

*An offprint from*

Anglo-Saxon Studies  
in Archaeology and History

18

Edited by  
Helena Hamerow

Oxford University School of Archaeology

Published by the Oxford University School of Archaeology  
Institute of Archaeology  
Beaumont Street  
Oxford

*Distributed by*  
Oxbow Books  
10 Hythe Bridge Street, Oxford, OX1 2EW, UK  
*Tel: 01865 241249 Fax: 01865 794449*

*Distributed in North America by*  
The David Brown Book Company  
PO Box 511, Oakville, CT, 06779, USA

[www.oxbowbooks.com](http://www.oxbowbooks.com)

© Oxford University School of Archaeology and individual authors, 2013

ISBN 978 1 905905 28 7  
ISSN 0264 5254

A CIP record for this book is available from the British Library

*Cover image: Gold bracteates from Denmark (T.F. Martin)*

Typeset by Oxford Book Projects  
Printed in Great Britain by  
Berforts Information Press, Eynsham, Oxford

# Foreword

*Anglo-Saxon Studies in Archaeology and History* is a series concerned with the archaeology and history of England and its neighbours during the Anglo-Saxon period.

ASSAH offers researchers an opportunity to publish new work in an inter- and multi-disciplinary forum that allows for a diversity of approaches and subject matter. Contributions placing Anglo-Saxon England in its international context are as warmly welcomed as those that focus on England itself.

Papers submitted to ASSAH must be comprehensible to non-specialist readers. They must, furthermore, conform to the journal's house style. A copy of the style-sheet is available on-line, at: <http://www.arch.ox.ac.uk/assah>. A hard copy can be obtained from the Editorial Assistant, Mrs. Lynda Smithson ([lynda.smithson@arch.ox.ac.uk](mailto:lynda.smithson@arch.ox.ac.uk)). All papers are peer-reviewed.

The Editor is grateful to the contributors to this volume for their prompt and efficient responses, and to those peer reviewers who have taken the time to read and comment upon submissions. Thanks also go to the Faculty of Arts and Letters, Idaho State University for a generous subvention towards the costs of the publication of this volume of ASSAH.

All papers for consideration for future volumes should be sent to the Editor.

Professor Helena Hamerow  
([helena.hamerow@arch.ox.ac.uk](mailto:helena.hamerow@arch.ox.ac.uk))  
Institute of Archaeology  
34-6 Beaumont Street  
Oxford OX1 2PG



# Contents

<i>List of Contributors</i>	vii
<i>Toby Martin</i>	
Women, Knowledge and Power: The iconography of early Anglo-Saxon cruciform brooches	1
<i>John Blair</i>	
Grid-Planning in Anglo-Saxon Settlements: The short perch and the four-perch module	18
<i>Thomas Klein</i>	
The Inscribed Gold Strip in the Staffordshire Hoard: The text and script of an early Anglo-Saxon biblical inscription	62
<i>Ian Riddler and Nicola Trzaska-Nartowski</i>	
Lundenwic and the Middle Saxon Worked Bone Interlude	75
<i>Alice Thomas</i>	
Rivers of Gold? The coastal zone between the Humber and the Wash in the Mid Saxon period	97
<i>Michael Hare</i>	
Anglo-Saxon Berkeley: History and topography	119
<i>Letty ten Harkel</i>	
Urban Identity and Material Culture: A case study of Viking-Age Lincoln, c. AD 850–1000	157

# Grid-planning in Anglo-Saxon settlements: the short perch and the four-perch module

John Blair

with an appendix by W. S. Kendall

## Introduction

This is the first statement of a new hypothesis: that a range of sites and settlements in Kent, Northumbria, Mercia and East Anglia (but perhaps rarely in Wessex) were laid out with the aid of pre-surveyed, geometrically precise grids, employing a short perch (about 4.6 m), in which a frequent basic module was the four-perch square. The idea of grid-planning is not new in itself. In 2003 Andrew Reynolds showed that both peasant and high-status settlements could be laid out on a basically rectilinear configuration, an idea that Andy Chapman has extended, in his recent publications of the Raunds and West Cotton settlements, to suggest formal grids using multiples of the standard perch.<sup>1</sup> What is new is the hypothesis that we can recognize a widespread practice of gridding in exact short-perch squares using techniques resembling – perhaps ultimately derived from – those of the Roman *agrimensores*.

The claim is a large one, and it will be useful to explain how it first arose. During an intensive study of excavated settlement plans from the seventh century onwards, I was repeatedly struck not just by the regularity of many of them, but also by the recurrence of box-like forms defined by groups of ditches, fences and buildings that seemed to be at precise right-angles to each other. Suspecting modular planning, I tested in turn a range of sites to see whether consistent dimensions could be identified through trial-and-error observation. Having established this to my satisfaction in four or five cases, I then enlarged the plans to the same scale, and was amazed to find that I had arrived in each case at the same unit, a length of about 60 feet (= 18.288 m). Working inwards to the finer detail, it became evident that groups and rows of buildings were often articulated in a unit that closely approximated to one-quarter of that length (15 feet, = 4.572 m), and that seemed likely to represent a short version of the rod or perch. At that point I recalled Peter Huggins's paper of 1991 adducing, from a substantial sample of excavated Anglo-Saxon timber buildings, a standard short perch of 4.65 m used in many though by no means all cases.<sup>2</sup>

Having thus arrived at a grid of c. 18.3 × 18.3-m boxes, potentially subdivided into a finer grid of c. 4.6 × 4.6-m

boxes, I applied the template to a range of seventh- to eighth-century churches and monastic sites and found it to fit in several cases. I then experimented with the first editions of the Ordnance Survey 25-inch maps, to investigate whether such planned systems could have survived into the modern landscape, and again found some convincing fits. At that stage I enlisted the help of a statistician, Professor Wilfrid Kendall, who kindly analysed measurements derived from a selection of the ecclesiastical sites, and has contributed an appendix (below, pp. 55–7). Although Professor Kendall's conclusions are provisional, they indicate a quantum of 4.75 m +/- 0.26 m (i.e. a range of 4.49–5.01 m), which is encouragingly consistent both with Huggins's proposed short perch and with mine. Discussions with local archaeologists subsequently revealed several new cases, which were still turning up at the point of going to press. These developments caused my own confidence to rise sharply, but readers must now judge for themselves: it is time to open the hypothesis to general debate.

In what follows, two working criteria and two observations are used as guides for accepting or rejecting sites and settlements as grid-planned:

- 1: Either the short perch, or the four-perch module, or both, will be consistently evident. This is crucial, since requiring the *same* unit to occur in all cases is a much higher threshold than merely requiring internally consistent modular systems to occur on individual sites.
- 2: A consistent and exact rectilinearity – some features on one axis lying at precisely 90 degrees to those on the other – will be visible in various places across the site, even though not necessarily in every place (see point 4). Regularity on both axes, not just one, is the essential difference between grid-planning and strip-planning.
- 3: Setting out a single building, even a large and complex one, is a different process from gridding an entire site and then fitting buildings into the grid. In the first case the axis of the building and the axis of the grid will be identical, so that for instance the grid-lines will coincide with either the inner faces or the outer faces of the

two side walls. In the second case buildings will simply be imposed on the grid as most convenient (compare point 4), so that conformity of the grid-lines with inner or outer faces of walls will not necessarily be consistent.<sup>3</sup>

- 4: There is a fundamental difference between the modular or proportional systems that in the high architecture of some cultures – whether for aesthetic, religious or symbolic reasons – are required to articulate finished buildings or complexes, and those that are simply functional, setting out a regular framework or allocation of land within which builders or farmers can then work.<sup>4</sup> It is the second of these, not the first, that is proposed here: the initial precise grids are likely to have been set out by skilled surveyors, but there is no suggestion that builders were then obliged to replicate the modules or proportions. Indeed, it seems that Anglo-Saxon surveyors used grids of squares precisely as did scribes and illuminators: as a foundation to be overlaid by the more complex final work.<sup>5</sup> As we will see, the prestige buildings of the monastic high culture were framed within the grids quite precisely, the more ‘vernacular’ timber buildings of other sites rather less so. In both cases, however, the sizes, proportions and relationships of buildings, while guided by the grids, were not constrained by them; the same perch could be used for planning buildings, but (except for some small and simple ones, Fig. 1) in multiples and fractions rather than single units. The builders were not necessarily the same people as the surveyors, nor necessarily had their skills: poor setting-out, or local constraints, produced deviations or deflections. All this means that while we should expect a more than random conformity to the grid, we should also expect non-conforming elements, especially on large and complex sites.

There will be sites that, although in fact based on grids, will fail these tests: because too small an area has been excavated, because later disturbance has been too intrusive, or because the builders were very free or very incompetent in their use of the framework provided. Several such potential cases have been observed, and ways of understanding them may emerge in future, but they are ignored here. A different kind of exclusion relates to sites that, although perhaps gridded, are based on different dimensions or modular systems. No attempt has been made to identify, for example, three-perch or five-perch modules. It is also certain, as will be shown below, that perches of different lengths were used at different times or in different places. In particular, the failure so far to identify any gridded systems in Wessex (with the striking exception of *Hamwic*) may well reflect the use of a longer West Saxon perch, as suggested by other evidence. This is one of the many further avenues to be explored in the future.

### A note on the plans

The function of the present illustrations is to display a range of different sites in a consistent fashion, and to allow

critical comparison and assessment. Since what matters here is how buildings relate to each other and to the grid, detail is to some extent summarized in the interests of clarity (for instance, clearly continuous rows of post-holes are represented as solid lines), so that the original publications should always be consulted for fine details of construction. Where phases pre-dating or post-dating the gridded systems are omitted, that is stated in the captions.

The underlying grids (in blue tone) are at four scales, appropriate to different levels of detail: a large scale for small individual buildings (Figs. 1, 3, inset and 11, inset); a scale showing 18.288-m boxes in solid line divided into 4.572-m boxes in broken line (Figs. 2, 3, 4, 6, 7, 9, 10, 13, 15, 18, 19, 21, 22 and 23); a scale merely showing 18.288-m boxes (Figs. 5, 11, 14, 16, 17, 20, 24, 25, 26, 27 and 28); and the smallest scale, again showing 18.288-m boxes, for two abnormally large sites (Figs. 12 and 29). In some of the second group the evidence for four-perch multiples is weak even when the basic grid of one-perch boxes is clear, but for the sake of consistency the same underlay is used.

Superimposing a grid on the plan of a settlement inevitably involves subjective choices. The fact that alternative correlations are sometimes possible does not undermine the argument, since such ambiguities will occur naturally when buildings planned on a modular system are located within a grid planned on the same modular system. The point applies especially to sites with stone buildings: if the distance between the west faces of two parallel footings of equal thickness is, say, 60 feet, the distance between their east faces will also be 60 feet. The grid correlations illustrated here have been chosen because they seem to make the best fit, but are open to modification in some cases.

### Units and modules: the short perch and the 60-foot square

Standard perches certainly existed in Anglo-Saxon England, although no surviving texts from the period say how long they were. The normal term was *gird*/*gyrd*/*geard* (i.e. ‘yard’ in the sense of ‘rod’ or ‘perch’), sometimes qualified as *met(e)gyrd*, ‘measure-rod’.<sup>6</sup> Properties in Winchester are partly described in *metegeurda* in tenth-century charters,<sup>7</sup> and Ælfric translates as *metegyrð* the reed (*arundo*) with which St Thomas, in his apocryphal ‘Acts’, measures out a new palace.<sup>8</sup> The early eleventh-century tract ‘Episcopus’ enjoins

that no measure-rod (*metegyrð*) be longer than another, but all are to be regulated by the confessor’s [i.e. parish priest’s] measure (*gemete*); and every measure in his parish (*scriftscire*) and every weight is to be regulated by his direction very correctly; and if there is anything in dispute, the bishop is to arbitrate.<sup>9</sup>

If this Wulfstanian text reflects reality rather than wishful thinking, it implies that bishops handed out standard measures to local clergy (at this point possibly still the

head-priests of minsters),<sup>10</sup> whose job it was to enforce their use within their parishes. The passage recalls Eadgar's prescription in the 960s of standard weights and measures throughout the kingdom,<sup>11</sup> and it would be consistent with Wulfstan's theocratic thought-world to place such secular regulation in the hands of bishops.

In a caution to those searching for modular planning in medieval buildings, Eric Fernie wrote: 'only documented lengths should be accepted, ... since allowing odd lengths ... increases the chance that the investigation will always produce an answer'.<sup>12</sup> In later contexts this makes good sense, but for the early middle ages there is a danger that very widely used units will not be 'documented' because no relevant documents survive. Nonetheless, Huggins's perch of 4.65 m does in fact have indirect support from a range of closely similar perches (between 4.48 and 4.67 m) used in the early modern era in north-western Germany: the suggestion that the Anglo-Saxons brought the short perch from their homelands<sup>13</sup> is therefore not unreasonable, even though no clear case of its use before c. 600 has yet been identified. This 4.65 m perch is, to all intents and purposes, the one being discussed here. To allow consistent comparison it is essential to use a single exact standard in plans, and here I have chosen the 4.572-m unit for the background grids, simply because I arrived at that result independently and without reference to Huggins's calculations. Common sense suggests, however, that the measuring-rods used by different generations of Anglo-Saxon surveyors could have varied within a range of 8 cm.<sup>14</sup>

Huggins concluded that consistent fractions of the perch were used in laying out elaborate timber buildings;<sup>15</sup> this is inherently plausible, but too fraught with uncertainties to be attempted here. In Figure 1 some simple and utilitarian buildings from a range of excavated settlements, mostly single square units, are overlain on 4.572-m squares, alongside a diagram comparing that unit with Huggins's. While a perch of this general size has clearly been used, it is obvious that the fuzziness of post-hole and post-trench edges precludes discrimination between two such closely similar dimensions. On large sites the multiplication of this discrepancy would produce a visible difference, and it is my own impression that the shorter unit fits marginally better than the longer one. But it seems simplest to conclude that a notionally standard unit, hereafter called the 'short perch', was in practice subject to micro-variation when cut out in rods for the use of surveyors.

Support for the idea that the short perch was standard everywhere except in Wessex comes from anomalies in the correlation between the actual perimeters of burghal forts and the perimeters calculated from their assessments in the Burghal Hidage. As both Nicholas Brooks and David Hinton have observed, to assume the later standard perch of 16.5 modern feet (5.03 m) produces some close results in Wessex, but gives a very poor fit for forts around its Mercian periphery (Bath, Malmesbury, Cricklade, Oxford, Wallingford), whereas a 4.65-m perch works much better for all these except Cricklade.<sup>16</sup> In fact, to assume a perch

of c. 4.6 m would produce an exact fit between hidage and physical perimeter at Bath (3,750 feet) and Malmesbury (4,500 feet). Eadgar's edict in the 960s that his realm should use 'one system of measurement (*gemet*) and one of weights as is observed in London and Winchester'<sup>17</sup> supports the idea that the later standard perch originated in Wessex, and may explain why the short perch has not been recognized in buildings or sites later than c. 1000.<sup>18</sup>

The existence of the short perch now seems very secure, but as a multiple of feet – which it certainly must have been – it is harder to interpret. Although the standard perch of 16.5 feet (5.03 m) has been the norm since the twelfth or thirteenth century (and has sometimes been unjustifiably taken for granted in discussions of early medieval land-measurement),<sup>19</sup> perches of almost every possible number of feet between 7 and 27 are recorded at different times and places on the Continent and in England.<sup>20</sup> We are never told how many feet composed an English *metegyrð*, and in any case the feet of which perches were multiples were almost as variable as the perches themselves.

Nonetheless, two alternative approaches are sufficiently concrete to be worth discussing. The first takes as a starting-point the short foot of 0.281 or 0.280 m adduced from analysis of dimensions at Yeavinger and Jarrow respectively,<sup>21</sup> and links that to the later definition of a perch as 16.5 feet:

$$0.280 \times 16.5 = 4.62$$

Alternatively, we might start with Eric Fernie's argument that the modern standard foot of 0.305 m was current by at least the late Anglo-Saxon period,<sup>22</sup> and infer from it a 15-foot perch:

$$0.305 \times 15 = 4.575$$

There is no direct evidence for the 15-foot perch in pre-Conquest England (a later and isolated definition of it as the national standard is puzzlingly incompatible with the other evidence),<sup>23</sup> but equally there is none for the 16.5-foot perch: we can opt either for the short foot (only recognized in Northumbria) or for the modern foot (only recognized from c. 1050).

In possible support of the second option (15 modern feet) is that the four-perch module would then be a square with 60-foot sides. This in turn would open up the possibility that the modular system was influenced by a well-known literary source. Possibilities of tracing influence from the Roman tracts on land-surveying are discussed below, but a different reworked Classical tradition could be relevant here. In his *Res rustica*, the first-century agricultural writer Columella describes units of land-measurement including what he calls a *clima*, a square with sides of 60 feet.<sup>24</sup> Anglo-Saxons did not read Columella at first-hand, but they certainly did read the early seventh-century *'Etymologiae'* of Isidore of Seville. In Book XV of that work Isidore has a passage on land-units, largely a paraphrase of Columella, that includes the statement '*climata quoque undique uersum pedes habent sexaginta*' ('*climata* have sides of 60 feet'); in the manuscripts this is followed by a small drawing of a square with 'LX' written against each of two contiguous sides.<sup>25</sup> In educated English



circles Isidore's 'Etymologiae' was one of the most widely known and used of all texts, cited in turn by Theodore, Aldhelm, Bede, Lantfred, Abbo, Ælfric and Byrhtferth, and there are many surviving manuscripts either made or used in late Anglo-Saxon England.<sup>26</sup>

As so often with the medieval reception of Classical learning, it is extremely hard to infer real-life use from scholarly copying, or even to be confident that the *clima* was a functioning unit of land-measurement for anyone after Columella.<sup>27</sup> But perhaps that does not matter: if, as suggested below, grid-planning was practised by such highly educated founders of Anglo-Saxon monasticism as Wilfrid and Benedict Biscop, it would only need one of these to have read Isidore and to have adopted the 60-foot

*clima* as an appealing classicism. Whether or not the English used Roman surveying techniques, as is tentatively proposed below, they did not use the repertoire of Roman areal measurements and were operating on an altogether smaller scale than the Roman land-surveyors: probably they worked out their own system by combining indigenous units of length with traits that could be perceived (at some remove from reality) to embody *Romanitas*.

### The gridding technique: an inheritance from the *agrimensores*?

Some educated Anglo-Saxons had access to technical writings on Roman surveying. During the first to third

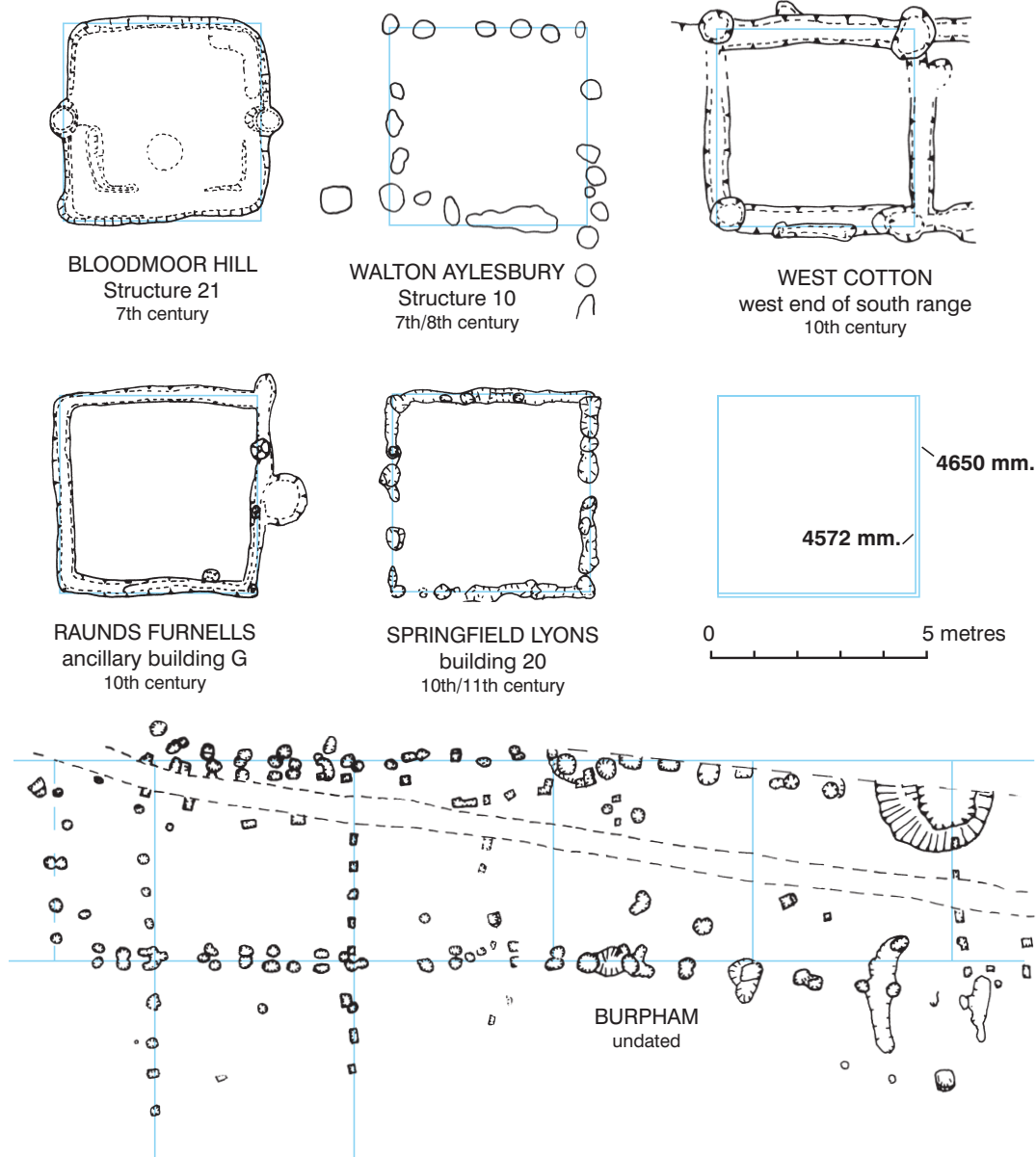


Figure 1. Examples of simple buildings exactly one short perch square. The diagram compares the short perch hypothesized here with the one hypothesized by Huggins. (Bloodmoor Hill after Lucy, Tipper and Dickens 2009, fig. 3.22; Walton after Ford, Howell and Taylor 2004, fig. 3.4; West Cotton after Chapman 2010, fig. 4.19; Raunds after Audouy and Chapman 2009, fig. 5.24; Springfield Lyons after Tyler and Major 2005, fig. 84; Burpham after Sutermeister 1976, fig. 3.)

centuries, a series of practical manuals were written by and for specialist land-surveyors (*agrimensores*), notably Frontinus's 'De limitibus' and Hygenus Gromaticus's 'De limitibus constituendis'.<sup>28</sup> This expertise was applied to setting out precise and very extensive grids, for the building of towns and forts and for the apportionment (especially to veterans) of tracts of land. Large-scale grid-planning of territories ('centuriation') is widely recognized in the Mediterranean provinces, though only one plausible case has been proposed for Britain.<sup>29</sup> This 'gromatic' technique involved forming main axes (the *decumanus* and *kardo*) in the configuration of a cross, after which the remaining grid-squares were filled in to the desired extent. The prime surveying tool was the *groma*: a staff with a cruciform head fixed horizontally, from the four corners of which hung plumb-bobs. An initial straight line across the landscape was surveyed using one opposed pair of plumbs, after which – with the *groma* set up in alignment at the desired junctions – a series of lines at right-angles to it could be surveyed with the other pair. This method, the tools for which were the *groma* and measuring-rods, was fundamentally different from the (now more familiar) one of forming right-angles by setting out 3-4-5 triangles, which requires ropes or chains.

The written transmission of gromatic knowledge needs to be considered in two chronological stages, of which the first is potentially relevant to the English monastic sites and dependencies of c. 600–800. By the fifth century the surveyors' writings had been assembled into a compendium, the 'Corpus agrimensorum', a fine copy of which may have belonged to the early sixth-century scholar Cassiodorus.<sup>30</sup> This compendium could easily have been available to rich seventh-century English patrons – not least from Cassiodorus's library in southern Italy, whence Benedict Biscop acquired books for Monkwearmouth–Jarrow. But it is also possible that Italian visitors to England, or English visitors to Italy, imported a continuing tradition. A comment by Cassiodorus shows that he had seen *agrimensores* in action.<sup>31</sup> Of more direct (indeed tantalizing) relevance, in 597 – the very year of his mission to England – Pope Gregory wrote to the Bishop of Syracuse offering the services of 'John the *Agri-mensor*' to resolve a land-dispute.<sup>32</sup> Expertise transmitted from Rome to Syracuse could equally have been transmitted from Rome to Canterbury. If that expertise survived in Rome for another century, there would be plenty of scope for well-placed English tourists, notably Wilfrid, Benedict Biscop and Aldhelm, to be instructed in surveying techniques just as they were in other aspects of *Romanitas*.

As we shall see, grid-planning probably lapsed in England between 800 and 950; if gromatic literature then informed the revival, it was from a different stage in textual transmission. In the Carolingian era the Roman texts on surveying were reworked in complex ways, in combination with more recent texts such as the Pseudo-Boethius 'Geometria I', to produce a variety of geometrical compendia.<sup>33</sup> The focus of this activity was ninth-century Corbie, which has been called 'the gromatic and geometric capital

of the medieval world'; and texts thus produced (illustrated with copious coloured diagrams which, though derivative, are executed with technical precision) were known in reformed monastic circles in England.<sup>34</sup> It has been argued that the purpose of these compilations was academic (to create a geometrical curriculum for the quadrivium) and that they therefore had no practical use,<sup>35</sup> but the first could be true without the second necessarily following. Whether or not the Carolingians practised gridded surveying (which remains to be explored), there are hints of a parallel Carolingian transmission of Roman map-making techniques, which may even have influenced the early ninth-century St-Gall plan.<sup>36</sup> In turn, it does not seem wholly implausible that intelligent and highly educated English ecclesiastics from the 940s onwards worked out how to use these manuals of instruction for their original practical purposes.

The absence of any evidence that early medieval people knew how to use the *groma* is less of a problem here than it might seem. There are other ways to offset right-angles – some of them extremely basic, but accurate given practice.<sup>37</sup> For instance, the late fourteenth-century Provençal surveyor Bertrand Boysset established right-angles with a large set-square, though his other techniques resembled those of the *agrimensores*, including a firm preference for rods over ropes.<sup>38</sup> However it was done, the sporadic recurrence on the excavated English sites of box-like forms, even when the actual boundary systems did not require these, suggests a technology that tended naturally to form multiple squares. The fact that the later Anglo-Saxons and their Continental contemporaries evidently used rods, not ropes, for surveying also supports the hypothesis of a basically gromatic technology against the alternative of a geometrical system using triangulation.<sup>39</sup> There seems to be no written English reference to surveying as a specialist skill, though Ælfric, paraphrasing the apocryphal 'Acts of St Thomas', highlights from his source-text (possibly because he had observed it in practice?) the procedure of first measuring out a site with a rod and then deciding where to place buildings.<sup>40</sup> Evidently this is one of the several forms of Anglo-Saxon technical expertise that can be recognized only in their end-products.

On balance, it seems likely that behind the English phenomena now to be discussed lie versions of the methods by which the *agrimensores* gridded sites, using rods in combination with devices (of whatever kind) for aligning right-angled offsets. At all events the grids that are here decoded from archaeological evidence seem more precise than those more familiar and obvious to us in twelfth- and thirteenth-century planned towns: they suggest a superior technology, and one that probably did not long survive the Norman Conquest.<sup>41</sup>

### Formal Anglo-Saxon settlements without grid-plans

The textbook example of formal planning in Anglo-Saxon settlements is in fact a late-pagan site: the royal complex of c. 600–30 at Yeavering (Northumberland) with its

spectacular alignments of halls. It is unquestionable that Yeavinger shows high-precision surveying, applied to a deliberate west–east axis supplanting a different one from a previous phase of the site.<sup>42</sup> The exceptional grave of a ritual specialist, laid out precisely on this axis, contains a staff-like object that actually resembles a Roman *groma*, although the absence of a cranked section in the shaft would have made it difficult to use.<sup>43</sup> This raises intriguing possibilities about links between Kent and still-pagan Northumbria in the years after 597: could exotic items sent during diplomatic contacts in the lead-up to Paulinus's mission have included a *groma*? We also now have a growing number of sites, notably Cowderys Down and Sutton Courtenay, which share Yeavinger's emphasis on monumental timber buildings, linear axes and formal spaces.<sup>44</sup>

But Yeavinger and its counterparts were not gridded. However precise the axes in one dimension, and however clear the attempt to create formal areas delimited by a broadly rectilinear configuration of buildings, it has proved impossible to recognize either true right-angles between axes or recurrently consistent four-perch grids. The same applies to many other excavated settlements through the seventh to eleventh centuries: a test of the plans of rectilinear settlements published by Reynolds in 2003<sup>45</sup> only reveals short-perch gridding in a minority of cases. It seems that while the Anglo-Saxons (like many other cultures) were capable of surveying lines across the landscape, the grid-system was something different and more specific. To find its origins, we must turn to the ecclesiastical culture that was the main link between seventh-century Rome and the English.

### Grid-plans in metropolitan religious culture

Although most of the complexes discussed here were built entirely in timber, it is likely that gridding was first applied to the top-level, architecturally ambitious masonry projects that – like gridding itself – looked back to Rome. Indeed, short-perch gridding is apparent at the very start of English church-building, when Augustine and his party, supported by King Æthelberht of Kent, were setting out their monastery outside the walls of Canterbury.

The main church of SS Peter and Paul (Fig. 2) is datable to c. 597–618; if we follow Eric Cambridge's argument, it is likely to have been built by Frankish masons reinforced shortly afterwards by masons from north Italy.<sup>46</sup> Enough remains to show that the nave was exactly two short perches wide internally, and that the array of *porticus* wrapped around its north, south and west sides were essentially (allowing for less than perfect surveying) one-perch by two-perch boxes, giving the church a total width of four perches. The east end is lost, but the same system is apparent in the associated, more complete and perhaps more precisely set-out church of St Pancras (Fig. 2).<sup>47</sup> Here the whole primary building is framed within a two-perch by five-perch grid, allowing three two-perch units for the nave, the other two for the markedly stilted apse

(the geometry of which is clarified by observing that the grid-line between these two eastern units is the chord of the apse proper). This accurate and purposeful use of short-perch gridding at such an early date is highly suggestive, given the direct link between this formative stage in English planning and Italian and Gaulish architectural circles where Roman surveying techniques may still have been known.

With the Northumbrian Renaissance, and especially the wealthy and highly educated monastic founders Wilfrid and Benedict Biscop, we find the technique extended from individual churches to monastic complexes. Wilfrid's surviving crypts at Ripon and Hexham famously combine his visual memories of major Christian monuments in Continental Europe: Rome rebuilt in Northumbria.<sup>48</sup> It is hard to imagine anyone more likely to embrace technologies redolent of *Romanitas*, or less likely to tolerate second-rate practice: we should expect precision grid-surveying in Wilfrid's works if anywhere.

At Hexham the fragmentary above-ground structures have been republished in a plan that distinguishes between fabric that is extant or carefully plotted by the Victorian architect Hodges, and Hodges's more summary observations.<sup>49</sup> Imposition of a grid of short perches (Fig. 3) shows a remarkably exact fit with the accurately recorded elements. The axis is a west–east row of one-perch squares. Represented at surface level are the outer north and south walls of the church, which was three squares wide internally, and the south wall of some internal liturgical structure framed by the axial row of squares. Running north from the church was a narrow range, the east face of its east wall on the grid-line that also defines the east end of the crypt. Further east, a detached apsidal chapel that is generally accepted as an early, perhaps original, feature was again framed by two grid-squares of the axial row. Hexham, more clearly than any other case, implies a co-ordinated and high-precision exercise in which, after the laying of the footings, the site was re-gridded with strings to which the standing walls conformed rigorously.<sup>50</sup>

At Ripon only the crypt survives, but superimposition of the Ripon and Hexham crypts on each other, and on a single short-perch square in the Hexham grid, reveals a shared planning principle (Fig. 3). In both crypts, the internal east walls of the main chamber and of the subsidiary western chamber are on the north–south grid-lines, whereas the west–east grid-lines align with the outer walls of the flanking passages at Hexham but the inner walls at Ripon. From this it emerges that the contrast between the compact planning at Hexham and the looser layout at Ripon is not random, but a purposeful variation articulated by the same pre-determined grid.<sup>51</sup>

Wilfrid's contemporary and rival Benedict Biscop, who (in Bede's words) built 'in the manner of the Romans which he always loved',<sup>52</sup> seems also to have used the short-perch grid for his monastic complexes at Monkwearmouth (673) and Jarrow (682). The straightforward though monumental plan of Jarrow comprises a pair of axially aligned churches

accompanied, to the south, by a pair of axially aligned domestic ranges (Fig. 4).<sup>53</sup> As at Hexham, a west–east row of one-perch squares forms the axis of the churches, the western church occupying a block measuring six squares by three, and the eastern a block measuring three squares by one. The domestic ranges are set out with the centre lines of their north walls on a grid-line three squares southwards from the one probably marking the internal south wall-face of the main church.<sup>54</sup> Registration of walls with grid-lines is looser than at Hexham, but close in several cases. At Monkwearmouth, interpretation is complicated

by the apparent presence of three early phases,<sup>55</sup> raising the possibility of more than one surveying exercise; however, a grid of short perches would in fact correlate well with the features ascribed to phases 1 and 2 combined, allowing the same relationship as at Jarrow between the main church and the grid. It is in any case clear that the two complexes were laid out on the same planning principles; as Rosemary Cramp observes of Monkwearmouth, they seem ‘from the beginning to have been carefully planned to bear little relationship to indigenous settlements and to invoke the plans of late antique villas’.<sup>56</sup>

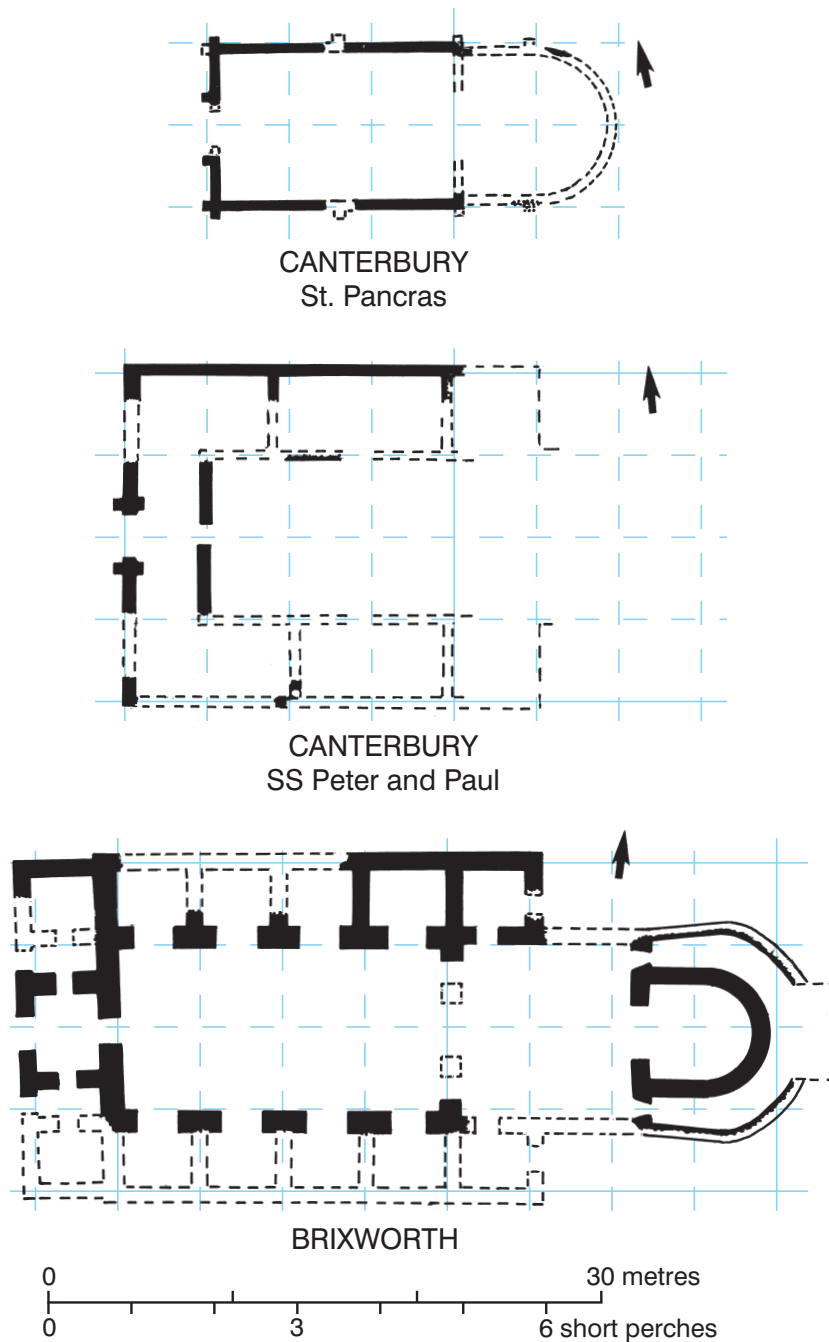


Figure 2. Gridding in churches of early Christian Southumbria: Canterbury, St Pancras, primary phase (after Cambridge 1999, fig. 10.5, with modifications); Canterbury, SS Peter and Paul (after Cambridge 1999, fig. 10.2, with modifications); Brixworth (after Audouy et al. 1984 and Gem 2011).

Finally, the small and undocumented church at Escomb (County Durham) is likely to be closely related to the major Northumbrian minsters.<sup>57</sup> Eric Fernie has noted the high quality and precise setting-out of the masonry (recycled from Roman buildings),<sup>58</sup> and indeed the plan can now be seen to derive very exactly from a line of four one-perch squares, of which the easternmost frames the chancel externally and the other three define the internal space of the nave (Fig. 3). The case illustrates how the grid-system could be used accurately but also flexibly to achieve required proportions; the precision, combined with the skilled and purposeful reuse of Roman ashlar also seen at Hexham, could hint that this too is associated with Wilfrid.

While there is persuasive evidence for grid-squares of a single short perch in the cases discussed so far, the four-perch module (in other words the grouping of squares into blocks of sixteen) is not yet clearly apparent. As we shall see, the four-perch square seems to have been adopted during the seventh century (conceivably when Isidore's *'Etymologiae'* was becoming well known in England?) for planning the more extensive, open-ground dependencies of major minsters.

Short-perch gridding was certainly not universal in Anglo-Saxon church-building. Birthe Kjølbye-Biddle has argued that the primary Old Minster at Winchester used a long perch of 5.5 m: Wessex going its own way once again.<sup>59</sup>

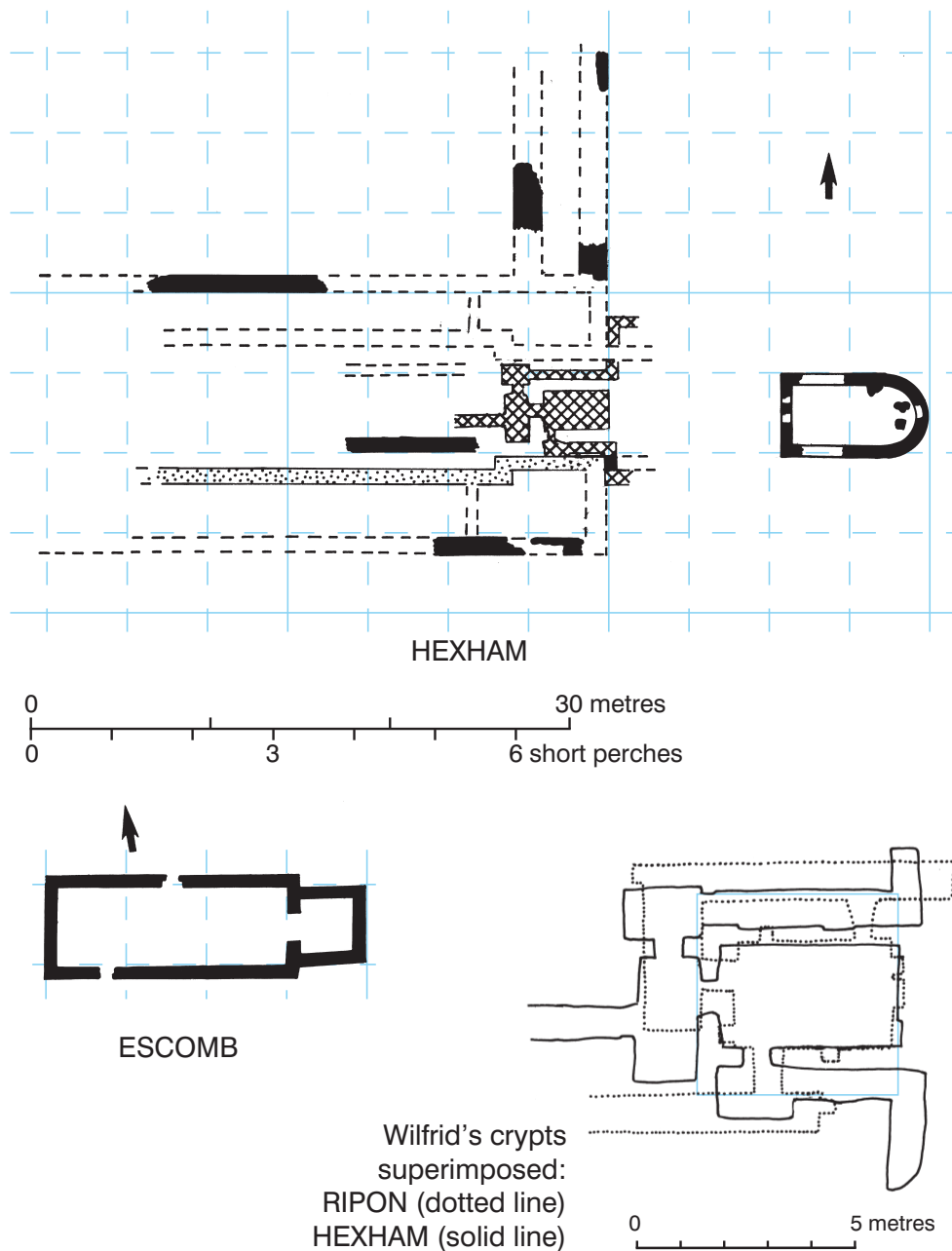


Figure 3. Gridding in churches of the Northumbrian Renaissance (1): Hexham after Cambridge and Williams 1995, fig. 16; Escomb after Pocock and Wheeler 1971, fig. 1. The superimposed plans of the crypts are after large-scale plans of Hexham (P. Bidwell in *Arch. Aeliana* 5th ser., 39 (2010), 86 fig. 17) and Ripon (by W. T. Jones, original lent by Richard Bailey).



Further examination of later church plans is not attempted here, beyond noting one striking and predictable case: the great basilican church of c. 790–820 at Brixworth (Northamptonshire).<sup>60</sup> Apart from the slightly misaligned west end the match here is very close indeed (Fig. 2), perhaps extending to the allocation of one whole four-perch square to the laity (nave with its flanking *porticus*) and another to the clergy (choir and presbytery with *porticus*, apse and crypt). Brixworth is the most ambitiously Romanizing structure to survive from the later years of the Mercian supremacy, a time of growing contacts between Charlemagne and his Mercian counterparts Offa and Coenwulf. Here if anywhere, reversion to the expert gridding of a century earlier is unsurprising, though the reminiscence of earlier Canterbury planning highlighted in Figure 2 gives food for thought.

It is possible that the domestic area at Whitby, another great seventh-century minster in Northumbria, was also based on a grid of short perches. Unfortunately the very

poor quality of the excavation is only partly mitigated by Philip Rahtz's heroic attempts to make sense of the plan:<sup>61</sup> my experiment of superimposing the grid was suggestive both of one-perch squares and of a broad articulation using four-perch squares, but the cluttered character of the site, apparently with several overlying phases, precludes an acceptable level of proof. This is a pity, since Whitby could have been a bridge between the monumental stone buildings just discussed and the monastically associated timber complexes to which we now turn.

### Grid-plans in monastic dependencies

The great minsters of pre-Viking England extended their imprint on the countryside through a range of cells, hermitages, and dependent, quasi-monastic estate centres. It is highly suggestive of the milieu in which gridding was employed that it seems, among excavated seventh- and

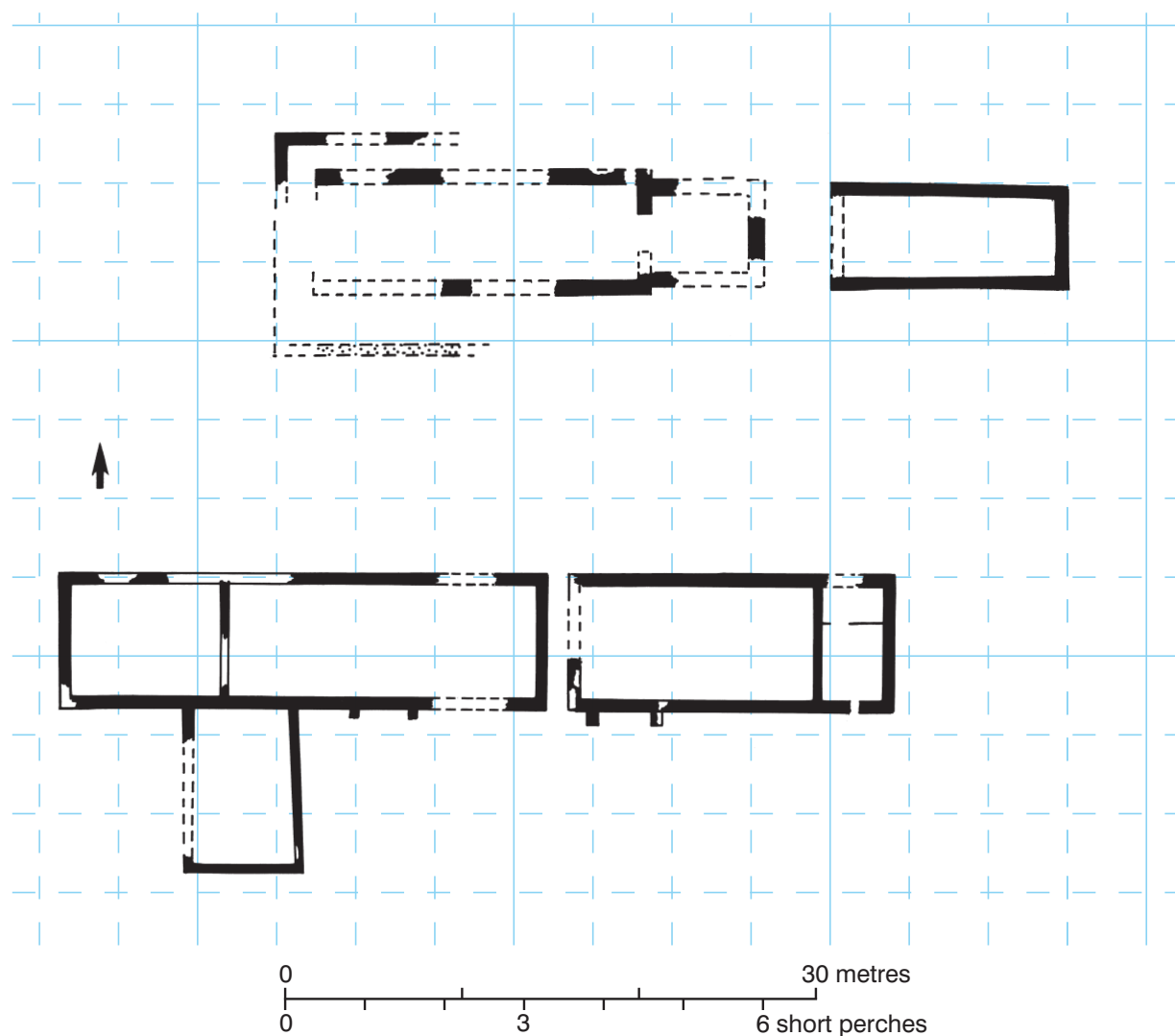


Figure 4. Gridding in churches of the Northumbrian Renaissance (2): the primary monastic buildings at Jarrow. Standing and excavated buildings are shown in solid black; the wall of the south porticus, inferred from indirect evidence, is stippled. (After Cramp 2005–6, Vol. 1, figs. 13.3, 13.4, 16.4 and 16.7.)

eighth-century settlements, to be largely or wholly confined to places such as this, in contrast to the more loosely rectilinear enclosure systems characteristic of eastern English settlements in general.

Cowage Farm, Bremilham (Wiltshire) is a seventh-century cropmark site beside the Avon, plotted from aerial photographs and examined by small-scale excavation.<sup>62</sup> There are clearly at least two superimposed phases of buildings, which cannot be placed in sequence but can to some extent be separated thanks to their alignments (Fig. 5). An apsidal-ended church, in its own enclosure at the east end of the complex, is aligned on Bremilham church some 450 m westwards, and two of the more westerly buildings conform to this alignment. Presumably of a different phase is the gridded main settlement, comprising a major hall with annexes and west–east lines of lesser buildings within a rectilinear ditch-system. Superimposition of a four-perch grid shows a precise conformity of some buildings, and an approximate conformity of the main enclosing boundaries. At a larger scale, juxtaposition of the central group with a one-perch grid (Fig. 6) suggests that the hall and its annexes to north and south were framed on a strip two perches wide, the grid-lines of which determined the inner west, east and south walls of the hall and the (slightly bow-sided) side walls of the annexes; five four-perch squares in T-shaped configuration contain the whole group.<sup>63</sup>

Another cropmark site with rectangular timber buildings, at Polebrook (Northamptonshire), has been explored by geophysical survey and sample excavation.<sup>64</sup> The recorded features are probably of more than one date, but include a central group of three buildings within enclosures which, together with another building further north, are very regular in form and alignment (Fig. 7). Imposition of a short-perch grid aligned on rectilinear boundary ditches shows a correlation with one or more walls of all three central buildings, and also with a light (perhaps temporary?) range underlying the one that was partly excavated. The wall-trenches are unusually wide, and in the excavated building had slender posts set against their outer faces.<sup>65</sup> This abnormal construction is hard to interpret, but one possibility is that the walls were of solid (presumably earthen) construction revetted by the posts, in which case these may have looked like stone rather than timber buildings. This planning episode has also left its imprint in the modern landscape: the buildings and boundaries visible as cropmarks conform in alignment to the major boundaries of Polebrook village, some 400 m due east (Fig. 8).

Excavations at Walton, Aylesbury (Buckinghamshire) have revealed a limited area – perhaps just a fraction – of a complex of small timber buildings on a rectilinear plan, dated broadly to the Mid Saxon period (Fig. 9).<sup>66</sup> While alignment is not exact, it seems close enough to propose

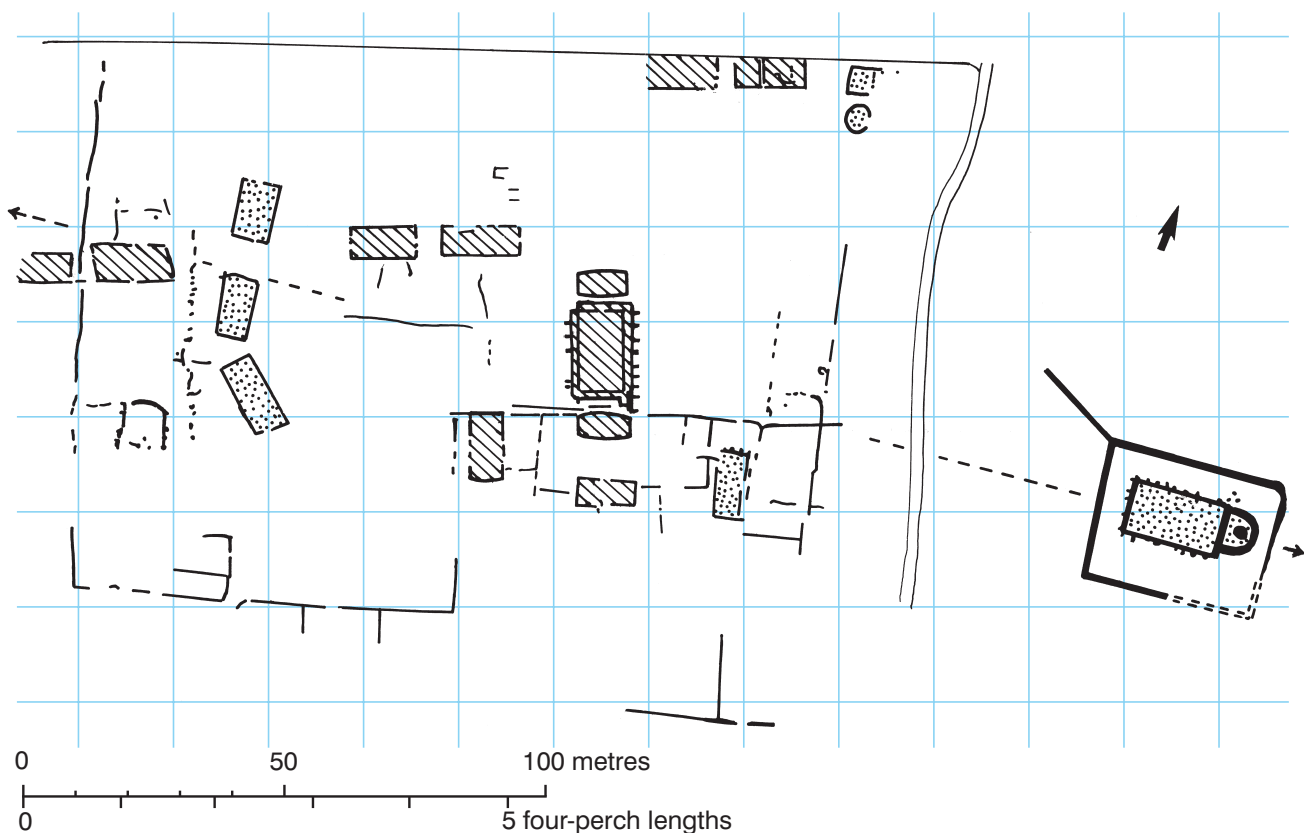


Figure 5. Cowage Farm, Bremilham (Wilts.): cropmark site. Buildings that conform to the grid are shown hatched, the others stippled. The broken line with arrows indicates the axis between the excavated church and Bremilham church to the west. (After Hinchcliffe 1986, fig. 1.)

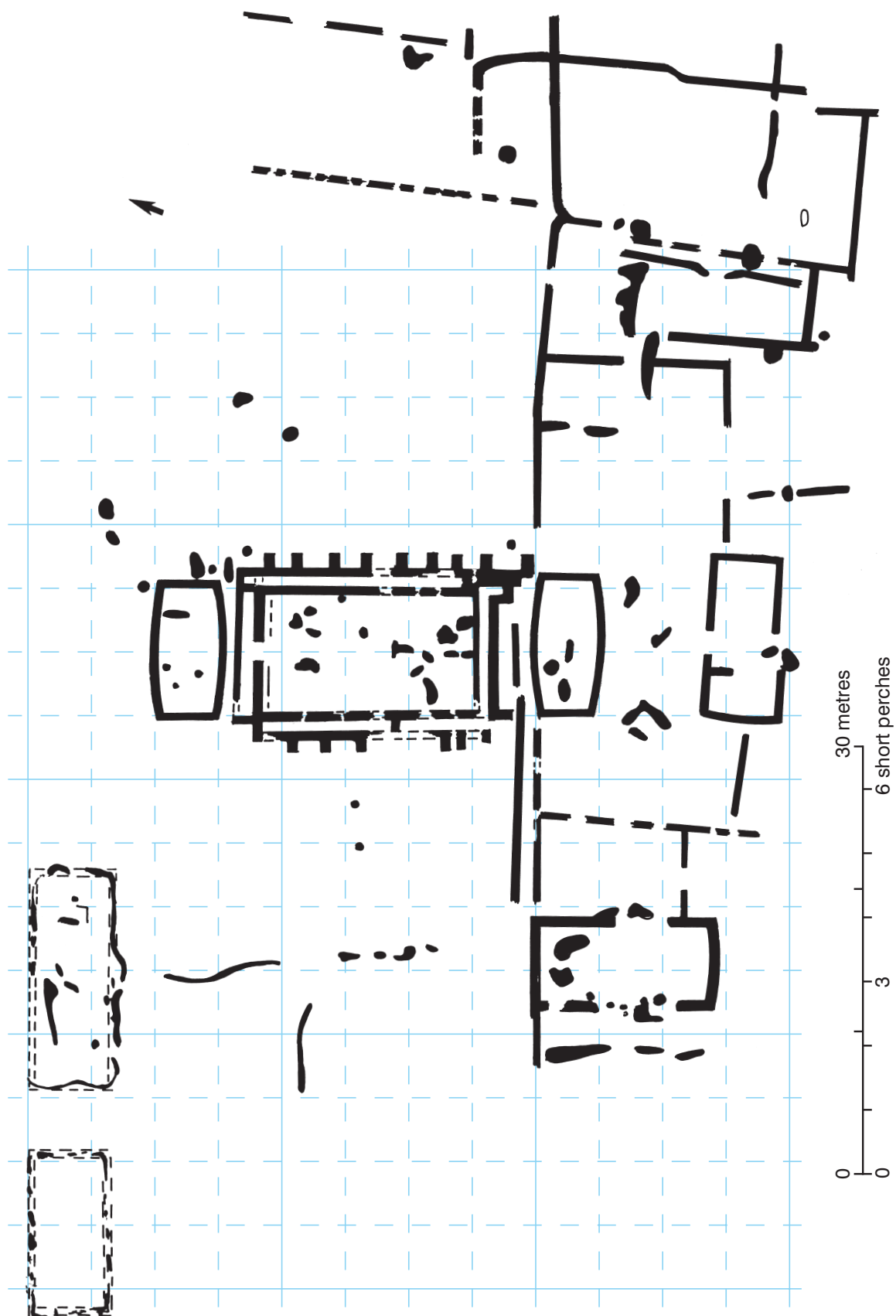


Figure 6. Cowage Farm, Bremilham: detail of central building complex. (After Hinchcliffe 1986, figs. 1 and 6.)



this as a gridded settlement where the builders observed the grid rather loosely. One building has a square annexe with sides of exactly one short perch (Fig. 1). The admittedly incomplete plan suggests the possibility of an open courtyard, eight perches (or two four-perch modules) square, around which the buildings were ranged.

A small sample of what could be a fourth such site has recently been excavated near Islingham in Frindsbury (Kent):<sup>67</sup> a single hall-like building in one corner of a rectilinear group of closes, with a concentration of heavy pit-digging. Some 400 m westwards is the hamlet of Islingham; the intervening field-boundaries, as shown on early Ordnance Survey maps, have a rectilinear configuration in alignment with the excavated ditches and

the hall. The excavated sample is consistent with the four-perch system, but too small to constitute a strong case. What makes it worth mentioning here is that this is potentially the most closely documented of all excavated examples. In 761×4 King Sigereð of west Kent gave Islingham to the see of Rochester,<sup>68</sup> and since the main period of occupation in the excavated area is dated c. 750–850 on pottery evidence,<sup>69</sup> it seems likely that the planned layout was created by Rochester on acquiring the estate.

An intriguing feature of these four cases is their proximity to major minsters. Bremilham is 3 km, and directly accessible by water, from Malmesbury: a probably Irish-founded minster on the frontier between Mercia and

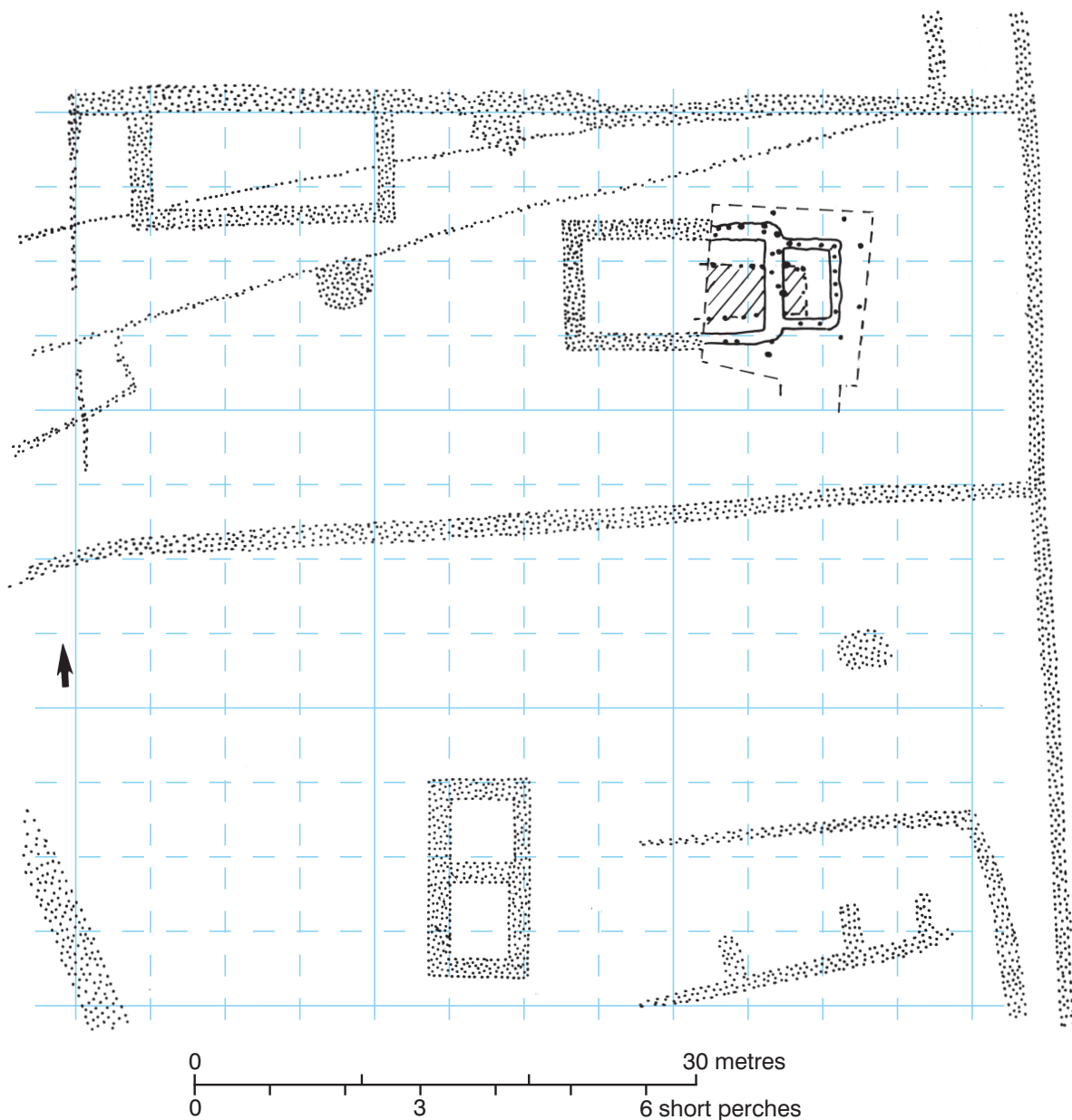


Figure 7. Polebrook (Northants.): detail of central zone of cropmark site, including excavated area. Features known from cropmarks and geophysics are stippled. The underlying building identified by excavation is hatched. Two features shown by the excavation to post-date the buildings are omitted. (After Upex 2003, figs. 6 and 8.)

Wessex, where the great scholar Aldhelm was abbot from the 670s. Polebrook is 3 km, and directly accessible by water, from Oundle (Fig. 8): a monastic possession of (yet again) Wilfrid, who dedicated a church there and died there in 709.<sup>70</sup> Walton is immediately down-slope from Aylesbury minster in its Iron Age hillfort, a community lacking contemporary record but with a rich later hagiographical tradition associating it with seventh-century aristocrats and princess-saints.<sup>71</sup> Islingham is 3 km from Rochester, the second episcopal see of early seventh-century Kent.

Embedded as they were in a homogeneous social and cultural milieu, at the highest level of English educated society, these minsters belonged to a network allowing ready exchange of specialized learning (such as Roman land-surveying?) in the later seventh century. In the light of Wilfrid's work at Hexham and Ripon, it is startling to note that the exceptionally regular buildings at Polebrook were probably also on his property. Here we may see an early stage in the application of such expertise beyond monastic precincts to a wider range of settlements.

Although undocumented, the recently published site at Bloodmoor Hill (Carlton Colville), a mile from the Suffolk coast, reveals what looks like a forgotten prelude to the era of female monasticism.<sup>72</sup> This settlement had already existed for a century or more when, during *c.* 620–50, its character changed markedly. The core area became more tightly focused; a preponderance of wall-post structures gave way to one of sunken-featured buildings; a

metalworking industry on an exceptional scale was established; and the central zone became used for burials, crowded around by domestic and industrial activities. This cemetery is very unusual: the furnished graves are mainly female, embodying strong expressions of female identity and status, with none of the weapon-graves that express male status in contemporary East Anglian cemeteries. As Christopher Scull observes, the location of the graves 'appears to have been strongly constrained by rank and social identity' and 'some initial structuring principles governed the development of the cemetery from the outset', making it likely 'that reordering the settlement space in this way was linked to a significant ideological or social realignment'.<sup>73</sup> The excavators, in reviewing a range of possible interpretations, tend to favour either an establishment 'headed by a woman, perhaps a widow with a predominantly female domestic household', or 'a short-lived establishment housing a small female religious community'.<sup>74</sup>

We can now recognize another of these 'initial structuring principles': around 620–40, contemporaneously with the start of the metalworking industry and of the cemetery,<sup>75</sup> the core area was gridded in short-perch squares, to which eight visible structures conform (Fig. 10). One sunken-featured building (21) fits precisely into a perch square (see the detail in Fig. 1). Another SFB (20) is positioned two squares north of 21. Two squares define a ground-level building (43), at the west end of which is an SFB (12) fractionally larger than a third

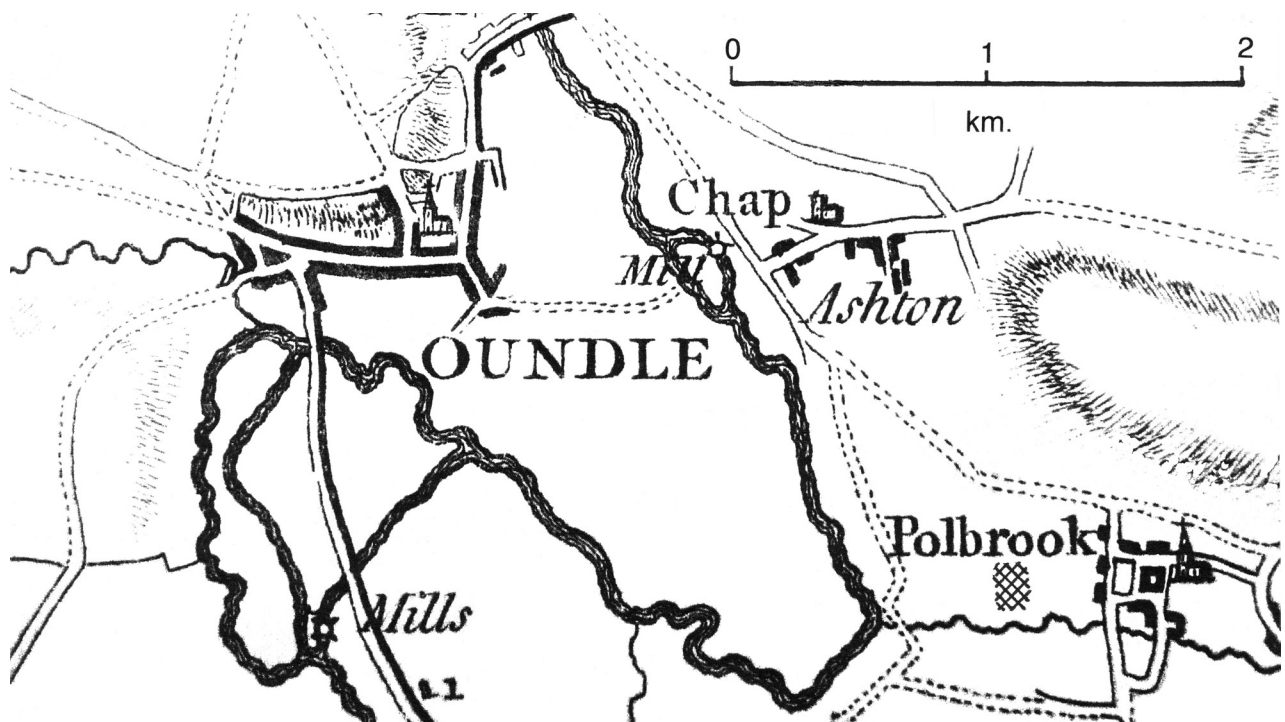


Figure 8. Oundle and Polebrook (Northants.). Wilfrid's minster occupied a classic river-confluence site, with the cropmark site at Polebrook (marked here by a cross-hatched rectangle) conveniently accessible down-river. Even at this scale, the rectilinearity of Polebrook village is apparent. (From Faden's map of Northamptonshire (1779), with site location and scale added.)

contiguous square. Ground-level buildings 45 and 47, and SFB 19, are on the same alignment but less precisely fitted to the grid. Further east, SFB 30, its west end on a four-perch grid-line, is axially aligned on the reserved four-perch square, at the focus of the complex, which contains the cemetery.

If the ladies of Bloodmoor Hill constituted themselves as a nunnery as early as c. 630 they were exceptionally avant-garde, although in a spot so near the eastern seaway, open to influence both from Kent and from the local missionary Felix, that may not be so unlikely.<sup>76</sup> If the intensive metalworking at the heart of the site, and the lack of any visible church, tell against such a conclusion, their interest in the formal structuring of space for living and dead is at least an eddy in the cultural cross-currents that would shortly drive the monastic boom. This grid-plan,

like the others just discussed, seems best ascribed to ecclesiastical expertise.

### Ely, Quarrington and Stratford: an interface between developing rural settlement forms and the monastic high culture?

Three further sites – at West Fen Road, Ely (Cambridgeshire), Quarrington (Lincolnshire) and Stratford near Biggleswade (Bedfordshire) – take us a step further by showing that widespread forms of settlement enclosure, proliferating in eastern England during the same period, could be formalized by the adoption of planned grids. West Fen Road lies on the fringe of the monastic core at Ely: one of the richest and most powerful ‘double houses’ of eastern England, founded by the princess-abbess Æthelthryth, who

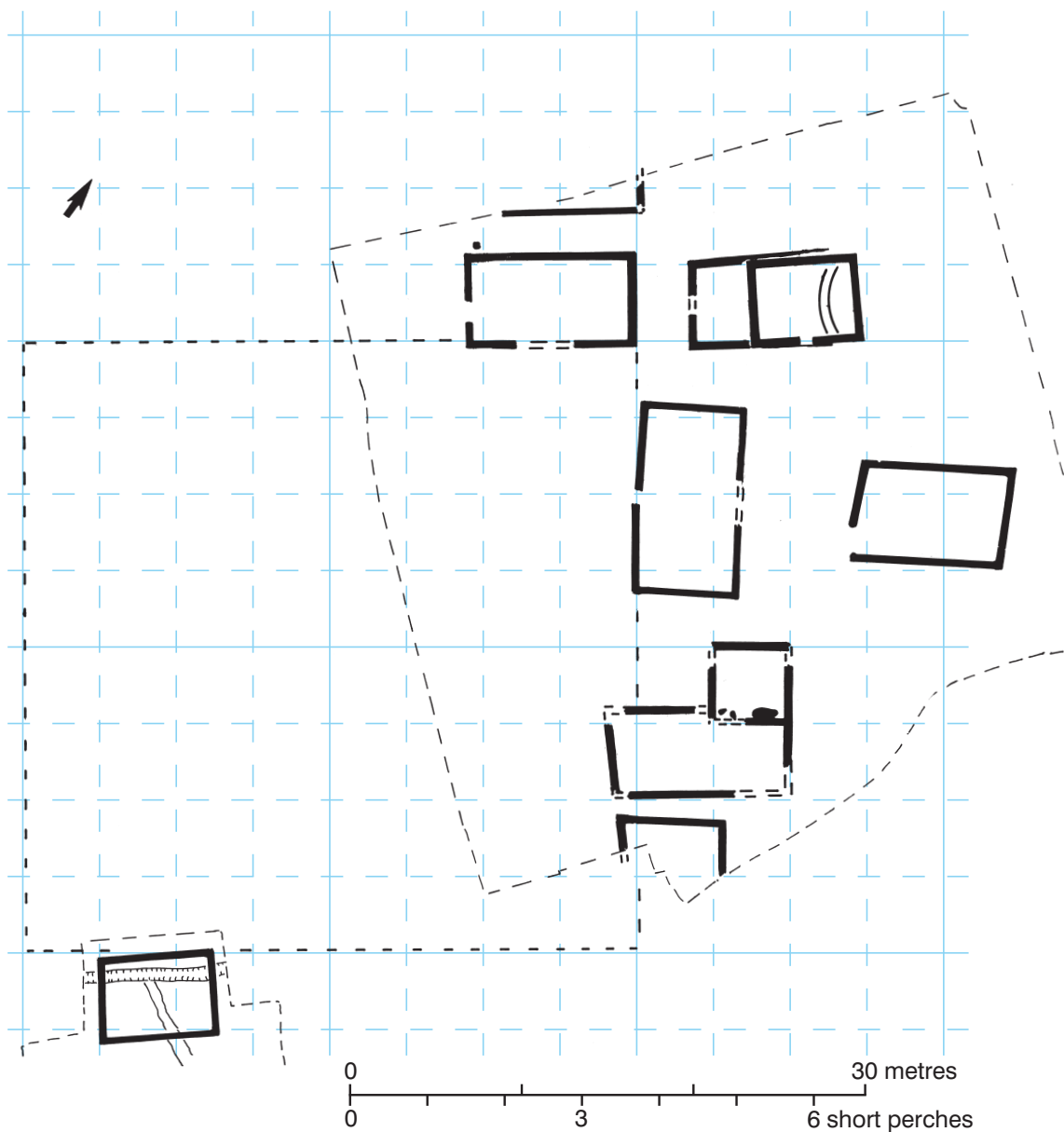


Figure 9. Walton, Aylesbury (Bucks.): the Mid Saxon settlement. The broken line illustrates the hypothesis of a possible square courtyard. (After Ford, Howell and Taylor 2004, figs. 3.2 and 3.16.)



Figure 10. Bloodmoor Hill, Carlton Coleville (Suffolk): the excavated seventh-century settlement, features of Phase 2 only. SFBs are stippled; areas of surface deposits are hatched. (After Lucy, Tipper and Dickens 2009, figs. 6.26, 6.36 and 6.37).

was buried there in 679 and whose miraculously incorrupt body was exhumed in 695 (an event for which Bede cites Wilfrid as a source).<sup>77</sup> Quarrington (just outside Sleaford) is undocumented, but adjoined – if it did not form part of – an estate of *Medeshamstede* (Peterborough) minster by the 850s.<sup>78</sup> Stratton was an appendage of Biggleswade, which is undocumented before the Conquest but which has some of the familiar late indicators of former minster status.<sup>79</sup> A high monastic context is therefore certain in the first case, likely in the second, and possible in the third.

The Ely settlement (Fig. 11), a new creation of around 730–50, was superimposed on a rectilinear Romano-British enclosure system and influenced by its surviving banks.<sup>80</sup> Two successive grids of four-perch squares, the first adapted to the relict Roman boundaries and the second on a slightly different alignment, are partially demarcated by ditches; each phase includes rather exiguous timber buildings that conform to the grid.<sup>81</sup> Through the mid-ninth to twelfth centuries the settlement remained remarkably stable in general character but changed in form, the enclosures becoming progressively less regular, and a block of curvilinear paddocks was added to the south-east.<sup>82</sup> The original complex formed part of a much larger settlement (of broadly rectilinear form but without other clear evidence of formal gridding)<sup>83</sup> that, from the relative poverty of its material culture, is interpreted as a service community attached to the adjoining minster.<sup>84</sup>

The Quarrington site (Fig. 11) begins in the early Anglo-Saxon period. The first phase is relatively formless, apart from an intriguing cluster in which three sixth- to seventh-century round buildings were replaced by three rectangular ones articulated by a short-perch grid, the sequence from round to rectangular being replicated in each of three squares (Fig. 11, inset):<sup>85</sup> a striking illustration that the grid-system on which grand church complexes were based could equally be used for ephemeral vernacular structures. Overlying this on a slightly different alignment is the main ditch-system based on four-perch blocks,<sup>86</sup> closely similar in appearance to the Ely site, of which the excavator Gary Taylor presciently noted that the 'land parcelling defined by these equidistant ditches seems to be based on a perch of about 4.65 m'.<sup>87</sup> Finds included moulds and crucibles for non-ferrous metalworking, and the 'range and variety of the fabrics indicates that Quarrington had access to an extensive trading network, mainly with the Northamptonshire area'.<sup>88</sup> In this case the settlement does not seem to have lasted beyond 800.

Remarkable in their scale are two superimposed grid-systems – one probably of the late seventh century, the other probably of the mid- to late eighth – excavated at Stratford (Bedfordshire), immediately east of the Roman road to St Albans where it runs southwards from Biggleswade (Fig. 12).<sup>89</sup> In both cases the recorded ditches were predominantly in parallel strips with occasional box-like elements, but the recurrence of four-perch (and occasionally two-perch) spacings is clear. Furthermore, the later system has evidently been offset from the Roman

road, implying a total surveyed area measuring about 20 by 20 four-perch units (i.e. some 360 m in each direction). The earlier system framed a diffuse but essentially structured settlement of rectangular post-hole and post-trench buildings; one of them accompanied a small mixed cemetery, of classic 'final-phase' type (which shows that some at least of the occupants were ordinary laity), aligned accurately on the grid.

Although these three cases are exceptional in their use of precise measured grids, they have a wider context. As Helena Hamerow has recently discussed, rectilinear enclosure systems were becoming widespread in central to eastern England during the seventh and eighth centuries.<sup>90</sup> From the same time-range, complexes of multiple curvilinear enclosures (currently known as 'Butterwick-type' sites) have been recognized further north, notably in the Yorkshire Wolds and Vale of Pickering, sometimes formed within the framework of surviving Roman boundaries, and sometimes combining paddocks for stock-management with sporadic buildings.<sup>91</sup> At least superficially similar are sites such as Catholme (Staffordshire), which was definitely a substantial and established settlement, and Riby Cross Roads (Lincolnshire).<sup>92</sup> These sites were not necessarily of like kind, and at this stage it is unsafe to categorize too rigidly; but Ely, Quarrington and Stratton do seem to illustrate the most formal end of a spectrum of enclosed settlement types new in the seventh century.

Did this enclosure habit develop from below upwards – because settlements adapted to new agrarian needs<sup>93</sup> – or from above downwards – because ecclesiastical, ultimately Mediterranean ways of articulating space percolated from the great minsters into English social practice? The seventh-century watershed would be consistent with either; indeed, the heightened interest in adopting and adapting relict Romano-British enclosure systems, apparent at some of the 'Butterwick-type' sites and at Ely, chimes with other new attitudes to ancient monuments in late pagan and early Christian England.<sup>94</sup> Probably the basic forces were economic (though in a milieu of growth where the Church was itself a key factor), but their physical products, in some special cases that were particularly closely associated with monastic centres, exemplified the new techniques of grid-planning. At Ely it is instructive to note that from the 850s, with the collapse of high monasticism, the initially grid-planned settlement became progressively more curvilinear and informal, and acquired paddocks of 'Butterwick-type' appearance; Stratton illustrates the same sequence, the grids being succeeded by a tenth-century phase of homesteads in large curvilinear enclosures.<sup>95</sup>

### *Hamwic: an anomalous case?*

The major commercial emporium of *Hamwic* (Southampton, Hampshire) was created c. 680–700. While it has long been recognized that the original layout embodied some systematic planning, there was no comprehensive grid: occupation zones were articulated by streets which



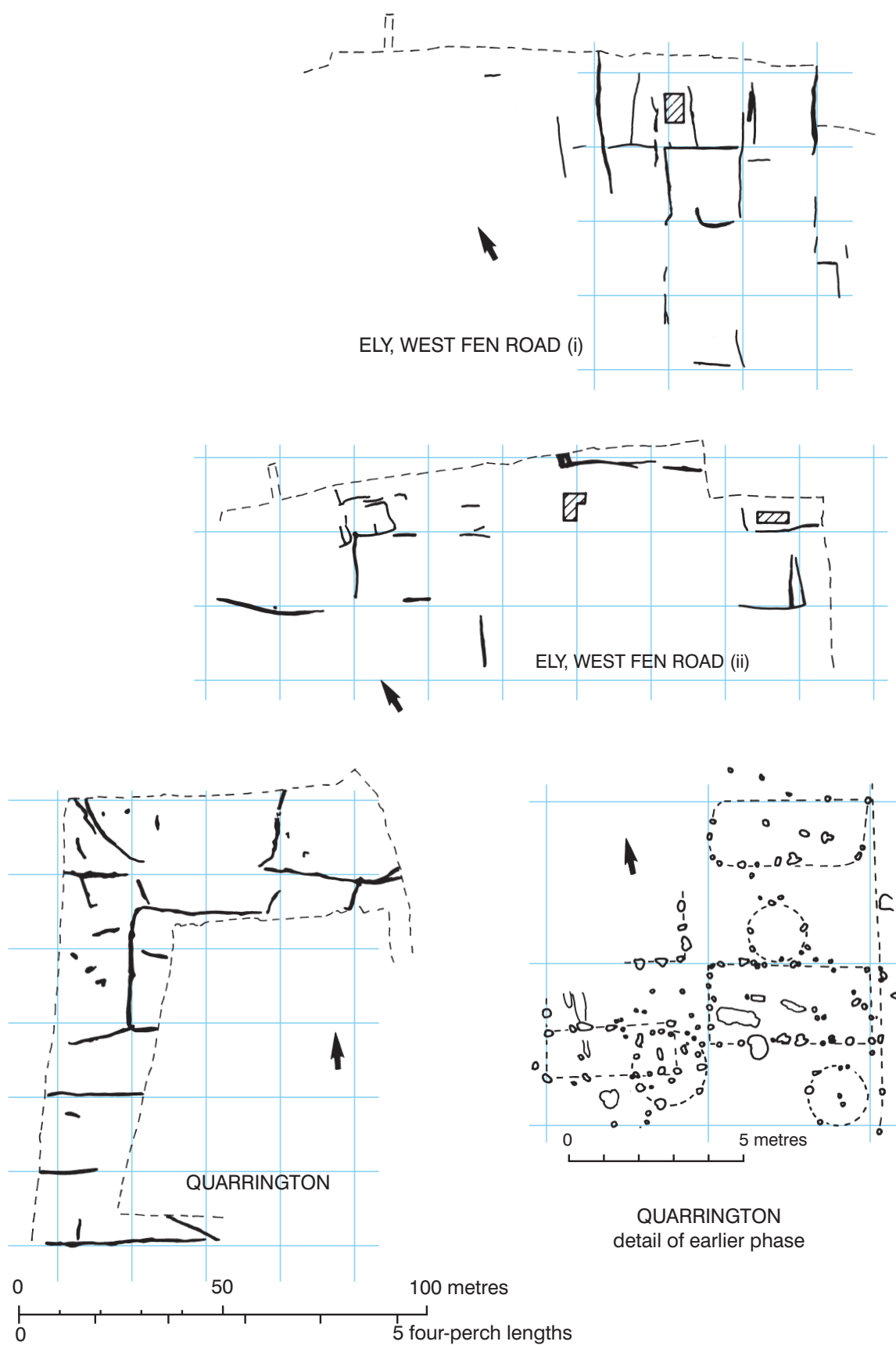


Figure 11. The gridded enclosure systems at Ely, West Fen Road (Cambs.) and Quarrington (Lincs.). (After Mortimer, Regan and Lucy 2005, fig. 3.1, and Taylor et al. 2003, figs. 7 and 10.)

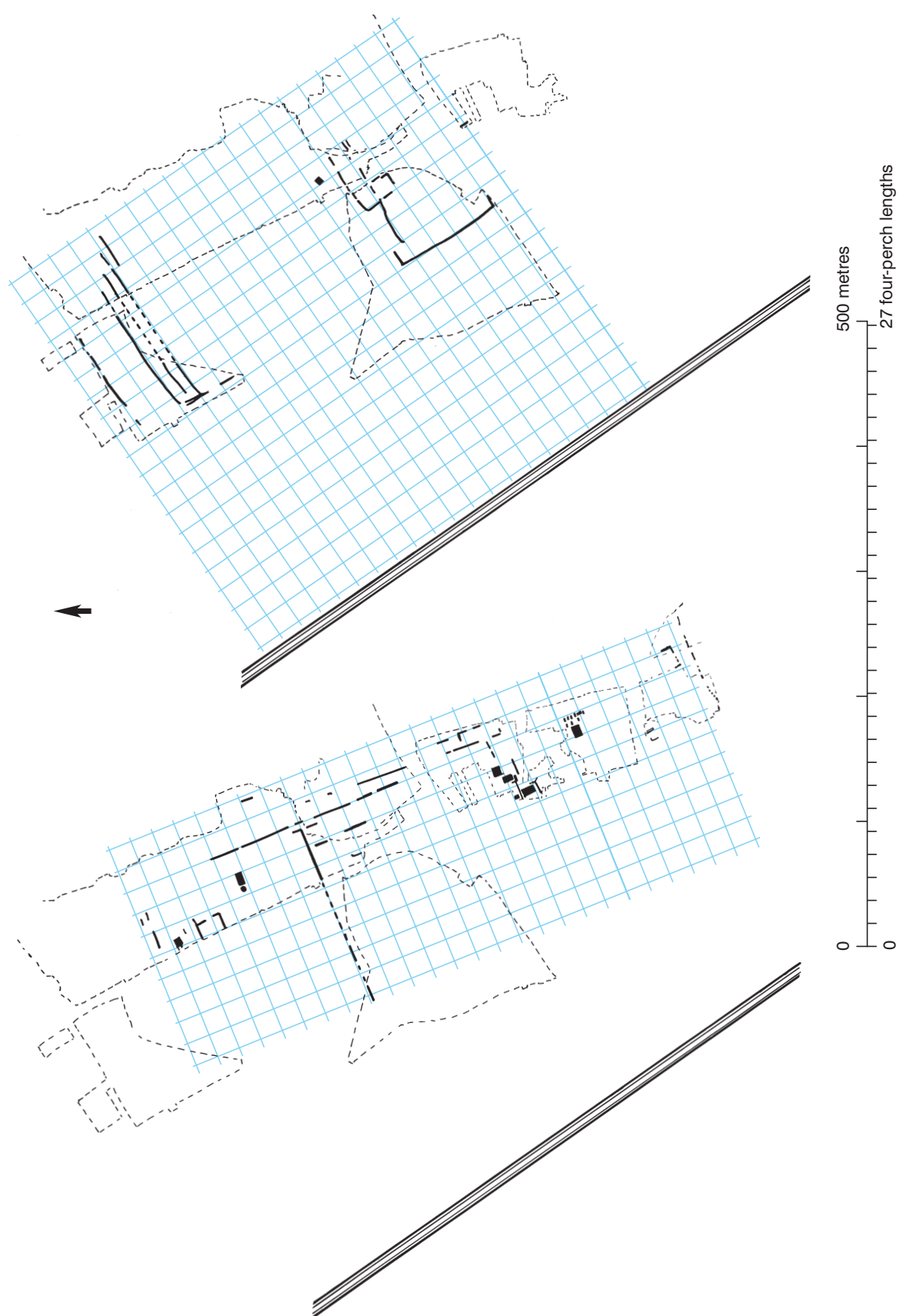


Figure 12. The two successive gridded enclosure systems at Stratford near Biggleswade (Beds.): probably late seventh century (left) and probably mid- to late eighth century (right). Buildings (ground-level in the earlier phase, one SFB in the later phase) are shown in solid black. The heavily-emphasised linear feature is the Roman road. (Albion Archaeology; after plans supplied by Drew Shotliffe.)

included straight sections but ran on a variety of alignments.<sup>96</sup> Nonetheless, the Six Dials site at the northern end of the emporium does display rectilinear planning using the short perch. One west–east street was demarcated by two parallel stake- or fence-lines that look like the primary setting-out marks: a rare glimpse of Anglo-Saxon surveyors at work.<sup>97</sup> These lines are 4.6 m apart, a dimension surely reflecting the rods used to define them. This street kinked in a series of straight sections, one of which, within an area of open excavation, was flanked by buildings on both sides (Fig. 13). Piecemeal development by (presumably) different occupants created a rather heterogeneous townscape, but it is apparent both that the plots were set out at right-angles to the road (shifting with it in alignment where it kinks to west and east), and that the short-perch module occurs in several places; it seems possible that a row of plots one perch wide was initially planned along the north frontage of this stretch of the road, which is eight perches long between the kinks.<sup>98</sup>

Six Dials cannot be called a true grid-plan, and in some ways it looks more like the row-planning of later towns and villages. Nonetheless, as an example of precise surveying with the short perch it is at odds with the other pre-Viking sites discussed here, both in being West Saxon

and in being secular. No clear explanation can be offered for this importation of Anglian modules and methods, beyond the slightly lame one that the surveyors were non-local.<sup>99</sup> The West Saxon royal court was cosmopolitan (both Wilfrid and Aldhelm had been among its frequenters in the 680s), and would not have found it hard to buy in expertise. It is also arguable that the context was not quite so secular as is generally assumed. Recent work has pointed out that much of the southern part of *Hamwic* could have originated as an ecclesiastical precinct, associated with St Mary's minster; as Ian Riddler comments, *Hamwic's* 'perceived role merely as a production and trading centre, without an ecclesiastical component, clearly needs to be questioned'.<sup>100</sup> Could parts of the emporium itself have been laid out by the minster, or by surveyors whom it provided?

### Grid-planned settlements in late Anglo-Saxon England

In the decades after 950 we confront a different range of phenomena: grid-planning is no longer distinctively ecclesiastical, and is hard to recognize in formal architecture, but instead occurs in a range of farmsteads, manor-houses



Figure 13. Six Dials, Hamwic (Hants.): detail of rectilinear planned area, showing interpretations of structural features. Recorded street-metalling is stippled. The visually distracting outlines of baulks are omitted. (After Andrews 1997, fig. 21, with details supplied from figs. 37–55.)



and settlements in the East Midlands, Norfolk and Lincolnshire. Central to all recent accounts of late Anglo-Saxon settlement have been the adjacent sites at Raunds and West Cotton (Northamptonshire), excavated during 1977–89. Andy Chapman's carefully considered interpretations include the hypothesis that both complexes were laid out using precise grids based on standard (5.03 m) rods.<sup>101</sup> As a mode of analysis this was ground-breaking, and it is no criticism to propose that, although the basic principle

stands, a reanalysis using the c. 4.6-m perch gives a more convincing result.

At Raunds, the contiguous excavations at Furnells Manor and Langham Road (Fig. 14) encompass a substantial area on the western side of the village, including the former rear plots of the houses on Rotten Row.<sup>102</sup> During c. 850–900 there was an enclosed farmstead to the north, but in the early to mid tenth century the whole excavated area was replanned on rectilinear lines, though

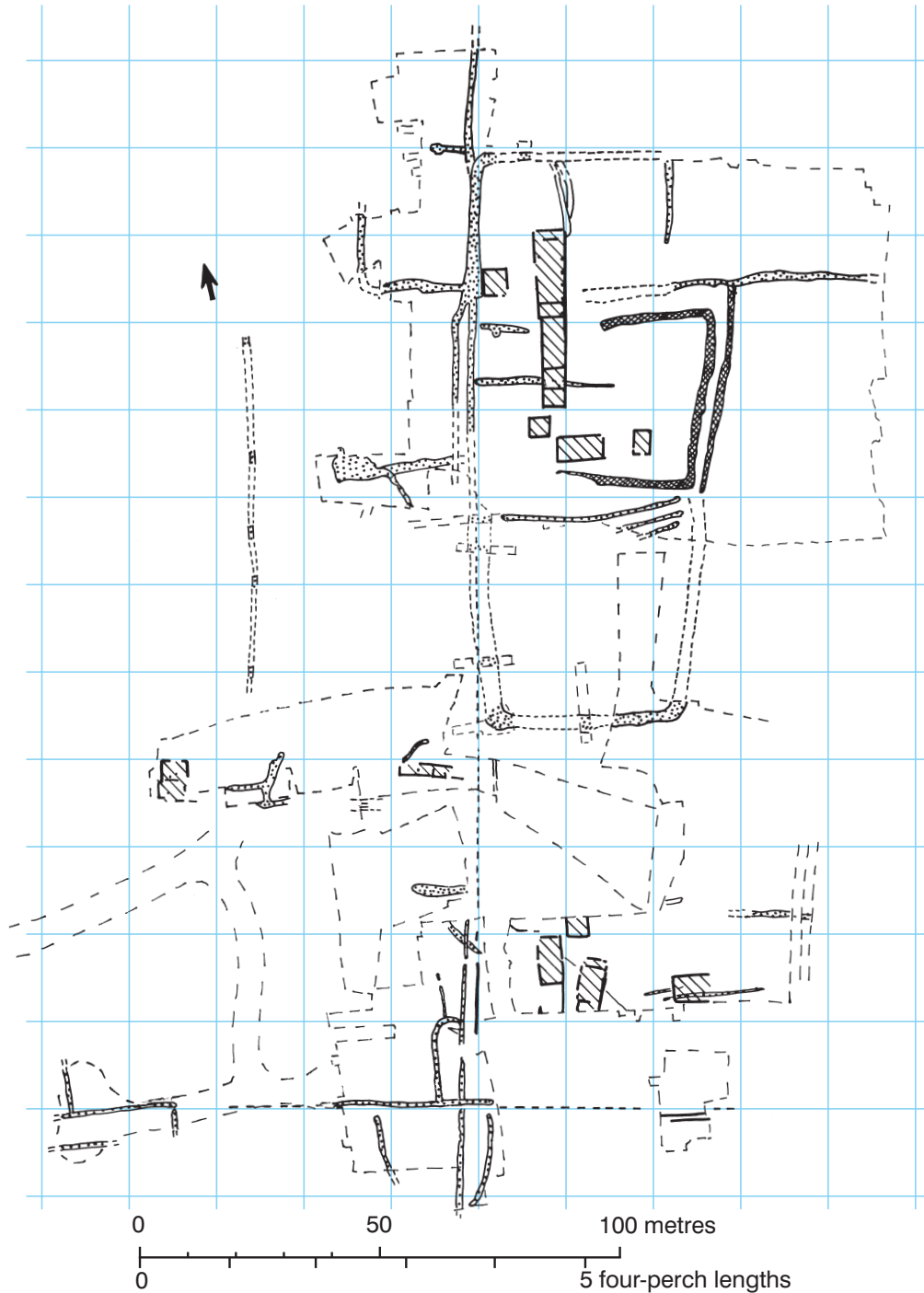


Figure 14. Raunds (Northants.): the mid-tenth-century phases of the Furnells and Langham Road sites. Buildings are hatched; the boundary ditches of the earlier farmstead that survived to be incorporated into the planned layout are cross-hatched. (After Audouy and Chapman 2009, figs. 5.15, 5.16, 5.17 and 5.57.)

incorporating the partly surviving perimeter ditch of the earlier house. Although the complex of ditched enclosures looks rather irregular and disjointed, its north–south ‘spine’ is a regular strip four perches wide, defined on the west by close-spaced parallel ditches and fences suggesting a narrow lane. Structures are ranged against the east boundary of this ‘spine’: to the north (Furnells), a linear ‘long hall’; to the south (Langham Road), a pair of buildings meeting corner-to-corner on the boundary, which is precisely four perches from the fence-line on the west side (see detail, Fig. 15, lower). West–east linear ditches conform to the grid at the north and south extremities of the excavated area, though others do not. Overall this can be accepted as a gridded site, albeit one where the grid was not closely followed except in the central strip; in this context it is interesting to find a ‘long hall’, a distinctively stereotyped tenth-century form that reflects ‘interest in standardised layout and measurement’.<sup>103</sup> But there is a complexity: although the hall is aligned on the gridded layout and seems virtually contemporary with it, it overlies a ditch, transverse to the central ‘spine’, which is also integral to that grid.<sup>104</sup> Evidently the introduction of complex buildings, of a kind that archaeologists usually label ‘manorial’, marked a rapid change of plan (even if the former enclosed homestead on the site implies some residential continuity).

The West Cotton site, on an old course of the River Nene, was low-lying and dissected by palaeo-channels.<sup>105</sup> Again it was comprehensively replanned in the mid tenth century, on a broadly square configuration (Fig. 16). There was a mill on its northern edge; straight mill-leats, meeting at a pond in the north-west corner, defined the west and north boundaries. Offset from the west boundary were a series of west–east ditches which, although not entirely regular, have average spacings of four short perches. It is plausible, as suggested in broken line on Figure 16, to reconstruct the original plan as a large square of eight by eight four-perch squares, comprising eight west–east strips each measuring four by thirty-two perches. This looks closer to a row-plan village than anything else known from Anglo-Saxon archaeology, a thought encouraged by the earliest forms of the place-name (*Cotes*, ‘cot-tages’).<sup>106</sup> But again things are not quite what they seem. Almost immediately, the western half of the two northern ‘rows’ was occupied by a small but substantially ditched rectilinear stronghold; this contained a rectangular palisaded enclosure, along the northern side of which another ‘long hall’ was added slightly afterwards in two stages.<sup>107</sup> The enclosure and hall conformed closely to the grid of short-perch squares already used to articulate the entire complex (see detail, Fig. 15, upper). Whatever the initial function of this unusual, apparently defensive structure (which was presumably connected in some way with the nearby mill), it soon developed into something looking more like a small manor-house, with probable stock-yards in the next two ‘rows’ southwards. But at no stage did the ‘rows’ contain anything resembling peasant houses.

It is intriguing that both Raunds and West Cotton suggest the same almost immediate change of plan: from something looking like prospective peasant settlement to something looking like manorial settlement. We should perhaps not automatically call the long halls ‘manorial’; the material culture of West Cotton seems remarkably poor, and the defended palisade there is *sui generis*. Nonetheless, both complexes did clearly develop into small manor-houses, including a church and churchyard at Raunds Furnells. Nor is anything in the excavated Anglo-Saxon archaeology ostensibly a ‘village’, though the grid of the southern (Langham Road) part of the Raunds site set a framework for the eventual house-plots on the west side of Rotten Row.<sup>108</sup> Raunds is sometimes invoked as a type-site for the ‘origins of the English village’, but the details of its development leave that process more rather than less problematic.

An exceptionally large and undisturbed site at Stotfold (Bedfordshire), measuring some 600 by 150 m, is probably the most complete late Anglo-Saxon settlement ever excavated.<sup>109</sup> The two main phases can be fitted into the period c. 950–1020: groups of small, relatively irregular closes associated with farmsteads spaced out at intervals of about 100–200 m, which were then comprehensively cleared and replaced by a much more rectilinear landscape of ditches dominated by two farmsteads 140 m apart. Because of its size, the central area of the second phase (see detail, Fig. 17) is our most complete excavated witness to formal rectilinear surveying, even though the four-perch module is only occasionally apparent. The very uniform appearance of the two farmsteads, framed within the same two west–east rows of four-perch squares, is noteworthy: given that the preceding phase had included a single farmstead almost mid-way between the sites of these two, it raises the possibility that gridding was here associated with the equal division of a holding between two heirs. The prominence of sokemen at Stotfold in 1086 makes it tempting to identify these substantial, spaced-out farms as sokemen dwellings.<sup>110</sup> This gridded phase was relatively transient, lasting at most for three or four decades on either side of 1000: thereafter the settlement zone was abandoned, presumably during either contraction or reorganization of the complex, multi-focal village immediately to its north.

To compare Figure 17 with Figure 14 reveals strong resemblances between Stotfold and Raunds, despite their different later histories. In both cases the underlying four-perch grid was very freely interpreted by the ditch-diggers, so that it only shows in occasional patches, whereas the rectilinearity remains clearer. Both episodes of gridding replaced existing but less regular homesteads and closes. The spacing between the two farmsteads in the gridded phase at Stotfold is comparable to that between the Furnells and Langham Road complexes at Raunds, a point that could have a bearing on the origins of Raunds Furnells: did the eventual manor-house develop from one in a series of spaced-out freeman dwellings? This scenario

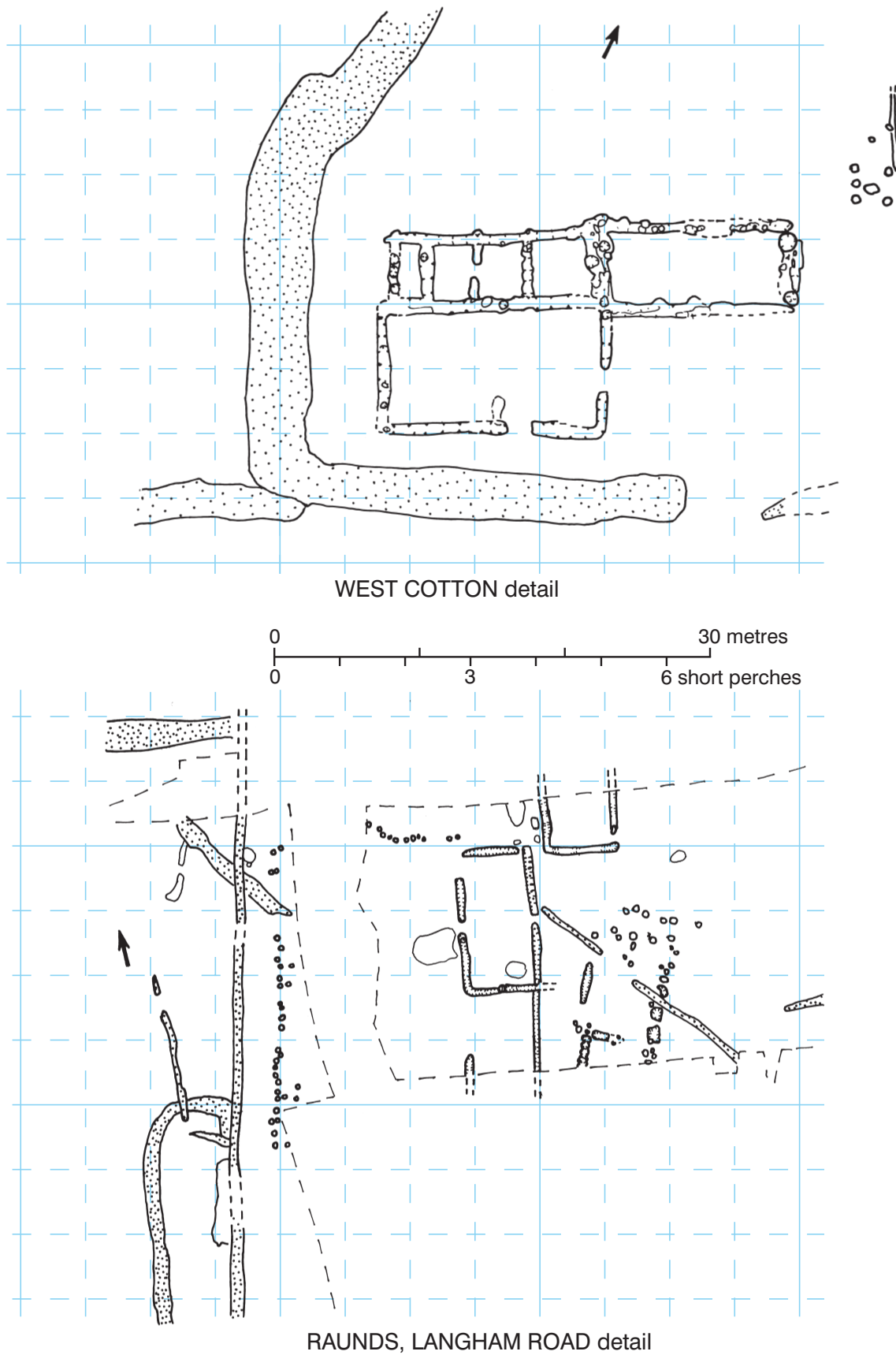


Figure 15. Above: West Cotton: detail of the palisaded enclosure, long hall and enclosing ditch (after Chapman 2010, figs. 4.3, 4.9, 4.11 and 4.14). Below: Raunds, Langham Road: detail of buildings in relation to fence-line and parallel ditch (after Audouy and Chapman 2009, figs. 5.57–5.61).

recalls Wulfstan's famous vignette of the prospering ceorl who, having acquired 'a church and a kitchen, a bellhouse and a fortress-gate', merited the title of thegn.<sup>111</sup>

A further four sites, Springfield Lyons (Essex), Ketton Quarry (Rutland), Howbury in Renhold (Bedfordshire) and Attlebridge (Norfolk), are convincingly – if again rather loosely – based on four-perch grids and have some basic features in common (Figs. 18–22).<sup>112</sup> The grid-plans were all apparently established in the tenth century, and all survived until some point beyond the Norman Conquest. At Ketton an intriguing sidelight is provided by the name 'Newbottle' – i.e. OE *niwe bodl*, 'new building' – recorded for this deserted outlying hamlet.<sup>113</sup>

presumably 'new' in relation to the main village? The Springfield Lyons settlement was laid out over an early Anglo-Saxon cemetery, itself in a Bronze Age circular enclosure. Older ritual monuments provided foci at Ketton, where a large tree attracted graves and was then replaced by a chapel and cemetery, and at Attlebridge, where the timber ranges were carefully framed around the earthwork of a Romano-British circular structure left standing in its own four-perch square.<sup>114</sup> All four sites are perceptibly articulated by four-perch modules: thus at Ketton a four-perch strip separates the aisled hall and churchyard complex from the next hall southwards, and at Howbury there is a four-perch gap between the

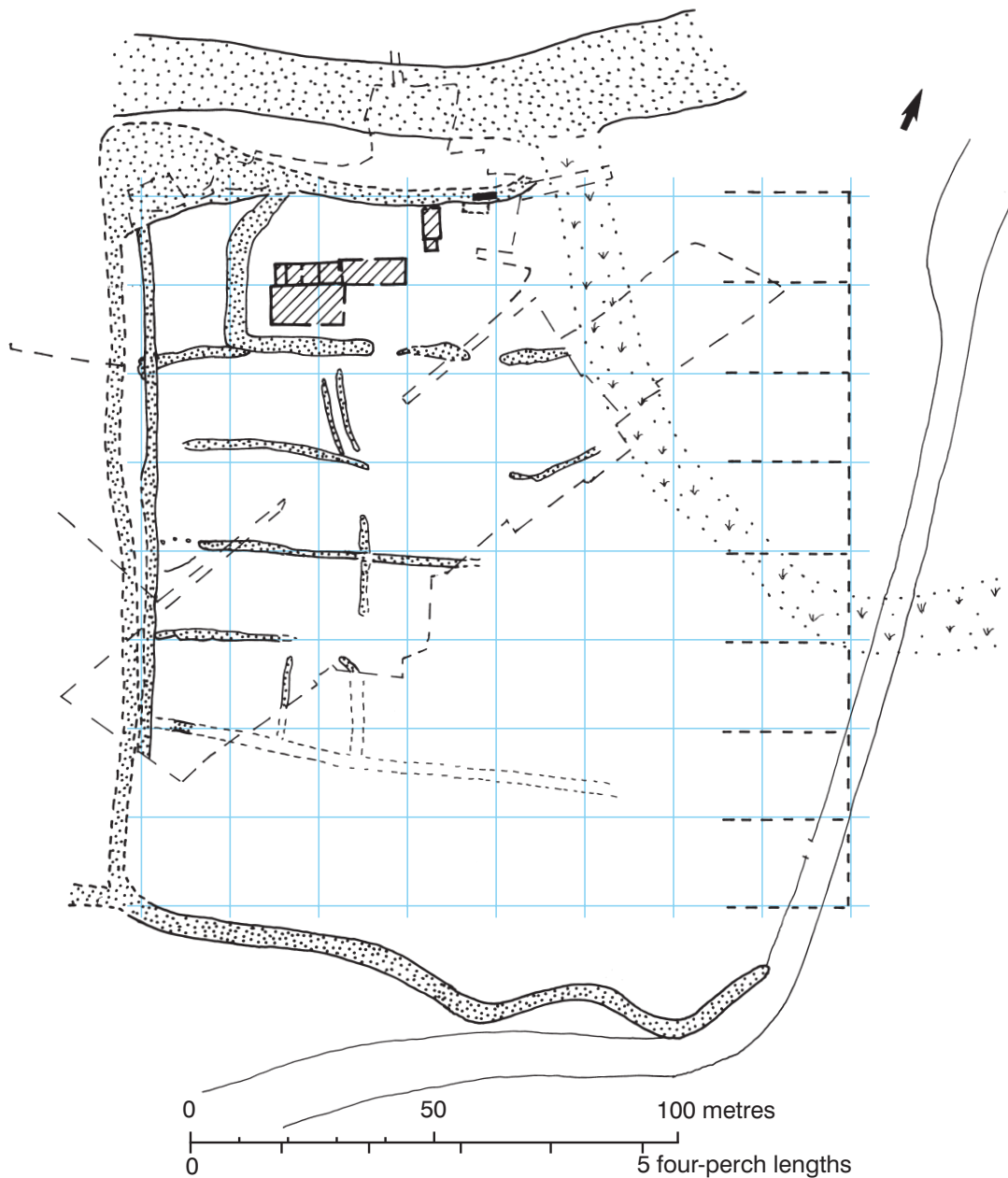


Figure 16. West Cotton (Northants.): the mid-tenth-century phases. Buildings are hatched; the broken lines illustrate the hypothesis that the complex was initially envisaged as a square divided into eight plots of  $4 \times 32$  perches. (After Chapman 2010, figs. 4.1 and 4.3.)

northern boundary ditch and the main hall, which is itself four perches long. All include substantial hall-like ranges (three each at Ketton and Springfield, one each at Howbury and Attlebridge), characteristically three to four perches in length and a perch or slightly more in width. Although there is no developed 'long hall' on the Raunds pattern, the halls that are aligned axially on small detached square buildings (Ketton, Howbury) look like steps in that direction. Also characteristic are scatters of small ancillary buildings, sometimes more or less a perch square (cf. Fig. 1).

Furthermore, all four of these planned settlements were located in planned landscapes. Correlation with the first edition Ordnance Survey 25-inch maps shows that the Springfield site is aligned on rectilinear field-boundaries around Cuton Hall and Trump's Farm; the Howbury site is similarly part of a rectilinear boundary system with the supposed early medieval ringwork at Water End in its south-east corner. At Attlebridge, the domestic complex seems to be aligned on a gridded ditch-system sampled in three small trenches, though at least the final fills of these were post-Conquest.<sup>115</sup> At Ketton, a right-angled ditch observed under a watching-brief not only continued the line of the major west-east ditch in the excavated settlement, but also conformed to the same four-perch grid

(Fig. 20).<sup>116</sup> These contexts raise larger questions about the scale of later Anglo-Saxon landscape planning, but also leave us unclear whether or not the excavated sites were isolated within their field-systems. The evidence certainly allows the possibility that these were components of spaced-out settlement landscapes like those at Raunds and Stotfold.

Domesday Book gives some evidence for the status of all four sites in 1066: Springfield a small manor (two hides and one yardland worth 40 shillings),<sup>117</sup> Ketton and Howbury probably the holdings of sokemen,<sup>118</sup> Attlebridge the holding of a freeman.<sup>119</sup> This is consistent with the archaeology: the Springfield complex does indeed have many more ancillary buildings than the other three, or at least the excavated parts of them. Yet the material culture of all four sites was basic, with no visible differentiation and no trace of elite standards: clear lines between 'lordly' and 'peasant' settlements cannot be drawn here, and questions remain. Do the three successive but separately located halls at Springfield reflect the life-cycle of one household or the formation of distinct ones? Do the three halls at Ketton constitute a central group (church, cemetery and aisled hall) with two offshoots, or a block of linear four-perch house-plots in which one has assumed greater importance than the others?

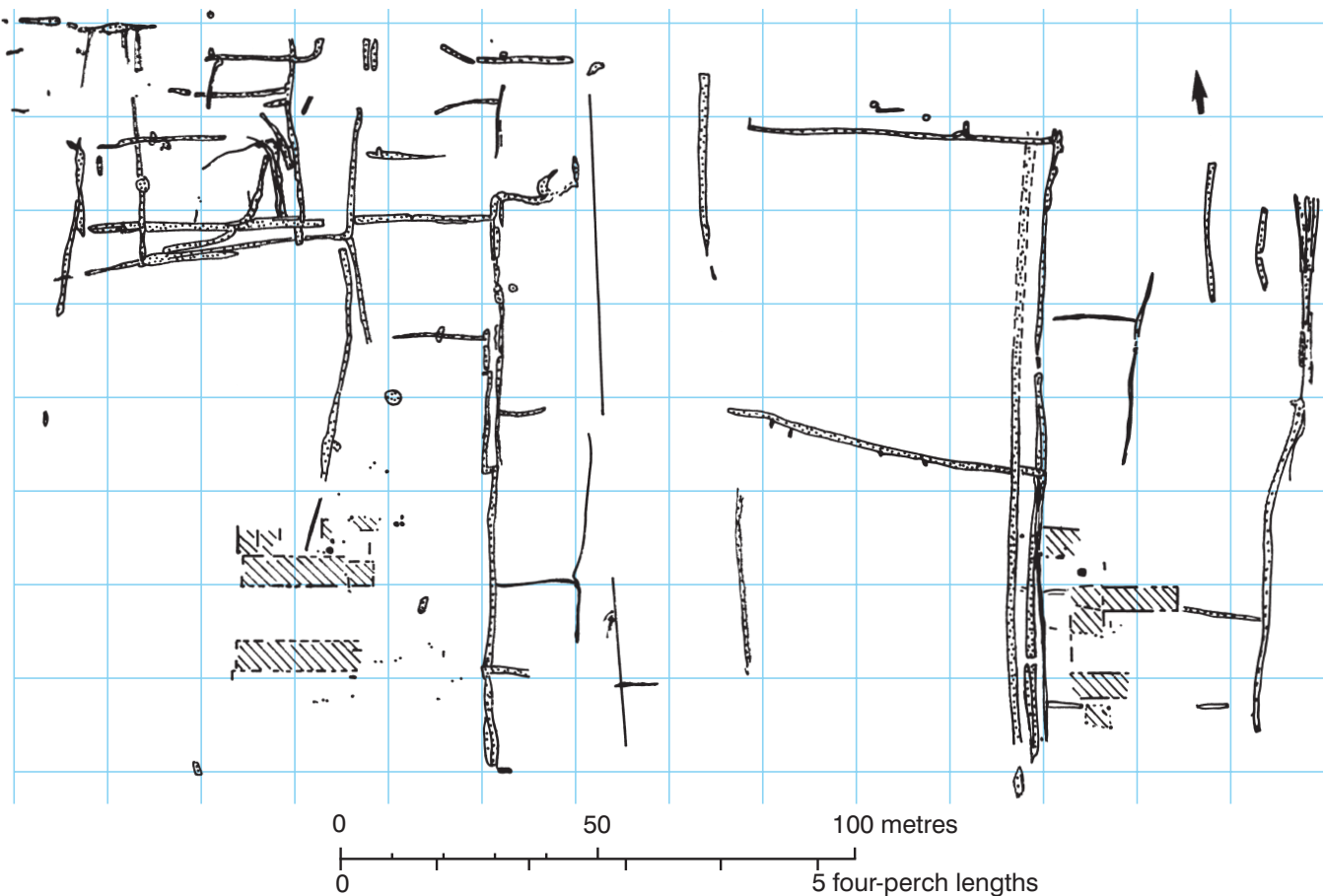


Figure 17. Stotfold (Beds.): detail of the gridded element in the late tenth- to early eleventh-century phase. The buildings of the two farmsteads are hatched. (Albion Archaeology; after plan supplied by Drew Shotliffe.)

A block of planned landscape at Brandon Road, Thetford (Suffolk), on the western fringe of the late Anglo-Saxon town,<sup>120</sup> raises similar problems of definition. Although this lay in the 'kiln belt' of Thetford, where the celebrated pottery industry concentrated, the area in question was divided up after c. 950 into large stock-enclosures entered from drove-ways. Around the year 1000 these were in turn supplanted by various structures on a rectilinear configuration, associated with metalled roads. Over the following century, the successive superimposition of buildings, boundaries and pits modified, and eventually largely obscured, the rectilinear plan. This was therefore both a very specific and a relatively ephemeral planning episode, carried out by some authority capable of effecting a clean sweep, but consistently maintained for a few decades at most.

Thetford is the extreme example of a 'latent' grid, which although not archaeologically visible, is revealed

as the basic structuring principle when it is imposed on the site plan (Fig. 23). Four-perch squares articulate the space: some empty, some containing small buildings with pit-groups, and one (in the north-west) partitioned by fences into rectilinear enclosures. The main north-south metalled road was aligned on the grid. The squares also seem to control the distribution of pits, which are completely absent from some of them, and in other cases grouped tightly against a grid-boundary (north-east) or into one corner of a square (south-west). What the squares were for is another matter. The obvious inference, that they were house-plots shared out in some allocation of equal holdings, must be resisted: the buildings are not domestic, several squares seem empty, and there is no formal demarcation of boundaries. Evidence may of course have been removed by truncation, but if so it was relatively superficial. A compelling analogy is a modern



Figure 18. Springfield Lyons (Essex): the excavated late Anglo-Saxon settlement (all phases). (After Tyler and Major 2005, fig. 68.)



landscape of allotments, with potting-sheds, compost-heaps, refuse areas, access-paths, and token marking of boundaries by loose fence-panels or strands of wire that would leave no below-ground trace. Perhaps allotments are precisely what these were, set out on the fringe of a major town to allow urban activities to be supplemented

with market-gardening: the Domesday smallholders 'with little gardens' in some other suburban locations come to mind.<sup>121</sup> But even if the Thetford site is to this extent different from the rural ones, it shares their distinctive combination of a formal initial grid with seemingly ad hoc and transient use of the spaces thus defined.



Figure 19. Ketton Quarry (Rutland): the excavated late Anglo-Saxon settlement at Newbottle. (Northamptonshire Archaeology; after plans supplied by Ian Meadows and Andy Chapman.)

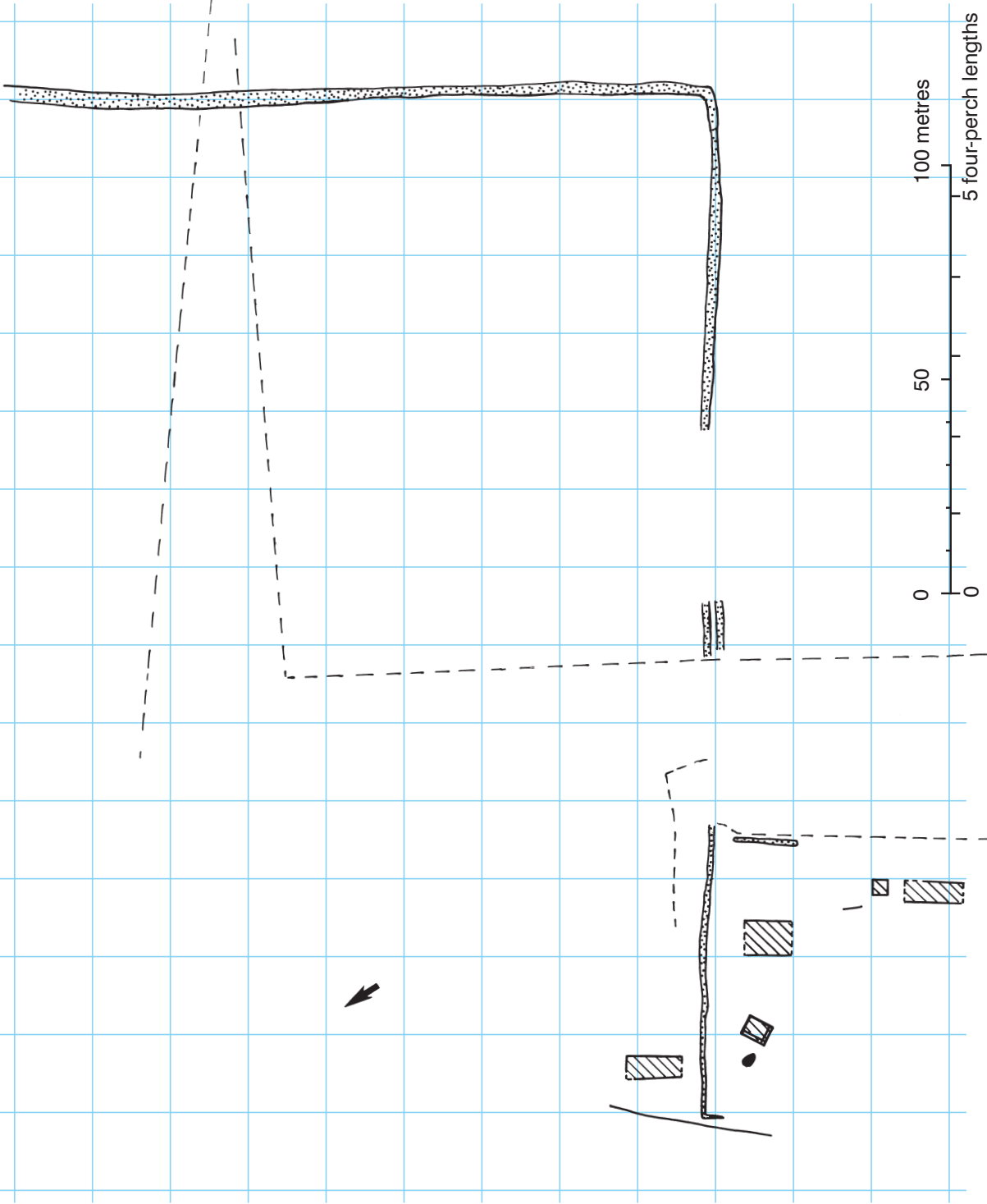


Figure 20. Ketton Quarry: the excavated settlement in the context of the rectilinear ditch-system observed under a watching-brief. (Northamptonshire Archaeology; after plan supplied by Andy Chapman.)



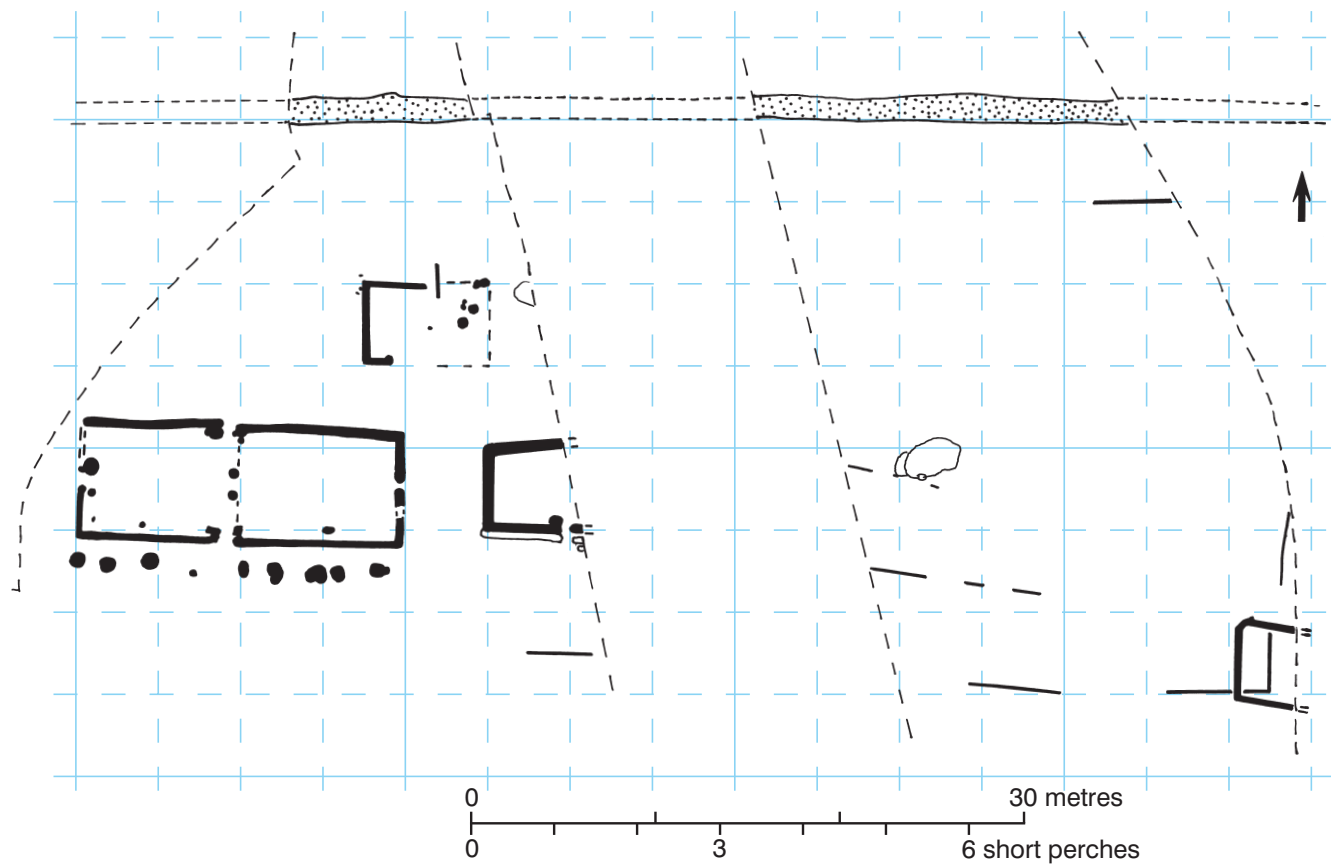


Figure 21. Howbury (Beds.): the excavated late Anglo-Saxon settlement. (After Timby et al. 2007, fig. 6.5.)

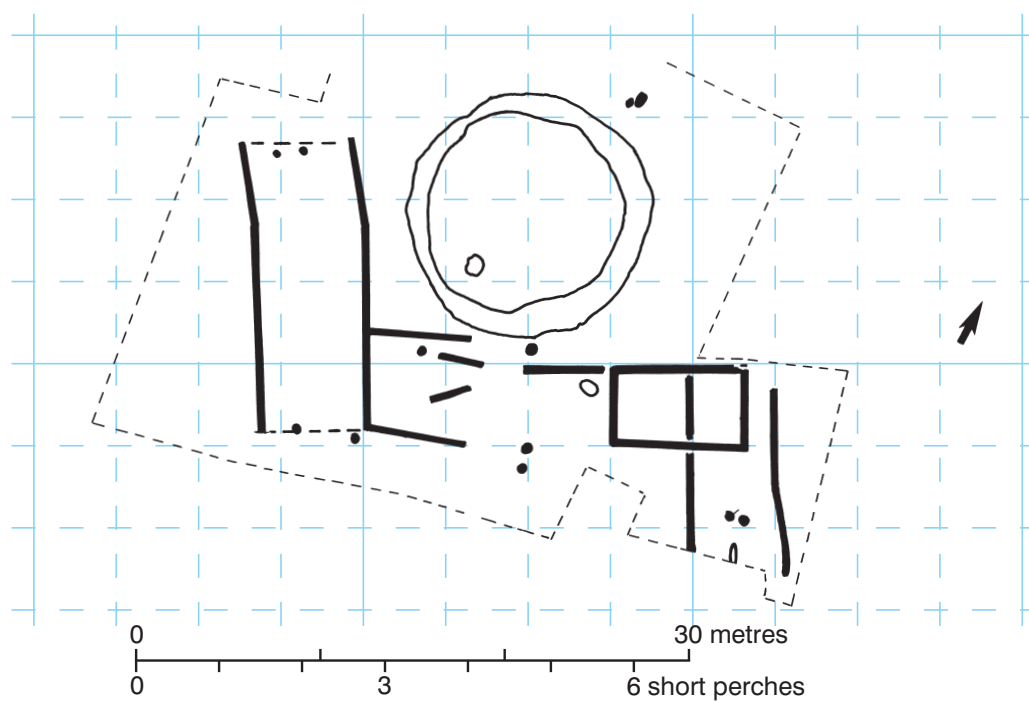


Figure 22. Attlebridge (Norfolk): the excavated late Anglo-Saxon settlement. (After Hall et al. 1996, fig. 5.)

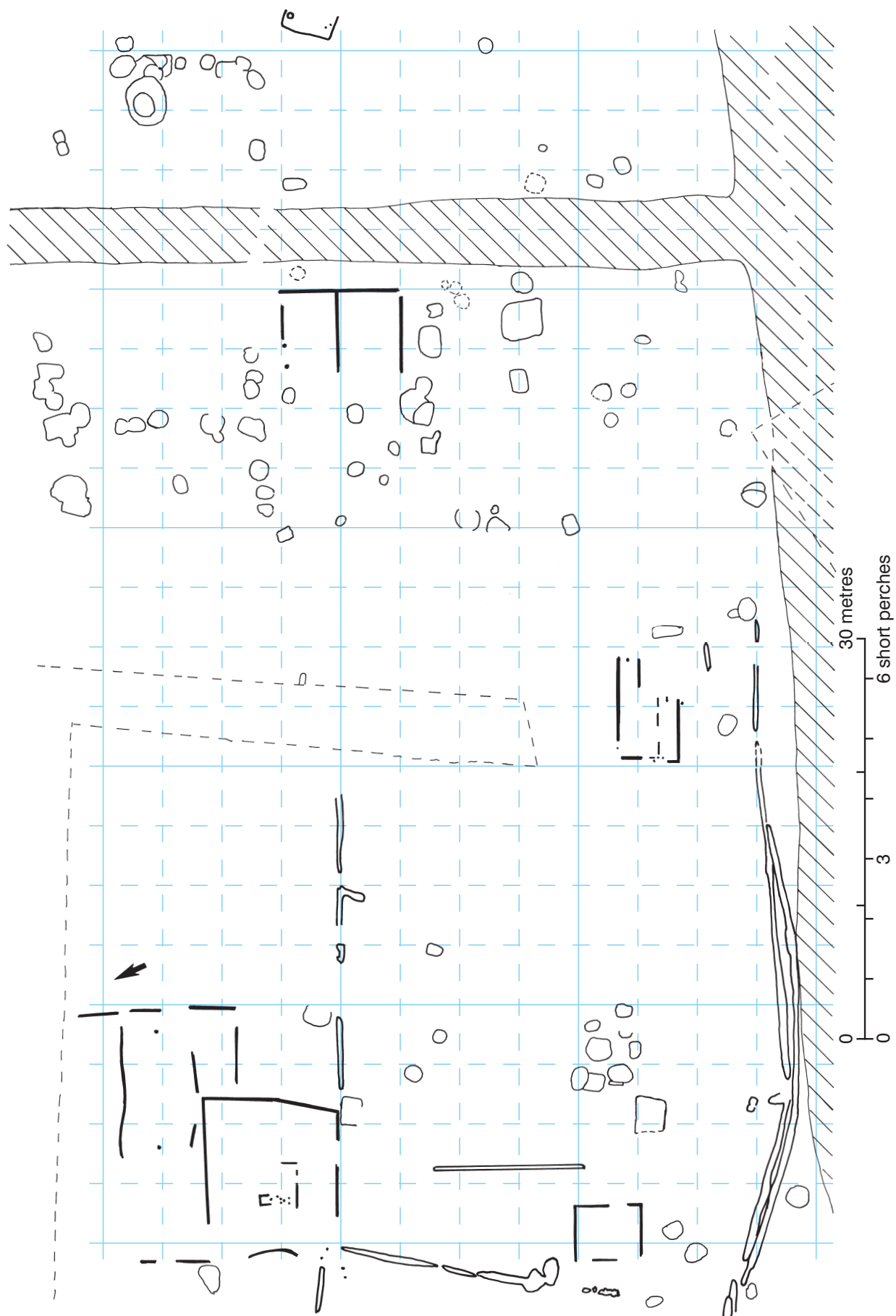


Figure 23. Thetford, Brandon Road (Suffolk): the excavated late Anglo-Saxon settlement, features of Period III only. (After Dallas 1993, fig. 7.)

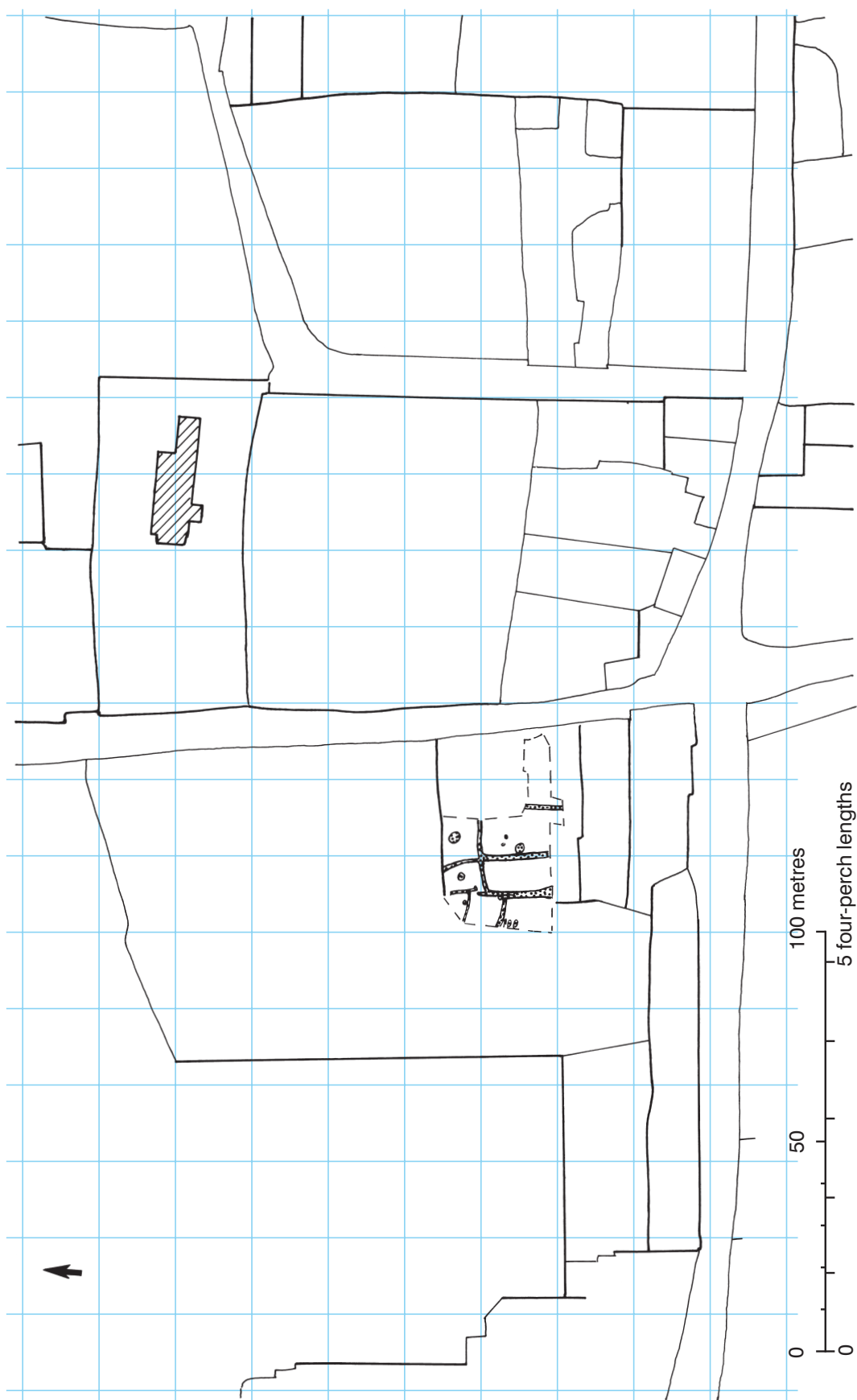


Figure 24. Glaston (Rutland): grid-planned settlement attested by surviving boundaries and an excavated sample. Boundaries aligned on the grid are emphasized in slightly thicker line. (After OS 25-inch first edition, by courtesy of Edina Digimap; excavation plan supplied by John Thomas.)

In no case can we detect anything resembling a post-Conquest village.

Finally, a single building – an L-shaped range of one-perch squares in the Burghal Hidage fort at Burpham<sup>122</sup> – is a so-far unique case of short-perch gridding in Sussex (Fig. 1). It is not closely dated, but the context is ostensibly one of Alfredian fortification, making this another anomalous intrusion of the technique into Wessex. However, Burpham had almost certainly been part of the minster complex at Peppering, controlled in the eighth century by the South Saxon kings<sup>123</sup> and thus presumably by their Mercian supplanter Offa, which raises interesting

questions about the date of both the fort and the building inside it.

### Grid-plans still visible on recent maps

As noted above, some of the excavated planned settlements seem to be in conformity with rectilinear field-boundaries surviving into the recent landscape. The recognition of such survivals needs pursuing, as they have the potential to enlarge our sample far beyond the tiny proportion that have been explored through excavation.

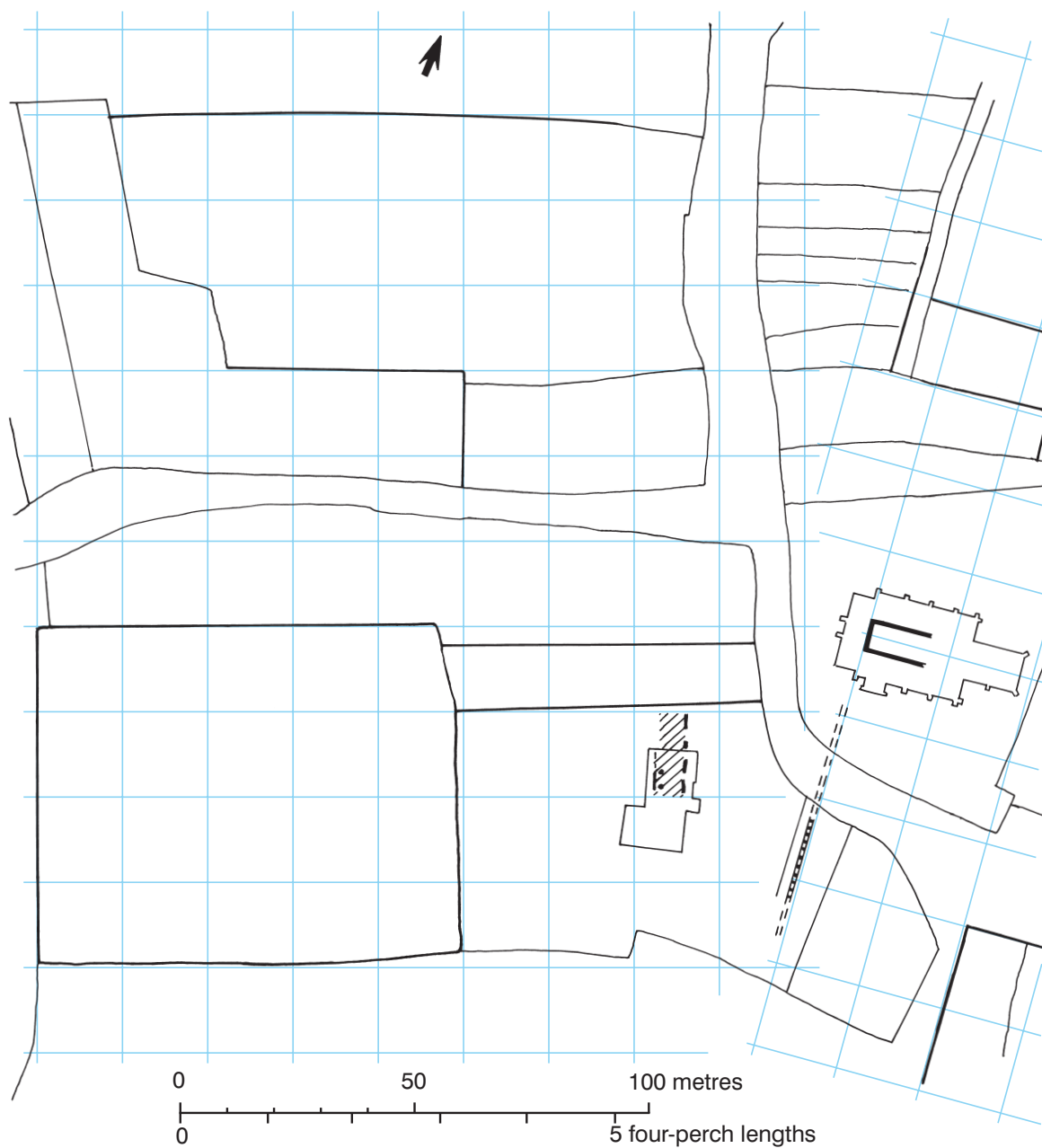


Figure 25. Nassington (Northants.): two contiguous grids, attested by one excavated feature in each and by surviving boundaries. Boundaries aligned on the grids are emphasized in slightly thicker line. (After inclosure map of 1778, Northamptonshire Record Office W (a) Map 2879-80, transcribed onto OS 25-inch base by courtesy of Edina Digimap; plans of excavated features supplied by Jane Baile.)

In three cases, short-perch grids, identified on the 25-inch Ordnance Survey maps of the later nineteenth century, are vindicated by excavations of small areas within them. At Glaston (Rutland), a small excavated area of rectilinear ditched enclosures of the tenth to eleventh century conforms closely to a grid-system, covering about half the village, inferred from boundaries surviving in the 1880s (Fig. 24).<sup>124</sup> More complex is Nassington (Northamptonshire), where an excavated later Anglo-Saxon timber range under the Prebendal Manor House conforms to one grid-system represented by boundaries mapped in 1778, whereas a nearby ditch conforms to a contiguous but differently aligned system also containing the late Anglo-Saxon nave of the parish church (Fig. 25).<sup>125</sup> If this seems an over-confident inference from tiny fragments, the same scenario is attested unambiguously by a larger excavation at Fordham (Cambridgeshire): a late Anglo-Saxon complex of rectilinear ditched enclosures is aligned on surviving west–east boundaries, whereas an abutting and therefore secondary north–south ditch conforms to another gridded system, on a slightly different alignment, that also includes the west boundary of the churchyard (Fig. 26).<sup>126</sup> An important message of Nassington and Fordham is that a single village plan may represent two or more distinct episodes of gridding, either superimposed or contiguous.

These three examples justify the hope that survivals of short-perch gridding can be recognized extensively on nineteenth-century maps, even when excavated confirmation is lacking. By their nature such potential survivals are, individually, undated. As a category, however, they must pre-date the abandonment of the short perch as a dominant measure, which as we have seen had happened by the twelfth century. Also indicative by way of contrast is the general use of strips rather than grids in formal villages of the twelfth century onwards. Even in those thirteenth-century planned towns that do have grids, such as Winchelsea and Salisbury, the geometry is far from precise and reflects a different (and inferior) surveying technology.

A preliminary trawl through a sample of Ordnance Survey maps included most regions of England, but only yielded results for the midland and eastern counties. Given that any pre-Conquest ditch- and fence-lines will have undergone a millennium of change, survival of gridded elements will be variable and never more than partial. Even more than with the excavated sites, therefore, it is a matter of judgement whether a specific instance is adequately plausible. My own impression is that visible cases are principally in Lincolnshire, Northamptonshire, Leicestershire, Cambridgeshire, Norfolk and Bedfordshire, and occasionally Oxfordshire, Warwickshire and Gloucestershire (in other words a zone corresponding partly but not wholly with Roberts and Wrathmell's 'Central Province'<sup>127</sup>), but that in at least parts of those counties they may be very common indeed. Three illustrative case-studies will now be described.

Kites Hardwick (Warwickshire), an outlying hamlet of Leamington Hastings, is a simple representative example, attenuated and distorted through the centuries but still recognizable (Fig. 27). The fragmentary survival of closes and boundaries, on both axes and in different parts of the hamlet even though now isolated from each other, is characteristic of this kind of relict planned landscape, and very much what might be expected.

A rather more complex case is Bampton (Oxfordshire), a small town centred on a minster documented from the tenth century.<sup>128</sup> Immediately east of the large oval enclosure (bounded by a substantial late Anglo-Saxon ditch) containing the minster, a notably regular block of house-plots and enclosures appears on maps from 1789 onwards (Fig. 28). Even today, after centuries of development, it is a curiously maze-like area, divided up by boundary walls and with straight, narrow lanes leading nowhere in particular. Imposition of the four-perch grid reveals several boundaries that fit precisely, and others that run parallel to grid-lines leaving a gap of about two metres. It seems likely, as suggested in broken line on Figure 22, that some of the latter represent more lanes, absorbed into abutting properties but visible in small fragments: the plan thus assumes a ladder-like configuration, with a central block five squares wide divided by lanes into one- or two-square strips. There is a possible comparison here with Raunds (Fig. 14), with its north–south trackway, of comparable width, bordering the central four-perch 'spine'.

It is perhaps above all in Lincolnshire that pre-Conquest grid-planning of villages has left a conspicuous impact. A survey of deserted village earthworks in north-west Lincolnshire reveals a large number of markedly regular plans, several of which could potentially be based on four-perch grids. These earthworks, some extending for hundreds of metres and with consistent rectilinearity on both axes, vindicate the hypothesis of gridding as a technique: it is hard to imagine any other practicable way to obtain the same result.<sup>129</sup> The important manorial site at Goltho seems to have been superimposed on an existing village with a rectilinear configuration, as Reynolds has observed.<sup>130</sup> A clear – indeed spectacular – surviving case is Brant Broughton, on the Lincolnshire/Nottinghamshire border, as mapped in 1838 (Fig. 29). Its rigidly rectilinear configuration, extending for at least a kilometre from north to south, conforms in many places to multiples of four-perch squares. A series of west–east lanes, mostly following the grid, connect a pair of more sinuous north–south streets in a ladder-like formation. Like Raunds, though perpetuating more of its original form, Brant Broughton can be understood as an eventual toft-and-croft village framed within an older gridded settlement and road-system.

## Conclusions and prospects

Formal grid-planning has been identified in settlements and buildings ranging in date between the early seventh



Figure 26. Fordham (Cambs.): two contiguous grids, the first attested by excavated ditches (black), the second by one excavated ditch (stippled) abutting the first phase. Boundaries aligned on the grids are emphasized in slightly thicker line. Buildings are only shown where omitting them would make boundaries hard to read. (After OS 25-inch first edition by courtesy of Edina Digimap; plan of excavated features from Patrick and Rátka 2011, fig. 3.2.)

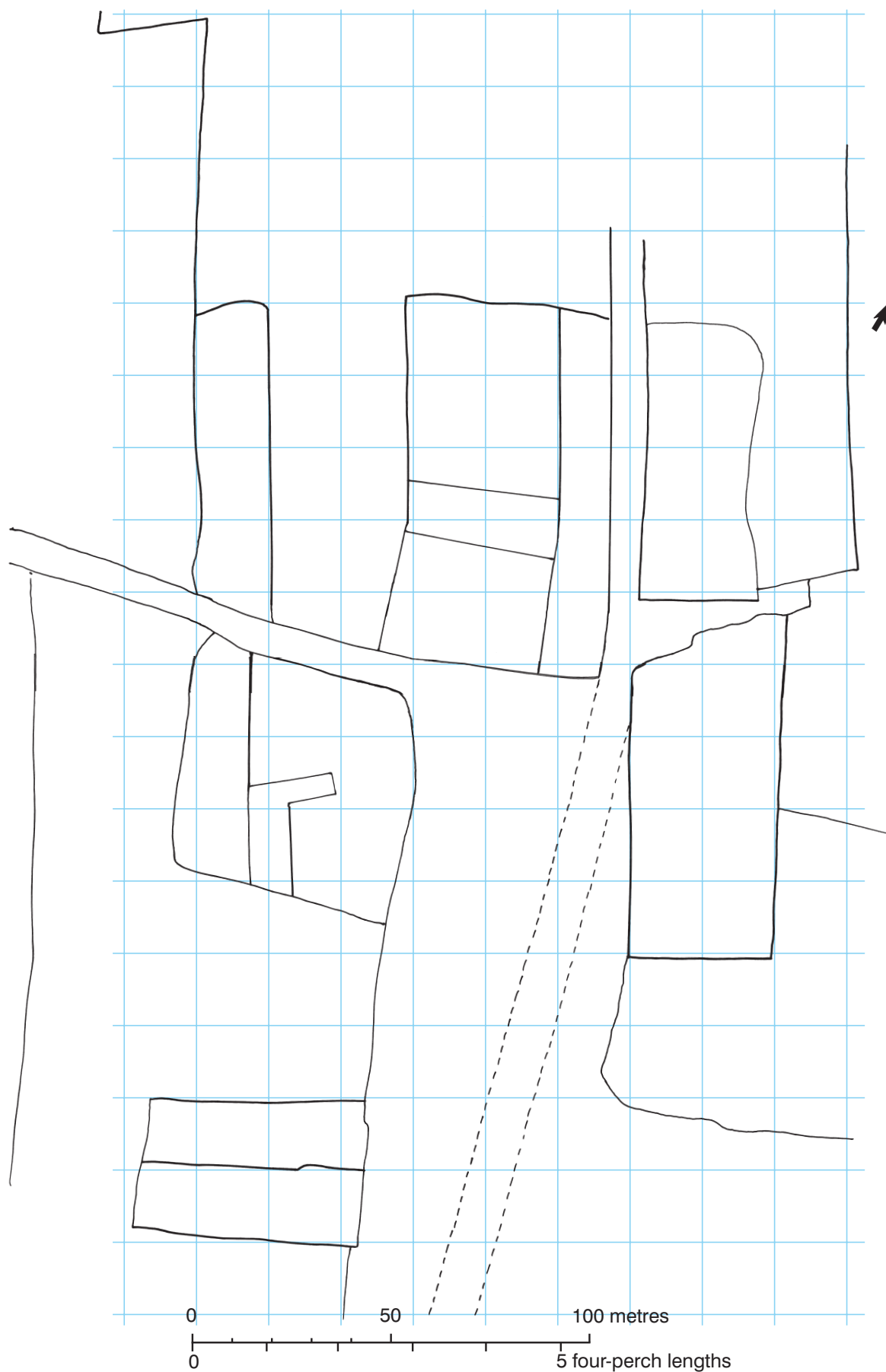


Figure 27. Kites Hardwick (Warwicks.): vestiges of a grid-planned settlement. Boundaries aligned on the grid are emphasized in slightly thicker line. (After Leamington Hastings tithe map of 1843, National Archives IR 30/36/93, transcribed onto OS 25-inch base by courtesy of Edina Digimap.)

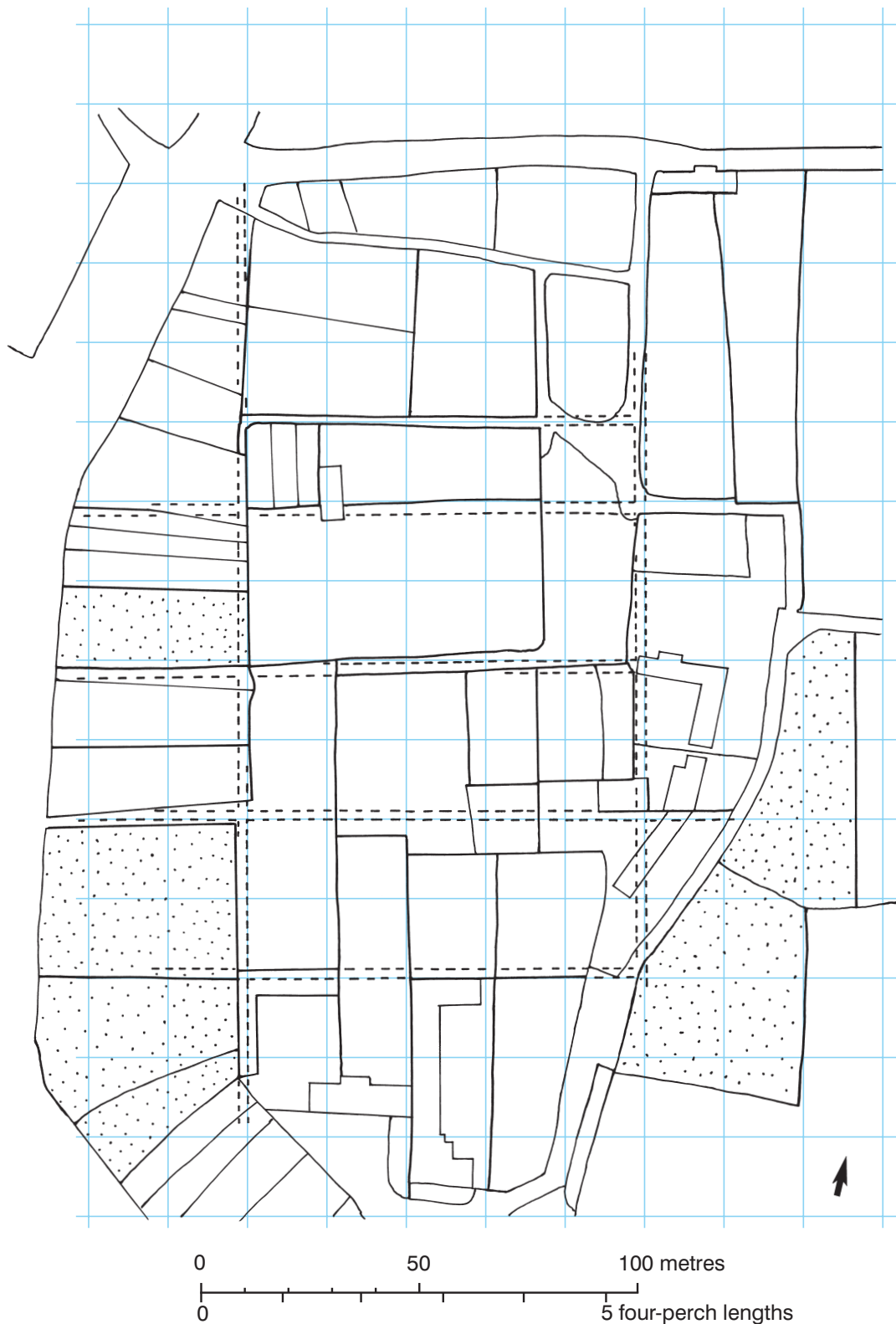


Figure 28. Bampton (Oxon.): area of grid-planned enclosures and lanes to the east of the main minster complex. Boundaries aligned on the grid are emphasized in slightly thicker line. Buildings are only shown where omitting them would make boundaries hard to read. Broken lines represent conjectural reconstructions of former lanes indicated by relict fragments. (After inclosure map of 1821, Oxfordshire Archives, transcribed onto OS 25-inch base by courtesy of Edina Digimap; tenelements shown stippled also appear on a 1789 estate map of the Earl of Shrewsbury's manor, British Library map-room, Map C7 e 16(3), between pp. 34–5.)



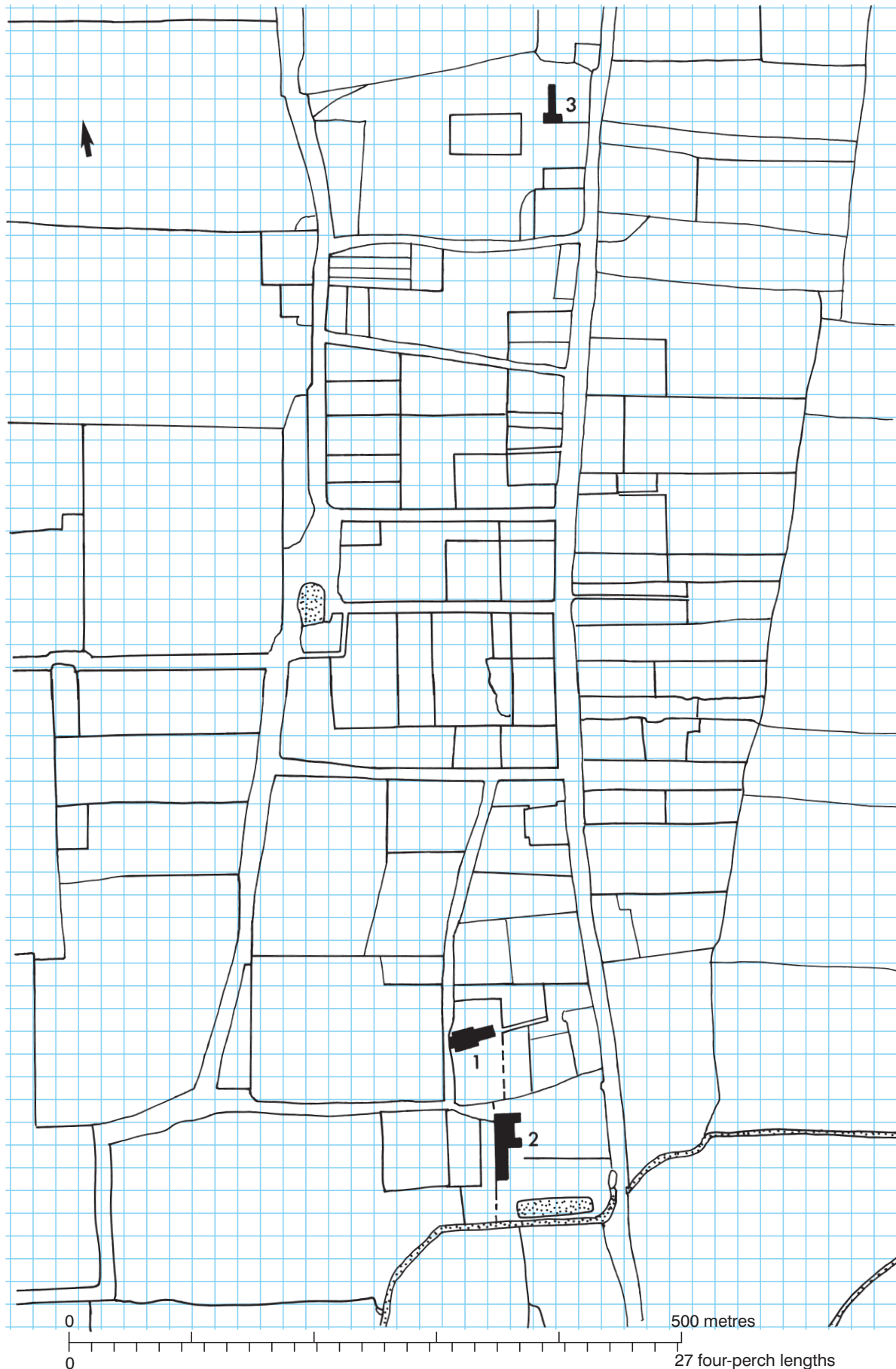


Figure 29. Brant Broughton (Lincs.): settlement grid-planning on a large scale. Boundaries aligned on the grid are emphasized in slightly thicker line. Apart from the church (1), rectory (2) and manor-house (3), buildings are only shown where omitting them would make boundaries hard to read. (After tithe map of 1838, National Archives IR 30/20/54, transcribed onto OS 25-inch base by courtesy of Edina Digimap.)

and early eleventh centuries, and from some very different contexts. Certainly the easiest sites to understand and explain are those associated with the monastic culture of c. 600–800, whose patrons were so addicted to Roman learning and artistic display. Just as the decorated pages of de-luxe manuscripts were constructed on grids,<sup>131</sup> it is unsurprising to find churches and claustral buildings articulated by a system of gridding derived ultimately from Roman technology. The gridding of enclosures and timber building complexes on rural dependencies of minsters is more unexpected, and extends our knowledge of the monastic impact on a wider world, but is also not inherently surprising. If one figure stands out as a proponent of high-precision surveying, it is (predictably) Wilfrid – that tireless and ruthless promoter of all things Roman – at Hexham, Ripon, perhaps even Escomb and Polebrook.

The extension of this technology to a wider range of settlement and landscape contexts recalls the many other ways in which the monastic high culture was gradually laicized and diffused during the two centuries after 750.<sup>132</sup> However, gradual diffusion is not easily reconciled with the very large chronological gap between the two groups of sites: at present no case of gridding in England can be dated between 800 and 950, a pattern highlighted by (and perhaps explaining) the invisibility of formal gridding in the burghal towns. Furthermore, the second phase looks quite compressed, into the time-span 950–1020 or even shorter. A phenomenon restricted to the years 600–800 on the one hand, and 950–1020 on the other, invites association with the two high tides of elite Anglo-Saxon monastic culture: could gridding have been reintroduced in the educated reforming circles at Eadgar's court (above, p. 22)? This idea has its attractions, but leaves unexplained the close similarities between early sites such as Ely and Stratton and the tenth-century grids; it also highlights the apparently unexplored problem of whether gridding was practised in ninth- and tenth-century Francia.

The later grids are harder to explain than the earlier ones to the extent that motivation and agency are less obvious. Whether high medieval row-plan villages and open-field furlongs were laid out by landlords or by peasant communities has been much debated, and in a sense the discovery that some of those villages and fields have pre-determining grids merely pushes the problem back a stage further. There is no obvious reason why the large grid-planned villages of the East Midlands, such as Brant Broughton or Raunds, should not have started as community initiatives into which seigneurial sites then encroached, and the identification of separate but contiguous grids at Glaston, Nassington and Fordham seems to strengthen this possibility by suggesting that more than one agency could be at work. On the other hand, some gridded settlements were on the fringes of important centres (Thetford, Bampton), extensions of existing villages (Ketton, Kites Hardwick), or redevelopments of former livestock enclosures (Thetford, Howbury). In those cases, gridding was apparently a

mode favoured for new planned development outside an existing core – a conclusion perhaps strengthened by the designation of the Ketton site as a *niwe-botl*.

There remains the problem of how these formally framed but loosely organized settlements were actually used. The excavated samples suggest occupation of considerably lower density than in later medieval villages, and it may be that after 1050 a process of contraction and intensification was normal, cases such as Brant Broughton representing archaic survivals. It is tempting to see the grid-squares as the basis for equal sharing of resources, or equal apportionment of dues and services, and Stotfold may give grounds for suspecting that, in at least one case, gridding was an instrument of equal division between heirs. But although some of the sites had an afterlife as villages, the excavated pre-Conquest phases look very unlike nucleated peasant settlements of a 'one-household-per-plot' kind. Rather, we find farmhouses or small manor-houses with scatters of outbuildings (Stotfold, Springfield Lyons, Ketton, Attlebridge, Nassington), or possible incipient villages into which manorial-type houses with their outlying paddocks and stock-yards intruded almost immediately (Raunds, West Cotton). Particularly enigmatic are the 'allotments' at Thetford, with their occasional shack-like outbuildings combined with intensive rubbish-disposal in grouped pits. Missing in all this is the regular, permanent demarcation of uniform peasant tofts and crofts that we take for granted by the thirteenth century: late Anglo-Saxon nucleated settlement looks different in kind, and much more fluid,<sup>133</sup> despite the defining grids that – paradoxically – were planned with more formality and geometrical precision than most later villages. Several of the farmsteads on excavated gridded sites can be associated with Domesday sokemen (Stotfold, Ketton, Howbury) and freemen (Attlebridge): do we see here the distinctive settlement form of a free peasant society that contracted sharply after the Conquest?<sup>134</sup>

The transience of so many of the grids found by excavation (already apparent in the eighth century at Ely and Stratton, with their superimposed grids) shows that only a small proportion of all those created in the later tenth century can have survived to appear on recent maps. Given that so many are, even so, still visible in the historic landscapes of central to eastern England, it seems possible that *most* east Midland villages experienced one or more episodes of gridding, and indeed that four-perch grids are the main hidden determinant underlying the nucleated settlements of that region. The transformation of extensive settlements based on grids into intensive ones based on tofts and crofts is beyond the present scope, though Raunds, Glaston, Nassington and Fordham suggest that it was often evolutionary, and West Cotton could just possibly be an early (if aborted) initiative in that direction. Another connecting link may be the systems of streets and lanes aligned on the grids, especially the ladder-like arrangements seen at Brant Broughton and Bampton. It is interesting to compare two Somerset villages which,

although not grid-planned, are very similar both to each other and to Brant Broughton: Shapwick, where field-work has built a strong case that the 'ladder' of streets was laid out before c. 1050,<sup>135</sup> and Cheddar, where the 'ladder' extends northwards from the late Anglo-Saxon royal residence. Parallel streets linked by close-spaced transverse lanes defining long, narrow rectangles is an arrangement familiar from the larger burghal towns, and in Winchester is now datable to the mid-ninth century.<sup>136</sup> The possible extension of this format to rural settlements needs more study.

A further question, not explored here beyond noting the rectilinear boundaries near some of the excavated sites, is whether the grid-planning recognized in settlements was also used to lay out arable or pasture closes or open-field furlongs: clearly this should now be investigated. One approach, given that a later measured acre was reckoned as  $4 \times 40$  perches,<sup>137</sup> would be to look for field-acres measured with the short perch (i.e. ten four-perch squares or  $18.288 \text{ m} \times 182.88 \text{ m}$ ).

In any event the implications of the present arguments – if they can be sustained – are far-reaching. They indicate that Anglo-Saxon settlements, and the landscapes around them, were more formally and more extensively planned than ever realized. The fragments of grid-planned enclosures still visible on Victorian maps could be the tip of a very much larger iceberg: a case such as Brant Broughton shows a grid extending as a framework for settlement over a kilometre or more, and there is nothing to say that this

was necessarily the limit. Perhaps most intriguingly, the background and framework provided by gridding open an entirely new perspective on much-debated but still intractable questions about the formation of medieval nucleated villages.

### Acknowledgements

The discoveries reported here would not have been made without the Leverhulme Trust's generous support through a Major Research Fellowship. I owe special thanks to Kanerva Blair-Heikkinen for supporting me through this phase (transient, we trust) of grid-obsessiveness; to Helena Hamerow and Stephen Rippon for encouragement and wise guidance in the early stages; to Wilfrid Kendall for his statistical advice and his appendix; to Jackie Stedall for correcting my presentation of numerical data; to Michael Lapidge for much valuable discussion of the manuscript transmission of the gromatic texts; and to Edward for helping in a surveying experiment. For comments and suggestions I am also very grateful to Richard Bailey, Richard Bradley, Nicholas Brooks, Rosemary Cramp, Eric Fernie, Richard Gem, Teresa Hall, Paul Harvey, Philip Lankester, Simon Loseby, David Palliser, Claudia Rapp, Andrew Reynolds, Stephen Rippon, Christopher Whittick, Mark Whittow and Chris Wickham. The other colleagues who were so helpful in providing information about sites, especially unpublished ones, are thanked in the relevant footnotes.

## Appendix. Modules for Anglo-Saxon constructions

### W. S. Kendall

The purpose of this preliminary note is to describe the use of a statistical method in Anglo-Saxon archaeology, specifically to assess evidence for the existence of an underlying module of measurement based on measurements of building ground plans. Statistical analysis can never constitute the whole story in such questions, since much weight must be given to subject-specific considerations. However the analysis can provide a useful basis for further discussion.

The fundamental idea underlying the following analysis was introduced by my late father D. G. Kendall,<sup>138</sup> following work of Broadbent.<sup>139</sup> It was motivated by a controversial question concerning whether dimensions of megalithic sites in the UK might reasonably be expressed in terms of a quantum of 5.44 ft. The statistical technique is concerned wholly with the question, whether the numbers in a list of measurements show signs of being based on whole multiples of an unknown quantum or module. D. G. Kendall described the procedure in terms of imagining  $N$  measurements  $X_1, \dots$ ,

$X_N$  marked out on a long transparent tape (each measurement producing a point located at a corresponding length starting from a single fixed reference point at the start of the tape); the tape then being wound around a wheel of fixed perimeter  $q$ . If the result of this winding is that the measurement marks are then seen to cluster on the wheel around the fixed reference point, then this is suggestive that  $q$  might indeed be an estimate of an unknown underlying quantum. One can argue statistically that the formula

$$\sqrt{\frac{2}{N}} \sum \cos(2\pi X_i/q)$$

provides a good measure of the evidence for  $q$  being a quantum: if this formula is graphed over a sensible range of values of the 'frequency'  $1/q$  then suitably high peaks of the graph point to the corresponding  $q$  as a possible quantum. The graph is then compared with graphs simulated using random data, based for example on judiciously constructed random perturbation of the original

dataset, thus allowing assessment of whether an observed peak might be due to a real effect, and estimation of the peak's location. This is D. G. Kendall's *quantogram* analysis. Pakkanen<sup>140</sup> describes a recent application in Greek archaeology.

In actual applications it is crucial to decide what measurements should constitute the data to be analysed. In the case of megalithic sites, attention was restricted to the diameters of circles defined by groups of standing stones. In the Anglo-Saxon context, it was decided to consider sequences of measurements taken by Professor Blair, measuring from fixed baselines (variously running E/W or N/S) on each of five ground plans from Canterbury (SS Peter and Paul), Canterbury (St Pancras), Hexham, Escomb and Brixworth. Measurements in metres (to the nearest 5 cm) were taken along fixed lines starting from each baseline, each sequence of measurements being determined by successive intersections of faces of walls with the fixed line in question. The sequences were then converted into lists of distances between intersections and subjected to quantogram analysis.

The above description begs a question about how to convert a sequence of successive intersections into a list of distances. One option is to take the distances between each neighbouring pair of intersections; another is to

consider the set of distances between all possible pairs of intersections on the fixed line. The second option produces a wider range of distances, at the price of some complication in generating appropriate simulations to produce comparison graphs. The difference in results between the two options is not great, but visual inspection suggests that the second option is more satisfactory. The quantogram for the second option, together with upper envelope generated by the simulations, is illustrated in Figure 30. The isolated peak at the left of Figure 30 rises well above the upper envelope, which is generated by the fifth highest running maximum of 499 simulated quantograms. This gives clear evidence that there is a quantum (the other peaks rising above the upper envelope are not markedly higher than the envelope, so are ignored). The peak corresponds to a quantum of  $q=4.75$  m. Further analysis suggests the accuracy of this estimate is of the order of  $\pm 0.26$  m (formally, two standard deviations).

To reiterate: statistical analyses of this form should be viewed as contributing to, rather than deciding, the debate on whether modules were in use in Anglo-Saxon architecture. Perhaps the most useful contribution of this analysis is to suggest the extent to which the quantum or module has been accurately determined by the particular

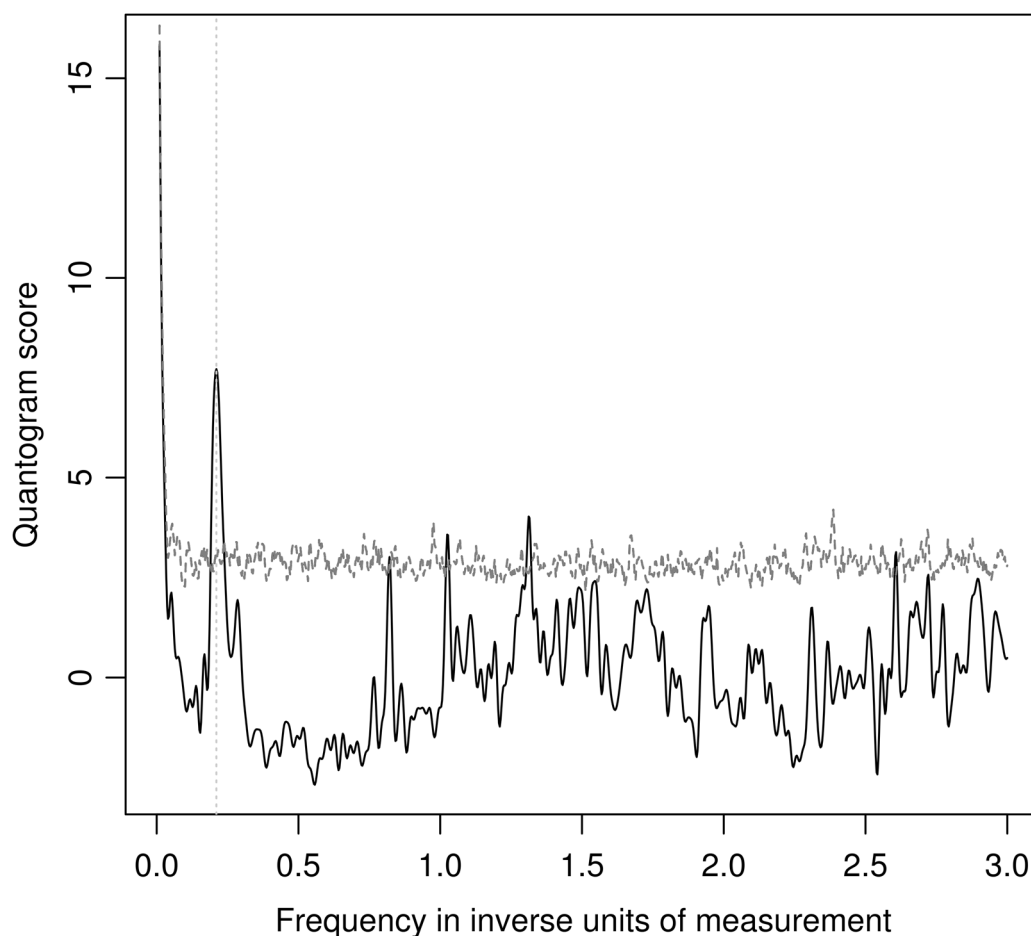


Figure 30.

dataset being considered: the range of  $\pm 0.26$  m given here suggests that the quantogram estimate of  $q=4.75$  m supports both the figure of  $q=4.65$  m proposed by Huggins<sup>141</sup> and the figure of  $q=4.57$  m suggested by Blair. Indeed the

later standard perch of 5.03 m is only just excluded by this preliminary analysis: future work will aim to incorporate more data in the hope of obtaining a more definitive result.

## Notes

- 1 Reynolds 2003, 119–28; below, note 101.
- 2 Huggins 1991.
- 3 Thus Eric Fernie's principle that 'measurements should be taken consistently between the same kinds of points' (Fernie 1991, 2), while entirely valid in the contexts that he is discussing, is in the present context only relevant to individual major buildings like those shown in Figure 2.
- 4 For this distinction, cf. Fernie 2002, 8.
- 5 Compare how, in the Lindisfarne Gospels, a polychrome step pattern is based on a grid of squares (Wilson 1984, illustrations 29 and 30). I owe this point to Rosemary Cramp.
- 6 J. Bosworth and T. N. Toller, *An Anglo-Saxon Dictionary* (Oxford, 1898), 682, s.v. *met-gird* (which is glossed *pertica* in a glossary cited there).
- 7 S 1443, S 1449 (ed. A. R. Rumble, *Property and Piety in Early Medieval Winchester* (Winchester Studies, Vol. 4.iii, Oxford, 2002), Nos. II and VII; cf. pp. 53 n. 22, 142 n. 24).
- 8 Below, note 40.
- 9 'Episcopus' c.12 (ed. D. Whitelock, M. Brett and C. N. L. Brooke (eds.), *Councils and Synods, 1. AD 871–1204* (2 vols., Oxford, 1981), Vol. 1, 421).
- 10 Cf. Blair 2005, 489–97.
- 11 Below, note 17.
- 12 Fernie 1991, 2.
- 13 Huggins 1991, 22–3.
- 14 Cf. Grierson 1972, 5–6, for the delusion of expecting micro-precision in medieval measurements.
- 15 Huggins 1991, 20–2.
- 16 Brooks 1996, 129–32; Hinton 1996, 153–4.
- 17 III Eadgar 8.1 (ed. A. J. Robertson, *The Laws of the Kings of England* (Cambridge, 1925), 28–9).
- 18 Compare, however, the slightly different conclusions of Huggins 1991, whose identification of the short perch at Cowderys Down and the long perch at Springfield Lyons is at variance with the present conclusions.
- 19 An example of this is Crummy 1979; see also below, note 101. For the standard perch in English sources after 1150, see Grierson 1972, 13–14, 20–1; Sunley 2011, 33, argues for its importance in Romanesque architecture, but the buildings he uses are all post-1050.
- 20 C. DuCange, *Glossarium Mediae et Infimae Latinitatis*, 6 (Niort, 1886), 287–8, s.v. *pertica*; Maitland 1897, 373–7; Grierson 1972, 20–1; Fernie 1985, 249–50. The possibly Corbie-produced tract 'Pauca de mensuris', preserved in late MSS of the 'Corpus agrimensorum' (Del Lungo 2004, 762–7) and in British Library, MS Royal 13. A. XI (for which see note 34 below) ff. 141v–142v, takes a 10-foot perch as the standard but recognizes longer perches, of 12, 15 and 18 feet, varying 'iuxta loca uel crassitudinem terrarum prout prouincialibus placuit': cf. discussion by Kidson 1990, 74–6. But we must reject the supposed 15-foot *pertica ad manus* (Hall and Nicholas 1929, 4, from Royal 13. A. XI f. 142v), which has caused confusion (e.g. Fernie 1990, 236): this is a misreading (*xv* for *xii* in the 'Corpus agrimensorum' version), and 12 must be correct since this perch is said to be divisible into 48 'palms' (of presumably 3 inches).
- 21 Hope-Taylor 1977, 125; Bettess 1991; 2006. However, Sunley 2011, 11, comments that 'my analysis of [Bettess's] data yielded a foot of 33.5 cm. as far more likely'. The present discussion may be compared with Sunley's argument (2011, 32–3) that the 16.5-foot perch is a different way of describing the length that had previously been defined as 18 feet of 28 cm and as 15 feet of 33.4 cm.
- 22 Fernie 1985, 252–3, showing that the modern foot was probably in use by Henry I's reign, and that it is the only plausible basic unit for the mid-eleventh-century church at Great Paxton (Hunts.). Sunley 2011, 17, 33 sees the short foot of c. 28 cm as a Norman innovation in Romanesque architecture, but is reluctant to draw conclusions about Anglo-Saxon feet.
- 23 British Library, MS Cotton Cleop. A. XVI f. 46, a fifteenth-century MS (printed Hall and Nicholas 1929, 6–7): 'trois greins dorge secches et roundes font le pouz, et xij pouces font i pie, et trois piez font laune, et v aunes font une perche, et iiii perches en laeure et xl in longure font i acre de terre'. This is in material headed 'De compositione monete et mensurarum tempore Regis E[dwardi] filii Regis H[enrici]', and beginning 'Par la discrecion de tout le royaume d'Engleterre fu la mesure nostre seigneur le roy ordenee en ceste maniere ...'. Given this ostensibly official context, however, the statement fits oddly with the numerous references in thirteenth-century English sources to a perch of 16 or 16.5 feet (Grierson 1972, 13–14, 20–1).
- 24 Columella, *Res rustica* Vi.5 (ed. R. H. Rodgers, Oxford, 2010, p. 186).
- 25 Isidore, *Etymologiae* XV.15.4 (ed. W. M. Lindsay, *Isidori Hispalensis Episcopi Etymologiarum sive Originum Libri XX* (2 vols., Oxford, 1911), Vol. 2 [unpaginated]).
- 26 Lapidge 2006, 311. This passage from Isidore also found its way into late MSS of the 'Corpus agrimensorum' (Blume *et al.* 1848, 367–8; Campbell 2000, 270–1); the ?Corbie treatise 'Pauca de mensuris' (note 20 above), drawn partly but not wholly from Isidore, includes the phrase 'clima dicitur pars agri quadrata, que habet ex omni parte pedes LX, id est perticas decimipedas undique sex' (Del Lungo 2004, 764). In turn these texts were used in computistic anthologies from late- and post-Carolingian France: British Library, MSS Harl. 3017 f. 52 and Royal 13. A. XI ff. 141v–142v (= Hall and Nicholas 1929, 3–5); for the latter see note 34 below.
- 27 But for a positive view of the influence of Classical texts on early medieval agriculture, especially in monastic milieus, see Brunner 1995, 31–4. In high medieval Bavaria, *iugera* were divided into twelve *clymata* of 2,400 square feet (Dollinger 1949, 105–11), which, if nothing else, might suggest Isidore's influence on the definition of real land-units.
- 28 Still the most complete edition, including the post-Classical texts, is Blume *et al.* 1848. A modern edition of the main texts, with translation and commentary, is Campbell 2000. The classic study is Dilke 1971. There is an important distinction between these gromatic techniques used in the western Empire (and, as argued here, its successors), and the geometrical rope-based techniques that are recorded in early Egypt and later formed the basis of Byzantine surveying practice (for which see Lefort *et al.* 1991).
- 29 Near Rochester: Dilke 1971, 191–3. However, recent fieldwork is also apparently suggesting the possibility of centuriation near Silchester.
- 30 Toneatto 1994–5, Vol. 1, items 001 and 002 (and 003 for related material copied in the sixth century); Dilke 1971, 127–9; Del Lungo 2004.
- 31 Dilke 1971, 45–6.
- 32 *Monumenta Germaniae Historica, Epistolarum I: Gregorii I Papae Registrum Epistolarum, Libri I–VII*, ed. P. Ewald and L. M. Hartmann (Berlin, 1891), 484–5 (letter VII.36); Dilke 1971, 46. The bishop was to accompany John to the disputed land and define its boundaries (*faciatis ... terminari*). Chris Wickham points out to me that John cannot be assumed to have used gromatic techniques, rather than those of later medieval Italian *mensuratores* who had a



- special expertise in drawing boundaries. However, arcane methods for delimiting disputed boundaries, using an elaborate repertoire of specialized boundary-stones, were conspicuous in the practice both of the *agrimensores* and, much later, of Bertrand Boysset (Dilke 1971, 98–108; Portet 2004, Vol. 1, 221–49): Gregory's *agrimensor* must have done something special to be worth sending from Rome to Syracuse, and it is possible that he worked in a long-continuing tradition.
- 33 Manuscripts listed by Toneatto 1994–5, Vol. 1, items 004–021; the best discussions are Ullman 1964 and Folkerts 1981.
- 34 Ullman 1964, 283. MSS attesting to an English audience are: Cambridge, Trinity College R. 15. 14 (939) pt.i; Durham, Cathedral Library, B. II. 11; London, British Library, Royal 13. A. XI; and Oxford, Bodleian Library, Douce 125; see Gneuss and Lapidge forthcoming, Nos. 185, 230, 483 and 615. I am grateful for Michael Lapidge's suggestion (pers. comm.) that Royal 13. A. XI, a northern French MS of c. 1100, 'is a copy of a manuscript of computistica assembled by Abbo and brought by him to England'. Cf. notes 20 and 26 above.
- 35 Ullman 1964, 266–8, 285.
- 36 See Harvey 1980, 131–2, for the argument that Arculf's plans of the holy places (only extant in later versions) and the St-Gall plan (extant in the original) share a distinctive convention for representing doorways. Jacobsen 1993, 43–6, 330–1, shows that at least the church on the St-Gall plan is based on 'ein quadratischer Schematismus'.
- 37 Barry Cunliffe has described to me the simplest possible method – standing with arms outstretched along the base-line, clapping them together, and sighting on a distant landmark – which I have used to survey an accurate right-angle.
- 38 Portet 2004, Vol. 1, 137–45.
- 39 Notker the German (c. 1000), paraphrasing Psalm 78.55 which mentions apportionment with a rope, explains that 'nowadays it would be done with a rod (*mit rûoto*)' (Grierson 1972, 20): presumably his readers were unfamiliar with rope-based surveying, and the statement accords with the late Anglo-Saxon references to the *metegyrð*. Whether the proportional system of 1 : root 2, well attested both in antiquity and in Romanesque and Gothic architecture, was used in early medieval surveying is highly contentious: see Fernie 1978 and 2002, 5–7, for one view, Jacobsen 1993, 328–31 (denying both triangulation and root-2 systems in Carolingian church planning) for the opposite. Here I must leave this problem aside, beyond noting that I see no compelling evidence for either triangulation or proportional systems in the plans under discussion. Richard Gem (pers. comm.) asks whether the 60-foot unit 'could have been transmitted in parallel in two bodies of knowledge: in one case as the ancient 60-foot *clima* of the surveyors; in the other case as a separate formula used by architects'. A reference to a major late tenth-century English church being laid out by skilled masons using rule (*recta rectitudine regule*), 'triangle' and compasses (Byrthferth, *Vita S. Oswaldi* iv.3, ed. M. Lapidge, *The Lives of St. Oswald and St. Ecgwine* (Oxford Medieval Texts, 2009), 98–9) might support the idea of a separate architectural tradition, at least by then.
- 40 "Thomas autem apprehendens arundinem coepit metiri et dicere, "Ecce ianuas in isto loco disponam et ad ortum solis ingressum. Primo proaulum ..." etc. ('Passio S. Thomae apostoli' c.16, ed. K. Zelzer, *Die alten lateinischen Thomasakten* (Texte und Untersuchungen, Vol. 122, Berlin, 1977), 12–13). Ælfric paraphrased this as 'Thomas eode metende mid anre metegyrde þone stede, and cwæð þæt he wolde wyrcan þa healle ærest on eastdæle ...' etc. (ed. W. W. Skeat, *Ælfric's Lives of the Saints*, 2 (EETS, Vols. 94, 114, London, 1900), 404). Ælfric's version introduces a stronger sense of two stages: first the overall framework, then the individual buildings.
- 41 Note here Orderic Vitalis's famous comment that Ranulf Flambard measured the land of England 'with a rope': *Historia Ecclesiastica*, ed. M. Chibnall (6 vols., Oxford, 1969–80), Vol. 4, 172: is this specified because the method was new?
- 42 Hope-Taylor 1977, figs. 60–2; for the two axes see Blair 2005, fig. 7.
- 43 Grave AX: Hope-Taylor 1977, figs. 25, 62, 94. Cf. the reconstruction of a Pompeian *groma* in Dilke 1971, 16, 50.
- 44 Hamerow 2012, 102–5.
- 45 Reynolds 2003, 119–28.
- 46 Cambridge 1999, 205–9, 222–7. The other churches of the 'Kentish' group may also be gridded, but the evidence is less clear.
- 47 *Ibid.*, 212–15.
- 48 Stephen of Ripon, *Vita Wilfridi* cc.17, 22 (ed. Colgrave pp. 34–6, 44–6); Fernie 1983, 59–60; Bailey 1991; Blair 2005, 93–6.
- 49 Cambridge and Williams 1995, 73–80 and fig. 16.
- 50 Richard Bailey observes (pers. comm.) that one excavated wall at Hexham 'had foundations stretching more than half a metre south of the southern face of the wall placed on it: there was obviously a great deal of care taken to begin constructing the wall on exactly the required line on such broad foundations'.
- 51 I owe this observation to Richard Bailey, the main authority on the buildings at Hexham and Ripon, who has kindly expressed confidence in the present hypothesis.
- 52 Bede, *Historia abbatum* c.5 (ed. Plummer p. 368).
- 53 Cramp 2005–6, Vol. 1, 146–72, 187–241.
- 54 *Ibid.*, 161–2 for the indirect evidence for the likely position of this wall.
- 55 *Ibid.*, 56–75, 91–114. I am grateful to Sarah Semple for discussions on this point.
- 56 *Ibid.*, 351 (plans of Monkwearmouth and Jarrow overlaid), 111.
- 57 Pocock and Wheeler 1971; the west and north *porticus* which they found are additions, even if early ones, and are therefore omitted from Figure 3.
- 58 Fernie 1983, 55–6. But I remain uncertain whether or not to accept Eric Fernie's idea of a proportional system at Escomb: see note 39 above.
- 59 Kjølbye-Biddle 1986 (but for a different view see Bettess 1991, 45). The proposed unit is considerably longer than the 'West Saxon' (i.e. modern) perch of 5.03 m inferred from the Burghal Hidage (above, p. 20). It is in any case certain that a short-perch grid does not fit this plan.
- 60 Audouy *et al.* 1984; Gem 2011. Surprisingly, the companion church at Cirencester, known from excavation, does not seem to use the short perch. For gridding in contemporary Carolingian architecture see above, notes 36 and 39.
- 61 Rahtz 1976.
- 62 Hinchcliffe 1986; cf. Blair 2005, 213–14. The only direct dating evidence is a single radiocarbon date, from oak charcoal in a wall-trench, calibrated at AD 555–660 (Hinchcliffe 1986, 249). The character of the site suggests that it lies at the end of, or beyond, this range.
- 63 There is a very similar T-shaped arrangement at Cowderys Down (Reynolds 2003, 106), even though that site is apparently not gridded.
- 64 Upex 2003.
- 65 *Ibid.*, 43 and figs. 7 and 8; cf. Hamerow 2012, 28n.
- 66 Ford, Howell and Taylor 2004, 60–88.
- 67 Clark, Rady and Sparey-Green 2009.
- 68 S 33, with confirmation by Offa S 105 (ed. A. Campbell, *Charters of Rochester* (Anglo-Saxon Charters, Vol. 1, London, 1973), Nos. 6 and 8).
- 69 Clark *et al.* 2009, 42–4; note especially three sherds of Ipswich Ware.
- 70 Stephen of Ripon, *Vita Wilfridi* cc.65–7 (ed. Colgrave pp. 140–6).
- 71 Hohler 1966–70.
- 72 Lucy, Tipper and Dickens 2009.
- 73 *Ibid.*, 423–4.
- 74 *Ibid.*, 426.
- 75 *Ibid.*, 363–5 for the three phases of the site: 1 (c. 500–80), 2a (c. 580–650) and 2b (c. 650–700). Of the eight structures conforming to the grid, four (30, 43, 45, 47) have been assigned to 2a and the others (12, 19, 20, 21) to 2b, which suggests that the grid was laid out



- towards the end of phase 2a. Inevitably some details of the phasing are less than conclusive, as illustrated by the ambiguous relationship between contiguous structures 43 and 12 (*ibid.*, 112).
- 76 Cf. Blair 2005, 65–73. Sarah Foot's account of religious women living outside the cloister and as 'vowesses' may also be relevant here: Foot 2000, Vol. 1, 56–9, 111–44.
- 77 Bede, *Historia ecclesiastica* iv.19 (ed. Colgrave and Mynors p. 394).
- 78 S 1440 (ed. S. Kelly, *Charters of Peterborough Abbey* (Anglo-Saxon Charters, Vol. 14, Oxford, 2009), No. 9), referring to land at Sempringham and Sleaford: an ambiguity of the Old English unfortunately leaves it unclear whether Sleaford was already a *Medeshamstede* estate, but that interpretation seems as plausible as the alternative. By 1086 Quarrington belonged to Ramsey Abbey (Great Domesday Book fo. 346v), though the charter purportedly granting it is spurious (S 1030).
- 79 Biggleswade was a valuable manor of Archbishop Stigand in 1066, later a prebend of Lincoln cathedral; Stratton was a chapelry of Biggleswade parish church: *VCH Beds.*, Vol. 2, 209–15. For the indicators see Blair 2005, 364–7.
- 80 Mortimer, Regan and Lucy 2005, 11–24. The first Anglo-Saxon phase is reliably dated by the presence of Ipswich Ware.
- 81 *Ibid.*, 25–8.
- 82 *Ibid.*, 28–39.
- 83 See plans in Mudd and Webster 2011, 32–3, 40. I am grateful to Sam Lucy for providing plans of another, newly excavated part of this complex (at Walsingham Way), which is also rectilinear without showing compelling evidence of gridding.
- 84 Mudd and Webster 2011, 131–2; Mortimer *et al.* 2005, 144–9.
- 85 Taylor *et al.* 2003, 237–42, 247.
- 86 *Ibid.*, 244–8.
- 87 *Ibid.*, 274.
- 88 *Ibid.*, 275–6.
- 89 I am grateful to Albion Archaeology, and especially to David Ingham, for allowing me to publish details of this important site and for discussing it with me. Although the sequence of the two phases as stated here seems fairly clear on the basis of associated features, there is no unambiguous stratigraphical relationship.
- 90 Hamerow 2012, 73–83.
- 91 For the current debate see Wrathmell 2012, 99–180, in which I find the arguments of Wrathmell and Richards more convincing than those of Everson and Stocker. For West Heslerton, where the practice of forming new enclosures (against a background of relict Roman ones) seems again to have started in the later seventh century, see Powlesland 2000, fig. 3.2; I am grateful to Dominic Powlesland for discussions and clarifications.
- 92 Reynolds 2003, 110–15.
- 93 As argued by Hamerow 2012, 88–94.
- 94 Blair 2005, 51–7.
- 95 Part of this later phase is illustrated in Reynolds 2003, 126.
- 96 Andrews 1997, 31–2. I am grateful to Ian Riddler and Andy Russel for discussions.
- 97 *Ibid.*, 36, 39 fig. 18 (lines on either side of the street marked B-B and C-C).
- 98 This idea is not incompatible with the property divisions proposed by the excavators (*ibid.*, 46–8); it is merely to suggest that those were formed by modifying an initially regular scheme.
- 99 Compare the isolated South Saxon case, at Burpham (West Sussex), of a building using the short-perch system (Fig. 1): Sutermeister 1976.
- 100 Cherryson 2010; I. Riddler in Wrathmell 2012, 152–3.
- 101 Audouy and Chapman 2009, 54; Chapman 2010, 33. I am not here discussing the Raunds Burystead site, on the other side of the main street and stream (Audouy and Chapman 2009, 128–9), which has a rectilinear layout but does not seem to use the short-perch module.
- 102 Audouy and Chapman 2009, 28–37, 66–84, 111–18, for what follows.
- 103 Hamerow 2012, 46–7.
- 104 Audouy and Chapman 2009, 75–7, feature SP 130/134.
- 105 Chapman 2010, 30–78, 113–51, for what follows.
- 106 *Ibid.*, 22.
- 107 *Ibid.*, 35–50.
- 108 Audouy and Chapman 2009, 23.
- 109 I am once again very grateful to Albion Archaeology, and especially to Wesley Keir, for access to this important unpublished site and for detailed discussions.
- 110 Great Domesday Book fo. 213. In 1066 a royal thegn (Eskil) held 9½ of 15 hides, seven sokemen held the remainder, and St Alban's Abbey held an additional hide; by 1086 the thegn and sokemen had been replaced by a Norman lord with a five-hide demesne and twenty-one villans.
- 111 Blair 2005, 370–1. Goltho (note 130 below) could be another case.
- 112 Blair 2005, 381–2 (drawing on unpublished data supplied by Ian Meadows); Tyler and Major 2005; Timby *et al.* 2007, 161–77; Hall *et al.* 1996. For the Springfield Lyons settlement, where the (rather uncertainly defined) series of phases seem to observe a single grid, see also Hamerow 2012, 111–12.
- 113 The name is recorded from 1296 (unpublished documentary report by Paul Courtney), and on John Speed's map of Rutland the caption 'Newbotle' appears in the general area of the excavated site. However, it remains unresolved whether it refers to the tenth-century complex or to another settlement, also now excavated, established nearby c. 1100.
- 114 This unusual monument, apparently originally palisaded, produced ninety Romano-British sherds (Hall *et al.* 1996, 302–4); presumably in the tenth century it was visible on the surface as an earthwork.
- 115 Hall *et al.* 1996, 299, 309–16.
- 116 I am grateful to Andy Chapman for providing a plan and for information. Since the ditch was not excavated an Anglo-Saxon date is impossible to prove, but it seems probable given the ditch's conformity with the layout of the buildings. It is considered unlikely that significant Anglo-Saxon features were missed within the watching-brief area.
- 117 Little Domesday Book fo. 59; Tyler and Major 2005, 200–2, arguing reasonably that the site is DB Cuton (*Keuentona*).
- 118 Ketton: Great Domesday Book fo. 219; the excavated site is obviously not the core of the royal manor, so by elimination it is likely to represent one or more of the twelve sokemen. Howbury: inferred to be one of the eleven sokemen of *Salchou* (Great Domesday Book fo. 213), on the assumption that that entry covers the whole of what was later Renhold parish (Timby *et al.* 2007, 205–6; cf. *VCH Beds.*, Vol. 3, 214–18).
- 119 The four entries for Attlebridge (Little Domesday Book fos. 147v, 196, 225, 241v) describe all TRE tenants as free men, with holdings of 16 acres downwards.
- 120 Dallas 1993, period III.
- 121 Blair 2005, 340–1.
- 122 Sutermeister 1976. The building was interpreted as being of more than one phase, though the sequence is unclear.
- 123 S 44 (ed. S. E. Kelly, *Charters of Selsey* (Anglo-Saxon Charters, Vol. 6, London, 1998), No. 5).
- 124 Cooper and Thomas 2001. I am grateful to John Thomas for providing (from a forthcoming publication) the excavation plan used in Figure 24.
- 125 I am grateful to Jane Baile for providing the unpublished plans of the domestic range (excavated for a Channel Four Time Team programme), and data allowing the location of this and the ditch in the village plan. For the ditch see Baile 2002.
- 126 Patrick and Rátkai 2011. The ditch is F166 (p. 53).
- 127 Roberts and Wrathmell 2000, figs. 1, 3, 21–2 etc.
- 128 This is the subject of a continuing research project: for details and bibliography see Blair 2010.
- 129 Everson, Taylor and Dunn 1991; the presence of grid-plans is recognized on pp. 14–15.
- 130 Reynolds 2003, 123–5. Unfortunately the excavation at Goltho poses some serious problems of interpretation, which will be examined in a future study; it seems possible that the manor-house developed within the enclosures of a gridded village.

- 131 Above, note 5.  
 132 Blair 2005, 132–4.  
 133 The point is made by Gardiner 2011, 207–10, who emphasizes discontinuity of form.  
 134 This is very consistent with Rosamond Faith's view of the Norman impact on peasant settlement: Faith 1997, 225–34.  
 135 Gerrard and Aston 2007, 44–74, 244–53, 503–12, 974–80 (but not in my view proving that the tofts, as well as the streets, existed this early).

- 136 Biddle 1976, 277–82 and fig. 25; for the dating see Ford and Teague 2011, 74–83, 189 (though their attempt to date property-boundaries this early is unconvincing).  
 137 Maitland 1897, 371–4; cf. the text quoted in note 23 above.  
 138 Kendall 1974.  
 139 Broadbent 1956.  
 140 Pakkanen 2004.  
 141 Huggins 1991.

## Abbreviation

- S P. H. Sawyer, *Anglo-Saxon Charters: An Annotated List and Bibliography*: cited by number with reference to the Electronic Sawyer, <http://esawyer-stg.cch.kcl.ac.uk/about/index.html>

## Bibliography

- Andrews, P. 1997. *Excavations at Hamwic*, Vol. 2. *Excavations at Six Dials*, Council for British Archaeology Research Report, 109, York: CBA.
- Audouy, M. et al. 1984. 'Excavations at the Church of All Saints, Brixworth, Northamptonshire (1981–2)', *Jnl British Arch. Assoc.*, **137**, 1–44.
- Audouy, M. and Chapman, A. 2009. *Raunds: The Origins and Growth of a Midland Village AD 450–1500*, Oxford: Oxbow.
- Baile, J. 2002. 'The Prebendal Manor Research Project, Nassington', *Northamptonshire Arch.*, **30**, 116–18.
- Bailey, R. 1991. 'St Wilfrid, Ripon and Hexham', in C. Karkov and R. Farrell (eds.), *Studies in Insular Art and Archaeology*, 3–25, American Early Medieval Studies, Vol. 1, Oxford, Ohio: Miami University.
- Bettess, F. 1991. 'The Anglo-Saxon foot: a computerized assessment', *Medieval Arch.*, **35**, 44–50.
- Bettess, F. 2006. 'Units of measurement', in R. Cramp, *Wearmouth and Jarrow Monastic Sites*, Vol. 2, 625–8, Swindon: English Heritage.
- Biddle, M. (ed.) 1976. *Winchester in the Early Middle Ages: An Edition and Discussion of the Winton Domesday*, Oxford: Oxford University Press.
- Blair, J. 2005. *The Church in Anglo-Saxon Society*, Oxford: Oxford University Press.
- Blair, J. 2010. 'Bampton: a minster-town', in K. Tiller and G. Darkes (eds.), *An Historical Atlas of Oxfordshire*, 30–1, Chipping Norton: Oxfordshire Record Society.
- Blume, F., Lachmann, K. and Rudorff, A. 1848. *Die Schriften der römischen Feldmesser (Gromatici Veteres)*, Vol. 1, Berlin: Georg Reimer.
- Broadbent, S. R. 1956. 'Examination of a quantum hypothesis based on a single set of data', *Biometrika*, **43**(1), 32–44.
- Brooks, N. P. 1996. 'The administrative background to the Burghal Hidage', in D. Hill and A. R. Rumble (eds.), *The Defence of Wessex: The Burghal Hidage and Anglo-Saxon Fortifications*, 128–50, Manchester: Manchester University Press.
- Brunner, K. 1995. 'Continuity and discontinuity of Roman agricultural knowledge in the early Middle Ages', in D. Sweeney (ed.), *Agriculture in the Middle Ages*, 21–40, Philadelphia: University of Pennsylvania Press.
- Cambridge, E. 1999. 'The architecture of the Augustinian Mission', in R. Gameson (ed.), *St Augustine and the Conversion of England*, 202–36, Stroud: Sutton Publishing.
- Cambridge, E. and Williams, A. 1995. 'Hexham Abbey: a review of recent work and its implications', *Arch. Aeliana* 5th ser., **23**, 51–138.
- Campbell, B. 2000. *The Writings of the Roman Land Surveyors*, Journal of Roman Studies Monograph, 9, London: Society for the Promotion of Roman Studies.
- Chapman, A. 2010. *West Cotton, Raunds: A Study of Medieval Settlement Dynamics AD 450–1450*, Oxford: Oxbow.
- Cherryson, A. K. 2010. 'Saxon Southampton and the development of churchyard burial', in J. Buckberry and A. Cherryson (eds.), *Burial in Later Anglo-Saxon England, c.650–1100 AD*, 54–72, Oxford: Oxbow.
- Clark, P., Radey, J. and Sparey-Green, C. 2009. *Wainscot Northern Bypass: Archaeological Investigations 1992–1997*, Canterbury: Canterbury Archaeological Trust.
- Cooper, L. and Thomas, J. 2001. 'Glaston, Grange Farm', *Trans. of the Leicestershire Arch. and Hist. Soc.*, **75**, 158–9.
- Cramp, R. 2005–6. *Wearmouth and Jarrow Monastic Sites*, 2 vols., Swindon: English Heritage.
- Crummy, P. 1979. 'The system of measurement used in town planning from the ninth to the thirteenth centuries', *ASSAH*, **1**, 149–64.
- Dallas, C. 1993. *Excavations in Thetford by B.K. Davison between 1964 and 1970*, East Anglian Archaeology, 62, Gressenhall: Norfolk County Council.
- Del Lungo, S. 2004. *La Practica Agrimensoria nel Tarda Antichità e nell'alto Medioevo*, Spoleto: Centro Italiano di Studi sull'Alto Medioevo.
- Dilke, O. A. W. 1971. *The Roman Land Surveyors: An Introduction to the Agrimensores*, Newton Abbot: David and Charles.
- Dollinger, P. 1949. *L'Évolution des Classes Rurales en Bavière*, Paris: Belles Lettres.
- Everson, P. L., Taylor, C. C. and Dunn, C. J. 1991. *Change and Continuity: Rural Settlement in North-West Lincolnshire*, London: HMSO.
- Faith, R. 1997. *The English Peasantry and the Growth of Lordship*, London: Leicester University Press.
- Fernie, E. 1978. 'The proportions of the St. Gall plan', *Art Bull.*, **60**, 583–9.
- Fernie, E. 1983. *The Architecture of the Anglo-Saxons*, London: Batsford.
- Fernie, E. 1985. 'Anglo-Saxon lengths: the "Northern" system, the perch and the foot', *Arch. Jnl*, **142**, 246–54.
- Fernie, E. 1990. 'A beginner's guide to the study of architectural proportions and systems of length', in E. Fernie and P. Crossley (eds.), *Medieval Architecture and its Intellectual Context: Studies in Honour of Peter Kidson*, 229–37, London and Ronciverte: Hambledon Press.
- Fernie, E. 1991. 'Anglo-Saxon lengths and the evidence of the buildings', *Medieval Arch.*, **35**, 1–5.
- Fernie, E. 2002. 'Introduction', in N. Y. Wu (ed.), *Ad Quadratum: The Practical Application of Geometry in Medieval Architecture*, Aldershot: Ashgate.
- Folkerts, M. 1981. 'The importance of the Pseudo-Boethian *Geometria* during the Middle Ages', in M. Masi (ed.), *Boethius and the Liberal Arts: A Collection of Essays*, 187–209, Berne: Peter Lang.
- Foot, S. 2000. *Veiled Women*, 2 vols., Aldershot: Ashgate.
- Ford, B. M. and Teague, S. 2011. *Winchester: A City in the Making*, Oxford Archaeology Monograph, 12, Oxford: Oxford Archaeology.
- Ford, S., Howell, I. and Taylor, K. 2004. *The Archaeology of the Aylesbury–Chalgrove Gas Pipeline, and the Orchard, Walton Road, Aylesbury*, Thames Valley Archaeological Services Monograph, 5, Reading: TVAS.

- Gardiner, M. 2011. 'Late Saxon settlements', in H. Hamerow *et al.* (eds.), *The Oxford Handbook of Anglo-Saxon Archaeology*, 198–217, Oxford: Oxford University Press.
- Gem, R. 2011. *Architecture, Liturgy and Romanitas in All Saints' Church, Brixworth*, 27th Brixworth Lecture, Leicester: University of Leicester.
- Gerrard, C. and Aston, M. 2007. *The Shapwick Project, Somerset: A Rural Landscape Explored*, Society for Medieval Archaeology Monograph, 25, [no place]: Society for Medieval Archaeology.
- Gneuss, H. and Lapidge, M. forthcoming. *Bibliographical Handlist of Manuscripts and Manuscript Fragments Written or Owned in England up to 1100*, Toronto (forthcoming 2013).
- Grierson, P. 1972. *English Linear Measures: An Essay in Origins*, The Stenton Lecture 1971, Reading: University of Reading.
- Hall, H. and Nicholas, F. J. 1929. *Select Tracts and Table Books Relating to English Weights and Measures (1100–1742)*, Camden Miscellany, 15, Camden 3rd ser., 41, London: Offices of the Society.
- Hall, J. J. *et al.* 1996. 'Excavations at Attlebridge, 1989', *Norfolk Archaeology*, 42.iii, 296–320.
- Hamerow, H. 2012. *Rural Settlements and Society in Anglo-Saxon England*, Oxford: Oxford University Press.
- Harvey, P. D. A. 1980. *The History of Topographical Maps*, London: Thames and Hudson.
- Hinchcliffe, J. 1986. 'An early medieval settlement at Cowage Farm, Foxley, near Malmesbury', *Arch. Jnl*, 143, 240–59.
- Hinton, D. A. 1996. 'The fortifications and their shires', in D. Hill and A. R. Rumble (eds.), *The Defence of Wessex: The Burghal Hidage and Anglo-Saxon Fortifications*, 151–9, Manchester: Manchester University Press.
- Hohler, C. 1966–70. 'St Osyth and Aylesbury', *Records of Buckinghamshire*, 18, 61–72.
- Hope-Taylor, B. 1977. *Yeavinger: An Anglo-British Centre of Early Northumbria*, London: HMSO.
- Huggins, P. J. 1991. 'Anglo-Saxon timber building measurements: recent results', *Medieval Arch.*, 35, 6–28.
- Jacobsen, W. 1993. *Der Klosterplan von St. Gallen und die karolingische Architektur*, Berlin: Deutscher Verlag für Kunstwissenschaft.
- Kendall, D. G. 1974. 'Hunting quanta', *Philol. Trans. of the Royal Soc., London Series A*, 276(1257), 231–66.
- Kidson, P. 1990. 'A metrological investigation', *Jnl of the Warburg and Courtauld Institutes*, 53, 71–97.
- Kjølbye-Biddle, B. 1986. 'The 7th-century minster at Winchester interpreted', in L. A. S. Butler and R. K. Morris (eds.), *The Anglo-Saxon Church: Papers on History, Architecture and Archaeology in Honour of Dr H.M. Taylor*, 196–209, Council for British Archaeology Research Report, 60, London: CBA.
- Lapidge, M. 2006. *The Anglo-Saxon Library*, Oxford: Oxford University Press.
- Lefort, J. *et al.* 1991. *Géométries du fisc byzantin*, Paris: Lethielleux.
- Lucy, S., Tipper, J. and Dickens, A. 2009. *The Anglo-Saxon Settlement and Cemetery at Bloodmoor Hill, Carlton Colville, Suffolk*, East Anglian Archaeology, 131, Cambridge: Cambridge Archaeological Unit.
- Maitland, F. W. 1897. *Domesday Book and Beyond*, Cambridge: Cambridge University Press.
- Mortimer, R., Regan, R. and Lucy, S. 2005. *The Saxon and Medieval Settlement at West Fen Road, Ely: The Ashwell Estate*, East Anglian Archaeology, 110, Cambridge: Cambridge Archaeological Unit.
- Mudd, A. and Webster, M. 2011. *Iron Age and Middle Saxon Settlements at West Fen Road, Ely, Cambridgeshire: The Consortium Site*, BAR British Series, 538, Oxford: British Archaeological Reports.
- Pakkanen, J. 2004. 'The Toumba Building at Lefkandi: a statistical method for detecting a design-unit', *Ann. of the British School at Athens*, 99, 257–71.
- Patrick, C. and Rátkai, S. 2011. 'Hillside Meadow, Fordham', in R. Cuttler *et al.*, *Five Sites in Cambridgeshire*, 41–122, BAR British Series, 528, Oxford: British Archaeological Reports.
- Pocock, M. and Wheeler, H. 1971. 'Excavations at Escomb Church, County Durham', *Jnl British Arch. Assoc.* 3rd ser., 34, 11–29.
- Portet, P. 2004. *Bertrand Boysset, la vie et les œuvres techniques d'un arpenteur médiéval (v.1355–v.1416)*, 2 vols., Paris: Éditions le Manuscrit.
- Powlesland, D. 2000. 'West Heslerton settlement mobility: a case of static development', in H. Geake and J. Kenny (eds.), *Early Deira*, 19–26, Oxford: Oxbow.
- Rahtz, P. A. 1976. 'The building-plan of the Anglo-Saxon monastery of Whitby Abbey', in D. M. Wilson (ed.), *The Archaeology of Anglo-Saxon England*, 224–5, 459–62, London: Methuen.
- Reynolds, A. 2003. 'Boundaries and settlements in later sixth- to eleventh-century England', *ASSAH*, 12, 98–136.
- Roberts, B. and Wrathmell, S. 2000. *An Atlas of Rural Settlement in England*, London: English Heritage.
- Sunley, H. 2011. *Linear Metrological Analysis*, Kenilworth: Pleasaunce Press.
- Sutermeister, H. 1976. 'Burpham: a settlement site within the Saxon defences', *Sussex Arch. Collections*, 114, 194–206.
- Taylor, G. *et al.* 2003. 'An Early to Middle Saxon settlement at Quarington, Lincolnshire', *Antiquaries Jnl*, 83, 231–80.
- Timby, J. *et al.* 2007. *Settlement on the Bedfordshire Claylands: Archaeology Along the A421 Great Barford Bypass*, Bedfordshire Archaeology Monograph, 8, Oxford: Oxford Archaeology.
- Toneatto, L. 1994–5. *Codices Artis Mensoriae: I Manoscritti degli Antichi Opuscoli Latini d'Agrimensura (V–XIX Sec.)*, 3 vols., Spoleto: Centro Italiano di Studi sull'Alto Medioevo.
- Tyler, S. and Major, H. 2005. *The Early Anglo-Saxon Cemetery and Later Saxon Settlement at Springfield Lyons, Essex*, East Anglian Archaeology, 111, Chelmsford: Essex County Council.
- Ullman, B. L. 1964. 'Geometry in the mediaeval quadrivium', in *Studi di bibliografia e di storia in onore di Tammamo de Marinis*, Vol. 4, 263–85, Verona: Stamperia Valdonega.
- Upex, S. 2003. 'A Migration Period site at Polebrook, Northamptonshire: surveys and excavations up to 2002', *South Midlands Arch.*, 33, 41–51.
- Wilson, D. M. 1984. *Anglo-Saxon Art*, London: Thames and Hudson.
- Wrathmell, S. (ed.) 2012. *A History of Wharham Percy and its Neighbours*, York University Archaeological Publications, 15, York: University of York.