g. Salway 1981, 136; Frere 1987, 85). Indeed, at the road's north-western end, dendro-dating has determined that timber for the fort at Carlisle (*Luguvalium*) was cut in the winter of AD72/3, suggesting that the fort was established then or very soon after, during Cerialis's term of governorship (Zant 2009, 413). At its presumed start point at Scotch Corner, major archaeological work during the A1 widening has shown that there was a substantial native settlement established well before the Claudian invasion, with some sort of Roman military presence probably there (or nearby) during the AD60s (Fell 2020). Dating of the road and the sites along its 65 miles has long been a matter of assumption and supposition with a paucity of datable evidence. For example, whilst it has been generally accepted that the route played a major part in the Flavian annexation of Brigantian territory, all that can be said with certainty for the date of formally built Roman road is that it post-dates the unusual semi-permanent camp at Rey Cross (Robinson 2001, 84).

Of all the thirty or more Roman military sites scattered along the road (excluding Scotch Corner), only the fort at Bowes (*Lavatris*) and extraordinary semi-permanent camps at Rokeby Park, Rey Cross, Crackenthorpe, and Plumpton Head, are generally held to have a date as similarly early (or earlier) to that which we now have for Carlisle. With the possible exception of Burnswark South (Jones 2011, 153-6), these camps stand out from every other known camp in Britain because of their irregular shapes without a precise right-angle

corner, uncommonly substantial ramparts and ditches, and their large number of gateways protected by large round or oval *tituli*. In contrast to the usual four (or occasional six) gates, Rey Cross, for example, had at least eleven gates and Rokeby Park possibly as many as fourteen (Haken, in preparation). Most recent scholars agree that they were probably built as part of Cerialis's presumed advance towards Carlisle in the early AD70s (e.g. Frere 1987, 85; Vyner 2001, 76; Bidwell & Hodgson 2009, 60), although the slight possibility that they could potentially be from the governorship of Vettius Bolanus (AD69-71) has occasionally been suggested (e.g. Woolliscroft & Hoffmann 2010, 189).

As part of a lidar-based re-assessment of the entire chain of camps and the well-known signal stations over the Stainmore, the full results of which will be published in a separate paper (Haken, in prep.), a stretch of braided trackway potentially of prehistoric date was identified at the supposed Roman signal station at Roper Castle, 2km west south west of Rey Cross. This raised the tantalising possibility that this braided trackway was potentially the first firm archaeological evidence of a prehistoric ancestor of the Roman Stainmore road. Several research questions then arose:

- 1 Is there evidence for a defined trackway, such as those recognised at Scotch Corner, or is it more a generalised routeway?
- 2 Can the trackway be confidently dated?
- 3 Can the trackway be traced over a greater distance?
- 4 Did the Late Iron-Age route have the same inter-regional function as the later Roman and modern iterations, or did it merely serve local purposes?
- 5 What was the relationship between the route, and that of the Roman road that followed it?
- 6 Could any such relationship tell us more about the earliest Roman activity along the Stainmore road, and give clues as to the strategic nature of the Stainmore road?

In order to attempt to answer these questions, the lidar study was then extended to look at most of the Stainmore road corridor, along with a substantial area in the Upper Eden valley as far south as Ravenstonedale. Thanks to very recent additions to the National Lidar Programme (not yet completed), there is now complete coverage of the route except for rather patchy coverage between Temple Sowerby and Plumpton Head.

After providing a brief overview of current understanding, this paper will address each of these questions and attempt to provide answers to all of them.

TOPOGRAPHY AND CLIMATE

At its eastern end, the Stainmore route provides trans-Pennine connectivity to a broad area of gently undulating lowland at the northern end of the Vale of Mowbray (North Yorkshire), and the Tees valley near Darlington (County Durham), generally between 50m and 70m

above Ordnance Datum (AOD). The geology is mainly glacial till over carboniferous limestone, sandstone & mudstones of the Yoredale Group (British Geological Survey, 2022), with the Agricultural Land Classification of this mainly arable area predominantly Grade 3 (good to moderate) improving to mainly Grade 2 (very good) from Leeming and Northallerton southwards (Natural England 2016). Immediately north west of the Vale, the mid-Tees valley forms a triangle of slightly higher, but still relatively gentle land, cutting a wedge into the eastern side of the North Pennine hills as far as Barnard Castle and Bowes. In the east about two thirds of the land is Grade 2, mainly in arable use, giving way to grade 3 pastureland (ibid.) as it climbs gently westwards from about 80m AOD reaching 290m AOD, at Bowes. The triangle is roughly defined by three Roman roads; Dere Street (RR8), the main road north, the Stainmore road (RR82) which leaves Dere Street at the substantial settlement at Scotch Corner (see Fell 2020), and RR820, from Bowes (*Lavatris*) to Dere Street near Binchester (*Vinovium*), which provides access to the Stainmore from the Wear valley. The triangle is often considered to be the heartland of the Brigantes, since within it is the huge Late Iron Age royal site at Stanwick (Haslegrove 2016) four miles north north-west of Scotch Corner (see fig. 1). Of course, it is quite possible, even likely, that the Stainmore road served a much wider area extending north into the Wear valley, and south down through the Vales of Mowbray and York – perhaps even beyond, as it does today.

Heading west from Bowes (*Lavatris*) through land used today mainly for rough grazing, mainly Grade 4 down to Grade 5 on the moors (Natural England 2016), the route follows the northern rim of the Greta valley as it climbs to Rey Cross (444m AOD), leaving the lowlands behind. As William Camden put it:

Heere beginneth to rise that high hilly and solitary country exposed to wind and raine, which, because it is stony, is called in our native language Stanemore. All heere round about is nothing but a wild desert, unlesse it be an homely Hostelrie, rather than an Inne, in the very mids thereof, called the Spitle on Stanmore, for to entertaine waifaring persons, and neere to it is a fragment of a crosse, which we call Rerecross, the Scots Reicrosse, as one would say The Kings Crosse (Camden 1610, 65).

This is the narrowest crossing point of the spine of England north of the Aire Gap and Craven and whilst not the only natural routeway through the North Pennines (Vyner, et al. 2001, 1), it is by far the most practical and convenient. From a military perspective, it is the only one that does not spend a substantial distance confined in a steep sided valley. Apart from Stainmore, only Wensleydale (White 2005, 38) has any evidence of use as a through route in the Roman period, solely based on the presence of two forts (Bainbridge and Wensley).

To the west of the Pennines the Stainmore road drops quickly into the Vale of Eden, which sweeps north-westwards towards Carlisle and the Solway plain, separating the North Pennine Hills from the Cumbrian mountains of the Lake District to the west, and generally below 200m AOD. East of Brough, the head of the Vale (specifically the catchment of the R. Belah) presents as almost a bowl, surrounded on the north, east and south by the North Pennine hills reaching up to 600m AOD. Just as to the east of the Pennines, the Vale's superficial geology is mainly glacial till, with bands of alluvial deposits close to the R. Eden (British Geological Survey, 2022), over underlying Permian and Triassic sandstones and conglomerates. From Brough (*Verteris*) to Brougham (*Brocvum*) the Vale is characterised by

the low small hillocks of a drumlin field which stretch along the Vale for 15 miles. Further north, the Vale gives way to the Solway plain, stretching from Gretna in southern Scotland through Carlisle and along the Solway coast as far as Maryport in Cumbria. Landuse of the area is mainly pastoral on largely improved grassland, with some arable, although whether or not this was also true of the Late Iron Age is not well understood.

Cumbria is generally perceived as having an extremely wet climate when compared to the east, whereas in fact the rain shadow effect created by the Lake District mountains gives the Vale of Eden a very similar climate to that at Bowes. Modern climate data (30 year averages) for the main sites along the Stainmore route are shown in Table 1, separated into groups east and west of the hills, and on the Stainmore itself, with additional Cumbrian examples provided to illustrate the stark difference between the Vale of Eden and the uplands either side. For example, whilst rainfall on the central Stainmore is high, rainfall at Rey Cross is still half that at Ambleside, despite being 400m higher.

Whilst the climate will have been different in the Late Iron Age and Roman periods, the differences between the three areas would have been akin to today. Table 1 shows clearly

Site	Roman name (if known)	Annual Rainfall (mm)	Mean Annual Temperature (°C)	Annual Hours of Sunshine	Elevation AOD (m)
Sites East of the Pennines (Tees & Wear valleys, Vale of Mowbray)					
Binchester	<i>Vinovium</i>	633	9.18	1398	93
Scotch Corner		744	8.53	1402	147
Rokeby Park		739	8.59	1355	140
Bowes	<i>Lavatris</i>	964	7.75	1308	293
Sites on Stainmore					
Rey Cross		1076	6.91	1225	444
Roper Castle		1242	6.82	1207	493
Sites in the Vale of Eden/Solway Plain					
Brough	<i>Verteris</i>	1005	8.42	1206	176
Crackenthorpe		949	8.66	1199	119
Old Penrith	<i>Voreda</i>	917	8.71	1299	131
Carlisle	<i>Luguvalum</i>	837	9.59	1385	20
Examples of other Cumbrian Roman sites					
Hardknott	<i>Mediobogdum</i> ?	2108	8.91	1281	245
Low Borrowbridge	<i>Alone?</i>	1575	8.39	1267	159
Ambleside	<i>Glannoventa?</i>	2368	9.38	1254	42

Table 1. Climate statistics for Roman sites along the Stainmore route, with additional Cumbrian examples. Data drawn from modelling provided by the Centre for Environmental Data Analysis (Hollis et al 2021) and Ordnance Survey Open Data

that the Vale of Eden has broadly similar temperatures to the land east of the Pennines, although in the slightly wetter and marginally less sunny climate, lush grasslands dominate the landscape (although there is some arable) as opposed to the almost exclusively arable land in the Vale of Mowbray. Whilst suited to different land use, with a probable marked polarity between the pastoral exploitation of the Cumbrian lowlands and the intensive agriculture in the east (Vyner, et al. 2001, 177), both areas were potentially highly productive in the Late Iron Age and Roman periods.

Perhaps key to understanding the clear prominence of the Stainmore in the Late Iron Age and Roman periods is the fact that it is the only route that conveniently connects these two important resource areas, with control of those resources ultimately passing from the Brigantian elites to Rome (ibid., 178).

THE STAINMORE ROAD BEFORE THE ARRIVAL OF ROME

Roman use of long-distance prehistoric trackways

The idea that Roman road surveyors may have sometimes utilised the lines of much older roads, tracks and routeways has been around for a long time. Clearly, if such tracks existed and headed in the right direction, it is matter of common sense that Roman military units on campaign would have utilised them, as is eloquently explained by Bishop (2014, 2). Whether or not it logically follows, however, that most major Roman roads are also based upon prehistoric precursors, as has frequently been claimed (e.g. Forbes & Burmester 1904, 26-39; Viatores 1964, 50), is far from clear. Indeed, there are only a handful of excavated examples, the best known being the Iron Age road surfaces beneath the Roman road (RR64) at Sharpstone Hill in Shropshire (Malim & Hayes 2011). It remains possible that those few known examples are essentially local, since there is no known archaeological evidence that any British Roman road closely followed an earlier track for more than a very short distance.

As Copeland recognised in his study of Akeman Street (2009), a Roman road long believed to have prehistoric origins (e.g. Salzman 1939, 271), there are immense difficulties in demonstrating that such presumed long-distance prehistoric routes existed, not least because they were not surveyed, generally not metalled, and may have migrated back and forth across the landscape over centuries (Copeland 2009, 31). Not only that, but the identifications of prehistoric routeways have often been based on the locations of ritual sites and settlement, along with artefact finds assumed to provide evidence of trade, from which the existence of routes has been deduced. Rarely is physical evidence of a routeway ever proffered; consequently, the very idea that such inter-regional trackways even existed at all has on occasion been challenged (see Davies 2006, 29-31).

Evidence for a Prehistoric Stainmore Road

Like Akeman Street, a prehistoric origin for the Stainmore road is usually regarded as fact. The belief that it had been part of an ancient trade route as long ago as the Neolithic period is well established, based largely upon the extensive presence in Yorkshire of Neolithic axes

made of rock from the Lake District (Elgee & Wragge Elgee 1933, 33). Manby even went so far as to suggest an annual migratory cycle in the early Neolithic from Eastern Yorkshire to Cumbria via both Stainmore and Craven (Manby 1979, 75-6). The monument complexes in the Vales of York and Mowbray, stretching in a 50-mile-long line from Ferrybridge in the Aire Valley to Catterick on the Swale, strongly suggest north-south movements of people through the Vales (Vyner 2007). Furthermore, the similarities between those monument complexes and the Neolithic ritual monuments in the Vale of Eden in Cumbria emphasise potential social interaction between the two disparate areas either side of the Pennines (Bradley & Edmonds 1993, 163-84). Whilst the case has been made for any trans-Pennine communications in the Neolithic being more likely via Wensleydale, with the Stainmore pass playing little part (Harding 2000, 42), given the sparse and largely circumstantial evidence available any conclusions must of necessity be speculative, especially when based solely on the proximity of settlement and ritual sites, which do not necessarily infer a routeway. Indeed, the stone circle known as Long Meg and Her Daughters near Penrith, Cumbria and close to the western approach to the Stainmore pass, has been recognised as potentially key for the export of axes into Yorkshire, and possibly for flint heading the other way (Frodsham 2019, 26) so the use of the Stainmore pass in the Neolithic seems probable.

In work covering the archaeology of the A66 on Bowes Moor (in the central Stainmore), detailed environmental assessment revealed evidence of pastoral activity in the Bronze Age which resulted in speculation as to whether this activity may be related to wealth and power, or to the presence of the route over the Stainmore, or both (Vyner, et al. 2001, 176-7). Certainly, round barrows appear at Mellwaters and Bowes, along with a stone circle on the Stainmore at Rey Cross and a Bronze Age field system at Ravock Moor, although whilst these are suggestive of a possible routeway, they are not direct evidence. Either side of the hills, the quantity of evidence is no better, indeed, the sparsity of excavated Bronze Age remains in the Vale of Eden, Pennine hills and the mid Tees valley when compared to the relative wealth of evidence from Eastern Yorkshire is marked (Manby, et al. 2003, fig.12). That said, a cluster of Bronze Age hoards from the Stanwick area may suggest that the landscape of the eastern approach to Stainmore held some special significance in the late Bronze Age (Zant & Howard-Davis 2013, 122). Indeed, the variety of axe types in a hoard found at Gilmonby (just south of Bowes) on the approach to Stainmore, may be reflective of exchange networks across the Pennines, and therefore by inference, the existence of the Stainmore route (Manby, et al. 2003, 105).

In Cumbria, the heavy concentration of Bronze Age metalwork finds in the Vale of Eden, particularly in the late Bronze Age (Clough 1969, 27), has also been used to suggest that the Vale was a major cultural routeway (McCarthy 2000, 138) leading to the Stainmore and north eastern England. As pointed out earlier however, finds distributions may often be suggestive of long distance routeways, but are not proof.

Moving on into the Iron Age, evidence for the use of the routeway has until recently been largely circumstantial. West of the Pennines, no real evidence for its use has to date been presented. Iron Age settlement is known in a few places alongside the eastern part of the route, for example at East Mellwaters (Laurie 1984; Vyner, et al. 2001, 63-5), utilising the protection offered from the worst of the weather by the Greta valley, and at Rock Castle

(Fitts, et al. 1994), along with evidence of Late Iron Age settlement at four sites identified during the widening of the A66 at its eastern end (Zant & Howard-Davis 2013, 126). Of course, the presence of such settlement close to the presumed routeway does not prove the latter's existence, but it may be indicative. Of much greater importance is the native settlement at Scotch Corner, first recognised three decades ago (Abramson 1995), the full significance of which has only been fully appreciated following the A1 upgrading scheme (see Fell 2020). This large Late Iron Age site (established c. 55BC), suggested by Fell to have perhaps been part of a 'poly-focal oppidum' including Stanwick and Melsonby (ibid, 689-93), is unusual in many respects, not least for the myriad of metalled trackways both within the settlement and leading out from it. One of those trackways appears to be heading west in the direction of the Stainmore pass (ibid., fig. 4.1, 164), and it is tempting to think that this trackway may be the eastern end of our putative inter-regional route.

If so, it would have encountered the Scots Dyke, a substantial linear earthwork which runs roughly south to north from the R. Swale at Richmond, past the eastern edge of the Late Iron Age site at Stanwick, and generally thought to have run as far as the R. Tees at Gainford although there is no definitive evidence north of Stanwick (see figs. 1 and 18). The Dyke originally had a ditch 5-7m wide and over 1.25m deep, with a bank surviving to 10m wide and 1.5m high in places (so originally much higher) and if continuous would have blocked any track or route running westwards from Scotch Corner, although the limited datable evidence, whilst confirming an Iron Age date, suggests it may not have been of one phase of construction (Zant & Howard-Davis 2013, 118-119 & Haslegrove 2016, 25), mainly but not entirely pre-dating Stanwick. Haslegrove, however, has suggested that a sharp dogleg in its course a few metres north of the A66 (NZ 1953 0640) may be due to an entrance through the Dyke for the Stainmore routeway as it ran along the ridge (2016, 24). Whilst there is currently no conclusive proof of this since the site has not been excavated, it is the most logical explanation for the dogleg, and could potentially demonstrate prehistoric continuity for the use of the route. Alternatively, if there was no entrance and the Dyke did block the route, then the routeway may have run through Stanwick itself, since the track through the west gate appears to head towards Greta Bridge and Stainmore and the east gate towards Croft and the mid Tees valley (Haslegrove 2016, 459-61 & fig. 26.6). Of course, there may never have been a defined single routeway east of Bowes, and there could have been multiple routes and tracks leading to a single crossing.

In summary, apart from Haslegrove's suggested entrance through the Scots Dyke, and the trackways leaving Scotch Corner and Stanwick in that general direction, evidence for a prehistoric Stainmore route has been almost entirely circumstantial. That certainly does not mean that it did not exist, merely that archaeological evidence for Late Iron Age use has been lacking.

New lidar evidence for a Late Iron Age Stainmore route

As previously outlined, a study of lidar data was carried out along the Stainmore road corridor and in the upper Eden catchment, predominantly from surveys conducted between 2017 and 2021 as part of the National Lidar Programme (Environment Agency 2021). Whilst lidar imagery was almost always produced using a simple hillshaded technique until about

a decade ago, in recent years there has been some considerable debate about the relative merits of different forms of processing and visualisation for archaeological analysis. The two main recognised drawbacks of hillshade are caused by the directionality of lighting, firstly resulting in linear features becoming invisible if the light direction aligns with that of the feature, and secondly with the possibility of misinterpreting positive and negative features because highlights and shadows can be reversed when changing the angle of illumination (Crutchley & Crow 2018, 41). As a result, other techniques such as *skyview factor* and *local relief models* (LRMs) have recently gained much traction, with the perceived advantages of *openness* (see Doneus 2013) also making it increasingly popular. It is beyond the scope of this paper to discuss in detail the relative pros and cons of the many techniques, except to point out that for long linear features trending along a fairly constant bearing, the perceived issues with hillshade often do not apply. All visualisations have their place, however in this case (and after some experimentation) it was felt that hillshade (with a vertical exaggeration factor of 6) overlaid with a 50% transparent local relief model to which a custom colour ramp was applied, gave the clearest results.

In addition to the unusual semi-permanent camps, it was considered important to consider the siting of other potentially early Roman sites, specifically signal towers, in relation to the road. In 1951, Richmond had identified a chain of sites which he suggested were part of signalling system that ran from York to Carlisle (Richmond 1951). He identified seven sites, namely Vale House, Bowes Moor, Roper Castle, Maiden Castle fortlet, Brackenber, Castrigg fortlet, and Barrock Fell, to which Wreay Hall was soon added (Bellhouse 1953). Unfortunately, most of these sites can now be ruled out as having played any part in the early Roman activity along the Stainmore road. Vale House does not resemble any kind of known tower site, and in any case an associated earthwork has been tentatively dated to 267-560 Cal AD, a similar date to the Roman tower site at Bowes Moor which itself cannot be earlier than AD340 (Annis 2001, 99). Maiden Castle fortlet has yielded no evidence of a tower, and in any case the limited excavation evidence suggests a mid 2nd century date (Annis 2001, 98). Both Brackenber (Railton 2011) and Castrigg (Railton 2015) have been shown to not be Roman military sites at all, so can be ruled out. Barrock Fell has only yielded 4th century pottery (Collingwood, 1930a), and may potentially be a fortlet rather than a signal station, and Wreay Hall (2.2 km from Barrock Fell) has been shown by excavation to be a late 4th century signal station (Bellhouse 1953), probably built under Theodosius c.AD360. Therefore, of Richmond's original list, only Roper Castle (sometimes known as Round Table, located high on Stainmore) remains as potentially Flavian. To this must be added three more sites discovered since, namely Augill Bridge, Punchbowl, and Johnson's Plain, all located between Maiden Castle and Brough and of an almost identical form to the penannular double ditched signal towers at the southern end of the Gask Ridge frontier in Scotland (Woolliscroft 2001, 99).

Roper Castle (NY 8822 1115), located in what has always seemed a peculiar location 1500m south of the Roman road and at 496m AOD, was first to be examined using lidar data and viewshed analysis. The site was recorded as early as the 13th century as *Rupecastel* (Vyner, et al. 2001, 13), and whilst its form is unusual, its regular outline and remote location make it hard to interpret as being anything other than Roman in date. The site is unusual for a signal tower, since it is not at the highest ground, which is over 1200m to the west. It is also oval

rather than circular and does not at all resemble the three double ditched sites referred to above. It has a single oval ditch surrounding the rampart, which survives up to 0.8m high and 5m across, with a single entrance on the southern side, and with evidence of a narrow berm between the two, most of which is now hidden by the collapsed rampart. Measured along the axes from the tops of the rampart, the site measures just 17m x 12.5m, so even allowing for slippage and spread of the rampart, the enclosed internal area could not realistically have been much more than an oval measuring 13.5m x 9m.

Roper Castle has always been an enigma, since it does not have a line of sight with any of the other known towers, or the fortlet at Maiden Castle or the fort at Brough to the west, it has always been hard to see how it would fit into any signalling system. Experimental archaeology conducted in 1977 by Bowes Museum and the Army Apprentices College in Harrogate, named 'Operation Eagle Eye' (Jones 2001), did establish that a tower at Roper Castle would be visible from Maiden Castle, and would certainly have been visible from Rey Cross and in good weather from Bowes. However, it is important to note that since there is no line of sight at ground level between Roper Castle and Maiden Castle, the experiment had to be undertaken from the higher ground to the west of the supposed tower site. This begs the question - if the supposed tower at Roper Cross were intended to signal to Maiden Castle, why use the Roper Castle site at all, rather than the much better viewpoint used in the experiment? Jones suggested that this may have due to the boggy ground on the moor (2001, 197), however since it was perfectly possible to conduct the experiment from there, we must consider the possibility that other factors were involved.

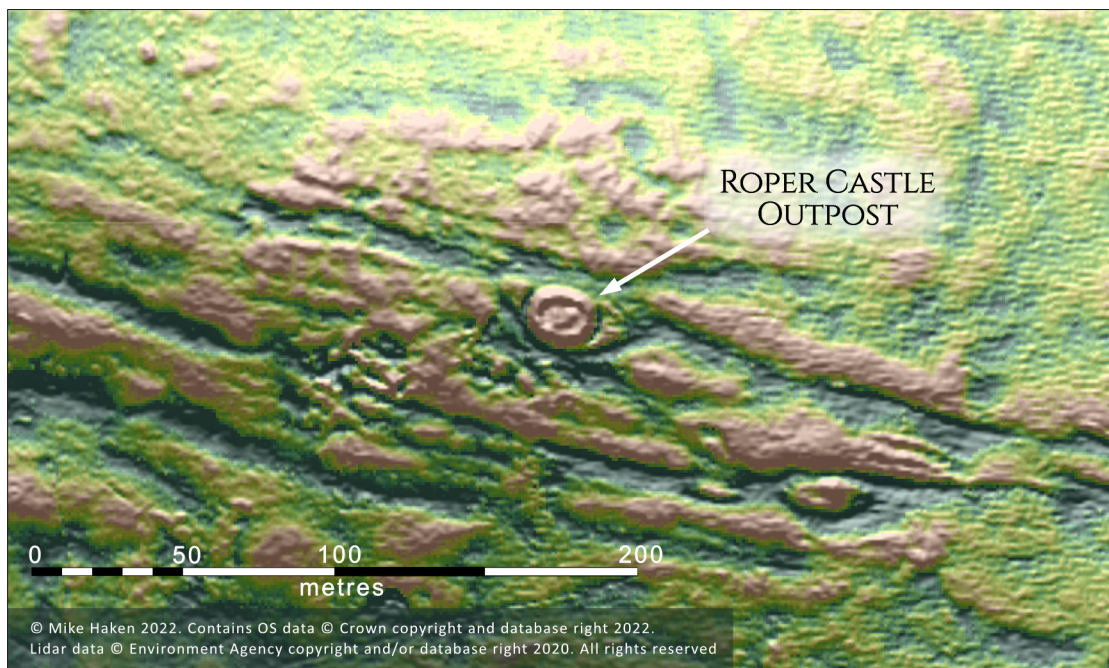


Fig. 2 Vertical Lidar image of Roper Castle, showing its deliberate siting on the indigenous trackway

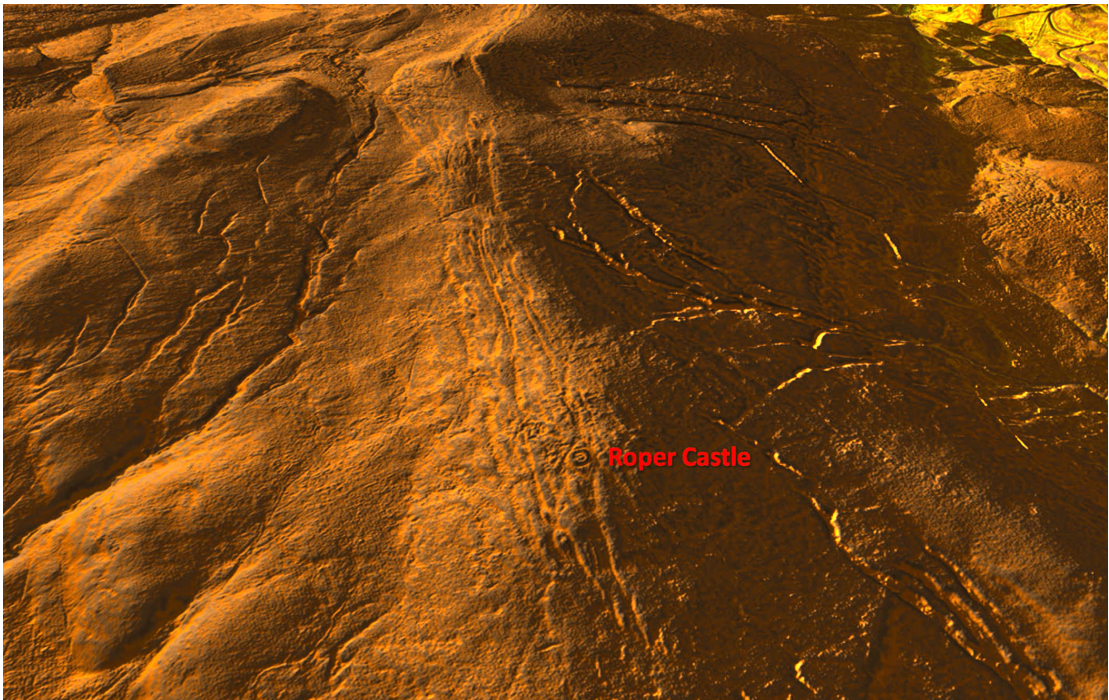


Fig. 3 3D lidar of Roper Castle, which clearly blocked an existing Holloway, with new ones then developing around the Roman installation

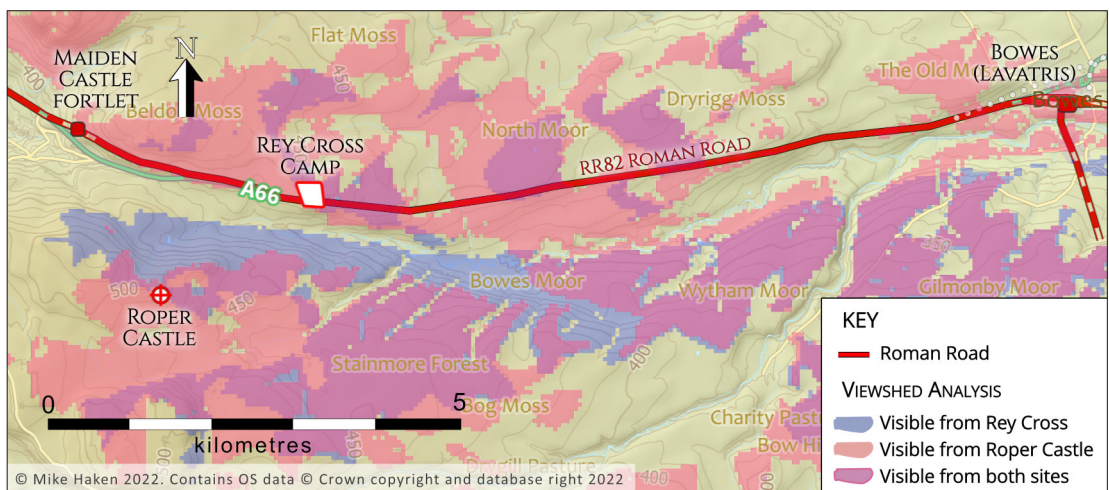


Fig. 4 Viewshed analysis from Roper Castle and Rey Cross, illustrating how the view from the outpost complements that from Rey Cross.

A more likely reason for the choice of site at Roper Castle became clear when the site was examined with lidar. It was immediately apparent that this small installation had been constructed within a broad band of braided trackways over 100m wide (fig. 2), that could be seen stretching a considerable distance to both east and west. Immediately following this important discovery, confirmation was provided independently by David Ratledge (pers. comm. email 12 December 2021), whose 3D image shows clearly how the Roman site at Roper Castle blocks a wide pre-existing holloway (fig.3), such that other holloways developed as traffic was forced to divert around the Roman installation. Roper Castle had clearly been deliberately positioned to monitor or control traffic along these trackways whilst they were still in use.

Viewshed analysis was conducted (fig. 4) to assess the view of an observer stood on top of a 2m high rampart at Roper Castle, which demonstrates clearly that the site has an excellent view of the Rey Cross Camp. It also has a reasonable view down the Greta valley (viewshed marked in pink), particularly of the northern flank, which supplements the rather restricted view east from Rey Cross itself (shown in blue; overlap shown in magenta). Indeed, additional analysis confirmed that had the site had been positioned any further west on the trackway, visibility of the valley immediately below Rey Cross rapidly diminished. Therefore, whilst it remains possible that Roper Castle and Maiden Castle were conceived as a pair (Symonds 2018, 75), which would give at the latest an early second century date (Welfare 2001, 98) for the trackway, it seems equally possible (even likely) that Roper Castle was actually a satellite post for Rey Cross. If so, this would strongly suggest that Roper Castle was contemporary with Rey Cross (generally thought to be early Flavian) and that the braided trackway was in use when the Roman military machine first arrived on the Stainmore.

Further analysis of lidar showed that the holloways and braided tracks could be traced almost continuously either side of Roper Castle, with just a few very short breaks, for some 12.5km (7.8 miles) from just east of Church Brough (at NY 7993 1372) to Aygill Bottom (NY 9141 1173) as is shown in figure 5b. West of Brough, possible surviving stretches have been identified at Warcop and between Coupland and Appleby (fig. 5a) whilst to the east the trackway heads down the Greta Valley and passes about 650m south of Bowes (fig. 5c).

Braided trackways

A braided trackway is a series of often deeply worn holloways and rutted trackways, each one forming as a diversion around a worn out or impassable predecessor, or simply as a parallel option. From above, they often appear like a plaited or braided cord, hence the name. The individual 'braids' can often be quite sinuous, cutting through the courses of other older tracks, such that it is often impossible to discern which is the oldest or original track. They can be relatively small, for example on a well-used modern right of way where walkers have deviated to one side to avoid a muddy area, or hundreds of metres across, where a major routeway has been randomly re-routed over centuries in successive attempts to take an easier or drier route. They can frequently be found where Roman roads have not been maintained, forcing traffic to deviate from the original course, often on the steeper slopes, such as on the later diverted course of the road in question (RR82) as it descends from

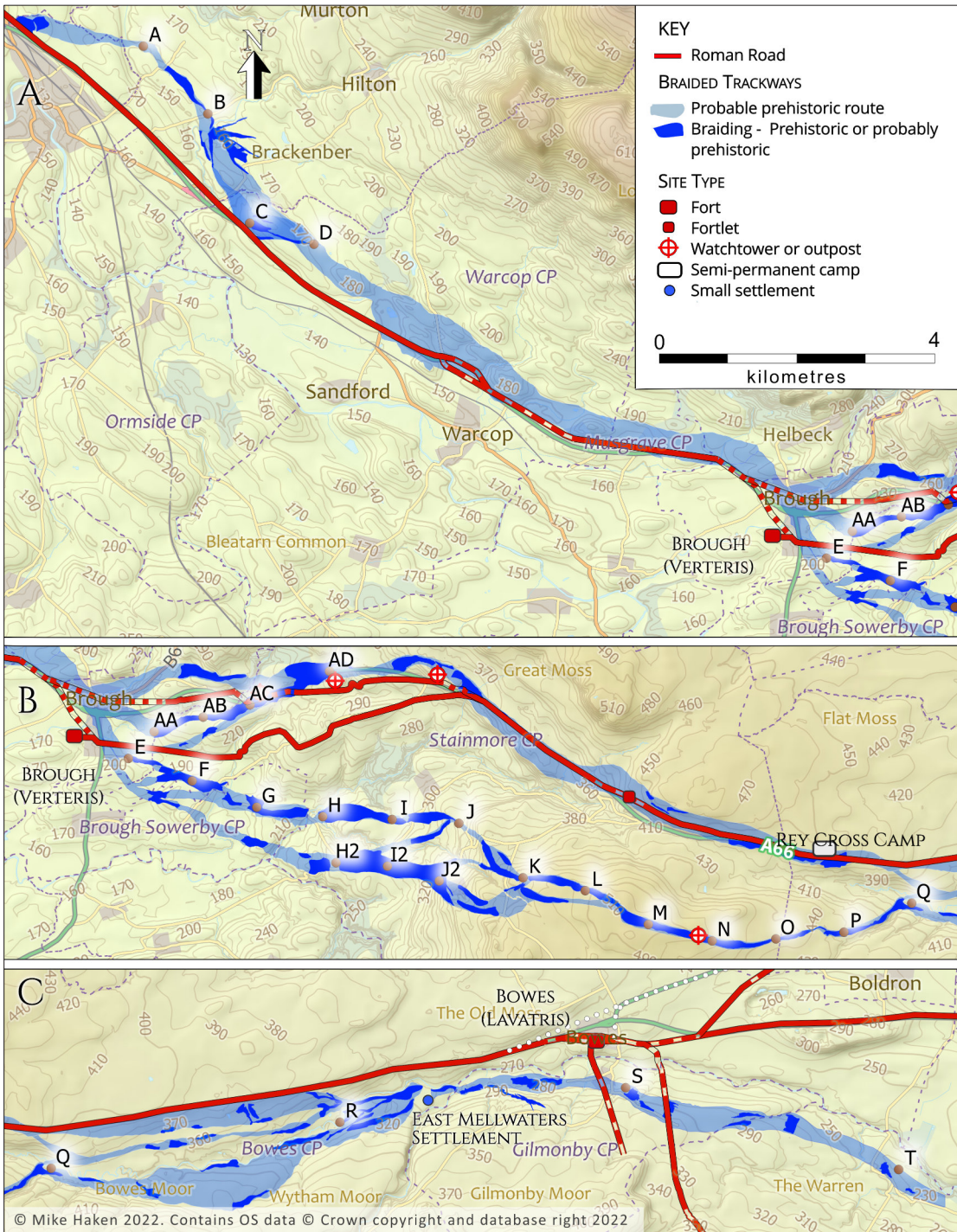


Fig. 5 a-c. Map showing the locations of the evidence for a Late Iron Age routeway across the Stainmore pass. The letters are reference points for the detailed maps in figs 7, 8 & 9, and are referred to in the following text.

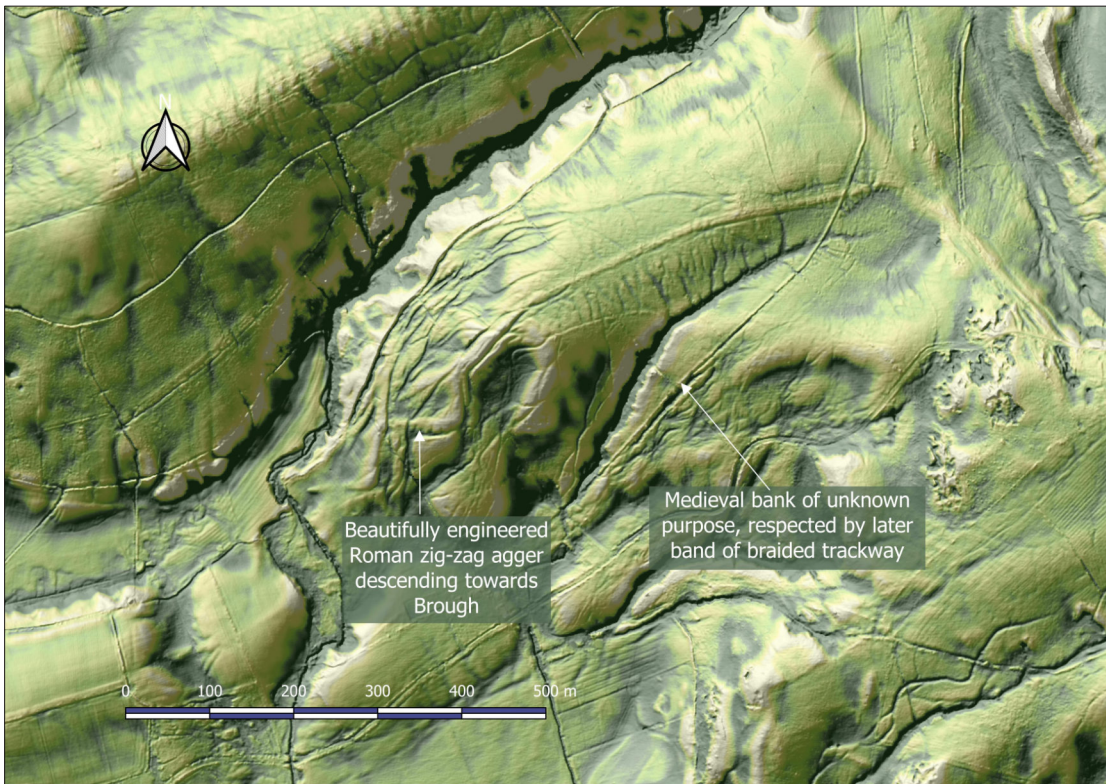


Fig. 6 Lidar Image showing braided trackways developing from the Roman road below Leonard's Crag

Leonard's Crag towards Brough, where the braiding is extremely clear on lidar imagery (fig. 6).

Braided trackways can develop along any path, track, or driveway, irrespective of historical period, and because they are rarely metalled, can be extremely difficult to date. Like any other linear feature however, a *terminus post quem* (ie earliest possible date) can sometimes be provided by datable features that they cut, and a *terminus ante quem* (ie latest possible date) by any datable features that cut through them. They are rarely studied in any depth, perhaps as a consequence of the dating difficulties, and it is noteworthy that Martin Bell's recent and acclaimed work on ancient trackways (reviewed in this volume), does not discuss them at all (Bell 2020). At a local level, they have been increasingly recorded in recent years thanks to lidar, although they are only rarely recorded in HER records, and the term is not (at the time of writing) recognised as a monument type in the heritage vocabularies maintained by the Forum on Information Standards in Heritage (FISH), which is unfortunate (Forum on Information Standards in Heritage 2021). Yet, an extremely common monument type they most certainly are, and fundamental to this study.

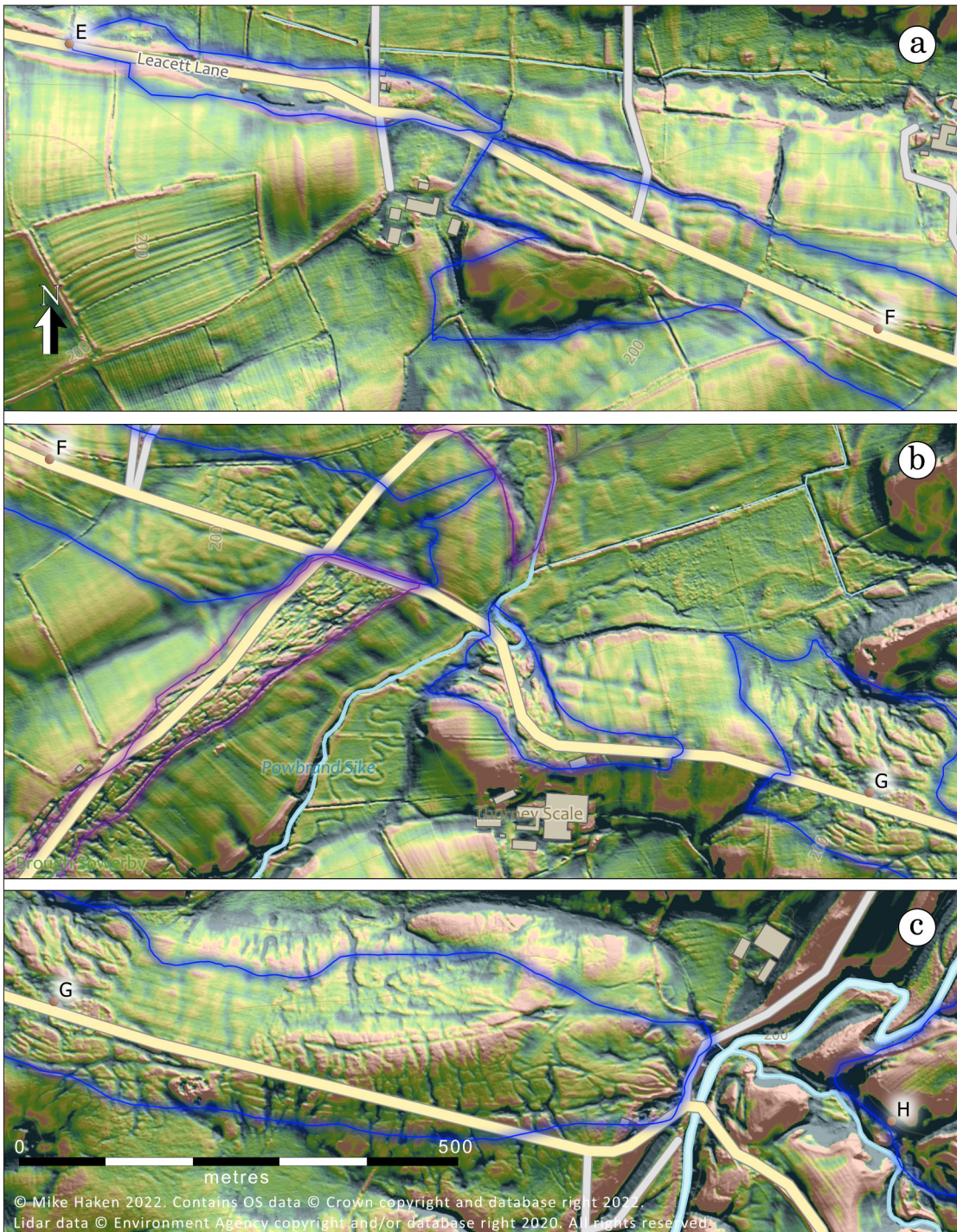


Fig. 7 a-c .Lidar imagery with OS Opendata overlay showing the prehistoric route between Points E & H, from near Church Brough along the course of Leacett Lane (confluence of the Argill Beck and the Mousegill Beck)

BRAIDED TRACKWAYS AND HOLLOWAYS ON THE STAINMORE ROAD AND ITS APPROACHES – RESULTS OF THE LIDAR STUDY

The Main Prehistoric Routeway over Stainmore

The evidence from lidar for an almost continuous chain of braided trackways over almost eight miles is presented in figures 7 a-l and is presented working eastwards from Point E (NY 7993 1372), about 800m ESE of Brough fort (*Verteris*). Immediately west of that point, a combination of medieval and modern agriculture has obliterated traces of most of the trackways.

The modern Leacett Lane appears to fossilise its course east from Point E, braiding being visible in places on both sides of the lane. Shortly after Point F, before Powbrand Bridge, a second braided trackway (similarly fossilised by a modern lane) crosses it at about NY 8121 1328, marked in purple on figure 7b. This later trackway seems to be heading to join the Roman road on Limes Head a little to the north east, supporting a prehistoric date for our trackway. About 300m further on, near Thorney Scale, it seems probable that a trackway branched off to form a parallel route running about 500m to the south of the main trackway. A patch of braided track at Field Head (NY 817 125) is probably part of it, and it can be easily traced eastwards from Oxenthwaite and Point H2 as far as point K (fig. 7d, e & f.).

The main trackway crosses the Argill Beck just north of Argill Bridge, at its confluence with the Mousegill Beck, just west of Point H (fig. 7c), after which it keeps north of Mousegill Beck. As the modern lane swings south, the trackway continues its course eastwards past Lowfield (NY 8372 1282) near Point J (fig. 7d & e), where another trackway joins having left the southern alternative route near NY83561235 running past Gillses Farm. The southern route, south of the Mousegill Beck, can be seen very clearly on lidar either side of the modern lane past Buckles Farm, Slip House, and Belah Place, the lane fossilising its course. Another branch leaves the southern route north of Point J2, although since it then crosses the main trackway, there is a suspicion that this branch may be medieval.

Additional evidence of a potential prehistoric date for both trackways is provided by the dyke system on Stainmore, which cuts the main trackway in several places (eg. NY 8302 1298, NY 8338 1293, NY 8363 1287, NY 8427 1286 & NY 8440 1286, all between points H & J). The dykes were recorded as medieval by Collingwood (1930b) and later re-assessed as mainly Roman by Higham and Jones (1975, 37-40), with Drury even postulating a prehistoric origin (Drury et al. 1998, 131). Whilst neither Collingwood nor Higham & Jones recorded dykes in South Stainmore, this is likely due to a reliance on ground observation and poor quality aerial photographs, whereas lidar shows that the system extends across the whole area, in a very consistent manner. The parallel southern course is similarly cut by dyke systems at NY 8303 1217, NY 8334 1227, NY 8349 1222 & NY 8400 1207 as shown between points H2 and J2 on figs 7d & 7e. It is clear that whilst the dykes were without question superimposed over a pre-existing routeway, at some point the routeway came back into use, since several of the banks have east-west holloways cutting through them. It is known that the Stainmore was used as a drove road in the medieval period (Drury, et al. 1998, 120-1), and this could potentially explain this secondary re-use of the route, just as it could explain some



Fig. 7d. Lidar imagery with OS Opendata overlay showing the course of the prehistoric route between Points H & I and between Points H2 & I2

THE STAINMORE ROAD: FROM IRON AGE ROUTEWAY TO ROMAN ROAD

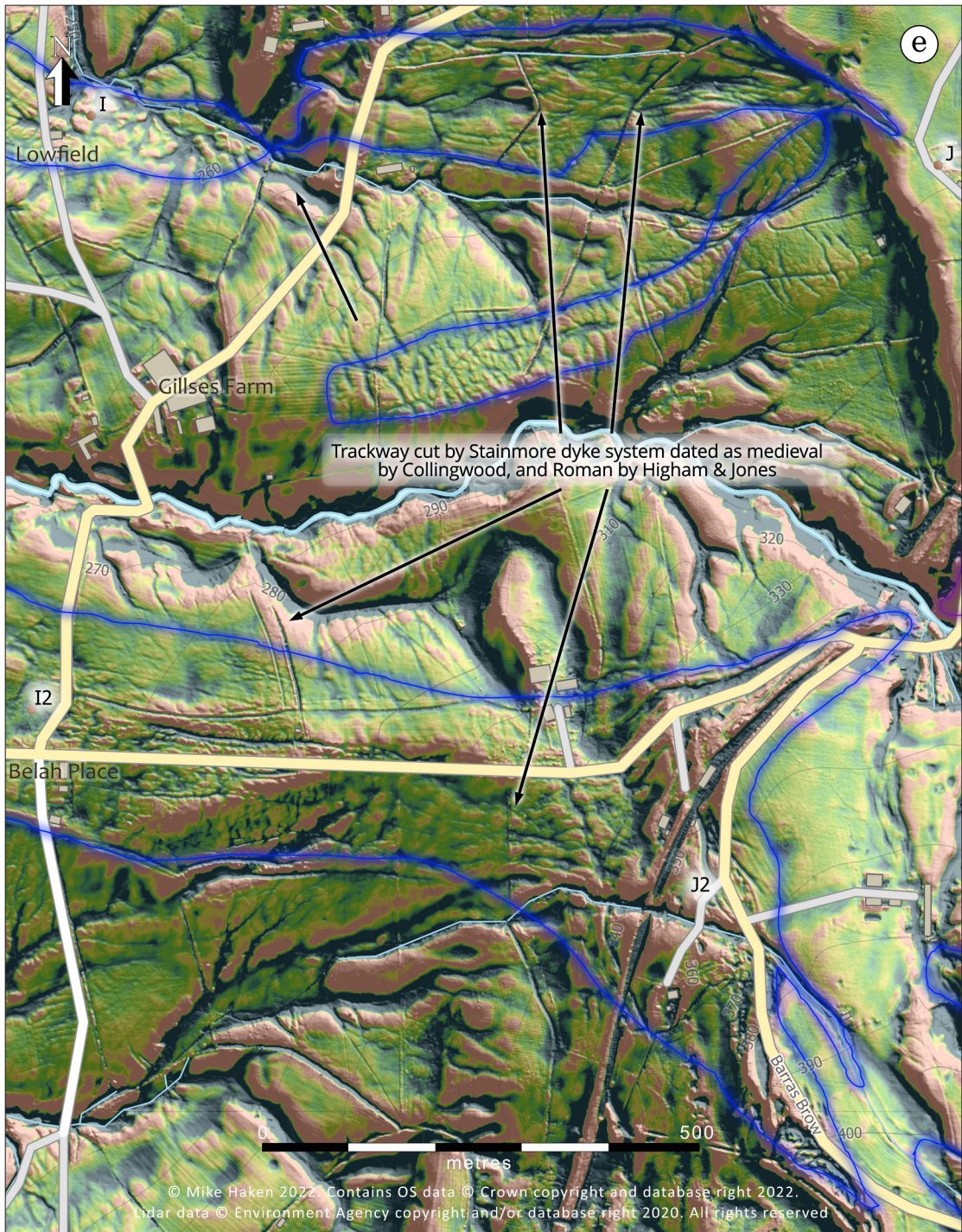


Fig. 7e. Lidar imagery with OS Opendata overlay showing the course of the prehistoric routes between Points I & J and between Points I2 & J2

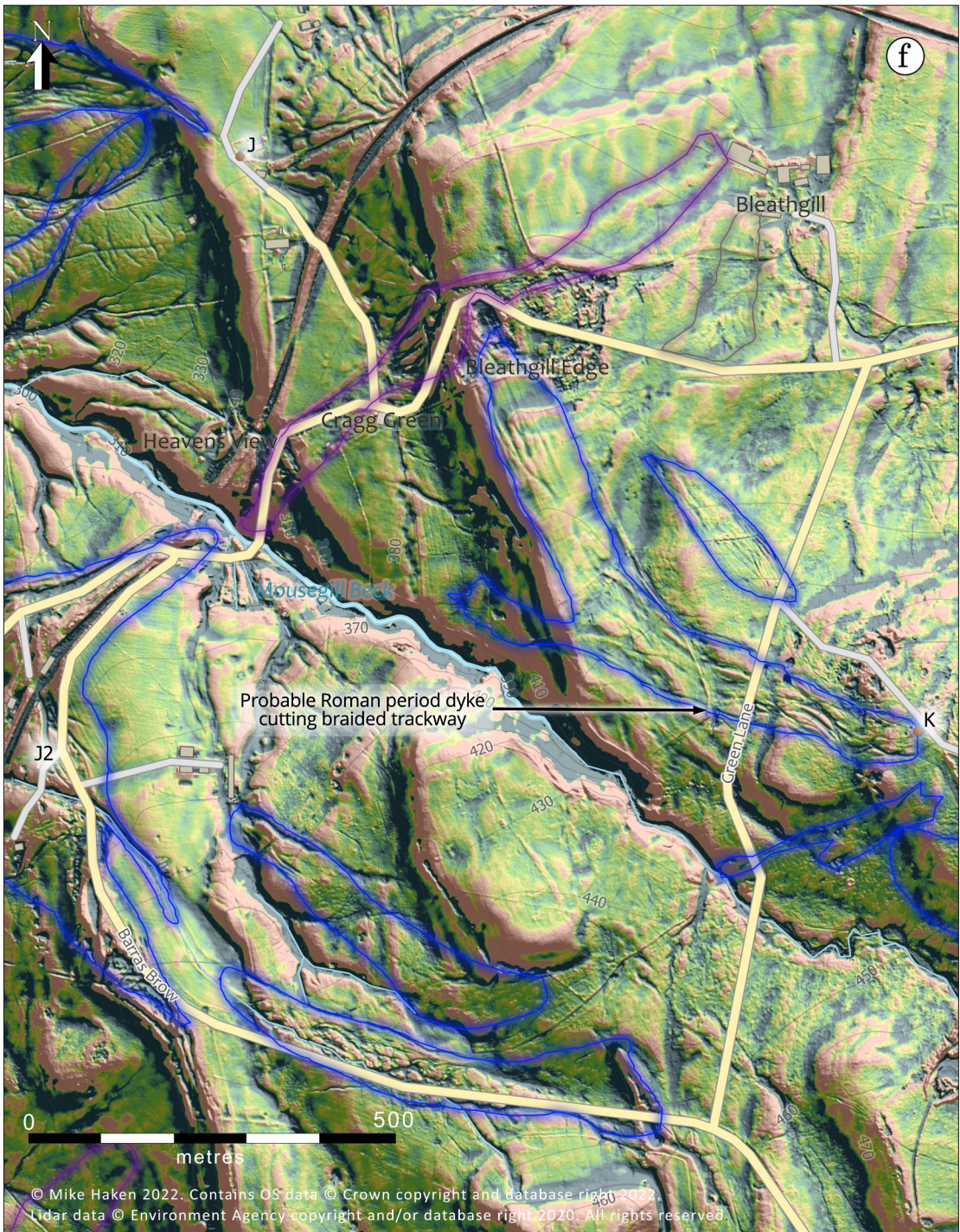


Fig. 7f. Lidar imagery with OS Opendata overlay showing the course of the prehistoric route from Points J & J2 to Point K

THE STAINMORE ROAD: FROM IRON AGE ROUTEWAY TO ROMAN ROAD

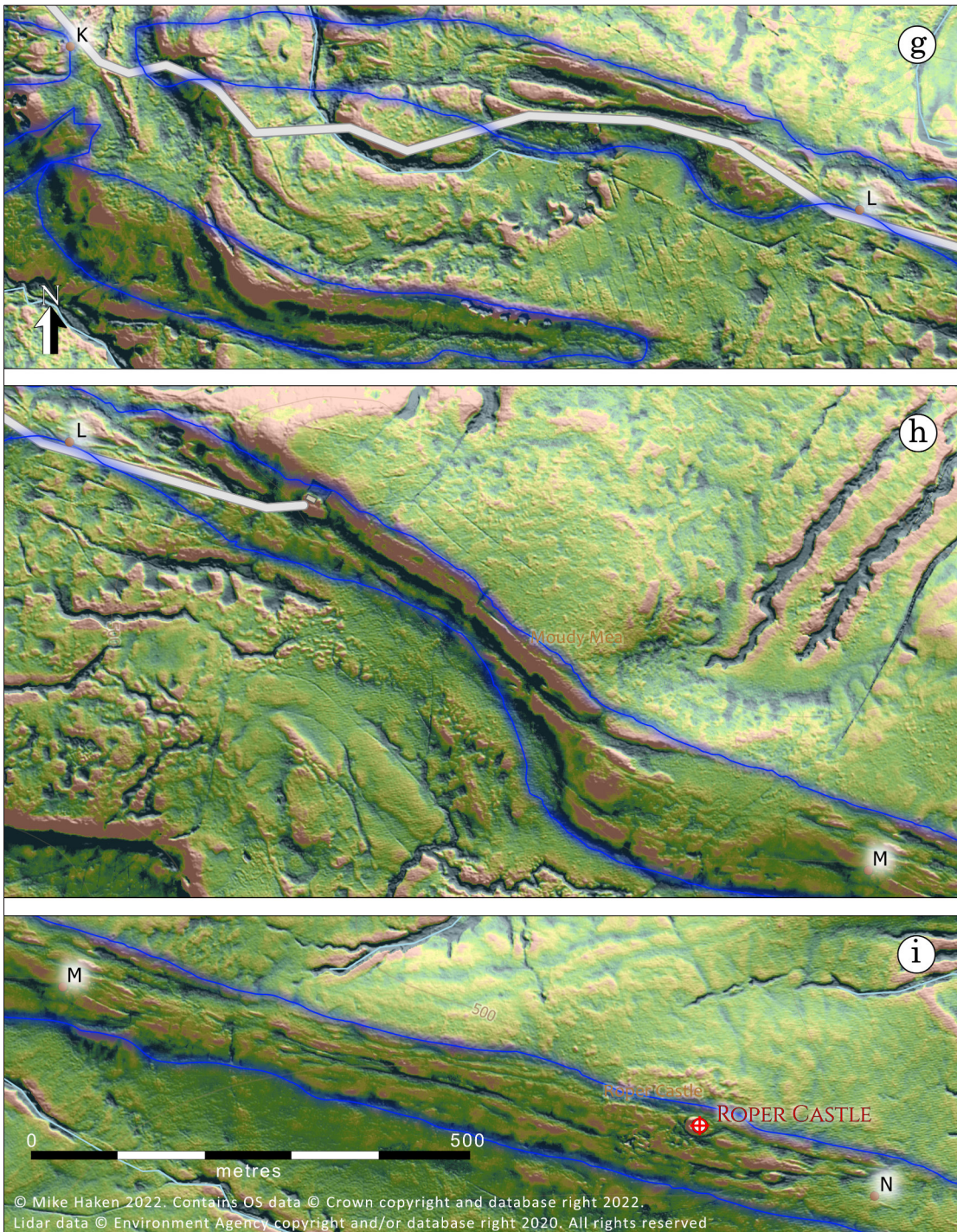


Fig. 7g - I, Lidar imagery with OS Opendata overlay showing the course of the prehistoric route from Point K to Point N

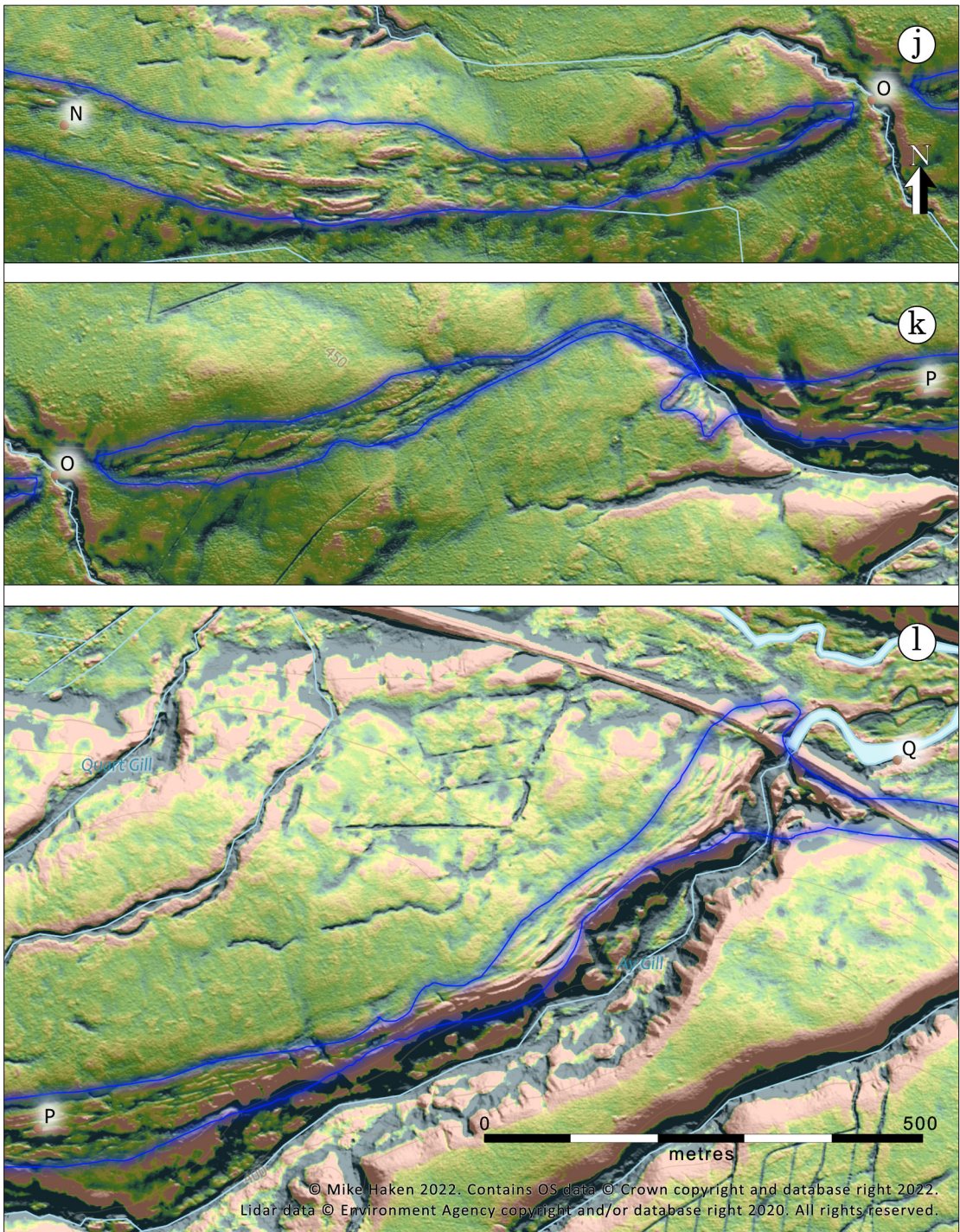


Fig. 7j - l, Lidar imagery with OS Opendata overlay showing the course of the prehistoric route from Point K to Point Q (Aygill Bottom)

of the broad bands of braided track adjacent to both the original and later courses of the Roman road.

The two routes maintain their parallel courses either side of the Mousegill Beck (fig. 7f), the main route bending south at Mouthlock (Point J), before climbing onto Bleathgill Edge and swinging eastwards to Point K. The southern alternative similarly swings south through Barras at Point J2, and runs along Barras Brow, before bending east and north east to cross the Mousegill Beck and rejoin the main trackway at Point K.

From K, the main trackway follows the southern lip of a ridge as it heads east and climbs towards point L (fig. 7g) and then on towards Moudy Mea, where it crosses the watershed at a maximum of 517m AOD. There is a probable alternative route a little to the south between points K and M but from Point M eastwards there is only evidence for a single trackway, still following the southern lip of the ridge as it descends gently past Roper Castle (fig 7i.). The trackway descends gently past points N and O (fig. 7j) to cross Deadman's Gill near point P (fig.7k.), and then swings slightly north east hugging the north bank of Ay Gill until it joins the R. Greta at Aygill Bottom (point 'Q'), where it splits into two, one course following the south bank of the Greta, the other crossing the river and then heading east along the northern flank of the valley (figs 7l & 12a). The course of braided trackways down the valley is discontinuous and complex, and we will return to it shortly.

Moving further west from Brough (see fig. 5a), surface evidence of the routeway has largely been obliterated by agriculture, with potential survival limited to a few small areas of woodland and permanent pasture. The 500m long stretch between NY 7678 1536 & NY 7628 1544 below Brough Hill is immediately south of the line of the Roman road and is probably related to it, but at the same time a pre-Roman date cannot at this stage be ruled out. Another small band survives in woodland at Toddygill Plantation, northeast of Warcop, centred at NY 7560 1605, some 200m north of the Roman road. Fell Lane does appear to cut through it, but the trackways could still be of medieval date, rather than anything earlier. The most interesting survival is at Brackenber Moor, on and around Appleby Golf Course, shown between points A & D on figure 5a and in detail on figure 8 a-c. Lidar appears to reveal a single routeway running between points A & B, following a dry valley northwest of Langton, before crossing the Hilton Beck and crossing Brackenber Moor, now mainly Appleby Golf Course. Once on the moor, the main course appears to continue in the same south easterly direction which would take it past the prehistoric defended enclosure known as the Druidical Judgement Seat (Cumbria SMR no. 1817, NY 7206 1883), although there appear to be two distinct phases, with relatively narrow and straight holloways possibly created by wheeled traffic running along heavily eroded terraceways over 20m across, of a similar scale to gullies found at Rey Cross which will be discussed shortly. There are four clear branches: the northern most one (marked 1. on fig. 8b) is heading ENE towards the possible Late Iron Age field system near Murton (NY 7297 2148, identified during this study), the next (marked 2 on fig. 8a) heads east towards a settlement southeast of Stoneriggs (NY 7299 1980, identified during this study). The third finger, quite broad, heads towards a field system, the defended enclosure known as the Druidical Judgement seat, and a probable scooped settlement also identified during this study. The fourth finger, and possible the main route, heads south towards the so called Coupland Fort, Warcop (Cumbria SMR no.

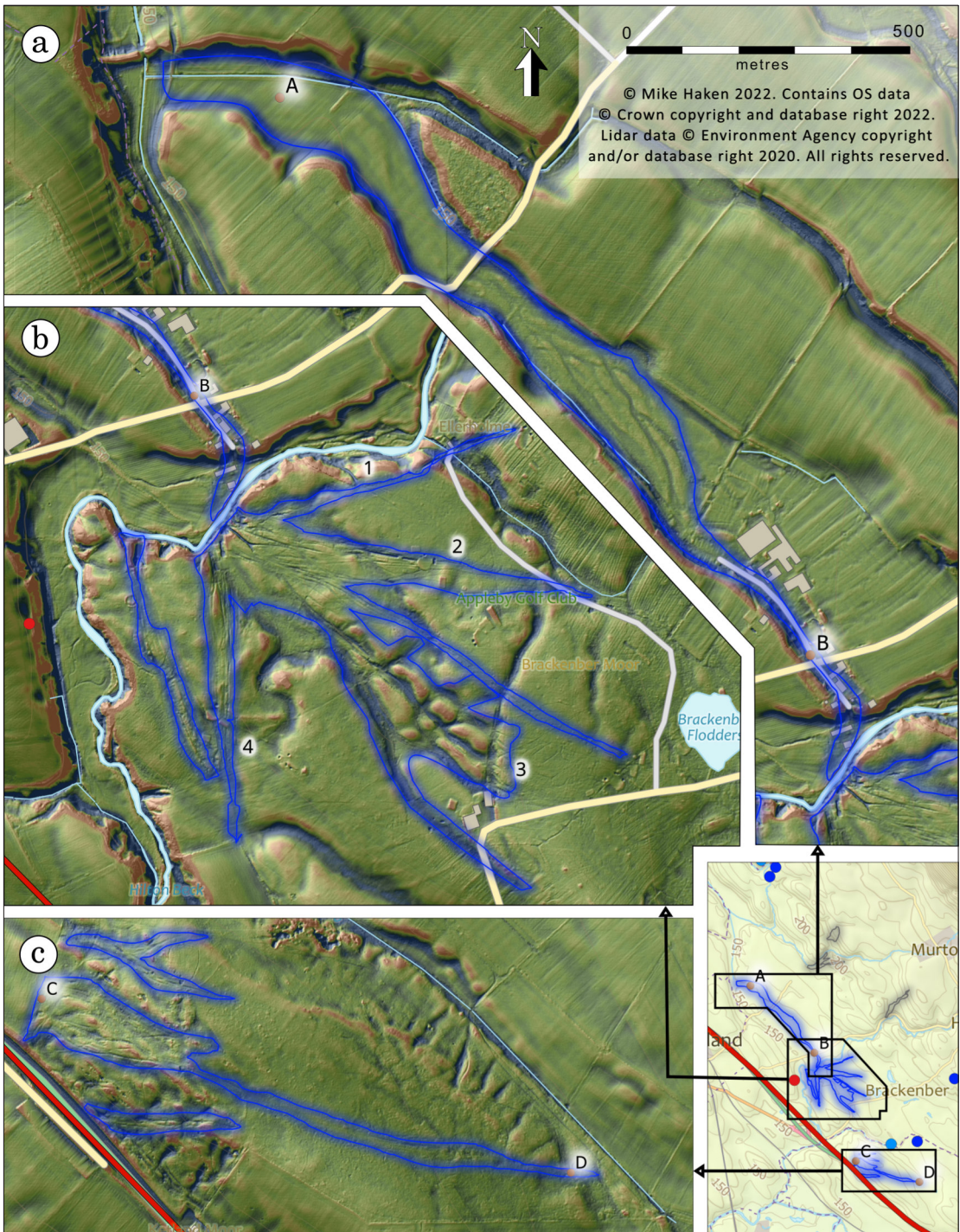


Fig. 8 Lidar imagery with OS Opendata overlay showing braided tracks and holloways on Brackenber Moor, between points A & D

1815, NY 7119 1887), a small enclosure measuring about 30m x 40m of uncertain date, close to the Roman road. Of course, since none of the branches can be traced all the way to the sites mentioned, the identification of apparent destinations may just be down to coincidence, although that seems unlikely since the branches seem to head to all three possible Iron Age sites in the vicinity. So, whilst it is not currently possible to determine whether or not these trackways are prehistoric, circumstantial evidence would suggest that this is more probable than not, and that this survival is potentially the same routeway identified running over Stainmore.

Northwest of Appleby, no convincing evidence could be found, and since lidar coverage is patchy (at the time of writing) beyond Kirby Thore, no analysis of lidar was conducted beyond that point. There are a few other small survivals of braided tracks and holloways elsewhere between Brough and Appleby-in-Westmorland, mainly in stream valleys; however none of these can be linked together with any confidence and none can currently be dated. The best that can be said is that there is certainly evidence for large scale mobility of uncertain date along the same general corridor as the Roman road and modern A66.

A second prehistoric trackway on Stainmore

Whilst tracing the above route on Stainmore, it became clear that there may be a second prehistoric route to the north of the first, much closer to the initial Roman line; indeed it approximates to the course of the A66 between Augill Bridge and Old Spital. A trackway

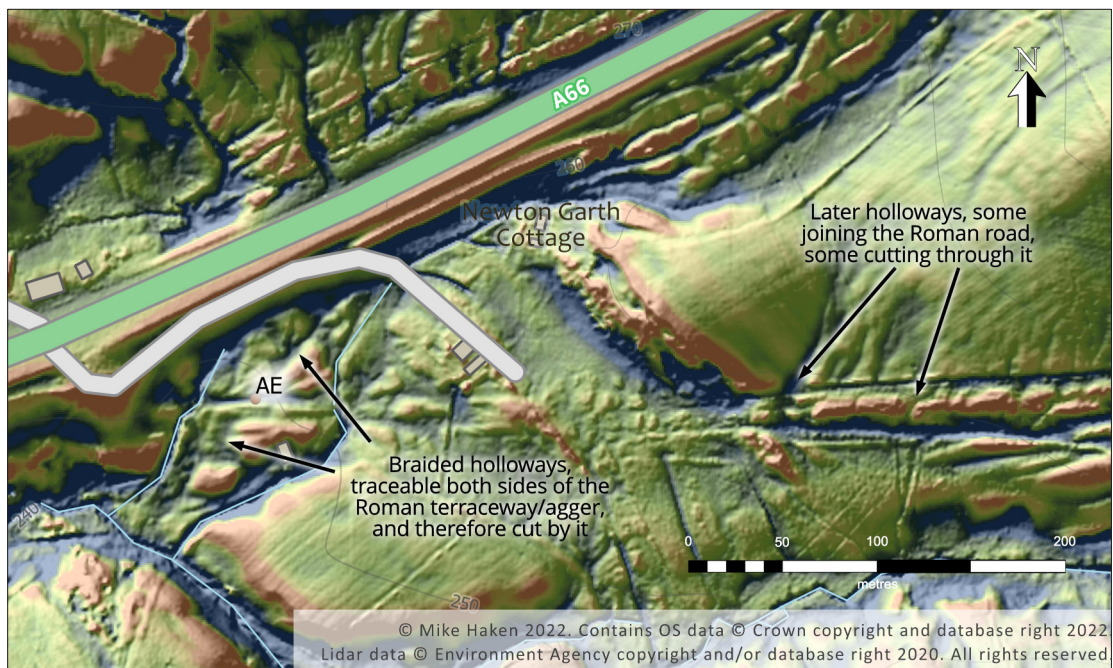


Fig. 9 Braided track cut by the Roman road at Newton Garth, with holloways clearly visible both sides of the Roman road. Later holloways east of point AE both join and cut through the Roman road.

following the northern route appears to be cut by early Roman construction at NY 8237 1469 just west of Newton Garth, North Stainmore, where the Roman road from Bowes (probably the earlier of the two Roman routes) appears to cut through a braided trackway running in a southwest to northeast direction (point AE, fig. 9 & fig. 10c). The lidar image exaggerates the appearance of the individual hollows which in general are not very deep, varying between 15cm and a maximum 90cm in depth, and between 3m and 10m wide. The Roman road immediately west of this point was actually investigated between 1992 and 1994 prior to the dualling of the A66 (Drury, et al. 1998); however, since it was not directly impacted by the construction work, investigations did not extend far enough east for this feature to be recognised. Whilst braiding was recorded on the stretch that was investigated, described as ‘numerous interweaving hollows’, this phenomenon was only recognised as an east-west trend close to the Roman line, ‘implying disuse or deterioration of the Roman route’ (ibid., 130). It should also be noted here that there is additional evidence of eroded tracks trending north to south coming down the hill from the general direction of the Punchbowl Roman watch tower, but these clearly post-date the Roman road since they cut into it in many places. Westwards from Newton Garth, the course of this second prehistoric route can be traced extremely well (fig. 10 a-c), the prehistoric, Roman and modern routes all utilising the same general course until just past Craco (point AD). North of Craco is the Augill Bridge watch tower, and whilst not certain, it does appear possible that the site could be superimposed on braided tracks. Further fieldwork is needed to determine this since some of those tracks here may well have been created by Roman soldiers accessing the site from the nearby fort at Brough (*Verteris*). As the modern A66 and the Roman line turn to the northwest, the prehistoric route went straight on, running along the valley side below Battle Hill before cresting the ridge. The surviving braiding stops dead at point AA where the medieval rig and furrow begins, ploughing having entirely removed all trace of it. Before it disappears, however, the band of braiding reaches over 190m across at one point, indicative that this was a major routeway over a long period. Just like the other prehistoric route, the trackway is cut by a dyke system at NY 8164 1450 (point AD). The dyke can be traced southwards for 890m, where it forms the western limit of the braided tracks below Leonard’s Crag (fig. 6), and must therefore be earlier than them, supporting the Roman period date for the dyke proposed by Higham and Jones and therefore a Roman or more probably prehistoric date for the trackway at Point AD. The trackway is further cut by dykes at NY 8101 1433 (point AC) and NY 8057 1416 (point AB). Incidentally, Higham and Jones had wrongly assumed that the braided trackway between AA and AD, easily visible on the ground, was the course of the Roman road (see Higham & Jones 1975, fig. 6), whereas we now know that the earlier Roman road is 300m to the north, and the later one some 500m to the south.

Whilst there is plenty of surviving evidence for braided trackways east of Newton Garth, between point AD and Rey Cross, many of these could well be medieval or later and a continuous line cannot be traced with confidence, although figure 5b shows a suggested route. Fortunately, there is conclusive evidence further up provided by Rey Cross camp itself. Figure 11 is a lidar image of part of Rey Cross camp, which shows clearly how the south rampart and southeast corner have been superimposed on top of three very broad and heavily eroded gullies. Their width is highly unusual, being up to 30m, and they are up to 1.5m deep. Whilst it might at first be suspected that these gullies are the result of natural

THE STAINMORE ROAD: FROM IRON AGE ROUTEWAY TO ROMAN ROAD

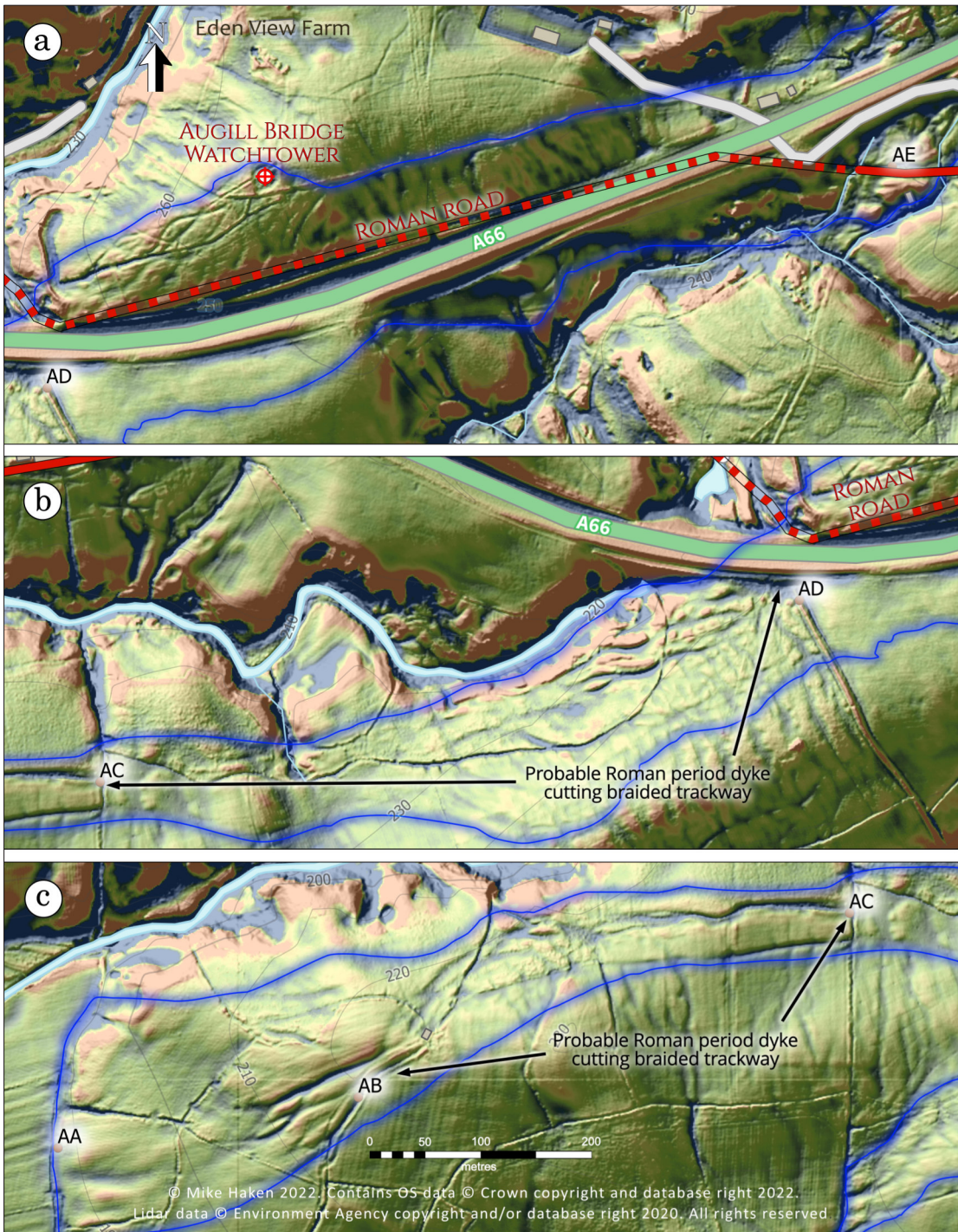


Fig 10a-c. The course of the prehistoric trackway running WSW from Newton Garth



Fig. 11 The remains of a wide, deep and eroded braided trackway beneath the SE corner of Rey Cross camp

erosion by water, the spot heights show clearly that the eastern moorland end of the gullies are much lower than where the rampart cuts across, indeed the bottoms of the gullies slope in both directions, something we should expect since the site of Rey Cross is positioned on the watershed. These cannot, therefore, have been created simply by water erosion and their curvature would also seem to rule out any possibility of them being the result of glacial action, leaving erosion by human or animal traffic, possibly over millennia, the only realistic possibility. Indeed, it is worth noting that the holloway just southeast of Point AA a few miles to the west is actually bigger, 36m wide and 1.6m deep. The gullies all lead down to a gently sloping shelf (about 1:15) running along the valley side, which might have offered some protection from the worst of the prevailing wind as it blew through the pass. Above the shelf, the clear remains of multiple braided tracks can be seen following the course of the Roman road, all presumably dating from after the road ceased to be maintained and became worn out. Finally, about 800m (0.5 miles) east of Rey Cross at Old Spital, the valley side suddenly becomes much gentler, and multiple shallow hollows suggest an easy route was followed off the high ground down to the valley bottom to join the northern branch of the other prehistoric trackway heading east from Aygill Bottom. This link route could also potentially have been related to the former medieval hospital which gives Spital its name, indeed it could be why the hospital was positioned where it was. Even if some traffic used the link route, it seems likely that traffic was actually spread across much of the valley side, since the band of braiding stretching down the slope from the Roman road and modern A66 reaches 260m wide above Valley farm, and 320m wide below Vale House. It seems unlikely that all this was medieval, although not impossible.

THE STAINMORE ROAD: FROM IRON AGE ROUTEWAY TO ROMAN ROAD

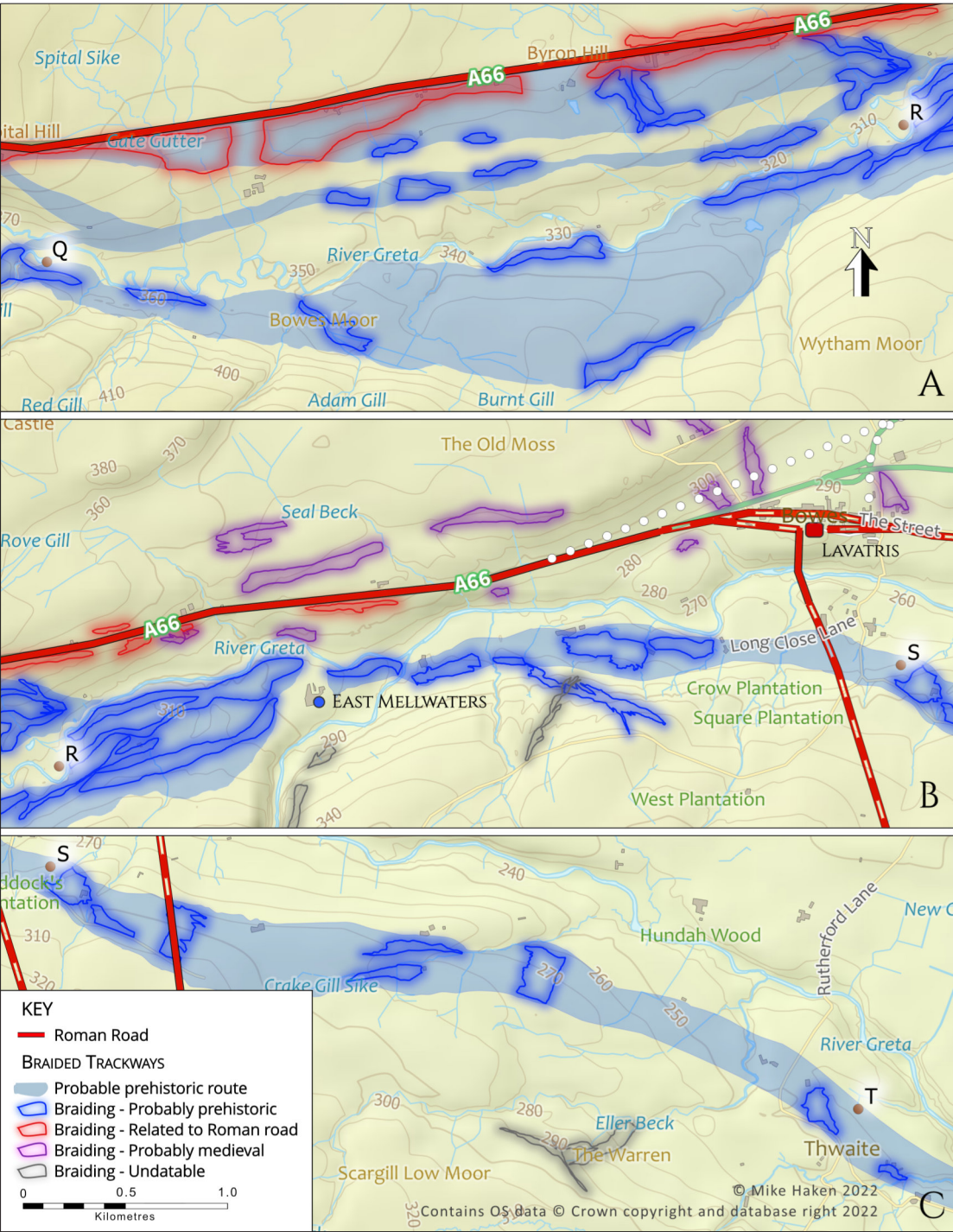


Fig. 12 a-c. Points Q to T. Maps showing the locations of stretches of braided trackway of different periods in the Greta valley, east of Aygill Bottom.

Clearly then, there were two distinct prehistoric routeways approaching Stainmore from the west. But why was there a need for two routes? Whilst the route via Roper Castle might appear slightly more direct, in fact the distances are almost identical. Measured from the point where they would be projected to meet at Brough, to the probable joining point at Aygill Bottom, the Roper Castle route is some 13.1 km (8.15 miles), whereas the Rey Cross route measures 13.4 km (8.3 miles). Perhaps the key to the difference is a combination of terrain, and maximum altitude. The Roper Castle route crosses the watershed on the ridge at 515m AOD, some 83m higher than the Rey Cross route which heads through the pass at 432m, making Roper Castle far less attractive in winter, given the notorious weather on Stainmore. The western approach to the Roper Castle route, however, utilises a much more even climb over easier terrain, making it much more attractive in better weather despite the altitude, especially if wheeled vehicles were being used. Therefore, it is suggested that the use of the routes was probably seasonal, the Rey Cross route being mainly for winter use. When the Roman army created their engineered all weather road, possibly many years after the creation of both Rey Cross camp and the Roper Castle site, the need for the Roper Castle route simply disappeared, and it seems likely that it eventually went out of use.

East of Aygill Bottom and Old Spital, both routeways can only be heading to the vicinity of Bowes and potentially beyond, utilising the Greta valley. The locations of patches of braiding in the valley are shown in figure 12, with those suggested as potentially prehistoric shown in blue. If the trackways were to leave the shelter of the valley, then there would surely be clear evidence on the moorland either side which would be visible using lidar. However, there is none. Within the confines of the valley, it is a different story, with patches of braiding, some large, some small, all over the northern valley side (ie south facing). On the southern (north facing side), the remains of braided trackways are to be found mainly in the bottom the valley, no more than 10m higher than the river, a little higher when the valley opens out at Bowes. The sheer quantity of braided track in the valley strongly suggests that some were formed at later periods, perhaps partly when the Roman road wore out in places, and partly due to the movement of large quantities of livestock. As already referred to, the route is well recorded as being used as a medieval drove road, and indeed there will have been the need to move cattle east from the many medieval and post medieval vaccaries on Stainmore (Newman 2014, 392). It is difficult, if not impossible, to discern any prehistoric tracks on the northern slope from those of later periods. However the Roper Castle route clearly splits at Aygill Bottom, with one branch remaining south of the Greta, and it is tempting to conclude that this southern route might be predominantly a prehistoric one. This idea is strongly supported by the fact that at the Iron Age / Romano British settlement at East Mellwaters (NY 9672 1260), one patch of braided track clearly swerves to avoid the field system, and another appears to pass beneath the Romano-British enclosure (fig. 13), both strongly suggesting a prehistoric origin. It also seems possible, but not certain, that the trackway that crossed the R. Greta to access the north of the valley at Aygill Bottom, recrossed the Greta west of East Mellwaters. Taking this alongside the apparent routes heading ESE from Old Spital and Vale House Farm to the valley bottom, the possibility arises that the prehistoric route may have favoured the valley bottom, either side of the R. Greta, with possible preference to the south bank.

THE STAINMORE ROAD: FROM IRON AGE ROUTEWAY TO ROMAN ROAD

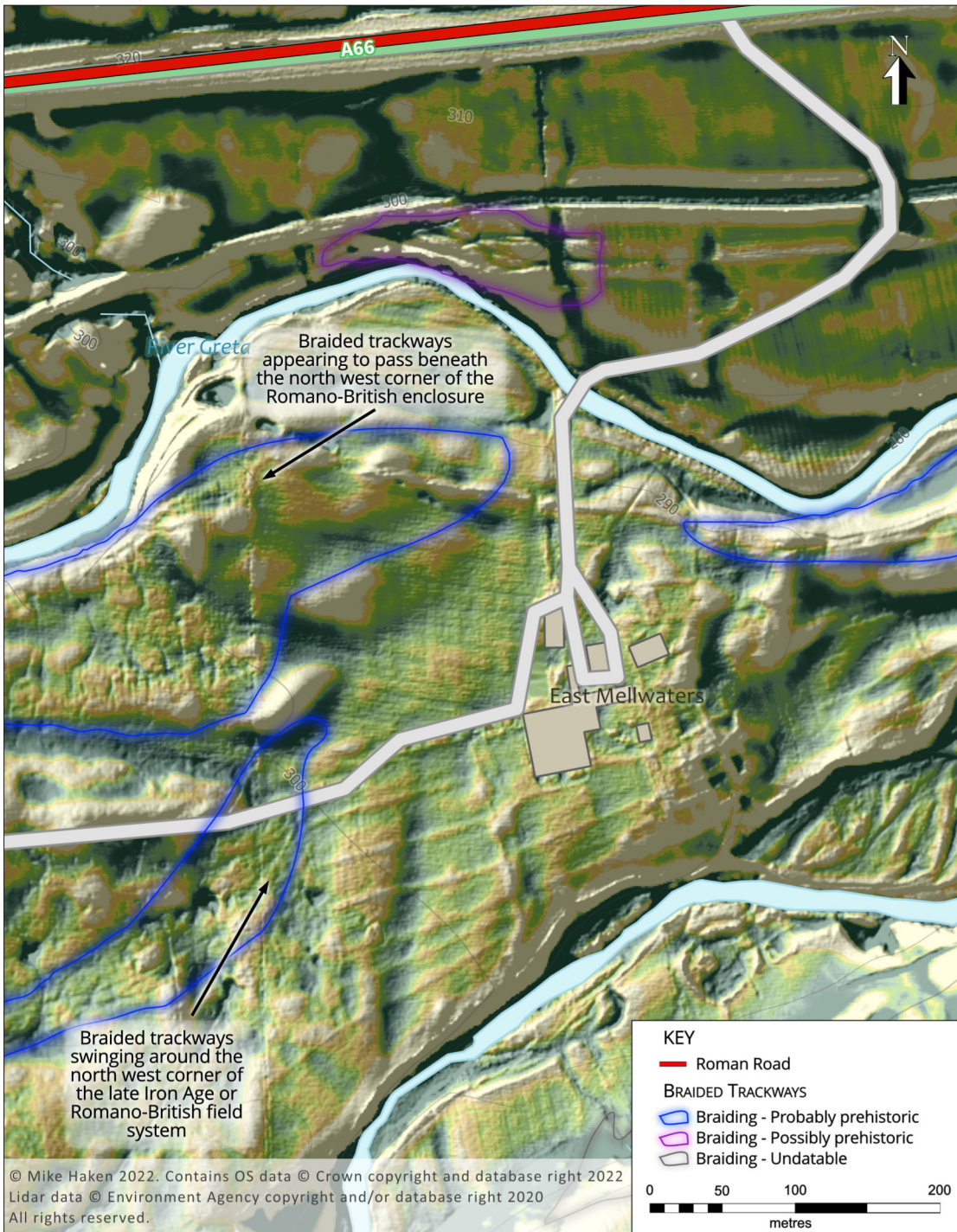


Fig. 13 Lidar image with OS Opendata overlay showing a braided trackway at East Mellwaters settlement which appears to swing north to avoid the narrow field system and a second trackway which has been overlain by the site's Romano-British boundary dyke, suggesting a prehistoric date for the routeway.

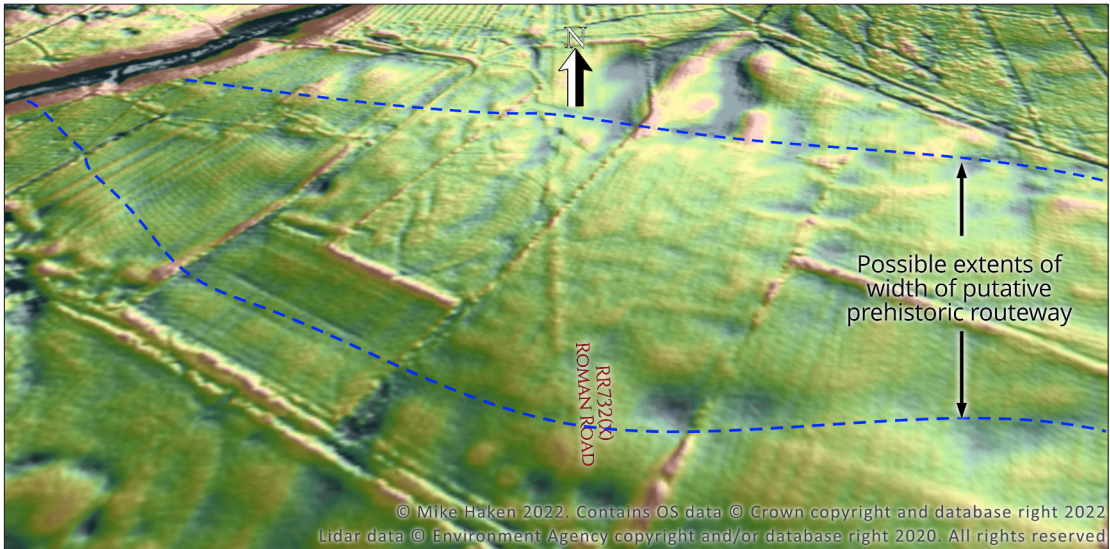


Fig. 14 3D Lidar image about 1500m SE of Bowes, looking along Roman road from Bainbridge (RR732(x)) as it cuts through a series of roughly parallel linear features, possibly the prehistoric routeway from Stainmore. Note how there is slight erosion into the *agger* in places, suggesting that the routeway was also in use after the Roman period.

Downstream of East Mellwaters, the trackways south of the river become more discontinuous (see fig. 12), although there appear to be two distinct routes followed, both of which keep south of the river and do not appear to branch towards Bowes. The first heads east southeast and gradually climbs up on to the moor, reaching about 325m AOD before it can no longer be traced. The other seems to aim to be about halfway up the hillside. Whilst there is no clear evidence to give a prehistoric date to either of these branches, other than the fact that they come from East Mellwaters, there is one piece of suggestive evidence, mainly in the field centred at NZ 0032 1247, about 1.5km (0.93 miles) southeast of Bowes. Lidar imagery here (fig. 14) clearly shows the remains of the *agger* of the Roman road from Bainbridge (RR732(x)) as it descends to approach Bowes. There are clear indications of very slight linear depressions, generally aligned west northwest to east southeast, which the Roman road cuts through. Since rig and furrow can be ruled out (the features do not cut the Roman road), multiple shallow holloways must remain a distinct possibility, and if this were indeed the case, then it would establish that a prehistoric routeway headed down the valley towards Greta Bridge, and potentially on towards Stanwick and Scotch Corner. In the other direction, it seems likely that the routeway went at least as far as Appleby, and presumably much further.

The Upper Eden valley

In order to assess whether or not the routeway also served a more local purpose in the upper Eden valley, the lidar study was extended to identify all stretches of braided track and potential Iron Age settlement within an area of 18km x 22km. The results are shown in figure 15.

THE STAINMORE ROAD: FROM IRON AGE ROUTEWAY TO ROMAN ROAD

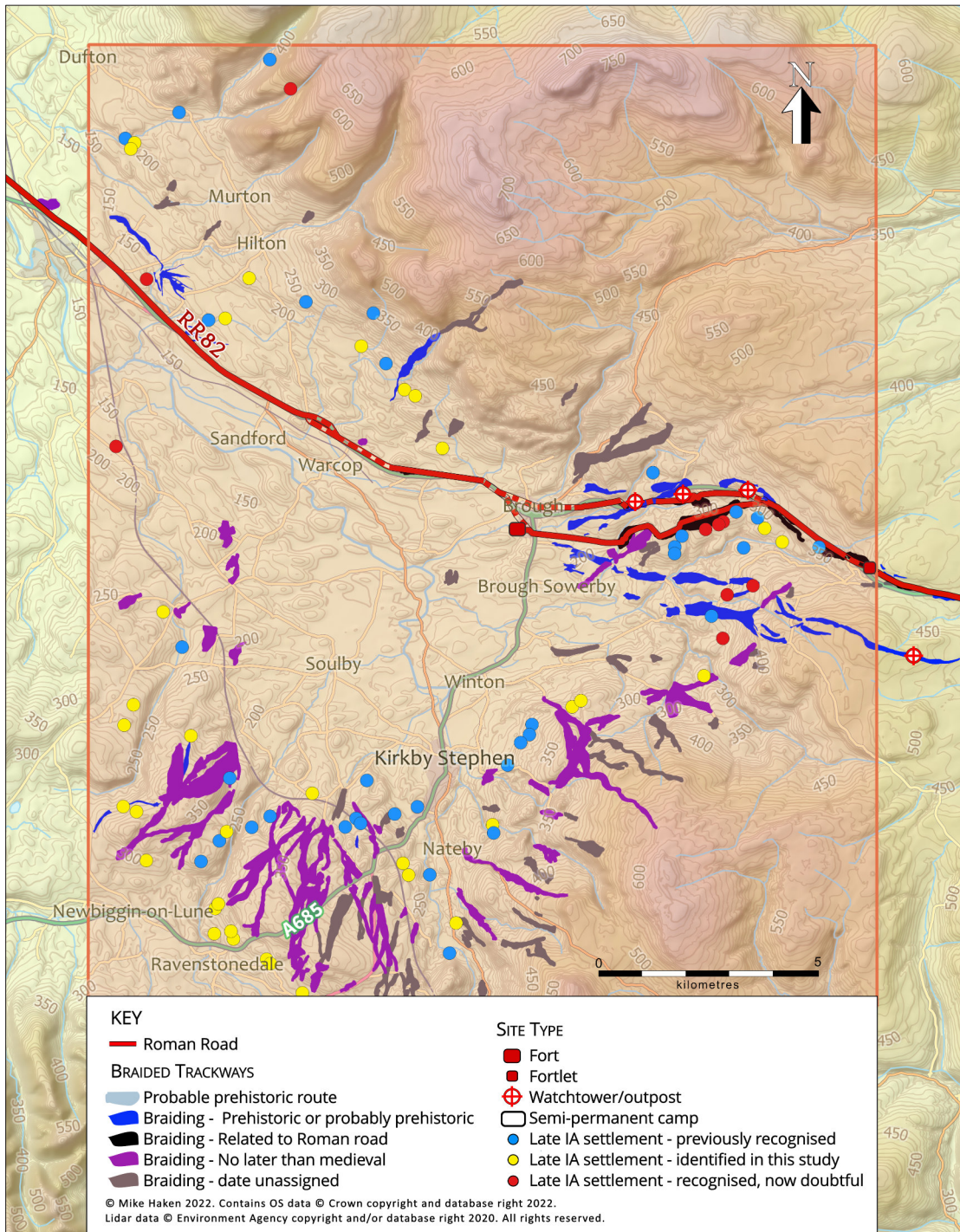


Fig. 15 Map showing the areas of braided trackway identified in the upper Eden valley during this study, with distribution of Late Iron Age settlement.

One thing was immediately apparent: that the slopes below about 420m AOD and above 210m AOD are densely packed with braided trackways, indeed 236 discreet survivals were identified within the 18km x 22km area. Below the 210m contour, there is little survival of either trackways or settlement. The transition is quite sharp when moving out of the more marginal land into a more intensively farmed landscape, mainly one which saw arable farming in the medieval period, as evidenced by the extensive survival of rig and furrow beneath modern permanent pasture.

Most of the trackways were impossible to date, with just two, at Crosby Garrett and Warcop, clearly relating to Iron Age sites and thus of probable prehistoric date (shown in blue on fig. 15). The vast majority stop at the limit of late medieval arable cultivation, and thus probably pre-date it, but beyond that their origins are currently unknown, more detailed study being needed to understand potential relationships with both settlement and dyke systems. That said, given the sheer scale of the trackways it seems reasonable to assume that many more than the two already identified will have a prehistoric origin, even if some remained in use later. Apart from their probable dates, however, the trackways can also be categorised according to their apparent function, of which there seem to be four distinct types.

- 1 Long distance routeways, in this case the route from the Vale of Eden over into the vale of Mowbray and the Tees valley. The patches of braiding along the Roman road, whilst not strictly speaking an independent routeway, also fall into this category.
- 2 Routeways that appear to connect one concentration of population to another some miles distant, or possibly to the Stainmore route, as with the numerous trackways running from the area around Newbiggin-on-Lune and Ravenstonedale over the fells north into the upper Eden valley around Crosby Garrett and Kirkby Stephen. How much some of these may relate to transhumance is unclear.
- 3 Trackways that provide local connectivity with the long distance routes, such as the one that connects the high ground and associated settlements east of Kirkby Stephen with the Roper Castle route above Barras, or the branches running off the main routeway on Brackenber Moor.
- 4 Trackways serving local purpose only, mainly running up the valley sides and stream valleys and petering out. Some of these will relate to transhumance, others giving access to areas of quarrying and mining.

It is clear that the prehistoric Stainmore routes were not merely serving a population in the upper Eden valley. If they were, then we would have expected them to have swung around to the southwest, towards modern Winton, rather than maintaining their course towards Brough as they do. Furthermore, this arterial route may have been met by at least some of a very clear and dense band of trackways aligned roughly SSW to NNE over Crosby Garrett Fell, Smardale Fell and Wharton Fell. Whilst there was clearly major mobility between the catchment of the R. Lune to the south and the upper Eden valley, the degree to which this represented longer distance movement, or a more local traffic such as transhumance is currently unclear but given the sheer scale of that band of tracks, it seems highly probable that at least some fed into the Stainmore route. Thus it appears that our trans-pennine route

is truly inter-regional, serving populations well away from the Stainmore to the south and south west, as well as beyond Appleby to the north west into the Vale of Eden and potentially the Solway plain.

The very existence of the clearly well used Stainmore route, along with the density of trackways in the upper Eden valley, is at odds with traditional notions that Late Iron Age populations in northern England, unlike those in the south, were small and scattered and avoided a supposedly heavily wooded lowland. No surprise, then, that in recent decades, the traditional view has been seriously challenged. As Manby put it with regard to Yorkshire: *'Extensive field systems, querns and evidence for cereal crops are not supportive of a mid 20th century notion of an economically retarded Late Iron Age in central and Pennine Yorkshire.'* (Manby 2003, 123). Indeed, the areas that the Stainmore route connected in the Late Iron Age may well have been some of the most densely populated in Britain. For example, in his focussed study in the mid Tees valley around Stanwick, Haslegrove recorded 146 settlements, mainly within subrectangular enclosures (2016, table 20.2), a massive increase in numbers from some previous studies. For example, just six years previously, Sherlock could only identify 169 Iron Age settlements in the whole of Yorkshire and Durham (Sherlock 2010, 59). Haslegrove also estimated that in the area around Stanwick the density of settlement could be as high as 0.5 settlements per square kilometre, perhaps even higher, making it comparable with settlement on the heavy boulder clays of Northamptonshire, usually thought to be one of the most densely populated areas in Late Iron Age Britain (Haslegrove 2016, 422).

This paper's lidar study of 396 km² in the upper Eden valley unexpectedly revealed no fewer than 33 previously unrecognised settlements and farmsteads of probable Late Iron Age date. Prior to the study, 44 settlements had been recorded in the study area, largely from aerial photographs in the analysis by Higham and Jones (1975). Of those, the study showed that two, at Stainmore and Mouthlock (Cumbria HER 3506 & 3486), were clear misidentifications and were actually where two braided trackways crossed, creating a false appearance of enclosures on aerial photos. A further eight were also removed pending further investigation, since given their locations, evidence for them would have expected to have been visible on lidar and there was nothing visible whatsoever. This reduced the number to 34. However, during the study a further 33 sites were identified, mainly settlement but including a few field systems and defended sites where the settlement was almost certainly present, but is no longer visible. The sites are marked on figure 15. All remaining sites were situated between 195m AOD and 370m AOD, which accounted for 137 square kilometres. This gives an estimated density of 0.49 settlements per square kilometre, settlement which may originally have covered the entire valley below 195m AOD. This is almost exactly the same as Haslegrove's estimate for the area around Stanwick, although in the upper Eden valley only thirteen appear to be within a sub-rectangular enclosure. Whilst much greater analysis and comparison between the two areas is needed, along with expansion of lidar study westwards, this difference in settlement plan could potentially suggest a major cultural difference between the populations either side of the Pennines.

The picture that emerges from this brief study is one of a population living mainly in discrete small settlements and farmsteads that do not appear to have been linked by a network of well-defined trackways. Instead, there was an informal network of loose

routeways, unmetalled, and not defined or confined by ditches or banks as far as is currently known. The population appears to have been extremely mobile, at a local and regional level, being connected to populations further afield by a long distance routeway, the ancestor of both the RR82 and the A66, which can now for the very first time be proven, and not simply assumed.

THE 'ROMANISATION' OF THE PREHISTORIC ROUTEWAY.

The idea that some Roman roads were merely a 'Romanisation' of a prehistoric predecessor has already been discussed. The route of the Roman road was analysed to attempt to identify how the road may have been planned and surveyed, using the principles identified by John Poulter (Poulter 2009 & 2010 & summarised briefly in Poulter 2014, 3-8).

Poulter recognised that the directions of planning could sometimes be determined in two ways, both of which could be regarded as simple common sense that no-one had previously recognised:

- 1 Roman surveyors would generally go over the brow of high ground far enough to have a clear view of the landscape before setting out a new alignment
- 2 Alignment changes at rivers tend to happen on the side from which the surveyors are coming. This is because the best field of view is usually on the descent to the river, rather than on the other side where views forward are often restricted.
- 3 Poulter also recognised that Roman road planning was often a process of multiple stages:
- 4 Long distance alignments were set out across the landscape
- 5 Deviations from the main planning lines were set out to enable the road to negotiate major landscape features such as valleys of which main planning lines took no account
- 6 Further deviations were made from the planning of both previous stages to account for local landscape features, such as the crossing of a stream, or a small rocky outcrop.
- 7 Considerable time may elapse during the previous three stages, sometimes resulting in the need to make additional deviations to forts and other military sites which did not exist when the process began.

However, not all Roman roads were set out in this way, with some merely following the contours, particularly in hilly or mountainous terrain. In some of these cases, it has been suggested that the Roman surveying merely translated an original prehistoric route into a series of straight lengths, but without any of the longer alignments that characterise so many Roman roads, for example RR72b (Ilkley to Tadcaster) in Yorkshire (Haken 2018a). Here, excavation has proved that a Late Iron Age track, carbon dated to the mid 1st century BC, lay beneath the Roman road at Adel, north of Leeds (Jefferson & Roberts 2006). Given the varying and often difficult terrain the Stainmore route traversed, we might have expected the same phenomenon here, especially as Dere Street (RR8b) approaching Scotch Corner

from the south, is based upon a Middle Iron Age trackway (Fell & Johnson 2021, 30), and the trackway leading from Scotch Corner towards Gatherley Moor was certainly in use in the early 1st century AD (Fell 2020, 164). However it turns out that things were much more complicated, with planning alignments set out over the entire length (in two stages) with some deviations being laid out in short alignments, others merely following the terrain.

The line of the A66 from Scotch Corner to Greta Bridge (and Rokeby Park) is often thought of as being straight. In fact the line followed by the Roman road changes alignment slightly on Gatherley Moor, then runs virtually straight for 9.5 km (5.9 miles) before turning slightly again at Smallways to head towards the semi-permanent camp at Rokeby Park, where it turns sharply west. The start point at Scotch Corner, and the point at Rokeby Park where the road turns west, are both precisely on a direct alignment to the fort at Carlisle, unlikely as that may at first seem (fig. 16). The alignment, however, was not set out from Scotch Corner, but from a low hill 21.5 km (13 miles) southeast of Scotch Corner, at Bullamoor, just east of

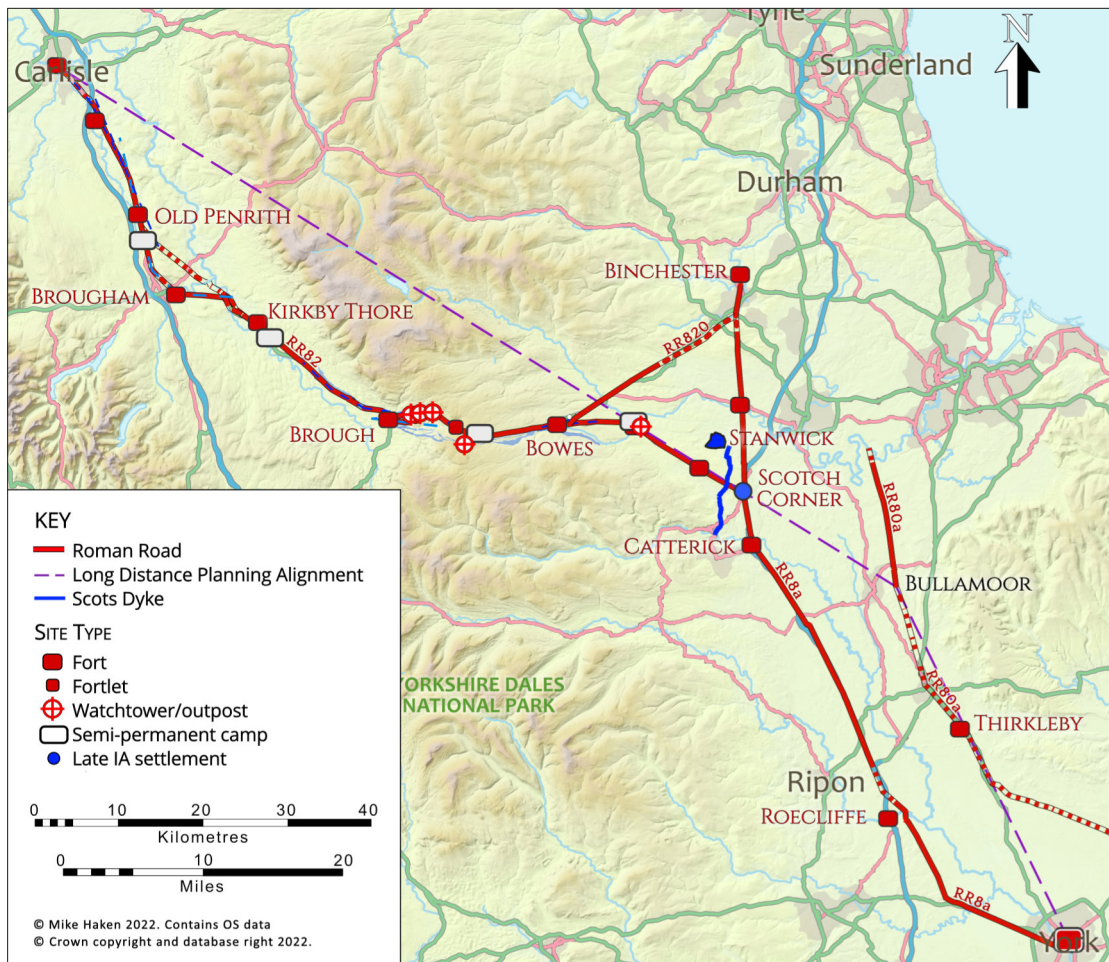


Fig. 16 Map showing the long distance alignments from York to Bullamoor, and from Bullamoor to Carlisle through Scotch Corner and Rokeby Park. Only relevant Roman roads and 1st century AD sites along them are illustrated

Northallerton (North Yorkshire). Interestingly though, the road as built does not lie along this survey line anywhere, its surveyors merely used it to locate key points at Scotch Corner and at Rokeby Park, supporting the idea proposed by both Poulter (Poulter 2014, 24-38) and Entwistle (2019, chapters 2-6) that such long-distance survey lines may have had purposes other than those of mere road planning. Of course, when plotting long lines on a map along apparently related points, ‘any straight line drawn on a map is bound to hit something somewhere eventually’ as Entwistle observes in his work on such long-distance surveying (Entwistle 2019, 3). The spectre of ley lines, killed off long ago by Williamson and Bellamy (1983), even starts to exude ectoplasm. But what are the odds of these important and far from random four points being on a 117 km (73 miles) long straight line purely by chance? It certainly seems that once surveyed, these long-distance alignments were well marked in the landscape, since they appear to have often been used (where appropriate) for road planning some considerable time after being set out, just as this one was.

The start point on Bullamoor is important, since it is also marks an alignment change of the road that runs north from the Legionary fortress at York past Thirsk to the R. Tees and

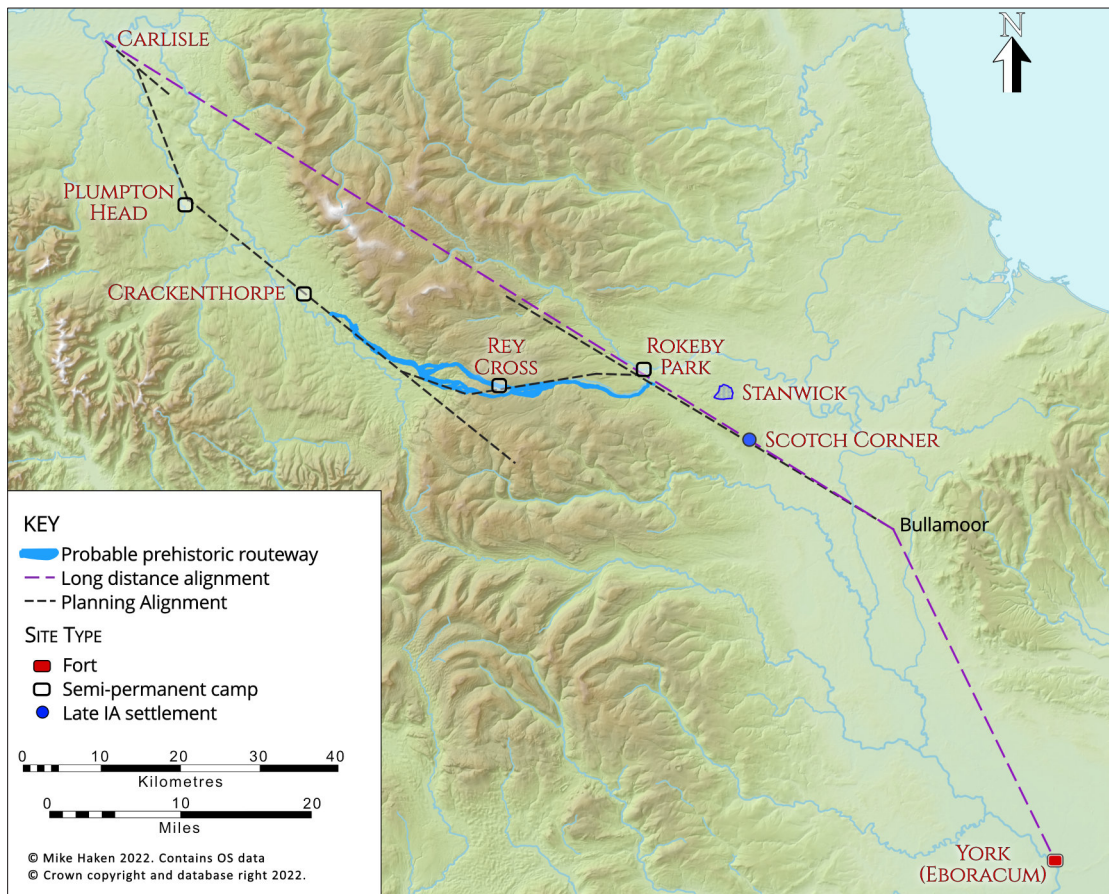


Fig. 17 Map showing the original long distance alignments (LDAs) from York to Carlisle, and the second phase of survey close of the course of the prehistoric routeway which formed the basis of the road planning. Whilst the semi-permanent camps are marked, these may not have been in existence when the survey took place.

beyond (RR80a) (Haken 2017). The early origins of this road have recently been attested by the discovery of a Flavian fort at Thirkleby, southeast of Thirsk (Millett & Brickstock 2020). Bullamoor is visible as a high point from York, 47 km (29 miles) away, and any survey of which the Bullamoor – Carlisle line was part, probably started there (figs. 16 & 17). If so, it would be unlikely (although not impossible) that it was set out before a Roman presence was established at York. There is, however, no reason to assume that Carlisle must have already been established. The site could have been selected as a target point for the survey, with a view to the establishment of a possible fort there years before the fort was actually built, or the survey line could have been laid out from Bullamoor, through Scotch Corner, and then effectively 'into the blue' (John Poulter, pers. comm. March 2022) as a convenient means of surveying Teesdale. The date for the foundation of York has generally been assumed to be in about AD71 under Petillius Cerialis (eg Frere 1987, 83) although there is evidence to suggest possible pre-Flavian Roman military activity in York and at other Yorkshire sites such as Malton and Rocliffe (Wilson 2009) and more recently at Newton Kyme & Burghwallis (Haken 2021). Therefore, the possibility that the long-distance alignment to Carlisle was set out whilst the Brigantes were still a client of Rome cannot be ruled out.

When the time came to plan the actual course of the road to Carlisle, the surveyors chose not to follow the surveyed line beyond Rokeby Park, since that would have involved an almost impossible route through the North Pennines, preferring to be guided by the general route taken by the prehistoric routeway over Stainmore, which may well have included the Late Iron Age track heading out of Scotch Corner. This is not to say that the Roman principles of surveying were abandoned, far from it. It appears that a series of seven planning alignments were set out for the route and as is true of most Roman roads, these were not followed slavishly, many local deviations being made from the planning alignments due to the terrain and obstacles such as watercourses. The way they were set out in the landscape has been analysed using Poulter's principles set out above.

THE LONG DISTANCE PLANNING

Scotch Corner to South Stainmore

Given the clear contact and, as Fell puts it, 'concord' between Rome and the Brigantes over at least two decades (see Fell 2020), the surveyors setting out the initial planning lines were probably well aware of the dominant prehistoric route over Moudy Mea, so it should come as no surprise that they appear to have based much of their initial planning on it (see figure. 17).

When determining the first of the seven lines, it will have been clear that the surveyed line to Carlisle was a little too far to the northeast, since it had apparently been deemed important that the road sat just southwest of the top of the low ridge from Gatherley Moor to Smallways. Consequently, a new alignment seems to have been set out from the same point on Bullamoor (Haken 2018b), with the summit of Scarset Rigg and Green Fell behind used as a sighting point. Robert Entwistle (2019, 91-8) has suggested that this alignment may

not have been laid out from Bullamoor, but started at Scotch Corner and ran past Rokeby Park to Startforth (near Barnard Castle) and formed one side of an intriguing Isosceles triangle of alignments surrounding Stanwick. In Entwistle's model, the triangle is part of a system based on Lancaster, rather than the one proposed here starting in York. Whichever model is correct (and they are not necessarily mutually exclusive), there is no doubt that the alignment passes within a few metres of Haslegrove's proposed gap in the Scot's Dyke, so could potentially have been following the Roman road's prehistoric ancestor quite closely. Indeed, the line crosses the R. Greta just 120m south of the Roman fort at Greta Bridge, still within the natural break in the steep sided river valley that provides a relatively easy crossing point today, just as it did then. It is also the point where any routeway that avoided crossing the river would be forced to turn, as evidenced by one small segment of multiple trackways visible on lidar at Mill Wood (NZ 0849 1266). Whether the Rokeby Park camp existed before this line was laid out is unknown, but since the two are about 520m apart, it seems unlikely.

A short distance further on, when the line reached the eastern end of a long low ridge close to NZ 0720 1375, near to where St Mary's Church, Rokeby, stands today, a new alignment was set out heading almost due west in order to follow the ridge, similar planning to the previous alignment. This was sighted on a point just north of the hillock at Kilmonds, now Kilmond Wood Quarry. The alignment was carried over a slight brow as far as NZ 0189 1390 (now within Hulands Quarry), where the Roman surveyors could see the Greta valley come into view as it climbs westwards. As we have seen, there is no concrete evidence as to the route of the prehistoric trackway between Rokeby/Greta Bridge and Bowes. What little evidence there is, however, suggests that the main part of it kept to the south of the R. Greta, 2.5 km (1.5 miles) to the south of the Roman alignment at this point. Whilst a second prehistoric route north of the river and closer to the Roman line cannot be ruled out, it could be argued that the Roman alignment was making an improvement to the route by cutting off a corner, taking a more direct, and from a Roman perspective, more practical route to achieve the same objective.

From what is now Hulands Quarry, the Roman surveyors could easily see Moudy Mea, the hill at the Pennine watershed south of the Stainmore pass, which they used as a convenient sighting point for the third alignment heading up the Greta valley. South of Bowes, we see the first evidence for the prehistoric route south of the river, as the narrowing valley forces both the prehistoric and Roman lines close together, with the prehistoric route being probably best regarded as now using both sides of the valley, certainly west of East Mellwaters. At Aygill Bottom, just south of Spital, the prehistoric route splits, the northern branch heading through the Stainmore Pass and then skirting around the valley, whilst the southern branch takes to higher ground, eventually crossing Moudy Mea at about 510m AOD before heading down towards Brough, where all trace of it is lost. Whilst the Roman road, as eventually built, followed the northern route, there is no indication of any long alignment branching from the Bowes-Moudy Mea line in that direction, and it seems much more probable that the initial planning line was projected on a further 1500m from Moudy Mea to South Stainmore (NY 8566 1127), where the view across the upper Eden valley will have opened up in front of them. It is suggested, therefore, that from South Stainmore, the next alignment ran along the southern edge of the prehistoric routeway to the top of Thorny Hill,

a drumlin west of Brough, close to the point where the north and south prehistoric routes must have converged before turning to head northwest. Since this fourth alignment was not actually used when the road was built along the northern route, its existence is only ever going to be theoretical, but logically a fourth alignment must have been set out somewhere, and there is no evidence whatsoever for any realistic alternative.

From Thorny Hill, it is clear that whilst the long-distance planning from Scotch Corner to Brough was all made as a single continuous process heading northwest, the rest of the planning was actually carried out in the opposite direction from Carlisle, both sections meeting at Thorny Hill.

Long Distance Planning from Carlisle to Thorny Hill

The nature of the terrain southeast of Carlisle must have caused the Roman surveyors no end of difficulties, partly because after crossing R. Petterill, they needed to keep just east of it, and partly because the numerous undulations and low hills of the morainic landscape meant that line of sight visibility in the desired direction was always going to be difficult, if not impossible.

From Carlisle (*Luguvalium*), using the high hill of Barrock Fell as a sighting point would have been ideal, since it is close to the actual route but that would have meant crossing the R. Petterill at least three times. Neither could they use the long-distance alignment direct from Bullamoor and Scotch Corner, since that would have carried the road too far to the east. Instead, the first long distance planning alignment seems to have been set out south eastwards from the fort (approximately in the area between where Tully House Museum and Carlisle Castle now stand) close to the line of London Road (the modern A6), using High Stand, a hill just southeast of Cotehill, as a sighting point. The surveyors clearly understood that they needed to follow the course of the river Petterill fairly closely, possibly suggesting that they were using a pre-existing routeway as a guide, although there is currently no known evidence of it in the modern agricultural landscape. Three and a half miles from Carlisle, northeast of Newlands (at about NY 4421 5232) immediately after crossing the top of a low hillock, a new alignment was set out heading more southerly. This was the first clue that suggested the system was set out from Carlisle towards Brough, and not the other way round. From here, Barrock Fell is prominent, but masks much of the high terrain further up the valley, including the col between the twin high points at Plumpton Head and Burnt Wood, the new alignment's destination. It would have been easiest for the surveyors to set out two alignments, one to the edge of Barrock Fell and another from there to the col between Bowscar Wood and Burnt Wood; instead, they went to some trouble to set out a perfectly straight line whose ends are not intervisible. There can be little doubt about this, since the Roman road between High Hesket (NY 4770 4418) to near Blackrack Beck (NY 4838 4258) aligns perfectly with the col nearly five miles further on. It should be noted that the alignment passes almost a mile from the early semi-permanent camp at Plumpton Head, sited below it in the valley, strongly suggesting that the camp did not yet exist.

Once the col between Plumpton Head and Burnt Wood was reached at about 260m AOD, the alignment was carried over the hill in typical Roman fashion as far as Back Wood (NY 5173

3477) at about 240m AOD, from whence there is a clear line of sight all the way to the Eden Valley near Brough. A new alignment was thus set out to Thorny Hill, 32.8km (20.4 miles) away, although the sighting point was more likely to be Rogan's Seat in Swaledale (672m AOD), a further 16 km (10 miles) distant, most specifically where it's eastern flank emerges on the horizon. This was the clincher as to the direction of planning, since from Back Wood the view southeast is generally very good, whilst if sighted the other way, most of the route cannot be seen from Thorny Hill. Indeed, whilst the top of the high point near Back Wood is theoretically visible from there, once Back Wood is reached there is no visibility north whatsoever, therefore the planning only makes sense if set out from northwest to southeast.

It seems that the first four alignments were all set out heading northwest, and therefore probably contemporary. However, the northwestern part of the route was clearly set out in the opposite direction starting at Carlisle. Whether this took place at the same time, with two teams working in opposite directions, or if one half of the survey preceded the other, cannot be easily determined. Certainly, neither half appears to pay any heed to the locations of the semi-permanent camps at Plumpton Head, Crackenthorpe, Rey Cross and Rokeby Park, or indeed to any known Roman military installations, suggesting none of the sites along the route existed at the time. Indeed, the fact that the camp at Crackenthorpe appears to respect either the survey or the road that followed it, seems to confirm this view.

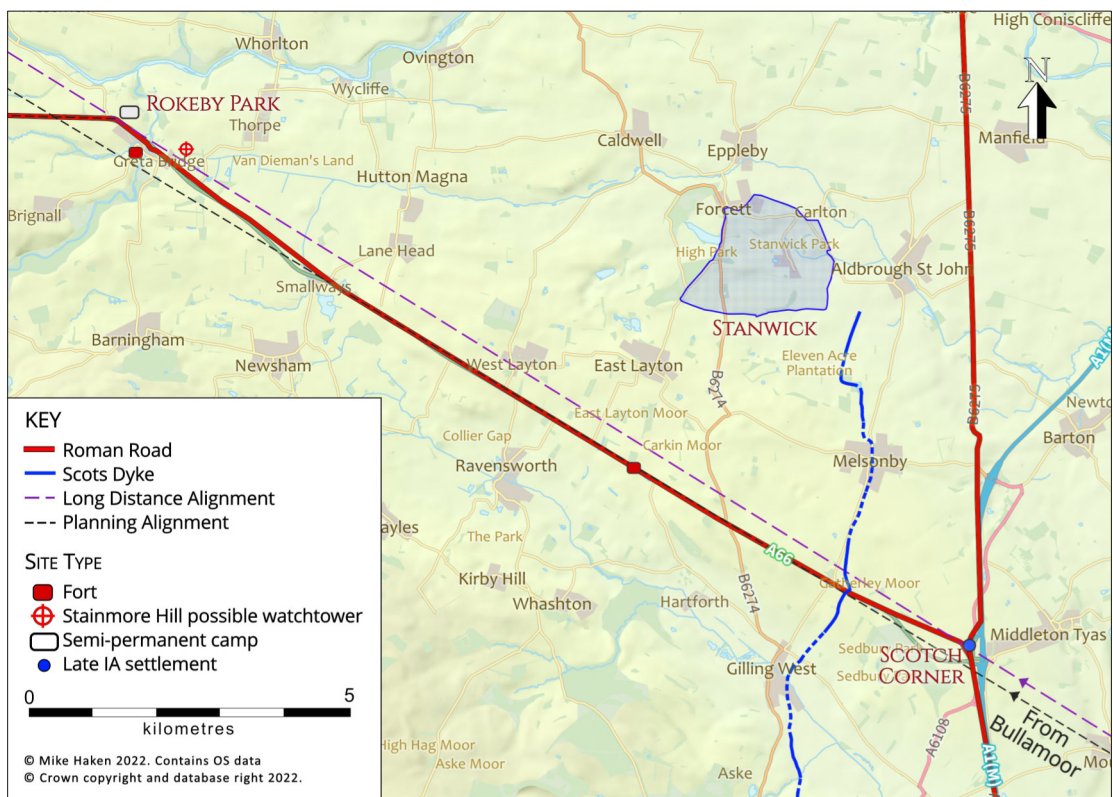


Fig. 18 Map showing both the original survey line from Bullamoor through Scotch Corner and Rokeby, and the revised line running just below the ridge, utilised when the road was built.

LATER STAGES OF ROAD PLANNING

Scotch Corner to Rokeby Park

When planning the road in detail from the settlement at Scotch Corner, a new alignment had first to be set out to meet the long-distance alignment from Bullamoor on Gatherley Moor, which it does at NZ 1953 0635, immediately east of the Scots Dyke (fig. 18). The implication that it might have been following an earlier route through the Dyke at that point, as postulated by Haslegrove, cannot be ignored. From here, the road was not built quite on a precise straight line, rather a very long shallow curve, being 34m north of it at the Scots Dyke, reaching 40m south of the line on Carkin Moor, and just about on the line by the time it reaches Smallways. Whether this represents issues with marking out the original alignment, or an error that crept in during the detailed surveying, we cannot determine, but deviations of this magnitude and sometimes much more, apparently accidental, are extremely common, as will be seen later. Whilst it would have been feasible for the road to stick to the long-distance planning alignments and change direction to head west near St. Mary's, it does not, rather it changes alignment at Smallways (NZ 1141 1120) turning slightly more northerly to converge with the original long-distance alignment to Carlisle, meeting it at Rokeby Park. The only logical reason for this would have been to ensure that the road ran close to the semi-permanent camp at Rokeby Park, strongly suggesting that the camp (but probably not Greta Bridge fort) was built before the detailed planning of the road took place (although after the long distance planning).

Rokeby Park to Bowes

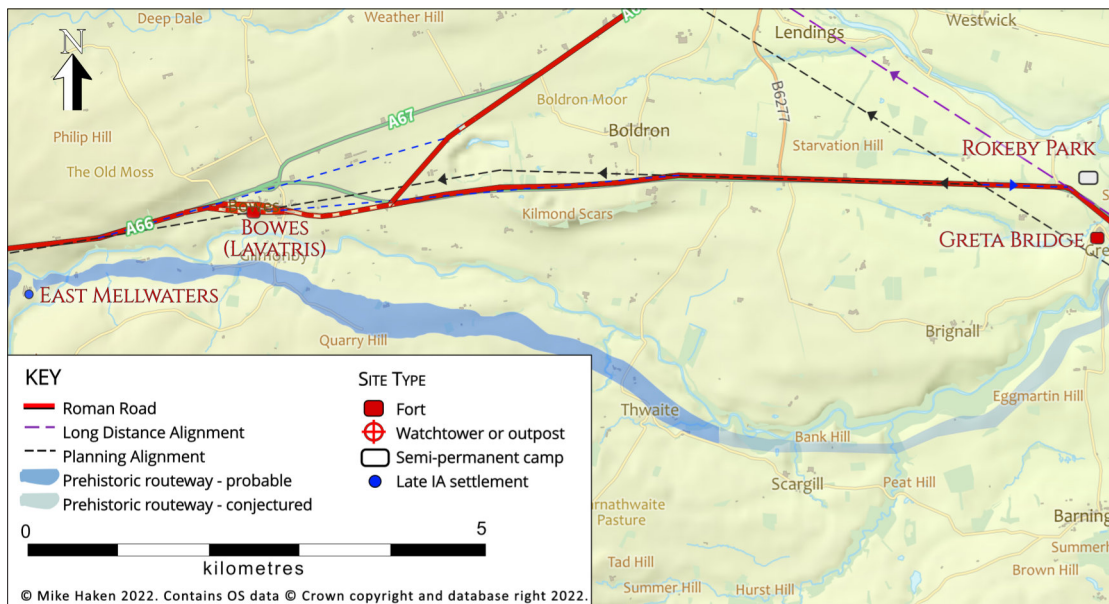


Fig. 19 Map showing road planning between Rokeby and East Mellwaters, cutting the loop in the prehistoric trackway which seems to keep south of the R. Greta

The deviation from Smallways meant that the long-distance planning alignment west towards Bowes then had to back-sighted east as far as the camp (fig. 19). The line of the road west adhered to its alignment very closely as far as Gallows Hill (NZ 0388 1385), as is reflected in the straightness of the A66 today. A deviation was set out from Gallows Hill to the east gate of Bowes fort, establishing that Bowes must have been built before the road was constructed, ie probably about AD72, which fits well with previous interpretations of the evidence there (Frere & Fitts 2009, 49-51). The road does not follow the new deviation very closely, (fig. 20) deviating about 50m from it to the north near Bowes Cross Farm, presumably to avoid the edge of the hill at Kilmond, now quarried away. Closer to Bowes however, it wanders over 100m from the line, where it seems to be just south of the current lane that becomes the main road through the town, known as ‘The Street’. The actual course of the road in and around Bowes is not known, and whilst it is often assumed to be represented by The Street, that is problematic given the known presence of an annexe to the north of the fort.

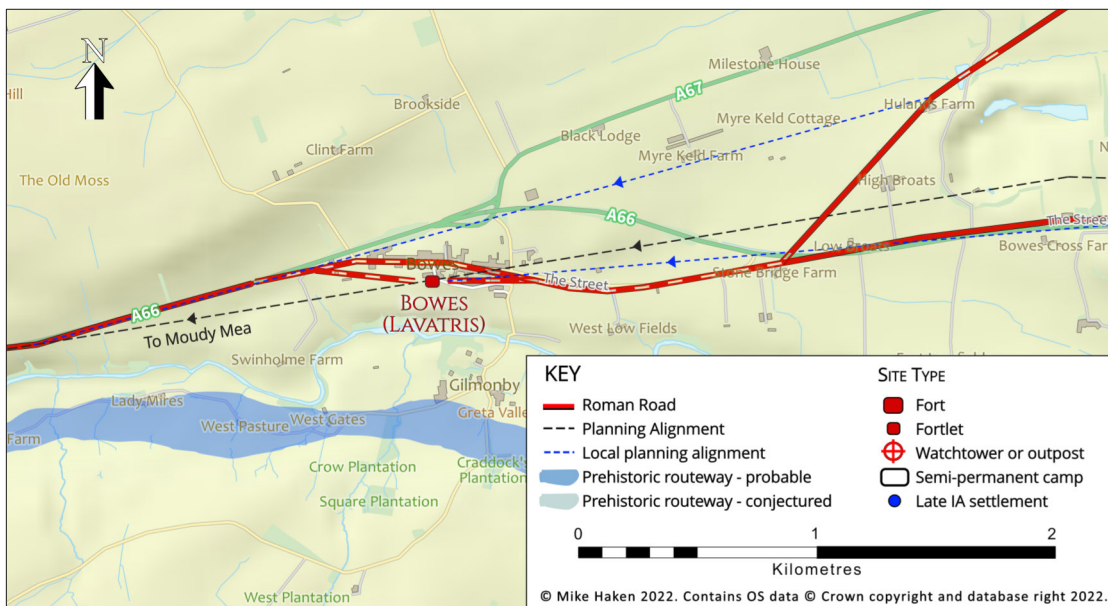


Fig. 20 Closer view of road planning around Bowes, showing how the local deviation runs to the east gate of the fort, and how the first alignment of RR82 west was started from the point where RR820 changes alignment .

Bowes to Moudy Mea & South Stainmore

The earlier long-distance alignment actually passes through the west gate of the fort at Bowes (Lavatris), thought to be early Flavian with a date of c.AD72 or just after being quite possible. It seems, therefore, that the fort was deliberately positioned so that the west gate sat on the long-distance planning line. This only makes sense if the road had not yet been constructed when the fort was built in c.AD72, the west gate then effectively becoming the viewpoint for the alignment up the valley when the road west was eventually built. The road from Scotch Corner was substantially constructed, and as Fell points out, could only

plausibly have been constructed once military control had been established (Fell 2020, 703), presumably soon after the establishment of Bowes c.AD72, but perhaps no further than Bowes at this stage, as has been suggested previously (Bidwell & Hodgson 2009, 9 & fig. 3).

Indeed, there is recent evidence to support the idea of the road temporarily stopping at Bowes, with the construction of the road west happening several years later than the original planning stage. Part of the road west of the fort falls along a new alignment, a deviation, set out from the point near Hulands Farm where RR820 from Bishop Auckland changes alignment as it turns to join RR82 (RRRA 2001, 335-6) (fig. 20). This alignment could not have been set out before RR820 had at least been planned, and it would seem unlikely that such planning would have happened before the fort at Binchester was established, probably somewhere between AD75 & AD80 (Mason 2021, 119) (Ferris 2011, 41). It appears, therefore, that whilst the initial planning for the road west from Bowes took place no later than AD72, it was probably not constructed until sometime after AD75 fitting well with an Agricola date for construction suggested by Robinson (2001, 86).

The Roman road follows the alignment from Hulands Farm from at least as far east as NY 9849 1346, west to NY 9756 1320, where it meets the long distance planning alignment aimed at Moudy Mea. There is an immediate gentle deviation to avoid a stream valley at Rovegill House, the road returning to its alignment at Pasture End (NY 9562 1289), following it reasonably well for the next 2.7 miles as far as Spital.

Roman road layout in the upper Eden valley

From Spital as far as Warcop, the road follows a major deviation from the original planning for nearly 18 km (11 miles), with a clear decision having been made to follow the course of

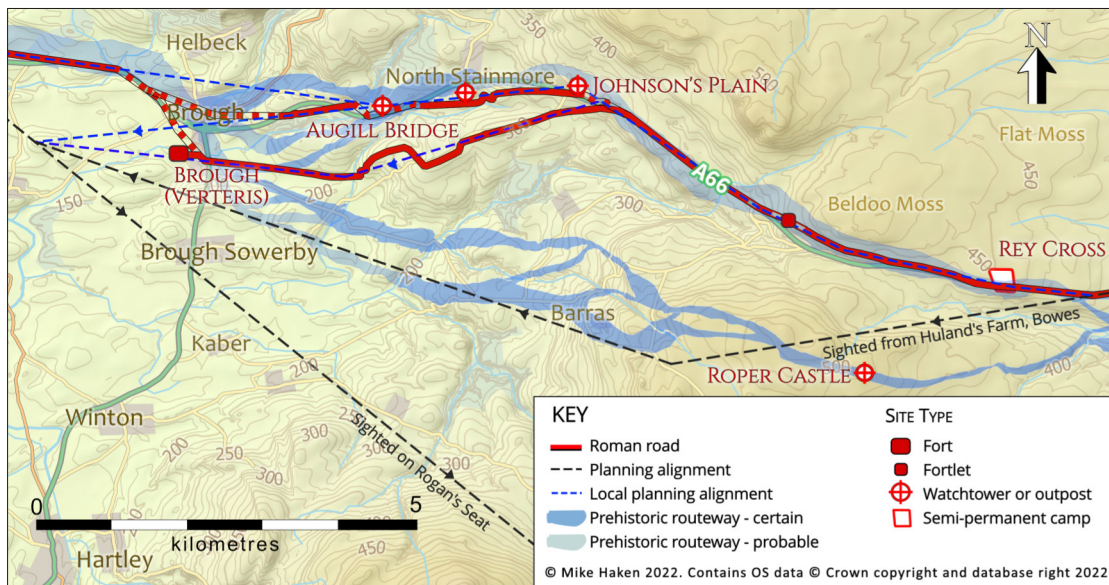


Fig. 21 Overview of the original survey and the later local deviations made during road planning between Old Spital and Thorny Hill

the northern prehistoric routeway, instead of the original plan to take the southern route (fig. 21). It is also clear that by the time this new planning took place, Rey Cross had now been built, since the road from Spital is aligned on the southeast gate at Rey Cross but makes a slight change of alignment to allow it to pass through the southwest gate. Other archaeological evidence found during excavation supports this conclusion (Robinson 2001, 81). Leaving Rey Cross, forward visibility is extremely limited by the curvature and undulating nature of the valley side and it seems that it was deemed impossible to set out any long alignments. Instead, the surveyors laid out two alignments around the hillside for about 3500m to NY 8681 1333, which the road followed as well as was possible given the terrain (fig. 22). The road as built appears to have run through the fortlet of Maiden Castle, although previous commentators have suggested that it must have run around the north of the fortlet (Welfare 2001, 98). Either way, the course of the road is far from straight, and it seems that some re-routing of the road must have taken place, since the limited datable evidence for the fortlet suggests a late first/early second century date (ibid), much later than seems probable if it has any relationship with the watchtowers, as has previously been suggested (Woolliscroft 2001, 99-100).

From Maiden Castle, the road continues to run north westwards in shortish straight lengths, the longest being 1150m, the shortest just 25m, with continuing poor visibility forwards. There are stretches of braided trackway close to the Roman road most of the way between Rey Cross and Johnson's Plain watch tower, and whilst most of those just down the slope

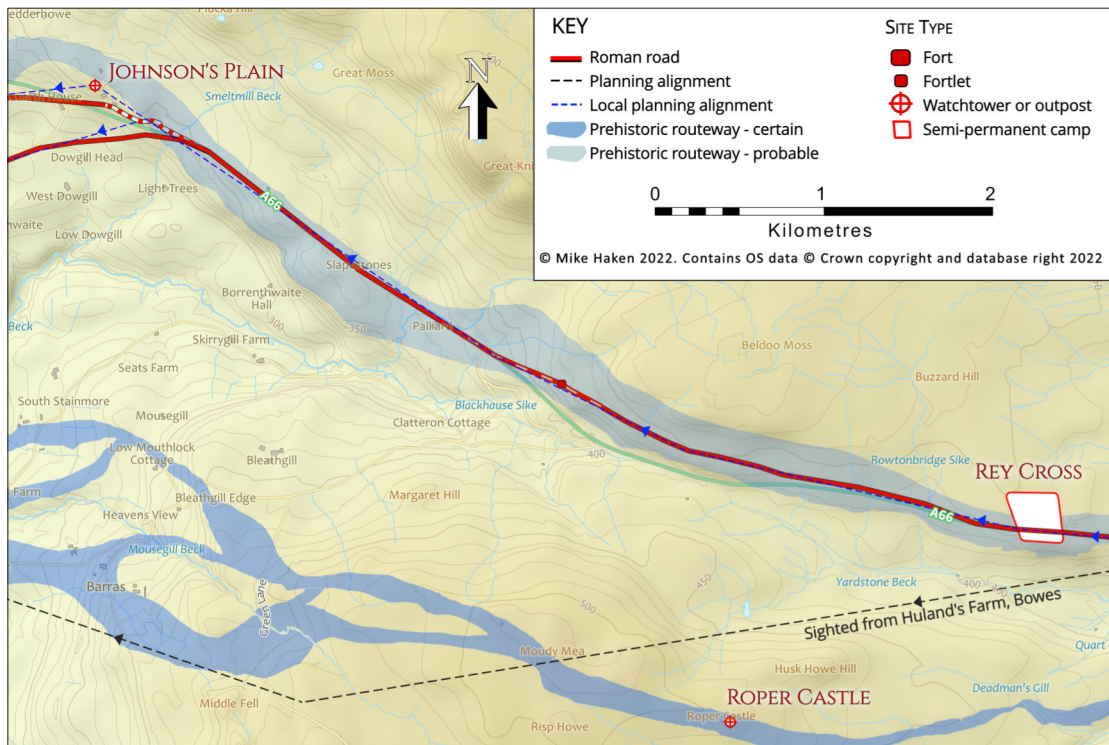


Fig. 22 Map showing the Roman road from Rey Cross to Johnson's Plain, where long alignments were impossible due to the terrain.

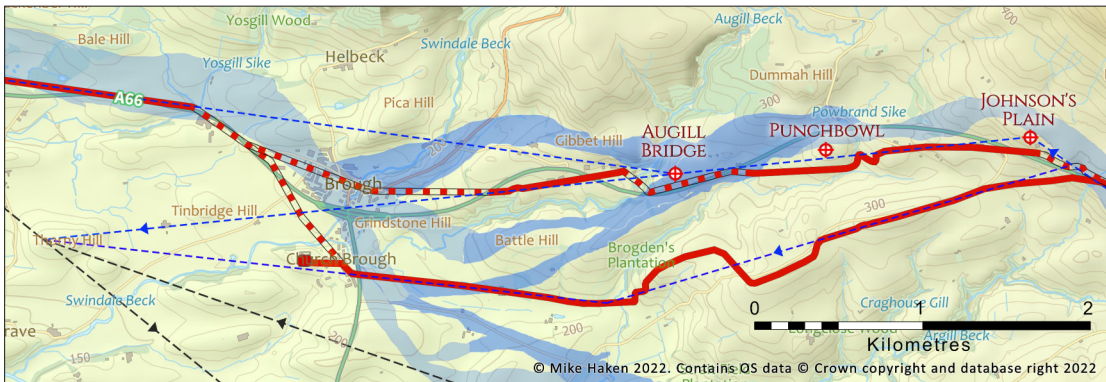


Fig. 23 The alignment from Johnson's Plain watchtower to Thorny Hill, also showing the secondary deviation set out from Augill Bridge watchtower towards Warcop. For Key, see fig. 22.

from the Roman road are likely to relate to use when the road was unrepaired in the medieval period, some could well be prehistoric and used as a guide by the Roman *mensores*, especially those up the slope from the road on the long arc around the valley near the Punchbowl and Johnson's Plain towers. There is currently no way of knowing for certain. There is however, a strong possibility that an alignment may have been set out, from the bottom of the short descent from Maiden Castle at NY 8681 1333 running directly to the watch tower at Johnson's Plain. Whilst the road does not follow this line perfectly at any point, neither does it deviate more than 46m from the line for over 2.75km (1.74 miles). Certainly, such an alignment would make sense, since an alignment was clearly set out from Johnson's Plain down the valley to the already utilised sighting point on Thorny Hill (fig. 23). Not only do two short sections of road fall upon this line from the tower, from NY 8366 1487 to NY 8336 1484 past Bluebell Farm, and from NY80511454 to NY80511454, but the watchtower at Augill Bridge does as well. The tower at Augill Bridge was also used to set out an alignment running to a point east of Warcop (NY 7623 1546), with the alignment being used perfectly for the westernmost two kilometres, although the direction of planning could not be determined. As can be seen from figure 23, a series of local deviations had to be made from both planning lines to account for the difficult terrain. The course of the original road near the fort at Brough (*Verteris*) is currently unknown, but there presumably had to be some sort of link road (fig. 23). Brough itself was probably established before the road was constructed, possibly being early Flavian (Jones 1977) and almost certainly founded before AD80. As for the towers, their use as sighting points demonstrates that they must have been built (or at least planned) before the detailed planning of the road took place, but after the establishment of Brough fort, since the watch towers are pointless without a garrison to relay information to. Figure 24 shows the results of viewshed analysis of the watchtower sites, assuming an observation height of 10m as suggested by Wooliscroft (2001, 16). The many trackways identified in the Eden valley during the lidar survey are also shown, and suddenly the purpose of the towers is clear: to observe for potential threats approaching from the south. This fits well with the previous suggestion, i.e. a construction date of somewhere between AD72 and AD80, but possibly before full military control was established.

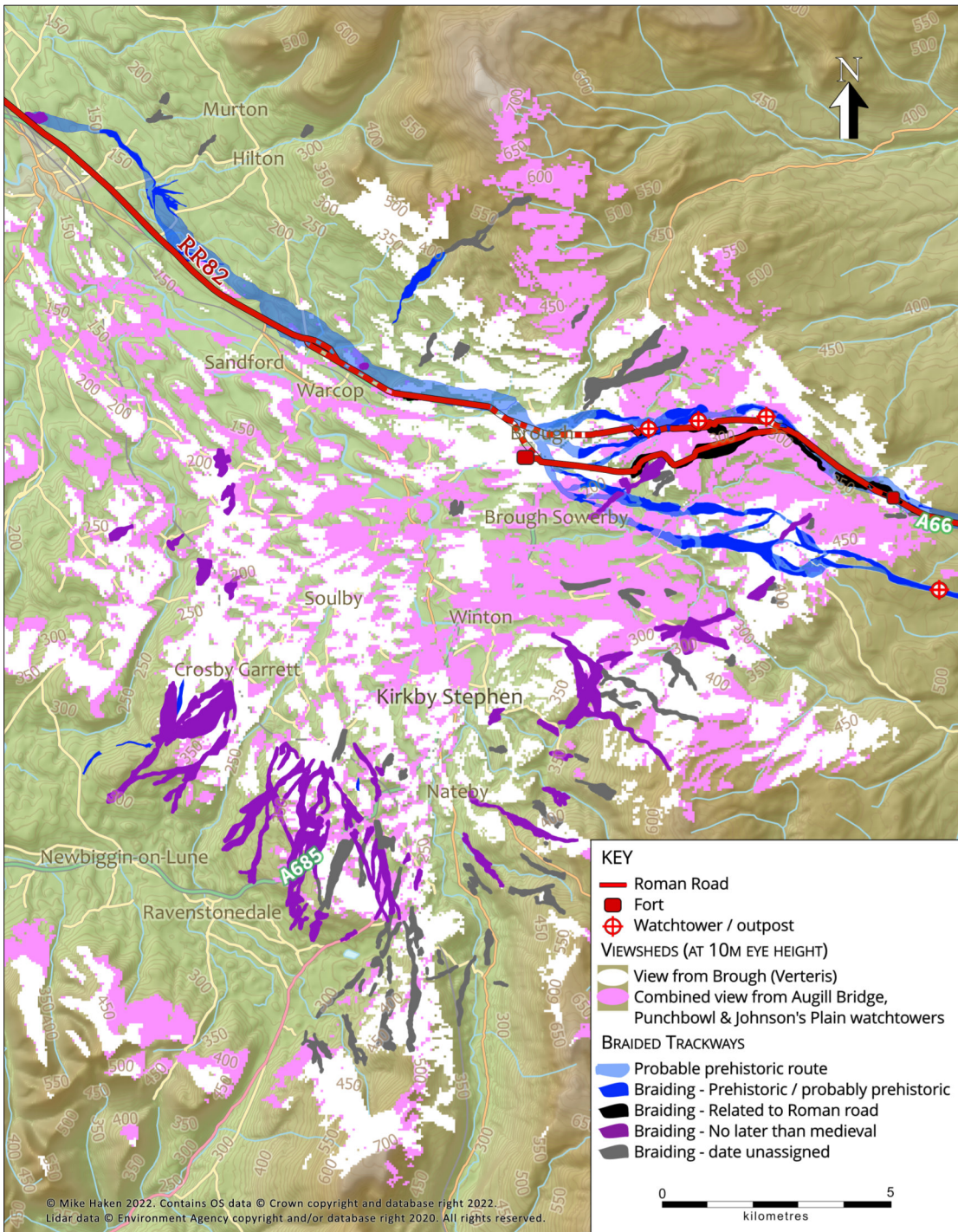


Fig. 24 Viewshed analysis showing how the combined view from the Stainmore watchtowers fills a substantial gap in the view from Brough Roman fort (Verteris).

At some later date, there had clearly been difficulties maintaining the stability of the road as it traversed the slope between Johnson's Plain tower and Augill Bridge. East of Newton Garth, lidar shows how the road appears to have been seriously eroded, and possibly collapsed down the slope in places. To alleviate the problem, a second road was constructed, utilising an alignment along Long Rigg which was set out from the original road at about NY 8468 1473. To ease the gradient, the new road left the old at around NY 8511 1455, east of Slapstone Bridge, and made a gentle turn using four short straight lengths before following the alignment south of the modern lane along Long Rigg. Rather than make a tricky descent through Leonard's Cragg, which would have involved major engineering, the road took a circuitous course around the crag before using a very well-engineered zigzag to descend the steep slope down to the crossing of the Powbrand Sike. After crossing the stream, the road follows a single alignment again set out towards the drumlin known as Thorny Hill. Whilst the road presumably stops short of the fort (it cannot be traced west of the modern A685), the alignment runs along the southern edge of the fort to Thorny Hill. It is unclear in which direction this last alignment was planned.

ROAD PLANNING BETWEEN BROUGH AND CARLISLE

As has already been shown, the road left Brough along an alignment set out between the Augill Bridge watch tower and NY 7623 1546 just east of Warcop. Rather than continue to the long-distance alignment northwest to Back Wood, a further deviation was set out to a point 340m southwest of the long distance alignment (NY 7235 1770), thus avoiding several drumlins. Halfway along this line, the modern A66 makes a chicane at Street House which appears to be on a Roman line, although there is also evidence for a Roman road keeping largely straight on; it is not clear which came first (fig.25).

From NY 7235 1770, another alignment was set out to NY 6920 2068, just northeast of Appleby, where the road rejoined the long-distance alignment. The road followed the alignment reasonably well over Ketland Moor and past Coupland, drifting from the line by up to 30m in two places. Whilst the modern road swings away towards the river near Crackenthorpe, the Roman road kept very close to the original alignment, running very close to the semi-permanent Crackenthorpe camp (fig. 26). The camp is not quite parallel to the road, but it is close, however this does not mean that the camp must post date the Roman road or the earlier planning alignment it runs along; not if the Roman camp was built next to a prehistoric route that the Roman road later followed, as we suspect is the case. Even if the prehistoric route was closer to the Eden, as is possible, the general bearing is determined by the funnelling effect of the River Eden and the Trout Beck either side, just as the Roman road is.

By the time the road between Bowes and Carlisle was built, plans were forced to change due to the establishment of the fort at Brougham. This meant not only constructing a road close to the original long distance planning line from Burnt Wood but also planning a new route from west of the Eden crossing (NY 6022 2856) near Temple Sowerby, linking Brougham to the route in both directions. It appears that in both cases, the detailed planning took place from southeast to northwest at every stage. Whilst Ratledge has suggested that the direct

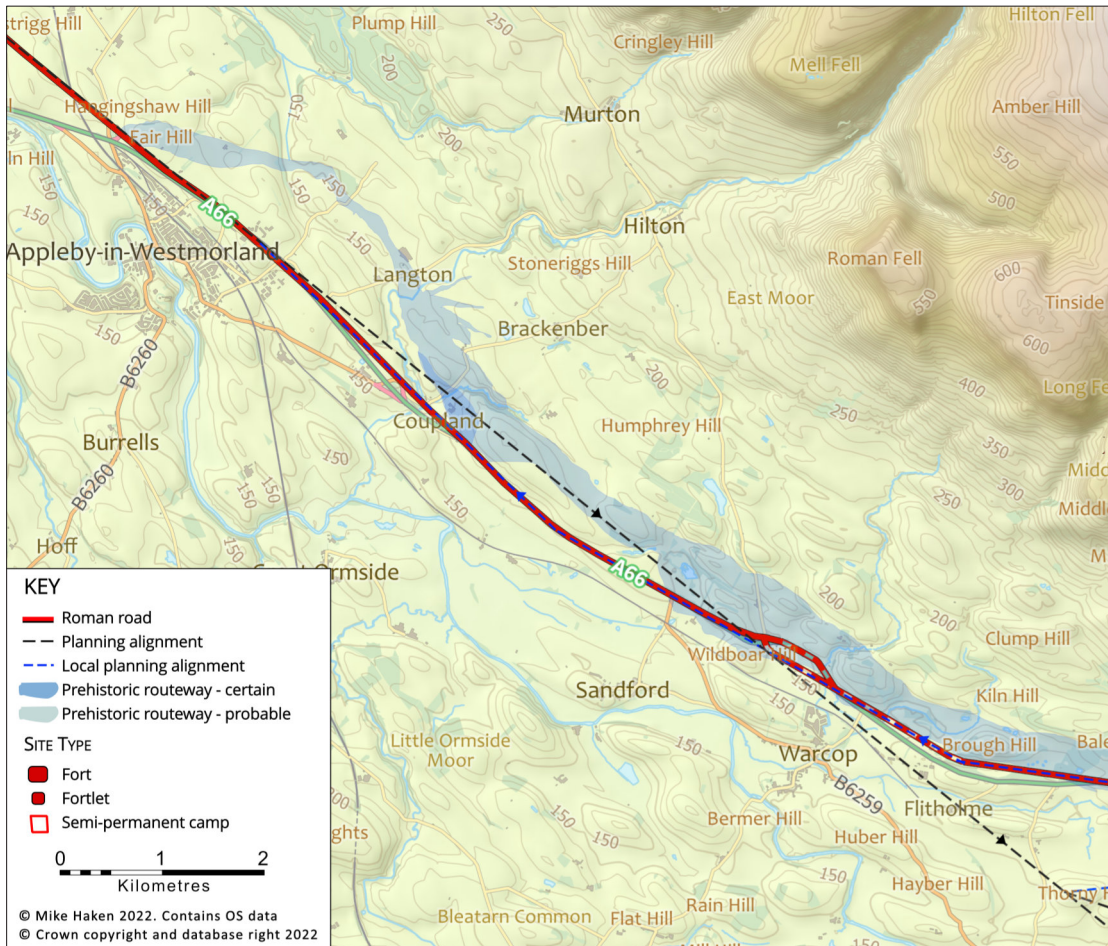


Fig. 25 Map showing the road planning from Thorny Hill to Appleby-in-Westmorland

route through the hills (RR82aa(x)) was the earlier of the two (Ratledge 2018b) (it was certainly the earliest planned), in fact it seems likely that both routes were built at roughly the same time, the direct route serving long distance traffic, and the new diversion via Brougham serving military traffic to the fort, and potentially to the Cumbrian mountains to the south west. This is the only interpretation that explains why the Brougham diversion branched off the direct route near the R. Eden, and yet by the time they met again, the 'diversion' was the major road with the original direct route joining it.

Whilst the direct route (RR82aa) unquestionably exists (Ratledge 2018b), its route is far from certain, and any attempt to analyse the planning of the local deviations would undoubtedly prove fruitless. The planning of the 'diversion' past Brougham, however, is quite straightforward. Due to the undulating terrain, line of sight planning at a local level was impossible, although from the start point, the easternmost summit of Bowscale Fell over 15 miles away is just visible and was used as a sighting point (fig. 26). A slight correction (possibly accidental) was made at School House (NY 5735 2885) where there is still no line of

THE STAINMORE ROAD: FROM IRON AGE ROUTEWAY TO ROMAN ROAD

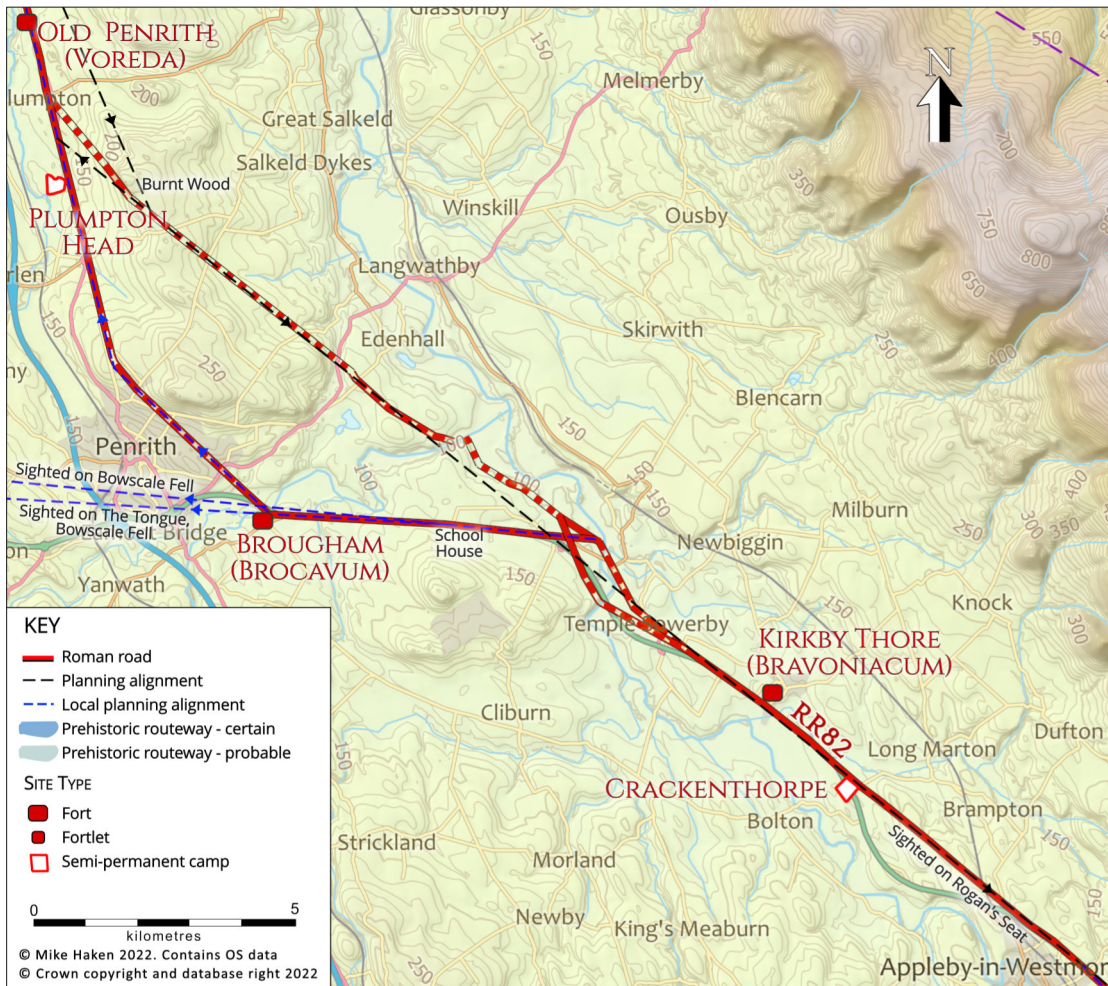


Fig. 26 Map showing the road planning, as far as can be determined, from Appleby-in-Westmorland to Plumpton Head, with the planning of the major deviation for the road from the R.Eden to Brougham, sighted on two high points on Bowscale Fell.

sight with Brougham just two miles away. The line again sighted a high point on the top of Bowscale Fell, albeit a slightly different one this time, since more had by now come into view and may have caused some confusion.

At Brougham, the new line changed significantly at a point just above the riverbank (NY 5399 2904), with a clear aim of keeping to the south west of Beacon Hill before swinging northwards towards the camp at Plumpton Head and ultimately Carlisle. A new line was set out from above the R. Eamont towards Fair Hill (fig. 26), with a couple of minor changes of alignment as it turns around the edge of the hill as far as NY 5097 3206. The line on Ordnance Survey maps shows the Roman road running along Inglewood Road at this point, which is incorrect. From here, the view north opens up and a new long alignment was laid out running just west of north, aligned on Barrock End, a level promontory on the eastern edge

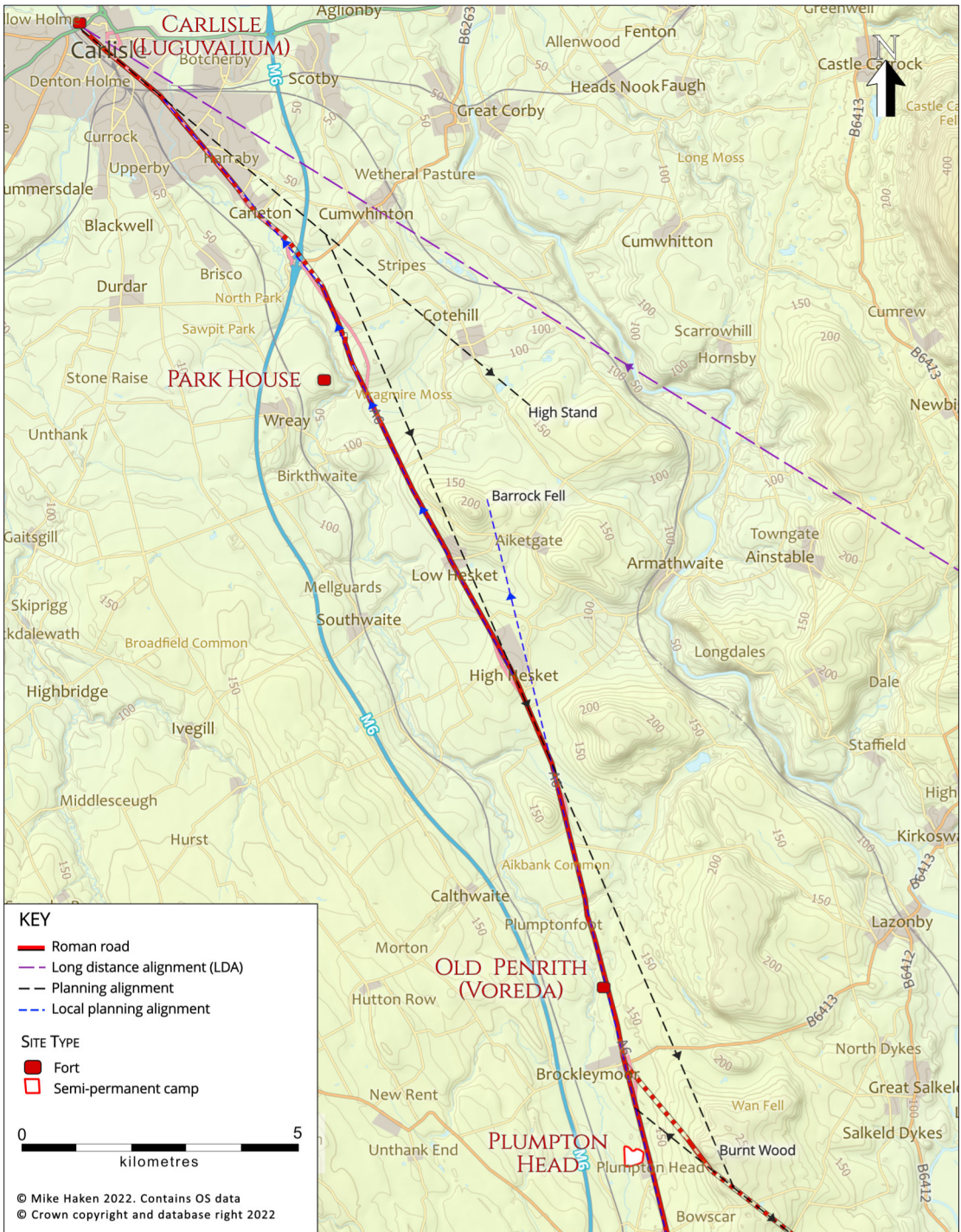


Fig. 27 Map showing the road planning from Plumpton Head to Carlisle

of Barrock Fell. The road was built along this new alignment very closely, with only two very minor local deviations, until it met the original long alignment from northeast of Newlands to the col between Plumpton Head and Burnt Wood, at about NY 4838 4260 (fig. 27). The road then turned west slightly to follow the original long distance planning alignment for about a mile as far as High Hesket.

From High Hesket, the long-distance planning was not followed since it would have meant climbing over the north western flank of Barrock Fell. Instead, a deviation was planned keeping west of the original planning line from Newlands, whilst also keeping east of the R. Petteril. Unfortunately for the surveyors, the terrain is undulating and generally low, with few good sighting points. Consequently, the road appears to have been set out in relatively short lengths, changing alignment as little as possible but maintaining an easy course just east of the R. Petteril. The first of these was set out to the end of the northwestern flank of Barrock Fell, deviating from the original alignment by just 4.5 degrees. The line was then carried just over the brow to about NY 4584 4759, with a very slight adjustment then made to keep east of the steep slope above the river, just below Carleton Hill. Again, the line was carried a little further over a rise so that the view was again improved, the next section being set out from about NY 4472 4992. The new line was moved a little more northerly, to keep to the more even ground away from the river, until about NY 4418 5135 at Lyndhurst. Again, the road has come over a rise to drop down to a point with much better visibility, where a slight hillock can be seen just west of the point where the first long alignment from Carlisle crosses the R. Petteril. The eastern side of the hillock was used as a sighting point, and whilst the road deviates from the line a little, first to the northeast, and then to the southwest over the first mile and a half, the last mile and a half lies along the alignment, before the road turns slightly northwest (at NY 4121 5483) along the original long-distance planning line to head directly to Carlisle.

SUMMARY & DISCUSSION

Recent analysis of lidar coverage from the National Lidar Programme has resulted in the identification of a routeway which can be traced almost continuously for just over seven miles from just east of Brough (Cumbria) via Moudy Mea to Aygill Bottom (Co. Durham) (fig.17). It survives as a series of interwoven holloways, usually known as braided trackways, in bands up to 300m across. The word 'routeway' has been used for good reason, since there is no indication anywhere along its course, either from lidar or aerial photography, that any part of the braided tracks and holloways identified were ever defined by either ditches or banks. It is also likely that the braiding seen on lidar is only a part of what originally existed, with ploughing and 'improvement' of grassland almost certainly destroying surface traces of the tracks. The braided trackways could perhaps be considered as the physical manifestations of users finding the most suitable ways to negotiate the landscape, rather than a defined track or road in any modern or even Roman sense. That said, it is possible that at some stage there was a thin metallised surface on one or more trackways as there is in and around the settlement at Scotch Corner, although there is currently no evidence for that, and it will only be determined one way or the other by field investigation, probably requiring a major excavation.

There were clearly two alternative routes between Brough and Aycliffe Bottom, the main southern one over Moudy Mea past Roper Castle, and an alternative northern route via Rey Cross and North Stainmore, possibly a winter or bad weather alternative since its maximum altitude is 70m lower, although the terrain is more difficult. The creation of the latter can now be given a given a *terminus ante quem* of c. AD72, which, if Roper Castle is contemporary with Rey Cross as now seems a distinct possibility, can be applied to the main southern route as well. The northern route is also cut by the Roman road near Newton Garth, giving an additional *terminus ante quem* there of c.AD80. The extensive dyke systems in the catchment of the River Belah east of Brough, to which three different authorities have attributed anything from prehistoric to early medieval dates, provide further confirmation of at least an early medieval date for many of the surviving stretches of trackway, since they cut the trackways in several places.

The southern route's course is marked in a few places by modern lanes, such as at Leacett Lane, west of Powbrand Sike, making it clear that at least parts of the route remained in use through the medieval period, probably as a drove road, and arguably have never gone out of use. A slight note of caution must therefore be sounded, since whilst some of the braiding and therefore the origins of both north and south routes on Stainmore are unquestionably prehistoric, some of it will be much more recent, and it is often impossible to tell the two apart. This is particularly problematic with the more isolated surviving patches of braiding well away from Stainmore itself, such as at Coupland and Greta Bridge.

There is clear evidence for the routeway continuing beyond Bowes south of the R. Greta, and in all likelihood following the R. Greta past Greta Bridge to either Stanwick or Scotch Corner or more likely both. In the upper Eden valley, the north and south routes converge near Brough, with no indication of bending south, or of any major route joining from the south, which would certainly be expected if they were created mainly by traffic coming from around the local population, or from the Lune catchment to the south. This strongly suggests that the routeway extends much further down the Eden valley. Whilst the fragmentary evidence northwest of Brough is far from conclusive, it is sufficient to suggest the possibility that the route went at least as far as Appleby. Further release of new lidar data will be needed to be able to assess the most probable route over Plumpton Head. Therefore, it seems reasonable to suggest that the routeway was inter-regional. If so, this does somewhat beg the question as to what sort of traffic may have used it.

The mid Tees Valley to the east and the upper Eden valley to the west (thanks to the discovery of 33 'new' settlements during this study), appear to have been some of the most densely settled areas in Late Iron Age Britain. However, whether these population densities can be extended to the Vales of Mowbray and Eden is currently unclear, especially as an almost total lack of settlement in part of the Vale of Eden has been suggested (Ross's region 13; 2009, 335-6). What can be said with certainty, however, is that routeways on this scale only develop when there is a need for people to move across them, usually for trade. Both areas were agriculturally productive, although the marginally wetter climate in the Vale of Eden coupled with the slightly poorer soil, could well have resulted in the generally perceived 'polarity' between a prevalence of cattle husbandry in the west, and grain production in the east. It has been suggested that both areas were capable of producing a

surplus during the early Roman period (Stallibrass 2018, 50 & Fell 2020, 165), and the same could easily have been true in the Late Iron Age, with a potential exchange of produce across the Pennines. It is also quite possible that cattle from the west were being channelled through the settlement at Scotch Corner, given its clear relationship with Roman military supply networks in the AD50s and 60s whilst the Brigantes were still a client of Rome (Fell 2020, 163), supplying the Roman forces along the proto frontier perhaps 150 km (93 miles) to the south. The distances involved of potentially over 250km (155 miles) are not even close to the 600 mile long cattle drives from Caithness to London that Daniel Defoe recorded in 1726 (Defoe, 1727). If cattle were being supplied to the Roman army through Scotch Corner, then it would follow that at least elements of the Roman army would have been familiar with the Stainmore route well before AD70.

When the initial survey for the road itself was carried out, it certainly appears that the seven long distance alignments corresponded well with the prehistoric route, at least as far as Appleby where evidence runs out. That could be countered with the observation that when planning a road from Scotch Corner to Appleby, there are very few options as to the route chosen. However, it is the fact that the long-distance alignment from Bowes was carried over Moudy Mea and then another line from South Stainmore to Thorny Hill, rather than making any attempt to use the route later chosen for the road, that demonstrates how the initial surveyors were following the main pre-existing routeway. That inclination to follow a pre-existing route was demonstrated again when the road was built, since it follows the alternative prehistoric route skirting around North Stainmore fairly closely (fig. 28), albeit with Roman alignments set out from the watch towers.

The other fascinating observation about the survey which set out the long planning alignments, is that it completely ignores the four semi-permanent camps of Rokeby Park, Rey Cross, Crackenthorpe, and Plumpton Head, whereas the surveying for the road as built made sure to include them all. The only logical conclusion is that the camps had not yet been built when the survey was undertaken. Under the conventional model of the camps being part of the initial push north by Petillius Cerialis in c. AD72, this would have meant that the whole survey would have had to have been carried out in what was effectively enemy territory, which seems highly unlikely - unless of course the survey took place much earlier, before Venutius took advantage of the Roman civil war in AD69, the Year of the Four Emperors (Tacitus; *Historiae* 3.45). Just a decade ago such a suggestion would have been unthinkable, but now, given our knowledge of the Scotch Corner settlement, it makes perfect sense for the Roman military machine to wish to understand the logistics of supply if the Stainmore route was being used to supply the Roman army to the southeast in former Corieltauvian territory with food. This would also suggest that cattle were being moved from at least as far as the Solway plain, and could explain why a long-distance survey line appears to have been set out from Bullamoor to Carlisle, possibly even earlier.

A difficulty with this scenario is that the surveying can be traced back to Bullamoor, a location that only makes sense if the survey actually started in York; yet York is conventionally thought to have been founded under Cerialis. In recent decades, however, this conventional wisdom has been challenged, with a small but increasing body of evidence

Suggested dates	Action
Before AD69	Long distance survey from Bullamoor to Carlisle, part of a survey from York
Before AD69	Initial survey of route in seven alignments, set out from both Carlisle and Bullamoor, meeting near Brough
c.AD69	Construction of the semi-permanent camps & Roper Castle watch post
c.AD70/72	Construction of RR8, Dere Street, north reaching Scotch Corner
AD72/3	Establishment of fort at Carlisle (<i>Luguvalium</i>)
c.AD72/3	Establishment of fort at Bowes (<i>Lavatris</i>)
c.AD72/3	Construction of RR82 between Scotch Corner & Bowes
c. AD72/80	Establishment of fort at Brough (<i>Verteris</i>) and three watch towers in the upper Eden valley
c. AD 72/80	Establishment of fort at Brougham (<i>Brocavum</i>)
c.AD75/80	Planning & Construction of RR820 Bishop Auckland to Bowes
c.AD75/80	Planning & Construction of RR82 Bowes to Carlisle

Table 2. A suggested chronology of the various stages of survey, planning and construction along the Stainmore road up to about AD80.

supporting a potentially pre-Flavian date for Roman military activity not only in York (Ottaway 2004, 33), but at other sites in Yorkshire (e.g. Wilson 2009; Haken 2021).

Going back to the Stainmore route and the idea of the camps being part of Cerialis's push north, there is a further problem. Viewshed analysis has shown that Roper Castle appears to have been built to help fill the gaps in visibility down the Greta valley from Rey Cross, with neither site having any view across the Eden valley. In other words, they are looking east, which is incompatible with Rey Cross having been built to accommodate an army moving north westwards. This is discussed in detail in a separate paper (Haken in prep.) which will suggest that they were not built by Cerialis at all, rather by his predecessor Vettius Bolanus.

From all the various logical arguments proposed in this paper, it is now possible to construct a probable timeline of the various stages of survey, planning and construction along the Stainmore road up to about AD80. There remains considerable uncertainty, particularly with the establishment of Brougham which was probably in place by the time the road was built but could just conceivably be later. Kirkby Thore (*Bravoniacum*), whilst not in Table 2, is probably of Agricolan date (Bidwell & Hodgson 2009, 64), but its relationship to the Stainmore road is currently unclear.

In conclusion, the discovery of the predecessor to the Roman Stainmore road has provided evidence, for the very first time, that Roman *mensores* did indeed use the course of existing routes when planning new roads, although they did not follow them slavishly. Subsequent detailed analysis of both the prehistoric and Roman routes, has helped to shed further light on the fascinating period at the end of the Brigantes' time as a client of Rome, and the start of the Roman military occupation of northern Britain.

ACKNOWLEDGEMENTS

Whilst it eventually took on a life of its own, the initial research behind this paper only took place to provide background to the geophysical survey conducted by the RRRRA on the semi-permanent camp at Rokeby Park. I therefore wish to thank all the volunteers from both the RRRRA and NAG who made that survey possible, along with Sir Andrew Morritt, on whose land the camp lies. The paper would not have been possible without John Poulter's incomparable work on Roman road planning and his comments during the final preparation of this paper have been invaluable, as indeed have those of Rob Entwistle; the paper is greatly improved as a result, even if we do not always agree on every point!

BIBLIOGRAPHY

- Abramson, P. 1995: 'A Late Iron Age settlement at Scotch Corner, North Yorkshire'. *Durham Archaeological Journal*, Volume 11, 7-18.
- Annis, R. 2001: 'The Stainmore 'signal stations' or tower chain'. In B. Vyner, P. Robinson, R. Annis & J. Pickin (eds.), *Stainmore: The Archaeology of a North Pennine Pass*, Tees Archaeology, Hartlepool, 98-111.
- Bellhouse, R.L. 1953. 'A Roman post at Wreay Hall, near Carlisle', *Transactions of the Cumberland & Westmorland Antiquarian & Archaeological Society*, Volume 53, 49-51.
- Bell, M. 2020: *Making One's Way in the World*, Oxbow Books, Oxford.
- Bidwell, P. & Hodgson, N. 2009: *The Roman Army in Northern England*. The Arbeia Society, Newcastle upon Tyne
- Bishop, M.C. 2014: *The Secret History of the Roman Roads of Britain*, Pen & Sword Military, Barnsley.
- Bodleian Libraries 2021: *The Gough Map of Great Britain* <<http://www.goughmap.org/about/>> accessed 2 January 2022.
- Bradley, R. & Edmonds, M. 1993: *Interpreting the Axe Trade*, Cambridge University Press, Cambridge.
- Bridgland, D., Innes, J., Long, A. & Mitchell, W. 2011: *Late Quaternary Landscape Evolution of the Swale-Ure Washlands, North Yorkshire*, Oxbow, Oxford.
- British Geological Survey 2022: *GeoIndex Onshore*.< <https://www.bgs.ac.uk/map-viewers/geoindex-onshore/>> accessed 14 January 2022
- Camden, W. 1610:. *Britannia, or, a Chorographickall Description of the most flourishing Kingdomes, England, Scotland, and Ireland*.
- Centre for Ecology and Hydrology 2011: *UKSO Land Cover Map 2007* <<http://mapapps2.bgs.ac.uk/ukso/home.html>> accessed 22 August 2019.
- Clough, T.H.M. 1969: 'Bronze Age Metalwork from Cumbria', *Transactions of the Cumberland & Westmorland Antiquarian & Archaeological Society*, Volume 69, 1-39.
- Collingwood, R.G. 1930a: 'A newly-discovered Roman site in Cumberland', *Antiquity*, Volume iv, 472-7.
- Collingwood, R.G. 1930b: 'The Medieval Fence at Rydal and other Earthworks', *Transactions of the Cumberland & Westmorland Antiquarian & Archaeological Society*, Volume N.S. 30, 1-13.

Collingwood, R.G. 1930c: *The Archaeology of Roman Britain*, Methuen & Co, London.

Copeland, T. 2009: *Akeman Street: Moving through Iron Age and Roman Landscapes*, The History Press, Stroud.

Crutchley, S. & Crow, P. 2018: *Using Airborne Lidar in Archaeological Survey: The Light Fantastic*, Historic England <<https://historicengland.org.uk/images-books/publications/using-airborne-lidar-in-archaeological-survey/heag179-using-airborne-lidar-in-archaeological-survey/>> accessed 20.2.2022

Davies, H. 2006: *From Trackways to Motorways*, Tempus Publishing Ltd., Stroud.

Defoe, D. 1727: *A tour thro' the whole island of Great Britain, divided into circuits or journies* Vol. 3, Letter 13, Part 2.

Doneus, M. 2013: 'Openness as Visualization Technique for Interpretative Mapping of Airborne Lidar Derived Digital Terrain Models', *Remote Sensing*, Volume 5, 6427-6442.

Drury, D., Hair, N., Howard-Davis, C. & Krupa, M. 1998: 'Stainmore, Cumbria: archaeological investigation on the A66 Stainmore to Banks Gate road improvement scheme', *Transactions of the Cumberland & Westmorland Antiquarian & Archaeological Society*, Volume 98, 119-32.

Elgee, F. & Wragge Elgee, H. 1933: *The Archaeology of Yorkshire*. Methuen, London.

Entwistle, R. 2019: *Britannia Surveyed*, The Armatura Press, Pewsey. .

Environment Agency, 2021: National LIDAR Programme. < <https://data.gov.uk/dataset/f0db0249-f17b-4036-9e65-309148c97ce4/national-lidar-programme> > accessed 23 January 2022

Fell, D.W. 2020: *Contact, Concord and Conquest: Britons and Romans at Scotch Corner*. Northern Archaeological Associates, Barnard Castle. <https://archaeologydataservice.ac.uk/archives/view/scotch_a1_2021/> accessed 14 November 2021

Fell, D.W. & Johnson, P.G. 2021: *The Evolution of Dere Street from Routeway to Motorway*, NAA <https://archaeologydataservice.ac.uk/archiveDS/archiveDownload?t=arch-4155-1/dissemination/pdf/A1L2B_Dere_Street_Paper.pdf> Accessed February 2022

Ferris, I. 2011: *Vinovia. The buried Roman city of Binchester in Northern England*, Amberley, Stroud.

Fitts, R.L., Haselgrove, C.C., Lowther, P.C. & Turnbull, P. 1994: 'An Iron Age farmstead at Rock Castle, Gilling West, North Yorkshire', *Durham Archaeological Journal*, Volume 10, 13-42.

Forbes, U.A. & Burmester, A.C. 1904: *Our Roman Highways*. F.E. Robinson & Co., London.

Forum on Information Standards in Heritage 2021: FISH Vocabularies. < <http://www.heritage-standards.org.uk/fish-vocabularies/>> accessed 11 January 2022

Frere, S., 1987: *Britannia*. 3rd ed. (London: Book Club Associates)

Frere, S.S. & Fitts, R.L. 2009: *Excavations at Bowes and Lease Rigg Roman forts*. Yorkshire Archaeological Report No.6. (Leeds: Yorkshire Archaeological Society).

Frodsham, P. 2019: *North Pennines Archaeological Research Framework. Part 1: Resource Assessment*, Altogether Archaeology.

Haken, M.S. 2021: *Pushing Forwards: new evidence for pre-flavian Roman penetration into Brigantia*, Lecture delivered to the RAI. Royal Archaeological Institute, London. <<https://www.royalarchinst.org/rai-lectures-online/14-April-20213pm>>

- Haken, M.S. 2017: *RR80a York/Stamford Bridge to the River Tees*. < <http://roadsofromanbritain.org/gazetteer/yorkshire/rr80a.html> > RRRRA accessed 21 December 2021
- Haken, M.S. 2018a: *Ilkley-Adel-Newton Kyme-Tadcaster*. < <http://roadsofromanbritain.org/gazetteer/yorkshire/rr72b.html> > RRRRA accessed 20 December 2021
- Haken, M. S. 2018b: *RR82 Scotch Corner - Bowes - Maiden Castle*. < <http://roadsofromanbritain.org/gazetteer/yorkshire/rr82.html#Scotch-Corner-Bowes> > accessed 2 February 2022
- Harding, J. 2000: 'Later Neolithic ceremonial centres, ritual and pilgrimage: the monument complex of Thornborough, North Yorkshire'. In: A. Richie, ed. *Neolithic Orkney in its European Context*. MacDonald Institute Monographs, Cambridge, 31-46..
- Haslegrove, C. 2016: *Cartimandua's Capital? The Late Iron Age royal site at Stanwick, North Yorkshire, fieldwork and analysis 1981-2011*, Council for British Archaeology, York.
- Higham, N.J. & Jones, G.D.B. 1975: 'Frontier, Forts and Farmers', *Archaeological Journal*, 132(1), 16-53.
- Higham, N.J. & Jones, G.D.B. 1985: *The Carvetii*. Alan Sutton Publishing Ltd., Stroud
- Hollis, D. et al., 2021: *HadUK-Grid Gridded Climate Observations on a 1km grid over the UK, v1.0.3.0 (1862-2020)*. NERC EDS Centre for Environmental Data Analysis, Met Office.
- Hornblower, S., Spawforth, A. & Eidinow, E. 2012: *The Oxford Classical Dictionary*. 4th ed., Oxford University Press, Oxford.
- Horne, P.D. & Macleod, D. 1995: *The Yorkshire Dales Mapping Project (pdf version)*. Royal Commission on the Historical Monuments of England.
- Jefferson, P. & Roberts, I., 2006: *Adel Roman Road, Adel, Leeds, Archaeological Evaluation*; Archaeological Services WYAS Report no. 1468, (Leeds: Archaeological Services WYAS)
- Jones, M.J. 1977: 'Archaeological work at Brough under Stainmore 1971-72: 1. The Roman discoveries', *Transactions of the Cumberland & Westmorland Antiquarian & Archaeological Society*, Volume 77, 17-47.
- Jones, R. 2001: 'Appendix 2: A signal station experiment on the Stainmore Pass'. In: Vyner, B. (Ed.), *Stainmore: the Archaeology of a North Pennine Pass*, Tees Archaeology, Hartlepool, 197-8.
- Jones, R.H. 2011: *Roman Camps in Scotland*, Society of Antiquaries of Scotland, Edinburgh.
- Laurie, T. 1984: 'An enclosed settlement near East Mellwaters Farm, Bowes, Co. Durham', *Durham Archaeological Journal*, Volume 1, 35-39.
- Malim, T. & Hayes, L. 2011: 'An Engineered Iron Age Road, associated Roman use (Margary Route 64), and Bronze Age activity recorded at Sharpstone Hill, Shropshire 2009', *Transactions of the Shropshire Archaeological and Historical Society*, Volume 85, 7-80.
- Manby, T.G. 1979: 'Typology, materials, and distribution of flint and stone axes in Yorkshire'. In T.H.M. Clough & W.A. Cummins (eds.), *Stone Axe Studies*, CBA Research Report 23, CBA, York, 65-81.
- Manby, T.G., 2003: 'The Iron Age of Central and Pennine Yorkshire'. In T.G. Manby, S. Moorhouse & P. Ottaway (eds.) *The Archaeology of Yorkshire: An assessment at the Beginning of the 21st Century*. Yorkshire Archaeological Society, Leeds 121-4.

- Manby, T.G., King, A. & Vyner, B 2003: 'The Neolithic and Bronze Ages: a Time of Early Agriculture'. In T.G. Manby, S. Moorhouse & P. Ottaway (eds.) *The Archaeology of Yorkshire*. Yorkshire Archaeological Society, Leeds, 35-113.
- Margary, I.D. 1973: *Roman Roads in Britain*, John Baker, London.
- Mason, D.J.P. 2021: *Roman County Durham. The eastern hinterland of Hadrian's Wall*. Durham County Council, Durham.
- Mattingley, D. 2007: *An Imperial Possession: Britain in the Roman Empire*. Penguin Books, London
- McCarthy, M.R. 2000: 'Prehistoric Settlement in Northern Cumbria'. In *Northern Pasts: interpretations of the later prehistory of Northern England and Southern Scotland*. BAR British Series 302. Archaeopress, Oxford, 131-40.
- Met Office 2022: *UK Climate Averages*. < <https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages>> accessed 23 January 2022
- Millett, M. & Brickstock, R. 2020: *An Early Roman Fort at Thirkleby, North Yorkshire*. Britannia, Volume 51, 318-323.
- Natural England 2016: *Regional Agricultural Land Classification Maps*. < <http://publications.naturalengland.org.uk/category/5954148537204736> > accessed 15 January 2022
- Newman, C. E. 2014: *Mapping the Late Medieval and Post Medieval Landscape of Cumbria* (PhD Thesis). Newcastle.
- Ordnance Survey 2016: *Roman Britain*. OS, Southampton.
- Ottaway, P. 2004: *Roman York*. 2nd ed., Tempus Publishing, Stroud.
- Poulter, J. 2009: *Surveying roman military Landscapes across Northern Britain: the Planning of Roman Dere Street, Hadrian's Wall and the Vallum, and the Antonine Wall in Scotland*. BAR British Series 492, Archaeopress, Oxford.
- Poulter, J. 2010: *The Planning of Roman Roads and walls in Northern Britain*, Amberley Publishing, Stroud.
- Poulter, J. 2014: *Further discoveries about the Surveying and Planning of Roman Roads in Northern Britain*. BAR British Series 598, Archaeopress, Oxford.
- Railton, M. 2007: 'Prehistoric Farmers? Evidence for Early Settlement in the Eden Valley'. In *People and the Land: settlement in the Eden Valley, prehistory to the present day*, Appleby Archaeology Group, Appleby, , 8-21
- Railton, M. 2011: *Archaeological Evaluation of a Bronze Age Cremation Cemetery on Brackenber Moor, Appleby-in-Westmorland, Cumbria*, North Pennines Archaeology Ltd..
- Railton, M. 2015: *Geophysical survey of Castrigg Roman Fortlet, Appleby-in-Westmorland, Cumbria*, Appleby Archaeology Group, Appleby-in-Westmorland.
- Ratledge, D. 2018: *The Roman road from Kirkby Thore to Old Penrith, RR82aa*. < <http://www.romanroads.org/gazetteer/cumbria/M82x.htm> > accessed 21 November 2021
- Ratledge, D. 2018. *Travelling with the Romans*. < <http://www.twithr.co.uk/cumbria/M82x.htm> > accessed 11 January 2022

- Richmond, I.A. 1951: 'A Roman arterial signalling system in the Stainmore Pass'. In W.F. Grimes (ed.), *Aspects of Archaeology in Britain and Beyond. Essays Presented to O.G.S. Crawford*, H. W. Edwards, London, 293-302.
- Richmond, I.A. & McIntyre, J. 1934: 'The Roman Camps at Reycross and Crackenthorpe', *Transactions of the Cumberland & Westmorland Archaeological & Antiquarian Society*, Volume 34 (series 2), 50-61.
- Rivet, A.L.F. & Smith, C. 1979: *The Place Names of Roman Britain*. B. T. Batsford, London.
- Robinson, P. 2001: 'The Rey Cross Camp'. In B. Vyner (ed.), *Stainmore: the archaeology of a north Pennine pass*, Tees Archaeology, Hartlepool, 76-86.
- Ross, C.R. 2009: 'Tribal Territories' from the Humber to the Tyne. As analysis of artefactual and settlement patterning in the Late Iron Age and early Roman period. PhD thesis, Durham University.
- RRRA 2021: Roman Roads in 2020. *Itinera*, Volume 1, 319-376.
- Salway, P. 1981: *Roman Britain*. Clarendon Press, Oxford.
- Salzman, L.F. 1939: 'Romano-British Remains'. In L.F. Salzman (ed.), *A History of the County of Oxford: Vol. 1. Victoria County History*, London, 271-281.
- Sherlock, S.J. 2010: *An Examination of Late Prehistoric Settlement in North East England with Specific Emphasis on the Settlements of the Tees Valley*; PhD Thesis, University of Leicester.
- Shotter, D. 1998: 'Roman north-west England: the process of annexation', *Transactions of the Historic Society of Lancashire and Cheshire*, Volume 148, 1-26.
- Stallibrass, S. 2018: 'Scratching a Living or Fleecing the Army? Livestock Farming in Central Britain'. In R. D. Martlew (ed.), *Romans and Natives in Central Britain*. Yorkshire Archaeological Society, Leeds, 43-60.
- Symonds, M. 2018: *Protecting the Roman Empire. Fortlets, frontiers, and the quest for post-conquest security*, Cambridge University Press, Cambridge
- Toller, H. 2014: 'The Roman road between Low Borrowbridge and Kirkby Thore', *Transactions of the Cumberland & Westmorland Antiquarian & Archaeological Society*, Volume 16, 39 - 62.
- Viatores, 1964: *Roman Roads in the South-East Midlands*. Victor Gollancz Ltd., London.
- Vyner, B. 2001: 'The Romans on Stainmore - Background'. In B. Vyner (ed.), *Stainmore: The Archaeology of a North Pennine Pass*, Tees Archaeology, Hartlepool, 75-76.
- Vyner, B. 2007: 'A Great North Route in Neolithic and Bronze Age Yorkshire: The Evidence of Landscape and Monuments', *Landscapes*, 8(1), 69-84.
- Vyner, B.(Ed.) 2001: *Stainmore: The Archaeology of a North Pennine Pass*, Tees Archaeology, Hartlepool.
- Welfare, H. 2001: 'Maiden Castle Fortlet, Stainmore'. In B. Vyner (ed.), *Stainmore; The archaeology of a north Pennine pass*. Hartlepool: Tees Archaeology, pp. 96-8.
- Welfare, H. & Swan, V. 1995: *Roman Camps in England: the Field Archaeology*, HMSO, London.
- White, R. 2005: *The Yorkshire Dales. A Landscape Through Time*. 2nd ed., Great Northern Books, Ilkley.
- Williamson, T. & Bellamy, L. 1983: *Ley Lines in Question*, World's Work Ltd., Tadworth.

Wilson, P. 2009: 'Holding the line? The Humber frontier and the Roman expansion into Yorkshire reconsidered'. In D.J. Breeze, L.M. Thoms & D.W. Hall (eds.), *First Contact. Roman and Northern Britain*, Tayside and Fife Archaeological Committee, Perth, 8-14.

Woolliscroft, D. J. 2001: *Roman Military Signalling*, Tempus Publishing, Stroud.

Woolliscroft, D. J. & Hoffmann, B. 2010: *Rome's First Frontier*, The History Press, Stroud.

Zant, J. 2009: *The Carlisle Millenium Project. Excavations in Carlisle 1998-2001, Vol. 1: Stratigraphy*. Lancaster Imprints 14, Oxford Archaeology, Lancaster.

Zant, J. & Howard-Davis, C. 2013: *Scots Dyke to Turnpike: The Archaeology of the A66, Greta Bridge to Scotch Corner*, Oxford Archaeology North, Lancaster.