Discovery, Innovation and Science in the Historic Environment

RESEARCH

Historic England

ISSUE 26

Welcome...

...to this issue of Research magazine.

Historic England has a strong and continuing record in undertaking research, and preparing advice, guidance and publications on England's industrial heritage. Having gone into partnership with Liverpool University Press, this issue focusses on a number of recent Historic England publications on our rich industrial past.

We start with George Demidowicz's seminal volume The Soho Manufactory, Mint and Foundry, West Midlands: Where Boulton, Watt and Murdoch made History, which describes one of the key sites of the Industrial Revolution. The article introduces this ground-breaking industrial complex, including the first purpose-built steam engine manufactory in the world and the first industrial building to be lit by gas – the Soho Foundry.

Some of the engines manufactured at Soho Foundry supplied sites described by James Douet in The Architecture of Steam: Waterworks and the Victorian Sanitary Crisis. His article points out transformative effect these had on our towns and cities by providing clean water and removing sewage and waste. Drawing on international comparisons, Douet highlights the significance of the British evidence with the remarkable statement that 'there are more conserved steam waterworks in Staffordshire than in most European countries'. Many retain in-situ steam plant and a number are open as heritage attractions.

Geoff Timmins considers the impact of textile factories, workers' housing and their variability, together with associated infrastructure improvements, which are addressed through a series of cases studies in his publication The Built Environment Transformed: Textile Lancashire during the Industrial Revolution. This complements our other work carried as part of the Mills of the North project, where further resources can be found, including the recently published Textile Mills: Introduction to Heritage Assets.

Drawing on material from Oasts and Hop Kilns – A History (Grattan 2021) and The Buildings of the Malting Industry – The Production of Malt from Prehistory to the 21st Century (Patrick 2023) two articles by Patrick Grattan and Amber Patrick look at two building types both associated with the brewing industry. They describe their history, form, function, distribution, development, including the influence of technological improvement, survival and future reuse. These completement two earlier English Heritage (now Historic England) publications: Built to Brew – The History and Heritage of the Brewery (Bevin 2014) and 'Licensed to Sell – The Historic and Heritage of the Public House' (Brandwood, Davison and Slaughter 2011).

We also build on the previous issue's theme of managing change at landscape level with two further articles on that topic:

- 'Mapping the Palaeolithic' by Keith Wilkinson and Monika Knul, looking at the landscapes of the longest and perhaps least familiar period in our past and
- 'Investigating the Intertidal Zone', by Louise Firth and Daniel Maudlin, which looks at investigating both the intertidal historic landscape and biodiversity of Plymouth Sound.

Finally, in this issue we have our regular roundup of recent research reports.

Shane Gould
Head of Industrial Heritage
with Historic England.

Front cover image: The interior of Crossness Pumping Station, Abbey Wood, London.

Contents

When Soho led the world

The technological accomplishments of the Soho Manufactory, Mint and Foundry.

These three Soho sites formed a ground-breaking historic industrial complex. They were established in the second half of the 18th century to the west of Birmingham, their fame in no small part due to their association with the great industrial pioneers Matthew Boulton, James Watt, and William Murdoch. The Soho Manufactory (1761-1863) and Soho Mint (1788- early 1850s) were both situated in the historic parish of Handsworth, now in the City of Birmingham. The Soho Foundry (1795-1895) lay in the historic township of Smethwick, now within Sandwell Metropolitan Borough. Together they played a key role in the Industrial Revolution, achieving many world 'firsts '.

This article is based on research that was carried out on the material history of the three Soho sites, published by Historic England and Liverpool University Press (Demidowicz, 2022). I would like to express my gratitude to Historic England for funding the publication of the book, allowing room for nearly 300 figures. It could not have been accomplished without consulting the magnificent Soho Collection, lodged in the Library of Birmingham. This material was also used to guide the location of archaeological excavations carried out in 1996 in a difficult urban environment.

The local dimension

The Soho Manufactory with its smaller neighbour, the Soho Mint, was the largest factory in the Birmingham area in the late 18th century, employing on average between 600 and 700 workers. This scale of operation was unusual at the time, since industry in Birmingham was then otherwise characterised by small workshops. These were led by a master employing a correspondingly small but skilled workforce, producing metal goods or 'toys', as they were called. Most machines were hand and foot-operated, water power, being used for rolling and slitting metal and sharpening blades, including scythes and swords.

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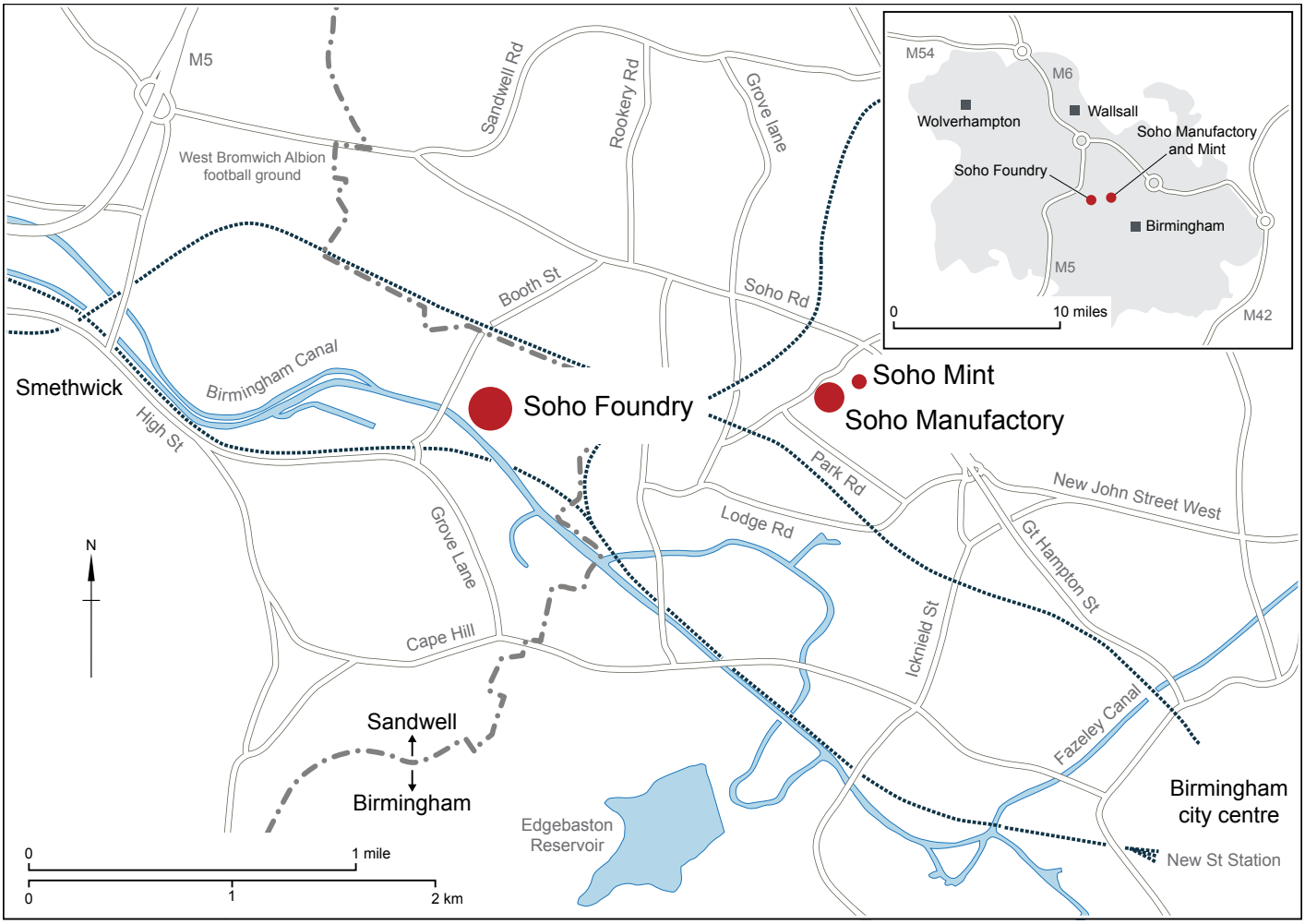
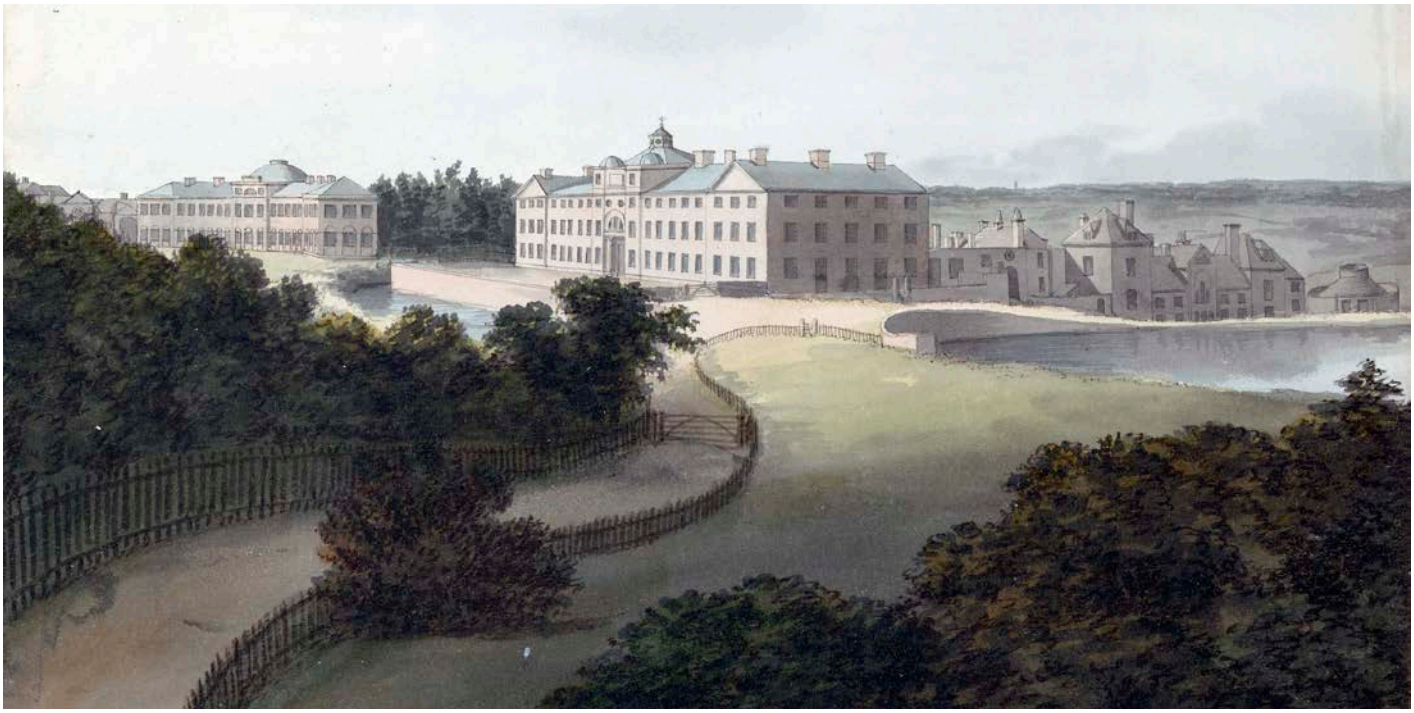


Above: Location of the Soho Manufactory, Mint and Foundry.



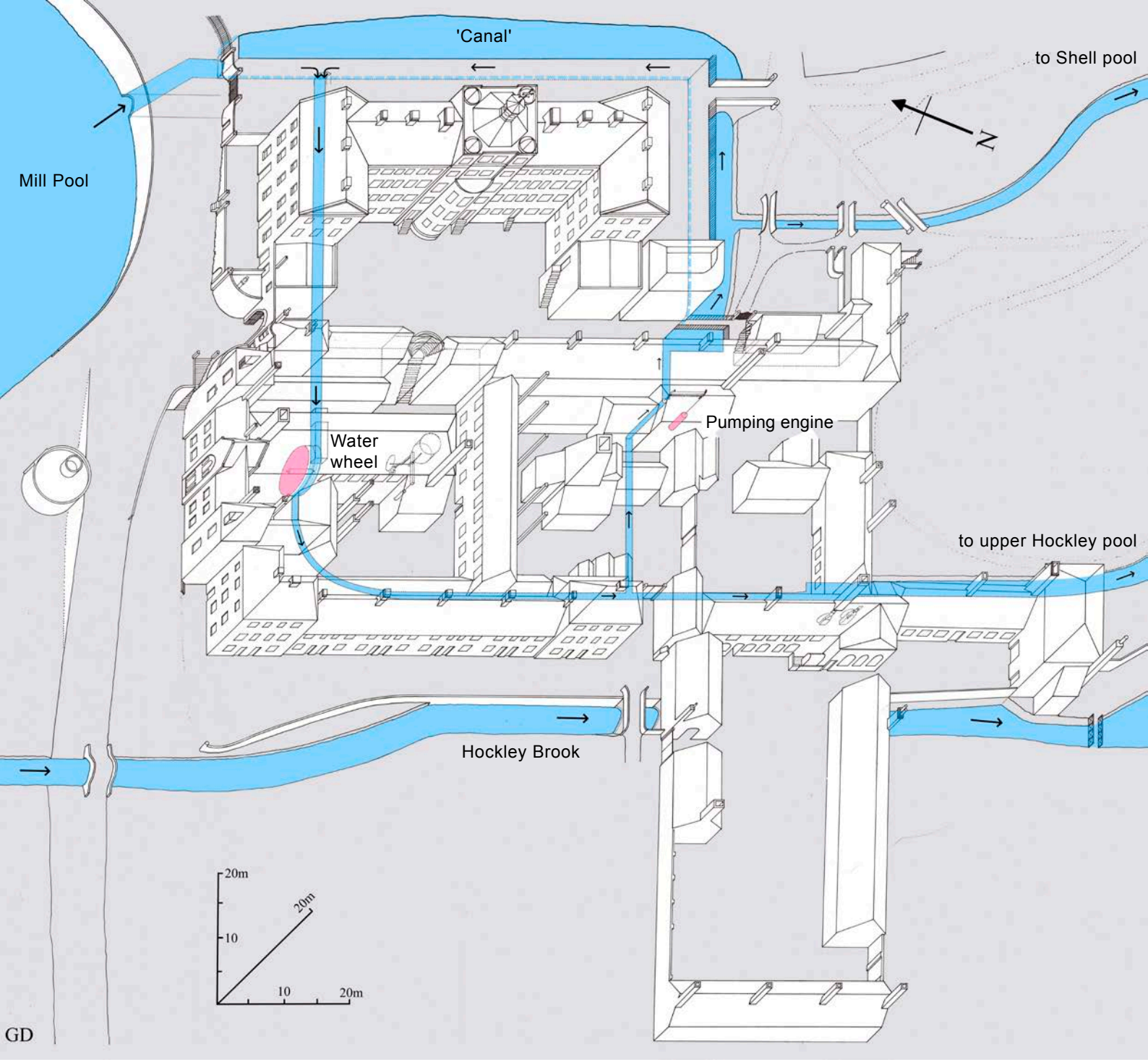
Above: The classic view of the Soho Manufactory around 1798. Courtesy of British Library, King George III collection, 82-n

Water power and steam – the first working James Watt steam engine in the world

Matthew Boulton, already a manufacturer of toys, moved to Soho in 1761 in search of water power, leasing a small mill which he quickly enlarged to allow increased production. Within a few years he boasted that he had erected 'the largest Hardware Manufactory in the World' (Demidowicz, 2022, 9). The water source was the diminutive Hockley Brook, from which water was conducted to a mill pool. This can be seen in the classic view of the Soho Manufactory, but the mill itself is hidden by the majestic Palladian silver and plated works (the 'principal building') which was constructed between 1765 and 1767.

The famous partnership of Boulton & Watt was initially founded in 1775 to sell the rights to erect Watt's improved steam engine, making use of a separate condenser, and then, after 1795, to manufacture the complete engines themselves. But Matthew Boulton's immediate motivation in persuading James Watt to leave Scotland in 1774 and to join him at the Manufactory was to solve the common problems suffered by water mills: floods, drought in the summer and winter freezes. Any of these could stop the mill from operating.

Above: 'Old Bess' Science Museum, London. In 1777 the cylinder was changed from 18in (457mm) to 33in (838mm). Courtesy of Science Museum, London



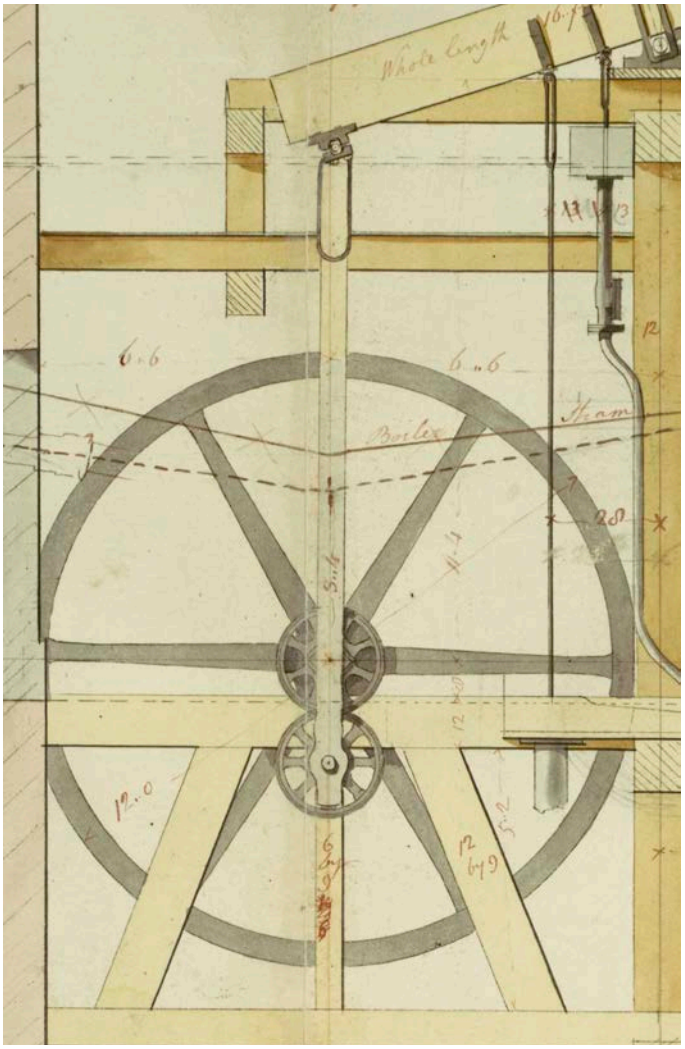
Above: Axonometric projection of the Soho Manufactory around.1805, showing the mill water circulation. Courtesy of George Demidowicz

Boulton had Watt's improved steam engine with its separate condenser shipped down from Scotland. It was set to work almost immediately to recycle water after use in the mill by pumping it through a newly constructed intercepting culvert back up to a 'canal'. The Watt engine was, in fact a so-called water-returning engine. Fortunately, in recognition of its significance as the first working Watt engine in the world, it was donated to the Science Museum, London, in 1861. With no specific documentation available, it was only through examining various maps and plans of the Manufactory, and in particular, the bodies of water which were a significant feature of its layout, that the water circulation system was deduced. This is shown in above, in an axonometric projection of the Soho Manufactory in about 1805 when it had reached its maximum extent.

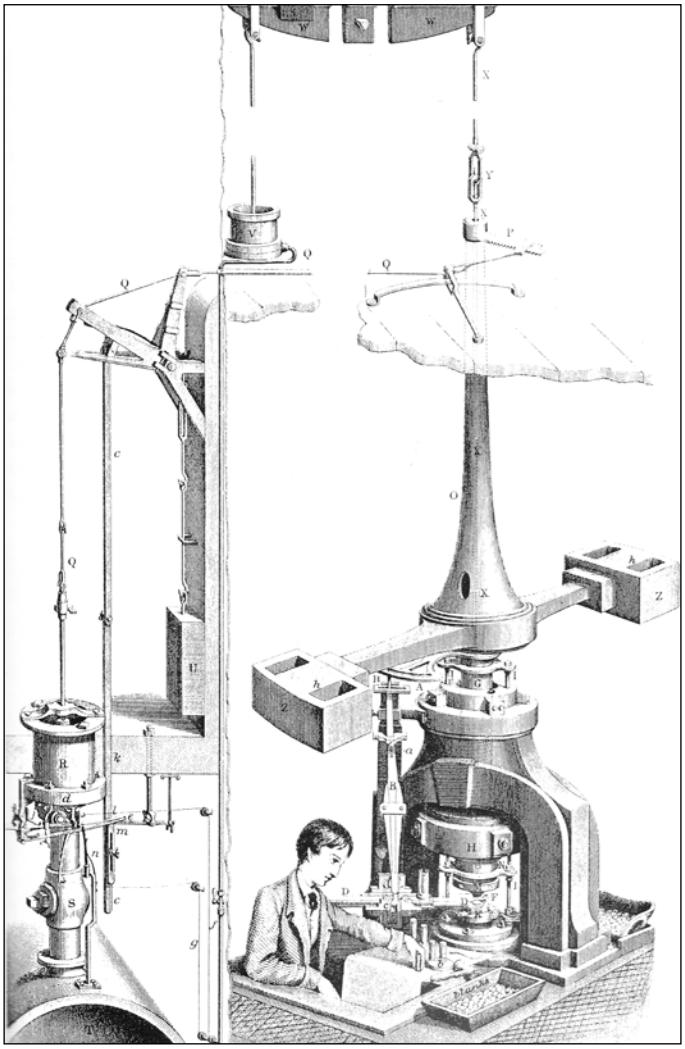
Soho Mint - the first steam-powered mint in the world

The pitiful state of the national coinage, plagued by shortages and counterfeiting, irked Boulton for many years and he finally resolved in the mid-1780s to establish a steam-powered mint to improve the quality of the coinage and increase the rate of production. With the development of the 'sun and planet' crank in the early 1780s, Boulton and Watt steam engines could now provide rotary motion. This offered huge potential for a number of manufacturing applications. Boulton's water mill had also been rebuilt in 1785 to provide the extra metal rolling capacity required to produce copper sheeting. The mint was erected in 1788-9 about 110 metres south east of the Manufactory's 'principal' building, hidden deliberately within Boulton's garden buildings for secrecy. It contained one of Watt's new steam engines.

Boulton's technological ambition was matched by his determination to obtain the contract to produce the national coinage, but he was initially disappointed on both counts. The presses in the first Soho mint were driven mechanically by the steam engine, but this motion proved to be too violent and an entirely new and radical method of applying power to the presses was developed. The steam engine was adapted to no longer rotate shafts, cog wheels and cams but instead to produce a vacuum in a tube, the 'spirit pipe', to which each press was connected in a complicated arrangement of levers and balancing beams to reduce the impact of the recoil.

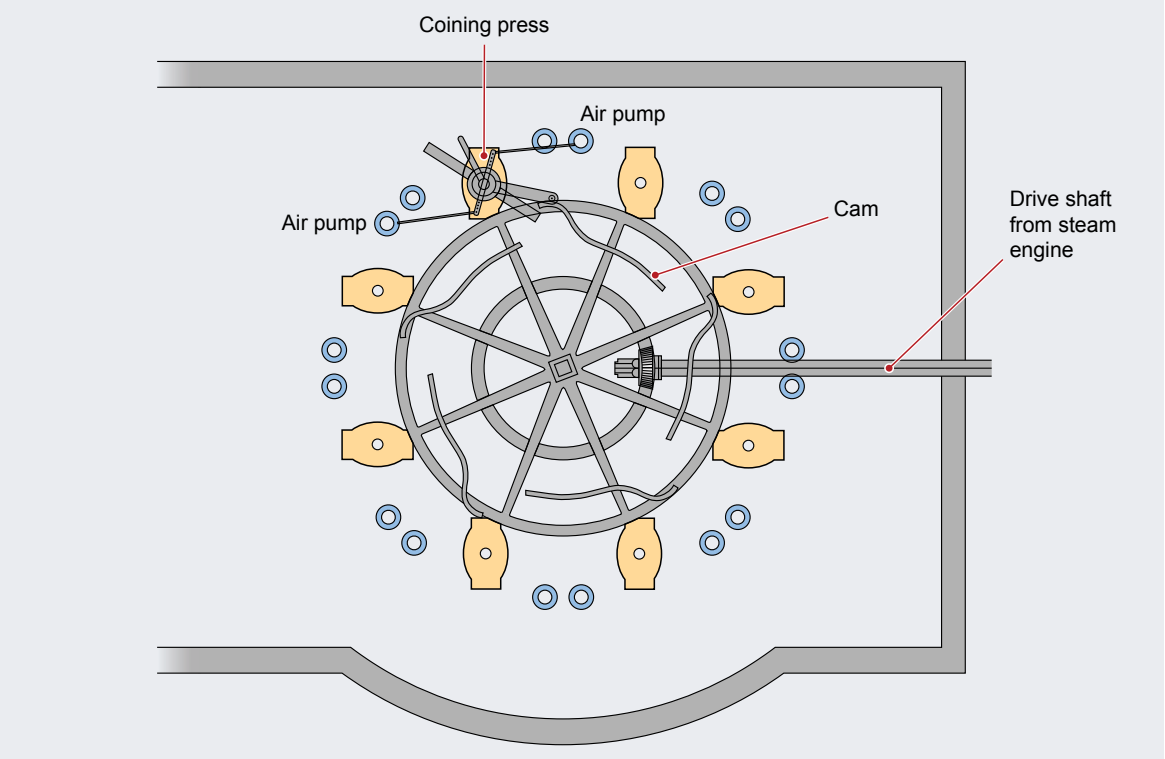


Left: Sun and planet gear. The 'sun' was a cogged wheel attached to the main rotating shaft and its fly wheel. The 'planet' was fixed to a connecting rod from the working beam and the action of the engine made the 'planet' orbit around the 'sun' imparting rotation to the main shaft. Courtesy of Archives and Collections, Library of Birmingham

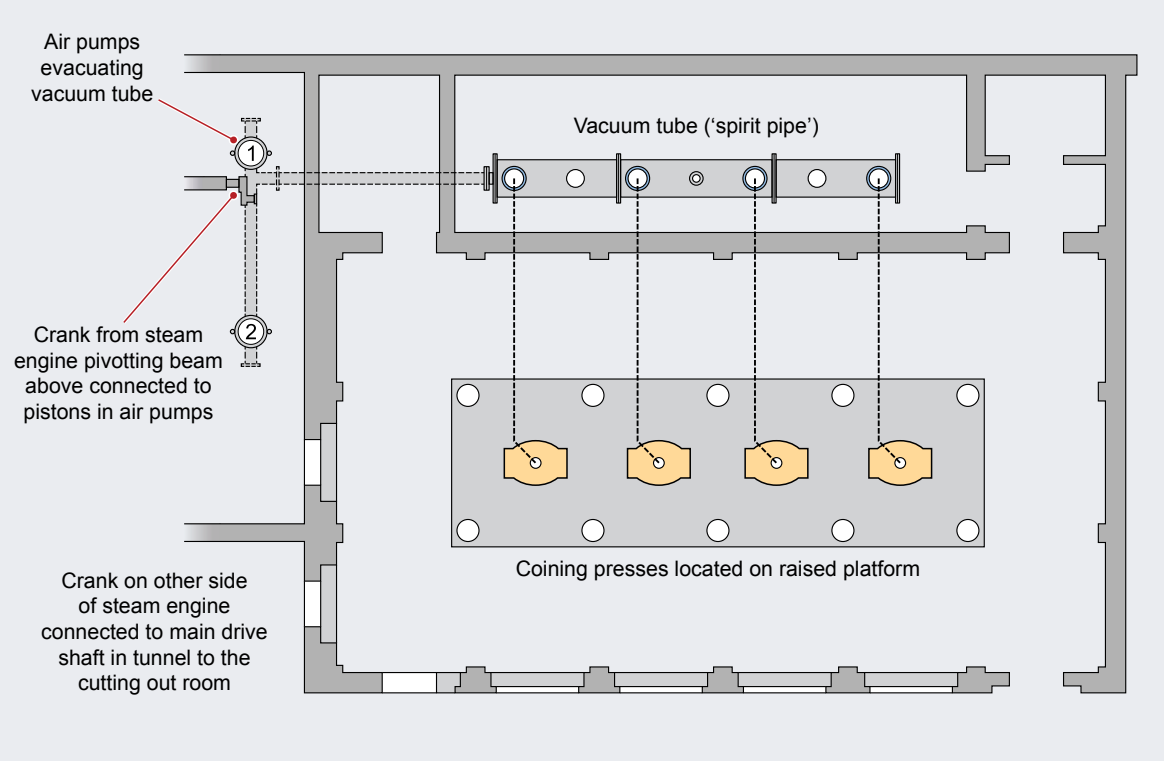


Right: Boulton's vacuum press installed in the Royal Mint London, (1805-7) illustrated in Ansell, G F 1871 The Royal Mint, between pp 52 and 53

Boulton finally signed a contract to produce the national coinage in 1797 and the new vacuum-powered mint was ready by December 1798 to produce the famous but cumbersome and impractical 'cartwheel' pennies and twopences. The two distinctly different coining room layouts are illustrated below, showing the mechanical driven presses in a circle, and the vacuum-powered presses in a line.



Left: The layout of coining presses in the round, 1788-98. Courtesy of George Demidowicz



Left: The layout of presses in line as used from 1798 onwards in all Boulton mints. Courtesy of George Demidowicz

The Soho Foundry – the first purpose-built steam-engine manufactory in the world

The patent for Watt's improved steam engine was due to expire in 1800, a development that would allow competitors to produce engines of similar type and quality and challenge Boulton and Watt's supremacy in the field. In 1795 the Wilkinson brothers, who made Boulton & Watt's engine cylinders, quarrelled, and ceased production. The firm had no choice but to build their own manufactory to keep ahead of the competition, drawing all the different stages of production together on a single site. The Soho Foundry was established in 1795-6 by the Boulton and Watt second-generation, by James Watt junior in particular, in a canal-side location in Smethwick. It was initially a relatively modest establishment but grew significantly over the next hundred years. The following plans demonstrate its growth over a century.

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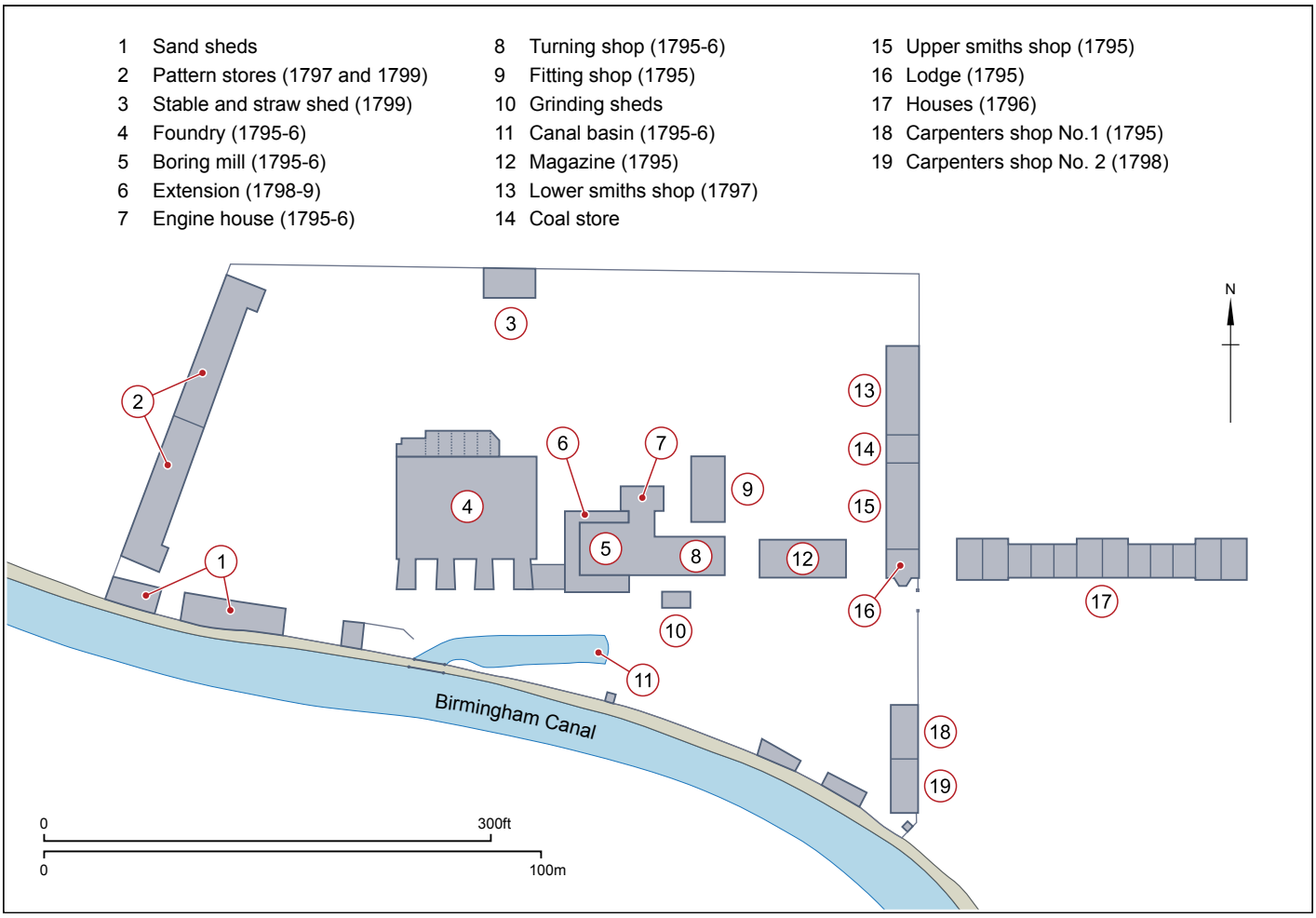
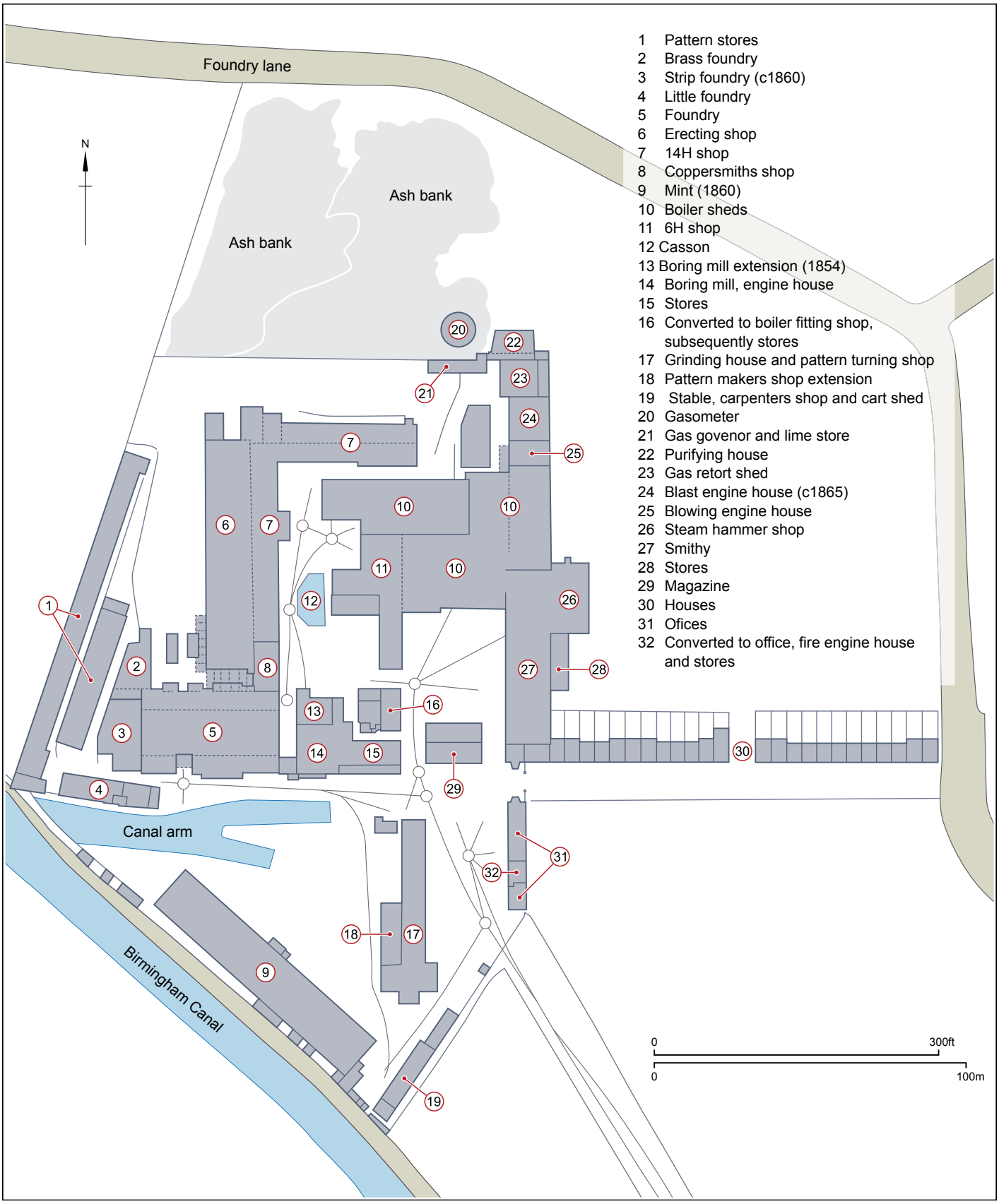


Above: The Soho Foundry 1795-9: modest beginnings. Courtesy of George Demidowicz



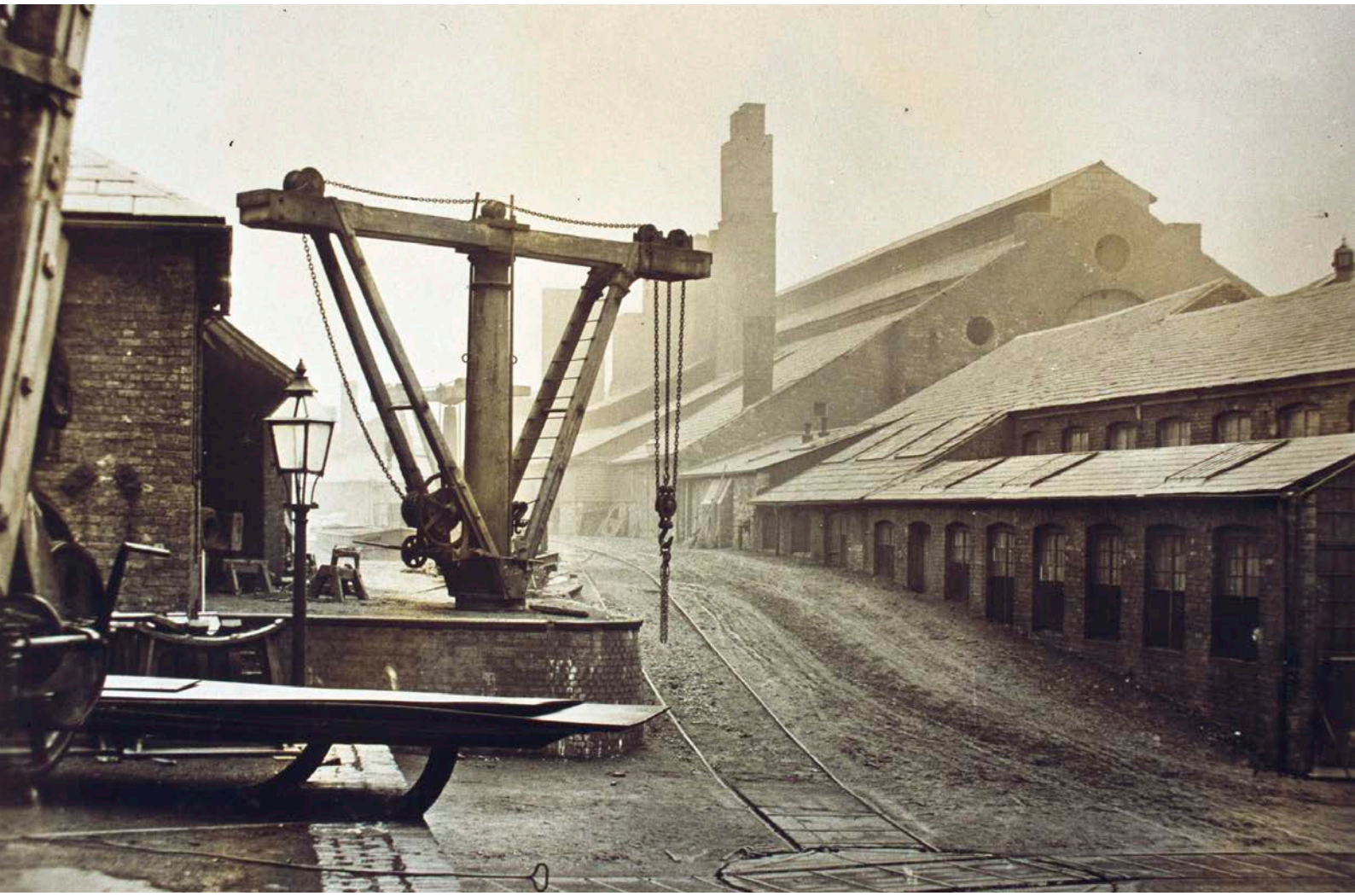
Above: The Soho Foundry 1854-1895. Reaching its maximum extent in the latter half of the 19th century after James Watt and Co. took possession in 1848, a partnership with no Boulton or Watt family connection. Courtesy of George Demidowicz

The Soho Foundry – the first manufactory in the world to be lit by gas

In 1798 the inventor of genius, William Murdoch, an employee of Boulton & Watt, the company, was persuaded back from Cornwall, where he was installing Boulton & Watt pumping engines, to rectify the problems of excessive vibration in the boring mill machinery. In this he was successful, introducing for the first time small beamless engines, each dedicated to a boring machine. At the same time, he took the opportunity of furthering experiments on gas lighting that had been carried out at his home in Cornwall. At the Soho Foundry he erected a small gas retort in his laboratory, connected by 'a tube of about thirty or forty feet in length', leading into the main Foundry building: this became, in December 1798, the first industrial building in the world to be lit by gas (Demidowicz 2022 158).

Steam engine production at Soho Foundry ceased in 1895 and the site was purchased by Avery's where weighing machine manufacturing continues to the present day. The early Boulton & Watt buildings were abandoned many decades ago, but they survive, and proposals for their repair and restoration are in the earliest stage of development. Unlike the site of the Manufactory and Mint, where nothing remains above ground, the substantial standing buildings at the Soho Foundry are listed Grade II* and the site is also scheduled (Figs 9 and 10) in recognition of the national importance of the site and its association with one of the great pioneering companies in the nation's industrial history.

Below: The main Foundry building 1895.
Courtesy of Archives and Collections, Library of Birmingham



Above: 3-D oblique aerial photo of the Soho Foundry looking east. The protective roof was erected over the main Foundry building in 2006. Courtesy of Google Earth 2020

The author

George Demidowicz

George Demidowicz (M.Soc Sci, IHBC (ret)) retired in 2012 as head of Conservation and Archaeology, Coventry City Council. He continues to work as a consultant in building and landscape history, and industrial archaeology, applying wherever he can a multi-disciplinary approach to the study of the historic environment. He is an Honorary Research Fellow in the Department of History, University of Birmingham, and was elected as a Fellow of the Society of Antiquaries in 2013.

Further Information

Demidowicz, G 2022 **The Soho Manufactory, Mint and Foundry: Where Boulton, Watt and Murdoch Made History**. Swindon: Liverpool University Press of behalf of Historic England In 2023 the book received the annual Association of Industrial Archaeology Peter Neaverson Award for outstanding scholarship in industrial archaeology. https://historicengland.org.uk/images-books/publications/soho-manufactory-mint-and-foundry/

Liverpool University Press Blog: 'The Soho Manufactory, Mint and Foundry, West Midlands: Where Boulton, Watt and Murdoch Made History' 19 May 2023 https://liverpooluniversitypress.blog/2023/05/19/the-soho-manufactory-mint-and-foundry-west-midlands-where-boulton-watt-and-murdoch-made-history/

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Steam-powered pumping stations and the sanitary crisis of Victorian cities

International research illuminates an English building type.

Accurately pinpointing the historical value of fairly uncommon buildings like steam waterworks can be puzzling, especially when, as in this case, an apparently common-place purpose is contradicted by architectural drama. Three research projects, two national and the other global, helped to establish and demonstrate the importance of this particular class of industrial building.

Steam waterworks were built all over Britain from the 1840s as sanitary improvements became identified as the solution to the drastic urban health problems associated with the Industrial Revolution. American environmental historians named this the Victorian Sanitary Crisis, and it is associated globally with the rapid urbanization and migration that accompanies industrialization. Providing clean drinking water, and later removing sewage and waste, became intense social problems to which the steam-powered pumping station was the critical technical solution, and they were built throughout the country up until the 1920s. By then, improved sanitation and drainage and compact electric pumps made them obsolete, and they began to disappear from the landscape.

Right: Abbey Mills (Listed II*), designed by Charles Driver, holding eight large steam engines in the four wings, exemplifies the seeming contradiction between function, moving north London's sewage, and architecture.
© Malcolm, Public Domain

Research in Britain

In the 1990s, the Listing Section of English Heritage (now Historic England) under Dr Martin Cherry ran a series of thematic projects to clarify the significance of some of the more unusual building types which were coming under the scrutiny of his department. Among these were military or military/industrial buildings, notably barracks and the historic naval shipyards, as formerly classified sites were opened or sold following the end of the Cold War. Another typology was waterworks, prompted by the privatisation of the regional water authorities, and their transfer to new private water companies. The national pumping stations list review aimed to apply the listing criteria on a consistent basis across England. In this way, individual examples of this frequently overlooked architecture, which might have been missed or under-appreciated in the previous local listing process, were recognised and given statutory protection.

The listing project benefited from concurrent research by another team within English Heritage, when in 1995 the exhaustive Monument Protection Programme published its 'Step 1 Report' on the water and sewage industry. The Monument Protection Programme approached the sector from an archaeological perspective, Step 1 identifying and distinguishing each component and site type and assessing their significance, and then suggesting priorities for statutory protection. This highlighted, for instance, the remarkable survival of in-situ steam plant, with many supply and treatment sites occupied by successive generations of pumps, tied to wells and boreholes dug by Victorian well-sinkers. Another rare type identified by the Monument Protection Programme was the early pumping station in town centres close to rivers, most of which were abandoned after mid-19th century laws were passed banning extraction from the more polluted reaches.

The combined sites at Kew Bridge and Kempton Park in west London, a Grade I listed building and a Scheduled Ancient Monument respectively were tipped as the strongest candidate for a modern water supply World Heritage site.

Right: Kempton Park II was the end of the grand steam waterworks, built by the municipal Metropolitan Water Board in 1929. © Thames Water Archive

International comparisons

I stopped working with English Heritage in 1996, but then became involved with The International Committee for the Conservation of the Industrial Heritage, known as TICCIH.

The world association for industrial archaeology, TICCIH is also International Council on Monuments and Sites' scientific adviser, as part of which it has coordinated and disseminated a series of international comparative studies whose purpose is to help assess nominations to the World Heritage list, which ICOMOS felt were not well understood. These studies include the railway industry, company towns, coal production and the oil industry, and they were joined in 2018 by 'The Water Industry as World Heritage'.

The research methodology has varied, but in general each study starts with a summary of the global development of the sector under review, then plots the evolution of the main elements to identify key steps or gateway advances, and lastly highlights when the subject made a significant contribution to human development, using UNESCO's criteria of Outstanding Universal Value.

It is obvious that water supply and waste treatment have been extremely important at different historical periods and cultural conditions, but the global contribution to solving the mid-19th century Sanitary Crisis of industrialising towns really stood out as having special significance. TICCIH's 2018 report immediately substantiated the nomination of the Water Management System in Augsburg, Germany, which dates from the 15th century and was inscribed in 2021. At the conference in Barcelona to discuss the report, the combined sites at Kew Bridge and Kempton Park in west London, a Grade I listed building and a Scheduled Ancient Monument respectively, were tipped as the strongest candidate for a modern water supply World Heritage site.

Above: Ponder's End, London (1898) in the East London Waterworks Company's house style.
© Thames Water Archive

A fresh evaluation of the water heritage

All three lines of my research came together in the publication by Historic England in 2023 of *'The Architecture of Steam – Waterworks and the Victorian Sanitary Crisis'*. This argued that pumping stations were consistently, and globally, treated as civic rather than industrial buildings, more like libraries or schools, a reading reinforced by the presence of powerful, symbolic figures at their inauguration. The Prince of Wales was in Canada in 1857 to start the Hamilton waterworks and in south London eight years later to do the same for Crossness sewage pumping station. Their designers – almost exclusively water engineers not architects – were conscious of a crisis in public health enveloping European and American towns and cities as they were transformed by industrialisation and inmigration.

Right: Elkesley (1911-1979), demolished before the English Heritage thematic listing programme reached Leicestershire. © Historic England

All over the world, the designers of new waterworks made the same promise of health, hygiene and wellbeing as in Britain, and used the most potent architectural styles and symbols to transmit their message.

And this was the case all over the world: the designers of new waterworks made the same promise of health, hygiene and wellbeing as in Britain, for which they used the most potent architectural styles and symbols to transmit their message. For Dresden's first modern waterworks, the 1871 Saloppe pumping station, the city architect drew on local medieval architectural traditions for his riverside design. The pumping station in Louisville, Kentucky, of 1860 is a magnificent neoclassical temple with a tetrastyle Corinthian portico and a huge Doric standpipe surrounded by a peristyle base, rebuilt in iron after the first wooden shaft burned down.

The British contribution to this international effort to improve urban living conditions was immense. The first pumping station in Paris in 1781 imported two Boulton and Watt pumping engines from Birmingham. The earliest steam pumping station in the United States in Philadelphia in 1801 was designed by Benjamin Henry Latrobe who had trained with the great British civil engineer John Smeaton (1724-1792), while his assistant had studied under Samuel Wyatt, architect and engineer (1737-1807). British sanitary engineers and specialist constructors built water and sewage systems all over the world, frequently using British-built pumping engines.

Louisville, Kentucky (from 1860) reassured local citizens that supplying them with safe drinking water was taken seriously.
© Wayne Hsinth, Public Domain

The international importance of England's water industry heritage

The global viewpoint opened by the 2018 study of the monuments of the water industry stressed just how important the English evidence is. Water companies and local museums have conserved special engines and their buildings in other countries, a Cornish beam engine in Lyon, four in Lisbon, four horizontal engines in Barcelona, five triple-expansion engines in Melbourne, and around a dozen sites in the United States with big American-built steam pumps. But the water heritage in England is outstanding. There are more conserved steam waterworks in Staffordshire than in most European countries, and these waterworks, moreover, represent the full history of steam pumping from the earliest steam engines to the diesel and electric

The British evidence is outstanding. There are more conserved steam waterworks in Staffordshire than in most European countries.

Above: The conserved horizontal steam engine at Brindley Bank waterworks (1903) in Staffordshire.
© Morturn, Public Domain

pumps that replaced them. This remarkable situation, which has a strong bearing on the protection and the interpretation of these sites, only became apparent after the international comparative research underscored their singularity.

Reconciling full public enjoyment of a historic building with the comprehensive conservation of a historic place used to be the outstanding advantage of turning it into a museum, and many steam waterworks are conserved and open for visitors. More nuanced approaches to designation in the 21st century also encouraged new ways to combine these objectives, as well as satisfying contemporary goals of retaining the embodied energy in existing buildings. People who want to enjoy a steam waterworks can now do so while working in one (many possibilities), looking at art (Fergusson Gallery, Perth), getting married (Abbey Park, Papplewick or Dalton pumping stations, to name three with in-situ engines), studying wildlife (Walthamstow Wetlands Nature Reserve), or even by practicing rock climbing (Green Lanes, aka the Castle Climbing Centre, north London). Better informed as we now are, who knows what a beautiful, well-constructed building like Elkesley might have become.

The author

James Douet
Professor of Cultural Resource Management at CEA Study Abroad, Barcelona

James is a consultant in industrial heritage and teaches urban history and cultural studies in Barcelona. He moved from Britain in 1996, preparing exhibitions and museums related to the history of work and industry. A long-time collaborator with The International Committee for the Conservation of the Industrial Heritage, he prepared the text of the TICCIH's Nizhny Tagil Charter and guidance for UNESCO World Heritage nominations. His book on the architecture of steam was published by Historic England and Liverpool University Press in 2023, and a new study on Barcelona's urban image for Palgrave Macmillan will be published in 2024.

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Hassan, J.A., 1985. The Growth and Impact of the British Water Industry in the Nineteenth Century. **The Economic History Review 38**, 531–547.

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Investigating the built environment in Lancashire's historic textile areas

A recent book explores local infrastructure underpinning the industrial revolution.

The remarkable rise in industrial and commercial activity that occurred during the Industrial Revolution in Lancashire's textile districts, essentially the central and eastern parts of the county, brought profound changes to the built environment, in rural as well as urban locations.

The author has had a long-established interest in the history of regional industrialisation. This interest was stimulated by noting that former handloom weaver's cottages with distinctive rows of windows in their upper storeys, which were commonly found in the woollen weaving districts of the West Riding of Yorkshire and parts of East Lancashire, especially the Rochdale area, did not appear in other parts of Lancashire where cotton textile manufacturing was strongly represented.

This variety within the textile belt in the north of England raised questions which demanded inquiry into the explanation of the observed pattern of building.

Above: Cheesden Lumb Mill, near Rochdale, a water-powered cotton spinning mill. The site made use of a natural fall of water.

Above: Former handloom weavers' cottages, West View Place, Blackburn. A row of windows, now blocked, was provided in the cellars, along with a light well in front of them. © Geoff Timmins

Throughout textile Lancashire, factories powered by steam and water-power featured prominently, of course, as did tens of thousands of cottages provided with loomshops, mostly situated in cellars, used by handloom weavers. But other types of houses, along with buildings meeting a varied range of business and social needs, also added distinctive components within what became, in effect, a transformed landscape in the area's towns and rural areas. So, too, did new methods of transporting goods and people.

Unfortunately, demolition has taken a heavy toll on the historical evidence these developments provide, giving credence to the despairing complaint of W. G. Hoskins, the eminent landscape historian, about the 'modern lust for destruction'. Nonetheless, especially in the more rural parts of the area, notable elements of the built environment established at the time have survived. For the historian, these remains have high value in helping to reveal the nature, extent and timing of the changes taking place.

Especially in the more rural parts of the area, notable elements of the built environment established at the time have survived.

Coping with rising traffic volumes

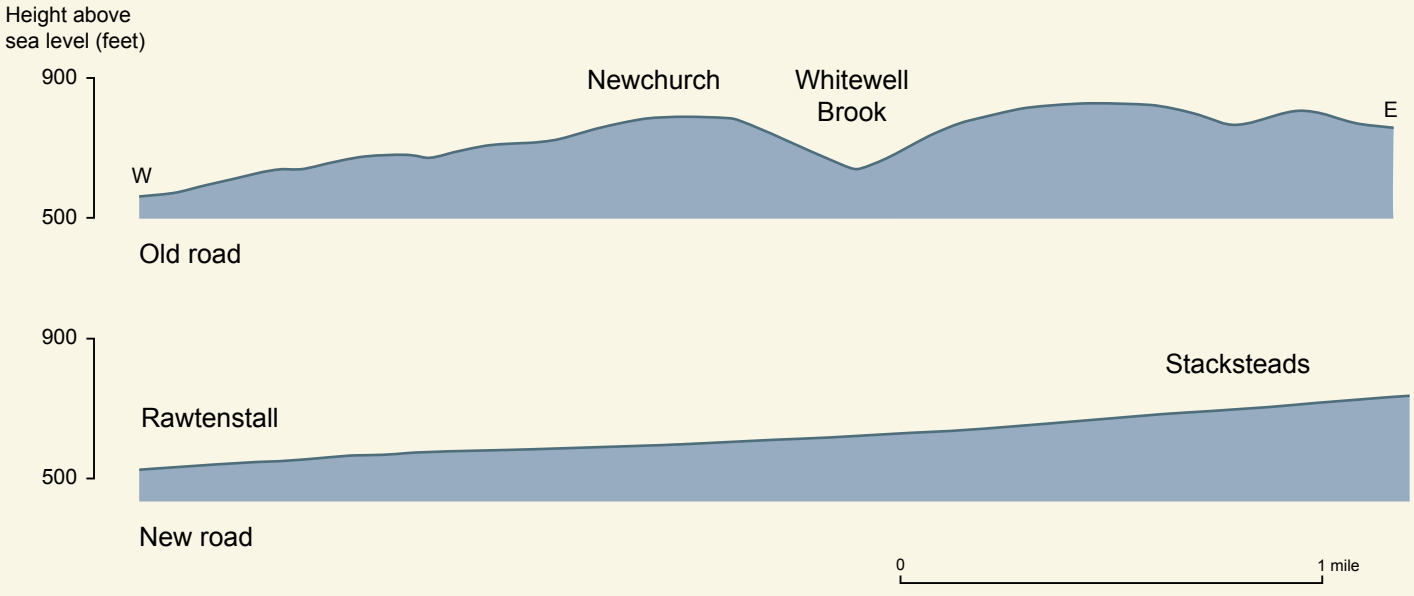
Consider, for instance, the changes made to the district's road transport network. Lancashire was unusual in that an additional turnpike (toll) road was constructed between several neighbouring towns to facilitate the movement of freight and passengers between them. The common characteristic of these towns, which explains why the new roads were built, was that they lacked linkage by canal. Accordingly, an alternative means of transporting increased traffic between them was sought. Alterations have been made to these roads, but the routes they took are largely intact, enabling field evidence to be adduced in revealing how and to what extent improvement arose.

Several towns were joined by two generations of turnpike roads, often designated as 'old road' and 'new road'. This was the case between Preston and Blackburn, for example, and between Bolton and Bury. Amending steep and narrow roadways leading to and from canal wharves and railway goods yards did much to ease expanding traffic flows. For example, a more circuitous route was taken to ease the gradient along the road between Blackburn's town centre and its canal wharf at Eanam.

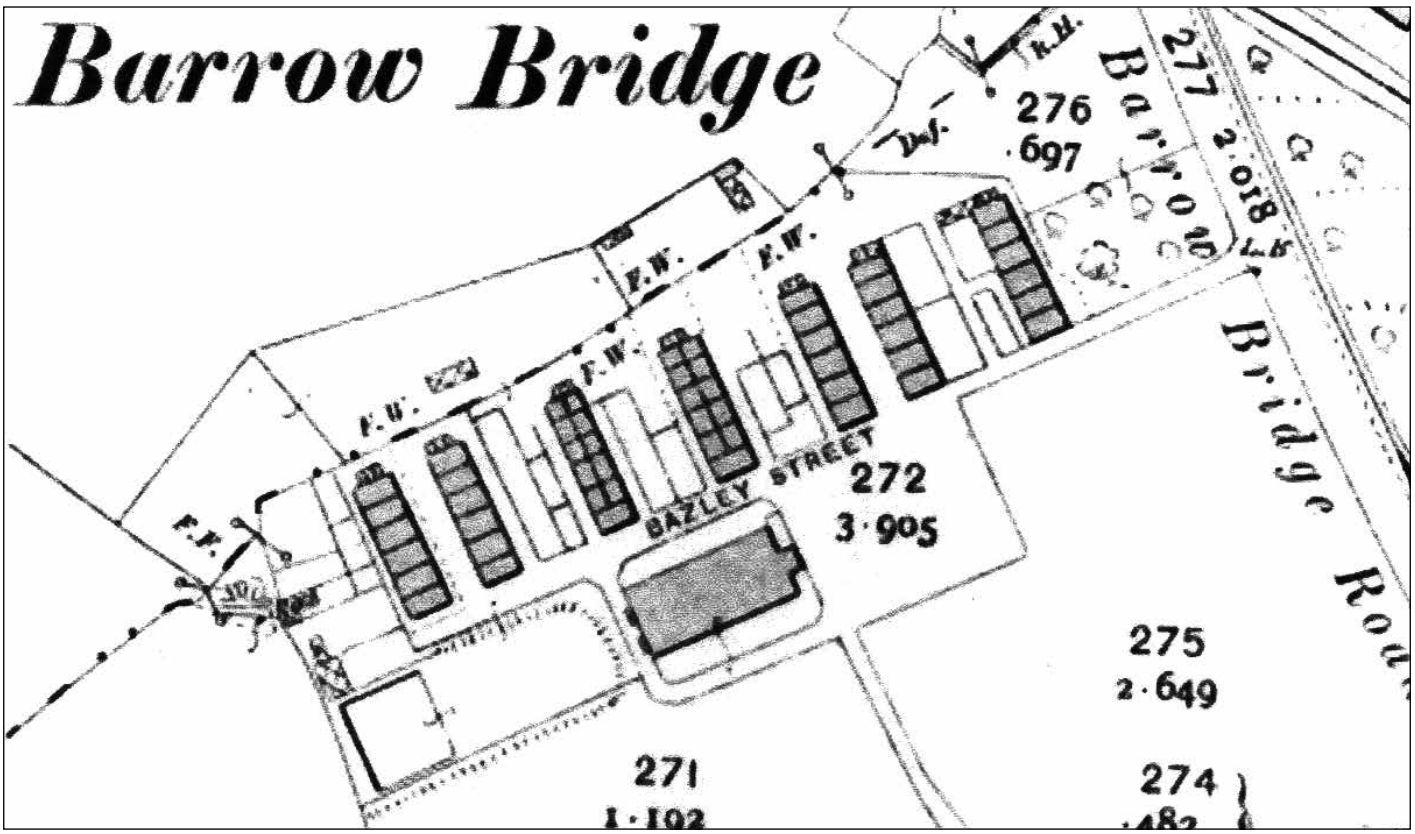
Easing movement along roads

An often overlooked aspect of transport during the Industrial Revolution relates to the road system. Given the dependency on horse-drawn road vehicles during the Industrial Revolution, widening roads and minimising gradients along them were matters of high importance to contemporaries. To cope with increased traffic, the width of roads had to be sufficient to enable vehicles to pass and overtake, whilst gradients no steeper that one in thirty were favoured, reflecting a concern for horse welfare and the weight of payloads.

Lancashire was unusual in that an additional turnpike road was constructed between several neighbouring towns to facilitate the movement of freight and passengers between them.



Above: Logitundinal profiles on new and old turnpike roads in Rossendale, showing the exceptionally striking improvements achieved in gradient easing. The steep inclines along the old road, especially in traversing the valley at Whitewell, were avoided and a very even and gentle gradient was created along the new road. © Geoff Timmins



Above left: Plan of Barrow Bridge as shown on the 25-inch OS map of 1907. The uneven spacing of the rows is revealing. (Source: Ordnance Survey).

Documents and fieldwork can reveal changes to roads. Plotting spot heights on contemporary Ordnance Survey maps of both old and new roads enables insights to be obtained about the extent of improvement. Field investigation reveals much about the ways in which road gradient easing and widening was achieved by making cuttings and embankments, as well as by lowering summit heights and raising bridge heights in valley bottoms.. These methods were applied to minor as well as major roads to provide an improved network. These advances were significant in developing the area's rural industrial activity, as well as in helping to realise the full potential of the regional canal and railway facilities with which minor roads linked. Amending steep and narrow roadways leading to and from canal wharves and railway goods yards did much to ease expanding traffic flows.

Housing the workers

Studying the surviving housing stock in textile Lancashire that remains from the period also offers rich opportunities for historical research. Regarding working-class houses, surviving examples are highly informative about the standard of accommodation made available, not least in the numerous factory villages and hamlets that were created. What emerges is support for the often-expressed view that their proprietors provided 'model' housing for their employees, which set high standards for the period that others might follow. But what also becomes clear is that, in doing so, factory owners still offered considerable variation in the standard of provision they made and that they did so because they took due account of the differing income levels.

At Barrow Bridge near Bolton, for example, where all the cottages built during the 1830s have survived, through houses with two rooms downstairs and as many four bedrooms were provided. But so, too, were back-to-back and back-to-earth houses, both types that met with profound contemporary condemnation, mainly because they were seen to lack through ventilation.

The houses formed part of a low-density rural development that contrasted sharply with the crowded and highly insanitary back-to-back houses often built in urban areas, of which contemporaries were so critical.

However, both field and documentary evidence demonstrates that the Barrow Bridge back-to-backs were superior examples of their type in several respects. Field evidence on the standing buildings establishes that they were well constructed from coursed stonework - and that they had two bedrooms at first-floor level. This was a more generous provision than in many other back-to-back dwellings and a more convenient arrangement than in houses of this type that, as was commonly the case, had two bedrooms situated one above the other Maps show the uneven spacing of the rows of housing in the village and that all the houses opened out onto quite a sizable amount of yard or garden space. The houses formed part of a low-density rural development that contrasted sharply with the crowded and highly insanitary back-to-back houses often built in urban areas, of which contemporaries were so critical.

Above: Part of one of the three-roomed back-to-back house rows at Barrow Bridge.

Findings arising from combining field and documentary evidence enable important new insights to be gained into the transformation of the region.

Conclusion

This article provides a very brief account of how the landscape of the textile district of Lancashire changed radically during the Industrial Revolution. The recently published book explores the subject in more depth and breadth. Particularly important in terms of methodology is the demonstration of how findings arising from combining field and documentary evidence enable important new insights to be gained into the transformation of the region. The book adopts a contextualised case study approach in investigating the major historical themes covered, namely those concerning housing conditions, transport provision and industrial development. Setting the local and regional evidence in context by examining changes occurring elsewhere in Britain and overseas at the same time allows in-depth analysis of what, on the one hand, Lancashire shared with other places and, on the other, of how and why its experience differed. The approaches adopted have widespread applicability in investigating key changes made to the built environment during various time periods.

The author

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Geoff is is a local and regional historian with a particular interest in the development of the built environment, especially in the Lancashire textile districts, and its impact on the way people led their everyday lives. He also researches and publishes on learning and teaching history at degree and pre-degree levels.

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500 years of oasts and hop kilns in England

A recent Historic England book tells the story of hop processing, drawing on multiple sources. As little as sixty years ago many hundreds of brick and timber hop kilns and oasts were still used to dry hops. Now very few remain in use.

Hops are an essential ingredient in the production of beer, helping to preserve the beer in good condition and give it a bitter flavour.

Imported hops were introduced in London in the 15th Century, to brew bittered beer instead of the traditional unhoped ale common in England.

The growing of hops in Kent was introduced by Huguenot Refugees during the Reformation. The first documentary evidence of oasts built to dry hops in England appears soon after.

Hop-drying buildings are called oasts in Kent and Sussex and hop kilns in Hampshire, Surrey, Hereford, and Worcestershire.

There are about 1500 hop-drying buildings on Historic England's National Heritage List. Oasts and hop kiln spread across the landscape until the late 19th Century when England was the world's largest producer of dried hops. A recent English Heritage/Liverpool University Press book (2021) gives us the first national account of this special branch of vernacular architecture, drawing on regional studies in the last 60 years.

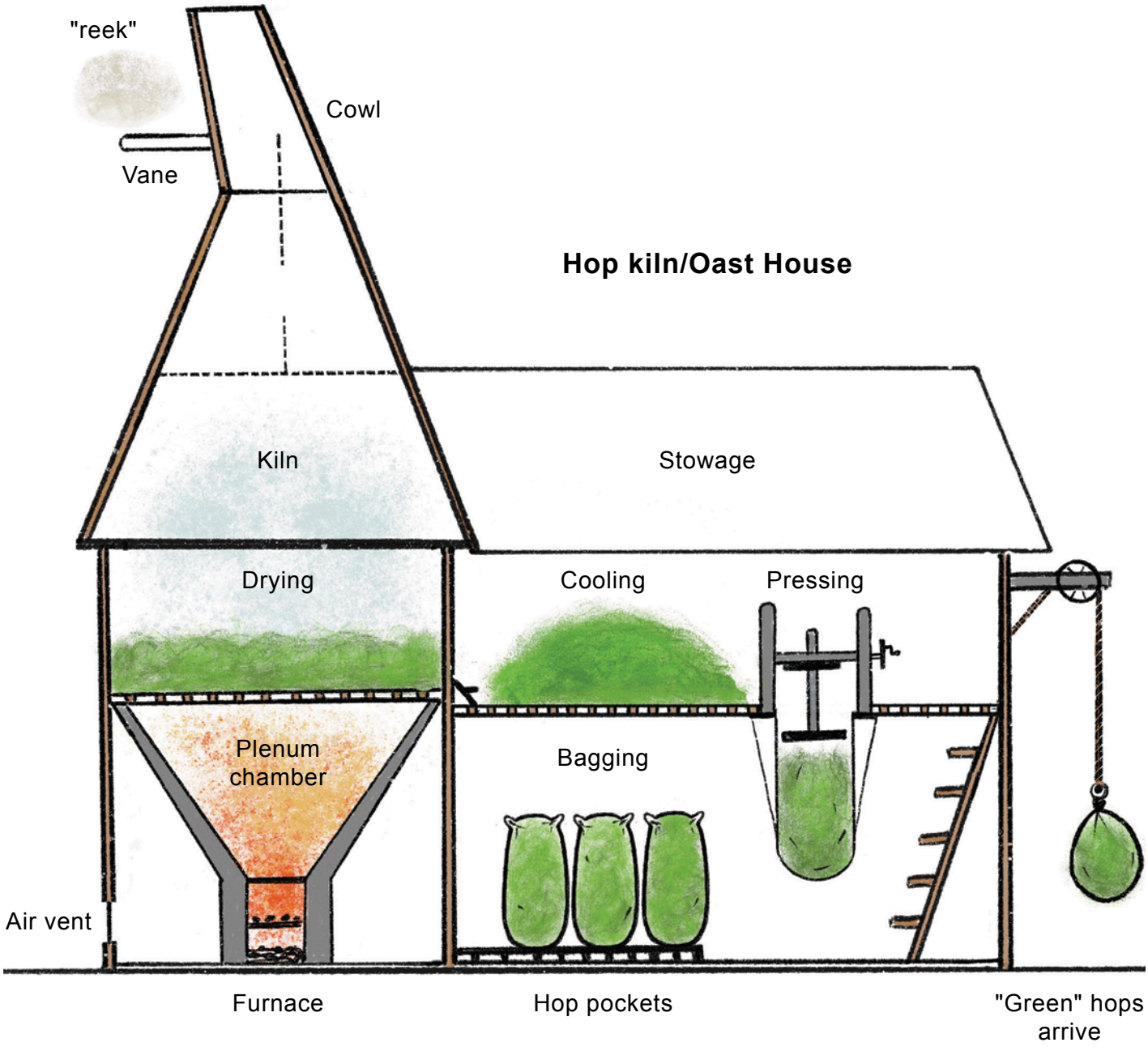
Oasts and hop kiln spread across the landscape until the late 19th Century when England was the world's largest producer of dried hops

Above: Great Dixter, East Sussex. 1933 Nathaniel Lloyd.
© Historic England Archive, BB008364

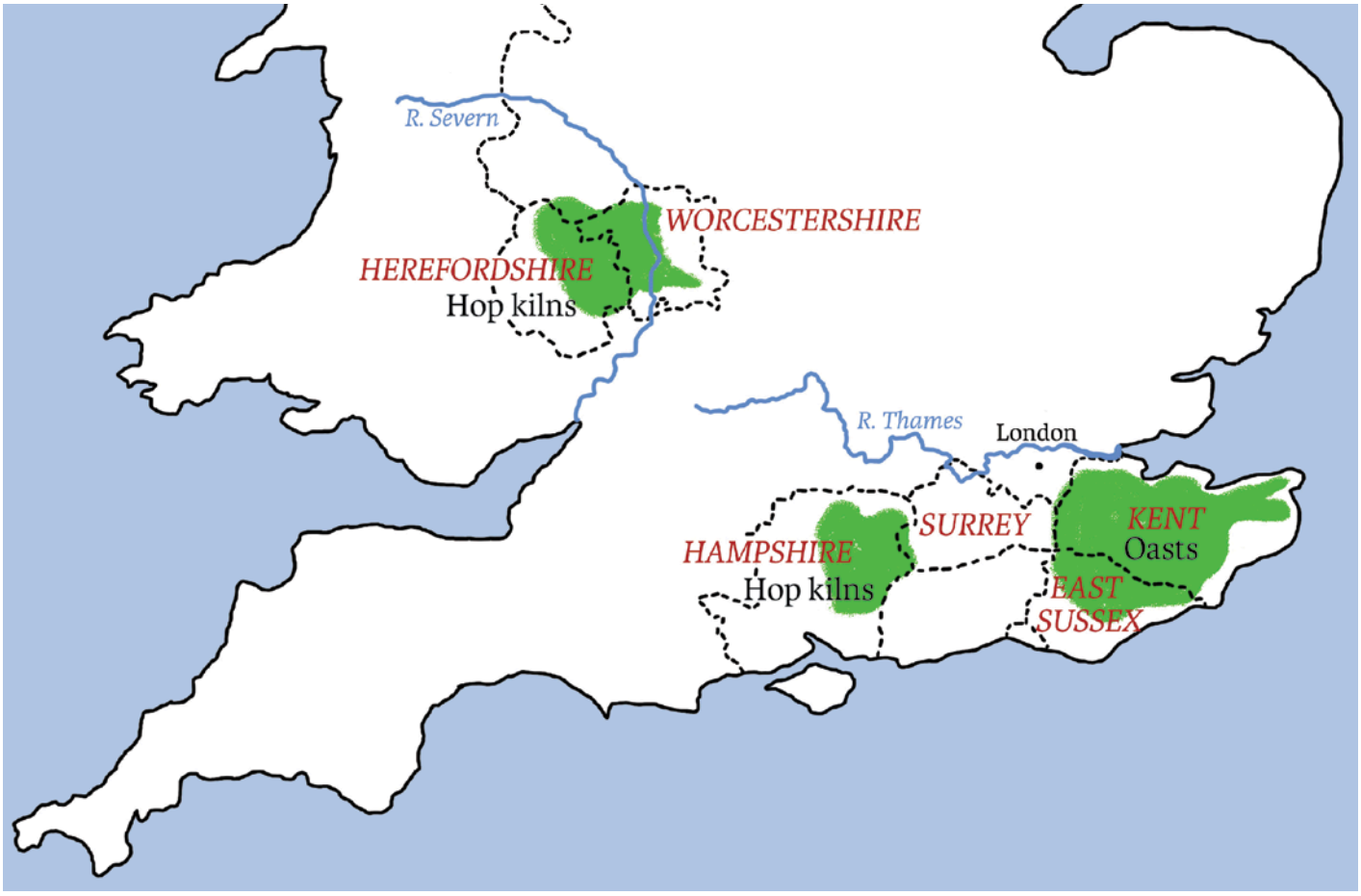
The function of hop drying

Oasts and hop kilns consist of a rectangular building of from one to three storeys, called a “stowage”, with a kiln or kilns (up to six) attached to it. A hop kiln had to be close to the hop farm to permit rapid transfer of the crop from field to kiln. Otherwise humid “green” hops decayed and were ruined.

The hops were first typically taken in to the upper floor of an oast or hop kiln and spread on a slated drying floor in the kiln for ten hours, heat being provided by a furnace below. This reduced the humidity from over 80% to less than 20%. The hops were cooled in the stowage and then tightly pressed in large “pockets” for despatch to a market or brewery.



Above: Loading, drying, cooling and bagging hops.
© Patrick Grattan.



Above: Main hop growing counties in England 1900.

The geography of oasts and hop kilns

Small-scale, local hop growing spread rapidly to many counties of England, mainly in the south and east, up to Nottinghamshire and down to Dorset. Recent research published by the Essex Society for Archaeology and History has used place names to map otherwise unsuspected hop growing and drying in the 17th and18th centuries in that county. Attempts to develop a hop industry in Scotland, Wales and Ireland were defeated by the weather and topography.

Over time, the industry became concentrated in three favourable regions: Kent/East Sussex, Hampshire/Surrey and Herefordshire/Worcestershire. The buildings in each area had a strong regional identity. By the later 19th century, Kent was producing 75 per cent of England's dried hops. In the present century, West Midlands production has overtaken Kent and Sussex for the first time.

Research into oasts and hop kilns

This topic is multi-disciplinary. The new Historic England book is based on studies conducted in1960, updated 60 years later. In the intervening years several experts have researched the history of hop drying in greater detail. Robin Walton in Kent, David Martin and Gwen Jones in East Sussex, Edward Peters, Joan Grundy and Jennefer Wheale in the West Midlands made important regional studies based on fieldwork evidence. When I returned to write the book their work and online sources contributed greatly.

Studies of hop farming, hop picking, marketing, transport, and brewing are all necessary to understand hop drying. Brewing has long attracted a wealth of excellent writing. All this work has provided a more solid context for the study of how the industry's buildings evolved.

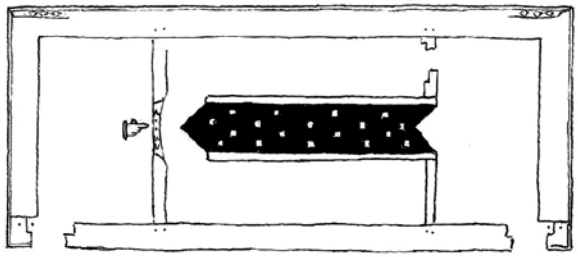
Over time, the industry became concentrated in three favourable regions: Kent/East Sussex, Hampshire/Surrey and Herefordshire/Worcestershire.

Hops were the most profitable, most risky and most volatile product of English farming, generating much passion between the participants.

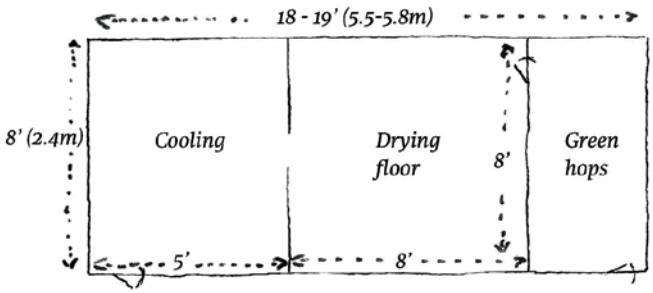
Major libraries, including Historic England's, contain an exceptional body of illustrated literature and manuals on hop farming, from the mid-16th Century through to the present day. Gentlemen farmers and landowners put on record illustrated instructions on the best way to grow and dry hops.

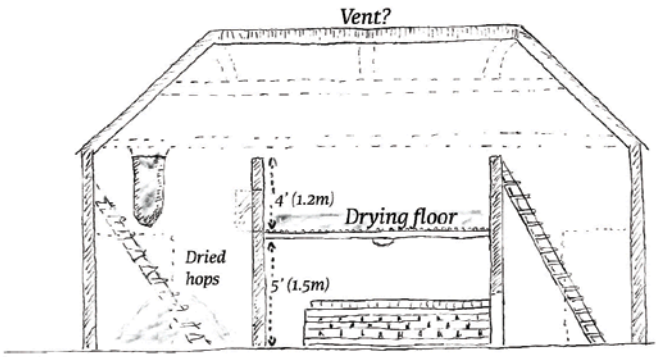
The study of hop drying buildings has also benefited from the growing discipline of industrial archaeology and its focus on technological innovation. Surviving buildings retain much evidence of how new methods of heating and draught control were introduced: ultimately the installation of electricity in kilns made drying far more efficient, but led to the scrapping and loss of many earlier furnaces

1574 Reynolde Scot: *'The Perfite Platforme of a Hoppe Garden'*



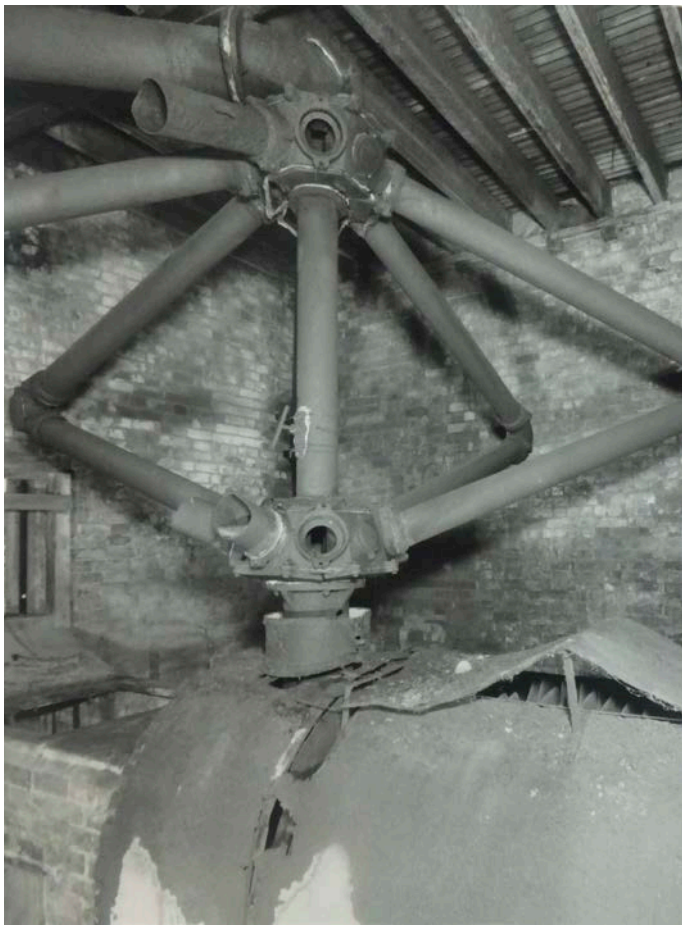
Scot's woodcut of the floor plan of an "oste'





Author's cross section of an oast as described by Reynolde Scot. The walls were 9 ft high. The lathes of the drying floor were 1 ins. wide and layed ¼ ins asunder.

Above: Diagrams based on descriptions in the leading 16th century book on hop growing and drying.



Above: Shrews drying plant Suckley, Worcestershire. Circulating hot pipes beneath the drying floor. 1986 photograph.
HE BB97 11536

Hops were the most profitable, most risky and most volatile product of English farming, generating much passion between the participants.

The evolution of Oasts and hop kilns

The earliest known oasts were square or rectangular structures inside a farm building which otherwise looked like a barn or shed. However, they contained a drying floor and a kiln. These "inset kilns", that is, kilns within the structure of the building, are hard to trace from the exterior and therefore it is difficult to estimate with any confidence how common they once were.

Modern field work has enhanced our understanding of how the building type and the industry developed. The expansion of brewing and therefore hop growing from the 18th century required larger kilns, hotter furnaces and stronger draughts. Taller square or pyramidal and round or conical kilns were built emerging from the stowage roof in a development of the 'inset kiln' type.

Above: Internal drying floor with low protective walls. Luntley Herefordshire. Hughes. Now demolished.

Above: Roundels at Scotney Farm, Lamberhurst. Kent Wealden roundels. © Patrick Grattan

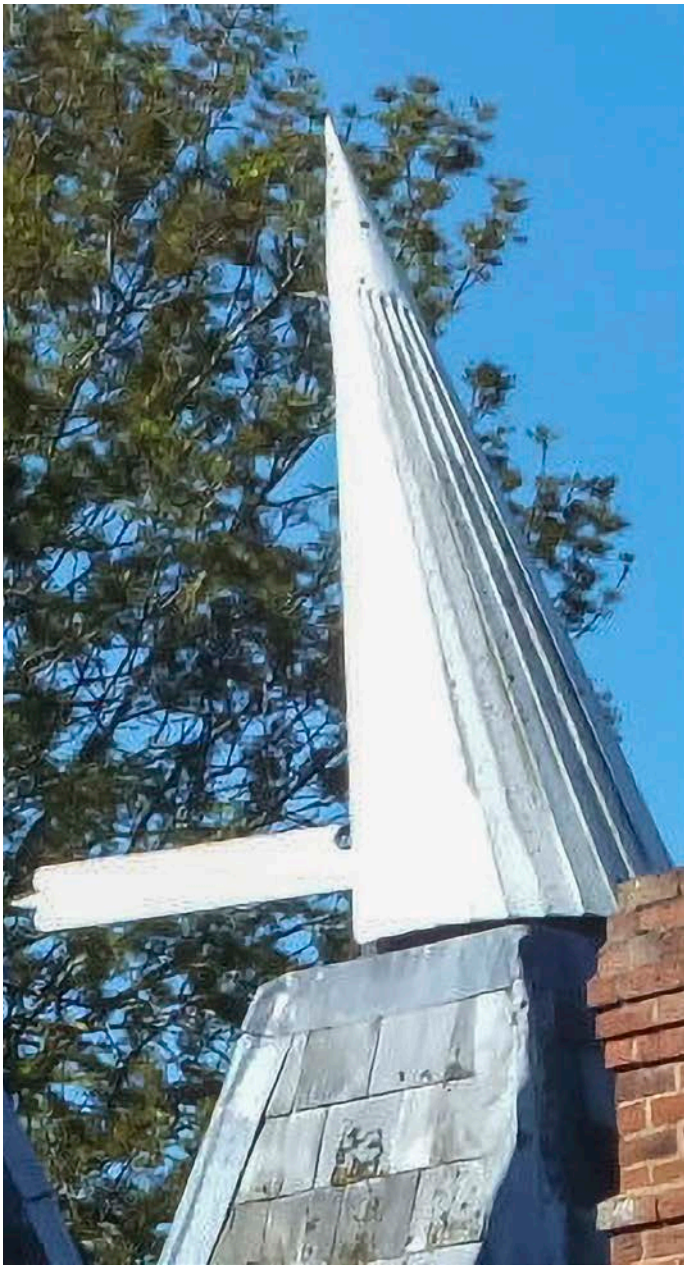
Above: Lower Venn, Avebury, Herefordshire. Note the kiln directly attached to the farm house. 2003. © HE IOE1/09397/07

Square and round kilns

The new scale of production encouraged the development of oasts and hop kilns in which kilns were built grouped around the stowage, rather than within it. Square pyramidal kilns developed before round kilns, but in the late 18th century John Reid from the Weald of Kent emerged as an indefatigable campaigner for the merits of round kilns. The roundel became the dominant type in Kent and Sussex, though not in the West Midlands or Hampshire, where the square kiln remained the norm. About 50 years later collective wisdom shifted again and square kilns became dominant in the final years of hop kiln building.

Cowls

White-painted wooden cowls revolve on a vertical spindle at the top of the kiln, turned by a long wind vane so that the open side faces down wind. They expel the fumes and humid air from the kiln and shelter the drying floor in bad weather. They are the most prominent symbol of hop country.



Above: Kent and Sussex Wealden cowl (top left), a "Nuns" Cowl (bottom left), the West Midlands model (right).
© Patrick Grattan.

The 20th Century

English hop farming declined throughout the 20th century, falling to 1 per cent of world production. As a result, thousands of oasts, especially in the Home Counties fell out of use. However, the decline coincided with strong demand for rural homes of character within reach of London. Former oasts, converted to residential homes now sell for £1 million upwards. Conversions to dwellings are less common in the West Midlands.

The survival of historic oasts and hop kilns in south-east England has therefore been greater than might have been the case. The oast exterior often remains little changed by conversion, its features giving valued character to the property in its new life. The interior of the kilns and their working parts have fared less well. Preserving them in situ is hard to combine with creating living space in domestic dwellings.

It is, however, still possible to understand how these buildings functioned. Working examples of oast interiors can be seen, for example Beltring Hop Farm, Paddock Wood, Kent and Scotney Castle (National Trust) near Lamberhurst. A scattering of others, some identified and recorded, are known.

Many more oasts and hop kilns remain to be identified on farms and private properties. The remains of early hop kilns are undoubtedly still hidden in many 17th-18th century buildings and further field work may help reveal them.. Special attention in recording them should be given to the upper storey and attics of timber-framed buildings, long converted to other uses, for evidence of roof vents, drying floors or floor holes for hop pressing. This will help us to understand more about the development of these important regional building types which give special character to their local landscape.

The author

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Independent researcher

Patrick received a 1960 Trevelyan Scholarship for a paper on oasts and hop kilns. He has worked as a Diplomat, oil industry executive and as a Prince's Trust and employment charities executive.

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A Perfite platforme of a hoppe garden and nescessarie instructions for the making and maytenance thereof. Reynolde (Reginald) Scot Henrie Denham of Paternoster Row, 1576

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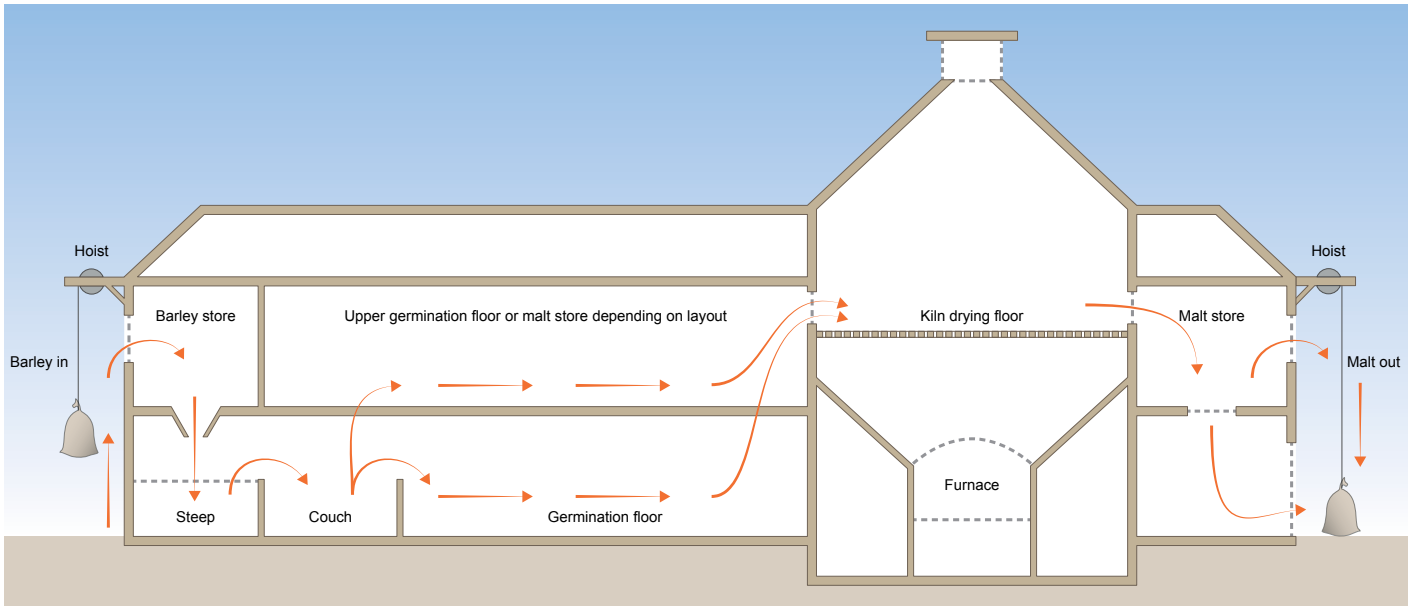
Malt kilns and malthouses

A new book tells the important story of how maltings evolved in England and looks at their future use.



Above: A typical malthouse layout showing the various stages of making barley into malt. (Based on a diagram by Amber Patrick)

How Malt is made

To understand the buildings which make up a maltings, it is necessary to understand how malt was produced.

Malt is artificially germinated grain, usually but not exclusively barley, and is a main ingredient in the production of beer. The process starts with the cleaning of the grain of any rubbish such as small stones. The grain is then soaked ('steeped') in water which encourages germination to begin. This first stage is sometimes referred to as 'growing', to produce a rootlet (but not a shoot), at which point the starches in the grain will be turning to sugars. It is at this critical stage that further germination, which takes place on an unheated open floor, is arrested by drying the grains in kilns. Once kilning is complete the malt is cleaned of its rootlets and is ready for use in brewing.

In Britain, for much of the last 2000 years, kilning has taken place in specially designed structures, the designs of which have changed over that time.

From Malt Kilns as Excavated Structures to Standing Buildings

Remains of kilns have been found dating from the Prehistoric and Roman periods. As few examples remain in situ, understanding them is best done from excavation reports. These early kilns are often referred to as corn driers, but probably they would have been primarily used for kilning malt. Certainly, they could have been used for drying corn, but if so, then it is more likely, they were used just prior to milling, in the same way that some corn mills in Scotland and western England had kilns attached to them. Evidence from experiments has shown drying grain for storage was not practical.

There are variations in design in these early kilns, with some kilns having solid floors over flues whereas in others the flue leads to a pit. The more common type, the solid floor kiln, had T-shaped flues, and examples of this have been found at Beck Row, Mildenhall, Suffolk, and Frocester, Gloucestershire. It would appear that pit kilns became more common in the Medieval period, although some solid floor kilns were still used. Pit kilns took the form of either an inverted pyramid or cone. In these the combustion gases from the fire went through a non-solid floor. Good examples of medieval pit kilns were found at Kimberley, Nottinghamshire, and at Barrow in Rutland.

Below: Medieval malt kiln at Kimberley, Nottinghamshire: the furnace chamber which is an inverted pyramid pit with its stoke hole in the immediate foreground. © Amber Patrick

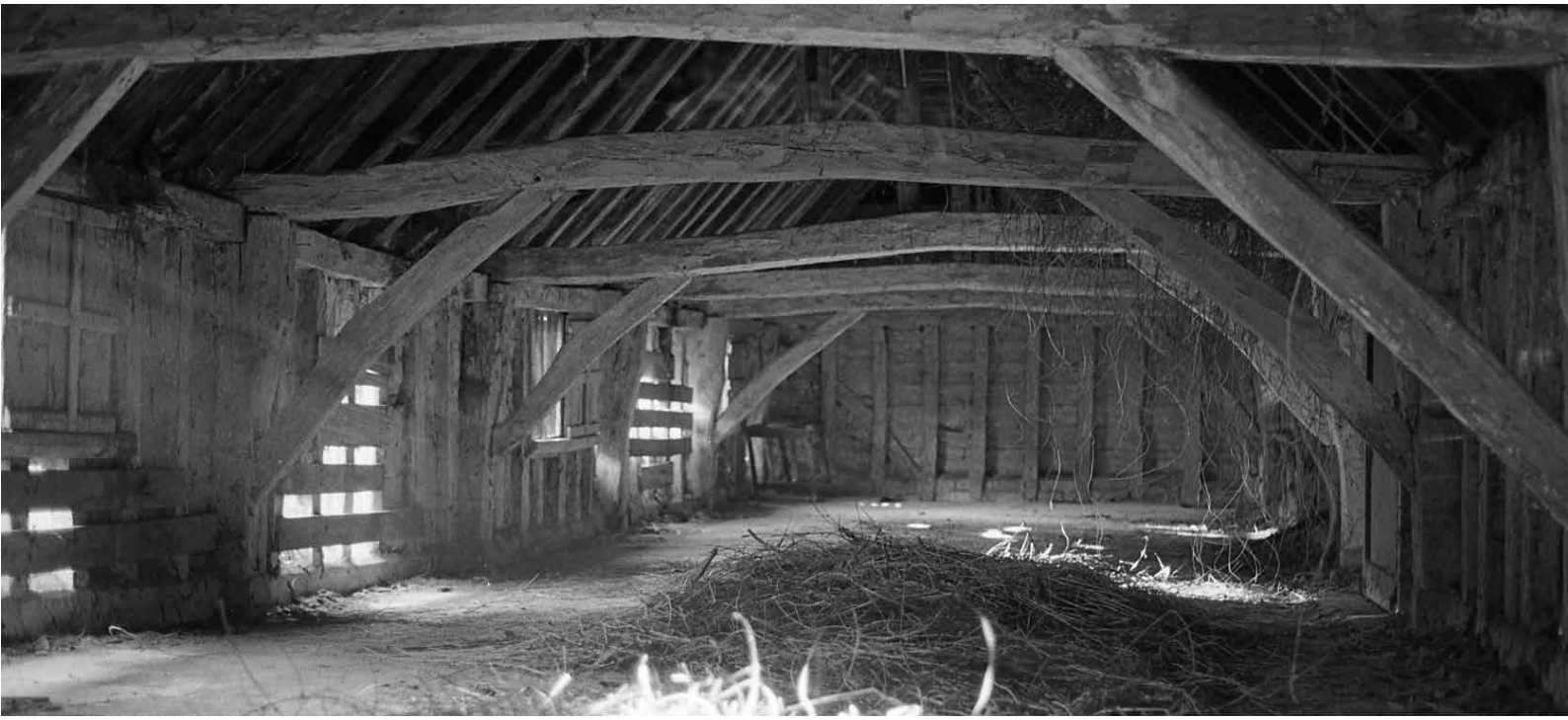
Remains of kilns have been found dating from the Prehistoric and Roman periods.

The earliest standing malthouse building is from Boyes Coft in Essex.

Above: Malthouse, Station Street, Mansfield Woodhouse: the furnace's interior showingthe brick spark plate as a vault and its supports which allowing the heat to pass through to the drying floor above. © Amber Patrick

Documentary sources for early malt kilns and malthouses rarely give much detail on the structures in which malt was produced. The change over from pit kilns to the type with a fixed spark plate probably occurred in the later 16th century. Evidence for this comes from the physician, John Caius. In 1556 he published an account of brewing and malting which included a description of the kiln as a vaulted furnace which had vents on all sides so that the heat could circulate to an upper level where the grain was dried. A good example is at Mansfield Woodhouse, Nottinghamshire, dating from the eighteenth century. This type of furnace continued in use well into the 19th century.

It is also from the 16th century that recognisable malthouse buildings survive. The earliest securely dated example is Boyes Croft, Great Dunmow, Essex, although it is only the middle section which is of that date (from 1512 onwards). From then on maltings as buildings become more recognisable, often by their kilns but also by small regularly-spaced windows, often in every other bay: good light was not a requirement for a malthouse. Good examples of the type can be found at Chipping Campden, Gloucestershire (of stone), and at Cropwell Butler, Nottinghamshire (of brick). This latter building does not have an evident kiln but the characteristic fenestration indicates its original use as a malthouse. An 18th century example with kilns is at Stowmarket, Suffolk.



Above: Boyes Croft, Great Dunmow: the first-floor timbers of a 16th century date. © Amber Patrick

Above: Malthouse in Back Lane, Cropwell Butler, Nottinghamshire with regularly spaced small windows. © Amber Patrick

Above: Malthouse between Prentice Road and Station Road, Stowmarket: the kiln is away from the camera and small windows face onto the Navigation. © Amber Patrick

Above: Malthouse, Sherwood Road, Worksop: large open space of the bottom germination floor. © Amber Patrick

Malthouses and Kilns from the 18th century onwards

The layout of malthouses changed little after the 18th century. The malthouse included separate barley and malt storage areas and a rectangular steeping cistern of stone or brick, usually on the bottom floor, although as the 19th century progressed it might be found on a middle floor of a three-floor maltings. The germination section of the building was still a large open space, the barley being spread over the floor and regularly turned by hand to encourage germination. The kiln still had a furnace on the ground floor and a drying floor above, the floor being often of perforated ceramic tiles but sometimes of woven wire. Later in the 19th century wedge wire gained prevalence. Externally the fenestration generally remained as in earlier periods: regularly-spaced small windows for the germination areas, and limited or no windows for storage areas.

Kilns increasingly had distinctive pyramidal or cone-shaped roofs surmounted by a cowl, and are often prominent features of urban and rural landscapes.

Kilns increasingly had distinctive pyramidal or cone-shaped roofs surmounted by a cowl, and are often prominent features of urban and rural landscapes.

Later in the 19th century there were also further changes. It became more common for a specialist architect to design a maltings, especially large ones. There was an increasing use of power, not primarily steam but more often gas and later oil engines. This enabled the greater use of machinery to move the bulky materials from stage to stage in production. Generally, equipment became more mechanised instead of being hand-operated. Kiln furnaces in newly built maltings were more likely to be supplied by specialist manufacturers such as Robert Boby of Bury St Edmunds, Suffolk, or H. J. H. King of Nailsworth, Gloucestershire.

The most important change came in 1880 with the repeal of the malt tax. Before the repeal of the malt tax, steeps had to be flat bottomed to comply with the legislation. Repeal enabled the use of hopper-bottomed steeps placed on upper floors as opposed to flat-bottomed ones on lower floors.

Above: Cirencester Brewery Maltings, Cricklade Street, Cirencester: H J H King patent furnace in south block.
© Amber Patrick

Above: Wolverhampton and Dudley Brewery Maltings, Langley Green, Oldbury: exterior with pyramidal roofed kilns. The maltings was designed by Arthur Kinder in 1898.
© Amber Patrick

Pneumatic malting ultimately led to the abandonment of floor malting, and many earlier malthouses were either demolished or turned to new uses.

Floor malting continued to be the dominant means of producing malt until the second half of the twentieth century. However, increasingly a new method of production was introduced. Pneumatic malting, first developed in the late nineteenth century, enabled the more precise control of temperature and moisture in the germination stage of the process and reduced labour costs. Initially pneumatic malthouses retained the distinctive features of a maltings, most notably a kiln, but this method of malting eventually led to fewer identifying features in the exteriors of the buildings, with perhaps just a flat kiln cowl. Pneumatic malting ultimately led to the abandonment of floor malting, and many earlier malthouses were either demolished or turned to new uses.

The Future is Reuse

Malthouses are usually not easy to reuse, generally having low floor heights and poor lighting. Reusing large malthouses for residences can mean the loss of a floor to increase head heights, the subdivision of the malting floors and the insertion of windows in otherwise blank bays. Steeps and kiln furnaces are usually lost, as neither fit easily within converted buildings. A kiln furnace can, however, form a feature in a small residential conversion, for example at Malthouse No 4 in Weymouth, where a kiln has been retained.

Commercial reuses may be less intrusive because they can retain large undivided spaces, but are rarely secure in the long-term. Cultural reuses may work better, but again internal features may be lost although exterior features can more easily be retained. The Maltings Theatre at Ely, Cambridgeshire, for example, fits comfortably inside the late-19th century building, largely unaltered externally.

Given that the majority of people will only be seeing the exterior of maltings, it is perhaps more important that exterior features such as fenestration and kilns are retained. Nevertheless to understand what might be lost it is important to fully understand malthouses and their kilns from all periods, and retain internal features where possible.

Above: The Maltings Theatre, Ship Lane, Ely. The kiln survives but is hidden by the tree on the right hand side. © Amber Patrick

Above: Germinating barley on the floor at Warminster Maltings, Wiltshire.
© Amber Patrick

The author

Amber Patrick

Amber is an industrial buildings archaeologist and specialist on the buildings of the malting industry. She is author of the book **The Buildings of the Malting Industry, The production of malt from prehistory to the 21st century** (Historic England/ Liverpool University Press, published in 2023).

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Emma Jones and Joseph Panes working together on the foreshore near Fisher's Nose, below eastern end of the Hoe with view to west
© Louise Firth

Investigating the intertidal zone

A pilot study in Plymouth Sound demonstrates the value of researchers in coastal heritage working with marine science in response to climate change.

Collaboration between buildings historians and marine scientists has the potential to generate innovative, transdisciplinary research methods that can lead to new insights into the value - and future use - of our coastal heritage as the intertidal zone experiences rapid environmental change. This was the key finding of a pilot study initiated by Antony Firth, Head of Marine & Coastal Heritage for Historic England and jointly funded by Historic England and the Marine Institute, University of Plymouth. The study brought together researchers in marine ecology and architectural heritage to investigate artificial structures of historic significance in the intertidal zone of Plymouth Sound.

The pilot also demonstrates the value of collaborative, interdisciplinary research between marine heritage and marine conservation.

While relatively short and small-scale, running only from January to April 2023, the pilot study clearly established the value of intertidal historic structures as marine habitats: more species were found on historic than contemporary structures and different species were found on historic structures than on natural rock. These findings open a discussion about the value - and use - of historic coastal structures in a future where the intertidal zone will experience changes in sea temperature, heat extremes and energy levels (from waves and swell) that will affect natural and artificial structures alike, which may also change the species and habitats they support. Importantly, the pilot also demonstrates the value of collaborative, interdisciplinary research between marine heritage and marine conservation: fresh insights emerge from new ways of working together based on a shared understanding of marine environments as cultural landscapes that are unique places formed through the interactions of humans and nature over time.

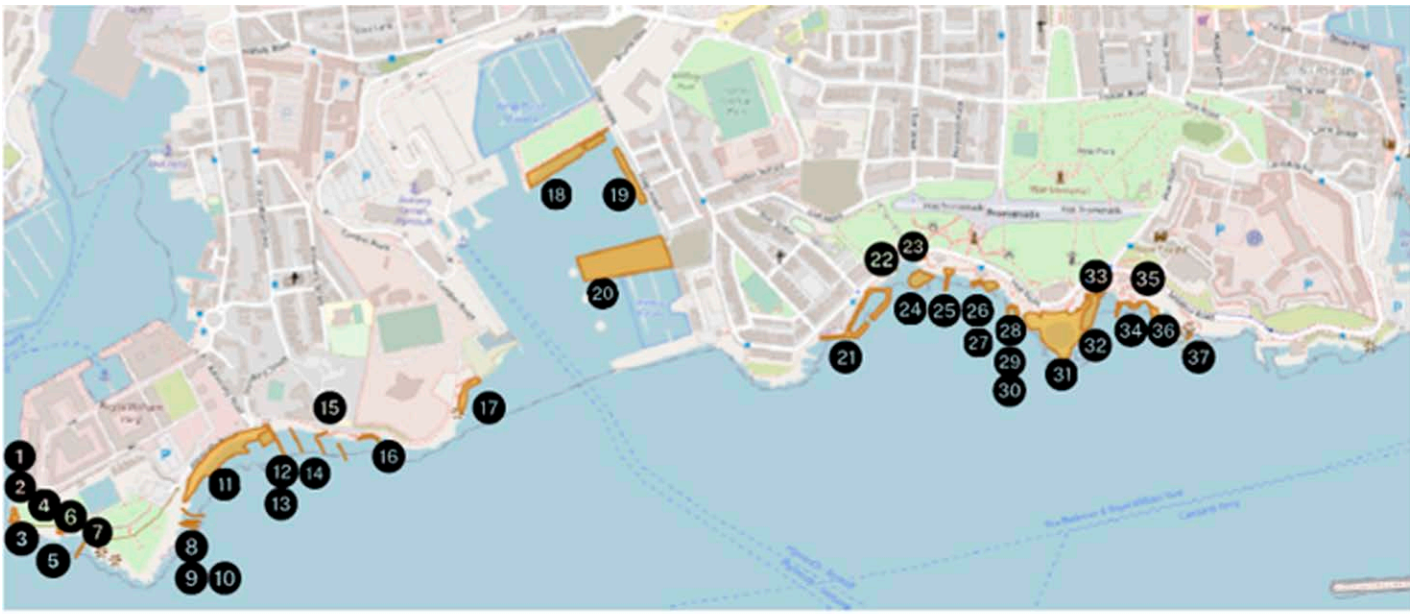
Plymouth Sound

A key aim of the project was to investigate the value of collaborative, interdisciplinary projects at coastal heritage sites. Plymouth Sound was chosen for three reasons: it is the site of the UK's first National Marine Park; there is specific expertise in marine heritage and marine science close-to-hand at the University of Plymouth; and it is of national historical and environmental significance.

Plymouth Sound is a unique marine environment and a significant historic landscape that has defined a city for centuries. It is the place where the largest naval base in Western Europe co-exists with fragile beds of sea grass. It is the place where many of the world's most daring voyages began and where fishing boats today still leave for the daily catch. It waved farewell to the men, women and children of the Mayflower, and four hundred years later welcomed descendants of the Native Americans who enabled their survival. It began Greta Thunberg's Atlantic adventure and gave sanctuary to survivors of the Titanic.

The pilot study focused on the 6 kilometre stretch of foreshore from Tinside to Devil's Point; that is, from the bluff known as the Hoe to where Royal William Yard juts out into the mouth of the Tamar. Since the construction of the 1.5 kilometre long Plymouth Breakwater, 'The Great National Undertaking' of 1812 – 1844, this stretch of foreshore has had its own distinct natural and human history as the breakwater calmed the waters of the inner Sound, enabling marine and human life to flourish, with amongst other things the rise of leisure sea-swimming. This hybrid maritime history can be read in the numerous little-known structures found the length of the foreshore, often layered upon each other, sometimes forgotten and left to the sea.

Plymouth Sound is a unique marine environment and a significant historic landscape that has defined a city for centuries.



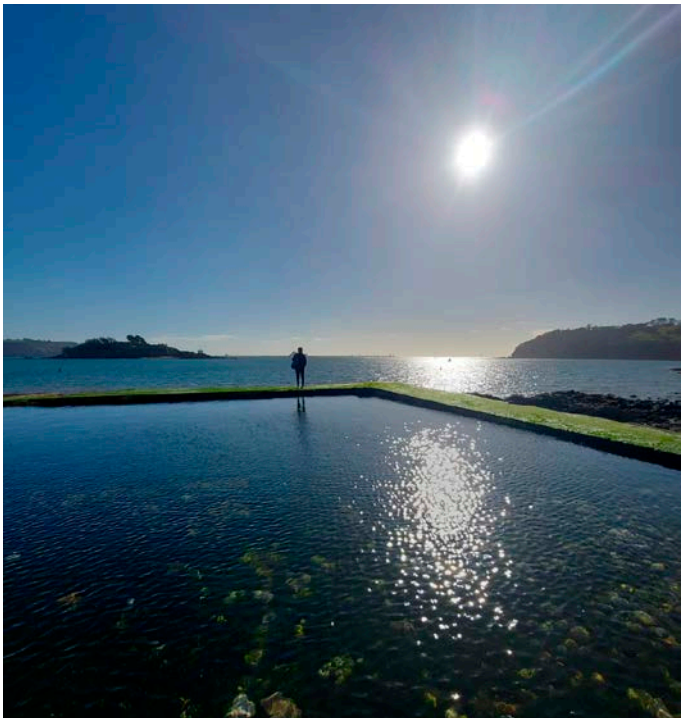
Above: Map of Plymouth Sound between Devil's Point and Fisher's Nose showing survey area (highlighted) and heritage structures (numbered) (Google maps).

Identifying intertidal heritage structures

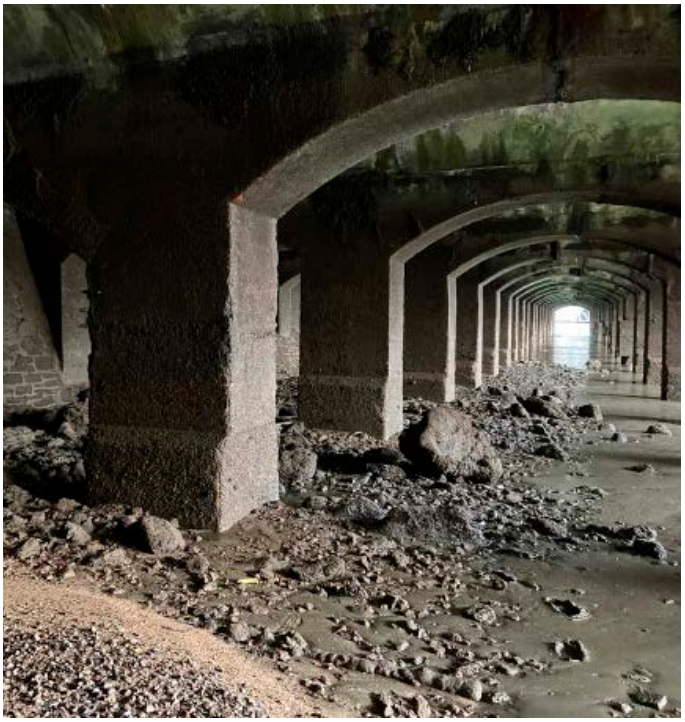
Combining the fieldwork skills and methods of historic buildings research with those of marine ecology, postgraduate students Emma Jones, Marine Ecology, and Joseph Panes, Heritage Theory and Practice, worked together at low tide identifying and recording historic structures and their biodiversity. They were able to assess how these structures compare to the adjacent natural habitat and demonstrate the distinctiveness of historic structures as habitats when compared to contemporary structures and materials.

Plymouth's waterfront is one of England's most significant coastal heritage sites.

Plymouth's waterfront is one of England's most significant coastal heritage sites. This is reflected in the area's extensive protection from the Barbican Conservation Area at Sutton Harbour to the east – with its fifty-plus seventeenth to nineteenth century dwellings and commercial premises – to the Royal William Yard – John Foulston's Royal Navy victualling yard, 1811-29, a fortified site comprising twenty-six Grade I, II* and II structures – to the west. The waterfront between these two areas features, from east to west, the seventeenth-century Royal Citadel, a scheduled monument; the Hoe, which is a Grade II Park and Garden with thirteen listed monuments including Smeaton's Tower, 1759 (moved from Eddystone Rock in the 1880s) and, most famously, the site of Sir Francis Drake's (possibly mythical) game of bowls; and Millbay Docks including Brunel's Grade II listed Inner Basin.



Above: Firestone Bay tidal pool, built about 1935, catalogue No. 12. © Joseph Panes, 2023



Above: Foundations of Trinity Pier, Millbay Docks 1852 – 70, catalogue No. 20. © Joseph Panes

However, knowledge and protection of Plymouth's historic waterfront structures does not fully extend to the intertidal zone. Some larger historic structures such as Tinside Lido, West Hoe Pier, and the Firestone Bay Sea Wall are listed; but most of the extant historic structures are a bricolage of small-scale interventions that are largely undocumented and unprotected. To address this gap, a full catalogue of all the assets in the survey areas has been produced including histories for each structure based on research in the Plymouth City archives. Their significance lies in their collective value as evidence of changing activities over time. Thirty-seven historic structures were surveyed, including twelve sets of steps, five piers, four swimming pools, three sea walls and thirteen other structures ranging from railings to groins, cabling, navigation beacons and mooring rings. Reflecting the changing history of Plymouth Sound, these small-scale, everyday structures can be arranged into four categories based on their original purpose: Royal Navy (defence, communication etc.); commercial shipping; tourism; and recreational swimming.

Due to its proximity to the Devonport Naval Base and the Royal William Victualling Yard, many structures at Devil's Point and Firestone Bay are linked to the Royal Navy. Starting with the Firestone Bay Sea Wall in 1827, The Admiralty built structures such as the boom defence rings, navigation beacon and the submarine cables to strengthen the defence, improve accessibility to the Devonport, and enhance communication. The Navy's presence in this area has diminished, especially after Royal William Victualling Yard was vacated in 1992, making many of these structures redundant.

In Millbay, the structures are primarily connected to commercial and passenger shipping. Although there has been a commercial maritime presence in the area since the eighteenth century, Clyde Quay, Brunel's Pontoon, and Trinity Pier originate from the Great Western Dock Company's expansion of the dockyard in the 1850s. A combination of bomb damage, the collapse of ocean passenger shipping, and the preference for large container ships instead of smaller freighters led

However, knowledge and protection of Plymouth's historic waterfront structures does not fully extend to the intertidal zone.

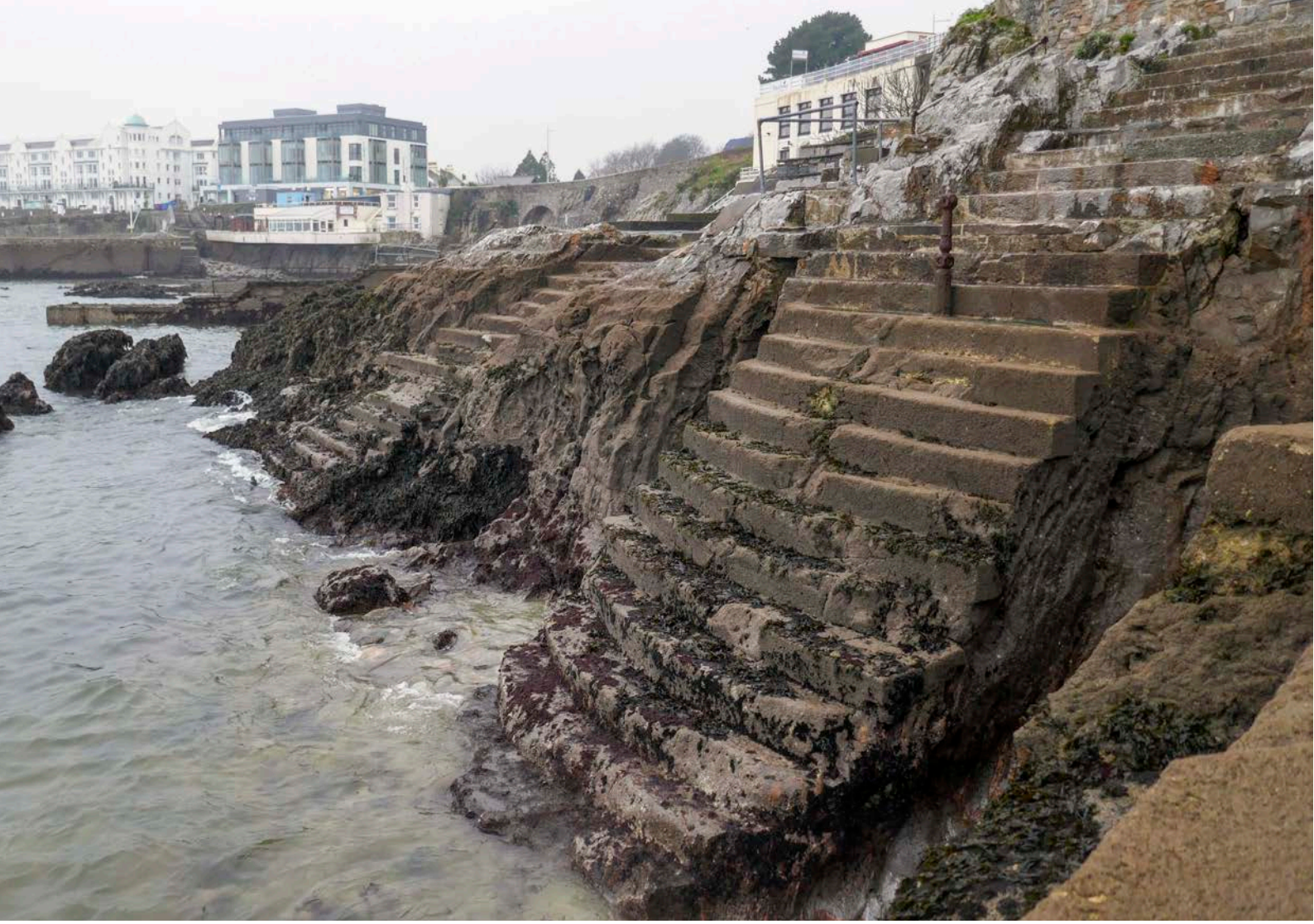
Above: Queen's Steps, Pebbleside Beach, catalogue No. 23. © Joseph Panes

to the decline of the dockyard as a substantial commercial entity. However, the area has been subject to fervent regeneration efforts throughout the past 15 years. In a notable example of adaptive reuse, Clyde Quay and Trinity Pier have been renovated into pedestrian boardwalks and used to host international sailing competitions.

Finally, the increasing popularity of outdoor bathing and expanding tourism industry gave rise to most of the structures on the eastern section of the Stonehouse foreshore (Firestone Bay, Tranquillity Bay, and Eastern King Point) and The Hoe. Between the 1850s and 1914, there were piecemeal additions to these areas to improve pedestrian access to the sea. The local authorities in Stonehouse and Plymouth constructed the steps at Second Beach, Tranquillity Bay, Eastern King Point, Reform Beach, and Lion's Den to establish designated bathing areas. Additional pressure from patrons to improve the outdoor swimming facilities led to the erection of enclosed tidal pools (Reform Beach Sundeck, Shacky Pool Platform), bathing houses and diving platforms.

Likewise, as holidaymaking and leisure time became commonplace during the Victorian/Edwardian era, The Hoe evolved into a popular vacation destination. Consequently, West Hoe Pier, Watermans Slip, Banjo Groyne, and the Shacky Pool Landing Place Steps were built to provide steamer ship and yacht access, to varying degrees of success.

In a notable example of adaptive reuse, Clyde Quay and Trinity Pier have been renovated into pedestrian boardwalks and used to host international sailing competitions.



Above: Reform Beach Steps, catalogue No. 26. © Joseph Panes

Above: Waterman's Slip, West Hoe, catalogue No. 25. © Joseph Panes

The 1930s proved the pinnacle of the foreshore's development.

The Plymouth Sound foreshore underwent its most intense construction period during the 1930s. Using the designs of John Wibberley, the Plymouth City Corporation embarked on an ambitious foreshore development scheme, leading to the installation of the concrete beaches at Pebbleside and Tinside, the East Tinside Sun Terrace, and the Extension Pier. The Corporation also enlarged Shacky Pool, installed a tidal pool at Firestone Bay, and, as its centrepiece project, built Tinside Lido, one of the most celebrated outdoor pools in the country.

However, the 1930s proved the pinnacle of the foreshore's development. Bomb damage led to the demolition of the Promenade Pier after World War Two. The artificial structures started to to deteriorate as tourism declined, investment dwindled, and coastal erosion took effect. By the end of the twentieth century, many were in a desperate condition. The concrete foreshores at Pebbleside and Tinside had fragmented; Extension Pier had partially collapsed; the City Council removed the Shacky Pool Diving Stage; and, most ominously, the iconic Tinside Lido was permanently closed.

Nevertheless, efforts have been made to renovate or repurpose some structures in the twenty-first century. After a vociferous local campaign, Tinside Lido was restored and reopened in 2003 and bathers continue to use it in the summer months. Likewise, The City Council partly refurbished Extension Pier, converting it from a landing stage into an observation platform; and filled in the Reform Beach and Shacky pools, transforming them into sundecks.

The structures continue to be used by the local community today. In the summer, people of all ages use the pools, steps, and stages along the foreshore; and Navy families gather on the platforms in Stonehouse to welcome sailors home from their tours at sea. Throughout the survey, we observed the public using the structures to relax, exercise, and honour their loved ones. These structures help make Plymouth Sound a uniquely accessible and engaging place for Plymothians and visitors.

Above: Emma Jones and Joseph Panes conducting a rapid biodiversity assessment at the former Royal William Yard reservoir drain at Kings' Western Battery near Devil's Point, catalogue No. 08. © Joseph Panes

Rapid biodiversity assessment

As well as being assessed for their heritage and contemporary value, each historic structure was subjected to a 'rapid biodiversity assessment'. The biodiversity of adjacent natural rock and contemporary/non-historical structures was also recorded. The results of the combined survey were mapped using GIS. Eighty species were recorded overall: 70 on the natural shore and 71 on the historic structures. Sixty-one species were common to both heritage structures and natural rock, 9 were unique to natural rock and 10 unique to the historic structures.

Most of these structures are heavily disturbed, especially during summer months in peak tourist season. It is, therefore, unsurprising that they support fast-growing species such as green or brown alga, which are the first to grow on uncolonised or disturbed structures. In the natural habitats with lower disturbance, other organisms such as crustacea and molluscs have had a chance to outcompete and even graze on the fast-growing species over time, a process known as ecological succession, which may, therefore, be a driving influence on the differences in biological community recorded within the study area.

Historic structures support biodiversity

While only a snapshot, it is apparent from this rapid assessment that historic structures have the potential to support a wide range of biodiversity, although this is highly dependent on the nature of the structure itself.

This emerges from the additional data recorded in the historic building survey. Crucial to the success of the pilot, Historic England's Level 1 recording system for historic buildings was modified at the request of our marine ecologists to include data relating to weathering of materials and structural decay.

Mapping this additional data enabled researchers to begin to understand what enables a historic structure to support biodiversity: information was gathered on the different materials encountered, recording their textures, joints and cracks, and delaminating layers. These set them apart from both contemporary structures (mostly smooth-faced concrete) and natural rock as a habitat for marine life.

The survey demonstrated that historic structures make good and sometimes species-specific eco-habitats, in part, because of historic craft practices - choice of materials, construction methods – and in part simply because they are historic; that is, the longer a structure has been exposed to the sea the more weathered it becomes and, therefore, the more attractive it is to some types of marine life.

Below: Detail of Reform Beach Steps, showing an array of benthic marine wildlife, catalogue No. 26. © Emma Jones

the Plymouth Sound pilot study demonstrates that there is much to be gained from interdisciplinary research in coastal heritage and marine science.

New insights, new questions

Further study is needed to elucidate the driving influences in these differences and to understand how we can conserve both biodiversity and the historic environment. However, these initial findings contribute to a conversation about the future use of coastal structures within a combined conservation framework, where the value of a historic asset might have not only a heritage value but also an environmental benefit through attracting species diversity (see recent publication by Baxter, Coombes and Viles). While this shows the historic environment has a role to play in environmental conservation, we should also acknowledge it needs to be balanced with its cultural value and future use and enjoyment by people in coastal communities (see work by Claesson; Jarratt; Firth).

In practice, as sea-level rise bring more structures within the intertidal zone of our historic harbours and port cities, decisions about this balance may favour managed weathering over repair or restoration: decisions that will require revised assessments of significance that balance historic against environmental values. These are discussions and decisions for the near future; what is more certain is that the Plymouth Sound pilot study demonstrates that there is much to be gained from interdisciplinary research in coastal heritage and marine science.

Below: Aerial view of Admiralty Road, Plymouth with the Artillery Tower and Firestone Bay Tidal Pool (catalogue No. 12) in the centre of the image, taken in 2009.

The authors

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Louise is a marine ecologist who works in both natural and artificial coastal environments. She is interested in the relationship between humans and coastal ecosystems (Marine Community Ecology) and how this relationship has changed over time (Historical Ecology).

Professor Daniel Maudlin
Heritage and Culture Lead, Faculty of Arts, Business and Humanities, University of Plymouth.

Daniel also leads the MA Heritage Theory and Practice programme and is director of Plymouth Heritage Praxis. Recent projects include the Interpretation Plan for the Plymouth Sound National Marine Park. His research is focused on the historic environment of the British Atlantic World.

Further information

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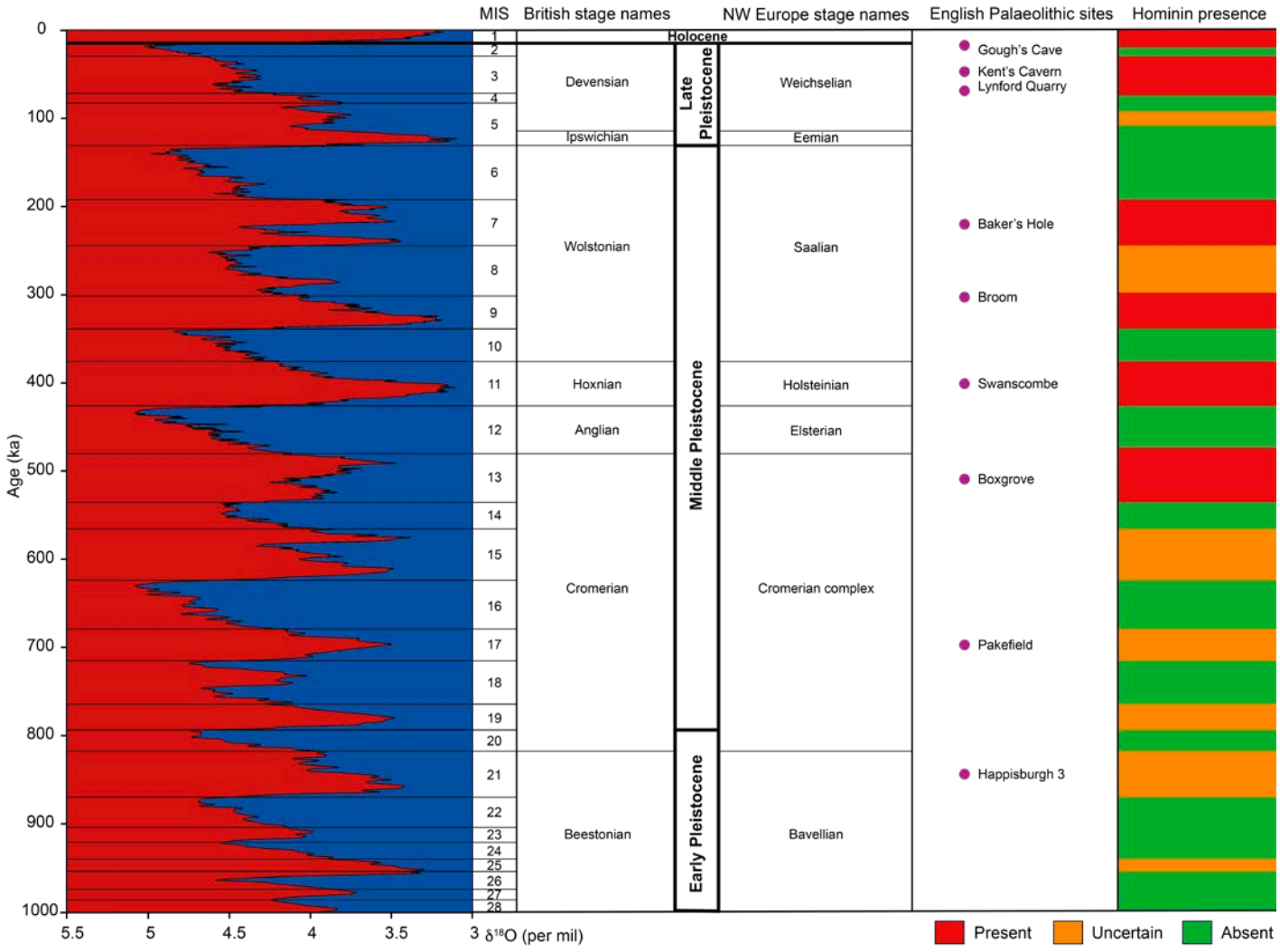
Mapping the Palaeolithic in England

The English Palaeolithic: archaeology with a difference.

The Old Stone Age, or Palaeolithic as it is more formally known, is an archaeological period apart. Lasting more than four million years at a global scale and at least 900,000 years in Britain (Fig 1), the Palaeolithic spanned time that is orders of magnitude greater than for any other archaeological period. The time encompasses the evolution of our earliest bipedal ancestors and indeed our own species, as well as the first human colonisation of Britain. The time depth means that the Palaeolithic coincides with momentous changes in climate, manifested in Britain by ice ages (glacials), during which northern England was covered by ice sheets and the south by tundra, and interglacials, during which conditions were broadly similar to the present day. Each glacial and interglacial period coincides with a Marine Isotope Stage (MIS). These latter categorise changes of climate as manifested by chemical properties of a class of marine invertebrate (Foraminifera). Unsurprisingly hominins (our evolutionary forebears as well as our own species) inhabited Britain during the interglacials (odd numbers in the MIS series) and (mostly) avoided the area during the glacials (even MIS numbers).

Lasting more than four million years at a global scale and at least 900,000 years in Britain, the Palaeolithic spanned time that is orders of magnitude greater than for any other archaeological period.



Above: Time chart of Pleistocene geological sub-divisions and the English Palaeolithic

As well as being differentiated by time and the often ephemeral nature of an archaeological record characterised by stone artefacts and (sometimes) animal bones, the Palaeolithic is also different from other periods on more prosaic grounds. These are associated with the methodologies by which Palaeolithic sites are investigated and, in Britain at least, the personnel doing the investigating. Most archaeologists working in the commercial and curatorial sectors in England may have attended one or two classes on the Palaeolithic but are unlikely to have worked on a Palaeolithic site. Such circumstances are the product of the relatively few Palaeolithic archaeologists teaching in universities compared to those specialising in other periods and consequently the limited Palaeolithic research excavations in Britain.

The unfamiliarity of the Palaeolithic to most archaeologists, when combined with the potentially huge scientific importance of sites of the period, poses particular problems in the cultural resource management sector. For instance, can the location of Palaeolithic sites be predicted? What is the likely nature of archaeological preservation given different topographic and geological circumstances? How should potential Palaeolithic sites be investigated before a planning decision is made that might affect their preservation?

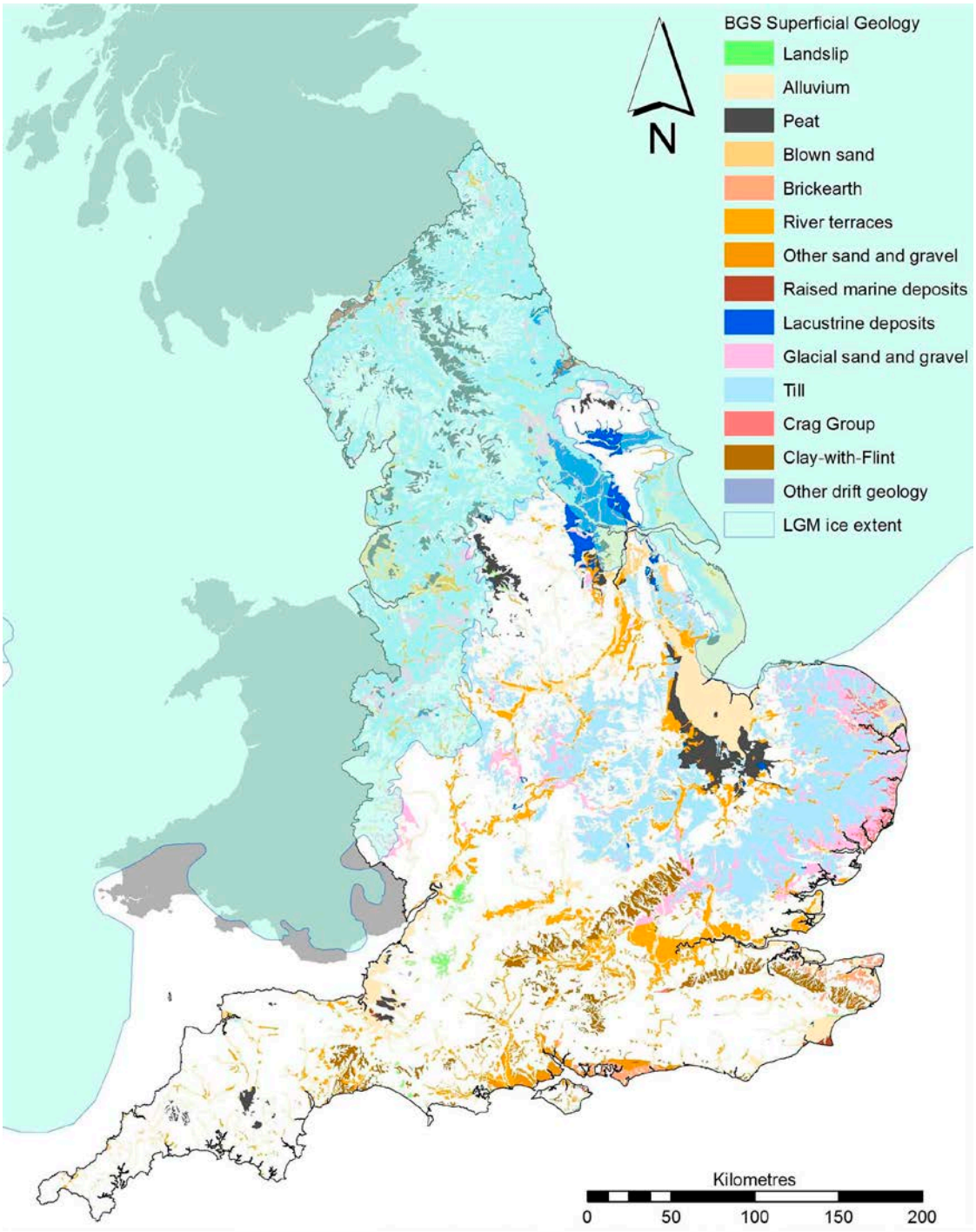
Above: Excavation of the MIS7 Palaeolithic site of Oak Tree Quarry, Cerney Wick, Gloucestershire in 2021

Historic England's recent guidance on Curating the Palaeolithic (2023) provides extensive background information and highlights the importance of seeking advice from a specialist with appropriate expertise in the Pleistocene (the geological period from 2.6 million to 11,700 years ago which encompasses the Palaeolithic). However, few staff in either local planning authorities or Historic England fulfil such a criterion.

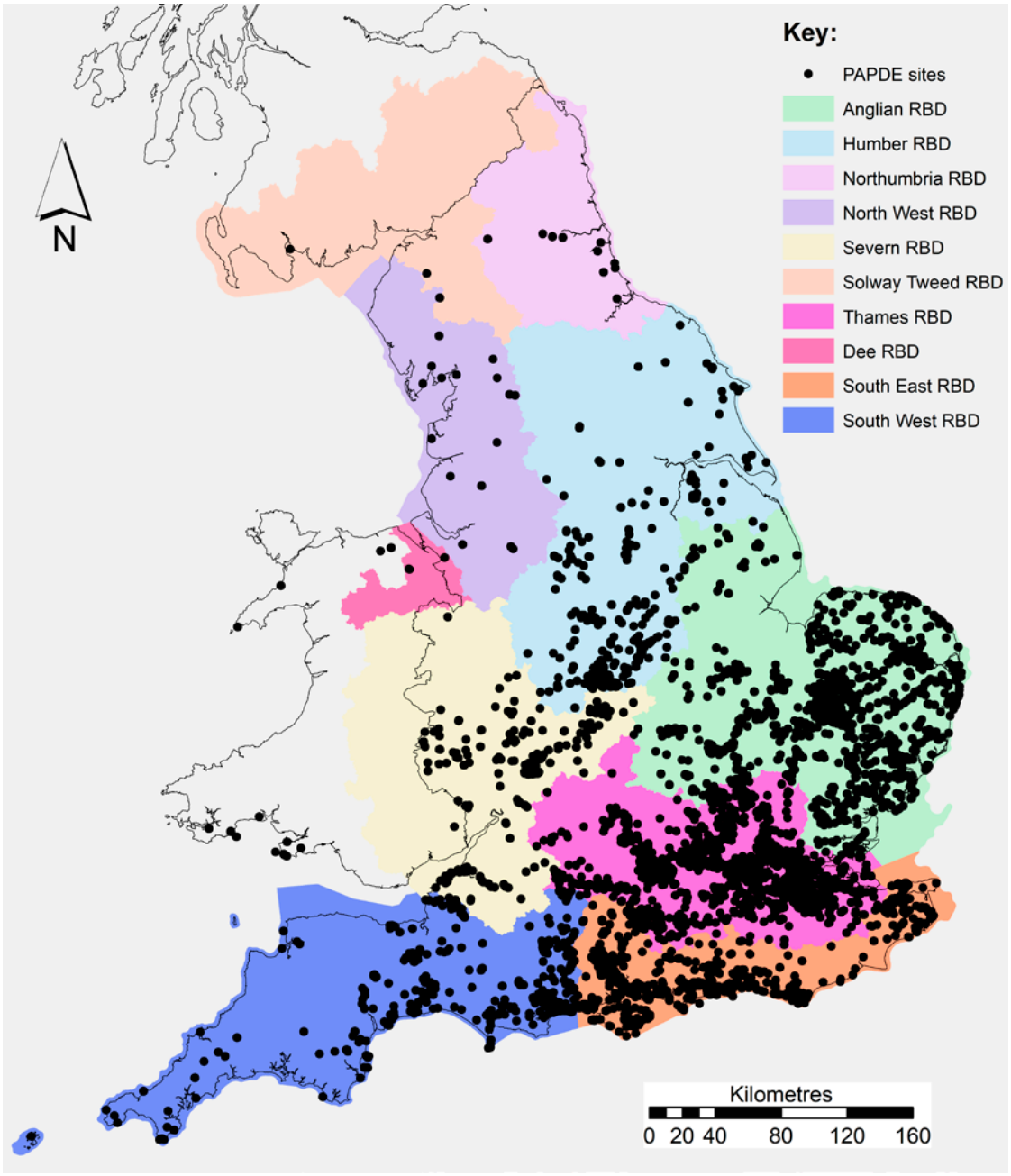
Recognising the particular problem of the Palaeolithic in the planning system, Historic England therefore commissioned a project entitled 'Palaeolithic archaeological potential of Pleistocene deposits in England: a geological mapping approach' carried out by ARCA geoarchaeology between 2018 and 2023. Its product is a nationwide predictive mapping tool for the Palaeolithic.

Palaeolithic archaeological potential

The presence or otherwise of Palaeolithic archaeological sites in any area is dependent on whether geological layers dating to the Pleistocene occur. Further, the nature of any Palaeolithic remains that might be present is also largely a product of the strata that are present. For example, Palaeolithic artefacts are unlikely to occur within deposits that accumulated as a result of glacial activity and any artefacts that might be present will almost certainly have been derived from older strata. Given this fundamental importance of geology in predicting the English Palaeolithic record, the project used as its main data source British Geological Survey (BGS) 1/50,000 maps.



Above: Superficial geology of England and Late Pleistocene glaciers (Contains public sector information licensed under the Open Government Licence v3.0; Contains British Geological Survey materials © UKRI 2024; ice sheet extent from Britice)



Above: Environment Agency River Basin Districts and Palaeolithic sites in the project database (contains public sector information licensed under the Open Government Licence v3.0.)

Geographic information system (GIS) polygons marking the distribution of geological strata of Pleistocene age (i.e. most categories of 'superficial' geology) were extracted from digital versions of the British Geological Survey maps. The polygons were next divided into the ten river basin districts used by the Environment Agency and then by individual river catchments.

The other main data source used was the English Rivers Palaeolithic Survey database, a nationwide catalogue of Palaeolithic sites compiled by John Wymer and Wessex Archaeology in the late 1990s. The project then combined further Palaeolithic archaeological site databases at county (e.g. Suffolk) and regional level (e.g. the Midlands) and information captured from the published

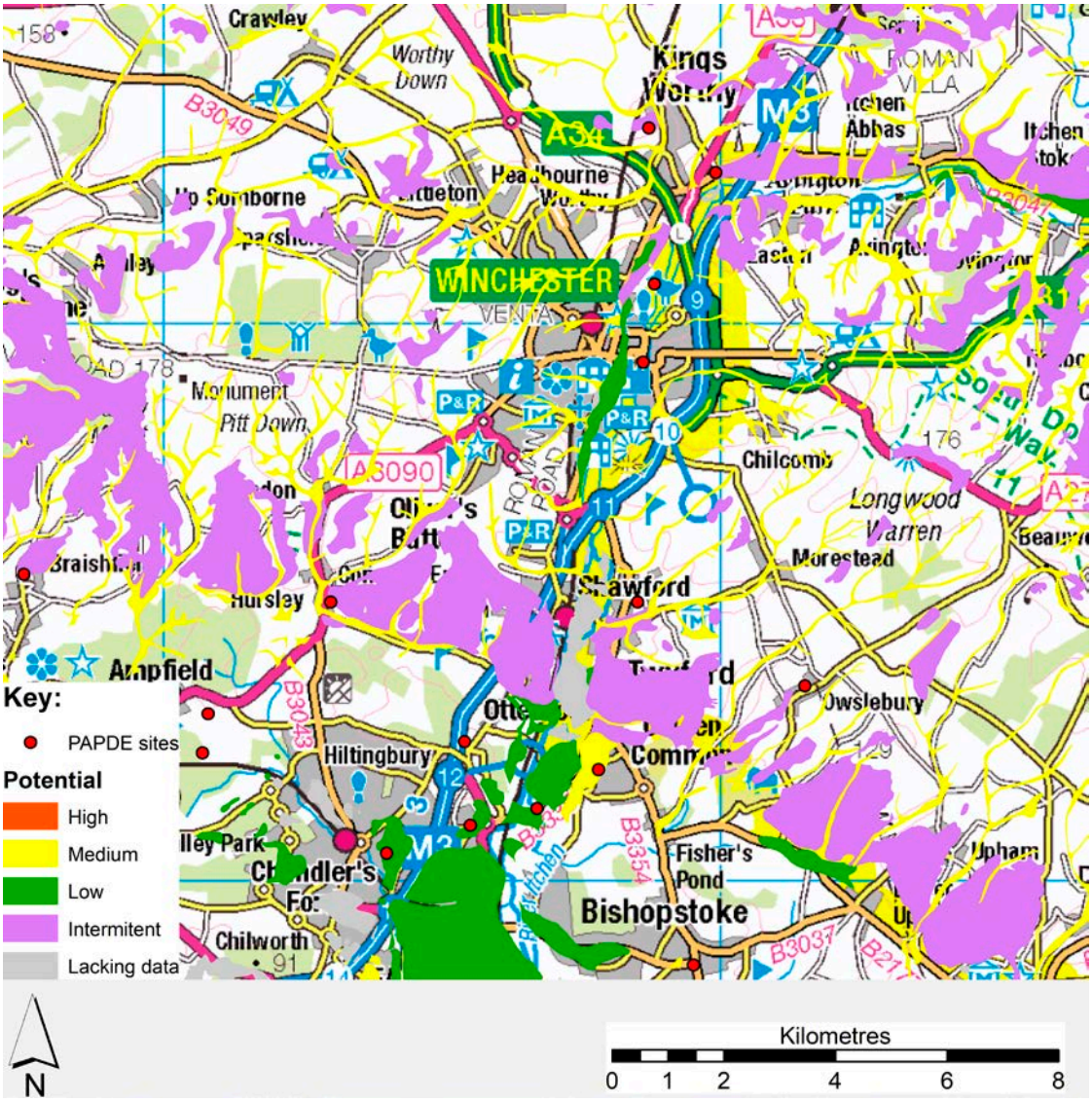
Pleistocene geological literature with the English Rivers Palaeolithic Survey in a new project-specific database. It then, finally, cross-referenced the geological polygons with the archaeological site database.

British Geological Survey categories that coincided with Palaeolithic archaeological finds were categorised based on the number and nature of the sites, according to the following scale:

Significance	Criteria
High	Fulfilling any of the ten categories of national interest given in Curating the Palaeolithic (presence of: human remains; remains from a period or area where evidence of a human presence is particularly rare; organic artefacts; well-preserved indicators of the contemporary environment; evidence of human lifestyles; deposits containing Palaeolithic remains that have a clear stratigraphic relationship; any artistic representation; features such as hearths, shelters, and floors; exploitation of a resource, such as a raw material; abundant artefacts)
Medium	Palaeolithic archaeological remains definitively present, but not meeting criteria for national interest
Low	Palaeolithic remains reported but their exact provenance is uncertain
Intermittent	A broad category indicating where: (a) deposits containing Palaeolithic archaeological remains are buried beneath a mapped British Geological Survey geological unit of Pleistocene age; (b) Palaeolithic artefacts occur in secondary context with at least one climate stage interval between their original deposition and the context in which they were discovered (e.g. glacial deposits containing artefacts from the previous interglacial); or (c) Palaeolithic artefacts occur as a lag (i.e. surrounding matrix has been lost, making it impossible to determine in which geological unit the artefacts were originally incorporated)
Lacking data	Palaeolithic archaeological remains not presently known and/or geological criteria (e.g. age) suggest that hominins were absent

The product

The end result of the project is a GIS resource for England comprising polygons that categorise potential Palaeolithic archaeological significance according to the five-point scale above. The GIS, and even the underpinning archaeological site database, is not a be-all-and-end-all resource that considers every aspect of the Palaeolithic and it is not a replacement for more detailed GIS resources available at a local level, for example those produced as part of a Historic Environment Record enhancement exercise. Rather it is intended to enable a 'first response', in other words a rapid assessment of whether a development coincides with deposits that **might** contain Palaeolithic archaeological remains. What happens after that initial assessment is a matter for an archaeologist working with a planning authority, but where any category other than 'Lacking data' is indicated, would likely commence with a desk-based assessment carried out by (or with input from) a Pleistocene specialist with appropriate expertise.



Above: Palaeolithic archaeological potential of the Winchester area
(Contains public sector information licensed under the Open Government Licence v3.0; Derived from 1/50,000 scale BGS Digital Data under Licence No. 2024/009 British Geological Survey © and Database Right UKRI. All rights reserved).

The end result of the project is a GIS resource for England comprising polygons that categorise potential Palaeolithic archaeological significance according to the five-point scale above.

Unsurprisingly, given that ice sheets of the last glacial maximum disrupted earlier Pleistocene strata in northern areas, geological units with Palaeolithic archaeological potential mainly occur in southern and central England. However, this is not exclusively so. Upper Palaeolithic remains post-dating the last glaciation occur across northern England, while in some locations (e.g. in Lincolnshire) Middle Pleistocene interglacial sediments containing archaeological remains lie beneath deposits of the last glacial maximum. Understanding the Palaeolithic archaeological potential is therefore a country-wide necessity.

At the time of writing (May 2024) the 'Palaeolithic archaeological potential of Pleistocene deposits in England: a geological mapping approach' GIS is undergoing evaluation and it is hoped that the resource will be available by the end of the year.

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Research Reports 2023-24

A roundup of new additions to the Historic England Research Reports database between September 2023 to February- 2024 arranged by heritage theme, along with an extra overview of industrial heritage reports added since 2019.

Climate Change

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

Seaford Head, East Sussex: Rapid Survey and Assessment
Ed Blinkhorn, Richard James, Emily Johnson, Jon Sygrave, Vasilis Tsamis

Historic England funded The Seaford Head project as a pilot study in how an archaeological site at threat from coastal erosion, accelerated by climate change, could be rapidly recorded ahead of its loss.

Read the report

Built Heritage

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.

New Shildon, County Durham: Historic Area Assessment
Lucy Jessop, Richard Pougher

This Historic Area Assessment considers the development and buildings of New Shildon, County Durham, from the foundation of the town in about 1825 to the present day. Its first buildings were constructed when the Stockton & Darlington Railway opened for business, and New Shildon became the home of its railway works for the next 150 years.

Read the report

10 Church Street, Tewkesbury, Gloucestershire: Historic Building Investigation
Johanna Roethe

This report sets out the documentary history and fabric analysis of this Grade II*-listed building.

Read the report

Inns Sites: Shropshire's Rural Public Houses
Victoria Hunns, Gwendolen Powell, Giles Carey, Caitlin Osborne

The report outlines the social and economic factors affecting Shropshire's public houses in the early 21st century and the reasons for this heritage being considered at risk. It covers the survey methodology of the sites. It also provides an overview of a range of community-focused learning opportunities.

Read the report

Inns on the Edge: Historic Public Houses Along the Lincolnshire Coast
Marc Knighton, Ian Marshman

This pilot project surveyed the status and condition of over 300 pub sites between November 2021 and July 2022. The report is an exploratory trial to help inform any future research to record public houses.

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.

Maumbury Rings, Dorchester: Radiocarbon Dating and Chronological Modelling
Peter Marshall, Susan Greaney, Michael Dee, Irka Hajdas

The results estimate Maumbury Rings to have been constructed in 2470–2405 cal BC (95% probability) and probably in 2465–2445 cal BC (68% probability).

Read the report

Brook Hall, 27 Broad Street, Leominster, Herefordshire: Tree-ring Dating of Oak Timbers
Alison Arnold, Robert Howard, Cathy Tyers

The results demonstrate that the two ranges of the building are broadly contemporary, utilising timber felled in AD 1570–95 (main range) and AD 1575–97 (north range).

Read the report

98a Watling Street East, Towcester, Northamptonshire: Tree-ring Dating of Oak Timbers
Dr Martin Bridge, Cathy Tyers

Twelve samples were taken from various elements in the two roofs and the basement. The dateable samples show the two roofs and basement to be broadly coeval, using timbers most likely felled in the AD 1680s and early AD 1690s, with one timber having a precise felling date of winter AD 1689/90.

Read the report

Radiocarbon dating of carbonised plant macrofossils: Woodcutts, Iwerne, Rotherley, Durrington Walls, Cuckoo Stone, Coneybury Henge, Lockington, Thanet Earth and Hunsbury Hillfort
Peter Marshall, Ruth Pelling, Bronk Ramsey, Elaine Dunbar, Irka Hajdas, Sanne Palstra, Paula Reimer

This document is a technical archive report on the radiocarbon dating of carbonised plant macrofossils. It includes full details of 32 radiocarbon measurements.

Read the report

Moggs Eye, Anderby Creek, Lincolnshire: Waterlogged Wood Recording and Radiocarbon Dating of a Putative Viking Age Ship's Timber
Peter Marshall, Steve Allen, Michael Bamforth, Ian Panter, Paula Reimer, Cathy Tyersl

Timbers washed up on the Lincolnshire coast at Moggs Eye, Anderby Creek, initially thought to be from an early medieval (Viking Age) boat, were found to derive from natural woodland that was growing in the early fourth millennium cal BC.

Read the report

The Former White Lion Public House, Holker Road, Buxton, Derbyshire: Tree-ring Analysis and Radiocarbon Wiggle-matching of Oak Timbers
Alison Arnold, Robert Howard, Cathy Tyers, Bisserka Gaydarska, Michael Dee

Dendrochronological dating supported independently by the radiocarbon wiggle-matching gave a felling date of AD 1780DR.

Read the report

Arden Mill, near Main Lane, Hawnby, North Yorkshire: Radiocarbon Wiggle-matching of Oak Timbers
A Bayliss, Bronk Ramsey, Shahina Farid, Paula Reimer, Alison Arnold, Robert Howard, Cathy Tyers

Timbers from the mill roof were felled in AD 1841DR, suggesting construction of this roof in that date or shortly thereafter.

Read the report

Dendrochronological Dating of Known-age Tree-ring Radiocarbon Standards from Windsor Castle, Berkshire
A Bayliss, Robert Howard, Cathy Tyers

Ten cross-sections from timbers recovered from the Great Kitchen at Windsor Castle following the fire on 20 November 1992 were selected to provide known-age tree-ring reference standards for radiocarbon dating. The rings formed in AD 1503, AD 1515 and AD 1524 were dissected for this purpose.

Read the report

Leicester's Gatehouse, Kenilworth Castle, Kenilworth, Warwickshire: Radiocarbon Wiggle-matching of Oak Stair Timbers
Alison Arnold, Robert Howard, Cathy Tyers, Silvia Bollhalder, Lukas Wacker, Peter Marshall

Radiocarbon wiggle-matching of undated site chronology KNWCSQ08 suggests the timber having an estimated felling date in the range cal AD 1567–1605 (95% probability).

Read the report

The Cedars, 1A & 3 New Road, North Walsham, Norfolk: Tree-Ring Analysis and Radiocarbon Wiggle-Matching of Oak Timbers
Alison Arnold, Robert Howard, Cathy Tyers, Michael Dee, Bisserka Gaydarska, Peter Marshall

Together the dating methods applied to samples from the principal rafters suggest that the timber was felled in AD 1657–80DR.

Read the report

Archaeology

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

Geophysical surveys

Stonehenge Visitors Centre, Winterbourne Stoke, Wiltshire: Report on Geophysical Surveys, July 2023
Megan Clements, Neil Linford, Paul Linford, Andy Payne

Earth resistance, caesium magnetometer and ground penetrating radar (GPR) surveys were conducted at the Stonehenge Visitor Centre, Wiltshire, as preliminary investigations into the archaeological potential of the area in advance of proposals to expand educational facilities at the site.

Read the report

Helmsley Castle, Hemsley, North Yorkshire: Report on Geophysical Survey, June 2023
Megan Clements, Neil Linford

The results confirm the location of the soakaway and, in addition, reveal significant structural remains possibly associated with an original keep or hall and a previous location of the chapel. Several service buildings have also been identified together with anomalies suggesting different phases of activity within the castle.

Read the report

Meon Valley and Archaeology and Heritage Group, Meonstoke, Hampshire: Report on Geophysical Survey, September 2023
Paul Linford, Megan Clements

The survey determined that the investigated feature thought to be possibly archaeological is of geological origin and likely represents either a narrow band of clay between layers of Cretaceous chalk, or groundwater draining along the interface between the chalk units.

Read the report

Fort Cumberland, Eastney, City of Portsmouth: Report on Geophysical Surveys, May 2017 to May 2023
Megan Clements, Neil Linford, Andy Payne

In addition to historic utilities the survey revealed the location of temporary military buildings known from aerial photography and the outer edge of the 1747 fort rampart and ditch.

Read the report

Eltham Palace, Greenwich, Greater London: Report on Geophysical Survey, September 2023
Megan Clements, Neil Linford

The results have predominantly identified the remnants of the Tudor palace, which include the royal apartments, kitchen and service buildings, in addition to the nave of the chapel.

Read the report

Saddlescombe Farm, Newtimber, West Sussex: Report on Geophysical Surveys, September 2023
Andy Payne, Megan Clements

The earth resistance survey succeeded in mapping both the layout of the Medieval earthworks and additional anomalies within the complex that provide further definition and understanding of the archaeological evidence at Saddlescombe.

Read the report

Archaeological landscape surveys, excavations and community work

Browndown Ranges (North), Gosport, Hampshire
Olaf Bayer, Fiona Small, Mark Bowden

The First World War trenches at Browndown Ranges (north) stand out as one of the best preserved and most complex examples in England. They represent at least two phases of trench digging and reflect two distinct activities: the practice excavation of trenches for troops to learn trench construction techniques, as well as to build individual fitness and group cohesion; and the provision of 'text book' training environments, mimicking sections of the Western Front, where troops learned to live and fight in trenches.

Read the report

Archaeology, Community and Landscape in the Lincolnshire Wolds
Jonathan Last, Steve Willis

This report covers the work of the Lincolnshire Wolds Landscape Network:

- to promote understanding of the historic environment by developing a research strategy and proposals for future work;
- to collate evidence to help understanding and appreciation of the interrelationships between the natural and historic environment;
- to understand the values attached to the Wolds landscape and heritage by communities and visitors, and their role in people's well-being.

Read the report

Medmerry, West Sussex: An early-fifteenth century fish trap
P Murphy, Hugh Fiske, Mike Kallaway, Kearns, Peter King, Peter Marshall, Lukas Wacker, Mark Seaman

The results from excavations by Archaeology South-East and subsequent intertidal recording by the Chichester and District Archaeology Society have defined a large intertidal fish trap, at least 225 metres long.

Read the report

Investigation of charcoal burning platforms at Barbon Park, Barbondale, Cumbria
Zoë Hazell, Vicky Crosby

Historic England carried out small-scale archaeological investigations on a selection of charcoal burning platforms that had been identified from aerial survey. The work involved test pitting and obtaining short sediment cores from some of the platforms; environmental samples were taken for charcoal analysis and identification of material suitable for radiocarbon dating.

Read the report

Identifying and managing nationally important archaeology sites

National Importance Programme: Lithic Sites Assessment (7046)
Antony Dickson, Barry Bishop, Jamie Quartermaine

This project investigated how prehistoric lithic sites can be identified, mapped and managed, with Cumbria as the principal study area and a secondary, comparative study of East Anglia.

Read the report

Identifying and Mapping Sites of National Importance within the East Sussex Wetlands (7043)
Authors: Carl Champness, Liz Stafford, R A Nicholson, Klara Spandl

The report reviews the distribution and character of all Scheduled Monuments within the county in relation to relevant research priorities, as well as existing heritage protection measures, including the use of constraint/alert mapping. It then proposes how these notification areas might change to provide opportunities for increased protection of significant wetland heritage assets, which are at growing risk from changing land-use strategies associated with flood risk mitigation and habitat enhancement.

Read the report

National Importance Programme - Assessing and Mapping Significant Heritage Assets in a Medieval University City, Oxford
David Radford, Klara Spandl, Julian Munby

This study concerns the assessment of national importance and how to define boundaries in urban contexts, in responding to development pressures, in the context of the medieval university city of Oxford. It focusses on the identification of nationally important, but unscheduled assets that are potentially under threat from the cumulative effects of many and varied developments.

Read the report

National Importance Pilot Projects - Landscape-Scale Assessment: A Pilot Study Using the Yorkshire Dales Historic Environment
James Brightman, Robert White, Miles Johnson

This study provides a high-level appraisal of issues relating to landscape-scale heritage sites in rural areas, where nationally important sites that are not currently, or are unable to be designated, can contain many individual monuments. Three case studies highlight practical implications.

Read the report

Maritime/Marine Heritage

Research into shipwrecks and other forms of heritage in the marine environment.

National Importance and Marine Assets – the Goodwin Sands and Farne Islands Case Studies
Wessex Archaeology

This study reviews the criteria and methodologies used to map the boundaries of large marine landscape-scale sites containing dispersed, overlapping and multi-period marine heritage assets, and to identify and define the boundaries of individual heritage assets within these. It makes recommendations as to how such mapping should be approached in the future, and considers whether, and when, it may be appropriate to identify such sites as being of national importance on the basis of this mapping.

Read the report

Aerial Investigation

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.

Hadrian's Wall: Birdoswald Sector Survey
David Knight

A project to carry out aerial photography, model, map and interpret the archaeological landscape around the fort. Ground based work included a walk-over survey

Read the report

Aylsham and Brampton Aerial Investigation and Mapping Project, Norfolk
Jack Powell, Sophie Tremlett

The survey has made a significant contribution to our knowledge and understanding of the historic environment of the project area. It comprised a new baseline survey of 99 square kilometres of the Norfolk landscape. Crucially, many sites have been accurately mapped for the first time, allowing them to be both better understood and better managed.

Read the report

Heritage Careers

Apprenticeships in the Historic Environment sector: Examining Employer Interest and Barriers to Implementation
Aisling Nash

The Historic Environment Trailblazer group developed six Historic Environment Apprenticeship Standards in response to the skills shortage reported by companies within the sector. However, to date, these apprenticeships have only been offered in low numbers. In 2023, Historic England commissioned MSDS Heritage to investigate the reasons behind this low take up of apprenticeships by employers.

Read the report

Key industrial heritage reports added 2019-2024

Gas industry

The Manufactured Gas Industry
Russell Thomas

This set of reports aims to provide a detailed but succinct national overview of the manufactured gas industry to inform Historic England policy and conservation strategies. It provides an illustrated summary of what we know about this once vast industry

Read the report

Stockton and Darlington Railway

Stockton and Darlington Heritage Action Zone – Aerial Investigation and Mapping
David Knight

The study identified and mapped many elements of original railway infrastructure, including bridges, buildings, crossings, embankments, cuttings and trackside boundaries.

Read the report

New Shildon, County Durham Historic Area Assessment
Lucy Jessop, Richard Pougher.

This Historic Area Assessment considers the development and buildings of New Shildon, from the foundation of the town in about 1825 to the present day. Its first buildings were constructed when the Stockton & Darlington Railway (S&DR) opened for business, and New Shildon became the home of its railway works for the next 150 years.

Read the report

Lime Depot, Hopetown Lane, Darlington: Historic Building Investigation and Statement of Significance
Archaeo-Environment Ltd.

This report records the structure as it is now, analyses how it has altered over time and identifies its value in terms of historic, evidential, communal and aesthetic interests, which will help inform future decisions on appropriate and sustainable uses for it.

Read the report

The Stockton & Darlington Railway Goods Depot, Darlington: Historic Building Investigation and Assessment of Significance.
Purcell Architecture Ltd.

This report examines the history, development, function and significance of the Stockton and Darlington Railway Goods Depot at Darlington. It provides:

- a general history of the North Road site;
- the historic development and functionality of the Goods Depot building;
- an analysis of the building and its principal phases;
- discussion of the building's place in the evolution of goods sheds as a building type;
- and an assessment of the building's significance.

Read the report

Stockton and Darlington Railway Locomotive-Coaling Stage, Shildon, Co Durham: Fabric Analysis and Assessment of Significance
Marcus Jecock, Elizabeth Stephens, Gary Young, Matthew Bristow.

This report describes and discusses the significance and place in railway history of the Shildon locomotive-coaling stage, built by the Stockton & Darlington Railway in early 1847 to improve the re-fuelling times of steam locomotives returning empty coal trains to the company's marshalling yard and engine shed at Shildon before they headed back east to staiths on the River Tees with their next train. It is argued that it represents one of the first attempts - if not the first attempt - in Britain (and given Britain's primacy in railways, possibly the world) to mechanise the process of coaling locomotives.

Read the report

Stockton and Darlington Railway Carriage Works, Darlington: Historic Building Investigation and Assessment of Significance
Purcell Architecture Ltd

The Carriage Works is a rare survival of a building type designed when railway architecture was in its infancy. Its layout was typical of its contemporaries, but its simplicity of architectural form reflects the Quaker values of the architect Joseph Sparkes and the Stockton & Darlington Railway. The Carriage Works is highly significant for its group value with several nearby survivals dating from this early period of railway history.

Read the report

Stockton & Darlington Railway Soho Works Geophysical Survey
Neil Linford, Andy Payne.

The aim of the survey was to investigate the below ground survival of Timothy Hackworth's Soho Works, which developed through the 1830s and 1840s, in the area adjacent to the standing Soho Cottages.

Read the report

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