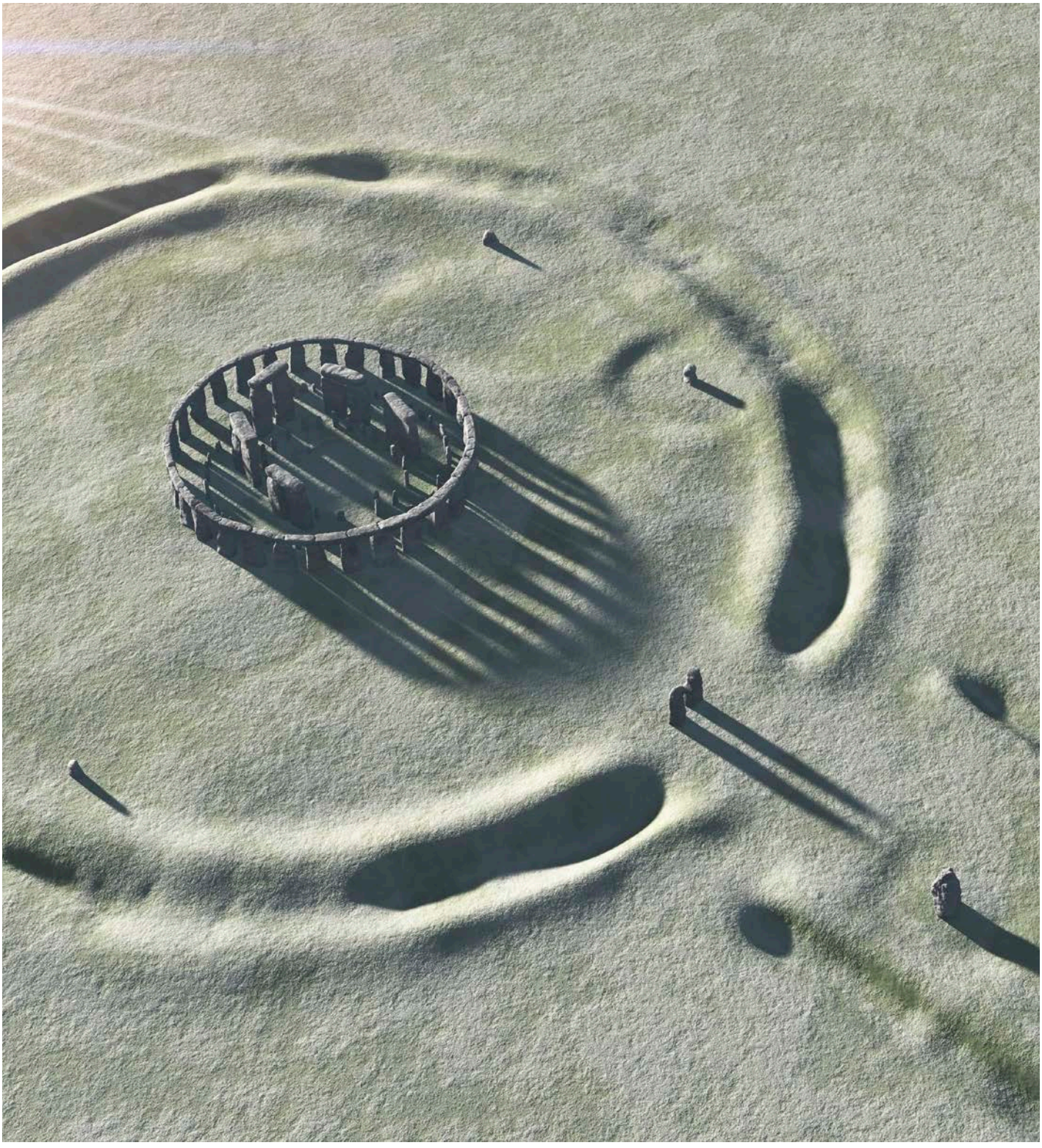
Discovery, Innovation and Science in the Historic Environment

RESEARCH



Historic England

ISSUE 27

Welcome...

...to the latest archaeology themed Research Magazine where we highlight a range of work by Historic England and partners.

A strong theme of this issue is how different approaches connect us to people in the past. Jonathan Last reflects on how lithics studies help us to understand where and how our predecessors created stone tools thousands of years ago.

At the other end of the time line, Olaf Bayer and Fiona Small's account of the First World War training trenches at Browndown evokes a sense of how the conflict affected new recruits and local people.

Pieces on two well-studied sites demonstrate how new research still brings different perspectives:

- Tony Wilmott and Ian Haynes' excavations at Birdoswald Roman Fort are transforming our ideas about the scale and function of towns associated with military sites.
- In a recent publication on the celestial alignments at and around Stonehenge, Clive Ruggles and Amanda Chadburn provide a tantalising glimpse into the belief systems associated with this incredible landscape.

Robyn Andrews shows how the view from above leads to exciting discoveries when ephemeral cropmarks reveal the substantial buried remains of past settlements. Robyn is a new addition to the Aerial Survey team and she, along with our two other archaeological apprentices, has brought a fresh energy and new ideas to the Archaeological Investigation Team.

We also present our standing feature rounding up recent additions to our research reports database. All our research ultimately underpins management and presentation of archaeological remains in highly varied forms. This includes providing the information needed to gain national protected status for the Browndown trenches or aerial photography to inform condition monitoring of already scheduled monuments.

The new lithics guidance by Oxford Archaeology builds on exciting discoveries made during commercial archaeological excavations. Our partnerships provide the understanding needed to present sites and landscape to the public.

Our partnerships, in particular with the English Heritage Trust, provide the understanding needed to present sites and landscape to the public.

If you would like to find out more about our approaches to research please see the Methods section of our website.

Helen Winton
Head of Archaeological Investigation, Historic England

Front cover image: A reconstruction of the winter solstice sunset at Stonehenge when the monument was complete.

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Surface lithic collection by a local society in Cumbria. © 2018 Oxford Archaeology; all rights reserved

Managing lithic sites

Sites where stone tools were made and used in prehistory contain unique evidence but present special challenges, which are addressed in a new guidance document.

Ploughzone archaeology

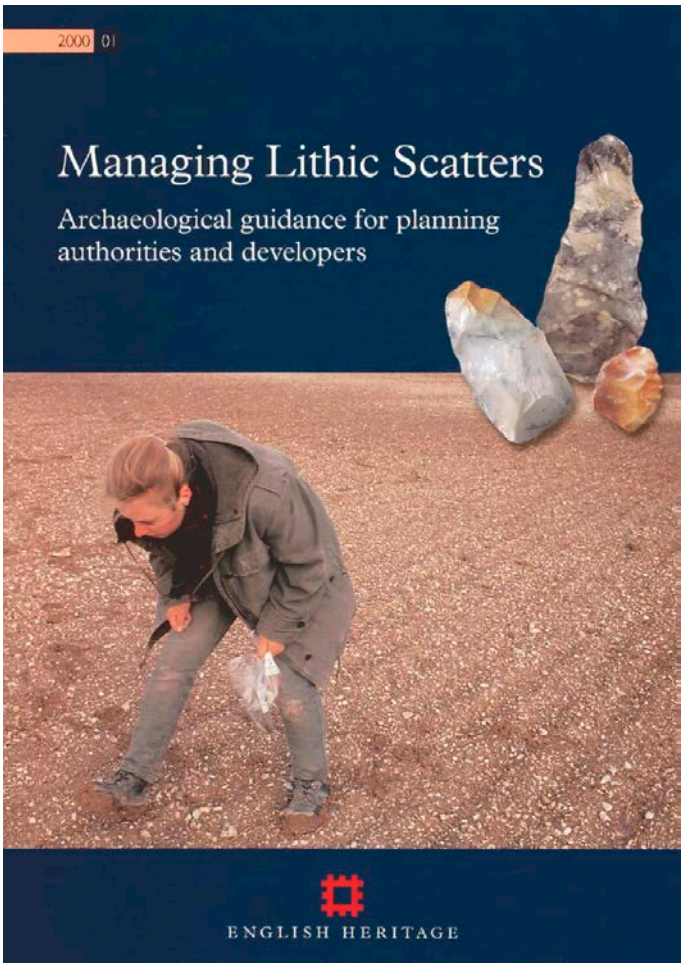
It is – or at least it used to be – fairly common to see a row of archaeologists slowly crossing a large ploughed field and stopping occasionally to pick up or mark a find. Fieldwalking has always been an essential element of the archaeological toolkit, offering a minimally intrusive way of providing a broad date for a site discovered by remote sensing, or mapping the manuring scatter around a medieval settlement, for example. But for earlier prehistory, especially from the Late Upper Palaeolithic to the Early Bronze Age, when people lived largely mobile lives as hunter-gatherers or pastoralists, the ploughzone holds much of the settlement record in the form of scatters of lithic (mainly flint) artefacts. After ploughing, a certain proportion of this material (at least 2%, but often more) will be visible on the surface.

From the 1970s to the 1990s a number of large-scale landscape survey projects based on fieldwalking took place across England: the Fenland Survey, the Kennet Valley Survey, the Stonehenge Environs Project and many others. Recognising this trend, in 1994 English Heritage (as was) initiated the Lithic Scatters Project in order to consolidate knowledge of these sites. One of the key outputs, at the turn of the century, was a guidance document entitled Managing Lithic Scatters (2000).

However, with the growth of development-led archaeology since the 1990s fieldwork methods evolved and a standardised process emerged, based on geophysical survey and trial-trench evaluation. Fieldwalking did not become a common element of professional practice, in part because the value (financial and archaeological) of ploughsoil data was called into question and in part because changes to farming practice in many areas reduced the window of availability for suitably ploughed and weathered field surfaces.

Old land surfaces

While we may bemoan the lack of attention given to ploughsoil lithic scatters in development-led archaeology, there is another type of site that needs to be considered – that is those scatters which survive within buried soils beneath the reach of the plough, often protected by deposits of colluvium or alluvium. We may call these 'lithic sites' to distinguish them from surface scatters. They represent a resource of considerably greater potential than scatters which are dispersed and damaged by the plough; while perhaps not strictly in situ (soil processes have often caused a degree of vertical movement) they usually retain a great deal of spatial integrity, allowing the elucidation of activity areas and physical refitting of knapping sequences, while individual artefacts are in better condition and therefore suitable for specialist analysis such as use-wear and organic residue.



Above: From scatters to sites: (left) Managing Lithic Scatters (2000); (right) Managing Lithic Sites (2024). © Historic England

The problem is that geophysical survey and trial trenching are also a rather poor way of prospecting for and evaluating lithic sites. This kind of site is especially labour-intensive when it comes to excavation, requiring close spatial control through a system of grid squares, 3D-location of all significant artefacts and on-site programmes of wet sieving for debitage (knapping waste). Not picking them up at the evaluation stage is, therefore, problematic. Indeed a number of sites have occurred as unexpected discoveries (or discoveries of unexpected scale) during development-led excavations. Consequently it was decided that the lithic scatters guidance needed updating to include more practical information on in-situ lithic sites.

By focussing primarily on the Mesolithic and Neolithic periods the new guidance, prepared by Oxford Archaeology, complements the recent Curating the Palaeolithic guidance which deals with (primarily) deeply buried archaeology of Pleistocene age. Like that document, it is accompanied by case-studies covering a number of important sites, with a particular focus on methodological approaches taken in the field and in post-excavation.

Above: Refit sequence from Star Carr, North Yorkshire, incorporating two burins and a scraper.
Photograph by Paul Shields, © University of York, CC BY-NC 4.0

We decided that the lithic scatters guidance needed updating to include more practical information on in-situ lithic sites.

Above: Excavation by grid-square at Stainton West.

One of these case-studies is the remarkable landscape at Stainton West, near Carlisle in Cumbria, where over 300,000 lithics of Mesolithic and Neolithic date were recovered in 2009 from an island between two palaeochannels. The artefacts were associated with hearths, cooking pits, hollows and stakehole structures, discussed in more detail in a recently published monograph report. Another is one of those cases where the evaluation failed to predict the scale of the lithic resource: the even larger assemblage (465,000 struck flints) from the Bexhill-Hastings link road in East Sussex, excavated in 2012, though this was distributed over some 260 scatters along a corridor more than 5 kilometres long. Post-excavation work is ongoing though it is already clear that the project will greatly improve understanding of the chronology of the Mesolithic in southern Britain.

Two new monographs

Lithic sites also tell the even older story of the reoccupation of Britain after the last ice age. The new guidance coincides with the publication, supported by Historic England, of the important site at Guildford Fire Station, in the floodplain of the River Wey in Surrey, where excavations in 2013-14 recovered an assemblage of over 15,000 flints dating to the Upper Palaeolithic, around 15,000 years ago. The lithics facilitated extensive refitting, with distinct concentrations indicative of different knappers, one apparently less experienced than the others. Trace-wear analysis of the tools showed that blades were used as hunting projectiles while scrapers were hafted and used for hide-working. There are parallels not only with the nearby site of Wey Manor Farm, also funded by English Heritage (as was), but as far afield as the valleys of the Somme and the Seine, which at this time were not separated from Britain by a sea channel.

We can also look back at the 'golden age' of landscape survey projects referred to above, in the form of a forthcoming volume on work undertaken in the Vale of Pickering in North Yorkshire, between 1976 and 2000. This project carried out auger and test-pit survey across a large area of former wetland, as well as excavation of several flint scatters around the shoreline of a palaeo-lake that was also the location of the internationally important Early Mesolithic site of Star Carr, first investigated in the 1950s. Although no sites of equivalent size or status to Star Carr were encountered during the fieldwork, around 45,000 lithics were recovered, which demonstrate the diversity of the evidence for hunter-gatherer activities that has survived in this landscape, spanning the end of the Palaeolithic to the Late Mesolithic.

Top: High-resolution recording at the Upper Palaeolithic site at Guildford Fire Station. © 2021 Oxford Archaeology

Middle: Excavations at Flixton Island in the Vale of Pickering in 1997. © Paul Lane

Bottom: Analysing flints retrieved during the excavations at Ventonteague, Cornwall. Courtesy of Cornwall Archaeological Unit

Moving between scales

If we are currently having a 'lithics moment' with the publication, recent or imminent, of a number of key sites, then the revised guidance seems especially timely. The return for the painstaking recovery of thousands of often tiny artefacts, intensive sieving regimes, long hours of refitting knapping sequences and detailed spatial plots is a level of intimacy rarely seen on later, less ephemeral sites, sometimes allowing us to identify the work of different individuals and the places they sat, as well as what particular artefacts were used for.

At the same time we need to remember the different sort of evidence provided by traditional fieldwalking: this is more of a palimpsest of landscape use, a distinctively archaeological contribution to the characterisation of the broader historic landscape, but one that can be tied into different sources of evidence, especially when the scatters are close to wetland locations of palaeoenvironmental potential, such as in the Vale of Pickering or the Kennet valley in Berkshire.

Impact

The new guidance is intended for everyone working with lithic material, from developers to those involved in community projects. As such, it encompasses a broad range of advice on approaches and techniques that can be applied to a wide variety of projects at a range of scales. It also provides an opportunity to engage the wider public with the pre-Bronze Age occupation of Britain, including the environmental and social challenges that communities in those times faced, and the connections across and beyond our island. The key message is that there is always a lot to be learnt from an assemblage of chipped stone, when it has been recorded with due care and precision.

The painstaking recovery of thousands of often tiny artefacts sometimes allows us to identify the work of different individuals and the places they sat, as well as what particular artefacts were used for.

About the Author

Jonathan Last

Jonathan is a prehistorian and landscape archaeologist who has worked in various roles for Historic England (formerly English Heritage) since 2001. He is currently Landscape Strategy Adviser in the Archaeological Investigation team.

Further information

Historic England, 2024: Managing Lithic Sites
https://historicengland.org.uk/images-books/publications/managing-lithic-sites/

Historic England 2023: Curating the Paleolithic
https://historicengland.org.uk/images-books/publications/curating-the-palaeolithic/

Astronomical research at Stonehenge

Investigating prehistoric monuments in and around the Stonehenge World Heritage Site and their relationships to the heavens

Stonehenge is often described as mysterious and impossible to understand. An example of this is that its relationship to the skies and heavenly bodies is often misunderstood, even sometimes by archaeologists. Perhaps this is because archaeoastronomy – the study of how ancient people understood phenomena in the sky and how they used this sky-knowledge in their cultures – is rarely taught in the UK. However, most archaeologists and indeed the general public are aware that there is a link between the summer solstice and Stonehenge, although many would be hard-pressed to elaborate further.

This combination of apparent mystery and a lack of detailed knowledge has led to some eye-watering claims about Stonehenge in the past – "it was a computer", "it was built by aliens", and so on. New studies of the landscape context of Stonehenge and a number of nearby monuments, and firming up the dates for these prehistoric structures, have cut through some of this confusion. They have established that certain monuments were designed to view heavenly bodies at certain times of the year.

This article is based on research in a lavishly illustrated new book by Ruggles and Chadburn, published by Liverpool University Press for Historic England on May 8th 2024.
We would like to thank Historic England for commissioning and publishing the book, for providing our expert illustrator Sharon Soutar, and for funding the dating programme for Woodhenge. Wiltshire Museum kindly provided the material to do this.

Solar alignments at Stonehenge

In 1720, the antiquarian William Stukeley first noticed that the architecture of Stonehenge related to the sun, famously noting that the axis of the monument was aligned upon the midsummer sunrise. Looking the opposite way, one can see that the solar alignment also works in that direction, as the midwinter setting sun is also framed by the stones. Standing at a fixed point, the solstice suns always rise or set each year at exactly the same points in the landscape, a phenomenon visible for a few days around each solstice. Stonehenge's architecture was designed to allow views of the exact points where the summer and winter solstice suns appear or disappear on the horizon. It is a monument designed to sight the sun. Today, many archaeologists think that the winter solstice was the more important of the two solstices for its prehistoric builders, and this axis and view is now marked by a large metal arrow for visitors.

Above: A reconstruction of the winter solstice sunset at Stonehenge when the monument was complete. © Historic England Archive Image reference IC095/074.

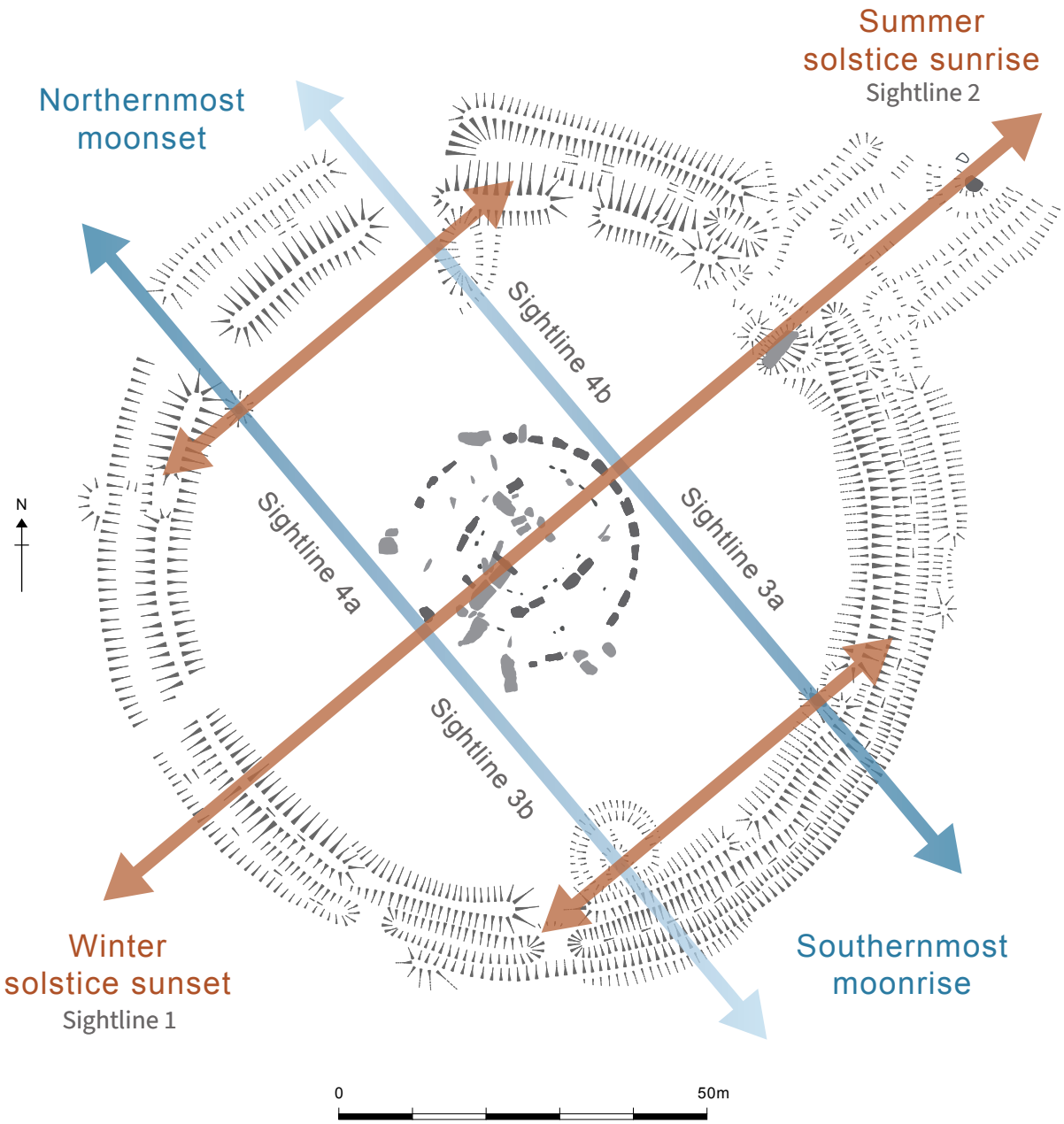
Above: An arrow explaining the direction of the winter solstice setting sun at Stonehenge for visitors. © Amanda Chadburn

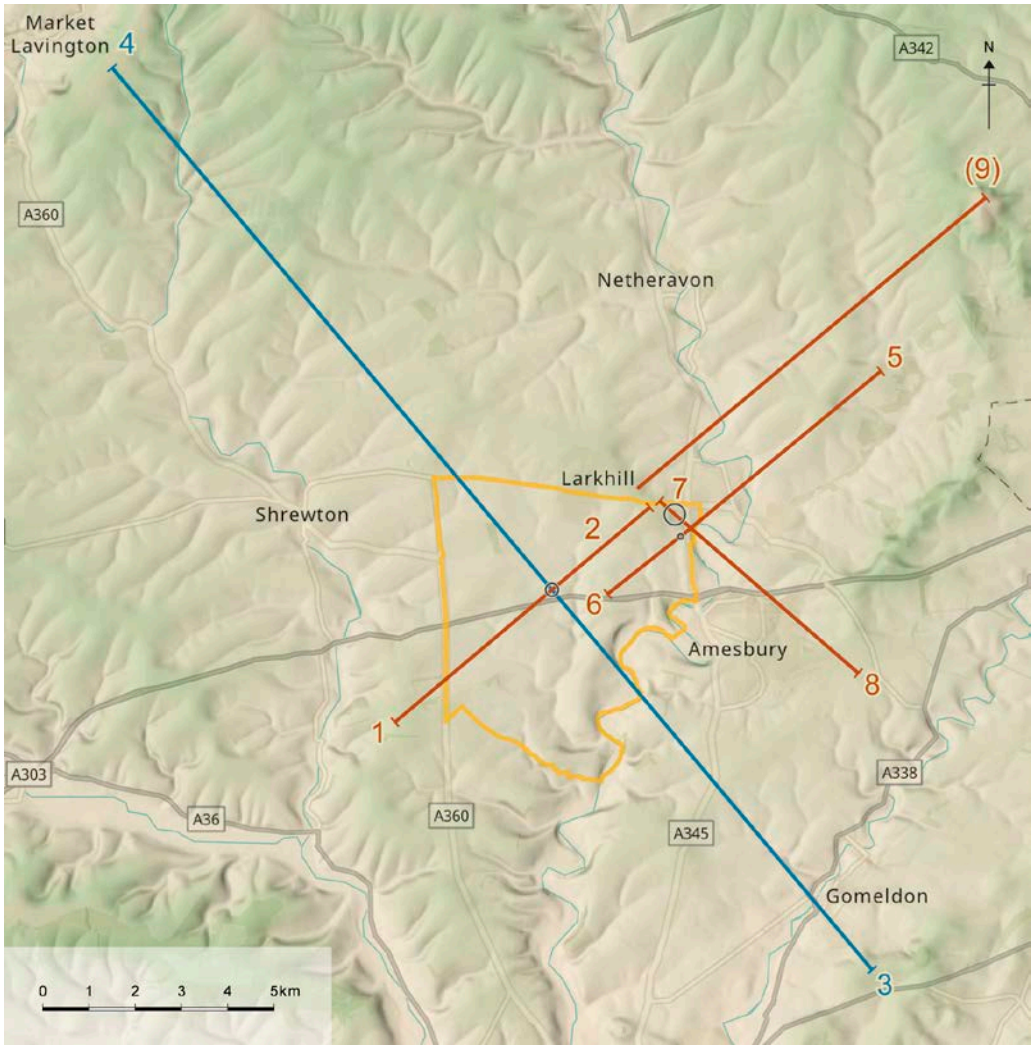
The moon and Stonehenge

As well as the sun, it is likely that the moon was also important to the builders of Stonehenge. The monument's relationship to the moon, however, is much more difficult to prove. Unlike the sun which has an annual solstice, the moon's 'lunistice' positions (reached every 27 days) themselves vary and are at their furthest apart in the landscape around every 19th year (a time known as the major lunar standstill). A rectangle of much smaller stones known as the Station Stones is positioned outside the stone circle, near to the henge earthworks (see illustration above) and the long sides of the rectangle are broadly aligned with the most southerly moonrise and the most northerly moonset. We believe that this was deliberate. It is currently the major lunar standstill season, so we are researching and observing the moon at Stonehenge during this critical time. It should be noted that the Station Stones rectangle is also aligned (along its short sides) with the solar axis which we have noted above.

As well as the sun, it is likely that the moon was also important to the builders of Stonehenge.

Below: Solar and lunar alignments at Stonehenge monument. Illustration by Sharon Soutar © Historic England Archive





Above: The solar and lunar alignments from Stonehenge, Woodhenge, the Southern Circle and Larkhill into the surrounding landscape. Illustration by Sharon Soutar. © Historic England Archive

Stonehenge and other astronomical monuments

Using computer modelling and field observations, our new research has established the exact positions of the rising and setting sun and moon positions in the landscape surrounding Stonehenge in prehistory, taking into account the slightly different position of the sun and moon in 2500 BC, the approximate date when the stones were erected at Stonehenge. This means we now know how far their views or sightlines stretched, which allows us to understand the prehistoric landscape rather better.

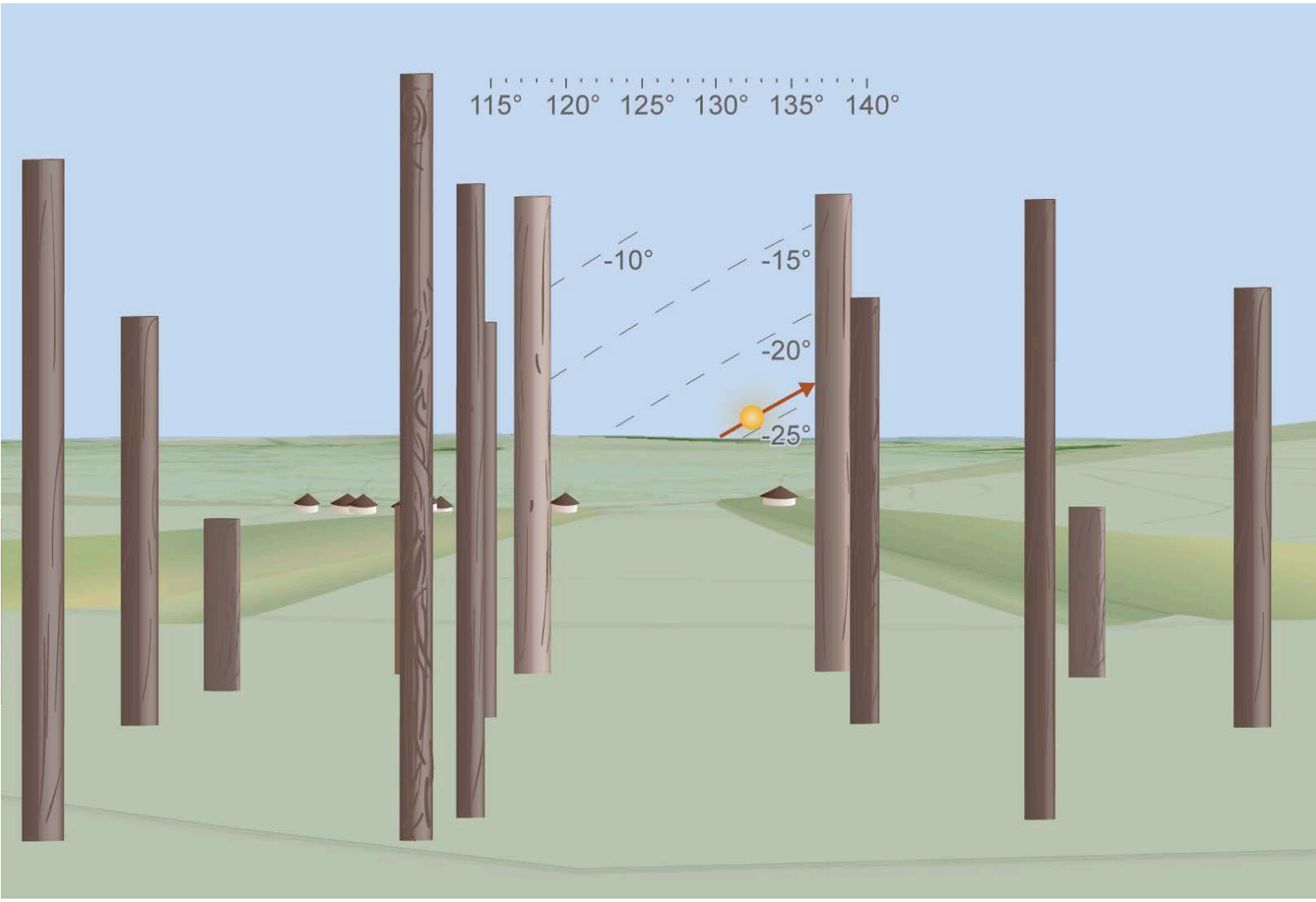
However, as well as Stonehenge, there are a number of other nearby monuments which precisely frame views of the sun at the solstices, including Woodhenge, the Southern Circle at Durrington Walls and a timber row at Lark Hill, and we have done similar calculations for them. It is clear that even distant horizons were important to the monument builders – the longest sightline is nearly 15 kilometres long (this is the view from Stonehenge to the most northerly moonset on the ridge at Gibbet Knoll, near Market Lavington).

New research has established the exact positions of the rising and setting sun and moon positions in the landscape surrounding Stonehenge in prehistory.

We have pulled together various data sets to precisely reconstruct astronomical views which are now impossible to see.

Reconstructing ancient sun-sighting monuments in their landscapes

We have pulled together various data sets to precisely reconstruct astronomical views which are now impossible to see. One example is at Durrington Walls henge, where the remains of the Southern Circle timber monument within it are now buried meters below ground, partly under a huge road embankment. The view from the centre of the Southern Circle, out through its entrance posts and down its Avenue toward the rising winter solstice sun, has been digitally reconstructed here. Data from two excavations, one in the 1960s and one in 2005-2006, and terrain modelling and calculations of the sun's position in 2500 BC have been combined to reconstruct this view with a high degree of accuracy.



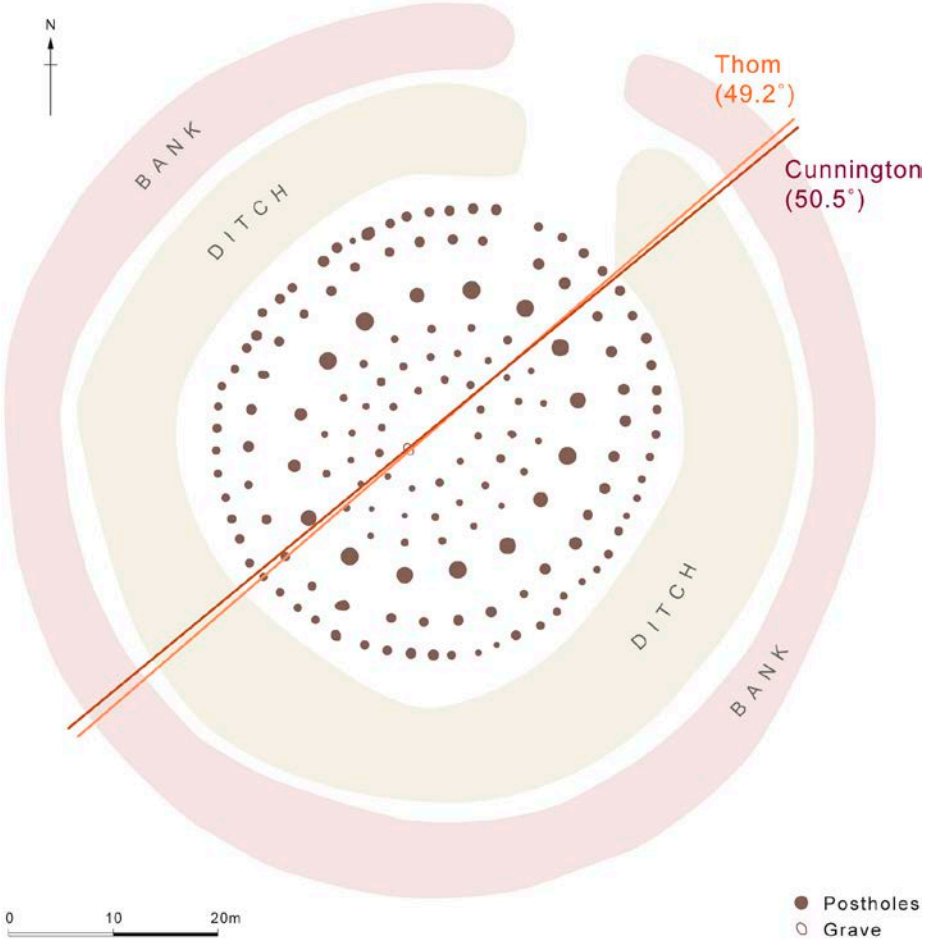
Above: The winter solstice sunrise as viewed from the centre of the Southern Circle in 2500 BC. Illustration by Sharon Soutar. © Historic England Archive

Dating Woodhenge

Critical to our understanding of these astronomical monuments is the date at which they were built. Unlike Stonehenge, Woodhenge was not well dated, but there was plenty of excavated material suitable for a dating programme in Wiltshire Museum. Charcoal from the timber rings, excavated nearly 100 years ago by the archaeologist Maud Cunnington, and antler picks discovered in later excavations of the ditch were all used. The results show that the oval timber rings – the astronomical monument aligned on the sun – were erected around 2600 BC but that the surrounding henge earthworks were constructed around 200 years later. This perhaps explains why the henge entrance is not aligned with the sun, ie because the monument was no longer used for astronomical purposes.

Impact of the research

We now know that the prehistoric builders incorporated distant views into the architecture of their monuments, and that these views framed the "targets" of the sun and moon at particular times of their cycles. These precise views are extremely rare for the British Neolithic, but there appears to be an unusual concentration of them in and around the Stonehenge World Heritage Site at 2500 BC. This research with new techniques has raised new questions as well as revisiting some old ones: - Why this area and not others? Why was sighting the sun important at this time? What did it mean to the monument builders? Did they manage the surrounding landscape? Were these people different from other nearby groups?



Above: Plan of Woodhenge showing the six oval timber rings, the solstitial axis as measured by Thom and Cunnington, and the henge earthworks. Illustration by Sharon Soutar. © Historic England Archive

Above: Antler picks excavated from Woodhenge in 1970 provided some of the new radiocarbon dates for the monument. © Historic England Archive. Image reference DP249369

About the Authors

Amanda Chadburn
Archaeologist and Heritage Consultant

Amanda is an archaeologist and heritage adviser. She worked for over 35 years in English Heritage/ Historic England until retiring in 2022, holding various positions including Lead Adviser, Stonehenge and Avebury World Heritage Site when she was responsible for the World Heritage Team.

She currently undertakes heritage consultancy and teaches archaeology and heritage management at Oxford University. She is a Visiting Fellow in archaeology at Bournemouth University. As well as her own research, she undertakes voluntary work in the sector and sits on numerous committees and charities.

She was elected as a Fellow of the Society of Antiquaries of London in 1999, as a Corresponding Member of the German Archaeological Institute (DAI) in 2009, and as a Fellow of the Society of Antiquaries of Scotland in 2023.

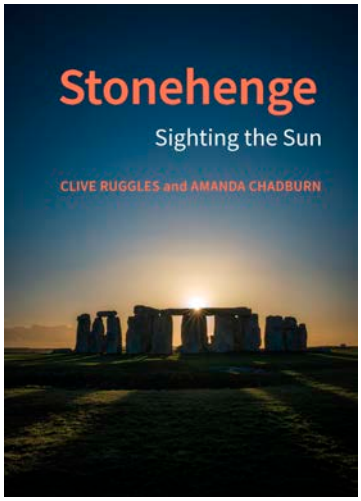
Clive Ruggles
Emeritus Professor of Archaeoastronomy at the University of Leicester

Clive has spent a lifetime investigating ancient people's perceptions of the sky and the uses they make of what they see there. Archaeoastronomy is an interdisciplinary field prone to misinterpretation and speculation and Clive's particular concern is to find the best ways to combine approaches from "hard science" and anthropology in order to reach sensible and robust conclusions. In 2017 he was awarded the Royal Astronomical Society's Agnes Mary Clerke Medal for a "lifetime of distinguished work in the overlapping areas of archaeology, astronomy and the history of science". He is also a former President of the Prehistoric Society.

While much of Clive's career has focused on Neolithic and Bronze Age Britain and Ireland, studying the design, landscape setting and orientation of ancient buildings and monuments in relation to the sky, he has also worked extensively on Hawaiian and Pacific star knowledge and in Peru, where in 2005 he co-discovered the 2200-year-old monumental solar observatory at Chankillo, which became a UNESCO World Heritage Site in 2021.

Further information

Ruggles R, Chadburn A: 2024 Stonehenge Sighting the Sun, Liverpool University Press, Historic England.



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Silva F, Chadburn A, Ellingson E; 2024: The Conversation 'Stonehenge May Have Aligned with the Moon as Well as the Sun' https://theconversation.com/stonehenge-may-have-aligned-with-the-moon-as-well-as-the-sun-228133

English Heritage, 2024: Major Lunar Standstill https://www.english-heritage.org.uk/visit/places/stonehenge/things-to-do/major-lunar-standstill/#:~:text=Stonehenge%20is%20famous%20for%20its,'major%20lunar%20standstill'%20occurs

Aerial view of Birdoswald from the south east to show its location above the river Irthing, and the various components of the complex. © Historic England

The military town and bathhouse of Birdoswald Fort on Hadrian's Wall

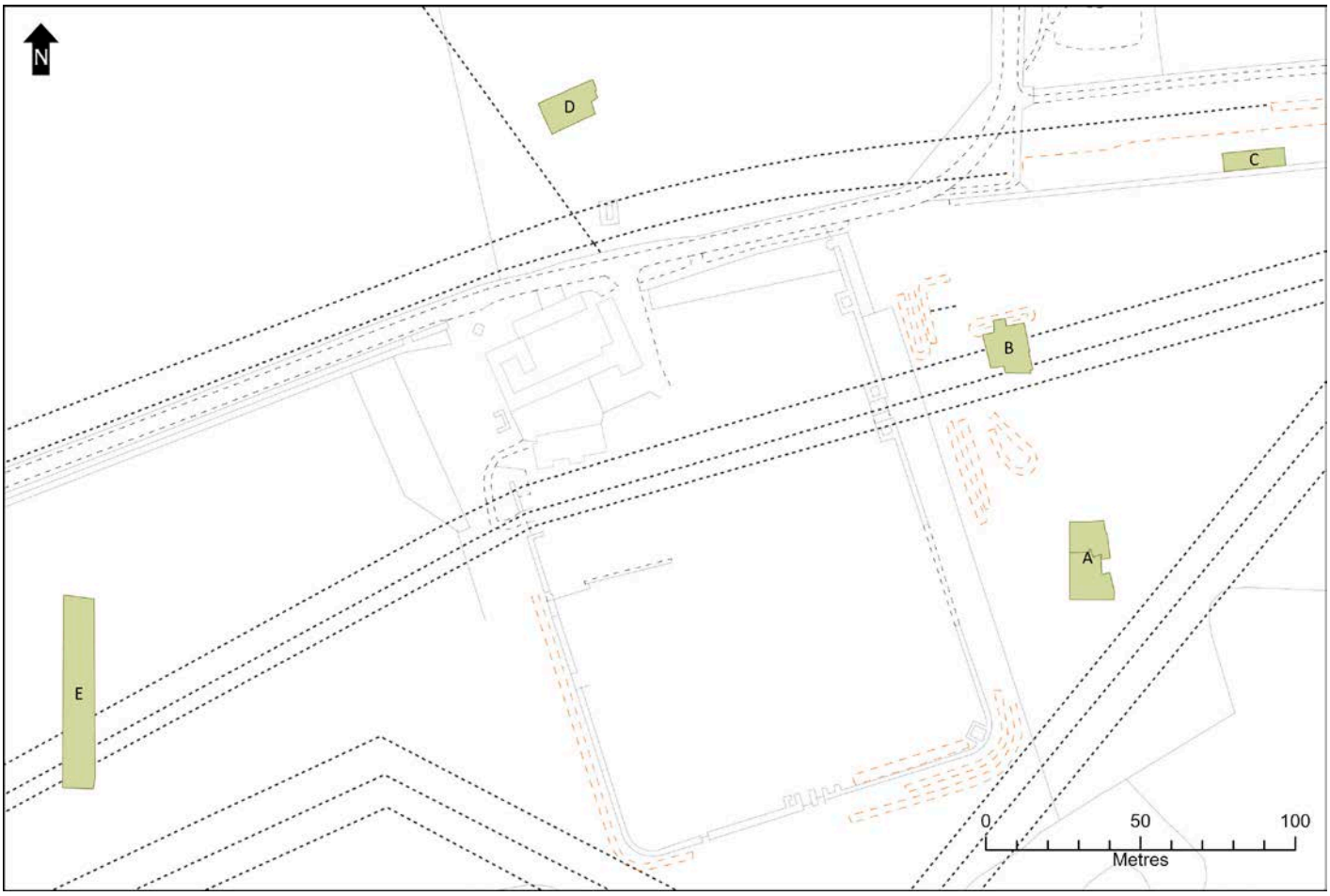
Recent excavation has provided important new understanding of the extramural settlement outside the fort

Introduction

Birdoswald is one of the most thoroughly investigated forts on Hadrian's Wall, with 21% of the interior of the fort excavated and published since 1987, and a long history of research before that date. The fort cemetery was also the subject of a major excavation in 2009. This means that there is a clear understanding of the various phases of occupation and their dating from the foundation of the fort in the Hadrianic period (*around* 120-138AD) to the 5th century AD, and probably beyond.

The parts of the complex which remained virtually unexplored were the extramural areas. Geophysical survey undertaken by the late Alan Biggins and David Taylor in the late 1990s revealed just how extensive and intensive settlement in these areas was. This survey, followed by their similar work at Maryport, revolutionised our view of the size and complexity of such settlements throughout the Roman frontier zone. What was missing was detail, which could only be recovered through excavation.

The work described here was a joint project between Newcastle University and Historic England, designed to excavate areas to the east, west and north of the fort to establish the relationship between phasing and activity in these areas and the fort interior, and to examine the types of activity that took place. The project, which ran seasonally from 2021 to 2024 (with a double season in 2021 because of the cancellation of 2020 due to COVID) was also a training excavation for Newcastle undergraduates, some 250 young people gaining excavation experience.



Above: Plan showing the location of excavation trenches at Birdoswald. © Illustration by Alex Turner, Newcastle University

The north

Two areas were excavated to the north of the fort, and therefore to the north of Hadrian's Wall. One (C), on the berm of Hadrian's stone wall, proved that this sector did not feature the obstacle pits found on the berm in the eastern 12 miles or so of the Wall. The second (D), led by the geophysical results, showed occupation, featuring clay sills for timber buildings. A large material culture assemblage indicated that domestic and industrial activity took place here, and one of the buildings was identified as a smithy.

This should not cause surprise; the Roman frontier was a zone, not a line, and a road, the Maiden Way, ran from the north gate of Birdoswald to the outpost fort of Bewcastle, seven miles to the north, and these structures were probably associated with this road.

Above: View of the fort from northern Area D. The two eastern areas A and B can be seen to the left of view. © Historic England

Above: Area D showing the ditches and clay sills for timber-built structures. Inset, a silver ring from this area with intact intaglio depicting Achilles. © Historic England

Above: Aerial view of the long narrow Area E, showing the broad central open area with to the north the footings of strip buildings, and to the south timber slots for an early large building, overlain by industrial stone-lined oven features. © Historic England

The west

To the west, a trench (E) measuring 60 x 15 metres was excavated 130 metres from the fort, where geophysical survey suggested that the road from the west gate expanded into an oval open area resembling a medieval marketplace with structures on each side. Excavation confirmed this basic layout, but occupation north and south of the space differed. To the north were long, narrow stone-founded strip buildings which probably originally had timber superstructures. Their narrow ends faced onto the street. To the south a large timber building was succeeded by a complex of industrial kilns. The date of this change of use has not yet been established.

The road from the west gate expanded into an oval open area resembling a medieval marketplace with structures on each side.

Above: Aerial view of Area B, a substantial stone-built strip house, its narrow end fronting onto the cobbled main road emerging from the fort's east gate. © Historic England

Above: The bathhouse; view from the east and from the *caldarium* hypocaust, up the flue and into the stoking chamber. © Historic England

Above: The bathhouse; the massive iron fire beams within the flue under excavation. © Historic England

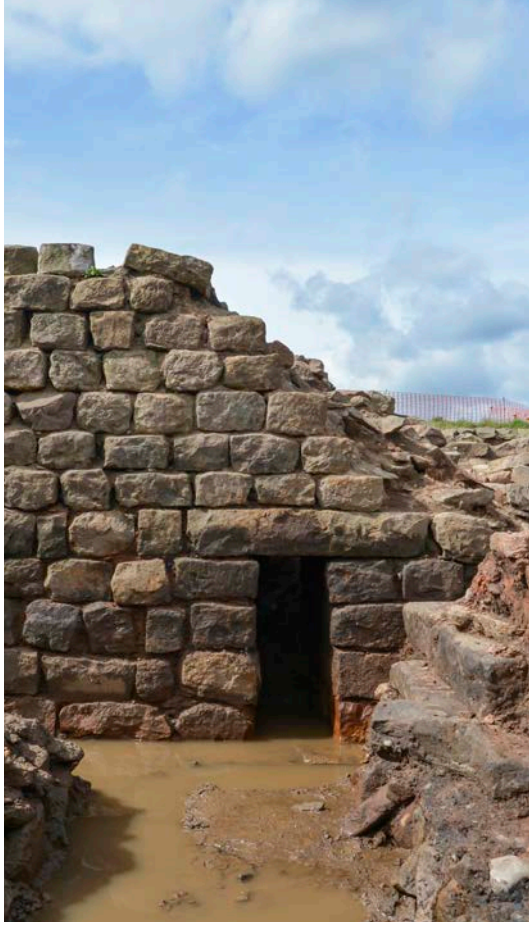
It was not until the third season of excavation that it was possible to demonstrate conclusively that Richmond's building was in fact part of the fort bathhouse.

The east and the bathhouse

Two areas were excavated to the east. One (B) was sited to enclose a single strip-house property, identified from the geophysical survey and facing onto the road emerging from the east gate. This gate had been excavated in 1855, establishing that the northern portal had been blocked in antiquity. The excavated building had two phases; the first respected the primary wide road, but the second fronted onto the narrowed road associated with the blocking of the portal, which was probably contemporary with the blocking of a portal of the west gate during the first third of the third century. The building was likely to be commercial in function, with a prime position on the street and near the fort.

The final area (A) was the most complex and productive of new information. Like all other areas it was sited with relation to the geophysical survey but was also deliberately sited to examine a substantial building first discovered in 1932 by Sir Ian Richmond. He had described a stone building 20 feet square, standing 13 courses in surviving height. He was unable to continue beyond this observation before being inundated by an inrush of ground water. Subsequently this structure was very tentatively interpreted as a signal tower.

The building proved to be part of a large building complex with several phases and structures, and its depth and stratigraphic complexity meant that this part of the excavation was returned to and continued during all four excavation seasons.



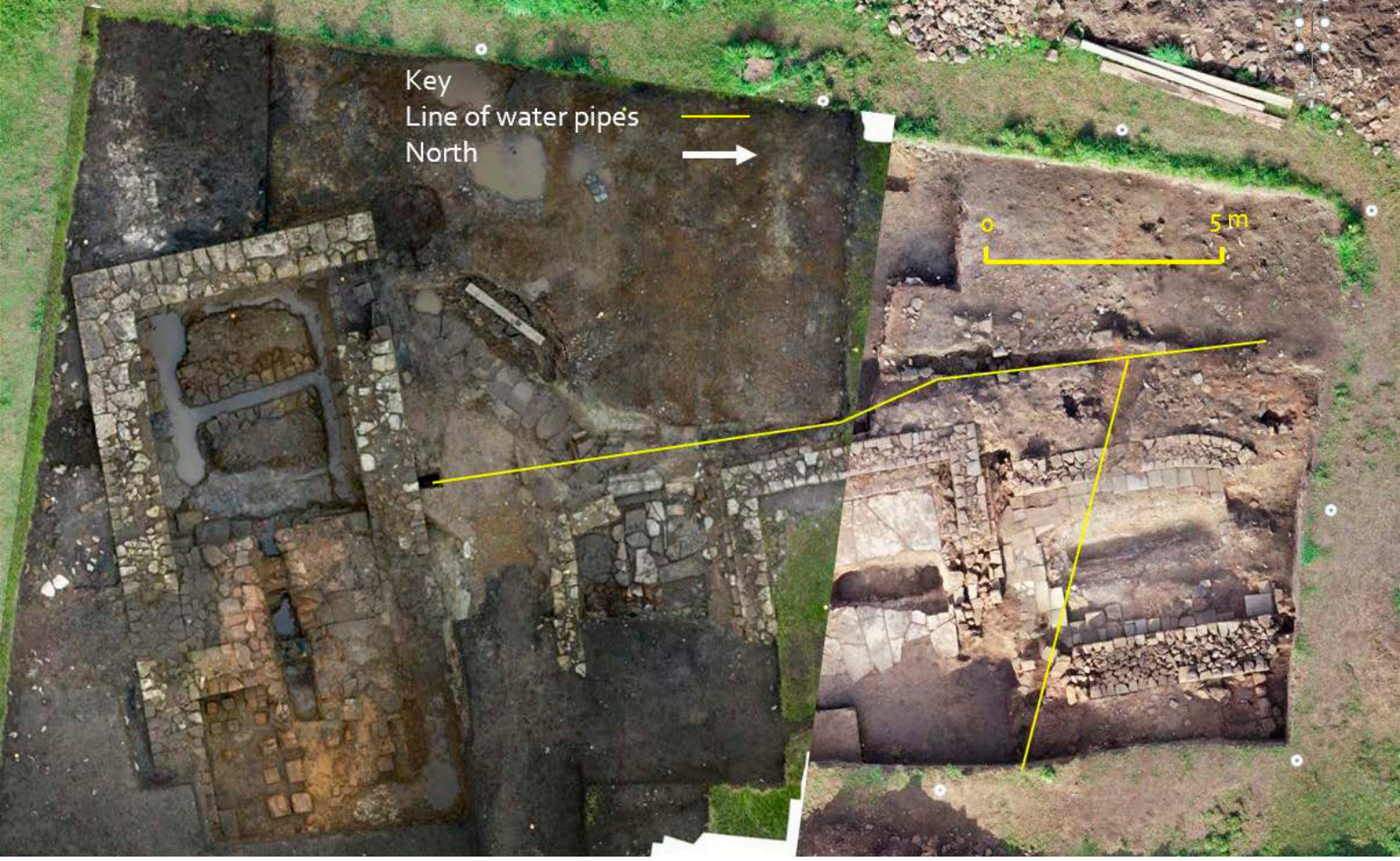
Above: The bathhouse; (left) Shaft outside the bathhouse to allow water to enter via (right) the internal aperture in the wall.

Uniquely in the Roman Empire, the iron fire beams provided over the flue survived intact.

It was not until the third season of excavation that it was possible to demonstrate conclusively that Richmond's building was in fact part of the fort bathhouse. Importantly the excavated area exposed the stoking chamber, the furnace, and part of the hypocaust of the hot bath (*caldarium*).

The construction of this facility was carefully planned. First a deep trench was cut in which a substantial stone lined drain was laid in order to take away ground water. This drain ran under the floor of the stoking chamber, which was itself semi- subterranean, with just over a metre of the walls beneath the contemporary early Roman ground surface. This allowed space for the stoking of the furnace providing sub-floor heat to the hot room of the baths and allowed the heated floor to be level with the exterior gravel surfacing.

Uniquely in the Roman Empire, the iron fire beams provided over the flue survived intact. These were over a metre long and 150 millimetres square in section and were immensely heavy. In use they would have supported a semi-cylindrical bronze or lead boiler called a testudo (not to be confused with the Roman shield formation), which would have been closed at the fire end, but open to the hot bath (*alveus*). Water within the bath and testudo would have circulated over the fire, reheating the bath water. The bath itself was supported on tile stacks (*pilae*), and the walls were heated by way of ceramic flue tiles (*tubuli*) set in the walls.



Above: Water supply; Photomosaic of Area A, with the course of the water mains shown.

Water supply

To the north of the bathhouse was a row of buildings of unknown function, which seem to have been frequently remodelled. Along the western edge of these buildings ran a narrow trench in which were found the iron rings which would have connected lengths of timber water pipe. This split into two branches north of the bathhouse, one of which ran off to the east. The main line of the pipe, however ran directly to a small stone-lined shaft against the wall of the bathhouse. This shaft led through the wall and was clearly the means by which water entered the building. Piped water would accelerate as it dropped into the shaft and would probably have been siphoned to the level required by the boiler though a system of now-vanished metal pipes. Full analysis of the engineering possibilities remains to be considered.

For piped water to be supplied, a consistent source would be required most probably led to the site by an aqueduct. There is suggestive evidence, in the shape of a primary culvert in Hadrian's Wall that such a facility was provided from the beginning of the fort's history, though this suggestion needs to be further pursued.

Above: Water supply; iron rings which would have connected wooden water pipes *in situ*. © Historic England

Above: Water supply; Primary culvert in Hadrian's Wall, which probably housed the fort aqueduct. © Historic England

The end?

Limited excavations in the extramural areas of other forts have generated the idea that these settlements were abandoned in the later 3rd century. One aim of the present excavation was to establish whether this applied to Birdoswald as well. Despite the extent of the excavation, nothing later than the later 3rd century AD was found. This indicates that, despite the size of the military town, it was abandoned, leaving the fort to remain in occupation for at least a century and a half. The bathhouse itself was demolished to a consistent level in antiquity, and the flue and stoking chamber deliberately filled with demolition debris. Analysis of these intriguing aspects have only just begun.

Impact of the research

The excavations have shed important light on the development and abandonment of the settlement outside the fort. They have revealed preserved rare details of a bathhouse construction.

The research demonstrates how different archaeological methods can complement each other to build up a better understanding of a site's development: geophysical survey provides an overall context, and excavation gives us a chronology and shows us in detail how a site developed.

About the Authors

Tony Wilmott

Tony is a Senior Archaeologist at Historic England. He has directed extensive excavations at Birdoswald at intervals since 1987. He has also excavated on other major sites, such as Whitby Abbey, and two Roman amphitheatres at Richborough and Chester.

Ian Haynes

Ian is Professor of Archaeology at Newcastle University, and Chair of Archaeology at the British School at Rome. The Birdoswald Extra-Mural project is the second major excavation he has directed with Tony, the first being the Maryport Temples Project, also in Cumbria.

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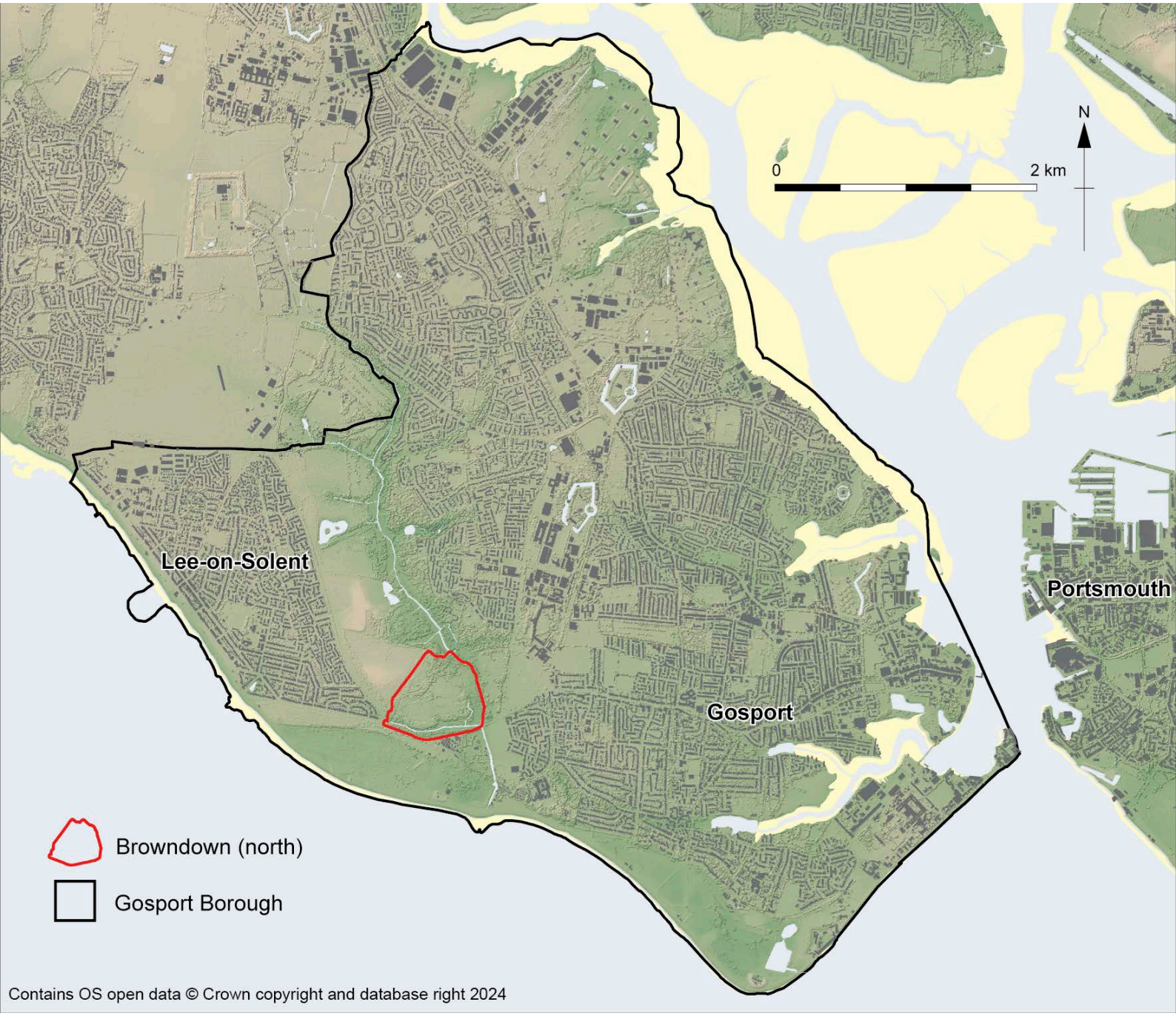
Browndown: training for trench warfare in the First World War

Recent survey has supported protection at one of the best preserved training grounds

Historic England's Archaeological Investigation Team have recently completed a detailed survey of First World War practice trenches at Browndown Ranges, Gosport, Hampshire. The trenches at Browndown stand out as one of the best preserved and most complex practice grounds in England. They offer a rare insight into how soldiers learned to live and fight in trenches before leaving for the Western Front.



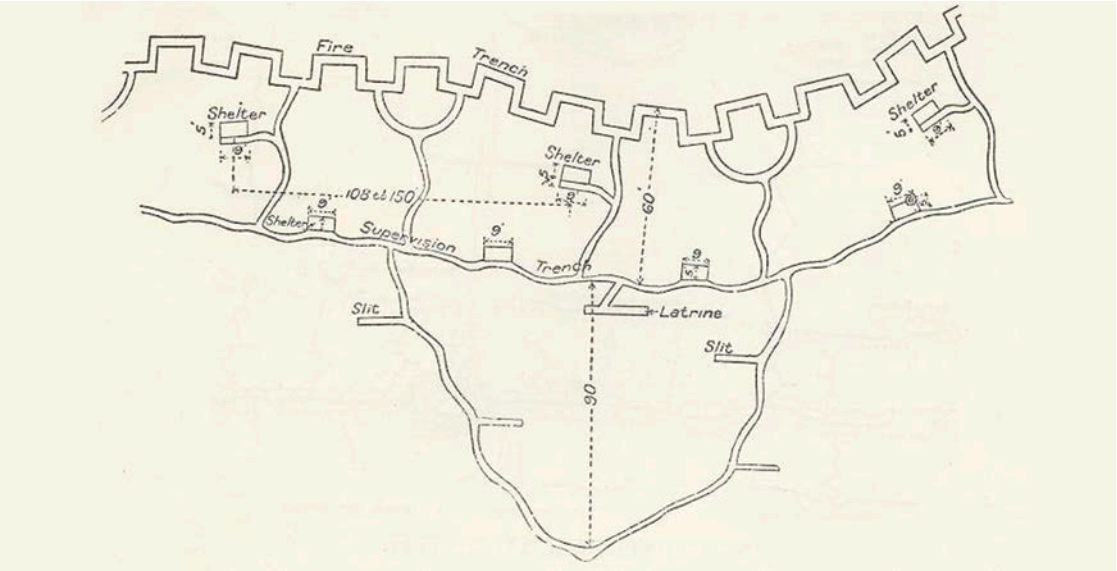
They offer a rare insight into how soldiers learned to live and fight in trenches before leaving for the Western Front.

Context

Work at Browndown forms part of a wider programme of research undertaken by Historic England for the Gosport Heritage Action Zone. Browndown Ranges occupy an area of heathland on the western side of the Alver valley, just inland from the coast between Gosport and Lee-on-the-Solent. The ranges are part of the Ministry of Defence training estate and the area has been used for military training since at least the late 18th century. Today public access to Browdown Ranges (North) is permitted subject to military by-laws.

Above: Browndown location.

Right: First World War trench layout from 'Notes on Trench Warfare for Infantry Officers' 1916.



Trenches mimicking the configuration of continental battlefields became a widespread feature at British training camps by 1915/16.

What are practice trenches?

Driven by advances in military technology, trenches became increasingly prominent in late 19th and early 20th century warfare. However, their importance came to the fore early in the First World War when open, mobile warfare ground to a halt, and fixed frontlines were formed. Experiences from the Western Front soon began to influence the training being given to thousands of new recruits at home in Britain. Trenches mimicking the configuration of continental battlefields became a widespread feature at British training camps by 1915/16.

A standard British First World War trench system had a distinctive form. This comprised:

- A crenellated front line, or 'fire trench'. The crenellations in plan were designed to prevent blast or gun fire travelling along the trench
- Behind, and parallel to the frontline were support or supervision trenches and reserve lines
- These were linked by perpendicular, often zig-zagging, communication trenches.

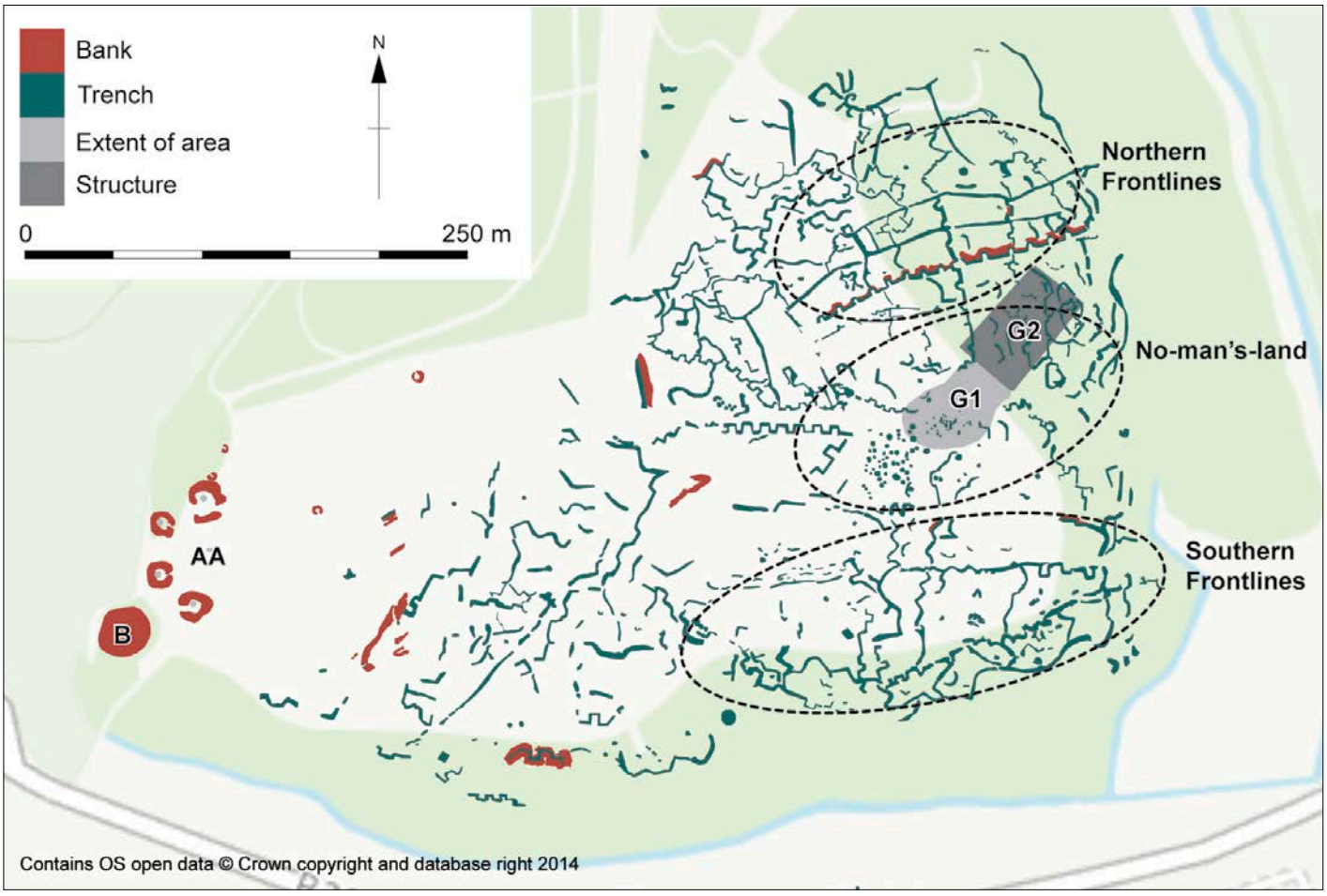
How we investigated Browndown trenches

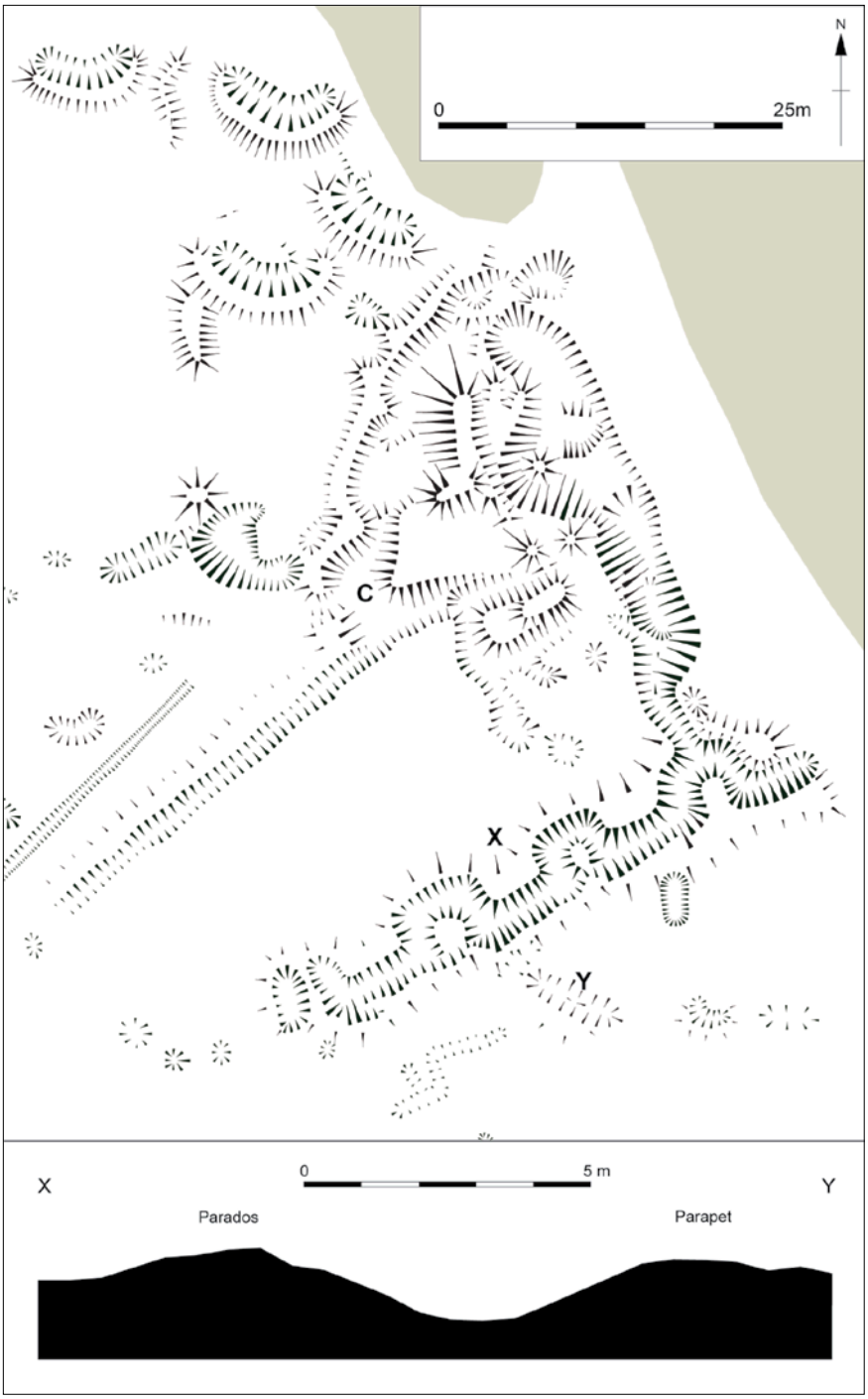
The trenches at Browndown were first identified by archaeologists studying aerial photographs in 2011 and were subsequently traced on the ground by Rob Harper of Gosport Borough Council. The current project combined aerial and ground-based survey techniques to better understand the extent, development and survival of the trenches at Browndown.

Aerial photographs dating from the 1920s to the present day were used to map the trenches and other features on the Ranges. The most useful photographs were those taken by the RAF in the 1950s and 60s. Although taken decades after the trenches' original construction, these detailed images capture the area with little of the vegetation that covers it today. A handful of photographs taken in 1923 provide independent confirmation of the trenches' First World War date.

Right: Browndown trenches in April 1951. © Historic England Archive, RAF Photography. Extract of RAF 540/453 4214 05-APR-1951

Below: All features mapped by aerial survey at Browndown. (AA = Anti-aircraft battery, B = Barrow, G1 = grenade range 1, G2 grenade range 2). Illustration by Fiona Small. © Crown Copyright and database right 2024. All rights reserved. Ordnance Survey Licence number100024900





Right: Earthwork survey of northern frontline trenches. Illustration by Olaf Bayer. © Historic England

The Landscape Archaeology team used digital survey instruments to make a detailed terrestrial record of the trenches and other earthwork features. In places this was made very difficult by thick vegetation. In several locations the course of well-preserved trenches disappeared into an impenetrable wall of gorse. Between 2020 and 2022 several gorse fires, as well as deliberate vegetation management, made further areas of trenches accessible.

A pattern emerges

The most easily recognisable features at Browndown are a complex of opposing frontline trenches on the eastern side of the study area. This complex echoes trench layouts seen on the Western Front and in contemporary field manuals. It consists of two opposing sets of crenellated frontline or 'fire' trenches, with associated support, reserve trenches and communication trenches. The opposing sets of trenches are separated by an approximately 130 metre wide 'no-man's-land'.

The trenches survive to a depth of over 1 metre. Traces of parapet and parados banks can be seen on the forward and rear edges of the fire trenches respectively. Parapet banks would have enhanced the forward-facing cover provided by a trench, whilst parados banks gave protection from the rear and prevented trench occupants from being seen in silhouette. To the rear of the trenches several semi-circular platforms fronted by low banks are likely to be mortar or light artillery positions.

In addition to the opposing frontlines are several more irregular trench complexes. These include interconnected elements of crenellated, wavy, and straight trenches. In addition to the trench complexes numerous separate lengths of trench and other features occur in isolation.

Our interpretation is that the Browndown trenches reflect two distinct activities. The simpler isolated trenches probably reflect practice digging where troops learnt trench construction techniques and built individual fitness and group cohesion. The more structured complexes comprise 'text book' training environments, mimicking sections of the Western Front, in which troops learned how to live and fight in trenches

Other examples of First World War practice trenches have been identified throughout England. However, those at Browndown stand out as some of the best preserved, and most complex examples. The Browndown trenches are unusual in that a wide variety of features and activities occur in a compact area.

Above: Northern fire trench with parapet bank. Scale 1m. Photograph by Olaf Bayer. © Historic England Archive. AF00452/P001

Above left: Northern frontlines (with repeated figure for scale).
Photograph by Steven Baker. © Historic England Archive. DP326063

Above right: Pupils from Brune Park School discuss the trenches with the survey team.
Photograph by Helen Spencer © Historic England

Left: View of the trenches in the centre of Browndown Ranges (north) looking south-east.
Photograph by Damian Grady © Historic England Archive HEA 26943_036 19-APR-2011

It has proved very difficult to establish exactly who dug and trained in the Browndown trenches.

The intensive nature of First World War activity at Browndown can make it difficult to interpret individual features, often several phases of activity occur in the same location. This is further complicated by the presence of much earlier and later features. This includes a probable early Bronze Age round barrow, a heavy anti-aircraft battery which formed part of Gosport's defences during the Second World War, and a series of interwar and later grenade ranges.

Who used the trenches?

It has proved very difficult to establish exactly who dug and trained in the Browndown trenches. The only documentary evidence comes from very early in the War. In his diary entry for 10/08/1914 James Thompson (Plymouth Battalion of the Royal Marines Light Infantry) writes "At Portsmouth. Fell in at 8 o'clock and marched to Browndown for trench digging.". This digging probably resulted in some of the simpler isolated trenches. It is uncertain which regiments constructed and used the more complex trench systems created later in the War. This could have been troops from the local Hampshire Regiment, or perhaps other regiments that encamped at Gosport prior to embarkation for the Western Front from nearby Southampton.

Conclusion and impact of the research

In April 2024 a substantial area of Browndown Ranges including the round barrow, the practice trenches and the anti-aircraft battery were designated as a scheduled monument by the Department for Culture, Media and Sport (DCMS) on the advice of Historic England. Scheduling will enable the MoD to better manage and protect these important archaeological features for future generations, whilst continuing to use the Ranges for training.

Working with the Historic England Heritage Schools team, Historic England archaeologists led several guided tours of the trenches for pupils from local secondary schools. The trenches offer a valuable opportunity to see how troops learned to live and fight in trenches before being deployed to the Western Front.

The Authors

Dr Olaf Bayer, MCIfA
Senior Archaeological Investigator with Historic England.

Olaf joined Historic England in 2015. He specialises in prehistoric landscape archaeology. Olaf carries out analytical earthwork surveys of sites and landscapes across the south and west of England.

Fiona Small, MSc
Aerial Investigator with Historic England

Fiona joined the Royal Commission on Historic Monuments of England in 1992. She carries out landscape survey and analysis recording sites from prehistory to the Second World War from aerial photographs and Lidar.

Further information

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Supporting Historic England's Strategic Agenda from the Air

Our Apprentice Aerial Survey Investigator reports on the vital work of monitoring heritage and discovering new sites.

In 2017, Historic England and more than 70 partner organisations launched the Historic Environment Trailblazer, designing a range of Apprenticeship Standards to train an increasingly diverse new generation of skilled professionals to care for, conserve and manage the country's heritage and historic environment. Providers of apprenticeships might include heritage organisations, the construction and craft industries and local authorities, with training provided both on-the-job and by formal education providers. Historic England itself offers apprenticeships at different entry levels in a range of specialisms. Robyn Andrews is a Level 7 Apprentice Aerial Survey Investigator specialising in reconnaissance, and here she describes her experience of working within the organisation.

Some surveys help to record and monitor the condition of sites and others record sites affected by climate change issues as well as those being affected by ongoing changes such as coastal erosion.

A Challenging and Rewarding Apprenticeship

Starting a new role as an apprentice working as an aerial survey investigator, specialising in reconnaissance, has been an exciting challenge. I have had a huge amount to learn about the practical skills required to plan and conduct a successful aerial survey and as an important part of the programme I have deepened my knowledge of archaeology around different parts of England.

Having been in this role since May 2023, I have been keen to collaborate and learn from many of our fantastic and knowledgeable colleagues, both within the Aerial Survey team but also more widely. Understanding the activities of other teams within Historic England has enabled me to develop my approach and ensure that the work I carry out benefits theirs. Through engaging with different colleagues, I have received a wide variety of requests for photography. Some surveys help to record and monitor the condition of sites and others record sites affected by climate change issues as well as those being affected by ongoing changes such as coastal erosion. Alongside these, I continue to search for new archaeological discoveries.

Above: Robyn and pilot Steve searching for cropmarks © Steve Wakeham

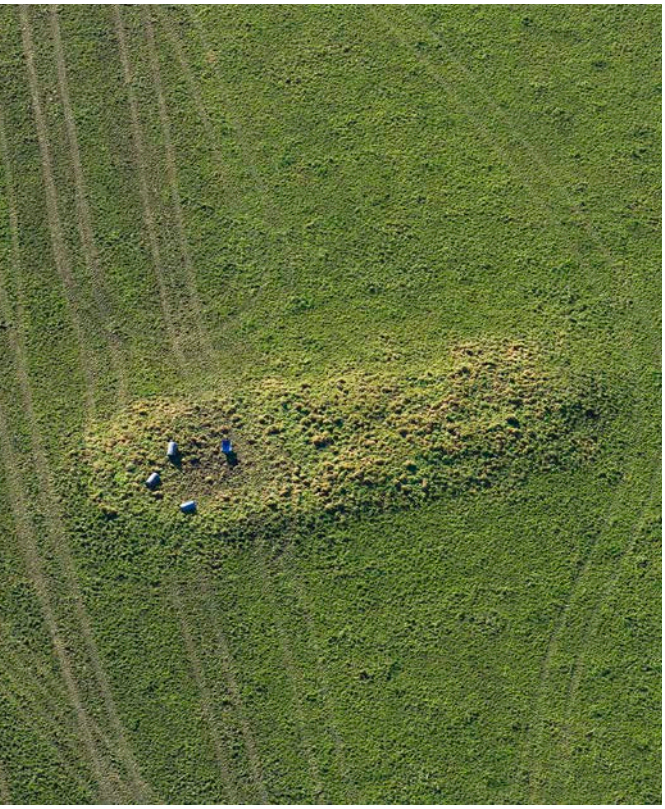
An important aspect of the survey work is monitoring the condition of scheduled monuments.

Heritage health-checks from the air

My work so far has been incredibly varied, I get the amazing opportunity to photograph such a diverse range of sites from the air.

An important aspect of the survey work is monitoring the condition of scheduled monuments. This work can be both reactive – responding to reports of damage to collect evidence – and proactive, assessing the current condition of monuments and feeding back any concerning issues to those working on Historic England's Heritage at Risk programme. I have to be on the lookout for many signs of damage such as animal burrowing, over grazing, excessive scrub growth on earthworks or clipping by the plough or the planting of damaging crops for below ground archaeology such as potatoes and sugar beet.

We have almost 20,000 scheduled entries on the National Heritage List for England and ensuring they are being cared for appropriately is a 'monumental' task. It feels good to be able to contribute towards the protection of scheduled monuments and ensure that they will be around for future generations to enjoy.



Above left: Potential erosion issues spotted on a scheduled Neolithic Long Barrow in the Peak District © Historic England Archive 34199_057 / 28-NOV-2023

Above right: A scheduled Neolithic Long barrow in a cultivated field, left to be protected from the effects of ploughing. © Historic England Archive 34267_040 / 29-JUL-2024

Recording the effects of Climate Change on heritage assets

Climate change is something that is having an ever-increasing effect on heritage assets. Damage can threaten their historical significance and new challenges arise in formulating how to adapt them to survive future threats.

Last winter I witnessed large-scale flooding events, some of which were directly affecting heritage assets. During a survey flight south of York, I observed a large proportion of the parkland at Moreby Hall, a registered park and garden, submerged by floodwater. The main house itself was also extremely close to being flooded.

During the survey I also observed many medieval sites which despite the high water managed to avoid flooding altogether. I always find it impressive how well-positioned some historical sites are and how they manage to avoid flooding even over hundreds of years of change. Modern extreme weather events may pose a heightened threat, however, and perhaps we can learn from past building practices.

Climate change is having an ever-increasing effect on heritage assets

Top: The parkland at Moreby Hall, a grade II registered park and garden, was flooded last winter. The water came up to the edge of the main house. © Historic England Archive 34238_043 / 17-NOV-202

Bottom: The medieval moated motte and bailey site including the medieval church at Aughton, south of York, avoided the floods last winter © Historic England Archive 34238_007 / 28-NOV-2023

Recording them ensures these values can be preserved and passed on to both contemporary and future generations.

Recording ahead of change

There are many archaeological sites around England facing threats from change whether it be from infrastructure development or more natural causes such as coastal erosion.

I recently surveyed the east coast, just north of Flamborough Head, East Riding of Yorkshire, in parts highly vulnerable to erosion. Dotted along this stretch of shoreline there are a vast number of wartime defences including pillboxes and anti-tank obstacles, many of which are gradually falling off the cliffs and slowly disintegrating in the sea. It is important to record these sites before they are gone as many hold not only historical value but also communal value to those with connections to the Second World War. Recording them ensures these values can be preserved and passed on to both contemporary and future generations.

Below: Two 20th-century pill boxes and a row of anti-tank obstacles photographed close to Bridlington. You can see just how much the coast has eroded by how far the coastal defences are from cliff edge. © Historic England Archive 34278_052 / 16-AUG-2024

Every year new features are revealed, whether on entirely new sites or in the form of additional details to a site which is already recorded.

Above: A new area of archaeological cropmarks revealing a section of Prehistoric ladder settlement in the Yorkshire Wolds. It was quite windy as you can see the rippled effect across the Barley crops. © Historic England Archive 34159_005 / 15-JUN-2023

Making new discoveries

An exciting aspect of my role is the continued search for new archaeological discoveries which occur in the height of summer when cropmarks reveal underlying archaeological features.

Cropmarks are formed when buried features, whether they are ditches or walled structures, affect the growth of crops, causing variations on the surface. The variations can cause changes to the colour and height of the crops, forming patterns which can be seen clearly from the air.

Every year new features are revealed, whether on entirely new sites or in the form of additional details to a site which is already recorded.

Last year I discovered a new Later Prehistoric 'ladder settlement' in the Yorkshire Wolds. Ladder settlements date from the Iron Age and are shaped by strings of enclosures used to keep livestock. Formed alongside a central drove way, they can often extend over many kilometres. Finding a new example of this type of settlement deepens our understanding of how Iron Age people were using the land in this part of the Yorkshire Wolds. The discovery illustrates how identifying new areas of archaeological activity can inform future research and help to build on what we know about our past.

The Apprenticeship scheme has given me a great opportunity to develop important skills.

Impacts of the work

My role has an important part to play in contributing towards Historic England's priorities set out in its Corporate plan 2023-26. Through recording and monitoring the condition of scheduled monuments around England I am helping to inform how these are managed and cared for. This directly contributes towards the Planning, Listing, Conservation Advice and Investment priority (Priority 3 in the Plan). Providing up-to-date information about the current condition of scheduled monuments enables advice to be given to landowners on how best to care for our treasured heritage, ensuring these significant sites will endure for future generations.

Delivering action on climate change and the role that heritage plays in tackling the effects of it, is a priority for Historic England. It is also something that I am personally conscious of and want to contribute towards. Through recording the effects of flooding on heritage assets I hope that we can learn from past societies and how successful positioning of settlements has enabled their structures to stand the test of time. Looking at heritage sites vulnerable to flooding may also help understand how we can adapt them to mitigate the effects of climate change.

Climate change can also be a factor in the rapid erosion of some of our coastlines. There are many historically significant sites along our coast vulnerable to erosion and these are inevitably going to disappear. Recording sites before they disappear will provide valuable information for current and future research and ensure that sites such as those from the Second World War are not forgotten. Recording sites over periods of time on the coast also provides useful data about the rates of erosion and will contribute towards the Climate Action priority (Priority 4 in the Plan).

The discovery of new archaeological sites helps to build on our current understanding of the past but also impacts the direction of future research and raises new questions which we want to answer. Through a greater understanding of our past comes a greater awareness of the significance and value of our heritage. This can positively impact the way people perceive their sense of place through a greater understanding of their local heritage, contributing towards the Better Places priority (Priority 1 in the Plan).

A crucial part of my role is preparing the photographs to the standards of the Historic England Archive. The processing of the photographs has been a steep learning curve, making sure the photos look good and contain the metadata required to help the archive with digital preservation and cataloguing. After all this work I was pleased to see over 7000 of my photographs appear on the Aerial Photo Explorer along with other Aerial Survey photos and scanned archive photos form the 1940s onwards. This contributes towards helping more people engage with our Archive services and collections (Priority 5 in the Plan).

The Apprenticeship scheme has given me a great opportunity to develop important skills in preparation for a career in the heritage sector. Through contributing towards the work of a variety of teams, my work will engage with many aspects of the corporate plan, and this is something I am really proud to be a part of.

The Author

Robyn Andrews

Robyn works as a Level 7 Apprentice Aerial Survey Investigator specialising in reconnaissance. She is currently completing a Masters degree in Archaeological Practice alongside her role at Historic England. www.linkedin.com/in/robyneandrews

Further information

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Historic England (2024) Climate Change Risks and Hazards Advice

Research Reports 2024

A roundup of new additions to the Historic England Research Reports database from March 2024 to September 2024 arranged by heritage theme.

Climate Change

We are researching and promoting how the historic environment can positively contribute to overall global sustainability through adapting and mitigating measures.

Climate Change and Heritage: A Review of Recent, Current and Planned Research
JBA Consulting

The report focuses on understanding the ongoing research that directly relates to improving adaptation options or relates to threats and risks to heritage from climate change and from our responses to climate change. The project aimed to identify gaps in the research landscape, novel approaches, and potential partner organisations for Historic England.

Read the report

Identification of Climate Hazard and Climate Change Adaptation Resources
JBA Consulting

This report outlines findings related to identifying climate hazard resources relevant to safeguarding heritage sites against the impacts of climate change.

Read the report

Climate Change Programme: Sector to Net Zero Consultation Report
Dan Miles

This report outlines the process, results and analysis of a consultation to understand the current situation of where heritage organisations are on their journeys to Net Zero.

Read the report

Creating a Vocabulary of Climate Change Hazards for Heritage
Helen Thomas, Philip Carlisle, Scott Orr

This project addresses gaps in consistency and understanding of terminology by creating a standardised vocabulary of climate hazards for heritage. It adapts the methods and definitions of the Intergovernmental Panel on Climate Change (IPCC), aligning cultural heritage with international climate change science.

Read the report

The Contribution of Designated Heritage Assets to Biodiversity and Natural Capital in England: An Approach to Integrated Conservation
Kate Jeffreys, Simon Ford, Alex Woolcock, Phil Collins, Brendan Cooper

This project looks at how heritage assets can support biodiversity conservation, and at the relationships between wildlife, geodiversity, heritage and natural capital through a series of case studies.

Read the report

Scientific Dating

Our reports on scientific dating, including dendrochronology and radiocarbon methods, add new insights to understanding the chronology of buildings and sites.

69 Newgate Street, Bishop Auckland, Durham: Tree-ring Analysis and Radiocarbon Wiggle-matching of Pine Timbers
Alison Arnold, Robert Howard, Cathy Tyers, Dana Challinor, Bisserka Gaydarska, Michael Dee

Allowing for missing sapwood, it is possible to suggest that the 9 dated timbers used in the roof were felled in the latter half of the eighteenth century or possibly in the early nineteenth century.

Read the report

The Radiocarbon Database for England: Structures and Definitions
Edrich Gonsalves, A Bayliss, Bisserka Gaydarska, Peter Marshall

This document details the design and content of the Radiocarbon Database for England, which is hosted by Historic England.

Read the report

Sea View, Mersea Island, Essex: Radiocarbon Dating of Waterlogged Timbers
Peter Marshall, Oliver Hutchinson, Danielle Newman, Zoë Hazell, Sanne Palstra, Irka Hajdas

Radiocarbon dating of two linear features recorded by CITiZAN at Sea View, Mersea Island, Essex has demonstrated that they were constructed from timbers felled in the late 7th–8th centuries AD.

Read the report

Point Clear, River Colne, Essex: Radiocarbon Dating of Waterlogged Timbers
Peter Marshall, Oliver Hutchinson, Danielle Newman, Gill Campbell, Sanne Palstra, Lukas Wacker

Radiocarbon dating and chronological modelling estimates that the three dated features groups of worked wood were constructed in the second half of the sixth century AD. The function of the structures is unclear, although possibly linked to the extensive fishing industry operational at the time in the Blackwater estuary.

Read the report

Dorchester Palisaded Enclosure, Greyhound Yard and Church Street, Dorchester, Dorset: Radiocarbon Dating and Chronological Modelling
Peter Marshall, A Bayliss, Michael Dee, Irka Hajdas, Susan Greaney

Results of radiocarbon dating and chronological modelling of samples from the Dorchester palisaded enclosure, suggest that the enclosure was constructed in 2470–2430 cal BC (95% probability) and probably in 2490–2360 cal BC (68% probability).

Read the report

Priory House, 33 High Street South, Dunstable, Bedfordshire: Radiocarbon Dating of Twigs from the Undercroft A Bayliss, Michael Dee, Lucy Allot, Diccon Hart, Maggie Henderson

Radiocarbon dating and chronological modelling suggest that organic material recovered from above the vault cones of the undercroft of Priory House, Dunstable, was deposited in cal AD 1217–1269 (95% probability). This provides independent confirmation of the early/mid-13th century date for the undercroft suggested on stylistic grounds.

Read the report

Exeter, The Old Deanery, Great Chamber, Devon: Dendrochronology and Radiocarbon Wiggle-matching of Oak Timbers
Cathy Tyers, Robert Howard, A Bayliss, Bisserka Gaydarska, Michael Dee, Sanne Palstra

The report covers re-analysis of timbers sampled in the 1990s. One group of timbers from roof/floor joists were probability felled at a similar time in the AD 1410s or AD 1420s. Examination of a further 8 timbers from floor joists clearly indicates that they were imported from Northern France, and as such they are the first structural timbers identified as being imported from this source into Medieval England. These timbers are likely to have been felled as part of a single felling event between the early AD 1120s and the mid-AD 1130s.

Read the report

1 High Street, Stratford-upon-Avon, Warwickshire: Tree-Ring Dating of Oak Timbers
Dr Martin Bridge, Cathy Tyers

Dating of 7 timbers shows it is likely that the present building was constructed in late AD 1441, or within a year or two after this date, using timber of local origin.

Read the report

Garrick Inn, 25 High Street, Stratford-Upon-Avon, Warwickshire: Tree-ring Analysis of Oak and Elm Timbers
Dr Martin Bridge, Cathy Tyers

3 oak timbers from the first-floor front range were dated, giving a likely felling date range spanning the late-16th to early 17th centuries, in line with the expected date of about AD 1596.

Read the report

Must Farm. Whittlesey, Cambridgeshire: Dendrochronological and Radiocarbon Dating
Ian Tyers, Peter Marshall, Bronk Ramsey, Elaine Dunbar, Irka Hajdas, Sanne Palstra, Paula Reimer, Lukas Wacker

The Must Farm pile-dwelling site is an extraordinarily well-preserved Late Bronze Age settlement in Cambridgeshire built over a freshwater palaeochannel that was destroyed by a catastrophic fire shortly after its construction. Predating the settlement was a double-alignment of massive oak piles. This technical archive report on the tree-ring and radiocarbon analysis of samples from the site provides full details of the dendrochronological and radiocarbon dating programmes.

Read the report

Gigi Bottega, Flying Horse Walk, The Poultry, Nottingham: Tree-ring Analysis of Oak Timbers
Alison Arnold, Robert Howard, Cathy Tyers

Dendrochronological analysis showed that the first floor contains at least 3 timbers felled in AD 1647 and two others, which were probably felled at this date too, plus 3 timbers, which were felled in AD 1655. The cellar also contains 1 and probably 2 timbers felled in AD 1655, plus 3 others, probably cut as part of either the AD 1647 felling or that of AD 1655.

Read the report

1 and 3 Market Place, Snaith, Snaith and Cowick, East Riding of Yorkshire: Tree-Ring Analysis and Radiocarbon Wiggle-Matching of Oak Timbers
Alison Arnold, Robert Howard, Cathy Tyers, Bisserka Gaydarska, Michael Dee, Sanne Palstra, Peter Marshall

Wiggle-matching suggests that the final ring of this site master chronology formed in cal AD 1729–1746 (95% probability) or cal AD 1732–1739 (68% probability). This is compatible with the tentative dating produced for the site master chronology by ring-width dendrochronology, which suggests that it spans AD 1669–1732. Interpretation of the sapwood on these samples indicates the timbers represented were all felled in AD 1732.

Read the report

Flag Fen, Cambridgeshire: Tree-ring Analysis of Oak Timbers (FFB21)
Ian Tyers

The dated timbers were from the late Bronze Age and replicate tree-ring chronologies originally constructed in the 1990's. This report archives the newest dendrochronological results and integrates them with previous studies on this important site.

Read the report

Higher Uppacott, Widecombe on the Moor, Devon: Dendrochronological and Radiocarbon Analysis of Oak Timbers
Ian Tyers, Michael Dee, Peter Marshall

The results demonstrated that the only original raised cruck truss from the roof of the longhouse was constructed from timber felled in either the mid- 14th or early 15th centuries. The hall roof contains timbers felled at the beginning and end of the 16th century.

Read the report

Dovecote, South-West of the Manor House, Village Street, Naunton, Gloucestershire: Tree-Ring Investigation of Oak Timbers
Daniel Miles, Dr Martin Bridge

8 timbers, 6 lintels and 2 purlins, were sampled from the dovecote. Although three pairs of timbers were cross-matched, all the timbers showed abrupt growth-rate changes, and none were dated.

Read the report

Outbuilding to Watton Abbey, Church Lane, Watton, East Riding of Yorkshire Tree-ring Analysis of Oak Timbers
Alison Arnold, Robert Howard, Cathy Tyers

Neither of the site sequences nor any of the ungrouped samples could be dated by ring-width dendrochronology.

Read the report

Church Tower, 100 Metres North of the Church of St John, Shenstone, Lichfield, Staffordshire: Tree-ring Dating of Oak Timbers
Alison Arnold, Robert Howard, Cathy Tyers

The project resulted in the dating of 21 timbers, ranging from 15th to 17th century dates.

Read the report

Archaeology Reports

We publish a range of reports on archaeological excavations, monitoring, survey work and archive practice.

Blood Hill, Thetford, Norfolk: Report on Geophysical Surveys, May 2024
Megan Clements, Neil Linford, Paul Linford, Andy Payne, Nathalie Barrett

The geophysical surveys suggest the current monument covers an original, circular barrow mound and some anomalies suggest the encircling barrow ditch has been infilled. The earth resistance and Electrical Resistivity Tomography results also support a tentative interpretation that the barrow was originally higher and has been flattened either through deliberate landscape re-shaping, erosion associated with the ride and movement across the mound, or through excavation into the monument.

Read the report

White Hill, Brandon, Suffolk: Report on Geophysical Surveys, May 2024
Megan Clements, Neil Linford, Paul Linford, Andy Payne, Nathalie Barrett

The geophysical results suggest the underlying monument at White Hill has a more diamond-like form, and a clear distinction between the mound, berm and the surrounding ditch can be seen on the north-eastern side of the monument.

Read the report

Leominster Priory, Leominster, Herefordshire: Report on Geophysical Surveys, October 2023
Megan Clements, Neil Linford, Paul Linford, Andy Payne, Nathalie Barrett

The vehicle towed caesium magnetometer survey was conducted over a large area of recreational space, known as The Grange, found to the south of the priory and produced evidence for evidence for medieval ridge and furrow cultivation. Earth resistance survey confirmed the survival of the double apsidal end to the east of the priory together with evidence to support a possible north building range of the priory cloister in Pinsley Mead.

Read the report

Ravenglass Roman Bath House, Muncaster, Cumbria: Report on Geophysical Surveys, January 2024
Megan Clements, Neil Linford

A Ground Penetrating Radar survey was conducted at the Ravenglass Roman Bath House to support English Heritage management of the site. It aimed to determine whether overhanging masonry at the site had been subject to previous reinforcement to mitigate against collapse.

Read the report

Old Wardour Castle, Tisbury, Wiltshire: Report on Geophysical Survey, March 2024
Megan Clements, Neil Linford

The aim of the survey was to provide a better understanding of the site of any limitations or risks relating to buried archaeology and to estimate its depth, to inform the location of temporary structures and transport of heavy equipment required for events held at the site. The results have confirmed the survival of formal garden features known from a previous earth resistance survey and suggest polygonal wall-footings of the castle may have extended further beyond the standing remains than has previously been recognised.

Read the report

Wroxeter Farm, Wroxeter and Uppington, Shropshire: Report on Geophysical Surveys, April and May 2024
Megan Clements, Neil Linford, Andy Payne

The aim of the survey was to determine the location of any archaeological remains within the farmyard and extend previous geophysical coverage within the adjacent paddock in advance of possible invasive investigation.

Read the report

Wigmore Castle, Wigmore, Herefordshire: Report on Geophysical Survey, February 2024
Andy Payne, Megan Clements

An earth resistance survey was conducted within the lower inner bailey to identify any significant sub-surface remains of the castle. The survey was requested by the English Heritage Trust to inform the reinstatement of visitor footpath routes to the upper shell keep.

Read the report

Mount Grace Priory, East Harlsey, North Yorkshire: Report on Geophysical Surveys, November 2023
Megan Clements, Andy Payne

A magnetometer and earth resistance survey were conducted at Mount Grace Priory, Staddlebridge House, Mount Bank, Northallerton, at the request of the English Heritage Trust in anticipation of planning application for a car park extension and to investigate the possible location of the medieval manor of Bordelbi. The surveys have mainly found evidence of former agricultural activity in the form of ridge and furrow cultivation.

Read the report

Costing Models for the Transfer of Archaeological Archives
Samantha Paul, Manda Forster

The main aim of the project is to inform the development of a charging system for the deposition of archaeological archives that is fair, proportionate, easily understood and calculated. The purpose of the document is to outline the results of the study, providing background information, cost model options and consultation results, and to outline the recommendations of the project team.

Read the report

National Collection of Archaeological Archives Operating Model: Museum and Research Institution Needs
Manda Forster, Samantha Paul, Jenny Durrant

The main aim of the project is to assist with the testing of the business model for a national store and collection of archaeological archives, focusing on the requirements of museum and research institutions. The purpose of the document is to outline the results of the study, providing background information and context, an outline of possible operational models, and to present consultation results and outline the recommendations of the project team.

Read the report

Archaeological Sensitivity Pilot Projects
Jonathan Last

Sensitivity mapping aims to assist planners and land managers to understand the potential impact of large-scale development or other landscape change on the historic environment. It indicates the likelihood of encountering significant archaeological remains in a given area, providing more upfront information for local plans and allocations than is usually available at present. The report covers Historic England's vision for sensitivity mapping, a review of previous approaches and the components of the model.

Read the report

Tonedale Mill and Tone Works, Wellington, Somerset: an Archaeological Landscape Assessment of the Water Management System
Nicky Smith, Fiona Small, Rebecca Pullen

The report clarifies the nature, extent and importance of the water management features, charts their development and examines the interconnections between them. This information will inform Historic England's advice on regeneration proposals and help to underpin future site interpretation.

Read the report

Flag Fen: Investigating the Survival and Preservation of the Archaeological Remains to Inform a Management Strategy
Mark Knight

This report presents the results of the Autumn 2021 condition assessment of the internationally significant Bronze Age post-alignment at Flag Fen. There is a risk of significant loss of preserved archaeology following the lowering of groundwater levels due to the draining of the surrounding fens for agriculture. The report provides new detail concerning the contextual and topographical setting of the monument and will inform the development a management plan for the site.

Read the report

Excavations at West Amesbury Farm: Medieval and Post-Medieval Charred Plant Remains
Ruth Pelling

Excavations focused on the prehistoric landscape of the south-eastern corner of the Stonehenge and Avebury World Heritage Site. An unexpected find of a sizable post medieval grain deposit within a ditch and pit provides evidence for the more recent arable activity within the landscape. Scattered medieval and post medieval arable crop remains were also encountered in several of the prehistoric feature fills.

Read the report

Built heritage reports

Our reports cover investigations into the built historic environment at different levels of detail. Particular focus points of this research is to support heritage-led regeneration and to inform heritage at risk cases.

Conserving Stained Glass Windows Using Tracery and Partial Environmental Protective Glazing: A comparative study on the efficacy of tracery, partial and full environmental protective glazing
Tobit Curteis, Domenico D'Alessandro, Stephen Clare, Jack Clare

The research demonstrates that, although there were some minor performance variations, in general the tracery and partial environmental protective glazing performed in a similar way to full environmental protective glazing, improving thermal buffering and significantly reducing the risk of condensation on the historic glass surfaces.

Read the report

Sowerby Bridge, West Yorkshire: Historic Area Assessment, 30 July 2024
Chris Curtis, Clare Howard, Lucy Jessop

The Sowerby Bridge Historic Area Assessment was undertaken in support of the Sowerby Bridge High Street Heritage Action Zone, a government-backed scheme aimed at using the historic environment to drive growth in historic places. This report focuses on the main thoroughfare and historic town core, including the historic County Bridge, the south-east end of Hollins Mill Lane, the southern end of Tower Hill, Town Hall Street, Wharf Street and Old Cawsey, as far as the canal basin. It provides an overview of the town's history, development, character and value to inform key decisions about its future.

Read the report

The Tudor House Hotel, 52-3 High Street, Tewkesbury, Gloucestershire: Historic Building Assessment
Johanna Roethe

The Tudor House Hotel is a large, timber-framed house dating probably from the 16th century, with significant 17th-century extensions. It is associated with several important figures, including Archbishop Thomas Secker (1693-1768) who studied at a Nonconformist Academy in the building and the local writer John Moore (1907-67) who spent part of his childhood there. The building has been in use as a hotel since 1929. This report sets out its history and the phases of its development.

Read the report

39-41 Westgate Street, Gloucester. Historic Building Assessment
Rebecca Lane

This report presents the findings of the investigation undertaken on 39-41 Westgate Street, Gloucester. Included within the report are the results of the measured survey and photographic survey undertaken during recent works to stabilise and restore both buildings. Documentary research was also carried out to support the analysis of the two plots.

Read the report

Evaluation Report: Shrewsbury Flaxmill Maltings Construction Phase
Historic England

This document provides an overview of the evaluation of the Construction Phase of the Shrewsbury Flaxmill Maltings project. An in-depth project report has also been drafted detailing the Construction Phase of the intervention from start to finish. The preliminary findings of this evaluation report will form the basis for the final impact evaluation in 2025 which will include long-term operational findings.

Read the report

Northumberland Square, North Shields: History, Investigation and Landscape Assessment
Lucy Jessop, Chris Curtis

Northumberland Square was built at the start of the 19th century as part of the expansion of North Shields. The houses on the north side of the square were completed by the 1810s, whilst development around the other sides continued piecemeal over the following decades.

Read the report

81-2 Barton Street and 1-3 Mason's Court, Tewkesbury, Gloucestershire: Historic Building Investigation
Rebecca Lane, Johanna Roethe

The buildings at 81-2 Barton Street and 1-3 Mason's Court comprise an early 14th-century cruck-framed hall to the rear and a front range which probably dates from between 1450 and 1500. The hall is the earliest, upstanding domestic building in Tewkesbury and the town's only cruck building. This report details the history and development of the building, based on fabric analysis and documentary research. It also discusses the findings of a previous investigation by Stanley Jones and the results of dendrochronological dating.

Read the report

Aerial Survey reports

These reports cover interpretation and mapping of sites, bringing together information on buried features revealed as cropmarks, soilmarks, parchmarks or features visible on the surface such as earthworks and structures, or features identified through Lidar.

Rutland Roman Villa Environs Aerial Mapping Project
Fiona Small

This report summarises the results of the assessment and mapping of aerial photographs and lidar data undertaken for the Rutland Roman Villa Project. As part of this project Historic England carried out an aerial investigation and mapping survey of the contextual area of 30 square kilometres around the villa.

Read the report

Warbrook House, Eversley, Hampshire: Aerial Survey of the Garden and Parkland
Edward Carpenter

Warbrook House, Eversley, Hampshire is a Grade I listed early 18th-century Palladian villa that sits within a Grade II* Registered Park and Garden that is on the Heritage at Risk Register. The house, formal garden and wider formal landscape were designed and constructed by the architect John James. This aerial survey has identified low earthworks within the formal garden and across the wider park, most of which have only been seen in lidar. Some of these appear to be the remains of the original early 18th-century garden design and allow a tentative outline of James's original design to be suggested. The results of this survey will help in the creation of a sustainable management plan to remove Warbrook from the Heritage at Risk Register.

Read the report

Scunthorpe and its Environs: Air Photo and Lidar Mapping and Interpretation
Alison Deegan

This report covers known and possible Neolithic and Bronze Age burial and ritual monuments; the distribution and visibility of Iron Age and Roman landscapes; medieval and post medieval sites and landscapes and 20th-century military installations. Particular attention is given to the physical remains that survive from warping and the iron and steel industry. Warping was a process of land improvement practised in the Trent Valley in the 18th and 19th centuries.

Read the report

Heritage and Wellbeing reports

Cultural Heritage Capital and Wellbeing: Examining the Relationship Between Heritage Density and Life Satisfaction
Thomas Collwill

This study investigates the impact of local cultural heritage density on individual wellbeing in England. The research estimates the average individual benefit of cultural heritage near individual residences to be £515, with a collective WELLBY (Wellbeing Adjusted Life Year) value of £29 billion across England. This quantification illustrates the significant aggregate economic and wellbeing benefits of cultural heritage. These results offer insights for policymakers on the significance of heritage conservation and its potential to improve quality of life, highlighting the intrinsic value of cultural heritage in contributing to societal wellbeing and providing a compelling argument for its preservation and integration into society development and wellbeing strategies.

Read the report

Heritage crafts reports

Machinery for Harvesting and Processing Cereal Straw for Thatching Phase 1 Report
Andy Scarlett

The production of thatching straw is a complex, time-consuming and very weather dependent process. Many thatching straw producers use unreliable or outdated machinery and labour-intensive working systems. These potentially threaten the efficiency and long-term viability of straw production. This report details the findings of Phase 1 of research into the mechanical and operational challenges faced by those harvesting and processing thatching straw

Read the report

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