

RESEARCH NEWS



Peter Williams © English Heritage

The aisle-less Norman nave at Christon church, Mendip – see story page 4

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In my foreword to the last issue of *Research News* I highlighted the likely impact of the National Heritage Protection Plan on English Heritage's applied historic environment research programmes. The Plan was launched on 23 May 2011 and is now live; for more information please visit <http://www.english-heritage.org.uk/professional/protection/national-heritage-protection-plan/>. Covering the period 2011-2015, the Plan aims to provide better protection for the most threatened and most significant aspects of our heritage. In order to do that, we need, through investigation, analysis and research, to identify important buildings, sites and landscapes, and to say what is important and why. But we recognise that we can't do it alone and our aspiration is to work with other organisations and local communities to ensure the Plan develops into something that is truly 'national'. To that end we have set up an external Advisory Board to help us on the further development of the Plan and to build partnerships.

The research highlighted in this issue contributes to the measures making up the Plan or to the underpinning actions that support it. Olivia Horsfall Turner and Elaine Jamieson explain how an architectural and landscape study of the churches of the Mendip Hills contributes to a wider understanding of this Area of Outstanding Natural Beauty. Another multi-disciplinary landscape-scale survey within an AONB, on Alston Moor in the North Pennines, is revealing a rich and hitherto largely unrecognised prehistoric landscape through aerial interpretation and archaeological survey among other approaches. Our understanding of rural landscape character in England is further advanced by making Roberts and Wrathmell's maps of settlement patterns available via GIS.

Martyn Barber describes how historic aerial photographs and other documentary sources can be utilised to shed new light on changes to the landscape in the 20th century, in this case in relation to a short-lived First World War-era aerodrome close to Stonehenge. Our archaeological scientists are researching the reasons for the decay of another category of archive material, the NMR's important collection of Bedford Lemere glass plate negatives.

Geophysics and targeted excavation have been used to elucidate the site of a Romano-British settlement on the other side of the A4 from Silbury Hill, while a recent title in the Informed Conservation series reveals the important military heritage of the Isles of Scilly and the physical threats to the fortifications. The work of our recent cadre of EPPIC placements is showcased by articles covering subjects as diverse as the 20th-century Cooling Radio Station on the Hoo Peninsula, to a zoological assessment of bones recovered from a Romano-British well, to a topographical survey of an Iron-Age hillfort in Cornwall.

Lastly, a piece by Adam Menuge emphasises the critical importance of high-quality building research and investigation to the decision-making process in the planning sphere. Training opportunities in this combination of documentary and field-based skills in relation to the built environment are limited, which is why English Heritage has been working with the University of Cambridge to establish a Master of Studies in Building History degree from this autumn.

I hope you enjoy this wide-ranging round-up of some of our latest research.

John Cattell

Heritage Protection Department

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Cooling Radio Station, Kent

Research into 20th-century transatlantic communications.

Between August and December 2010, the Archaeological Survey and Investigation team (Cambridge) undertook topographical survey, building recording, and aerial photographic transcription of the remains of Cooling Radio Station, Medway, Kent. The investigation was carried out as part of English Heritage's ongoing 'Hoo Peninsula Historic Landscape Project', an integrated multi-disciplinary study which aims to increase our knowledge of the historic development of the Hoo Peninsula in order to ensure that the historic environment makes a positive contribution to future development and growth in this part of the Thames Estuary. The survey was undertaken to provide an improved understanding of the history and the surviving remains of the radio station which will underpin future management decisions and support the plans of the site's owners, the RSPB, to reuse the building as an educational resource centre.

The investigation has led to a better understanding of 20th-century transatlantic communications and the role that the technologically advanced receiving station at Cooling played. Cooling Radio Station was constructed in 1938 to house the 'Multiple Unit Steerable Antenna' (MUSA) system developed by Friis and Feldman in the 1930s. The MUSA comprised of 16 rhombic aerials stretched out over 2 miles orientated towards the transmitter in the USA. Each rhombic antenna was connected to the receiving apparatus by an individual coaxial cable. Although the antennae remained mechanically fixed, it was possible to adjust the apparatus so that the vertical angle of reception could be aimed at a particular component of the incoming short-wave transmissions.

The MUSA array was the last major technological development in the short-wave communication era and represented the ultimate short-wave receiving system. This aerial array was used on the transatlantic radiotelephone circuit to the USA until the 1960s. It is believed that only two other stations using the MUSA system were built in the world: the experimental array constructed

near Holmdel, New Jersey, and one other full array at Manahawkin, New Jersey.

During the last stage of short-wave transatlantic communication, prior to the rise of satellites, an experimental short-wave receiving system was constructed at Cooling. The 'Multiple Direction Universally Steerable Aerial System' (MEDUSA) had the potential to be the next major development in global short-wave communication. Unlike the MUSA, the MEDUSA was capable of being steered in elevation and azimuth and was not restricted to a single channel. The experimental MEDUSA at Cooling comprised two identically arranged groups of 48 conical shaped aerials separated by 600m.

The MUSA system at Cooling Radio Station was unique in the United Kingdom and was probably one of the most complex radio receivers ever built. The radio station closed in 1965 and was reused for testing antennae in the 1980s and 1990s before becoming part of the RSPB reserve at Northward Hill.

The results of the survey will be available shortly both as hard copy and as a PDF download from the English Heritage website: Gregory, D and Newsome, S 2011 *Cooling Radio Station, Hoo Peninsula, Kent: An Archaeological Investigation of a Short-Wave Receiving Station* English Heritage Research Department Report Series 110/2010.

Derwin Gregory

The remains of Cooling Radio Station



© English Heritage

The churches of Mendip: their landscape setting and built fabric

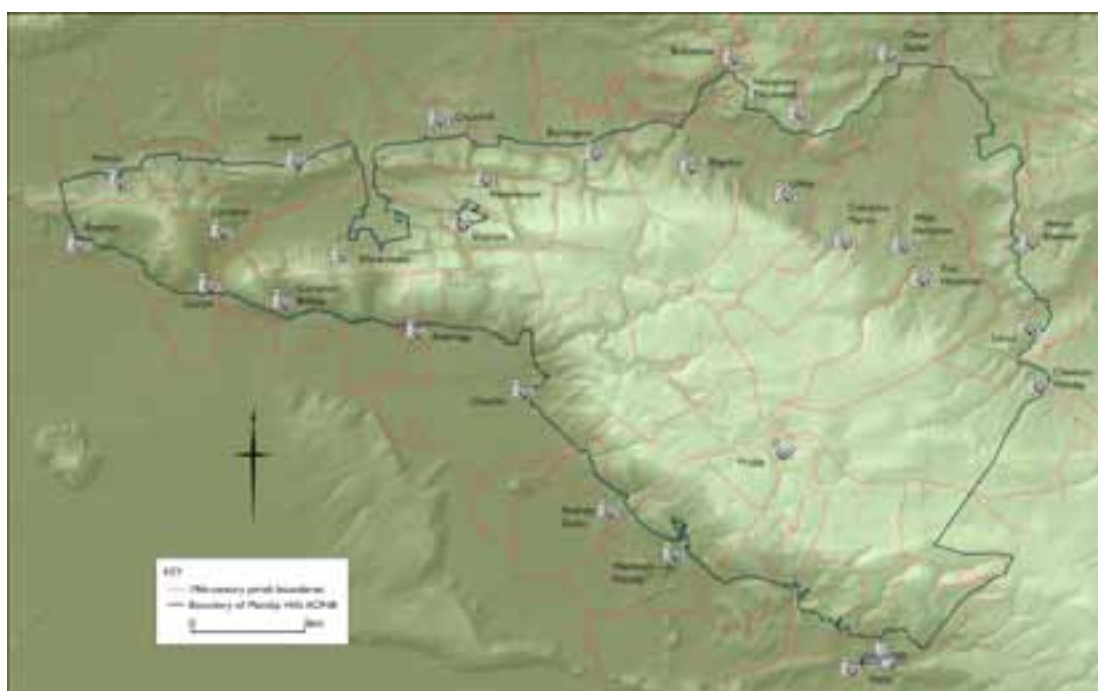
This holistic study demonstrates how places of worship reveal the historical development of the communities they served.

The Mendip Hills Area of Outstanding Natural Beauty (AONB) lies to the south of Bristol and is dominated by the Mendip Hills range, a gently undulating Carboniferous Limestone plateau. This nationally important protected landscape has been the focus of an English Heritage multi-disciplinary research project involving teams from across the Heritage Protection Department. The main aim of the project has been to increase our understanding of the archaeological and built heritage of the region through a programme of targeted research, creating a sound knowledge base to inform future management decisions.

Staff from Architectural Investigation and Archaeological Survey and Investigation (in conjunction with colleagues from Imaging, Graphics and Survey) have worked together

to assess the medieval churches within the project area examining both their built fabric and landscape setting. The architecture of these buildings, and how it developed through time, may be viewed as a reflection of a community's wealth and piety, as well as a key indicator of wider economic, social and cultural change. By analysing the landscape setting of churches, we can also assess their relationship to the local settlement pattern, and thereby begin to consider the nature of these foundations.

On and around the Mendip Hills lie a number of small market towns and villages, most of which have a parish church at their heart. The vast majority of these churches were clearly integral to their medieval village plan, with only a very few standing apart from the main focus of settlement. When we look more closely at the setting of the



Location map showing churches considered in the study

churches it is clear that they can be divided into two main categories: those associated with topographic features, such as springs, trees, river crossings, and knolls; and those associated with a manorial enclosure, either lying at its centre or towards one of its entrances.

Springs were clearly an important element in the foundation of a number of Mendip churches. Perhaps the most obvious examples are Banwell and the cathedral church at Wells, both representing important early church foundations. Along with Cheddar, these sites have produced evidence for Romano-British activity, suggesting they may have occupied locations with pre-existing landscape significance, later absorbed into Christian ambition. A number of parochial churches also adopted spring-side locations, with the headwaters of rivers attracting particular attention. The large Norman churches of Chewton Mendip, Compton Martin, and Winscombe all overlook the sources of major watercourses, locations which may have held particular cult significance. Caution must be exercised, however, when presuming all churches associated with springs and wells were early foundations. Churches established within existing settlements may have been located close to springs for practical or liturgical reasons in a period before baptism was undertaken indoors.

The second category of church foundations includes those which were associated with a manorial enclosure or *curia*. Some churches were clearly positioned close to the centre of the *curia*, such as those at Shipham and Litton, indicating they developed from proprietorial churches attached to the hall of a manorial lord. Others were located adjacent to the *curia* gate, either inside or outside, examples of which can be seen at Rodney Stoke and Christon. These sites were possibly selected for their accessibility, as they allowed the church to be used by both the manorial family and the wider community. It may be wrong, however, to assume that the church was always the secondary element. In one third of our Mendip examples there is evidence to suggest an earlier stimulus for the foundation of the church (such as a topographic feature), with a similar number representing dependent chapels. Early religious centres may therefore have been appropriated by manorial lords eager to establish control over a source of traditional power.

Damian Grady © English Heritage



In addition to analysing the landscape setting of churches, their developing physical form can be interpreted as a manifestation of a variety of factors: religious innovation and tradition, the aspirations of clergy and laity, and the financial status of groups and individuals. Fabric assessments were carried out at 26 sites in order to establish a phasing summary for each church, indicating its broad development over the medieval period. The evidence was used to identify and characterise periods of building activity. The fabric evidence was also augmented by preliminary documentary research. Absence of evidence for a particular period does not mean absence of building activity, as earlier phases may have been obscured or destroyed by subsequent ones, but with this caveat, the churches' physical fabric contains legible signs through which to trace the general trends in ecclesiastical building in the Mendips from the 12th to the early 16th centuries.

Aerial view of Banwell showing church at centre of medieval settlement. Note former site of springs under bowling green to right of church

Eleventh-century piscina at Blagdon: one of the earliest fabric survivals

Olivia Horsfall Turner © English Heritage



Interior of Christon church showing aisleless Norman nave



Peter Williams, © English Heritage

Thrubwell. We therefore have evidence that well over half the church sites of Mendip existed during the Norman period, and the actual number is probably higher, as by the end of the 12th century the parish structure was broadly established.

Fabric survival at a significant number of sites and documentary evidence at others shows that in the 13th century building was undertaken at over two-thirds of the surveyed churches. Much of the 13th-century work is associated with the east end, for example the rebuilding of the chancel at East Harptree and Compton Bishop, or the provision of a chancel aisle at Priddy and Chewton Mendip. This trend corresponds to the liturgical developments of the period, and suggests the role of clerical patronage, as diocesan statutes from the 13th century onwards decreed lay responsibility for the nave and clerical responsibility for the chancel.

Two specific examples of Anglo-Saxon fabric bear testimony to pre-Norman buildings. At Blagdon there is a re-set piscina that dates from the 11th century, and at Banwell part of a grave marker dated to the 10th century may indicate the existence of an associated ecclesiastical building. This is consistent with the connection of both these sites with springs and therefore with their establishment as early Christian churches.

Fabric evidence from the 14th century is less widespread, being found at about a third of the churches surveyed. Most of the examples are instances of aisle building: at Cheddar, Churchill, and Priddy. The addition of aisles is now understood to have been less a consequence of increased population and more an expression of new devotional practices, principally the provision of additional masses. There is little surviving fabric in the Decorated style: the chancel at Bleadon (dated by documentary sources to 1317) constitutes the only substantial ensemble, although there is Decorated tracery in the re-fenestration of some churches, for example, Chewton Mendip and East Harptree. Although the 14th century appears to have been a period of only modest building activity in Mendip, the building of aisles and re-fenestration can be seen as an index of economic upturn at a time of rising wages in the aftermath of the Black Death, and the growth of the wool trade.

There is evidence of foundation or re-edification during the 12th century at over half the sites, ranging from the extensive preservation of the nave and chancel at Compton Martin and Christon to the survival of fonts at Bleadon and Compton Bishop. At some sites documentary sources alone rather than fabric evidence indicate the existence of a 12th-century church, as at Cheddar, Churchill, and Nempnett

View of Priddy church showing accretion of tower, aisles, and porch around earlier nave and chancel



Olivia Horsfall Turner, © English Heritage

In the 15th century there was extensive expansion at most sites in the form of aisles, rebuilt naves, porches, and towers, as well as re-fenestration. The exceptions to this were the small Norman churches of Christon and Loxton, where there was some re-fenestration but no additional building. As well as the proliferation of ancillary spaces, the deployment of decorative parapets and pinnacles are distinctive features of the

Perpendicular style, and it is this period that has given the churches their most immediately obvious characteristics.

The majority of the churches' celebrated west towers date from the 15th century, though Banwell's was probably begun in the late 14th century, and that at Chewton Mendip was still being built in the early 16th century. The Perpendicular towers have, however, overshadowed a number of early medieval towers. In addition to Christon, Loxton, and West Harptree, the tower arch at Westbury-sub-Mendip points to a lost west tower, and irregular bay-spacing at Bleadon indicates a former central tower. An antiquarian drawing suggests a Norman tower at Shipham prior to the 19th-century rebuilding. It is also likely that a church of Compton Martin's status would have had a tower in the 12th century, and that the current Perpendicular one is a replacement.

The majority of aisles were also constructed in the 15th century, for example, Burrington, Ubley and Axbridge. As in the 14th century, the expenditure required for constructing an aisle was probably facilitated by buoyant wage levels and the lucrative cloth trade. Some churches in the group never acquired medieval aisles: Christon, Nempnett Thrubwell, Shipham, Rodney Stoke, Butcombe, and Loxton (whose south aisle dates to 1926). Possible influences on this include the modest size of some of these parishes and, in some instances, the dependent status of the church as a chapel of a larger foundation.

Though the Mendip churches' pattern of expansion follows typical trends that have been identified elsewhere in the country, anomalies at certain sites are indicative of the unique, if sometimes unfathomable, influences on each church's development. These include the peculiar continuation of exterior mouldings on the interior of Priddy's tower, as though the tower had been built entirely separately before being joined to the nave, Hinton Blewett's aisle described as 'new' in 1533 and therefore a notably late example of aisle-building on the eve of the Reformation, and Bleadon's aisle that was begun but never completed, leaving the bones of the planned arcade visible on the north wall. Surveying a substantial group of churches therefore offers the opportunity not only to discern



Peter Williams. © English Heritage

Chewton Mendip's Perpendicular tower

general trends but also to appreciate individual nuances and to understand each church as the unique outcome of general and specific circumstances. Furthermore, the churches provide an unparalleled corpus of information about the medieval period, and their assessment, which will be integrated with the other elements of the Mendip Hills AONB project in the forthcoming monograph, has therefore been a key means of harnessing the physical evidence in the landscape.

Olivia Horsfall Turner and Elaine Jamieson



Peter Williams. © English Heritage

View from Axbridge market square showing church, and wells (located on the left at the foot of the steps)

Defending Scilly

The accelerating threat of climate change and rising sea levels has prompted a thorough survey of the defences of the Isles of Scilly across half a millennium.

As long ago as the mid 18th century the Cornish antiquarian William Borlase noted that ‘the gradual advances of the Sea, and a sudden submersion of the Land’ were threatening the ancient remains of Scilly; two centuries later Professor Charles Thomas elaborated on the theme. The threat is accelerating as climate change, with the certainty of rising sea levels and increased storm events, advances.

Over the past decade members of English Heritage’s Aerial, Archaeological and Architectural Survey and Investigation teams and the Archaeological Projects team have been recording the threatened coastal military sites of the islands. The results of this work have now been summarised in an ‘Informed Conservation’ book, *Defending Scilly*, by the authors of this article. The remains date from the 16th to the 20th centuries and represent some of the best preserved historic military structures

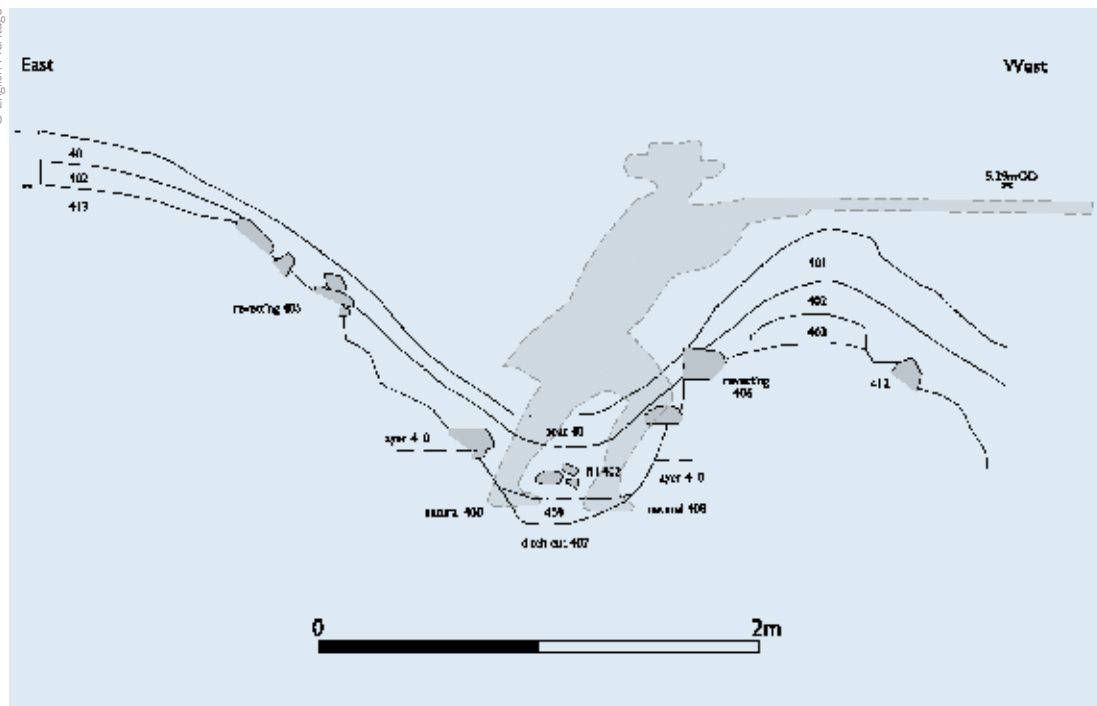
anywhere in Britain. Whenever the country has been threatened, defences have been built in Scilly and as soon as the threat has receded the works have been abandoned, leaving a cornucopia of half-finished or complete-but-never-used installations around the coasts of St Mary’s but also on the outer islands of St Agnes, Tresco and St Martin’s.

The earliest of these, the Old Blockhouse and the so-called ‘King Charles’ Castle’ date from the 1540s and defend the harbours on either side of Tresco. Faint remains of a bastioned trace cutting off the whole of the northern end of Tresco, may belong to the same period or slightly later; first noted by the keen eye of Norman Quinnell in 1978, this earthwork is all but invisible. Harry’s Walls on St Mary’s also dates to the reign of Edward VI; only one side and two corners of the projected square artillery fort was completed but enough survives to show that this structure was at the cutting

‘King Charles’s Castle’ high above New Grimsby Harbour, Tresco, and ‘Cromwell’s Castle’ at the water’s edge: ‘King Charles’s Castle’, begun in 1548, represents an earlier tradition of fortification but ‘Cromwell’s Castle’ is strangely anachronistic; built in a style suitable for the 1550s, documentary evidence nevertheless strongly suggests that it was constructed in the 1650s



Damian Grady © English Heritage, NMR 23934/002



A drawing showing the current and original profiles of the 17th-century breastworks on The Garrison (from D Fellows *The Garrison, St Mary's, Isles of Scilly* Research Department Report Series 69/2007, fig 14)

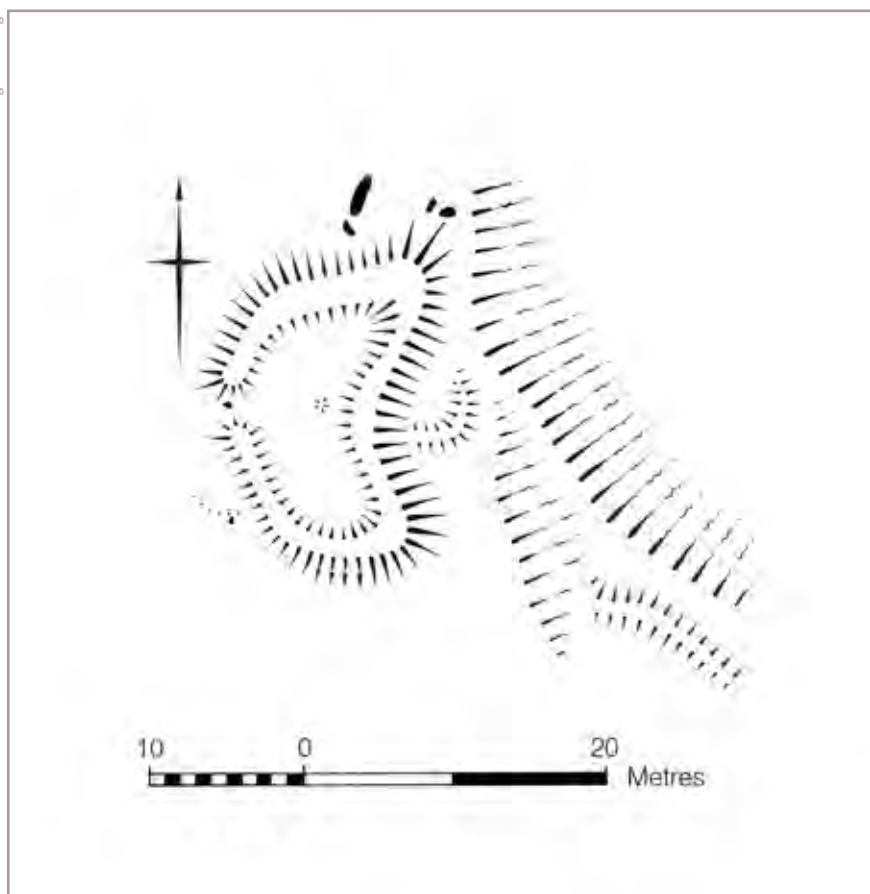
edge of 1550s military design and that it would have been a formidable fortification if completed. Tradition has it that it was abandoned because it was wrongly sited but the historical evidence shows that it was the passing of the threat (French invasion) and the consequent loss of funding that caused its demise.

The next phase in the long history of Scilly's defences belongs to the reigns of Elizabeth I and her Stuart successors. Star Castle, crowning the northern end of The Garrison (the western extremity of St Mary's), was built to hold Scilly against the Spanish. It was completed in 1594 but was already seen to be inadequate. The first element of the Garrison Walls was constructed across the face of the isthmus to protect Star Castle from an enemy landing on the beaches of Hugh Town. Further works in the 1620s probably included the construction of the earthworks around 'King Charles's Castle' and the magazine by the Garrison Gate.

The Civil Wars of the mid 17th century found the Islands being held by the Royalists, except for a short period between 1646, when Parliament blockaded the Islands and forced their surrender, and 1648 when the garrison rebelled and declared for the King. During the Wars many earthwork batteries and many hundreds of yards of breastworks were constructed around The Garrison and elsewhere on the Islands. For the Royalists the islands formed a perfect base for privateering and it was their success in this form of warfare from 1648 to 1650 that forced Parliament to take action against

them again. In April 1651 a squadron under General-at-Sea Robert Blake anchored off St Martin's and began the assault of Old Grimsby; the first attempt went awry but the second carried the Old Blockhouse and on the following day 'King Charles' Castle' was taken, though not before its defenders had blown most of it up. Blake next established a battery at Carn Near on the southern tip of Tresco, to bombard St Mary's and

Pellew's Redoubt, St Mary's, a substantial earthwork fortification, possibly of Civil War date, in the form of two conjoined bastions with a narrow entrance to the rear; a breastwork can be seen extending to the south-east along the top of the slope that drops to the sea





Map of The Garrison in 1742, showing the walls complete from King Charles's Battery (D) in the north-west to Lower Broom (I) in the south-east, with the old earthworks (R,R) and line of the proposed new walls (Q,Q) around the rest of the circuit

the shipping in The Road. Unfortunately the first shot fired from 'Oliver's Battery' exploded the gun, killing two people, but on the following days the bombardment had the desired effect and the Royalists on St Mary's were eventually forced to surrender.

Following the Parliamentary victory 'Cromwell's Castle' was built at New Grimsby, probably on the site of a pre-existing blockhouse or gun platform. This

brutalist military tower is something of an architectural enigma but also one of the most memorable sights of Scilly.

In 1715, in the face of Franco-Scottish aggression, the old breastworks and batteries on the Garrison were refurbished, which probably accounts for their survival today. However, it was the war that broke out in 1739, initially against Spain but soon involving almost the whole of western Europe, that led to the next great building campaign in the islands. The Garrison Walls, with their attendant batteries and redans, were built between 1741 and 1746; the recent architectural and historical research has allowed for the first time the unpicking of the detailed chronology of this massive construction. The ending of hostilities and cessation of funding once more brought an abrupt halt and the walls end, suspended as it were in full flow, above Steval Point.

Very little then occurred in the military history of the islands for over a century; the French Wars of 1793-1815 resulted only in some minor refurbishments. But it was the same potential opponent who caused the next spate of construction works in 1898-1901. Two massive batteries for 6-inch breech-loading guns were built on The Garrison with a barrack block in between, all surrounded by huge but low-profile earthworks. The guns were provided



The 1740s battery at Woolpack Point on the southern coast of The Garrison; one of the Defence Electric Lights of the 1890s defensive scheme can be seen in front of the battery; harder to see is the Second World War pillbox inserted into the point of the battery



The massive Woolpack Battery of the 1890s, showing the positions for two 6-inch guns and the sunken storage and working areas; also visible are two cruciform structures, modifications made during the Second World War for the erection of radio masts

with Defence Electric Lights, powerful searchlights for pinpointing and range-finding enemy ships at night. Soon after two batteries for Quick-Firing guns, for use against torpedo boats, were established, one above Steval Point and the other at Bant's Carn on the north coast of St Mary's; but before these were finished the *Entente Cordiale* of 1904 made them redundant and the guns were never installed. The 6-inch guns were removed before 1914.

During the First World War Scilly was involved in a doubly-novel mode of conflict – aircraft against submarines. The naval air base at Tresco, established in 1917, was equipped with Curtis flying boats and Short seaplanes, which flew anti-submarine patrols and escorted convoys through the Western Approaches, supported by airships based at Mullion. A few traces of this activity can still be found around New Grimsby: the iron rails on the slipway, some of the older buildings along the water front and some concrete bases to the south of the current houses. The Second World War was marked in Scilly by some tragic incidents resulting from aerial and naval combat. Numerous bombing raids resulted in death and destruction in the early war years but the permanent establishment of a flight of Hurricane fighters at the airfield in May 1941 was successful in keeping the Luftwaffe away thereafter. Winston Churchill had declared in 1940 that the

Islands must be held 'at all costs' and the defences were gradually strengthened. The most tangible result of this today is the ring of pillboxes, built in 1941, that surrounds the coast of St Mary's. A surprising number of these survive but they were designed to be well hidden and not all are obvious to the casual observer.

Much of the landscape of early Scilly already lies beneath the sea. The military sites of the early modern era and more recent times, largely in coastal positions for obvious reasons, have been threatened by rising sea levels and storms almost since they were first constructed. The advance of the sea has not been steady and is not easy to predict; there is evidence, for instance, that between the 16th and the 18th centuries the land to the east of Harry's Walls, which is low but currently dry, was frequently inundated. Nevertheless, modelling based on the most recent evidence suggests that by 2050 sea levels around Scilly could have risen by up to half a metre. The effects of coastal erosion are obvious in Scilly; elements of the islands' military heritage will inevitably be lost but by appropriate monitoring and recording we can preserve the memory of this important aspect of Scilly's past.

Mark Bowden and Allan Brodie

A zooarchaeological study of a Romano-British well assemblage

An EPPIC training project has increased understanding of Roman dogs and animal disposal in Yorkshire.

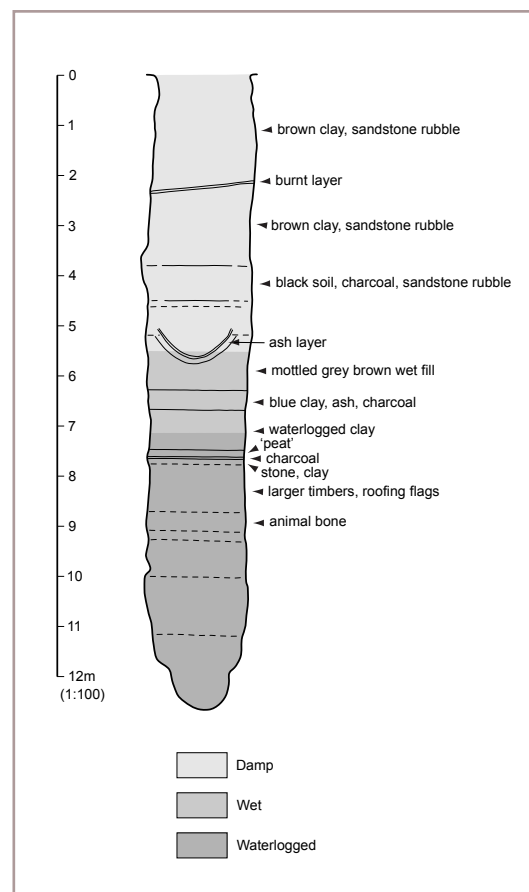
In the summer of 1977, the West Yorkshire County Archaeological Unit carried out a rescue excavation located to the north of Rothwell Haigh, immediately to the south of the M62 motorway. Archaeological remains were first identified during aerial reconnaissance in August 1977 and following stripping of the site archaeologists were afforded the opportunity to examine the features exposed. The excavation uncovered a rural square-ditched enclosure which contained post-holes, gullies, a pit and a well. Artefacts were scarce, though the well, which was excavated to its full depth of 12m,

produced finds and environmental material. The initial assessment of the pottery suggests that the well went out of use in the late 3rd century and was in-filled quite rapidly in the late 3rd to mid 4th century.

The formal assessment of the animal bone, undertaken in 2010 by Andy Hammon, Regional Science Advisor for Yorkshire and the Humber, noted the inclusion of kitchen and butchery waste inter-dispersed with dog remains. The presence of a large number of dogs was highlighted as being of national importance in terms of understanding ritual deposition in wells and advancing the understanding of dog breeding in Roman Britain. However due to lack of funding, assemblage analysis could not be undertaken. Consequently the project was completed in the context of an EPPIC placement in zooarchaeology with the support of English Heritage specialists based at Fort Cumberland.

The animal bone assemblage contained 4677 fragments of bone, of which 2510 were identified to species, including mainly sheep, dog, cattle and pig, but also cat, roe deer, rodents, chicken, rook and crow. The majority of the assemblage derived from the lower third of the well. The bones were in a fairly good condition though on some specimens the bone surface was cracked and flaking, which was probably associated with the drying out of wet and waterlogged bones.

The assemblage contained the bones of at least 19 dogs, both male and female. Dental eruption and epiphyseal fusion revealed that the majority of dogs were older than 18 months but at least four neo-natal animals were represented. The dogs were probably deposited as complete animals, but articulation was not noted during excavation.



Schematic section through the well. The majority of animal bones were recovered from the lower third of the well



Dogs are frequently recovered from Romano-British sites but usually in small numbers. The larger skeletons may represent the remains of hunting or guard dogs whilst the smaller animals may have been pets. In contemporary European society dogs are not generally consumed though dog meat contributes to the diet of many cultures around the world today and has long been considered a food item in China. The absence of butchery evidence on the dog skeletons from Rothwell Haigh leads us to conclude that these animals were not utilised as a food resource or to provide hides.

There appears to be a significant link with deposition of dog carcasses and wells and shafts. Excavations at Oakridge, on the chalk downs to the North of Basingstoke, revealed a large middle Iron Age to late Romano-British settlement complex. The animal bone assemblage (examined by Mark Maltby) from a 26 metre deep well contained 4919 canid specimens from partial and complete skeletons. A minimum of 116 individuals, including 87 puppies, were represented. The foetal and neo-natal dog skeletons may represent attempts to control the canid population by disposing whole litters at birth. The older population may represent dogs that died of natural causes as well as pit fall victims.

During the Roman period we see an increased variability in the sizes and shapes of dogs in Britain which indicates the presence of new breeds. The shoulder heights of most Romano-British dogs ranged from c.42-56cm, though both taller and shorter dogs have occasionally been recovered. The Rothwell Haigh dogs varied in size considerably, with shoulder heights of c.27-57cm. By plotting the length and diameter of the long bones, three different groups of dogs become apparent. These may represent different breeds and include a dwarf type characterised by short

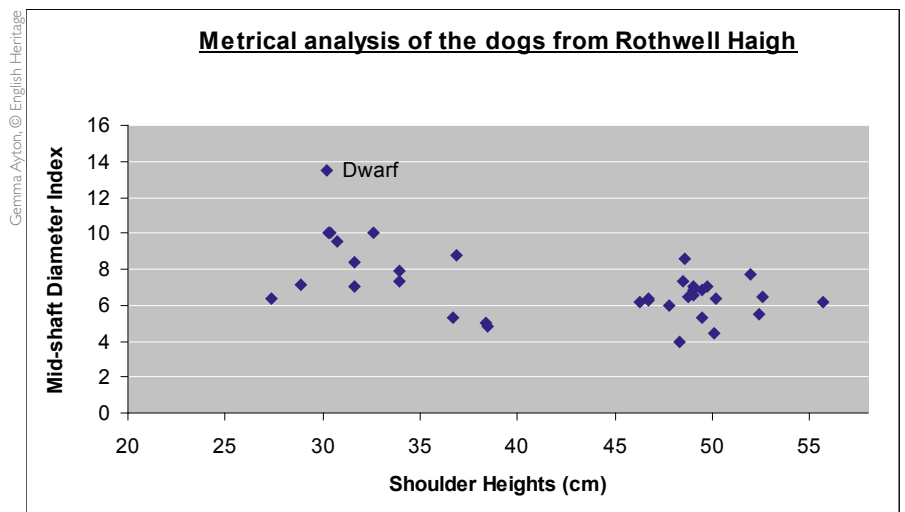
and thickened limbs. A wide variation in the size and shape of the dog skulls was also noted. Comparison of the cephalic, snout and snout width indices to metrical data from a range of Romano-British sites shows that the dogs from Rothwell had relatively narrow skulls.

During excavations at Tripontium, now the parish of Newton and Biggin on the border of Warwickshire and Leicestershire, two wells were revealed. The wells contained a minimum of six dogs, which were of a similar size to those at Rothwell Haigh (shoulder height of c.22-48cm), though an additional distinct type with a smaller shoulder height, was also identified.

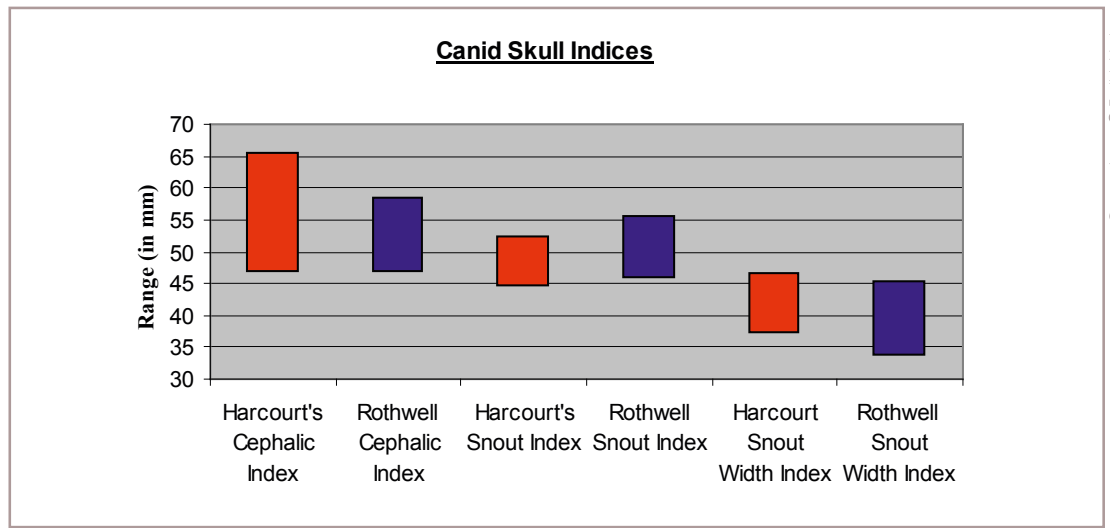
In addition to dog remains, a total of 20 fragments of equid bones representing one individual were recovered. The shoulder height of the animal was estimated to be between 123cm and 125cm (12 hands). Measurements of a metatarsal bone were equivalent to those of Roman donkeys. Elsewhere in Britain, donkeys have been found in Roman and late Iron Age sites with known contacts and trade with the Roman Empire, such as Danebury.

A selection of the dog tibiae showing size variation

Metrical analysis of the dog skeletons from a Roman well assemblage



A comparison of the metrical analysis of canid skull indices from Rothwell Haigh with those published by Richard Harcourt



Gemma Ayton, © English Heritage

The presence and absence of skeletal elements allows us to re-construct disposal patterns. The earliest sheep and goat assemblages, those from the bottom of the well, contained metapodials, mandibles and maxillae. These elements, which provide very little meat, are removed from the carcass during the primary butchery stage. This suggests that unwanted butchery waste was dumped in the well quite soon after it went out of use. Many of the specimens may have derived from partial or complete skeletons though these were rarely recorded or recovered together during excavation.

The reconstruction of mortality profiles was undertaken with reference to dental eruption and attrition. Mammalian teeth erupt in known sequences and the age at which each tooth erupts has been well documented. Teeth are constantly being worn down and once all permanent teeth are fully erupted, we can assess the degree of dentine exposure to estimate age-at-death. The dental eruption and tooth wear of sheep mandibles revealed that a large percentage of the population was slaughtered between 1 and 2 years of age

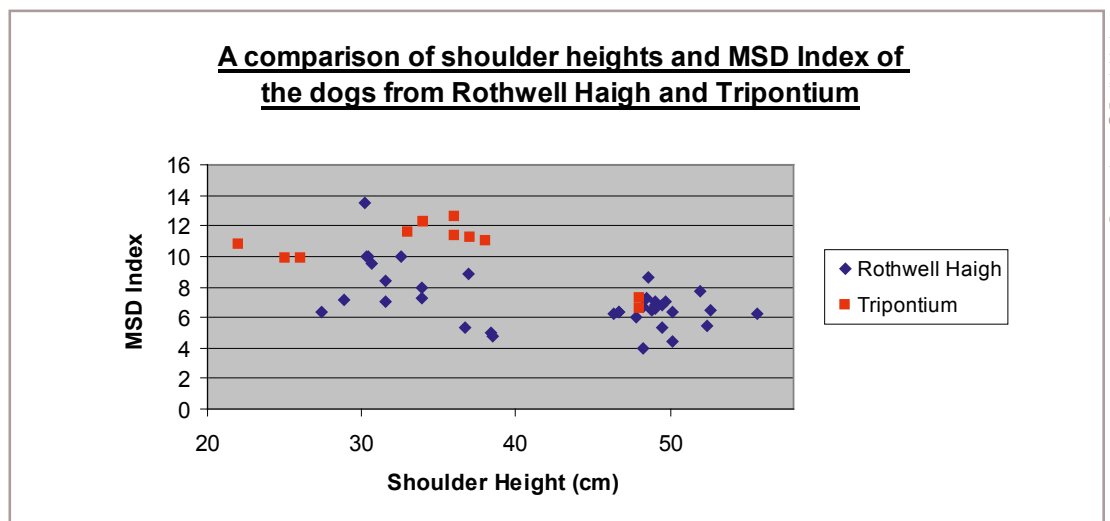
which suggests that lamb was consumed. Pigs were slaughtered between 14 and 21 months of age to provide young, tender meat.

It is clear that the well assemblage from Rothwell Haigh is relatively complex and contains butchery and kitchen waste alongside dog skeletons. The assemblage has highlighted the importance of recognising animal bone groups in-situ and retaining their associations when excavating. The deposition of dog carcasses in wells and shafts may be linked to a ceremonial or ritualistic event. Although we cannot be certain as to the nature of their deposition, the biometrical variation of the dog populations indicates that new breeds were introduced during the Romano-British period. Future analysis of pre-historic specimens will help us to understand the true extent of this variation.

I would like to thank Poly Baker and Fay Worley for their invaluable guidance and feedback.

Gemma Ayton

A comparison of dog bone measurements from Rothwell Haigh and Tripontium



Gemma Ayton, © English Heritage

Later Silbury Evaluation, 2010

Evaluative excavation investigated questions raised by geophysics, and examined the Roman aspect of the World Heritage Site.

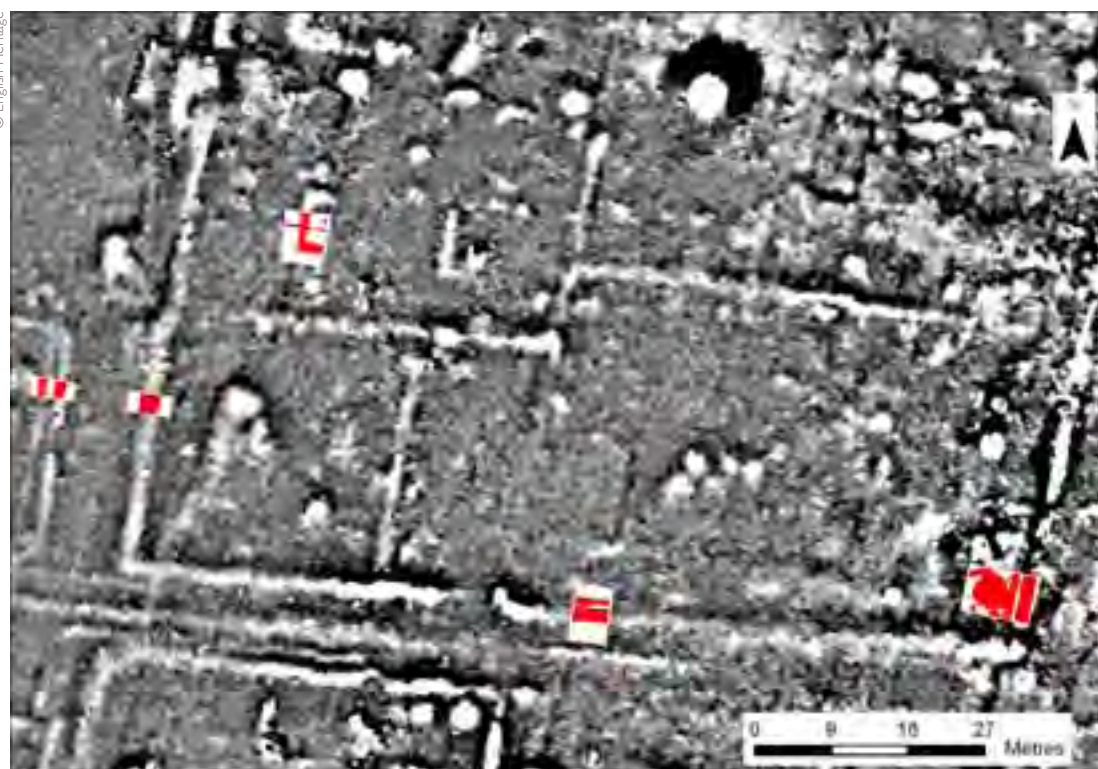
Geophysical surveys carried out for the Silbury Hill Conservation Project revealed an apparent Romano-British settlement in the fields south of the Hill (*Research News* 10); probably a roadside settlement or small town on the route from London to Bath. In 2010 these survey results were evaluated in order to gain information about the settlement itself, to determine the survival of archaeological features and to increase our understanding of the area's environmental history.

The quality and density of the results meant that the evaluation had to be carefully targeted, as we could only examine about a tenth of 1% of the known settlement area. We decided to focus on two areas: part of the Roman settlement in the arable field immediately south of the Hill, and a pattern of anomalies around the edge of a plateau

in the water meadow to the east of this field. Reluctantly we decided to avoid the large stone buildings shown on the GPR survey.

In the arable field geophysics, the street frontage south of the line of the Roman road was masked by the response of major pipelines. A road or trackway ran south from the road, with three large subdivided rectangular enclosures on its west side, and similar divisions to the east. The trackway may have been a local route, linking to another running north through the settlement along the side of Waden Hill towards Avebury. Five evaluation trenches explored one of these enclosures.

The enclosure boundary had two phases. A small earlier ditch, which did not show up on the magnetic survey lay inside a larger ditch.



The evaluation trenches and the main features (shown in red) against the background of the magnetic survey. One of the stone buildings shows as a dark rectangle in the top right of the figure

The wall trench for the corner of a building, showing the hill in the background. The 'stripes' are probably periglacial features, and were sampled for molluscs to add to our understanding of the past environment



© English Heritage

This may have been a marking out ditch, swiftly backfilled, or perhaps the enclosure had a different or less intensive use in the first phase. On the trackway frontage, a fence line lay between the two ditches, while furthest from the trackway, only one ditch was present.

Our largest trench was sited on area of high magnetic response inside the south-east corner of the enclosure. This turned out to be a large circular well, 3.4m in diameter at the top, narrowing to 1.8m and continuing straight downwards. The magnetic response was due to large heat affected stones and redeposited material dumped in the top fills, rather to any *in situ* industrial activity, though hammerscale, a smithing hearth

Work beginning on the well. In the foreground, the dark fill of the later ditch and the lighter brown fill of the earlier ditch can be seen



© English Heritage

bottom and pieces of vitrified hearth lining in the upper fill of the enclosure ditch close to the well did indicate iron smithing nearby. Several Roman wells have previously been found in this field – one, similar in size and location close to the trackway, was excavated in 1908. Though Roman wells often had ritual significance, the primary function of the well is likely to have been the practical one of providing a water supply. The burial of an infant lay west of the well. Such burials, unlike those of adults or older children, are common finds in the living areas of Romano-British rural settlements and small towns.

Elsewhere in the enclosure was a flat-bottomed wall-trench for a rectangular timber building about 7m across. As the wall trench survived only where it cut into the hillside, we don't know how far the building extended down the slope. No floor surfaces or internal features of the building survived. Pottery from the wall trench fills dated to the late 4th century.

These trenches yielded a small, standard assemblage of pottery, some scraps of metalwork and a few coins, generally dating from the early - mid 2nd century to at least the later 4th century. Building materials were sparse, due probably to the positioning of our trenches. Roman objects found in the Silbury Hill ditch by Atkinson, and by Brookes from the wells opposite are now in the Alexander Keiller and Devizes Museums. These finds will be studied alongside those recovered in 2010 in order to widen our understanding of the site.

In the water meadow, a slightly raised plateau with a ditch around its base forms a tongue of land between the Winterbourne and Kennet. Geophysical survey had shown a series of anomalies tentatively interpreted as relating to water management. Three trenches were opened. The anomalies were shown to represent a ditch around the plateau with a bank on each side, with a channel cutting the lower (riverside) bank. These features were neither substantial nor deeply buried, in contrast to inference from the survey results. They represent part of a contour-based water meadow system. The ditch acted as a leat to channel water from the Winterbourne round the edge of the higher ground. Channel through the bank would have been blocked or opened as needed to let water flow across the low ground to the river while the higher ground remained dry. All the pottery from this trench was post-medieval. Surprisingly no Romano-British material was found. Possibly the creation of the water meadows had removed earlier evidence.

A section was cut across the shallow bank of an earthwork enclosure which is still visible on the ground. The bank material was different from other soils in the field, and seems to have been imported to create the enclosure boundary. At present, we think this may be the remains of a cob wall which had slumped into a ditch on its inside, which cut a layer with early Romano-British pottery. The enclosure may be post-medieval, but no dating evidence was found and it does not appear on early Ordnance Survey maps.

We also took the opportunity to recover evidence for the past environment. As well as sampling some of the settlement ditches and periglacial features in the arable field for molluscs, a machine trench was cut through the valley-bottom alluvium in the water meadow. We hope the results of molluscan analysis and OSL (Optically Stimulated Luminescence) dating of these sediments will increase our understanding of palaeoenvironmental conditions around Silbury Hill and in the Kennet/Winterbourne valley.

Community involvement was an important aspect of the project. A site blog was kept (www.latersilbury.wordpress.com), regular interviews were given on BBC Radio Wiltshire, and there were site tours for



local residents, special interest groups and colleagues. We appreciated the interest and support shown by many archaeologists and historians working in the area. The positive public response was fantastic – people brought us their questions and their local knowledge, and showed us the pottery and other objects they had found.

Section cut through the watermeadow leat and bank. The cross-bank channel shows as a darker band

Vicky Crosby and Nicola Hembrey

Showing visitors the magnetic survey at the start of one of our well-attended site tours



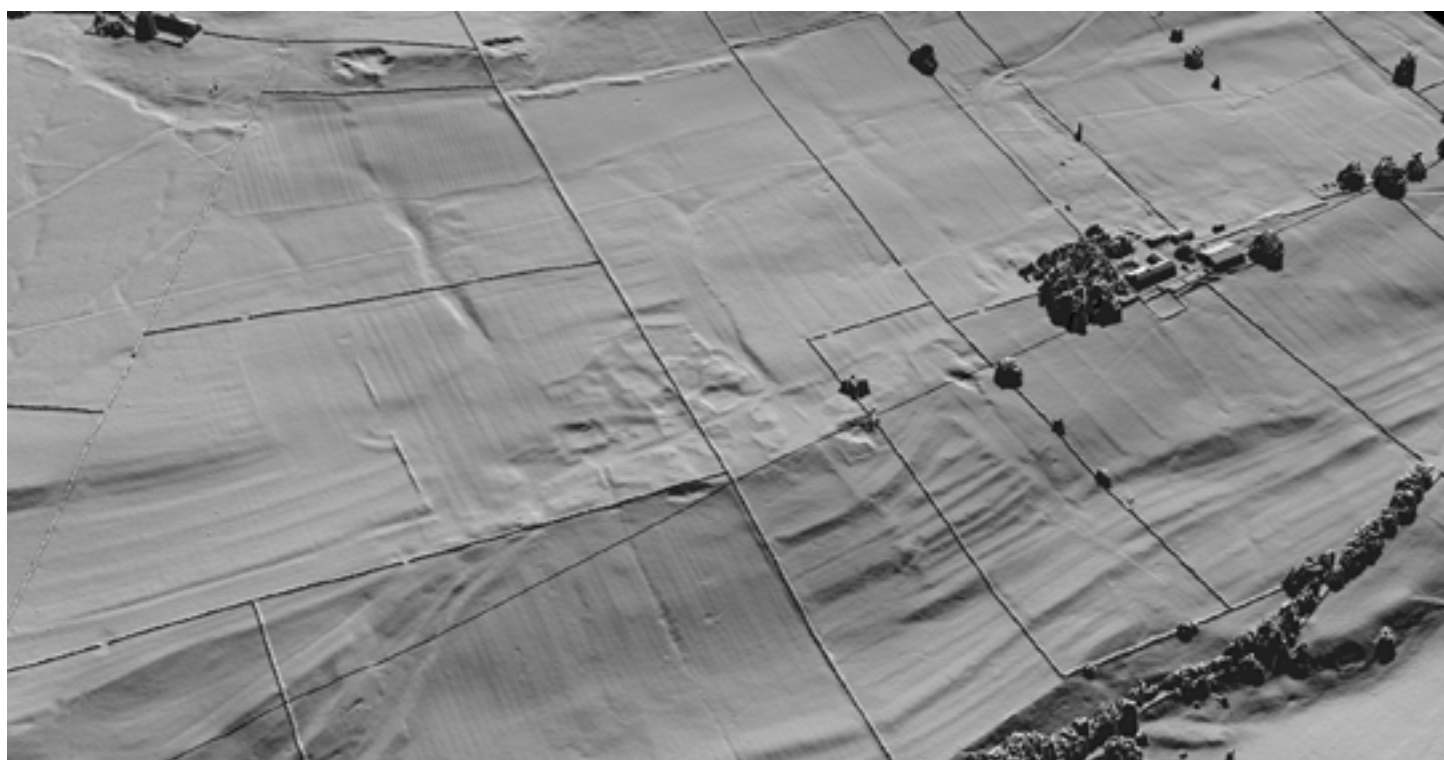
Putting the prehistory of the North Pennines on the map

In the North Pennines AONB, new discoveries of late Iron Age and Romano-British settlements are beginning to make a region once thought to be an uninhabited wilderness look well-populated.

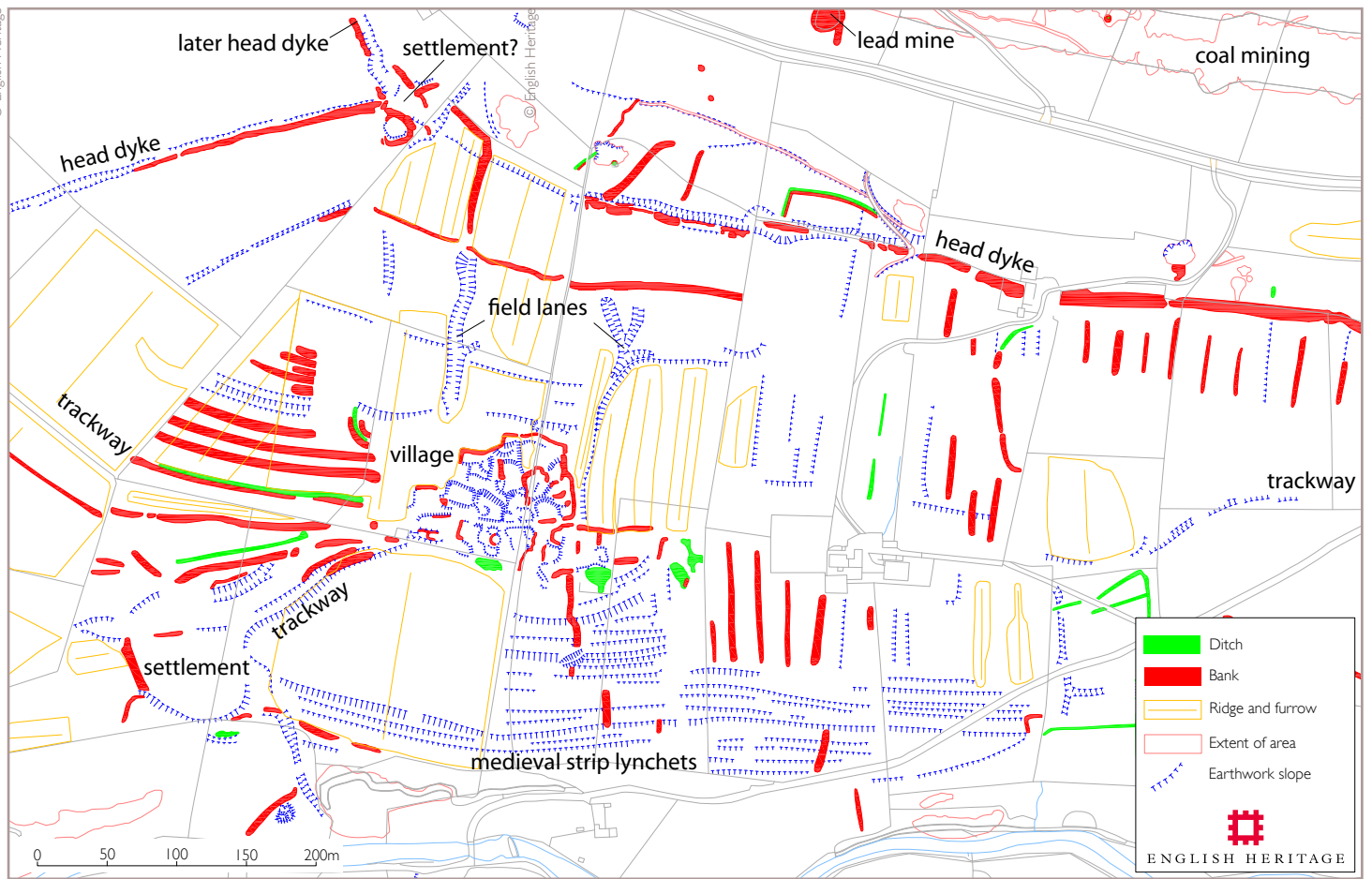
English Heritage's current multi-disciplinary investigation of Alston Moor in the North Pennines AONB is primarily designed to understand the interwoven influences of medieval and post-medieval industry and agriculture on the development of the landscape (*Research News* 11). The region's centuries-old tradition of lead mining, along with a suite of other extractive industries, has left long-recognised extensive and often highly conspicuous architectural and archaeological remains, which dominate the relevant Historic Environment Records. In contrast, evidence for prehistoric and Roman impacts on the landscape's development have remained elusive. The excavation of two

large burial cairns at Kirkhaugh in the 1930s, one of which produced a fine gold ear-ring now in the British Museum, pointed to the likelihood of some Early Bronze Age activity within the study area, but no contemporary settlement sites had ever been convincingly identified. The smattering of Celtic place-names, coupled with the apparent speed with which the Roman army moved into the area to lay claim to the abundant silver-rich galena, hinted at a late Iron Age presence, but again only one or two possible settlements had been tentatively identified. No evidence for Roman occupation in the area, apart from Whitley Castle fort had been convincingly recognised. The general

This 3D lidar image of the village and its environs is an extract from the wider coverage specially commissioned for the project. Though the image resembles an oblique aerial photograph taken under low sun, the flights that captured the data in fact took place at night



© English Heritage



consensus has been that for much of the prehistoric and Roman periods these uplands remained an untamed and largely uninhabited wilderness.

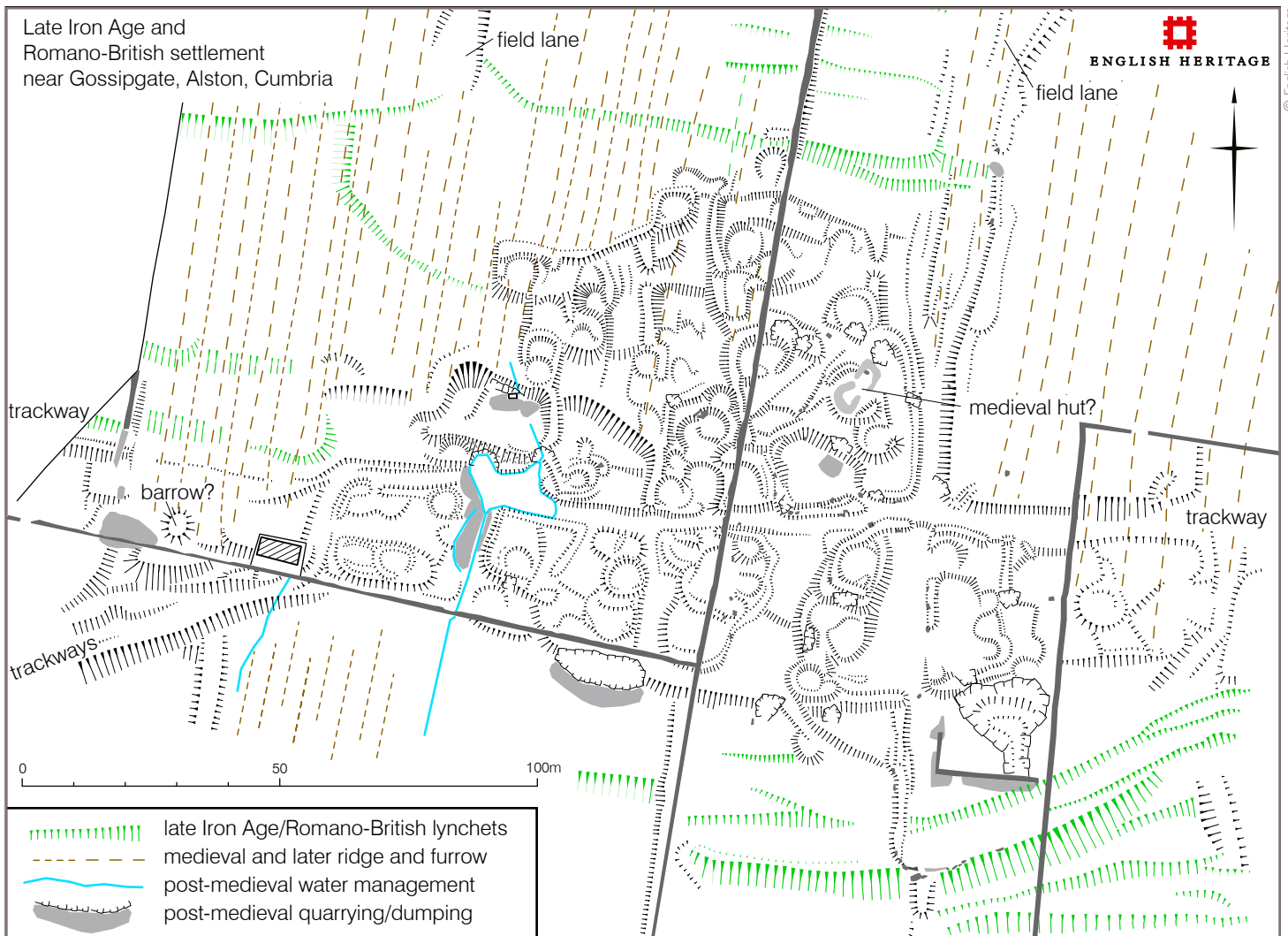
So, it has come as something of a shock, not to say a pleasant surprise, that in its first two years the project has turned up no fewer than twenty later prehistoric settlements (not including many more individual dispersed roundhouse platforms). Many of these settlements are extremely well-preserved as earthworks, rivalling anything that can be found in the nearby Hadrian's Wall corridor or the Cheviot Hills. Some sit amidst extensive contemporary field systems, represented by lynchets and/or cairnfields. Although several may well be Bronze Age, most of the newly-discovered settlements have been provisionally dated by their morphology to the late Iron Age and/or Romano-British periods. Presented with these exciting discoveries, and with the aerial survey phase of the Miner-Farmer Landscapes project and the first block of rapid field survey essentially complete, it was decided to embark on a carefully selected sample of large-scale, detailed, analytical

field surveys and geophysical surveys. One of the most significant of the newly discovered settlements overlooks the River Nent, less than a kilometre north-east of Alston, and this was the first site to be targeted for more thorough investigation.

The deserted village – for this is the most appropriate term to describe it – comprises an organic agglomeration of around eighteen small, irregular compounds, each containing evidence for several small circular buildings. In most cases, these faced into a central yard, which is sometimes sunken, a characteristic usually considered suggestive of livestock farming. The sites of around 40 separate circular buildings – undoubtedly not all domestic in function – are identifiable. The general pattern will be instantly recognisable to anyone familiar with the settlement evidence from the Cheviot Hills and other parts of the northern uplands, but the settlement has one extraordinary characteristic: the compounds are laid out on either side of a 'street'.

At the eastern end of the village, a particularly large compound, associated

Map of the earthworks produced by English Heritage's Aerial Survey team at 1:10,000 scale to National Mapping Programme standards



Detailed analytical field survey of the village and its environs, reduced from original at 1:1,000, produced by English Heritage's Archaeological Survey & Investigation team

with several unusually large roundhouse platforms, may have outlived the track, and indeed the rest of the village, for its perimeter bank eventually encroached so far into the carriageway that it would have been difficult for vehicles to pass, although the entrance of the compound continued to issue onto the eastbound section. Another strand or braid of the same route appears to have been called Gossipgate by the Norse period (the name translated, rather poetically, as 'road of the people with whom one has contracted spiritual affinity'). By the 13th century this name had become attached to a hamlet sited at the point where the route crossed the River Nent, just below the prehistoric village.

A fragment of beehive quern built into an overlying field wall could point to use of the site before about 50 BC and, at face value, the form of the compounds and their associated buildings is typically 'native'. However, two sherds of Roman pottery recovered from molehills seem to indicate

that occupation continued into the 2nd and 3rd centuries AD, and perhaps beyond. Even without this artefactual evidence, the remarkable arrangement of the settlement along the line of the trackway, which can be traced for some distance along the valley side in both directions, suggests Roman influence. Although the settlement's layout is almost reminiscent of a medieval planned village in places, the Norse name Gossipgate cannot be used to infer continuity into the early medieval period, for there is no evidence that the specific braid of the route that passed through the village was so named.

The village is surrounded by a field system of former arable plots and, on the steep south-facing scarp below the settlement, cultivation terraces so narrow that they can only have been worked by hand, all distorted and degraded in places by medieval and later ploughing. Above the village, side-lanes passed between the enclosed fields before spilling out, delta-like, into what appears



to have been infield pasture. At the foot of the escarpment, 250m to the south-west of the village, a second settlement, of typical curvilinear plan but more severely distorted by medieval ploughing, also appears to have been served by the main trackway. Above all this runs a 'head dyke' that can be traced for several kilometres along the contours of the valley side, one of several such linear earthworks to have been identified in the course of the Miner – Farmer Landscapes project. These major boundaries influenced the development of the landscape right into the 19th century, but any lingering suspicions that they might be of medieval or even later origin were dispelled by another carefully targeted large-scale analytical field survey. Nearly a kilometre to the east of the village, a second newly-discovered enclosure, this one directly associated with a single enclosed roundhouse platform, overlies the head dyke, proving its antiquity. This confirmation in turn gives greater confidence to the identification of a smaller enclosure,

previously only tentatively interpreted as a settlement, located 300m to the north of the village, overlying the junction of the main head dyke with a second boundary of similar form, which was evidently a later addition. All this seems to indicate that the infield pasture above the village was separated from unimproved grazing higher up the slope, a pattern which has continued in essence to the present day. Although the new surveys offer useful insights into the village's agricultural economy, no link can be proven – regrettably – with nearby mineral deposits. Nonetheless, the proximity of lead veins which were certainly exploited in the post-medieval period, on the slopes directly above the deserted village, remains tantalisingly suggestive.

Alastair Oswald and Matt Oakey

Interpretative plan of the village

Flying, pigs and Stonehenge

The 20th century saw the most substantial physical alterations to Stonehenge and its surroundings since prehistory. Here, we feature snippets from just one of these – the appearance and disappearance of the Stonehenge Aerodrome.

A major component of the Aerial Survey & Investigation team's contribution to the current Stonehenge landscape project is to use available aerial photographs (starting with a series of photos taken from the top of the outer sarsen circle in 1881) in conjunction with the surviving documentary archives to examine some of the key episodes of the last 130 years. The roles played by archaeologists and archaeological bodies, rather than just farmers and the military, are particularly prominent in many of these episodes.

THE WARY YEARS

The first edition of Frank Stevens' *Stonehenge Today & Yesterday*, the standard guidebook to the site until after World War Two, was published in mid-1916, shortly after Cecil Chubb had bought the stones and their immediate surroundings at auction, and a year or so before he handed the lot over to the nation, and at the same time a large

block of land a short distance south west of the monument was requisitioned under the Defence Of The Realm Act for use as a military airfield. Stevens' first edition noted how some visitors' first impressions were characterised by a sense of disappointment – Stonehenge seemed 'dwarfed by the wide expanse of downland which surrounds it'. Later editions complained that disappointment over the monument's size was now equally due to the presence of 'recent erections of the Great War'.

Documentation concerning the airfield's origins is sparse, but the main reasons for choosing that particular spot seem to have been (a) the presence of a reasonable expanse of level ground; (b) proximity to existing military facilities at Larkhill; and (c) road access (via the A303). As plans and photographs show, the relationship between road and airfield was a little awkward, the

Prior to the aerodrome's construction, the view southwest from the stones wasn't quite open downland. This photograph by architect JJ Cole, taken in 1881, shows Fargo Cottages, surrounded by arable, in the spot later occupied by the aerodrome buildings



Extract from © English Heritage, NMR ALO913/101/01/5613



Stonehenge Aerodrome, photographed on 24 May 1921, a few months after it closed. The road running through it is the present A303. Note earthwork and cropmark barrows to the east (right)

hangars and other buildings being aligned not with the road but (approximately) with the main axis of Stonehenge.

Initially, the airfield's presence seems to have been grudgingly accepted by archaeologists – there was a war on, after all – although there were some rumblings about damage being caused locally by the men stationed there, notably to trees in Normanton. Others were more concerned for archaeological monuments. In January 1918, Chief Inspector of Ancient Monuments Charles Peers complained that “Immediately to the west of the Stones is a group of barrows, several of which have lately been covered over with rubbish dumped on them. At a little greater distance...two other barrows are included in a site for [Aerodrome] hutments...The young officer in charge of the Aerodrome had no idea what a barrow was...”, although as Peers went on to point out, the War Office itself was well aware of the existence of all the barrows and other archaeological monuments on its land.

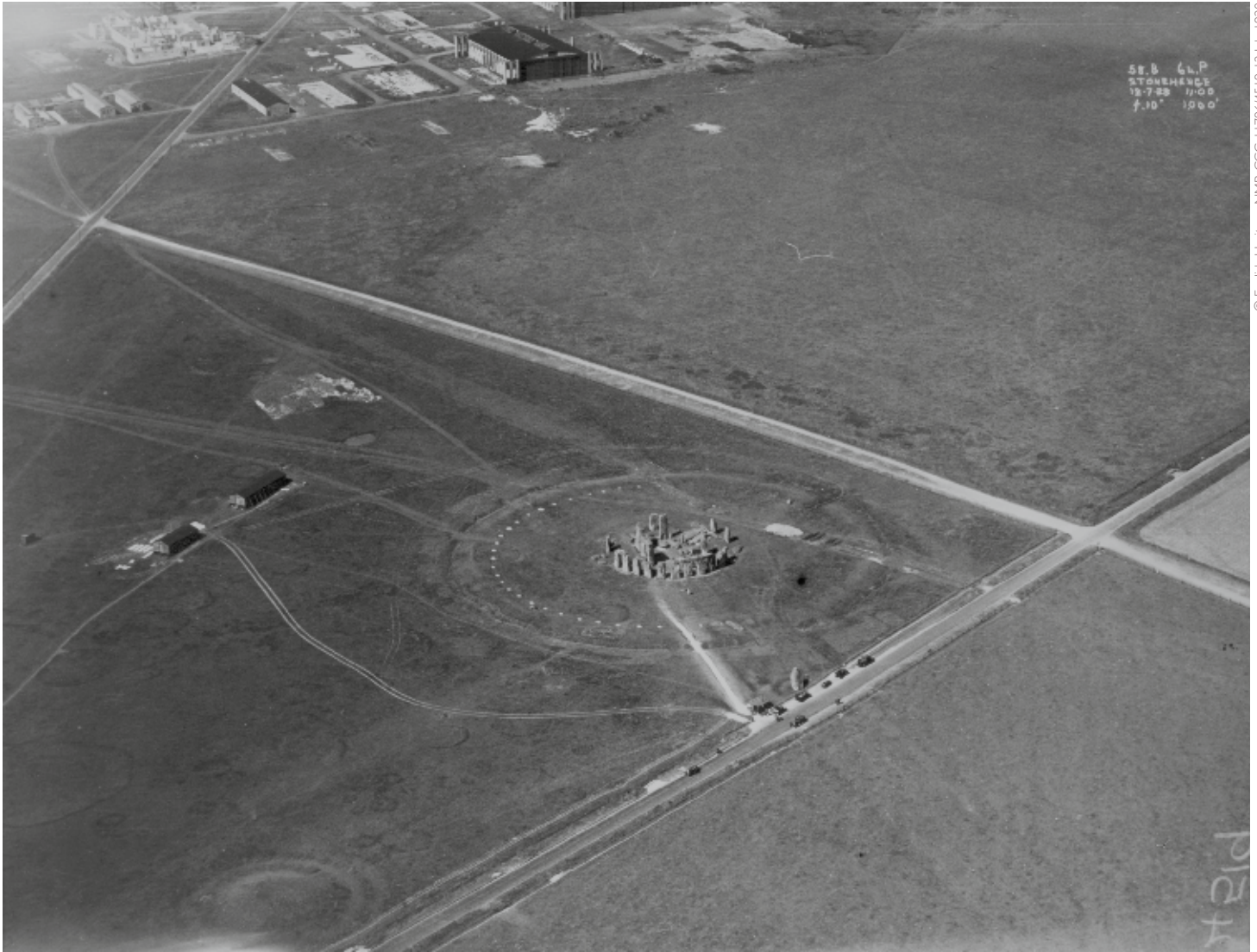
BUYING AND SELLING THE AERODROME

After the war, attention shifted from physical damage to the visual impact of the aerodrome buildings. In 1916, Stevens had begun his Stonehenge guide with a description of the wider setting, a timeless “vision of rolling

downs, a short, crisp, elastic turf dotted with flocks, and broken here and there by some crested earthwork or barrow, which rears itself from the undulating Down, and breaks the skyline with its sharp outline...There is something of grandeur in the immensity of [the Downs'] broad unbroken line stretching, as they do, or did, for mile upon mile, limited only by the horizon, a rolling sea of green pasture”. This conception of Stonehenge, forever sitting in almost splendid isolation in the midst of a springy, sheep-strewn, velvet-green carpet, seems to have been the one thing that all parties debating the site's origins and history were able to agree on. Clearly, the aerodrome couldn't stay.

However, in assessing future peace-time needs, the RAF decided initially that they wanted to hang on to the site, essentially for the same reasons that lay behind the original choice of location. They were quickly persuaded otherwise, with the result that the airfield at Old Sarum, earmarked for closure, received a hasty reprieve. Nevertheless, as far as archaeologists – Office of Works, Society of Antiquaries, Wiltshire Archaeological Society and many others – were concerned, the closure of the airfield was far from being the end of the matter.

It was proposed to auction off the aerodrome buildings individually to the highest bidder, with the condition attached that each building



© English Heritage, NMR CCC 11796/4519 12 July 1928

The few remaining aerodrome buildings still standing in the summer of 1928. In the foreground, traces of Hawley's excavations, which ended in 1926, remain fresh and clearly some work remained to be done

be dismantled and removed within a matter of months by the purchaser. The sale occurred in February 1922. A sizeable number of the buildings were bought by the owner of the land, a Mr Isaac Crook, who in the coming weeks, by various means, also managed to acquire most of the buildings he hadn't purchased at the auction. He then persuaded the government's Directorate of Lands & Accommodation to give him his land back, which they did on 1st July 1922, at which point the condition to remove the buildings became legally unenforceable. In any case, even if the buildings did come down, there was no means of preventing Crook from putting up new ones. The idea of planning permission was some years off.

Much to the annoyance of those determined to ensure that any visitor to Stonehenge was spared from the distress of seeing any modern intrusion in the surrounding landscape (apart from the barbed wire, the caretaker's hut, the

roads, assorted plantations, Larkhill etc), Crook leased some of the buildings to a pig-breeder. As a result, efforts began to persuade a reluctant government to purchase the land, although little of any consequence occurred until 1927 when Mr Crook put his land up for sale. Both the landowner (and his agent) and those who wished to 'save' Stonehenge's "lonely splendour" were keen to play up the possibility of the land being sold for building, speculative and otherwise, the recent construction of a café to the east of Stonehenge offering concrete supporting evidence of what might happen. This undoubtedly helped push up the price that was eventually paid.

Frank Stevens was one of those who raised the unwelcome spectre of houses and tea gardens, in both cases mixing concerns about the visual impact of new buildings with fears about the numbers and kinds of people they might bring. The type of people now visiting

Stonehenge had been a concern for some time – in 1919, George Engleheart, local secretary of the Society of Antiquaries, had written to Charles Peers that “If you had seen, as I saw, 6 charabanc crammed with Oldham mill-operatives drawn up at the turnstile, you w[ould] have been as perturbed as myself”. Stevens’ worries about who might live in any houses built in the vicinity were rooted in his opinions of some of the people already there – Crook had converted some of the former aerodrome buildings into dwellings for rent (a ‘highly speculative investment’, according to the District Valuer). Stevens argued that “any site within easy distance of the Camp at Larkhill will attract camp followers and small store keepers, hawkers &c. I speak from personal knowledge in connection with the County Education Committee. We have already had trouble with hawkers living in the huts &c at the Aerodrome in the matter of school attendance. The families are poor and shiftier hangers on of the military, and their children are badly clothed, verminous &c and I have called attention of the N.S.P.C.C. to the condition of more than one family. Their methods of living are questionable”.

Ultimately, Crook’s land, and surrounding holdings, was purchased over the next few years via a public appeal, mainly conducted through *The Times* and the National Trust, with much of the land being handed over to the latter organisation. By 1930, all the buildings had gone, although things didn’t always go smoothly. For instance, there were problems surrounding one of the hangars. The airfield site itself was sold separately, the deposit being paid by B.H. Cunnington (great-grandson of William Cunnington) apparently on behalf of the Wiltshire Archaeological Society. However, shortly before the sale was due to go through, it emerged that Crook had neglected to tell Cunnington that he had already sold the hangar to someone else. Crook refused to reduce his asking price. The matter was eventually resolved, presumably to Crook’s satisfaction. The demolition of this final hangar was filmed, and a clip can be seen via the British Pathé News website.

Physical remains of the airfield have largely been erased over the last 80 years, mainly through the conversion of the land on which it stood not to pasture but to arable agriculture, although it is now all under grass. Recent survey work shows that traces survive – as earthworks, cropmarks and geophysical

anomalies – but the contemporary photographic and documentary record is little explored, and the airfield (and the wider network of First World War sites of which it formed part) features only briefly in the current WHS research framework. The quality and quantity of surviving documentation, including aerial photographs, not only tells us much about the military use of the aerodrome, but also shows its subsequent focal role in debates about the appropriate setting for Stonehenge, something that heavily influenced the current pattern of land ownership and management in the area around the monument. Additionally, of course, this study underlines the potential for using these sources to tell a wider story about this landscape during a period – the First World War – which is likely to become a point of interest for future visitors..

Martyn Barber

The earthwork traces of the aerodrome captured by the USAAF on Christmas Eve 1943

Extract from © English Heritage, NMR US/7PH/GP/LOC1 221/050



Castle-an-Dinas, St Columb Major, Cornwall: field survey on an EPPIC scale

Topographical survey of an Iron Age hill-fort provides a training opportunity for two of English Heritage's Professional Placements in Conservation (EPPIC).

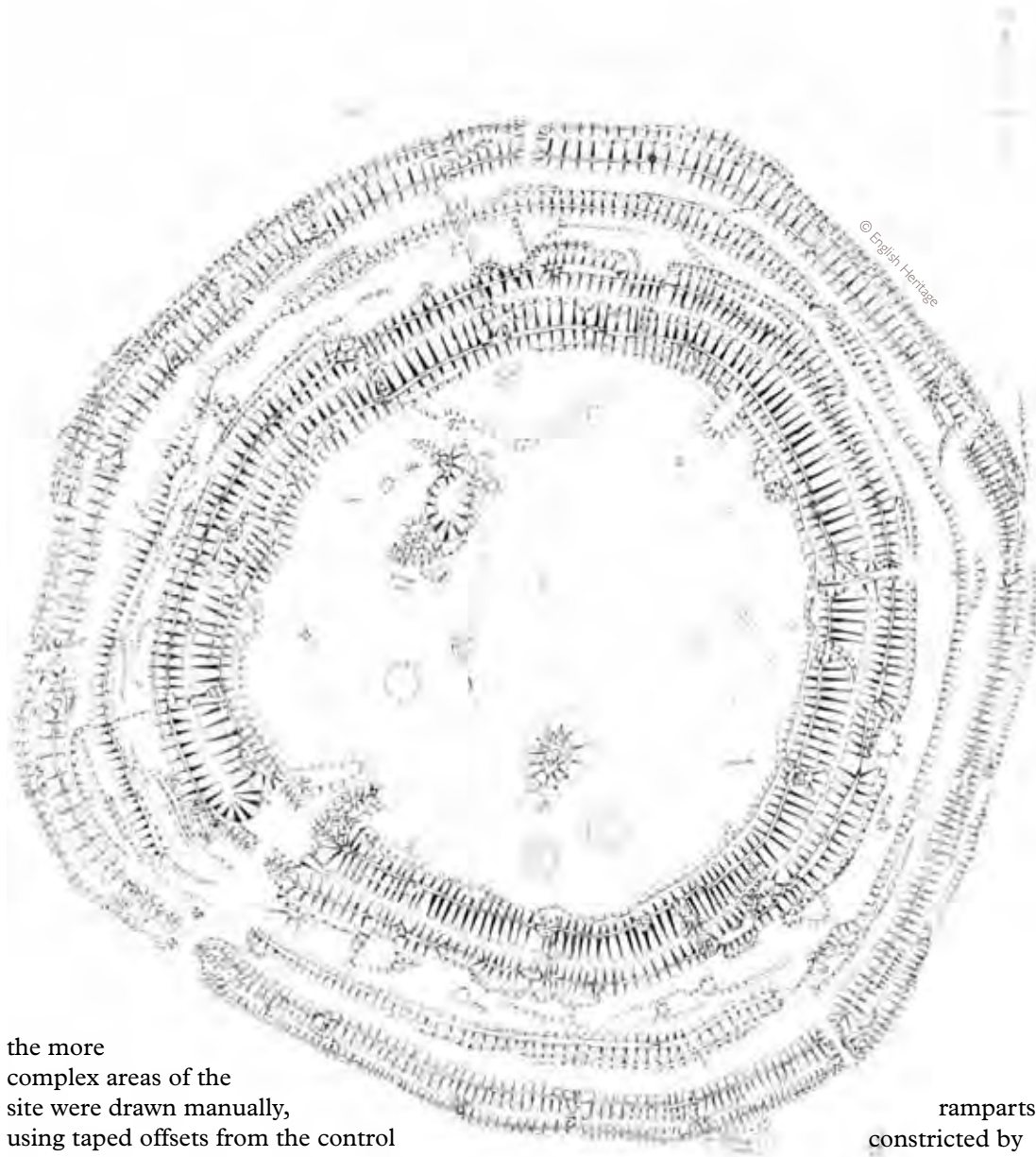
Castle-an-Dinas, one of the most impressive hill-forts in central Cornwall is located at the summit of Castle Down. On a clear day, Cornwall's north coast is visible, though during the survey visibility was often down to 100m. To the south, the landscape is dominated by massive china-clay spoil heaps. Smaller broadly contemporary enclosed farmsteads, known as 'rounds', are scattered across the surrounding landscape. Castle-an-Dinas was also the site of a significant early 20th century tungsten mine whose dressing buildings, formerly connected to the mine by an aerial ropeway across the ramparts, survive to the south of the hill-fort. During February 2011, members of the Archaeological Survey and Investigation Swindon team undertook an analytical earthwork survey of the site for the owners, the Cornwall Heritage Trust, in order to provide with accurate, detailed information for the future interpretation, conservation and management of the site. Survey grade Global Positioning System (GPS) kit and standard graphical techniques of tape and offset were used to record the earthworks at a scale of 1:1000.

The fieldwork was a training opportunity for two EPPIC placement holders with the Aerial Survey and Investigation team; Rob Skinner (based at Aerial Survey and Investigation team, Swindon) and Derwin Gregory (Archaeological Survey and Investigation team, Cambridge). It was undertaken over a two week period shortly after the whole site had undergone a rare episode of mowing; a perfect opportunity to observe the earthworks. The message, as conveyed by English Heritage's expert archaeological investigators Sharon Bishop and Elaine Jamieson, is that the most important tool in the field surveyor's box is

their own eyes. Earthwork survey requires practice in the art of observation. Knowledge and experience is required in order to understand what is being seen in the field, and every site needs time to 'get your eye in.' As a beginner this fact is only too apparent; sometimes it is unclear exactly what the more experienced surveyors are looking at. However, after only a few days it becomes easier, as the shapes of the sometimes very subtle earthworks become increasingly perceptible.

Derwin covered the outer two circuits and the spaces in between, while Rob covered the inner two circuits and the central area. The work proceeded in two phases and was geo-referenced via a temporary GPS base station located within the hill-fort. Initially, points were recorded using GPS rovers as giant pencils to draw around the earthworks, producing a vector digital outline. This process required learning how to best record the earthworks, adding points that accurately represent the features that are discernable on the ground. It is important to understand how much detail to include. Not enough and important features relevant to changes in the morphology of the site might be missed, too much, and the final field drawing might be too confusing for interpretation. The tops, bottoms and changes in gradient of the often very steep ramparts were recorded, creating lines that would form a guiding framework for the next phase of the survey. A few control points for graphical survey were also recorded.

The second phase involved taking the plot of vector GPS data and filling in the detail of the earthworks using hachures. This required a more detailed observation of the earthworks and practicing skilled draughtsmanship to produce a neat and readable drawing. Some of



The completed pencil field drawing

the more complex areas of the site were drawn manually, using taped offsets from the control points that had been recorded with GPS during the preceding phase. The drawing produced will go on to become the definitive document of the site's surviving earthworks. The GPS was also used to note additional details useful for the interpretation and understanding of the site. For example, three straight profiles across all of the ramparts and ditch circuits were recorded. The location of footpaths and tracks were also noted, to assess potential threats to the site's conservation.

Initial analysis indicates that Castle-an-Dinas comprised four concentric ramparts. Three of these (the outer and two inner circuits comprise large banks and deep ditches whilst the second circuit is much slighter. This had previously been recorded only as a scarp, though our survey clearly showed it to be a bank with outer ditch, that is visible intermittently. This circuit probably represents an earlier, pre-hill-fort, phase. There was a single original entrance, located, unusually, to the south-west. Access to the interior is through aligned breaks in the

ramparts, constricted by the later insertion of narrow banks. The second circuit was not altered in this way. Passing through the fourth (innermost) rampart, the earthworks suggest an in-turned entrance directing new arrivals towards one of two earlier barrows situated on the horizon within the interior of the hill-fort. Although the earthworks inside the hill-fort are degraded by post medieval quarrying and agricultural improvement, several possible hut platforms were surveyed.

Features associated with the later re-use of the hill top were also recorded. To the west, a large hole marks a probable prospecting shaft excavated into the outermost ditch. The miners made various cuts through the ramparts to enable better access to the mines to the north, including a break in the outer circuit to the south-east which now provides visitor access to the site. Three earthwork platforms, which provided footings for the pylons supporting the aerial ropeway, were recorded along the eastern side of the innermost circuit.

Derwin with a GPS Rover
or 'giant pencil'



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The skill of the surveyor is in recording the earthworks in a fashion to convey the history and interpretation of a site. Experience enables the surveyor to recognise the significance and chronology of the earthworks, whilst taking account of natural features and their setting within the wider landscape. This survey provided Derwin with the opportunity to learn from the experiences of other colleagues within the team. It also provided an opportunity to work in a landscape different to those within the remit of the team based in Cambridge.

For Rob the Castle-an-Dinas survey was an opportunity to experience a different aspect of English Heritage's work. Having surveyed excavations before some of the techniques weren't entirely new; however, working at a dramatic site like Castle-an-Dinas was, as was the valuable experience of understanding the professional approach of English Heritage

field surveyors and how they tackle a truly monumental site.

The results of the earthwork survey are currently being analysed. Background research will be conducted over the summer and a report issued in the autumn, which will be available on the English Heritage website.

We would like to thank Sharon Bishop and Elaine Jamieson for providing the training during the topographical survey of Castle-an-Dinas, and the Cornwall Heritage Trust for requesting the survey and allowing us to use it as a training exercise. We are indebted to English Heritage and the Institute for Archaeology (IfA) for the opportunity to undertake the EPPIC scheme. In particular we would like to thank the Archaeological Survey and Investigation and Aerial Survey and Investigation teams for sharing their expertise and enthusiasm.

Rob Skinner and Derwin Gregory

53 King Street, Blackburn

A case study in applied building history research demonstrates the centrality of high-quality research in planning and decision-making.

The system of protection for historic assets (through listing, scheduling and registration) is designed to ensure that when change becomes necessary or desirable it is governed by understanding of the asset's significance. Understanding emerges from the examination of a range of sources, chief amongst which must be the physical attributes of the asset itself. Sources can, however, give rise to differing interpretations. In such cases, especially where the proposed changes have major implications for the future of the asset, it is essential to establish which interpretation should be trusted.

The house now known as 53 King Street, Blackburn, is a Grade II listed building which for much of its existence was annexed to a police station. It has been empty for some years, is in poor condition internally and is currently threatened with demolition to make way for a proposed road scheme. Now isolated following demolition of the purpose-built portion of the police station and other nearby buildings, it presents a forlorn appearance, but its retention has been championed by Blackburn with Darwen Civic Voice among others.

As part of the preparation of the road scheme a study of the development of the affected area was commissioned. Among the materials examined by the consultant were title deeds for no. 53. These detailed the first development of the land and recorded the building of a house on the site between 1779 and 1781, and its subdivision into two occupancies in the latter year. A subsequent commercial archaeological building investigation endorsed the building date. Since the existing list description had estimated a date of circa 1830, the earlier date caused some excitement, understandably creating expectations that the building might be more significant than had hitherto been thought.

The proposed demolition of any listed building requires English Heritage to be

consulted, but a response could not be offered without resolving the uncertainties concerning date and significance.

Accordingly, York-based staff from the Architectural Investigation Division investigated the building. The inspection confirmed that the exterior shell of the house and the internal decoration (including lavish plaster cornices in the principal reception rooms) were contemporary with one another, while diagnostic joinery details pointed to a date not long before 1850. Some late 18th-century doors were observed in the basement but in every case they had been

53 King Street, Blackburn, now isolated from its late 18th and 19th-century neighbours, faces an uncertain future



Bob Skingle © English Heritage



The entrance hall and ground-floor reception rooms retain lavish mid-19th-century cornices

altered to fit new positions. It was clear that they had been recycled – most likely from the previous house on the site.

Exploration of historic maps confirmed this analysis. Most tellingly, the large-scale 1:1056 Ordnance Survey map, surveyed in 1847, depicted the present footprint of the house with precision, but omitted external steps and railings, which elsewhere on King Street were scrupulously detailed. This suggested that although the building had been erected it was still unfinished when the surveyors compiled their map. An earlier map by James Gillies, surveyed in 1822, showed a slightly different footprint doubtless belonging to the late 18th-century house.

Further research was curtailed by the deadline for the response, and was hampered by the discovery that the properties in King Street had undergone at least two re-numberings during the 19th century, making the interpretation of some documentary sources problematic. The fact that the building fabric and the map evidence agreed with one another nevertheless made a strong

case for stating that 53 King Street was built in or shortly before 1847; the deeds suggested that it was probably built for a surgeon named James Pickop.

The conclusion that 53 King Street was not a late 18th-century house, but an early Victorian replacement, was disconcerting to many who wished to see the building retained. The promise of heightened significance seemed to be evaporating. In fact 53 King Street fully justifies its Grade II listing, and both statute and government policy (as set out in PPS5) weigh strongly in favour of its retention unless very stringent conditions can be met. There was nevertheless some resistance to the interpretation set out by English Heritage. Research was therefore continued with a view to establishing definitively the facts of the case.

An essential preliminary was the clarification of 19th-century changes in street numbering. This necessitated a concordance of documentary sources giving the names of occupiers, their addresses or an indication

of relative positions, or the nature or size of the premises. The sources included trade directories, census returns, rate books, poll books and electoral registers. They are by nature periodic and most are selective to varying degrees, but by comparing them with each other and with large-scale maps it is possible to build up a detailed picture of a neighbourhood and its evolution. By chance there is a surviving rate book for 1854, the year in which the present system of street numbering seems to have been introduced. In the same year Mannex & Co.'s *Directory of Mid-Lancashire* gave addresses according to the immediately preceding system. The numerous individuals listed in both sources build up a series of cross-matches between premises, including no. 53, which is numbered 94 in the directory. Earlier sources confirm another change to the numbering, probably in 1838-9. Before then the order in which the properties appear in the rate books is the reverse of the subsequent pattern, and this wholesale change is consistent with directory evidence indicating that under the earlier system numbers were counted from a different starting point. Under this earlier system the present no. 53 appears as no. 27. There is even a suggestion of a fourth numbering system, defunct by 1824.

A by-product of the concordance was the compilation of a detailed list of occupiers, and in some cases owners, of no. 53 and neighbouring properties at different dates. This enabled sources which give relative positions rather than numbered addresses (including most of the early rate books) to be interpreted with greater confidence. Working back through the rate books we find references in 1843-4 to two adjacent premises, one of which belonged in 1841-2 to 'Dr Pickup', having been 'taken down' (a difficulty in interpreting the sources is the prevalence of the surnames Pickop and Pickup, which are sometimes spelt interchangeably). The references occur at the point in the sequence where (having established the addresses of neighbouring occupiers) the house should be, and the combined rateable value of the demolished houses, as given in earlier rate books, is consistent with the scale of the house shown on Gillies' map, suggesting that the subdivision of 1781 may have endured until demolition. The next rate book (1844-5) has a blank line in the same position, but the line

is given an assessment number, indicating no buildings on which a rate could be levied, but implying an expectation of building in the near future. The rate books for 1845-6 down to 1853 are missing but, as we have seen, map evidence indicates that the house was substantially complete by 1847. The likely construction date can therefore be narrowed down to the period 1845-7.

This account prompts some reflection. The investigation and research necessary to resolve the fundamental questions over the building's date and significance were quickly accomplished. Fully documenting these initial judgements took considerably longer. Applied building history research rarely if ever enjoys the luxury of unlimited time and resources. Determining the level of research necessary to provide a secure basis for decisions (which may be life-and-death decisions for the building concerned), without drawing disproportionately on scarce resources, calls for careful judgement. It requires broad-ranging knowledge and skills, including the ability to interpret and date building fabric quickly and confidently, and to follow the trail of relevant documentary evidence wherever it leads. These skills remain scarce. Much depends upon them.

Adam Menuge

An extract from the 1843-4 Blackburn Rate Book, noting the two properties 'Taken down' on the site of No.53 (Reproduced with permission of the County Archivist, Lancashire Record Office, CBBN 4/8)



Adam Menuge, © English Heritage

The Atlas of Rural Settlement in England GIS

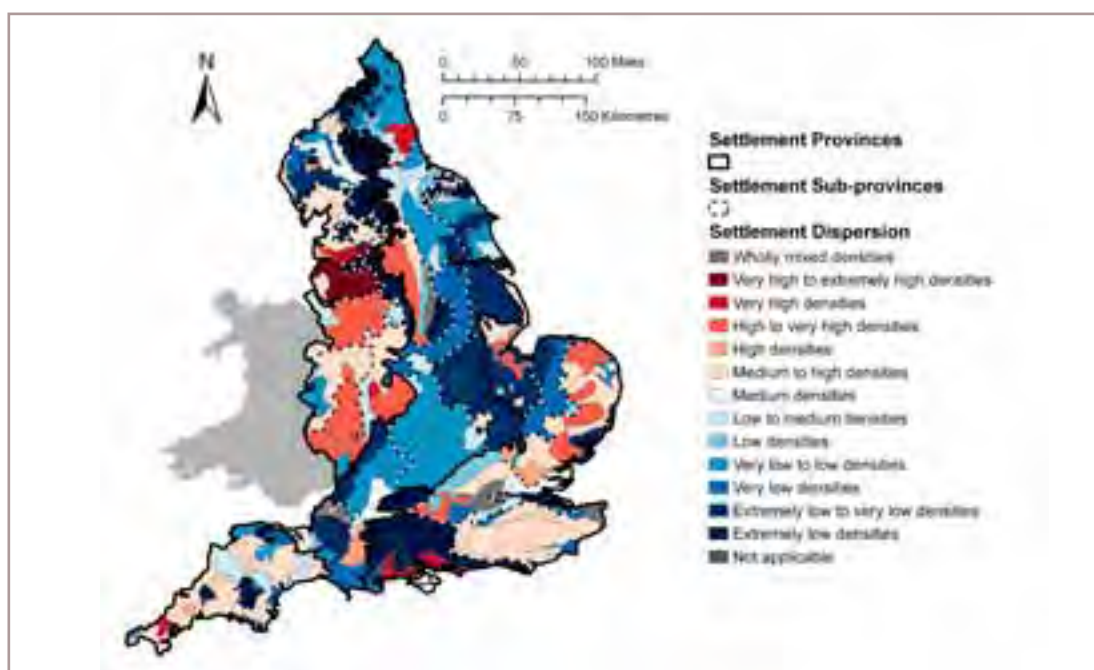
Modern mapping technology makes possible new visualisations and interpretations of key maps of 19th century settlement and terrain.

Since its publication by English Heritage in 2000, Brian K Roberts and Stuart Wrathmell's *An Atlas of Rural Settlement in England* has become a major point of reference for understanding the development of rural settlement in England and the historic character of the landscape. Their main interest was in portraying complex patterns of settlement organisation, contrasting nucleated settlement (where houses, farms, churches and so on stand in compact clusters) and dispersed settlement (where such structures are spread far more widely across the landscape), and the subtle gradations between the two.

The maps in the printed *Atlas* were produced digitally, but were created in a format which cannot be used in Geographic Information Systems (GIS) or similar programmes. GIS software is now widely used in the study and management of the historic environment, and many people have access to 'geobrowser'

software like Google Earth™. English Heritage wanted to make it possible to use Roberts and Wrathmell's materials in interactive, spatially-aware digital formats, enabling users to examine, query and re-interpret their results in new ways.

Roberts and Wrathmell created their maps through a process of interpretation and characterisation of the landscape of England at a national scale, using as a source the nineteenth-century Ordnance Survey 'Old Series' 1:63,360 (one inch to one mile) scale maps. The delineation of settlement provinces, sub-provinces and local regions was based on a carefully-reasoned but nonetheless subjective method, involving, as the authors put it, 'little science but much logic'. Similarly, the terrain maps they created are a highly generalised, synthetic portrayal of the physical landscape of England, based on a multitude of sources. Their intent was to build a national



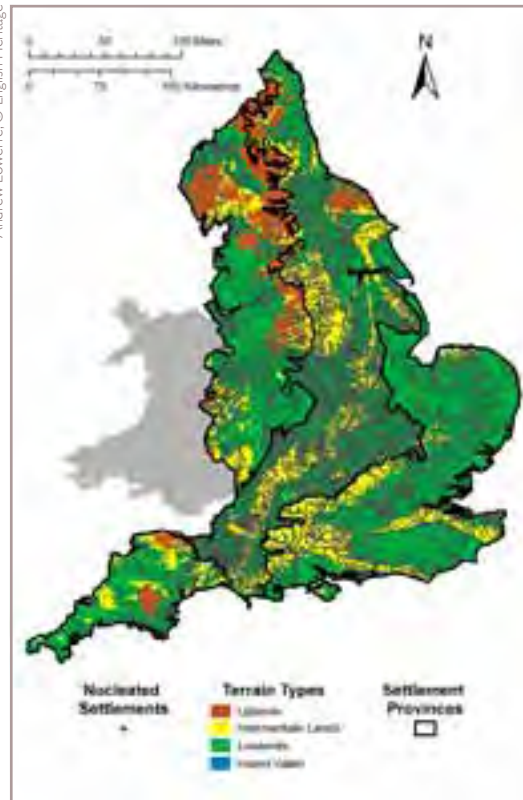
Roberts and Wrathmell's settlement provinces, sub-provinces and zones of dispersion

mosaic with no blank spaces, in which the description of the landscape would be consistent whether one looked at Cumbria or Kent, all regarded with an eye to help inform and put in context the settlement regions derived from the Old Series mapping.

Using copies of the original digital files supplied by Brian Roberts, Eddie Lyons (Imaging, Graphics and Survey) and I constructed new, GIS-ready spatial and attribute data. Polygons or areas were used to depict terrain types and zones and settlement provinces, sub-provinces, local regions and dispersion zones, lines for terrain escarpments, and points for the nucleated settlements and the locations of the sample areas where Roberts and Wrathmell quantified the degree of settlement dispersion. Attribute values identifying the terrain zones, settlement sub-provinces, nucleation categories, dispersion scores and so on were assigned to the relevant polygons and points based on the keys to the published maps and from additional information kindly provided by Brian Roberts.

We also prepared detailed documentation and metadata (ie, data about the data) to describe the various layers in the data collection and the processes by which the original files were converted. A digital copy of the descriptions and models of the settlement provinces and sub-provinces, presented in the latter part of the printed

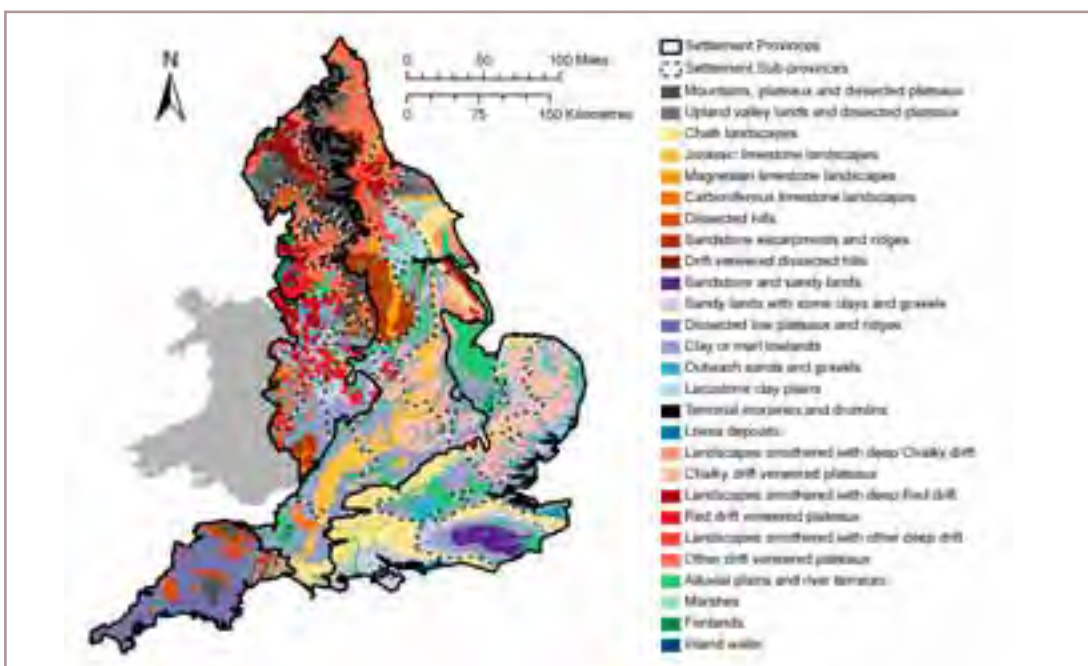
Andrew Lowerre, © English Heritage



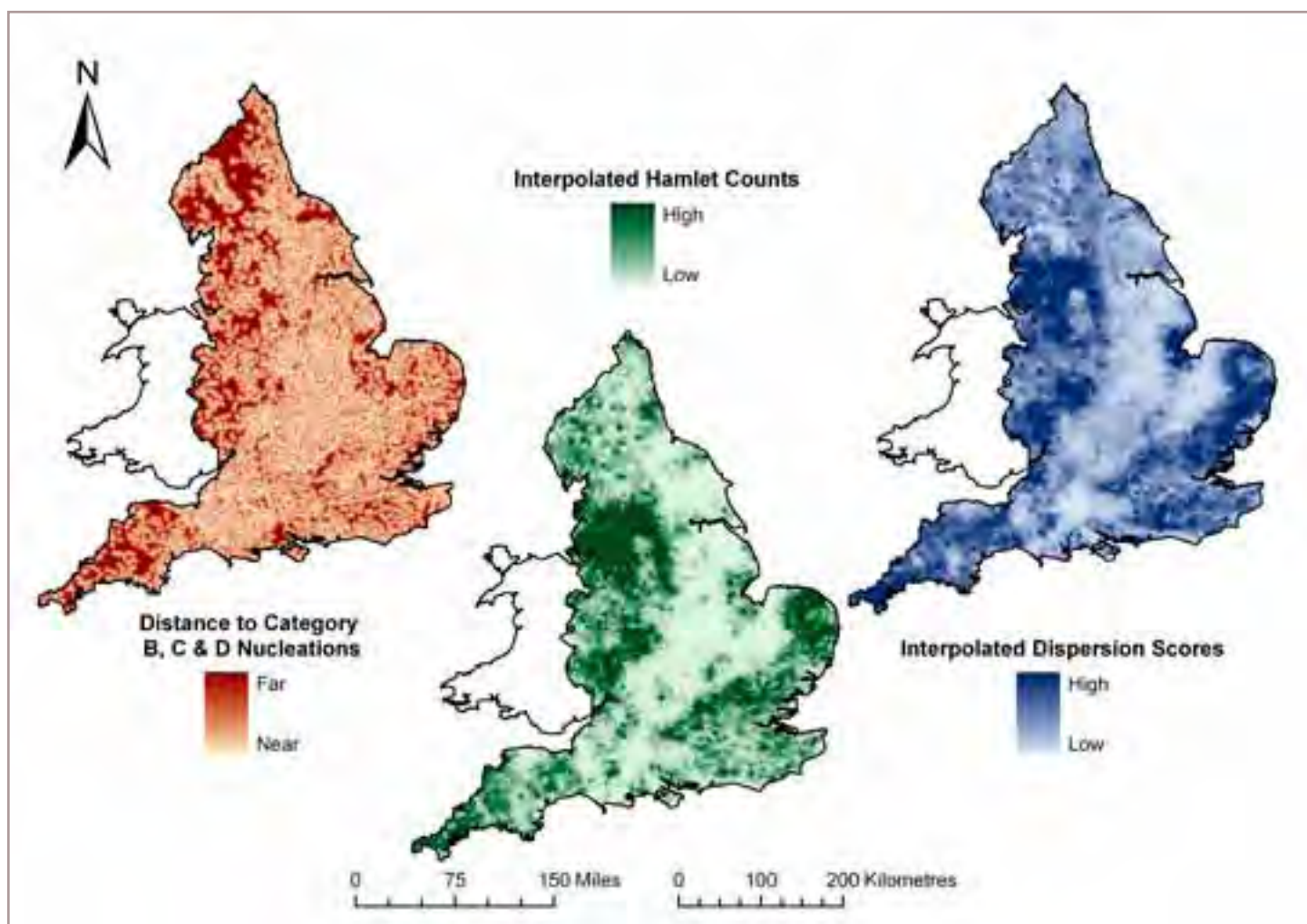
Nucleated settlements displayed over broad types of terrain

Atlas, is also included. These descriptions are key to understanding the different areas, but they could not be readily incorporated directly into the GIS data. The data are available in formats that can be used in most leading GIS applications and recent versions of many CAD (Computer-Aided Drafting/Design) packages, as well as free data viewers and ‘geobrowsers’ like Esri’s ArcGIS Explorer and Google Earth™.

Andrew Lowerre, © English Heritage



Settlement provinces and sub-provinces overlaid on more detailed terrain zones



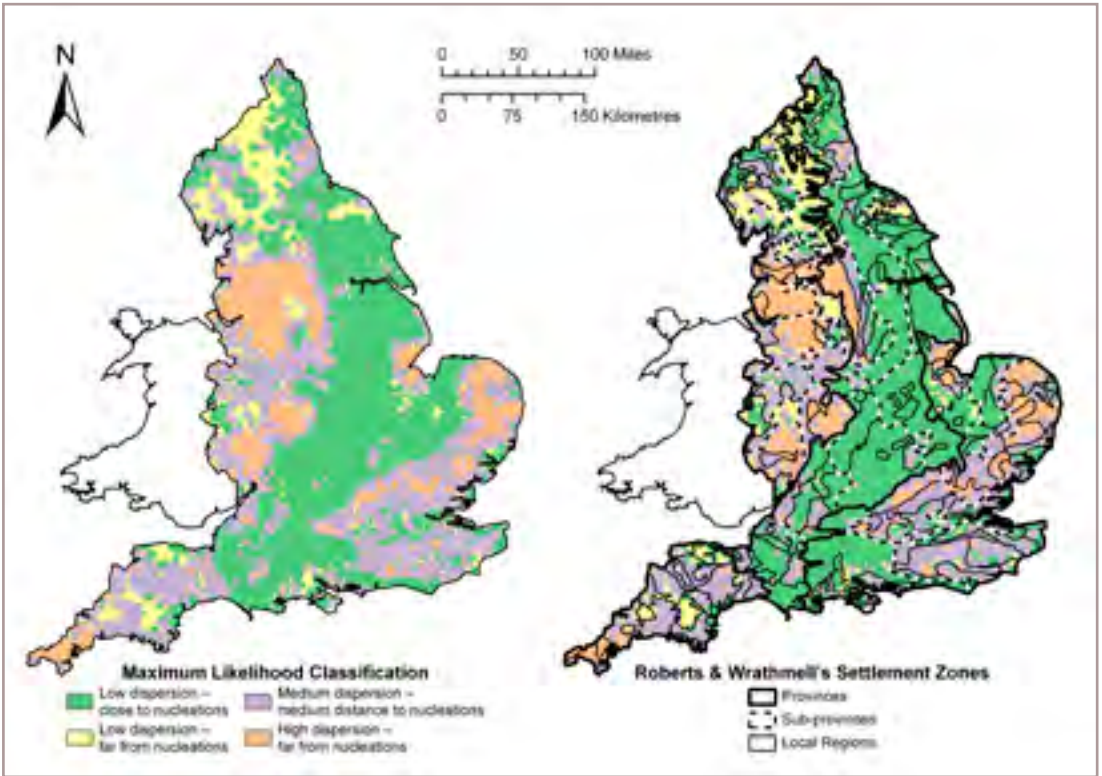
Data interpolated from nucleations, hamlet counts and dispersion scores

With the information from Roberts and Wrathmell's maps in GIS-enabled form, it is possible to examine the materials in new ways. The different layers of data can be displayed in a nearly infinite variety of colours and can be viewed together in combinations not depicted in the *Atlas*. For example, one can map how nucleated settlements are distributed across the broad terrain types – Uplands, Intermediate Lands and Lowlands. Overlaying the settlement provinces and sub-provinces on the detailed terrain zones helps illuminate where changes in the physical landscape may have influenced differences in patterns of settlement.

Deriving new data from Roberts and Wrathmell's materials is also feasible. GIS can estimate or interpolate values for the whole of England based on the locations and values of known features, eg, the points representing nucleated settlements. The software divides the landscape into a grid of regularly-spaced cells and then,

working from the known features, calculates a value for each cell based on the values of the points nearest to it. First, the GIS calculated the distance to all the nucleations in Roberts and Wrathmell's categories B, C and D, the distribution of which formed the basis of their delineation of the Central settlement province. Interpolated surfaces were also created from the sample locations at which Roberts and Wrathmell recorded dispersion scores and hamlet counts. The former represent the number of houses, farmsteads, cottages and the like shown on the Old Series maps; the latter a count of tiny settlement groups larger than the single buildings recorded in the dispersion scores but smaller than the smallest nucleated settlements. In each of the interpolated datasets, the broad outlines of Roberts and Wrathmell's three provinces are readily discernible, but the variation within each is also clear.

The three datasets can be integrated and then analysed using a method often applied to



Results of the Maximum Likelihood Classification analysis of the combined interpolated settlement data on its own, and overlaid with Roberts and Wrathmell's settlement provinces, sub-provinces and local regions

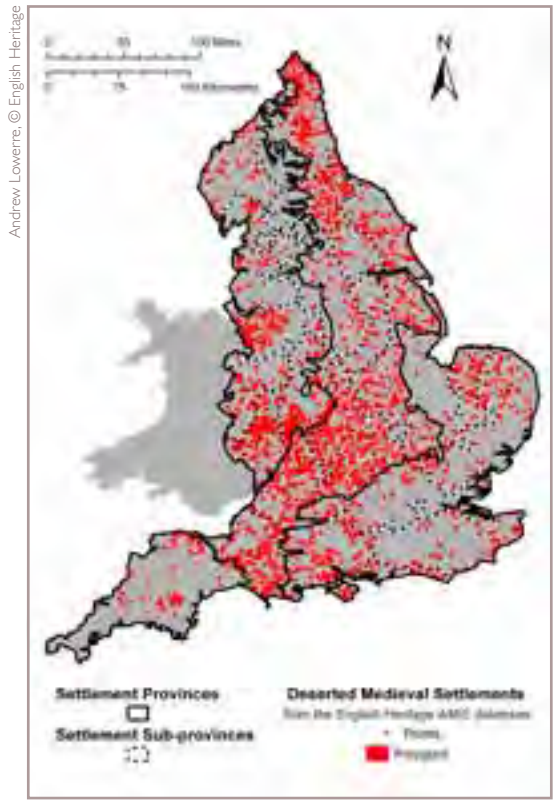
multi-spectral satellite images. The technique – Maximum Likelihood Classification – tries to find locations with similar values for each of the different variables and group them together. The results are similar, but not identical, to Roberts and Wrathmell's division of the English landscape into provinces, sub-provinces and local regions.

will encourage and stimulate future work on historic rural settlement and regional diversity, and that such work will be made at least slightly easier than it has been up to now.

Andrew Lowerre

Finally, it is also now possible to combine the data from the *Atlas* with a wide (and constantly growing) range of other spatially-enabled data relating to rural settlement, regional diversity and how they have changed over time. Aerial photographic transcriptions (e.g., from English Heritage's National Mapping Programme), historic landscape characterisation, GIS data from the National Monuments Record and from historic environment records up and down the country, and materials from research focused on regional or local scales can be easily related to the national scale data.

The Atlas of Rural Settlement in England GIS data, metadata and documentation can now be freely downloaded via the Internet (<http://www.english-heritage.org.uk/professional/research/archaeology/atlas-of-rural-settlement-gis/>). The data collection is also available on CD by request from the National Monuments Record. We hope that the creation and dissemination of the data



Deserted medieval settlements recorded in English Heritage's Ancient Monuments in England (AMIE) database, combined with the settlement provinces and sub-provinces

Conservation of the Bedford Lemere photograph collection at the NMR

Using scientific techniques to find out why some of the glass plate negatives in this wonderful collection are deteriorating.



Bedford Lemere

© English Heritage, NMR

The NMR is one of the largest publicly accessible archives in the country with a purpose-built cold store that contains over 10 million items, the majority of which are photographic materials. The Bedford Lemere collection is one of the most important. Bedford Lemere and Company was established in 1867 and rapidly became the nation's leading architectural photographers until the closure of the firm in the 1970s. Although the studio was based in London they worked nationwide capturing images of a burgeoning industrial Victorian society. Common subjects included exterior architectural shots, opulent interiors, industrial scenes and social history.

The firm's total output is estimated to have been around 100,000 negatives. The NMR has by far the largest extant holding of Bedford Lemere material globally with approximately

23,000 negatives, dating from the 1870s to the 1920s. This includes about 5,000 prints and wet collodion negatives but the vast majority of the collection is made up of gelatine dry plates. These large format, machine-made, negatives contain extremely high quality images with sharp definition, capturing astonishing detail.

In the autumn of 2009 the NMR began an ambitious 3 year project to conserve, digitise and catalogue this exceptional collection, which has this year culminated in a publication and exhibition at the V&A. The aims of the project are to make this resource available to a wider audience, as well as ensuring its long term preservation. Before any scanning or cataloguing takes place, the negatives first go through a conservation assessment and any that need stabilisation come to the NMR Conservation Department. Around 80% of the collection needs some form of interventive conservation treatment. Common problems include heavily soiled surfaces, broken or cracked glass and mould damage.

However one of the most devastating forms of deterioration occurs when the photographic emulsion, which comprises the image itself, peels away from the glass base. The delamination is accompanied by a change in the appearance of the glass; the surface becomes iridescent or opaque and a white crystalline deposit forms. Around 3% of the collection is affected by this problem and a further 5% shows early signs deterioration, so potentially 1,800 negatives could be affected. This phenomenon has also been observed in other collections. Conservators embarked on an inter-disciplinary, cross departmental project to investigate the cause of the degradation, involving Sarah Allen and Jenny Hodgson at the NMR Conservation

Furness House, Leadenhall Street, City of London, Greater London



© English Heritage, NMR

Department and David Dungworth and Sarah Paynter of the Archaeological Conservation and Technology Team based at Fort Cumberland.

The first step was to look at historical sources of information. For example, the photographers recorded when and where each negative was taken in the firm's 'Day Book'. Examination of the Day Books showed that the spread of deteriorating negatives was seemingly random, with just a few occurring every month since the introduction of gelatine dry plates in the 1880s. However the phenomenon did not occur in any negative processed after the 7th July 1899. Unfortunately there is no record of any corresponding change in practice, for example whether the firm changed the supplier of the negatives or if they began using a different type of developing chemistry. However it seems unlikely that a switch from one processing chemical to another is responsible as the phenomenon is sporadic. Other factors common to all of the negatives, for example previous storage conditions, were also ruled out although fluctuating temperature and humidity levels could certainly exacerbate the problem.

We then used analytical equipment at Fort Cumberland to better understand the mechanism of deterioration. The analysis required very small samples, only a few millimetres in size, which we were able to remove unobtrusively. A selection of affected and unaffected negatives of similar date were examined at very high magnification using a scanning electron microscope (SEM). We were also able to analyse the glass at the same time using energy dispersive X-ray (EDS) analysis. The plates contained mainly sodium, calcium and silicon oxides making the glass a soda-lime-silica type typical of 19th century sheet glass. Although the composition of the glass plates changed very slightly over time the negative deterioration was not restricted to any particular glass type, which suggested that there was another cause for the problem.

On each negative, the layer of gelatine emulsion containing the image stops about 5mm short of the edge of the glass plate leaving an uncoated glass border. On affected negatives, the glass that had been in contact with the emulsion layer was pitted and chemically altered; our analyses showed that some sodium had been

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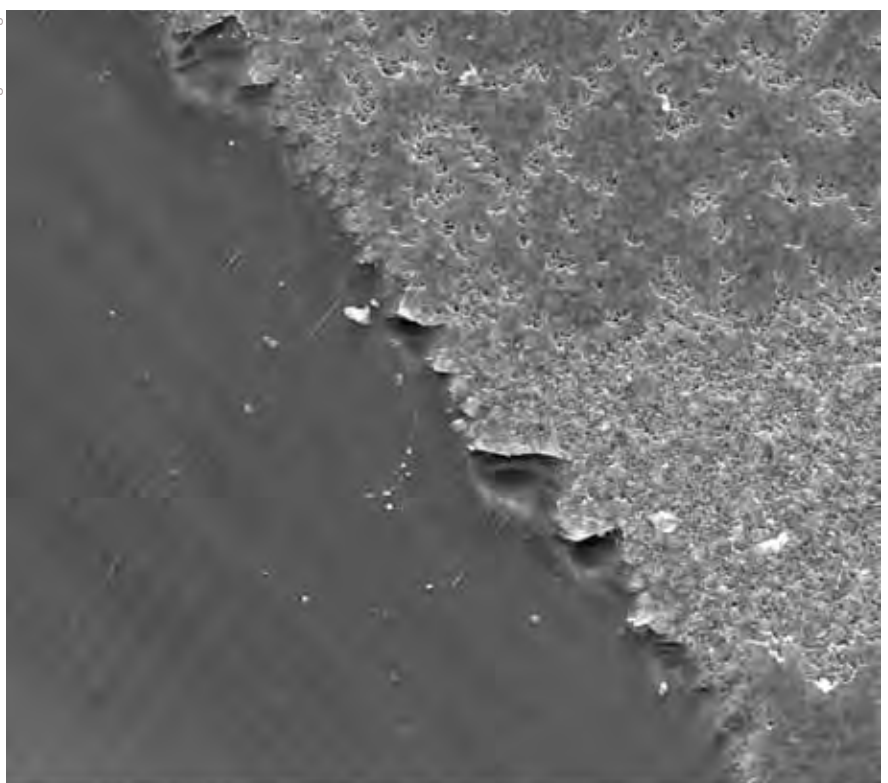
leached out of the glass surface. However the narrow border of uncoated glass around the periphery of the plate remained smooth and chemically unchanged.

A Bedford Lemere negative plate at an advanced stage of degradation

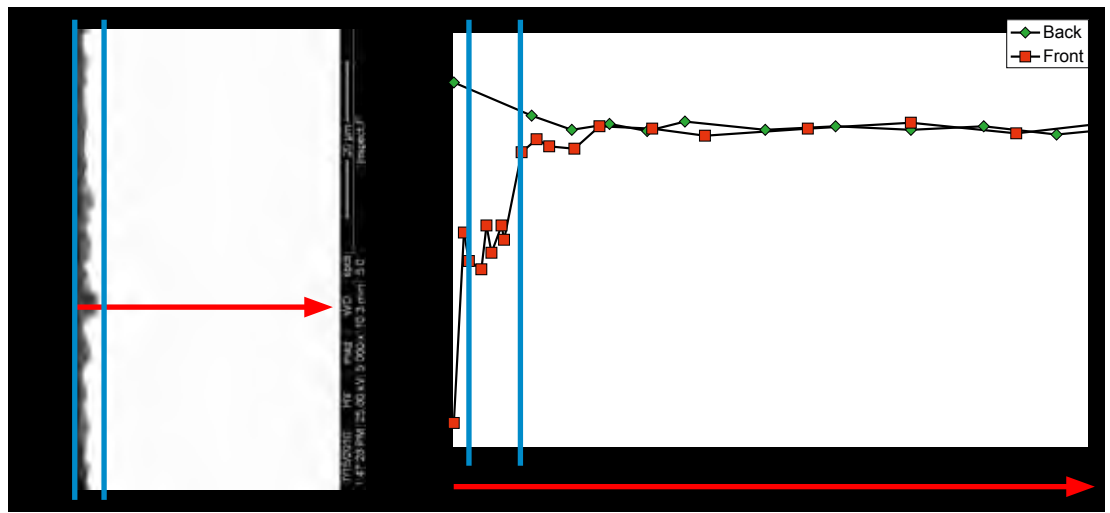
The white crystals forming on affected plates were identified using X-ray diffraction (XRD) in addition to the SEM-EDS results. These crystalline salts were concentrated between the glass and emulsion layer but sometimes erupted through the emulsion surface as small round blisters with a high density of crystals.

An SEM image of the surface of a deteriorating glass plate showing (top right) the pitted surface where the glass was previously in contact with the gelatine emulsion layer and (bottom left) the unaffected border of the glass plate

© English Heritage



An SEM image (left) showing a cross-section through a deteriorating glass plate, with the pitted surface visible between the blue lines and (right) the reduced concentrations of sodium in this layer compared to the rest of the glass



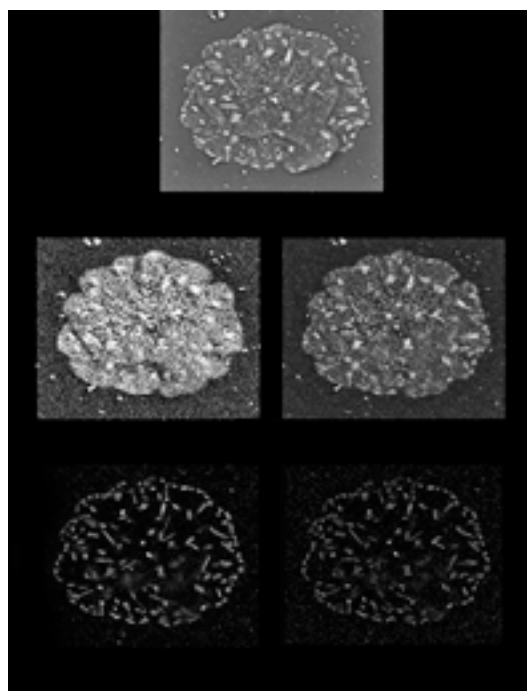
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These analyses show that some components of the glass, in particular the alkalis sodium and potassium, are reacting with sulphur-rich compounds at the interface between the emulsion and the glass. Alkali sulphate salts form and the process leaves the glass surface physically and chemically changed and weakens the bond between the emulsion and the glass plate, eventually contributing to the delamination of the emulsion layer. One possible explanation for the phenomenon is occasional poor processing, particularly insufficient washing, meaning that residual sulphur-rich processing chemicals were retained by the gelatine layer, eventually degrading the glass. Further research is needed to substantiate this.

What does this mean for the treatment of these objects? Traditionally, techniques to remedy delaminated negatives include the consolidation of the emulsion layer back

onto the glass. This would be unsuitable for a number of reasons. Aqueous consolidants may accelerate the deterioration and, even if a non-aqueous adhesive was used, it's likely that the damaged surface of the affected glass plates would not be strong enough for a lasting bond and that this problem would simply recur.

We believe that a passive solution is the key: the negatives need to be kept in environmental conditions where the relative humidity and temperature levels are low and stable. Fortunately the conditions in our archive adhere to these levels. However the conservation treatment must also result in a functioning object. One idea is to sandwich the affected plates between layers of glass to create a pressure mount. A sink mat contained within the sandwich would first be preconditioned to avoid creating a damaging microclimate and instead maintaining suitable conditions for long term storage. It is clear that further research is needed to find best way of ensuring the future stability and usability of the affected negatives.



© English Heritage

An SEM image of a blister (top) made up of many small indistinct crystals plus occasional larger angular ones on the surface of the emulsion. The four maps show the increased amounts of sodium, sulphur and to a lesser extent potassium and calcium at the site of the blister; the majority of the crystals are sodium sulphate whilst the angular grey crystals are potassium calcium sulphate

Many Bedford Lemere photographs are available through View Finder at <http://viewfinder.english-heritage.org.uk>. The exhibition 'Recording the New: the Architectural Photography of Bedford Lemere & Co 1870-1930' has opened in the RIBA/V&A Architecture Gallery at the Victoria and Albert Museum, London, and continues until 30 October 2011. The exhibition displays images and objects from the archive. Accompanying the exhibition is the English Heritage publication 'The Photography of Bedford Lemere & Co.' by Nicholas Cooper. This fascinating book showcases the wide range of the firm's subjects and perfectly illustrates the technical skill and level of detail evident in their work. See the English Heritage website for more details.

**Sarah Allen, Jenny Hodgson,
David Dungworth and Sarah Paynter**

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