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Summary

Eighty-four samples from 62 individual timbers were sampled during 1998 from the eastern chapel roofs of Salisbury Cathedral. This included the original roof of the northern Chapel of St Peter and the Apostles, and the southern Chapel of St Stephen and the Martyrs, as well as a couple of samples from re-used timbers from the former glaziers shop over the Chapel of the Trinity and All Saints. Of these 62 timbers, 49 were dated, three producing precise felling dates of spring AD 1222, which accords well with a documented consecration date of 28 September AD 1225. Of the samples dated, 35 formed a 314-year replicated chronology ***SARUM1***, spanning the years AD 908 - 1221. This matched extremely well with materials from the region around Dublin, suggesting that much of the structural timberwork for the earliest roofs was imported from this area. Five other timbers matched better with chronologies from southern England and were combined to form the 108-year chronology ***SARUM2***, spanning the years AD 1106 - 1213.

During 2000, a further 176 samples were taken from 159 timbers throughout the roofs of the north porch and north nave triforium. Of these, 123 timbers dated. Three precise felling dates were produced for the primary construction phase: two from the winter of AD 1251/2 and one from the winter of AD 1254/5. A fourth felling date of summer AD 1236 identified an earlier reused timber. A 201-year chronology from 27 trees ***SARUM3x*** was produced, spanning the years AD 1054 - 1254. A series of lead sarking boards from the roof were identified as imported from Ireland, and shown to be part of the original construction. Forty-nine of these timbers were considered to have originated from 42 trees and were combined to form the chronology ***SARUM4***, spanning the years AD 878-1230. Finally, other post-medieval roof boards and structural repair timbers produced three more site chronologies. These were ***SARUM5***, spanning the years AD 1558 - 1662, ***SARUM6*** spanning the years AD 1604-68, and ***SARUM7*** spanning the years AD 1672 - 1735. The identified three post-medieval phases of AD 1661 - 3, AD 1669, and AD 1736 respectively.

Both the eastern chapel roofs and the north nave triforium and north porch roofs have revealed exceptionally important carpentry features, including the earliest crown posts to be found anywhere in Britain, and the earliest use of Arabic numbers, both random and in sequence, again anywhere in British carpentry.

Keywords
Dendrochronology
Standing Building

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Salisbury Cathedral from the south east. © Crown copyright. NMR. FF95/110

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Introduction:

This report details the collection and analysis of 210 samples taken from the roofs of the eastern chapels, the north nave triforium roof, and the north porch (Parvis Chamber) roof of Salisbury Cathedral. This forms the first report from an extended dendrochronological survey of the Cathedral.

Salisbury Cathedral is considered by many to be the epitome of Early English church architecture. Unlike most other cathedrals, Salisbury was built almost entirely to a single design of unparalleled coherence and elegance within a new green-field site (NGR SU 144 294; Figs 1 and 2). The first foundation stones were laid in AD 1220, and the whole cathedral consecrated in AD 1258, a period of less than 40 years which accounts for its exceptional cohesiveness. The earliest part of the cathedral to be completed was the east end encompassing three chapels: the north being the Chapel of St Peter and the Apostles, the south being the Chapel of St Stephen and the Martyrs, and in between the Chapel of the Trinity and All Saints, also known as the Lady Chapel (Figs 3 and 4). These were dedicated at Michaelmas AD 1225, five and a half years after the foundation stones are said to have been laid.

Construction proceeded westwards during the ensuing 30 years. The choir and east transepts had progressed sufficiently by about AD 1237 for the choir stalls to be completed, and the west end had been reached by the early AD 1250s (Blum 1991). This included the nave triforium and north porch, with Parvis room over (Figs 3, 5, and 6). By about AD 1250 the central crossing had been completed (Simpson 1996) although the spire was not added until the first half of the following century. The lead roofing was completed by Bishop Bridgport from AD 1256, and the cathedral was consecrated on 30 September AD 1258. Most of the building works were probably finished by AD 1266, including the Cloisters and Chapter House, and the free-standing bell tower (Tatton-Brown *pers comm*).

Timber for the construction of Salisbury is known to have come from as many as 16 different forests across Wiltshire and Hampshire, as well as a far a field as Herefordshire. These include the forests of Trivelle and Dean in Herefordshire, Clarendon, Chippenham, Melksham, Savernake, Bramshaw, Downton, and Gillingham in Wiltshire, and Chute and Odiham forests in Hampshire (Fig 7). The question of timber source has been well researched by Gavin Simpson (1996).

Generally, it is not possible to conclusively provenance timbers from locations nearer than 100 miles distant (Bridge 2000a). Sometimes it is possible to provenance a group of timbers from a large group of building timbers from a known woodland with another group of unknown origin, if the matches are high enough. Unfortunately, no well replicated chronologies exist for the various woodlands from which timbers were drawn from for the building of Salisbury, with the exception of five medieval and post-medieval chronologies from Clarendon (Tyers 1999a; 2001).

During the following seven centuries, the cathedral continued to evolve. Probably during the first few decades of the fourteenth century the upper part of the tower and spire were constructed, and probably in AD 1415 the great strainer arches were inserted below to help counteract the excessive loading thus created (Cocke and Kidson 1993). In AD 1479 the stone vaulting was inserted into the central crossing, obscuring a Baltic oak ceiling of *c* AD 1370 (Simpson 1996).

From the sixteenth century repairs began to feature prominently in the accounts, the first major campaign dating from the AD 1560s by Bishop Jewel. Although the Reformation mainly affected the sculpture and decorative stained glass, the Civil War was much more damaging to the fabric of the roofs, primarily through the lack of maintenance although lead was removed wholesale from some of the roofs, such as the north nave triforium (Tatton-Brown 2001). Following the Restoration of the monarchy, the cathedral was surveyed by Dr Christopher Wren in AD 1668 in what was the first objective survey. Wren set forth a whole series of recommendations on the repair of the roofs, although major rebuilding of these was not undertaken until the AD 1730s. In AD 1734 Bishop Sherlock employed Francis Price, a master carpenter by trade, and in AD 1737 he was given the post of Clerk of the Works at the Cathedral. There then ensued a massive rebuilding campaign of virtually all of the roofs, some in their entirety such as the north transept, whilst others escaped with only minor repairs, such as the north nave triforium (Price 1753). About AD 1790 further, but very much more minor alterations and repairs were carried out by James Wyatt. The nineteenth century included restoration schemes by George Gilbert Scott from AD 1862 to AD 1866.

The Cathedral has been extensively studied by architectural historians for centuries (Dodsworth 1814; Cocke and Kidson 1993), and the roofs were first studied by Cecil Hewett in 1980 (Hewett 1980; 1985). More recently a detailed analysis of the phases of building has been undertaken by Tim Tatton-Brown, and of the documented sources of timber by Gavin Simpson (1996).

The first attempt at dendrochronological analysis at Salisbury was by John Fletcher. On 13 September 1968 he collected six samples from the north nave triforium. These were sections of timber offcuts saved by the Clerk of the Works, Roy Spring, who was repairing the roof carpentry of this part of the cathedral at this time. The samples included three sections of inner wall plate with a large hollow chamfer and measuring 7" x 8 ½", 7" x 10 ½", and 7" x 12". Two of these were so badly affected by death-watch beetle attack that they were discarded, the remaining section only had 41 rings with no heartwood/sapwood boundary. Other samples included a section of ashlar 6" square, again with no heartwood/sapwood boundary and 53 rings, and a rough corbel at the point of an inserted tiebeam measuring 4" x 9", this time with heartwood/sapwood boundary and 71 rings. The final sample was from a roof board from beneath the lead which measured 5" x ½" and which had about 35 rings including 4 rings of sapwood. These samples were processed during January and February 1969, but did not date, due to their being too few rings and no reliable reference chronologies for the period from which to work. Two of the data sheets were found in the Fletcher archive and were included in the present analysis.

Other limited but more successful attempts at dendrochronology were carried out by Nottingham University Tree-Ring Dating Laboratory. In 1990 eight samples were taken from the floor over the crossing vault in the central tower, and eight more samples taken from the ceiling boards fixed to the underside of this floor frame. Six timbers dated with an average heartwood/sapwood boundary date of AD 1220. An estimated felling date of *c* AD 1251 (-15, +20) was given for this group, and an estimated felling date of *c* AD 1371 (-6, +20) for six of the ceiling boards below. These were thought to be of Baltic origin (Howard *et al* 1991). Timber from the spire scaffold was also sampled, and two raking shore timbers dating from *c* AD 1231 (-15, +20) were found, but these were reused, probably from one of the high roofs (Howard *et al* 1992). Other timbers from the spire scaffold itself had too few rings for reliable dating. In 1995/6 six out of nine timbers sampled from the chapter house roof were also dated, giving a date of *c* AD 1259 (-10, +15), which uses a narrower sapwood range (Howard *et al* 1996).

Description of the Carpentry:

Eastern Chapel Roofs

When built, the eastern chapels were covered by five parallel steeply-pitched roofs which included two smaller roofs in between the three main chapel roofs, the Chapel of St Peter and the Apostles to the north, and the Chapel of St Stephen and the Martyrs to the south (Fig 8). These remained in position until the main roof over the Trinity Chapel in the centre, and the small narrow roofs either side, were demolished and reconstructed by Francis Price in AD 1736. The surviving roofs over the northern and southern chapels are, however, virtually complete and are unquestionably the finest and earliest roof carpentry in the county of Wiltshire (Figs 9 and 10). They each consist of 21 common rafter-couple trusses with collars, soulaces, and ashlar pieces. Originally, there were three tiebeams in each roof supported on inner and outer wall-plates connected together by intermediate struts. Above the inner wall-plate is a larger inner plate which is interrupted by the tiebeams into which these plates are tenoned. The ashlars are jointed into the top face of this timber, whilst the sole-pieces are jointed into its outside face (Fig 11). Only two tiebeams survive *in situ* in the northern roof, along with most of the northern wall-plates. The wall-plates and tiebeams in the southern chapel roof have been replaced, probably by Price in AD 1736.

The two surviving roofs are exceptional in that they were constructed of fine oak of carving quality. The timbers were dressed and neatly jointed wholly with mortice and tenon joints, and the tiebeams chamfered (Figs 12 and 13). Considering that these roofs were never to be seen on account of the stone vaulting over which they were constructed, this lavish quality and care of the carpentry is difficult to justify on practical grounds. However, in the eyes of the medieval craftsman, the roof could be seen by God, which probably explains much of the pride demonstrated by its builders.

One significant feature noted during the investigation was a series of large scribed assembly marks on some of the trusses in both roofs (Fig 14). Remarkably they appear to be early Arabic numbers, and given the ascribed consecration date of AD 1225, this makes this series of numbers the earliest known use of Arabic, rather than Roman, numerals in English carpentry (Hill 1915). These marks were noted on the lower sides of the rafters, on one or two ashlar pieces, and on the tops of a few sole pieces. Whilst it would appear that the whole Arabic number-set has been found throughout the whole of the two roofs, they are not used consecutively, and there are some other marks which are neither letter nor number. Therefore, it would seem they are used here primarily as individual truss identifiers rather than for the sequencing of elements during erection.

North Nave Triforium Roof

Hewett (1980) describes the north triforium roof as being 'the most impressive lean-to roof surviving in any English cathedral'. It is unquestionably the epitome of thirteenth-century carpentry surpassing even that of the Trinity chapel roofs.

This roof is 200 feet long and extends for ten double bays from the west front to the central crossing. Each bay is divided from the next by a flying buttress, and in half by an intermediate truss aligning with the central cluster of four Purbeck marble shafts. Thus, each bay has three trusses, bay 1 at the west end starting with Truss 0 at the corner (Fig 15), Truss 1 being the intermediate truss, and Truss 2 W being on the west side of the first flying buttress (Fig 16). The second bay comprises Truss 2 E, Truss 3, and Truss 4 W. This same pattern of trusses and numbering continues all the way along the whole ten bays.

The nave triforium trusses are typically of a lean-to design consisting of inner and outer principal rafters clasping two purlins on short struts (Fig 17). At the eaves, the rafters seat on double short solepieces which are tenoned into the back of a highly-decorated arcaded top inner wall-plate supported on a lower wall-plate set back to give additional bearing to the inner ends of the solepieces. The arcaded wall-plate is further decorated by a series of quarter-round pendants, tenoned into the projecting soffit, and extending across the face of the lower wall-plate giving the illusion of a series of stone corbels supporting an arcade, but all in timber (Figs 18 and 19). The top of the double principal rafters are jointed into a wall post carrying a top plate. The feet of these posts rest on a sole piece which is cantilevered out from the arcade wall-head, and is restrained from overturning by a brace at the nave end back up to the post. The line of this brace is continued to the principal rafters, aligning with the short strut immediately below the upper purlin. This gives the appearance that these three separate timbers are all one continuous member. The principal rafters are further supported by a collar which is jointed into inner principal at the lower purlin level, and continues to the wall post, halving over the brace. This elaborate engineering solution presumably left a majority of the space unencumbered by tiebeams which might clash with any inserted vaulting to the aisles.

Within each half-bay, there are three common rafters which measure on average 6" square. These rafters are all additionally supported by raking ashlars tenoned into the top of the upper wall-plate, not dissimilar to the arrangement in the eastern chapel roofs. Some of these are jointed with splayed scarfs, through splayed below but with sallied abutment above, but which are not undersquinted. This is secured by two 1" pegs at right angles to the line of the table, and further fixed by a large-headed nail at each end.

The juncture of the nave triforium roof with the north porch roof in bay 5 is equally exceptional. Here, valley rafters are tenoned into the side of the upper principals of the triforium trusses and meet at the top plate. There is a 'collar' to this set of valley rafters, and 'soulaces' as well, all on the plane of the triforium roof. Tenoned into these valley rafters are the feet of eight truncated jack or valley rafters. These rafter couples are scissors-braced with collars, and the severed ends of these scissors braces are picked up by the 'soulace' braces jointed into the side of the valley rafters (Fig 20).

This remarkable essay in carpentry is further enhanced by another series of Arabic assembly marks. Here the jack rafters are numbered from 1 to 8 starting at the eaves (Fig 14). Interestingly, the numbers run 10, 2, 3, 4, 5, 6, etc, and those on the west side of each rafter-couple have the numbers followed with an 'N' as a truss identifier. Coincidentally, the assembly marks are on the northern face of each of the timbers. Whilst the eastern chapel roofs of *c* AD 1222 are the earliest anywhere in Britain to have Arabic marks of any description along with other types of truss identifiers, those used on the valley rafters of the north porch/north nave triforium are the earliest to run *in sequence* (Jenkinson 1926) Again, the woodwork at Salisbury is a forerunner in the rich tableau of early English carpentry.

Unlike the eastern chapel roofs, the north triforium roof timber is predominantly of poor-quality, fast-grown, boxed-heart or halved timbers of small scantling. Many of the scantlings are not entirely straight, and many have been scarfed to make up the required lengths. This suggests a radically different source of timber, and is much more typical of structural timber found in other contemporary medieval and post-medieval roofs.

However, an extremely interesting feature is the survival of sarking boards measuring about ½" to ¾" thick and between 4" and 6" in width. These were spaced apart with an inch or two gap to allow ventilation to the underside of the lead. These are of varying periods, the majority of which are thought to date from the eighteenth-century Price repairs. The boards on the west side of the north porch are all of oak, whilst those from the north porch to the central crossing are entirely of softwood, which at Salisbury was introduced by Wyatt in the late-eighteenth century (Tatton-Brown *pers comm*). Those boards in bays 1, 2, and 3 are virtually all riven oak, fine grained, and of exceptional quality. The return of bay 1 at the point of the valley are of similar quality. The valley lay-boards themselves were also of oak, which was not riven but tangentially-sawn.

North Porch Roof

Probably the jewel in the crown of all the Salisbury roofs is that to the Parvis Chamber or room over the north porch. Here, 21 trusses continue northwards from the jack rafters at the junction with the north nave triforium to the end gable. Like the valley rafters in the north nave triforium adjacent, these all appear to be scissors-braced, but actually this is an illusion. The scissors braces are interrupted by a collar into which a set of cross-braces are tenoned into the top, and a set of soulaces continuing the same line are tenoned into the soffit of the collars and extend to the rafters. There are also vertical ashlars which are square set and jointed into an inner wall plate, and there are solepieces extending back from this plate to pick up the ends of the rafter feet. There are three tiebeam trusses, at trusses III, XI, and XIX. The central tiebeam truss is braced from below by short pendent wall-posts with carved bottom finials (Fig 21).

The crown-posts within this roof are another feature in the ever-expanding catalogue of superlatives in the roof carpentry at Salisbury. In each of the three trusses is a crown-post with saltire-bracing running between longitudinally. All of these are heavily chamfered to form octagonal sections. These were previously thought to be later insertions (Jones *pers comm*), but the joints with the tiebeams and the collars are wedged and pegged half-dovetails, which acts as an exceptionally strong hanger to support the mid-span of the tiebeams. Given that this arrangement would be impossible to insert at a later date, they are clearly original, and as such, make this the earliest, and one of the finest, crown-post roofs in the country (Fig 22).

These trusses also have assembly marks, but unlike the jack-rafters, these are all in Roman numerals. They run from I at the south end to 21 at the north, and are again on the north face of the timbers. This probably explains why the first jack rafter truss used an Arabic 10 rather than a 1, to avoid it being confused with the Roman I which is, of course, virtually identical.

The Parvis Chamber is separated from the rest of the nave triforium by a solid masonry wall continuing the outside aisle wall upwards. This comes up between and infills both trusses II and III of the main run of rafters. Access through the wall is gained by an original door of three heavy oak planks on a series of stout ledgers and vertical noggins, and there still remains an original draw-bar built into the cross-wall, complete with a draw-bar socket lining box (Fig 23).

Like the north nave triforium roof, the majority of the timbers used to construct the Parvis Chamber roof were from fast-grown boxed-heart or halved timbers, of poor quality. This roof is also covered in sarking boards of oak, the majority of which are later, but some are of high-quality slow-grown riven timbers which have been reset.

Objectives of dating:

During 1998, a programme of repairs was undertaken to repair the lead coverings of the eastern chapel roofs, which had apparently been last renewed in AD 1832 for the Chapel of St Stephen and the Martyrs to the south, and AD 1833 for the Chapel of St Peter and the Apostles to the north, and the Trinity Chapel. In conjunction with this, there were the repairs to the timber roof structure.

Following on from a limited selection of samples from the various cathedral roofs previously commissioned directly by the Dean and Chapter, English Heritage commissioned a further 60 samples to be taken in association with these works. Several objectives were initially outlined:

- to confirm the documentary construction date of AD 1220-25 and to confirm that these roofs were the first part of the cathedral to be completed. It was of paramount importance to obtain any samples from timbers with complete sapwood which had escaped the defrasser's axe.

- to try to determine whether any single trees were used in the construction of both roofs, as might be revealed by any same-tree matches between the two roofs. This was especially important as it was unlikely that any complete sapwood remained intact in the southern chapel roof. This would then confirm that the two roofs were constructed at the same time from the same batch of trees.

- to create a well-replicated chronology for the Wiltshire area which might assist in the future dating of other buildings or phases of work within the Cathedral itself.

- to employ dendro-provenancing to try and determine where the timber originated from, and whether there was any evidence to support the notion of timber being imported from Ireland as suggested by the Patent Rolls for AD 1224.

The next phase of repair works to the cathedral began in the year 2000, and included the re-leading of the north nave triforium and north porch roofs. Included in the sampling brief was the main roof structure of the roofs, both to date the original carpentry as well as to identify and phase later repair timbers. Preliminary analysis of the eastern chapel samples in taken in 1998 had identified a significant quantity of imported Irish timber as well as some others of English origins. Therefore, an extensive sampling programme was designed to identify any further Irish imports, as well as to give a large enough sample base, given that many samples were of 100 rings or less.

The objectives of the dendrochronology in the second phase of sampling were:

- to produce precise felling dates for the various sections of the roofs so as to allow a better chronological picture of the constructional development of the cathedral to be formed, and to confirm that the north porch was contemporary with the north nave triforium. Ancillary to this, it was proposed to sample the saltire bracing and crown posts in the Parvis chamber roof to determine whether these are part of the primary construction, or a slightly later insertion.

- to date later repairs to the roof structure to allow a better understanding of subsequent repairs, and to better inform the current repair programme.

- to sample the roof sarking boards which were thought to be seventeenth-century or later, and as such possibly to be some of the earliest to survive in a cathedral roof. The repair proposals included the removal of these boards and replacing them with new treated softwood boards as in the other cathedral roofs most recently releaded. Therefore, it was considered desirable to first ascertain the date and phasing of the boarding before it was removed.

- to discover the extent of timber stockpiling and whether the timber came from one or from many different sources, and whether these are the same as those from which the eastern chapel roof timbers originated.

- to produce a number of further replicated tree-ring chronologies for Wiltshire, particularly for the post-medieval period.

Assessment:

Initial inspection of the eastern chapel roofs during 1997 identified exceptional dendrochronological potential in the majority of the structural timbers of the Chapel of St Peter and the Apostles to the north, and the Chapel of St Stephen and the Martyrs to the south. Most of the rafters and many of the collars, as well as few soulaces had very slow-grown timber which had come from large trees cut into four or more members (Fig 24). A few rafters had originated from faster-grown whole trees which had been boxed-heart, as were most of the collars, soulaces, and wall plates (Fig 25).

Due to the recent defrassing of the roof timbers, very little if any complete sapwood remained. Regrettably, the roofs were thoroughly defrassed immediately prior to the repairs being carried out, resulting in the irretrievable loss of bark edge which would have thrown much light on the sequence of timber felling and procurement at the initial stages of the Cathedral's history.

Conversely, the structural timbers from the north nave triforium and north porch roofs were all medium to fast-grown timbers which had been boxed heart or at best halved. Thus the majority of the structural timbers had far less dendrochronological potential than their eastern chapel counterparts. Few of the first-phase timbers retained complete sapwood, again defrassing some time before had removed the majority of bark-edge surfaces left on the timbers by the original builders.

Some of the later phases had sufficient growth rings for successful analysis, but the inserted tiebeams in the triforium were too fast grown to be worth sampling. Timbers with good potential were the replacement trusses either side of the flying buttresses as well as some replacement rafters.

Some of the roof boarding to the north nave triforium appeared to have excellent dating potential. The best boards were the riven oak boards primarily from bays 1 to 3 which had been removed in advance of sampling. None of these boards retained complete sapwood, but some did have heartwood/sapwood boundaries. Other later phases of boards still *in situ* also had good dating potential, with a number of boards retaining complete sapwood. Most of these later boards were from bay 4 and the west side of bay 5 as well as both sides of the north porch roof.

A number of reused timbers with stop chamfers were replaced during the course of the works. These were assessed for possible dendrochronological potential, but had too few rings to date reliably. Most of the eastern wall plates in the north porch roof had been replaced at some point, but with second-hand timbers, again with too few rings to date.

Sampling strategy:

Sampling to the eastern chapel roofs was carried out during 1998, as repair works progressed. Sampling was primarily restricted to the two surviving roofs, but two samples were taken from re-used timbers in the Trinity Chapel roof to see if any primary phase timbers had been re-used in the present eighteenth-century roof. Generally, the northern chapel roof was sampled first, as it was the first to be repaired, with the Trinity Chapel roof and the south chapel following on afterwards later in the year.

The samples were numbered using the prefix ***scec*** followed by numbers 1 - 73, with multiple samples from the same timber being labelled ***a***, ***b***, etc. Cores which had broken were labelled ***a1***, ***a2***, etc. The sample numbering was unavoidably haphazard due to the necessity of working around the areas of roof structure as they were being repaired. Access was also determined by the presence of scaffolding and staging. Further samples were obtained later on from offcuts directly resulting from the repair works. Sometimes these were from timbers already sampled, but they were used because they often had longer ring sequences, and gave a more replicated sequence. Some gaps in the numbering sequences are due to these secondary timber offcuts being re-numbered to conform with previous samples from the same timber.

Work in sampling the north nave triforium began with some difficulties. The first sampling session was scheduled with the architects to coincide immediately after the leadwork had been removed, but before the roof boarding was dismantled. Unfortunately, the lead workers progressed faster than programmed, and had inadvertently carried on to remove the sarking boards to bays 1 to 3 the day before the scheduled visit. This resulted in much of the boarding, later determined to be primary and *in situ*, to be discarded into a skip for disposal. Immediately on attending site, the quality of the recently-removed boards was assessed, and the possibility that they were medieval was raised. On consultation with the architects and English Heritage, it was agreed that no further boards would be removed until the spot dating of eight representative samples of boards could be completed. This initial analysis concluded that the riven oak boards were in fact primary to the original construction of the north nave triforium, and that they originated from Ireland.

Given this development, the sampling brief was extended to include a much more thorough analysis of the roof boards. A total of 81 samples were to be taken from the boards already removed, as well as an additional 24 samples taken from the boards still *in situ*. Given the importance of the woodwork as revealed through the initial spot-dating, it was probable that the salvageable boards already removed would be put back on the roof. Therefore, additional sampling was limited to the ends of boards, or to suitable fragments, so that they could be reinstated. Similarly, the sampling of the boards which had not yet been removed was restricted to parallel slices over the backs of rafters so that no visual disturbance would be noticeable from the inside. Samples from the roof boards were given the prefix ***scl***.

Apart from the roof boards, the sampling of the structural timberwork was much more straightforward. Forty samples were taken from the north nave triforium and 11 samples from the north porch roof. These were all given the prefix ***scnt***. In addition, two samples taken from the north triforium by J M Fletcher in 1968 were found in the archives, and despite having 41 and 53 rings respectively, these were included in the analysis. These were labelled with the prefix ***F129***, with sample numbers ***XI*** and ***XIV*** respectively.

Methodology:

All samples were taken from what appeared to be primary first-use oak (*Quercus* spp.) timbers with reasonably long ring sequences, or with some indication of sapwood. The only exceptions to this were two samples taken from the Trinity Chapel roof which had been reconstructed in AD 1736, and the south rafter to truss III to the north porch roof, which had clear evidence of having been reused from an earlier roof. All *in situ* timbers were sampled using a 16mm hollow coring bit. Many of the timbers had multiple samples, the first being from core samples, with later slices from subsequent repairs being used to obtain well-replicated ring sequences. The roof boards were sampled through sectioning with a fine saw. Details of the samples taken, together with dates produced, are shown in Table 1, and located on the drawings in Appendix 1.

The dry samples were sanded on a linisher using 60 to 1200 grit abrasive paper, and were cleaned with compressed air, to allow the ring boundaries to be clearly distinguished. They were then measured under a x10/x30 microscope using a travelling stage electronically displaying displacement to a precision of 0.001mm, rounded to the nearest 0.01mm.

After measurement, the ring-width series for each sample was plotted as a graph of width against year on log-linear graph paper. The graphs of each of the samples in the phase under study are then compared visually at the positions indicated by the computer matching and, if found satisfactory and consistent, are averaged to form a mean curve for the site or phase. These mean curves, together with the individual ring sequences, are then compared against dated reference chronologies to obtain an absolute calendar date for each sequence.

In comparing one sample or site master against other samples or chronologies, *t*-values over 3.5 are considered significant, although in reality it is common to find demonstrably spurious *t*-values of 4 and 5 because more than one matching position is indicated. For this reason, dendrochronologists prefer to see some *t*-value ranges of 5, 6, and higher, and for these to be well replicated from different, independent chronologies with local and regional chronologies well represented. Where two individual samples match together with a *t*-value of 10 or above, this may suggest they originated from the same tree.

Here dating was accomplished by using a combination of both visual matching and a process of qualified statistical comparison by computer. The tree-ring curves were first matched visually, and then independently matched by computer. The ring-width series were compared on an IBM compatible computer for statistical cross-matching using a variant of the Belfast CROS program (Baillie and Pilcher 1973). A version of this and other programmes were written in BASIC by D Haddon-Reece, and latterly re-written in Microsoft Visual Basic by M R Allwright and P A Parker.

A methodical approach is taken in dealing with the individual samples. First, all duplicate radii from a single timber are cross-matched and compared, and if the matches are satisfactory, they are combined to form a single-timber mean. These multiple radii are generally identified by using an 'a', 'b', etc after the timber sample number. Cores which have broken into one or more segments are further identified by a '1', '2', or 'i', or 'ii', after the radii prefix. Once a single mean sequence for each timber has been produced, then the next step in the analysis is to check for same-tree matches. Generally, this is identified through *t*-values of 10 or more, but sometimes this is identified through the external characteristics of the timber itself, such as knots and shake patterns. Again, all samples clearly identified as having originated from the same parent tree are combined to form a mean sequence for each tree. It is not until this preliminary analysis stage is completed that individual samples / trees are then compared with others from the site and combined into larger site masters.

All individual sequences and components of same-timber means and same-tree means are presented in Table 1. Because this is the primary summary of all material on which the dendrochronological analysis has been based, both actual samples and averaged sequences are presented here. The means of individual radii, as well as same-tree means, are differentiated in the table by the use of italic text. To avoid unnecessary confusion, felling seasons and dates, or date ranges, are not presented in the final column for individual radii comprising a single timber, instead these are presented only for the mean of these individual sequences. Where two or more timbers have been found to originate from the same parent tree, each timber has been given a felling date or date range, but this would be the same as the mean sequence for the tree. Where one of the components making up a same-tree mean has complete sapwood, and another only partial or no sapwood, then the latter would be given the precise date in brackets, even though it would have only produced a *terminus post quem*, or at best a felling date range, on its own. Where all the individual same-tree components have incomplete sapwood, then a felling date range for the mean is produced by taking the average heartwood/sapwood boundary date, from which the appropriate 95% sapwood estimate is used to work out the felling date range. This range, in brackets, would then be used for the individual timbers comprising the mean. Similarly, where one or more radii or timbers make up a same-timber or same-tree mean have complete sapwood, the average sapwood ring count is presented for the mean.

Litton-Zainodin Grouping Procedure

A great problem is that the timber clearly originated from a variety of sources. Whilst it was possible to differentiate between the Irish and English material, the sourcing of the latter was potentially spread over a wide variety of locations, given the documentary sources (Simpson 1996). Usually, in assessing the quality of matching between a sample and a chronology, the proximity of the reference chronology to the site is a contributing factor. Here, because the origin of the trees could be anywhere between Trivelle in south Wales and Odiham in Hampshire, this could not be counted on as being reliable (Fig 7). The other problem is that much if the timber, particularily in the later phases such as the north triforium and north porch roofs, may well have been stockpiled, making internal cross-matching equally difficult.

To overcome the problem of lack of homogeneity, the Litton-Zainodin Grouping Procedure was used to help separate out the Irish from the English material, and to hopefully group the latter by forest source. Developed at the Nottingham University Tree-ring Dating Laboratory, this provides a rigorous, independent, and non-subjective method of separating tree-ring sequences on the basis of *t*-value comparisons (Laxton *et al* 1988; Litton and Zainodin 1991). This routine is done entirely by computer and begins with the calculation of a matrix of *t*-values of all samples within a group. The highest cross-matches between a pair of samples are then automatically selected and averaged together to form a mean of the two, and this mean is substituted for its constituent components. This process is repeated with the *t*-value threshold gradually being lowered until no more individual samples are left which can be matched above the minimum acceptable threshold. This results in one or more groups of samples relatively matched together which are averaged into site masters.

Ascribing Felling Dates and Date Ranges

Once a tree-ring sequence has been firmly dated in time, a felling date, or date range, is ascribed where possible. With samples which have sapwood complete to the underside of, or including bark, this process is relatively straight forward. Depending on the completeness of the final ring, ie if it has only the spring vessels or early wood formed, or the latewood or summer growth, a *precise felling date and season* can be given. If the sapwood is partially missing, or if only a heartwood/sapwood transition boundary survives, then an *estimated felling date range* can be given for each sample. The number of sapwood rings can be estimated by using a empirically derived sapwood estimate with a given confidence limit. If no sapwood or heartwood/sapwood boundary survives, then the minimum number of sapwood rings from the appropriate sapwood estimate is added to the last measured ring to give a *terminus post quem* or *felled after* date.

An accepted sapwood estimate for British and Irish oaks is given as between 10 and 55 rings with a 95% confidence range (Hillam *et al* 1987). A recent review of the geographical distribution of dated sapwood data from historic building timbers has shown that a 95% range of 9 - 41 rings is more appropriate for the southern part of England, and 11 - 41 for Wales and the Border counties (Miles 1997a). For Irish timbers, a 95% sapwood estimate of 14 - 50 rings has been used (Baillie 1995). Irish imports apart, documentary sources suggest that timber had been imported from woodlands as far to the north-west as Trivelle and the Forest of Dean in Herefordshire, to more southern counties such as Wiltshire and Hampshire. Whilst it should be possible through dendro-provenancing to identify the Irish material and apply the appropriate 14 - 50 range, it would be much more difficult to distinguish the Herefordshire timber from the other English material. Although the 95% felling date ranges of 11 - 41 and 9 - 41 years respectively are remarkably similar, the *terminus post quem* dates for those individual samples without a heartwood/sapwood boundary would differ by two years. Some 100 oaks from Trivelle Forest were given on the 7th of October AD 1224, however it is highly unlikely that they would have been used in the eastern chapel roofs as these were consecrated only a year later; instead they most probably were given well in advance of their actual need (Simpson 1996, 14). As for the 100 oaks from the Forest of Dean, these were granted on the 22nd of January AD 1234 but not had arrived by the 20th of June AD 1236. Therefore, it is unlikely that timber from either of these sources would have been used in the eastern chapel roofs or the north triforium and north porch roofs, which are a generation later. Given this, the sapwood estimate of 9 - 41 years was used for all English material in this present study.

Some caution must be used in interpreting solitary precise felling dates. Many instances have been noted where timbers used in the same structural phase have been felled one, two, or more years apart. Where ever possible, a *group* of precise felling dates should be used as a more reliable indication of the *construction period*. It must be emphasised that dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure under study. However, it is common practice to build timber-framed structures with green or unseasoned timber and construction usually took place within twelve months of felling (Miles 1997a). Given the protracted nature of cathedral building campaigns, more latitude must be given in interpreting construction dates, especially in later phases of an extended building campaign. When estimated sapwood ranges can cover virtually the whole of the construction period of a cathedral such as Salisbury, interpretation based on only a few precise felling dates must be circumspect. However, this can sometimes be mitigated in the light of complementary documentary evidence, as exists here at Salisbury (Simpson 1996). A recent study of almost 600 samples from Lincoln Cathedral by Nottingham University (Laxton *et al* 2001) illustrates the difficulties of interpreting a large complex site with very few precise felling dates coupled with evidence for stockpiling and reuse of older timbers.

Cross-matching and dating:

All samples included in this study are listed, together with summary statistics and felling dates, in Table 1. Sample locations are shown in Appendix 1.

Due to the complexity of the wide-ranging source of the timbers used, the analysis was carried out in two stages. The first stage covers the basic cross-matching of samples between themselves and with the master chronologies to provide absolute dating. The second section deals with the complexity of provenancing the material to enable the relevant site masters to be constructed, and through the provenancing of the timbers, to allow the appropriate sapwood estimate to be used reliably.

The actual dating of the majority of the samples was relatively straightforward. This was accomplished using standard dendrochronological techniques of cross-matching individual sequences together to form a site master which is then dated with a database of local, regional, and national reference chronologies (English Heritage 1998). As a cross-check, many of the samples were also dated directly with the reference chronologies. These matches are detailed in Tables 2 and 3 and are covered in the Discussion section below.

Eastern Chapel Roofs

Altogether some 84 samples were taken from 62 individual timbers, the majority of them rafters. The south soulace of truss 19 (***scec11***) was sampled several times as it was the only timber in the south chapel roof to retain complete sapwood at its outer edge. The first sample (***scec11a***) was a core taken through what was complete sapwood, but the sapwood broke up during coring. The second sample (***scec11c***) was a photograph taken of the edge of complete sapwood where exposed to the joint on the collar, which was the most non-destructive way to include the sapwood intact. Eventually, the engineer decided to replace the soulace completely, so a slice (***scec11b***) was taken through the discarded timber which retained most of the sapwood. All three sequences were therefore combined to form the mean ***scec11*** of 73 rings including 21 rings of complete sapwood (Table 4).

Sixteen other timbers were sampled two or more times, generally due either to the fracturing of the core, or to the subsequent availability of sections of offcuts. These multiple radii were in each case combined to form single-timber means, as shown in Tables 5 - 13.

Of the 62 timbers sampled, 49 were dated (Tables 1 - 3), three producing precise felling dates of spring AD 1222. An additional 24 timbers retained heartwood/sapwood boundaries, and these ranged from AD 1152 to AD 1213. These results are discussed in the Interpretation and Discussion section below, but it is clearly apparent that much of the timber used to construct the eastern chapels was imported from Ireland.

Many of the timbers have originated from very slow-grown trees. Sample ***scec57*** for instance had 193 rings and extended back to AD 929, while sample ***scec70*** had a first measured ring date of AD 908. Clearly a number of the trees used in the construction of these roofs were in excess of 300 years old.

Despite intensive work on some additional samples, a number failed to date conclusively. This is primarily due to shorter, complacent ring sequences from faster-grown material.

Regrettably, as it retained complete sapwood, sample ***scec11*** failed to date due to it having wider, complacent rings. However, this timber did have one interesting feature in that it showed evidence of an original fracture which had been repaired with two nails at the time of erection (Fig 26). Another timber sampled was ***scec3***, the westernmost tiebeam of the north chapel roof. Three cores were taken from this timber which exhibited a clear heartwood/sapwood boundary. Initial analysis on the first core suggested a tentative date slightly later than the other felling dates. As this core had only 77 rings, it was decided to take two more cores from this timber, the last one having 95 rings. The three samples were all combined into one mean, but the tentative date was not confirmed, so this timber must remain undated for the present.

A number of other samples failed to date, generally due to there being insufficient number of rings. These included ***scec3***, ***scec6***, ***scec26***, ***scec50***, ***scec51***, and ***scec68***, all with 60 rings or less. A number of other samples, ***scec15*** with 99 rings, ***scec18*** with 75 rings, ***scec32*** with 83 rings, ***scec58*** with 123 rings, and ***scec73*** with 94 rings, all failed to date despite reasonable ring sequences.

North Nave Triforium and North Porch Roofs

Here 176 samples were taken from a number of different phases of construction spread out over five centuries. Fortunately, these could initially be distinguished by the carpentry and character of the timber between the primary construction phase and the later post-medieval repairs.

Thirteenth-century primary phase - Structural

Preliminary cross-matching showed that the two earliest phases were again represented by both English as well as Irish imports. However, as the Irish material was used solely for the roof boarding, and for one packer placed between a purlin and a rafter (***scnt28***), it was very straight forward initially to separate the English from the Irish material. The roof boarding was also of a number of different phases, but only the earliest phase was Irish, the remainder was again of English origin. These were physically differentiated by the fact that only the Irish boards were of slow grown *riven* timber (Fig 27), whilst the later boards were all sawn and of a more regular appearance (Fig 28). As for the structural timberwork, sometimes the phasing could be distinguished by the surface character of the timber, as well as from the carpentry. Sometimes however rafters were difficult to distinguish and it was only through the dendrochronological analysis that the actual phasing was resolved.

The first group of samples to be studied were the first-phase structural timbers including four valley boards from bay 1, and two sets of 1968 data from John Fletcher. Altogether, 58 individual samples were taken from 45 timbers. A number of subsidiary samples were taken from 11 individual timbers to gain the maximum overall sequence length or complete sapwood. These were combined to form single-timber means (Tables 14 - 17).

Once this process had been completed, the 45 individual timber sequences were compared with each other and four additional pairs were found which had originated from the same parent tree. These included inner principal rafters ***scnt02*** and ***scnt04***, rafters ***scnt43*** and ***scnt46***, valley lay boards ***scl102*** and ***scl103***, and valley lay board ***scl104*** with outer principal rafter ***scnt03***. These are combined as shown in Tables 18 - 19.

Of these 45 timber sequences, 32 were dated. However, only four of these retained complete sapwood. Two rafters from the north porch, ***scnt43*** and ***scnt46*** both retained complete sapwood, and were felled in the winter of AD 1251/2. One other rafter with obvious signs of reuse, ***scnt42***, was found to be felled in the summer of AD 1236. From the north nave triforium, one upper principal rafter from truss 3 was found to be felled in the winter of AD 1254/5. Some 22 other timbers dated which retained some incomplete sapwood, or heartwood/sapwood transition, and a further six samples dated with no clear heartwood/sapwood boundaries (Tables 1 and 20).

Although the majority of the samples from these two roofs dated, 13 failed primarily due to there being too few rings. These samples included ***scnt10***, ***scnt12***, ***scnt29***, ***scnt31***, ***scnt45***, ***scnt49***, and ***F129XI*** from the Fletcher archive. Most of these were from fast-grown boxed-heart trees with relatively complacent ring sequences. Other timbers with more than 75 rings failed to date, notably ***scnt15*** with 107 rings, ***scnt25*** with 82 rings, ***scnt47*** with 82 rings, ***scnt48*** with 75 rings, ***scnt50*** with 101 rings, and ***scnt51*** with 89 rings. These contained areas of distorted, narrow, ring sequences which prevented conclusive matches.

Thirteenth-century primary phase - Boards

The next group of timbers to be analysed were the sarking boards from the roof (Fig 29). Fifty-two were unprovenanced boards from within bays 1 to 3 at the west end of the north triforium roof, removed by the leadwork contractors during the initial stripping of the roofs before sampling on site commenced. Another eleven boards were sampled *in situ* from bay 4 of the north triforium roof and from the western roof slope of the north porch, with the sole exception of one from the eastern roof slope. With 64 samples from 63 roof boards, and a single pack from underneath a rafter, a total of 65 samples with Irish characteristics were first compared with each other. Initially, one pair of samples from opposite ends of the same board was taken to link a short piece with heartwood/sapwood transition to a much longer heartwood sequence. Thus, sample ***scl34a*** was combined with ***scl34b*** with a *t*-value of 4.88 and an overlap of 21 years, forming the mean ***scl34***. Now only individual boards were left, and these were compared with each other to identify any same-tree matches. Thus, four pairs and two groups of three were found to match together with exceptionally high *t*-values and were similarly combined to form same-tree means (Tables 21 - 23).

Of the 64 boards sampled, 51 were found to date, as shown in Table 1. Although none of these retained complete sapwood, 18 of the boards that dated retained heartwood/sapwood boundaries. These ranged from AD 1175 to AD 1230, with only three lying before AD 1200. The remaining 33 samples had no heartwood/sapwood transitions. These ranged from AD 963 to AD 1212, and matched best with Irish rather than English chronologies.

One sample had 238 rings and dated, spanning the years AD 908 - 1145. This was from the board used as a packer between a purlin and a rafter in the north triforium roof, ***scnt28***. This sample also had two bands of exceedingly narrow rings making matching difficult.

Thirteen boards failed to match, either with the other samples, or with the English and Irish reference chronologies individually. Most of these were due to distorted rings rather than wide, complacent ring patterns. These had reasonable ring lengths such as ***scl101*** with 108 rings, ***scl20*** with 135 rings, and ***scl40*** with 170 rings.

Post-medieval repairs

Two elements representing later repairs were sampled - structural roof timbers and the sarking boards above. Adjacent to the flying buttresses, the majority of the principal rafters had been replaced, and four of these were sampled (***scnt08a***, ***scnt08b***, ***scnt20***, and ***scnt35***). Six common rafters were also sampled in bays 8 and 10 (***scnt21***, ***scnt22***, ***scnt27***, ***scnt33***, ***scnt39***, and ***scnt40***). A repair to the lower purlin in bay 8 (*scnt24*) was also sampled, as was a cleat on the east rafter X of the north porch roof (*scnt51*). From these, a total of 17 samples was taken from 12 timbers.

As in the other phases of timbers analysed, multiple radii from single timbers were first combined, as in the case of sample ***scnt08a*** and the other sequences from ***scnt08b*** and ***scnt08c***, and the four radii from sample ***scnt35***, as shown in Tables 24 and 25.

In addition to the structural timbers detailed above, some 38 boards were sampled from the north triforium and north porch roofs. Twenty-five of these were unprovenanced boards within bays 1 to 3 at the west end of the triforium roof which had been removed during the initial stripping of the roofs before sampling on site commenced. The remaining 13 boards were sampled from bays 4 and 5 of the north triforium roof as well as both sides of the north porch roof.

Again, multiple samples from single timbers were combined, therefore samples ***scl79a*** and ***scl79b*** were combined to form the mean ***scl79***.

All but two of the structural repair timbers dated (Tables 1 and 26). Samples ***scnt08*** and ***scnt20*** dated to the winter of AD 1661/2, and samples ***scnt21***, ***scnt22***, ***scnt27***, and ***scnt35*** all dated to the spring of AD 1662. Three other samples, ***scnt33***, ***scnt39***, and ***scnt40*** had incomplete sapwood but produced felling date ranges consistent with these felling dates (see Interpretation and Discussion below).

Two timbers failed to date. Sample ***scnt24*** with 85 rings is a repair and could therefore date from any period, as was sample ***scnt51***, a cleat on the side of a rafter from the north porch.

As for the roof boards, 21 dated to this phase of construction, all from bays 1 - 4 of the north triforium roof. Six had complete sapwood which varied over three years. Sample ***scl86*** dated to the winter of AD 1660/1, samples ***scl64*** and ***scl76*** dated to the winter of AD 1661/2, samples ***scl69*** and ***scl84*** were felled in the spring of AD 1662, and sample ***scl77*** was felled in the spring of AD 1663. A further 15 samples with incomplete sapwood produced felling date ranges consistent with these felling dates (Table 1).

Two other boards from the west face of the north porch, ***scl94*** and ***scl95*** were found to have originated from the same tree. These both retained complete sapwood and dated to the spring of AD 1669.

Two *ex situ* boards from bays 1 - 3 of the north triforium roof, and five more from the west face of the north porch all dated to the eighteenth century. Five of the boards retained complete sapwood and were all found to be felled in the spring of AD 1736. The remaining two had incomplete sapwood but produced felling date ranges consistent with these felling dates (Table 1).

Eight of the post-medieval boards failed to date, all due to having too few rings. These included samples ***scl80*** and ***scl83*** with 50 and 35 rings respectively but from the same parent tree, ***scl85*** with 45 rings, and samples ***scl96*** through ***scl100***, all with less than 43 rings even though they were all derived from the same tree and combined to form the 48-year mean ***scl96100*** (Table 27). The photograph of samples ***scl96*** - ***scl100*** illustrates how they had been cut from a single log (Fig 30).

Construction of site masters:

Eastern Chapel Roofs

Very early on in the analysis it became clear that some of the material had indeed originated from Ireland, due to the exceptionally high and consistent individual matches of the majority of the slower-grown samples with the DUBLIN1 chronology (Baillie 1977a). Therefore, it was going to be necessary to construct at least two individual site masters for the same building phase, one of the Irish material and the other for the locally-grown timber. The problem was to be able to identify clearly exactly which were which in order to ensure that no samples were mistakenly placed in the wrong regional group, thus destroying any attempt at creating a well-provenanced master chronology. This was achieved by not only producing groups of timbers based on inter-site matching as described in the methodology section above (Table 3), but additionally through individual matching with a range of regional chronologies (Table 2). Tabulating which areas the samples matched best would give some indication of the provenance of the timber.

Nine reference chronologies were selected for this purpose. DUBLIN1 is a well replicated chronology from the Dublin area and covers the period AD 855-1306 (Baillie 1977a). MC13 is one of Dr John Fletcher's working composite chronologies thought to be made up of material from Exeter, and thought to include some material from Trichay Street by Jennifer Hillam, and spans the period AD 811-1170. As the precise provenance of the material used in this working regional reference is not known, it has only been used as a dating tool. WALES97 is a composite chronology made of 58 chronologies from Wales and the Border Counties (Miles 1997b), and SALOP95 is similarly composed of 71 chronologies from Shropshire (Miles 1995). BRISTOL is a 55-timber composite chronology produced by Jennifer Hillam from a number of sites around Bristol, and covers the period AD 770-1320 (Hillam 1994). SOUTH is also a large composite chronology produced by Jennifer Hillam and Cathy Groves of 320 chronologies from the south half of England (Hillam and Groves 1994). PALACE is the chronology from the Bishop's Palace Hereford and spans the years AD 889-1179 (Haddon-Reece *et al* 1989). EASTMID is the large, well replicated chronology for the East Midlands produced by Nottingham University (Laxton and Litton 1988), and SCOTLAND is another long chronology produced for Scotland by Mike Baillie (1977b). It should be borne in mind that some of the chronologies are not independent, for instance the material from BRISTOL is almost certainly included in SOUTH, and SALOP95 shares some of the same Welsh Marches material as WALES97. Some chronologies have a larger sample base, such as EASTMID and SOUTH, whilst others are individual site chronologies, such as PALACE. Whilst MC13 is a useful dating chronology, it may have components which are included in SOUTH or BRISTOL. One could of course choose many more chronologies, but these appeared to cover most of the British Isles yet were generally restricted to a single region.

During the first phase of the analysis, 28 samples showed a clear predilection towards DUBLIN1 with one sample matching with a *t* - value of over 14 (Table 2). These were combined to form an intermediate site master ***SCECIRE*** which dated, spanning the years AD 908 - 1221. This 314-year chronology matched with a *t* - value of 17.75 with DUBLIN1, showing without any doubt an Irish origin for this group.

Five samples displayed very different ring characteristics to the Irish material, particularily having wider mean ring widths and were generally converted from boxed-heart trees whereas most of the Irish material were from larger trees which were at least quartered if not cut into more sections. These all seemed to match better with English or Welsh chronologies and so were combined to form a five-timber site master ***SARUM2***.

Sixteen other samples dated, eleven of which were found to match equally well with most of the chronologies to such an extent that they could not be provenanced with any certainty. The other five samples were found to match less well with these chronologies, but were still dated both with a miscellaneous group of masters as well as other samples from the site (Tables 2 and 3).

The remaining material was then compared with the two site masters ***SCECIRE*** and ***SARUM2***, and seven additional samples were found to match particularily well with the 28-timber ***SCECIRE*** intermediate master (Table 2), backed up by consistent matches with the 28 individual components. Therefore, samples ***scec1***, ***scec2***, ***scec9***, ***scec30***, ***scec46***, ***scec52***, and ***scec59*** were all considered to be of Irish origin and were combined with the previous 28 samples included in the intermediate site master, making a new 35-timber master ***SARUM1***, again of 314 years (Table 28).

It is quite likely that samples ***scec41***, and particularily ***scec53***, ***scec64***, and ***scec65***, are also of Irish origin, but because of some strong individual matches with southern English chronologies, it was felt safer to leave them out of the site master. This would at least ensure that the individual components of ***SARUM1*** would all be from a single homogeneous data set as best as could be determined.

Therefore these four samples, plus samples ***scec8***, ***scec13***, ***scec25***, ***scec66***, and ***scec67***, have been left out of either the Irish site master ***SARUM1*** or the Southern England master ***SARUM2***, but have nevertheless been dated. Some of the matches are weaker than others, for instance sample ***scec8*** had no outstanding matches with the above mentioned chronologies, but did match with t = 4.96 with NANTWICH (Leggett *et al* 1982), 5.66 with ROOKLEY (Miles and Worthington 1997), and 6.05 with UPWICH2 (Groves and Hillam 1997).

The ring-width data for the 108-year site master ***SARUM2*** are shown in Table 29.

North Nave Triforium and North Porch Roofs

Unlike the eastern chapel roofs, the segregation between the English and the Irish imports was very much more straight-forward in this part of the Cathedral because the material used for the structural timberwork was entirely English, and the roof boarding fixed to it was entirely Irish, at least for the primary-phase boards.

Thirteenth-century primary phase - Structural

Here, all of the structural timbers appeared to be English. This assessment was initially based on the faster-grown and poorer-quality character of the timber which was very similar to the English material found in the eastern chapel roofs. This was confirmed by better independent matches with English rather than Irish reference chronologies.

Initially, the 21 best-matching timbers was constructed to form a 195-year site master ***SARUM3***. This spanned the years AD 1054 - 1248 and respectably high matches with the reference chronologies were observed (Miles and Worthington 2001, 74-9).

Six additional timbers, some from a later sampling visit, were subsequently found to match this preliminary site master and all 27 timbers were found to match as shown in Table 20. This created the master chronology ***SARUM3x*** of 201 rings (Table 30), which dated, spanning the years AD 1054 - 1254 (Table 31). The matches with the reference chronologies were slightly lower than the preliminary 21-timber chronology, but it was felt that the larger group of 27 timbers better reflected the material found in the north triforium and north porch roofs.

One sample from the Fletcher archive, F129XIV, dated with a t -value of 4.86 with ***scnt42***, and 4.21 with ***SARUM3x***, as well as with a number of individual reference chronologies independently. However, this was not included in the site master because there were only a few matches, and it did not contribute to the overall master chronology.

Thirteenth-century primary phase - Boards

The next group of timbers to be analysed were the Irish sarking boards from the roof. Together with the single pack from underneath a rafter, a total of 64 samples with Irish characteristics were combined to form 57 individual trees. Of these, 42 matched together sufficiently well as shown in Table 32 to form another site master, ***SARUM4*** (Table 33). This chronology was 353 years long and spanned the years AD 878 - 1230. The matches between this site master and the Irish chronologies were exceptionally high, and the best match was with ***SARUM1***, the eastern chapel timbers felled some 30 years earlier, with a t - value of 18 (Table 34). Two other samples were not included in the site master due to sections of very narrow and distressed rings, but were nevertheless dated. Sample ***scl8*** matched with ***SARUM4*** with a t-value of 4.45, and ***scnt28*** (a packer below a purlin at T 15), matched with t = 7.93 (Table 35).

Confirmation of Irish grouping through the Litton-Zainodin Grouping Procedure

With the samples from the eastern chapel roofs, some four separate datasets had been analysed and grouped into four replicated chronologies:

Chronology:	*Rings:*	*Dates AD spanning:*	*Made up of:*
SARUM1	314	908 -1221	35 trees
SARUM2	108	1106-1213	5 trees
SARUM3x	201	1054-1254	27 trees
SARUM4	353	878-1230	41 trees

These had been grouped primarily by individual matches with a variety of reference chronologies as detailed above. Given that over 180 individual timbers, all dating from within 30 years of each other but from diverse sources were present, it was decided to double-check the grouping. The material was run through the Litton-Zainodin Grouping Procedure by Dr Cliff Litton at Nottingham University, and a large number of groups were produced at varying *t* - value thresholds. Above the highest threshold level of $t > 10$, ten groups of Irish timbers were formed, and two groups of English timbers identified. In progressing down through lower and lower thresholds, a trend was noticed. At $t > 6$, the Irish material from both the eastern chapels as well as the north nave triforium had merged into one homogeneous group, whereas the English material had actually increased into four disparate groups, before both the Irish and English material melded into virtually one grouping at a $t > 5$ (Table 35).

Basically, the grouping procedure confirmed the 28 timbers in the intermediate master ***SCECIRE*** as being of Irish derivation. It also identified seven samples which did not match overwhelmingly well individually with the Irish chronologies, but showed them to group with the Irish material at $t > 10$. These same timbers were included in the final site master ***SARUM1***. One timber, ***scec53***, grouped with the Irish material at $t > 8$, and three others, ***scec25***, ***scec41***, and ***scec64*** grouped with a $t > 6$. It is quite probable, given this independent analysis, that these additional four timbers are of Irish origin and could be included in any future overall Irish chronology from Salisbury. However, it is envisioned that this will not be constructed until the completion of the present extended dendrochronological programme. Therefore, the ***SARUM1*** master chronology was left with the 35 individual components.

Another interesting phenomenon highlighted by the Litton-Zainodin Grouping Procedure is the fact that one set of timbers, group D, included four samples from the eastern chapel roofs, and five from the north triforium roof. These two roofs dated 30 years apart, yet these samples match together within a group of $t > 10$. Similarly, virtually all Irish samples from both the AD 1222 and AD 1254 phases meld together in a group of $t > 8$, indicating that this material has come from the same homogenous source. This unquestionably is the area within five or ten miles of the south-east coast of Ireland between Dublin and New Ross. Here virgin woodland was exploited during the early medieval period, and therefore the timber all matches exceptionally well. For instance, it is quite common for individual samples to match with the Dublin chronology with *t* - values in excess of 12 or 13 (Brown *pers comm*). This can be compared with the recent analysis of a collection of imported Baltic oak boards from Bowhill near Exeter in Devon (Groves 2002). Here the timber was slow grown like the Irish material, and matches between different radial sections of the same tree produced *t*-values of over 10, and opposite ends of the same boards matched with *t* - values of over 20.

Post-medieval repairs

As discussed in the previous section on the first stage of the basic analysis and dating, all subsidiary samples from the same timbers were combined to form single-timber means. Once this was achieved, the 49 individual timbers were compared to see if there were any same-tree matches. This revealed a number of multiple same-tree samples which were combined to form nine same-tree groups (Tables 36 - 42).

This reduced the number of samples from 49 timbers to 24 individual trees. These were compared and four separate groups were formed. The earliest was formed from five of the same-tree composites ***sarum5a*** - ***sarum5e***, together with six individual timbers: ***scnt35***, ***scnt40***, ***scl70***, ***scl76***, ***scl81***, and ***scl88*** (Table 26). This produced the 105-ring site chronology ***SARUM5*** (Table 43), which dated, spanning the years AD 1558 - 1662 (Table 44).

The second group was formed of two samples, ***scl94*** and ***scl95***. These had matched together with a *t* - value of 11.31 and were clearly from the same tree (Table 45) . These were from two roof boards on the north porch and were combined to form the 65-year mean ***SARUM6*** (Table 46) which dated, spanning the years AD 1604 - 68 (Table 47).

The third group was composed of seven roof boards, two of which were from the same tree (***scl68***, ***scl72***, ***scl90***, ***scl91***, ***scl93***, and the mean ***scl8992*** (Tables 37 and 48). These were combined to form the 64-ring site master ***SARUM7*** (Table 49), which dated spanning the years AD 1672 - 1735 (Table 50).

The final group of timbers included boards ***scl96*** through ***scl100*** which were combined to form the mean ***scl96100*** (Table 27). This 48-ring mean failed to date, primarily due to there being too few rings (Fig 30).

Interpretation and discussion:

Eastern Chapel Roofs

Of the 35 clearly identified Irish timbers, three retained complete sapwood, producing precise felling dates of spring AD 1222. They were from the collar of truss 6 (***scec1***), the south rafter of truss 7 (***scec2***), and the north rafter of truss 10 (***scec4***). Although all three of these were from the northern chapel roof, the very strong matches between certain pairs of timbers from both roofs suggest that they may have come from single trees or at least the same woodland. For example, sample ***scec1*** from the north chapel matched with sample ***scec52*** from the south chapel with a *t*-value of 12.51, sample ***scec5*** from the north matched with sample ***scec55*** from the south with t = 12.33, and sample ***scec7*** from the north matched with sample ***scec57*** from the south with t = 12.23 (Table 2). Whilst these high matches are very likely to have originated from single trees, it is also possible that these could have been from same area of woodland trees with the same growing and management conditions. It also must be born in mind that some of these samples are made up of several different radii, therefore giving a cleaner, more robust, signal resulting in better matches. Furthermore, matches between virgin Irish trees tend to be much higher than would normally be found in English examples (Brown *pers comm*). Nevertheless, this shows that the two roofs were constructed from material almost certainly resulting from the same consignment of timber, and if not constructed at the same time, were at least planned as a whole ensemble.

Of the Irish samples which dated, three of these retained complete sapwood, having 22, 24, and 26 sapwood rings respectively. Some 24 other samples showed clear signs of having a heartwood/sapwood boundary (Table 1; Figs 31 and 32). The homogeneity of this group of Irish timbers, as shown by the *t*-values in Table 2, is further supported by the fact that all three samples with complete sapwood were found to be felled in the same season and year, the spring of AD 1222. Given the reference to shipping of some, *but not necessarily these*, Irish timbers sometime in AD 1224, and completion of the chapels in late AD 1225, it is extremely likely that the vast majority of the trees were felled within a year, or two at the most, of AD 1222. The felling date ranges and *termini post quem* dates for the Irish timbers were calculated using the 14 - 50 year range (95% confidence) appropriate for Irish oaks (Baillie 1995).

By using this assumption, an assumed sapwood distribution for the Irish material for this phase can be calculated based on the known heartwood/sapwood boundary dates. These range from AD 1152 for ***scec49*** to AD 1208 for ***scec42***, giving an absolute range of 13 - 69 sapwood rings. Using the same methods as Hughes *et al* (1981), a 95% confidence level felling date range of 16 - 56 years was calculated for this group of 27 eastern chapel timbers. This is slightly higher, but broadly similar to, the

14 - 50 range used for other Irish timbers (Baillie 1995). Of course, extreme caution must be used in interpreting these figures too rigidly as some allowance must be allowed for earlier felling, windfalls, etc, not to mention the small sample base (Miles 1997a). Still, it does support the findings by other practitioners that Ireland has a wider and higher sapwood range than England and Wales (Hillam *et al* 1987).

Of the remaining timbers which have dated, the majority of which are of English extraction, we do not have any with complete sapwood. However, six of these have heartwood/sapwood boundaries which vary from AD 1198 to AD 1213 (Table 1; Fig 32). These are all consistent with the AD 1222 felling dates of the Irish timbers. For these, a sapwood estimate appropriate for southern England of 9 - 41 years (95% confidence) has been used (Miles 1997a).

Of the remaining timbers which could not be clearly provenanced to either southern England or Ireland, the southern England sapwood estimate of 9 - 41 years has been used, as being the more conservative at the earlier end of the range.

Although not an insuperable problem, we have trees which have been felled near Dublin in the spring of AD 1222, a record of transporting timber from Ireland during the middle of AD 1224, and a consecration date of September AD 1225 for the three chapels with roofs presumably completed. This leaves only a year to completely convert the timber and frame the roofs, not to mention laying the roof covering and gutters, and putting in the vaults below. However, it must be borne in mind that the Patent Rolls are not a complete series of records, and it is quite possible that other shipments of timber from Ireland a year or two before might have been omitted or unrecorded. Although less likely, it is just possible that the roofs were not quite finished at the time of the consecration at Michaelmas AD 1225, although the stone vaults below undoubtedly would have been. Still, given enough labour and some good direction and organisation, it could have been possible to erect these roofs in the space of a year, even in the AD 1220s.

Thus, one possible interpretation is that the roofs were originally intended to be constructed from timber supplied from local Royal forests such as Clarendon, but that difficulties in actually acquiring the trees resulted in the procurement of timber from further afield. Therefore, at least one shipment of oak from Dublin was obtained during AD 1224. Given this, it would appear that framing was taking place during the latter part of AD 1224 and the early part of AD 1225. This scenario is further bolstered by the fact that some of the rafters in the roofs were from much faster-grown trees, quite unlike the Irish material, suggesting that timbers from several diverse sources were brought together at the time of framing. This faster grown material is spread throughout the roofs, rather than limited to individual trusses or group of trusses, suggesting that most of the material was together before framing began in earnest.

North Nave Triforium and North Porch Roofs - primary phase

Here, the demarcation between Irish and English timber was much more clear - all of the structural timbers were from southern English sources, and all of the early first-phase boarding from Irish sources near to Dublin.

From the north nave triforium, only one timber retaining complete sapwood, ***scnt05***, dated, producing a felling date of winter AD 1254/5. This was a principal rafter at truss 3, towards the west end at the bottom of the valley to the return.

Three other timbers from the north porch gave precise felling dates. Two of these were from rafters ***scnt43*** and ***scnt46***, and both were felled in the winter of AD 1251/2. A third felling date of summer AD 1236 was from the west rafter in truss II (***scnt42***). However, this timber showed clear signs of having been reused, and therefore the date is of little use in the interpretation of the present roofs.

Twenty other timbers retained clear heartwood/sapwood boundaries as shown in Figure 24. These vary in date from AD 1200 to AD 1235, with a single early example of AD 1192 for sample ***scnt14*** for an outer principal rafter. With this single exception, all other heartwood/sapwood transition dates are consistent with the AD 1251/2 and AD 1254/5 felling dates. A sapwood estimate of 9 - 41 years (95% confidence) appropriate for southern England was used for these English timbers (Miles 1997a).

It is perhaps misleading to suggest that these few solitary felling dates reflect the actual felling dates of the remainder of the timbers, indeed they themselves may have been stock-piled for a year or more. It is highly unlikely for the north porch to have been constructed *before* the north nave triforium on which it is clearly supported. Indeed, the carpentry clearly suggests that both roofs were designed as an integrated ensemble. It is quite likely that the north porch roof, together with bay 5 of the north triforium roof, were prefabricated in advance of the erection of the other bays of the triforium, and this is supported by the use of sophisticated carpenter's assembly marks in this area. Clearly this element was not initially framed before AD 1252, and could have been framed as late as AD 1255. The trusses to the west end of the north nave triforium were not framed up before AD 1255, nor would they have been framed up much later. This is based on the good matches between the outer principal rafter of truss 3 which produced the AD 1254/5 date, and the principal rafters from truss 2 adjacent, as well as the valley lay boards in bay 1 (Table 20).

There are some documentary references to the purchase of oaks which might relate to the AD 1251/2 felling dates from the north porch roof. On the 24th of June AD 1251, 20 oaks were obtained, five each from Melksham Forest and Chippenham Forest, as well as from Doiley and Finkley in Chute Forest. These were for making 20 rafter couples (Simpson 1996). It is very tempting to suggest that these were for the north porch roof, which was constructed from 21 full rafter trusses, one of which has been proven to have been reused from an earlier dismantled roof.

Certainly, the north porch roof and that of the north nave triforium were the last of the roofs to be completed. The AD 1254/5 date is not long before the consecration of the cathedral on the 30th of September AD 1258, and the lead roofing was said to have been completed by Bishop Giles of Bridgport during his period in office between AD 1256 - 62.

The rafter felled in the summer or autumn of AD 1236 found reused in the cross-wall of the north porch is an interesting anomaly. Exactly why a roof less than 20 years old should be dismantled does not fit into the normal idea of building construction. At this time, the choir was being finished and lead roofing to the eastern transepts completed. It is quite possible that this rafter had been a left-over from this work, or had been part of some sort of temporary structure later dismantled as the construction moved westwards.

As for the Irish roof boards, none of these retained complete sapwood. However, 18 of the boards which dated retained heartwood/sapwood boundaries. These ranged from AD 1175 to AD 1230, which is broadly similar to the absolute range of 56 years found on the Irish timbers from the eastern chapel roofs of AD 1222. Three of these dated from before AD 1200: AD 1175, AD 1187, and AD 1196. Despite having a sample base of only 18 timbers with heartwood/sapwood boundaries, an attempt was made to determine an assumed sapwood estimate as was done with the Irish timbers in the eastern chapel roofs. Here, none of the samples retained anything near complete sapwood, so the AD 1254/5 date from one of the principal rafters of the trusses below was used as the most probable felling date for the Irish boards, assuming they were brought over immediately before the roof was ready to receive them. Given this, an absolute range of 24 - 79 rings was produced, with a 95% confidence felling date range of 27 - 75 rings of sapwood. This is significantly broader and higher than the assumed sapwood estimate for the 27 timbers from the eastern chapel roof which produced an absolute range of 13 - 69 and a 95% confidence range of 16 - 56 rings, and substantially higher than the 95% confidence range of 14 - 50 rings found in other Irish timbers (Baillie 1995).

Given that the material from the north triforium roof had originated from the same geographical area, chronological period, and parent sapwood population as the eastern chapel roofs, one would have expected the felling date ranges to be broadly similar. As they are clearly not, the answer probably lies in the possibility of stock-piling. As the eastern chapel roofs were the first to be completed, it is unlikely that any of the material was stock-piled. Conversely, the north triforium roof was one of the latest to be finished, and the likelihood that timber was left over from earlier phases of building is very much higher. The study of the assumed sapwood ranges support the hypothesis that the north triforium roof boards include some material which has been stock-piled for a number of years, perhaps by as much as a decade or more in some instances. Given this, the obvious result is that the 95% confidence assumed sapwood range of 27 - 75 years for the north triforium roof is not valid as the actual dates for some of the material are somewhat earlier than the estimated AD 1254 felling date. Given that the distribution of heartwood/sapwood boundary dates from the eastern chapel roofs is 56 years for a single felling episode, the 55-year span for the nave triforium roof boards strongly suggests a narrower felling period rather than an extended one, even though the sample base is rather small.

Figure 24 shows the relationship of last heartwood dates to those with heartwood/sapwood boundaries. Some boards had remarkably early last heartwood rings dates, 12 from before AD 1100, and one as early as AD 963. Obviously the minimum number of sapwood rings were not removed here, but instead the trees were large enough that both an inner and outer board could be converted from a single radial section. The 14 - 50 year sapwood estimate (95% confidence) for Ireland has been used for all Irish boards (Baillie 1995).

North Nave Triforium and North Porch Roofs - post-medieval repair phases

Three clear phases of work were found in the post-medieval period (Fig 34). The first represented a major course of repairs which included the replacement of the trusses adjacent to the flying buttresses which pierce the roof at intervals. Here a number of principal rafters as well as common rafters produced felling dates of spring AD 1662. The timbers dated included the principal rafters of truss 6 east and west, the lower principal rafter of truss 12 east, several rafters in bay 7, and the outer principal rafter to truss 19, together with two adjacent rafters. These repairs have also been reflected in some of the roof boarding removed from the western three bays of the nave triforium, which produced felling dates of winter AD 1660/61, winter AD 1661/2, spring AD 1662, and spring AD 1663. This work clearly represents repairs being carried out to the roof following the Civil War when the lead was stripped from this part of the cathedral. This may relate to a gift of £500 given by Bishop Duppa for repairs in or before AD 1662 (Cocke and Kidson 1993, 94).

A slightly later phase of repairs has been identified to the western slope of the north porch, following the report made by Wren in AD 1668. Two boards over rafters XVII produced felling dates of spring AD 1669, and probably represent only minor releading.

A third phase of leadwork repairs has been identified by a series of boards dating to the spring of AD 1736. Two of these were found removed from bays 1 to 3, and five others sampled *in situ* from the west side of the north porch roof. This clearly relates to the repairs being carried out by Francis Price, and identifies this area having been worked on, probably during AD 1736 or AD 1737.

All post-medieval timbers sampled proved to be English rather than Irish, and consequently the sapwood range of 9 - 41 years (95% confidence) has been used (Miles 1997a).

Source of Timber and Dendro-Provenancing

England

There are plenty of documentary references to timber being obtained from as many as 16 different forests across Wiltshire and Hampshire, as well as a far a field as Herefordshire. The locations of these woodlands are shown on the map in Figure 6. These include the forests of Trivelle and Dean in Herefordshire, Clarendon, Chippenham, Melksham, Savernake, Bramshaw, Downton, and Gillingham in Wiltshire, as well as Chute and Odiham forests in Hampshire. The question of timber source has been well researched by Gavin Simpson (1996).

Unfortunately, there are no well replicated reference chronologies whose origins are clearly from any of these forests, with the exception of Clarendon. Here a number of buildings comprising Clarendon Palace were constructed between the thirteenth and eighteenth centuries. The Salisbury site masters, as well as the individual samples, were compared with this collection of Clarendon chronologies (Tyers 1999a; 2001), and only two thirteenth-century samples from the north porch roof matched significantly. When compared with the chronology from Queen Manor Farm (CL_QMF1), which spanned the years AD 1218 - 1328 (Tyers 1999a), samples ***scnt43*** matched with a *t*-value of 5.63 and ***scnt46*** matched with a *t*-value of 5.11. These two samples probably originated from the same tree, and the mean of these, ***scnt436*** matched with a *t*-value of 5.90 with the Clarendon chronology. Considering that these samples overlapped with the earlier part of the Clarendon chronology by only 34 years, the matches are especially significant. However, given that Downton, Melchet, and Buckholt forests are all within five miles of Clarendon, and Bramshaw and Chute within ten miles, it is not possible to provenance these two timbers to Clarendon over any of these others (Fig 7). Nevertheless, there is a documentary reference of Doiley and Finkley wood in Chute Forest each giving, or promising to give, five oaks for rafters on the 24th of June AD 1251 (Simpson 1996), which would accord well with the winter AD 1251/2 felling dates for samples ***scnt43*** and ***scnt46***, both rafters from the north porch roof.

Otherwise, it has not been possible to conclusively provenance any of the English timbers through the dendrochronology. Part of this problem is that many of the primary-phase timbers have been obtained from diverse sources, and even if there were a selection of well-replicated chronologies from these various forests, matches with individual samples would tend to have lower *t*-values than groups of timbers from the same source.

Ireland

Altogether, 75 trees showed clear evidence of having originated from Ireland. For the eastern chapels, the 35-timber mean ***SARUM1*** produced a *t* - value of 18.02 with DUBLIN1 (Baillie 1977a), which is about twice as high as the other matches from England with comparable replicated regional chronologies. Baillie's DUBLIN1 site master extends from AD 855 to AD 1306 and is comprised of 20 individual trees carefully provenanced from the Dublin area. Given the exceptionally high *t*-values between the ***SARUM1*** and DUBLIN1 chronologies, there can be little doubt that the trees did originate from the area around Dublin.

Dendro-provenancing is perhaps better illustrated in Figure 35 where *t*-values for various chronologies are shown plotted on a map of the British Isles. Some of the largest general regional chronologies such as SOUTH have been left out due to their wider-ranging coverage, and high degree of replication. Similarly, single sites have been avoided due to their low degree of replication, which gives lower *t*-values than those regional chronologies with a moderate number of samples such as DUBLIN1. Nevertheless, somewhat higher *t*-values than neighbouring chronologies are produced by some chronologies such as LONDON (Tyers *pers comm*), PETERC (Tyers 1999b), and EASTMID (Laxton and Litton 1988) due to their exceptionally large sample base. Additional chronologies include BELFAST (Baillie 1977c), CARLMED (Groves 1993), YORMEDX (Hillam *pers comm*), NORWCHQY (Groves *pers comm*), CRESING1 (Tyers *pers comm*), OXON93 (Haddon-Reece *et al* 1993), EXCATH1 (Mills 1988), and KENT88 (Laxton and Litton 1989). A composite chronology from Brittany (BRIT3) produced by Pilcher, Guibal, and Merion-Jones was also used to see if there was any correlation with northern France. It should be borne in mind that those chronologies with a larger sample base, and of longer overall length, will give higher *t* - values than those of shorter, less replicated, sequences which are nearer the true source. Nevertheless, a trend from east to west towards Ireland is clearly evident.

Similarly, dendro-provenancing within Ireland has shown an equally clear progression from the north-west to the south-east, with the best matches centring around Dublin and New Ross.

The selection of Dublin is also corroborated through documentary evidence in the form of Henry III's Patent Rolls. Gavin Simpson has outlined many of the sources of timber for much of the building history of the cathedral, the earliest being a gift of 40 good rafters from Clarendon on the 18 May AD 1220 (Simpson 1996). Clearly Clarendon Forest, only a few miles distant from Salisbury, would have been the most logical place to obtain timber economically. However, the timber was probably not actually collected until the 14 March AD 1224 when the king settled a dispute between the chief carpenter Godardus and the warden of the forest. This suggests a delay in obtaining sufficient timber, and it is likely that as the stonework of the vaults was nearing completion, considerable anxiety would have been expressed over the delay in the timberwork.

Clearly something would have to be done about this, and what is of particular interest is that later on in AD 1224, a consignment of timber was carried on the western (Irish) sea by William of Dublin (*Cal. Pat. Rolls* Henry III i. (1216-1225), 444). Here is clear evidence for the importation of timber from Ireland, with Dublin mentioned specifically.

The second batch of Irish timbers used for boards in the north triforium roof produced the 40-tree site master ***SARUM4***. This matched remarkably well with ***SARUM1*** with a *t*-value of 17.2, but less so with DUBLIN1 with a slightly lower *t*-value of 15. However, based on the map of *t*-values for the north triforium boards, it would appear that these had come from a similar, but not quite the same source as the eastern chapels (Fig 36).

Conclusions:

The first phase of tree-ring analysis during 1998 and 1999 confirms the documented construction date of AD 1225 for the eastern chapels, but the scarcity of precise felling dates makes it difficult to show any chronological development between the north and south chapel roofs. It is particularily regrettable that the majority of the timbers in the eastern chapel roofs were defrassed only months before they were sampled, with the result that we could have had dozens of precise felling dates rather than the measly three which survived the axe. The information lost through the removal of non-structural sapwood is incalculable and may be likened to the excavation of a Roman villa with heavy earth-moving equipment.

However, similarity between the timbers used in both roofs shows that they were from the same consignment of timber, if not the same trees, and that they were most likely framed at the same time. Although the dendrochronology failed to produce a well-replicated early chronology for Wiltshire, it did produce an excellent chronology of 314 years for the Dublin area, as shown through dendro-provenancing. Whilst it has not been proved that this is the same shipment as the AD 1224 documentary reference of timber being bought from William of Dublin, it does nevertheless confirm that substantial imports of Irish oak were being obtained during the construction period immediately before this reference. Other samples matched more local chronologies, suggesting that at least some of the material was obtained from more local sources. Some of the undated samples are likely to have originated from these latter sources and may date in the future should further work be carried out on the later roofs of the Cathedral, which documents suggest were supplied from English woodlands. Hence, one chronology was produced which was clearly from the Dublin area, but it was not possible to suggest a provenance for the home-grown material except in the broadest terms.

The second phase of tree-ring research during 2000 and 2001, on the north nave triforium and north porch roofs, identified several felling dates from AD 1251/2 and AD 1254/5, showing that these were some of the last parts to be constructed before the Cathedral was consecrated in AD 1258. The dendrochronology, together with an analysis of the carpentry, has confirmed that the north porch roof is basically coeval with the north nave triforium. Furthermore, although the crown posts and saltire bracing within the north porch roof were unsuitable for dendrochronology, again the carpentry clearly shows that they are contemporary with the rest of the roof structure, making this the earliest crown-post roof in the country. A paucity of precise felling dates makes it difficult to assess the degree of stockpiling, but the tree-ring analysis shows that the timbers did come from a variety of sources.

The Fletcher archive revealed original measurement work sheets for two samples obtained from the north nave triforium as a consequence of repairs in 1968. One of these has dated, an ashlar piece, dated with a *terminus post quem* of after AD 1239.

Analysis of the under-lead sarking boards identified a hitherto unknown batch of Irish material. This produced another well replicated chronology of 353 years encompassing 40 trees, and dated from AD 878 to AD 1230. Excellent matches with Ireland showed that it originated from the south-east coast of Ireland between Dublin and New Ross. Although the best intra-site matches for both the AD 1222 and the AD 1255 groups of Irish timbers were found within their respective groups, rather than between phases, the analysis using the Litton-Zainodin Grouping Procedure has demonstrated that while the Irish material has not come from the same woodland, it has come from broadly the same geographical area. Through the production of assumed sapwood estimates for both the 1222 and 1254 batches of Irish timbers, evidence has been produced suggesting that the earlier group of Irish timbers from the eastern chapels was most likely coeval, whereas the Irish boards from the north triforium roof would appear to have some degree of stockpiling, perhaps by as much as a decade or more.

Analysis of later roof boards identified repairs dating from AD 1661 to AD 1663 following the Restoration of the monarchy, and a slightly later repair to the north porch roof of AD 1669 following a survey by Christopher Wren. A third batch of roof boards from both the north nave triforium roof as well as the west face of north porch identified further repairs undertaken by Francis Price in AD 1736 or AD 1737. Early analysis of this material allowed an informed decision to be taken on the fate of this boarding over the north porch, and the repair programme was amended accordingly.

Altogether, analysis of a total of 260 samples from 220 individual timbers over the past four years has resulted in 170 timbers dating. This material was combined into seven new well-replicated master chronologies, two of them for south-east Ireland, extending back to the year AD 878. Two other chronologies for English timbers were also produced, spanning the years AD 1106 - AD 1213, and AD 1054 - AD 1254. Three more were post-medieval chronologies covering the periods AD 1558 - 1662, AD 1604 - 68, and AD 1672 - 1735, a period poorly represented in English tree-ring chronologies.

Further recommendations:

Before any future programme of repairs to the cathedral roofs, the affected areas should be assessed to evaluate the impact on the dendrochronological potential of the timberwork. Certainly, defrassing must *never* be undertaken, as vital archaeological evidence is irretrievably lost in this process. If decayed sapwood must be removed to effect repairs, or to assess the structural condition of the timbers, this should be done in conjunction with the dendrochronologist to ensure the retention, or retrieval, of any sections of complete sapwood.

All timbers removed during the course of repairs should be clearly labelled for provenance, and set aside for any future tree-ring analysis. Again, consultation with the dendrochronologist at an early stage is advisable.

In order to get as complete picture of the development of Salisbury Cathedral, it is obviously desirable to sample as many roofs as possible, including any reused primary-phase timbers as well as the eighteenth-century repairs undertaken by Price.

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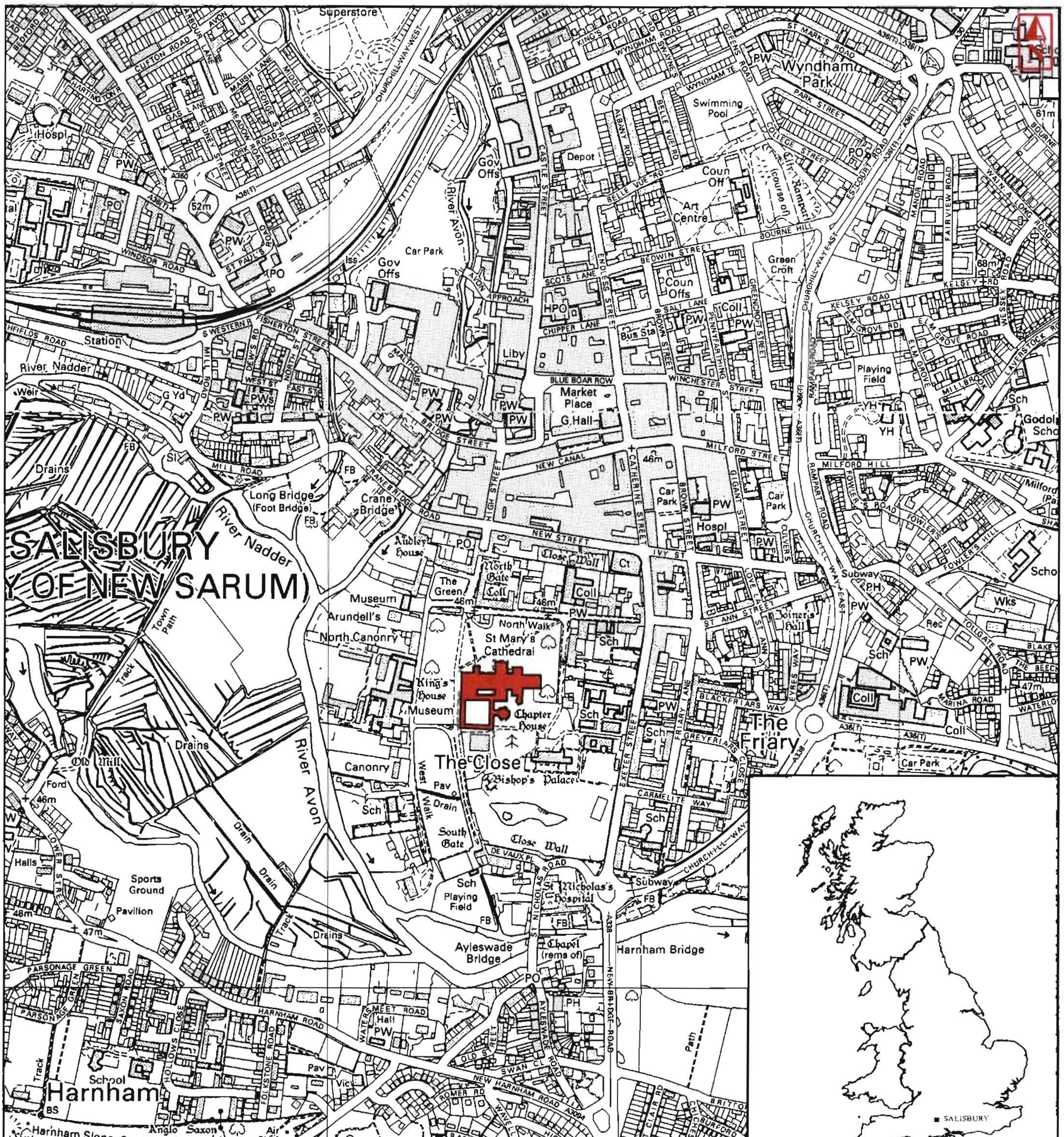

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Figure 1: Plan of Salisbury with inset map of the United Kingdom

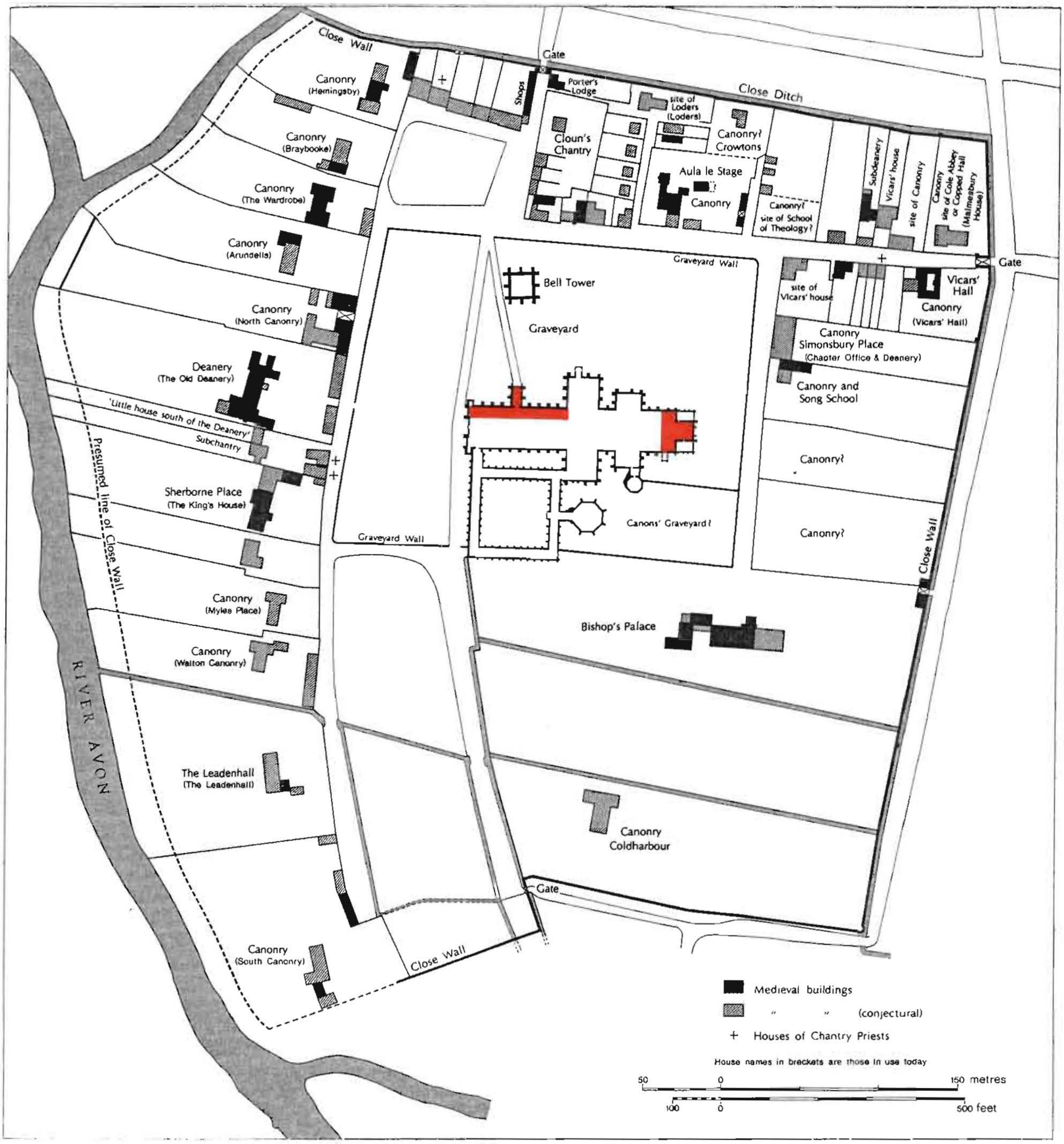


Figure 2: Reconstructed plan of the close in the late medieval period (RCHME 1993)

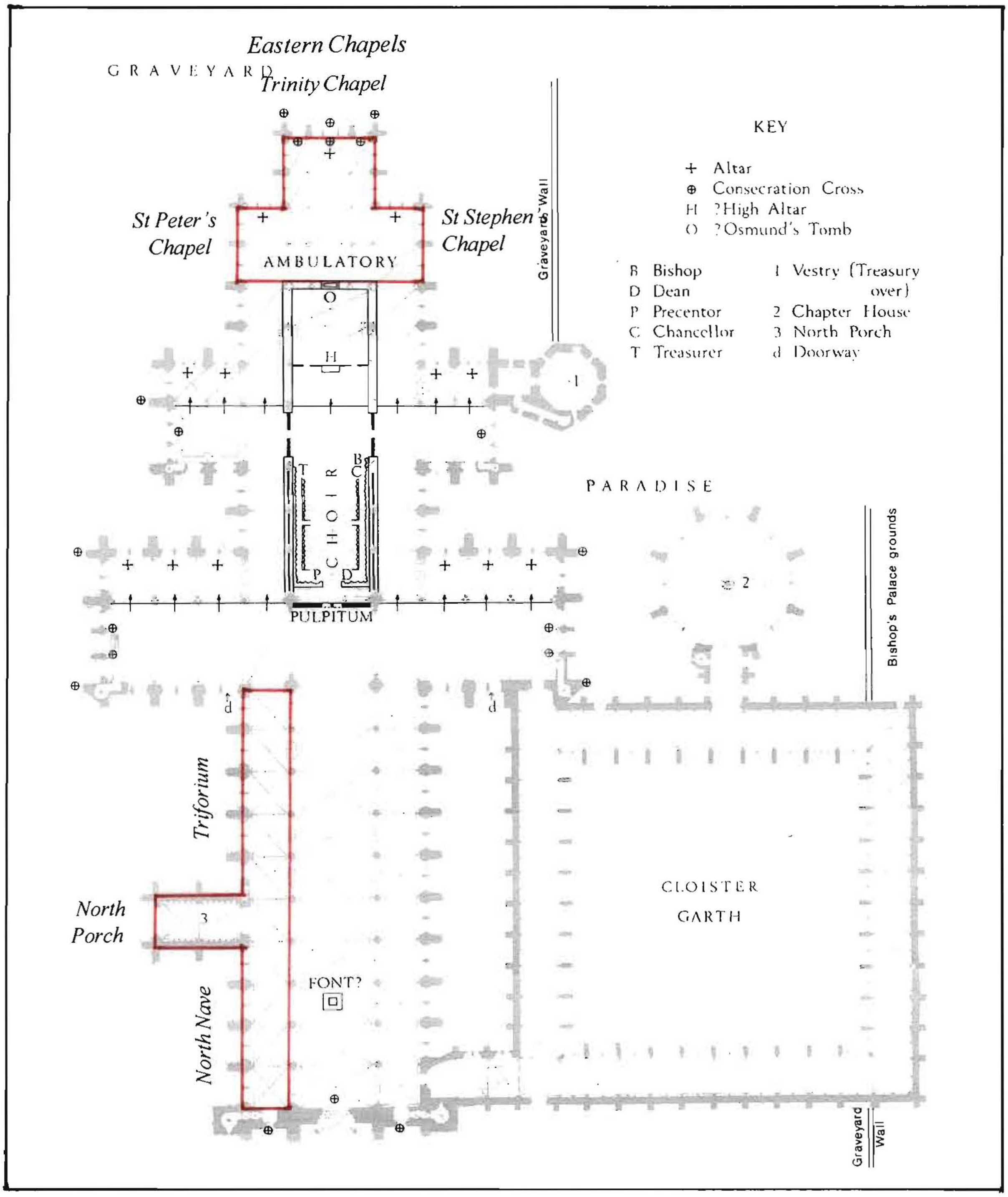


Figure 3: Plan of Salisbury Cathedral showing areas sampled (after Cocke and Kidson 1993)

Figure 4: Salisbury Cathedral from the north-east, with eastern chapels at the left end of the building. © Crown copyright. NMR. BB71/3292

Figure 5: North-west end of Salisbury Cathedral showing north porch and north nave triforium. © Crown copyright. NMR. BB71/2458

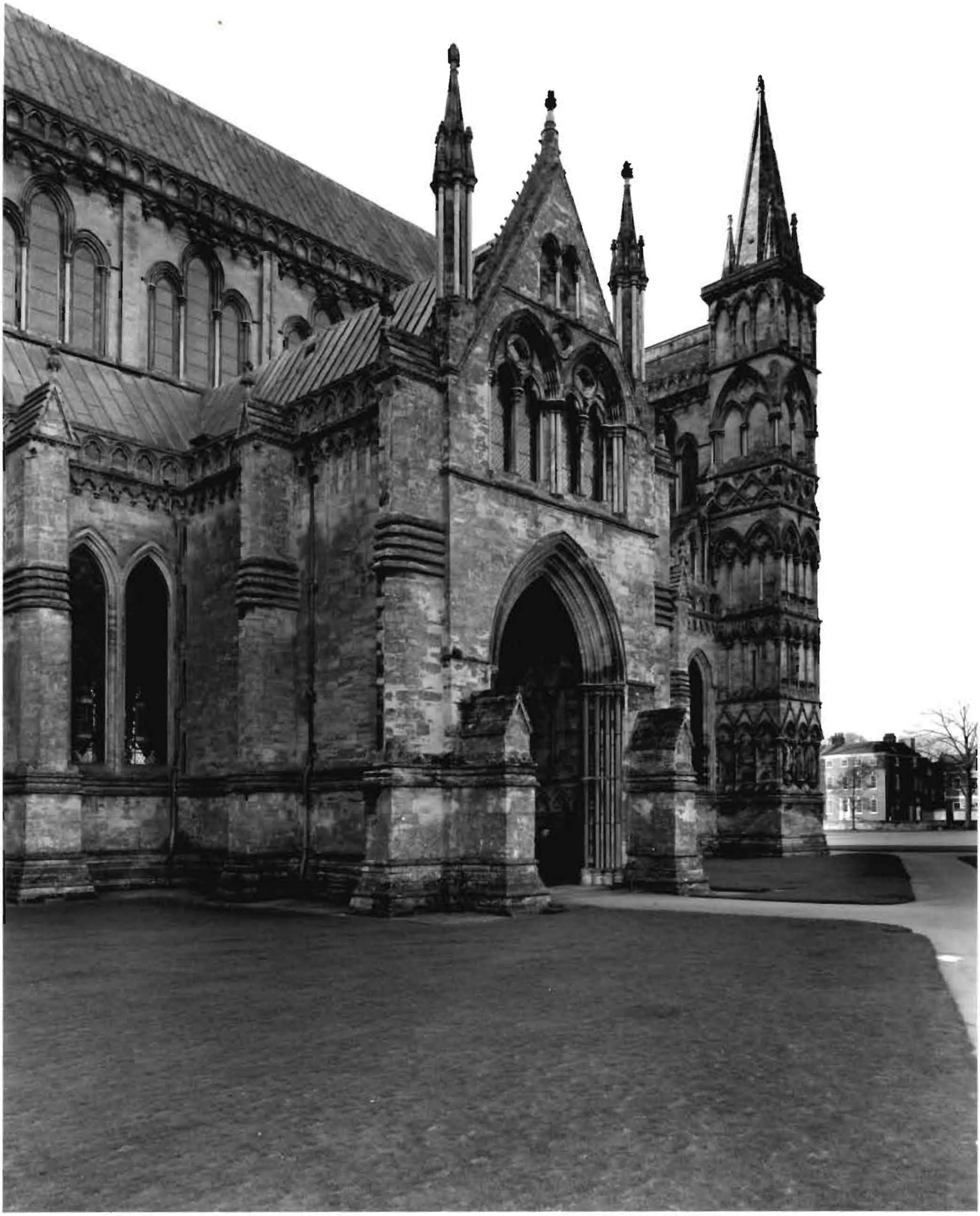
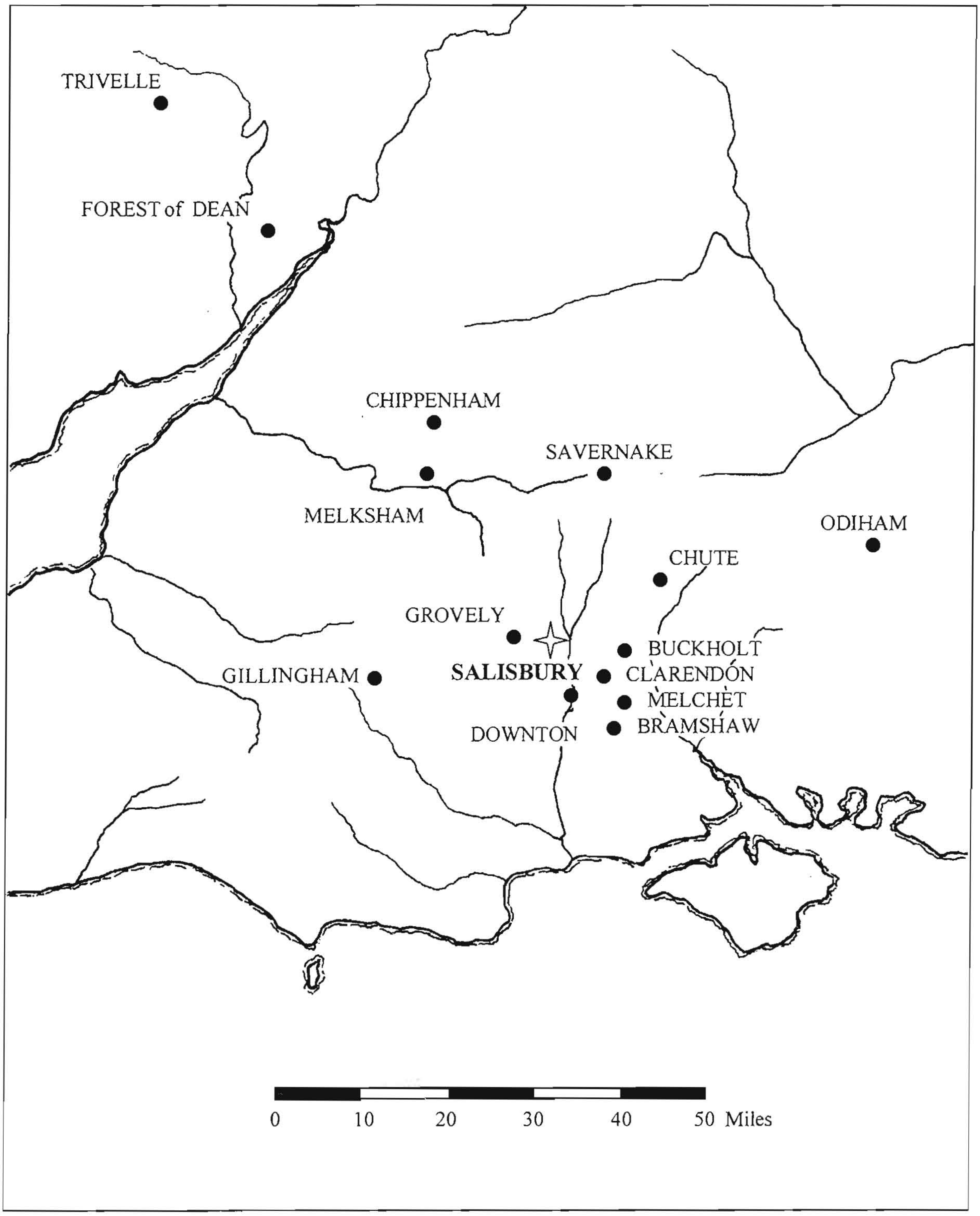


Figure 6: North porch of Salisbury Cathedral from the north-east. © Crown copyright. NMR. BB71/2307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BRAMSHAW
DOWNTON
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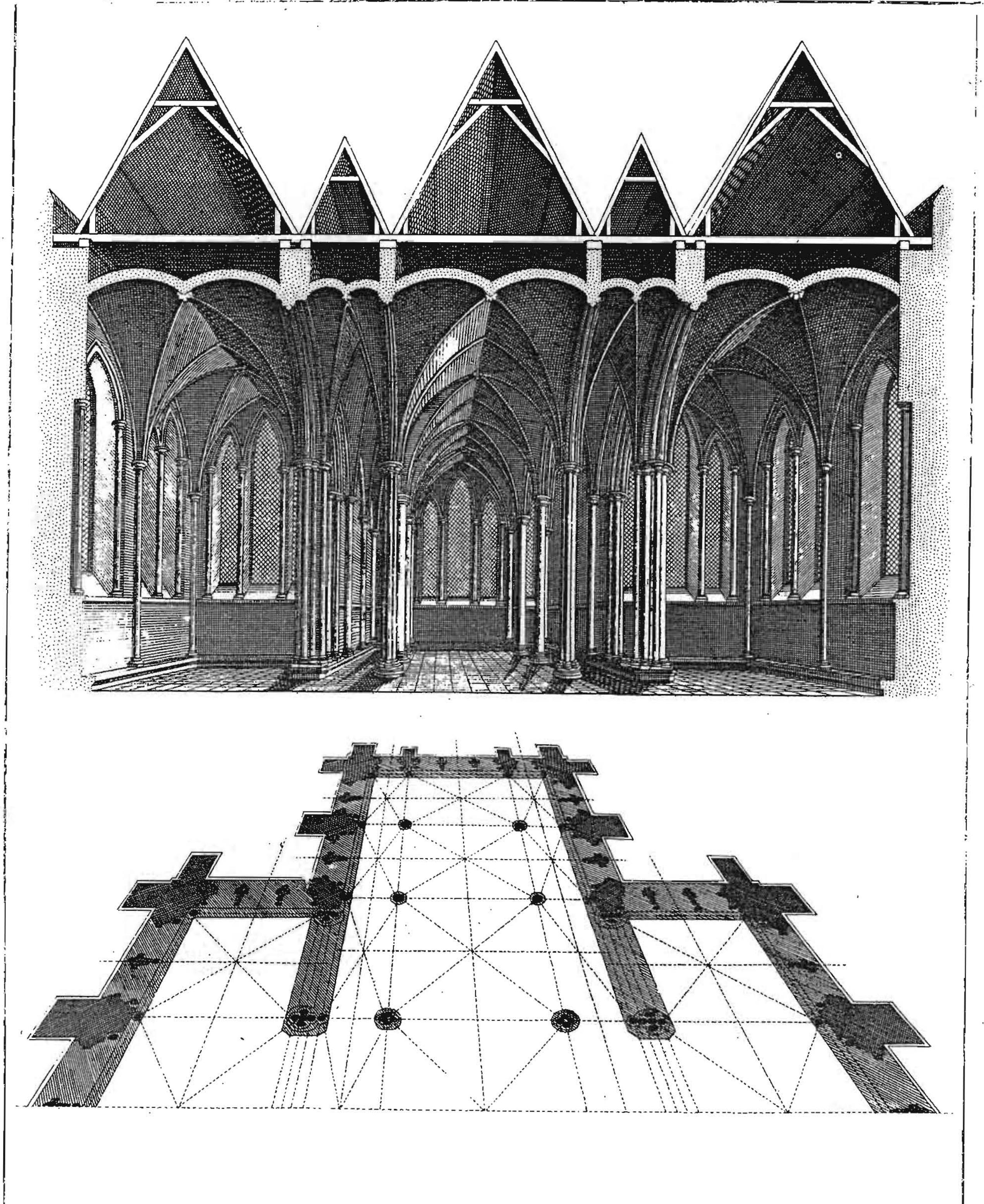
Plate 12. to face Page 63.



F. Price Del. 1747 P. Fourdrinier Sculp

A Perspective View of the termination of the Isles, with St. Mary's Chapel, at the East extremity of the Church.

Dedicated by Bishop Poore on Michaelmas Day 1225, as may be Seen Page 11 and 12 of this Work

Figure 8: Section showing original five roofs of eastern chapels prior to demolition of centre three roofs to Trinity Chapel by Price in 1736 (Price 1753)

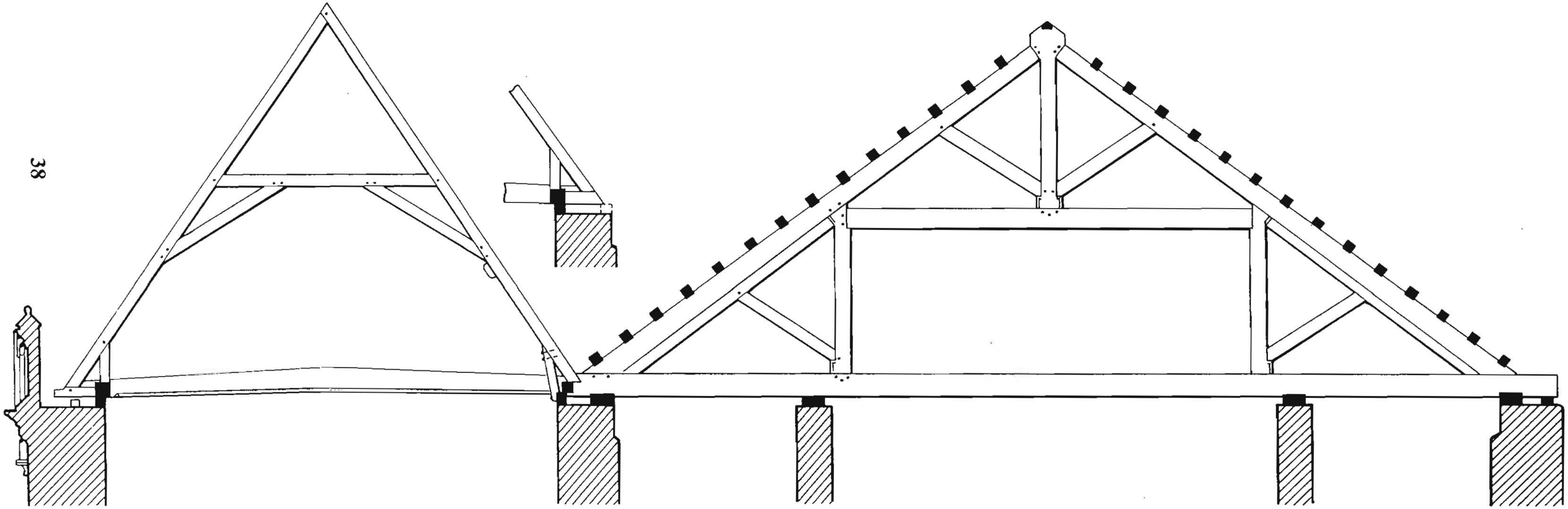


Figure 9: Section looking east through St Peter's Chapel and the Trinity Chapel (N Fradgley, RCHME unpubl)

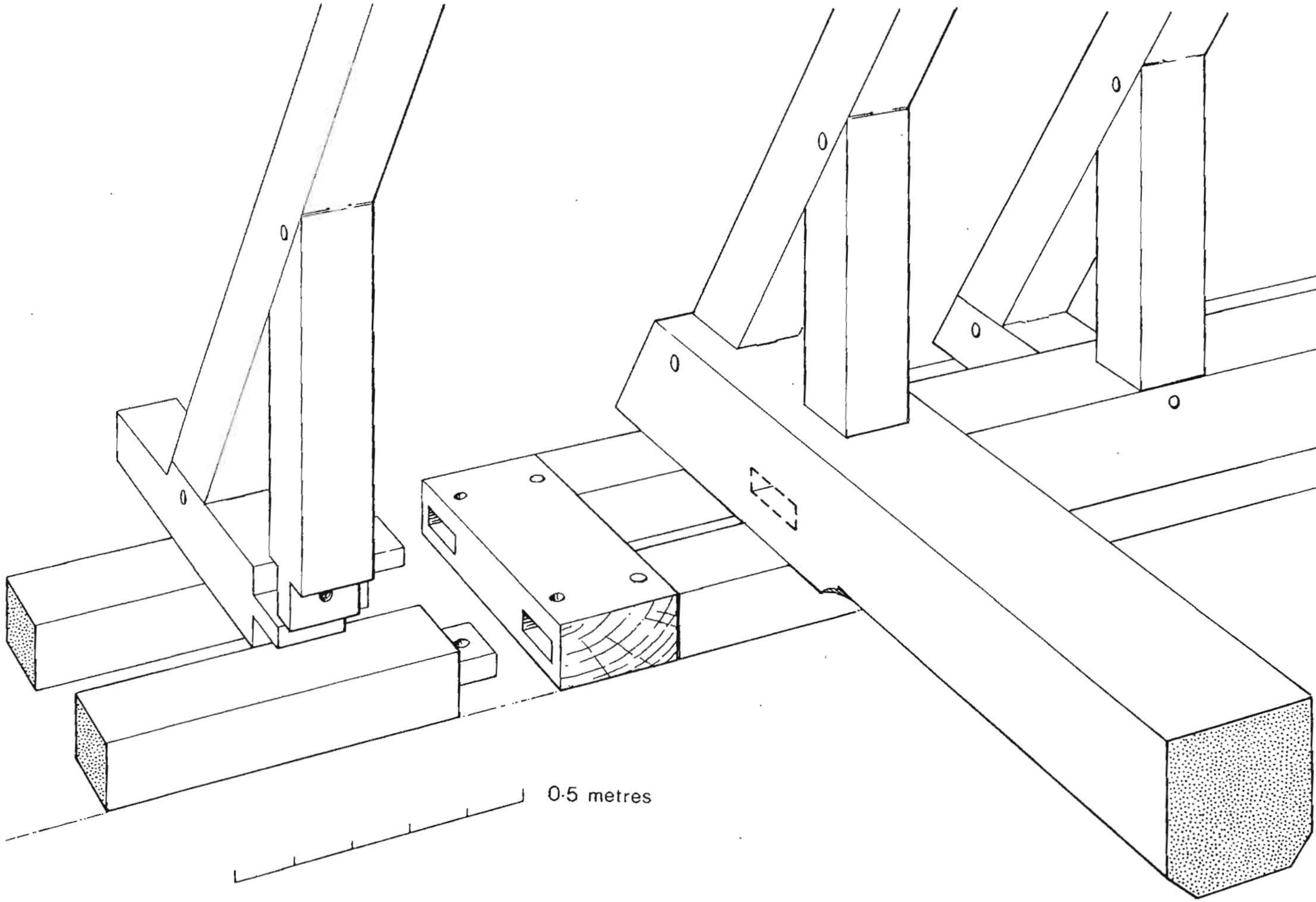


Figure 10: St Peter's Chapel - details of plate assemblies (N Fradgley, RCHME unpubl)

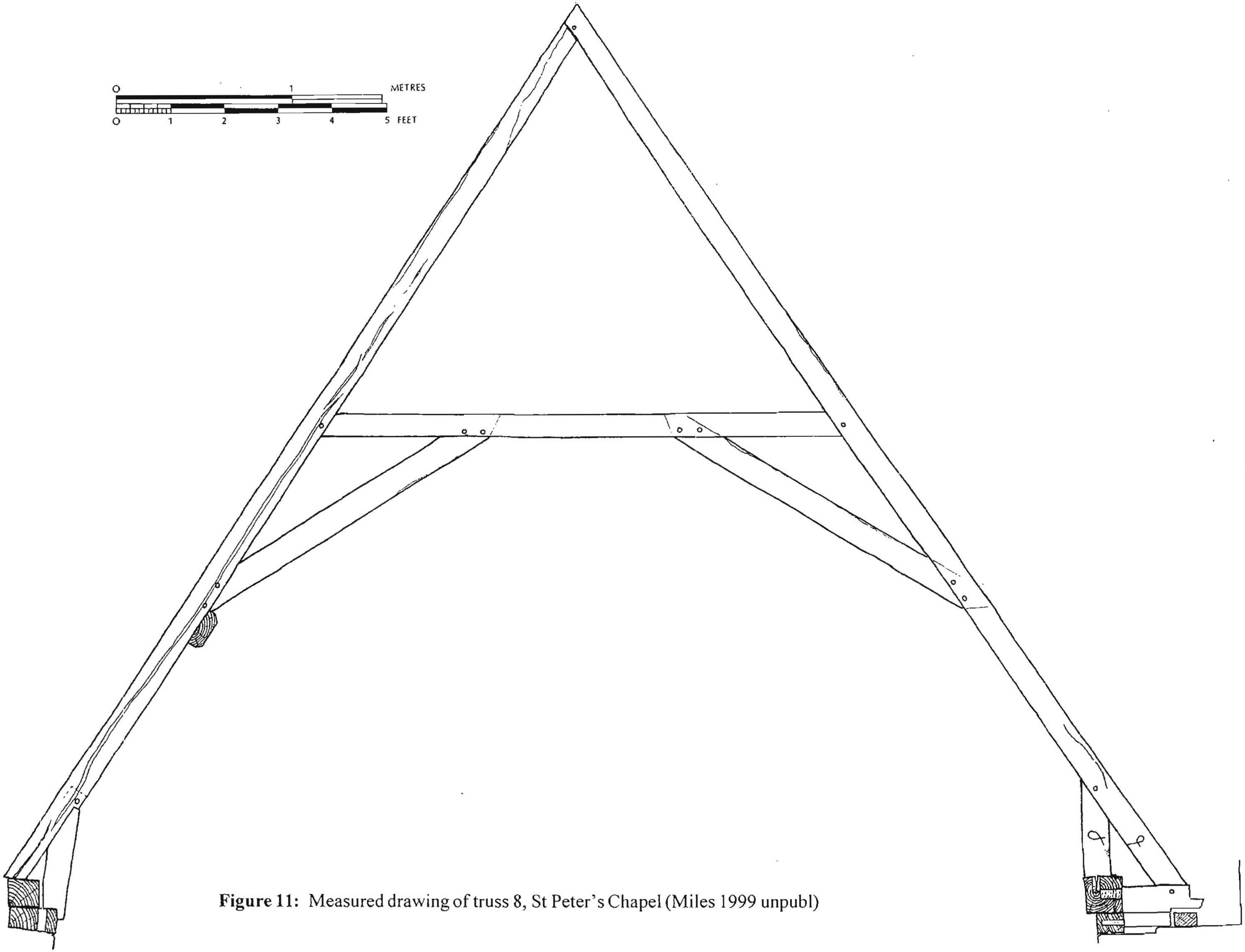


Figure 11: Measured drawing of truss 8, St Peter's Chapel (Miles 1999 unpubl)

Figure 12: St Peter's Chapel - general views (B Gilmour)

Figure 13: Typical roof timbers from the eastern chapels showing fine slow-grown, quarter-cut grain (B Gilmour)

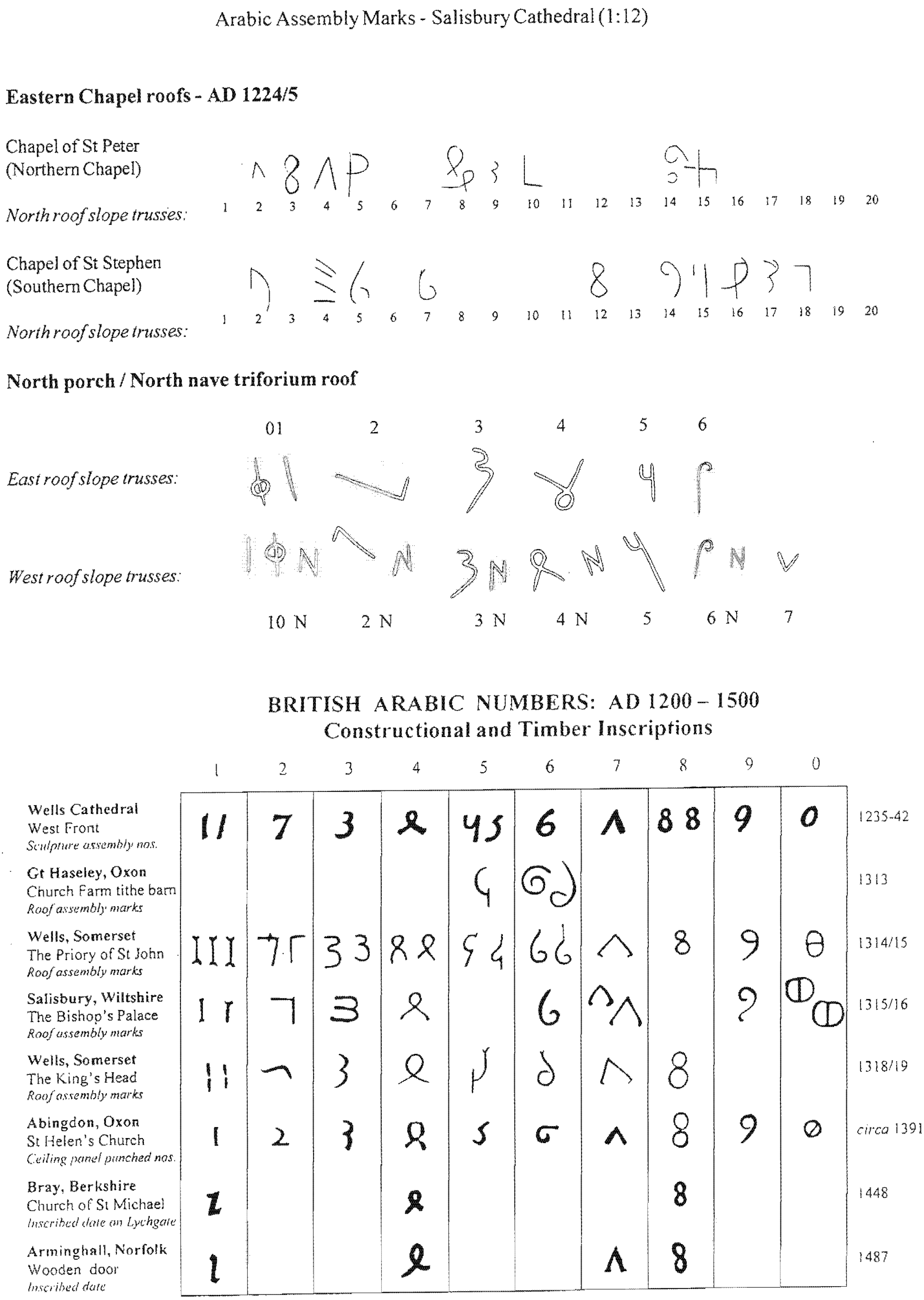


Figure 14: Arabic assembly marks recorded in eastern chapel roofs and north porch at Salisbury Cathedral, and other comparative examples from England (Miles unpubl)

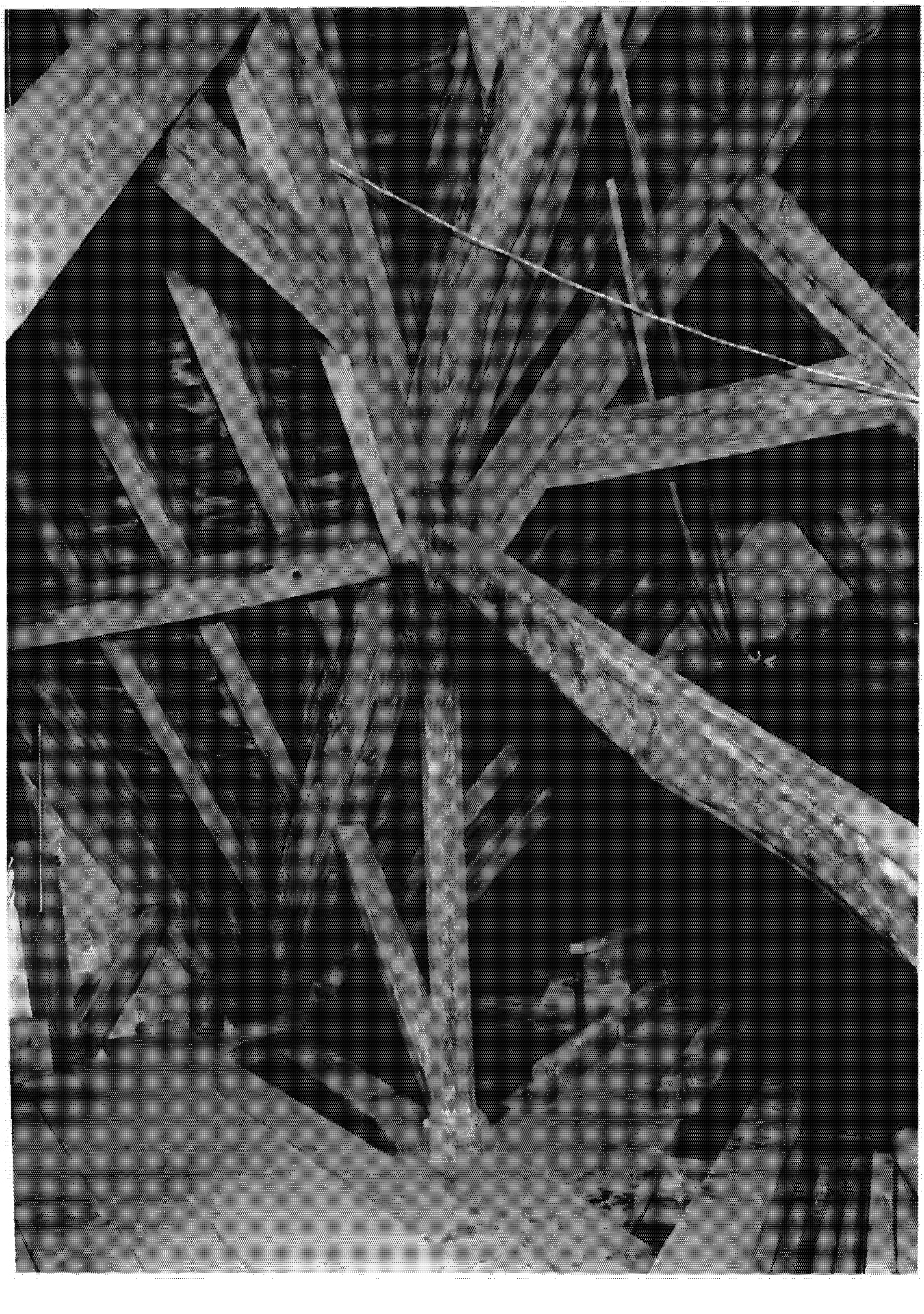


Figure 15: Valley of north nave triforium at west end, truss 0. © Crown copyright. NMR. BB69/4394

Figure 16: North nave triforium looking east showing truss 2 west. © Crown copyright. NMR. BB71/2660

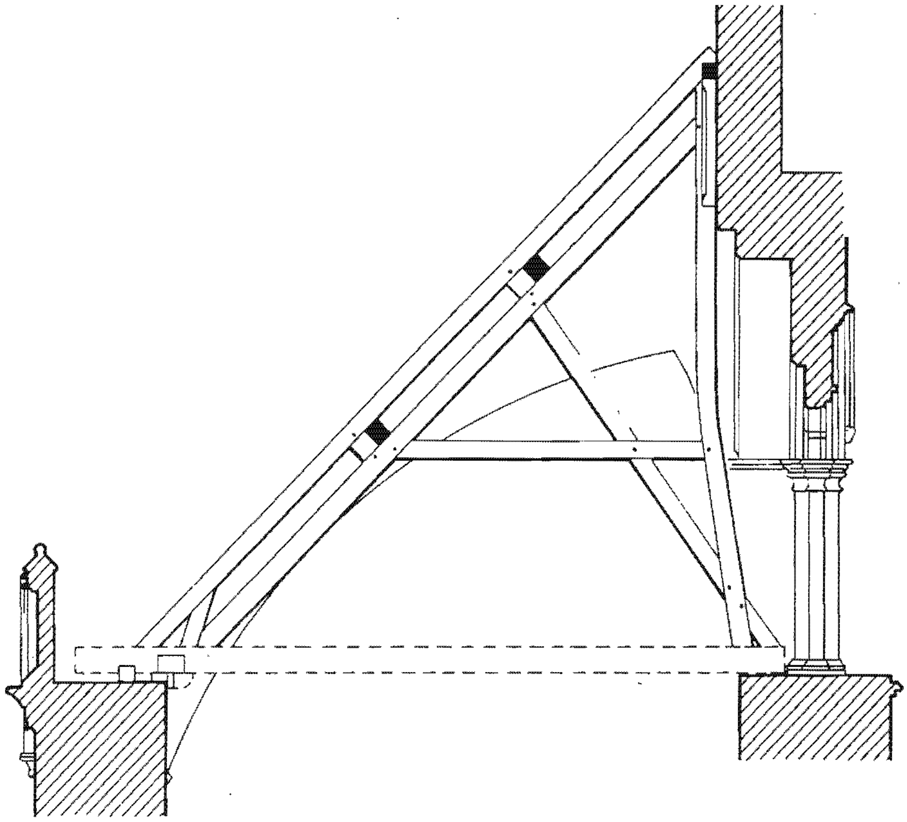


Figure 17: Typical section of north nave triforium (N Fradgley, RCHME unpubl)

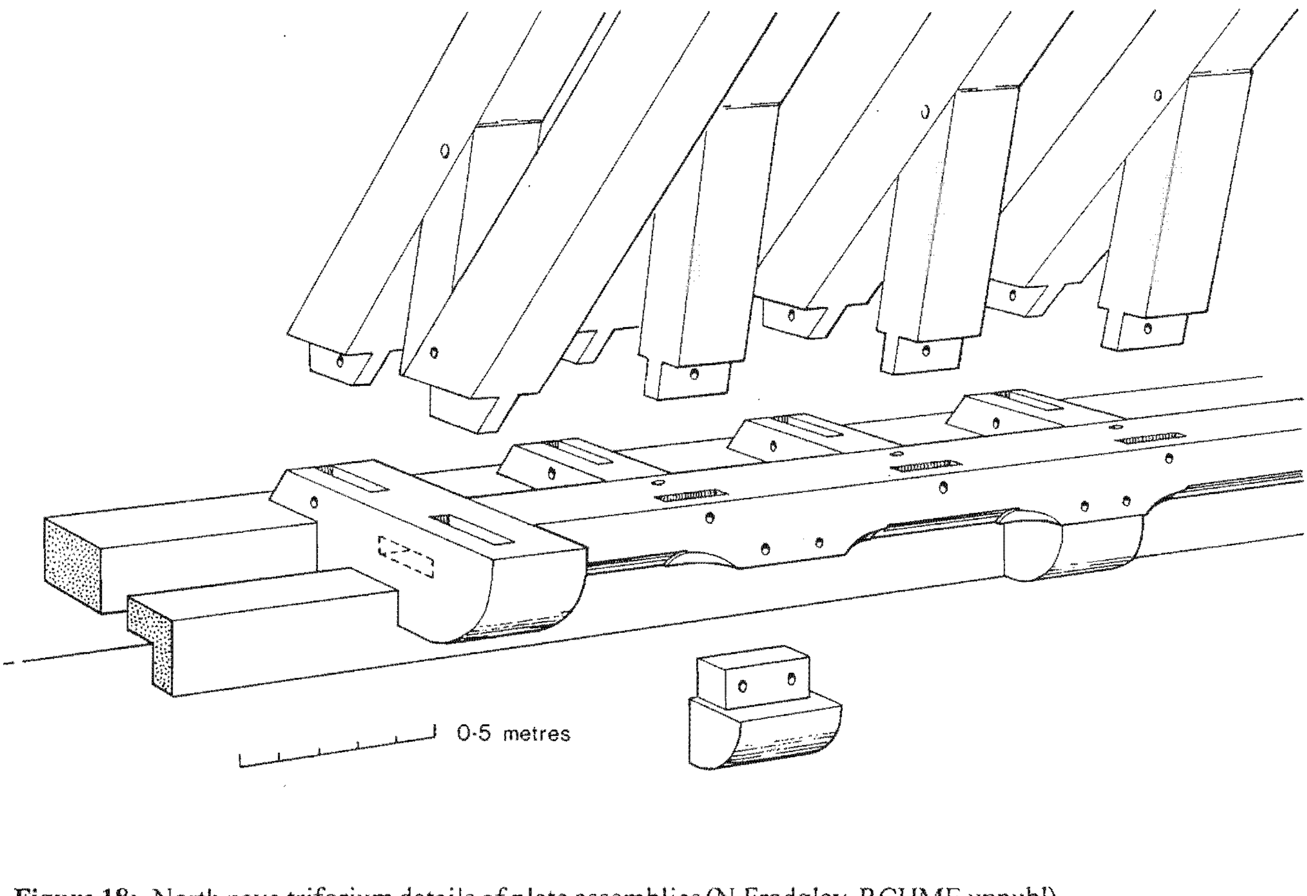


Figure 18: North nave triforium details of plate assemblies (N Fradgley, RCHME unpubl)

Figure 19: North nave triforium wallplates and roof sarking boards. © Crown copyright. NMR. BB69/4393

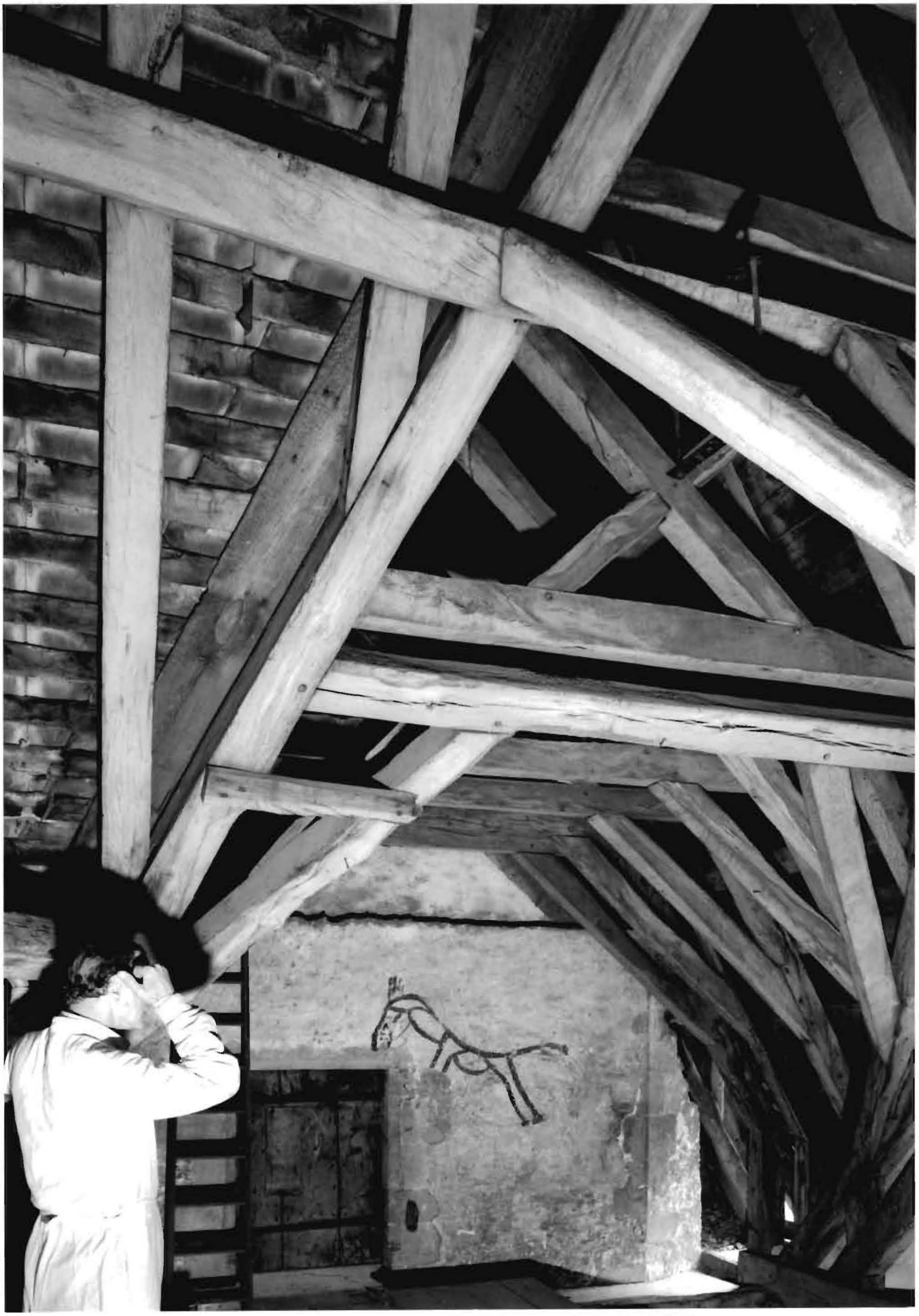


Figure 20: Intersection of scissors-braced north porch roof and north nave triforium. © Crown copyright. NMR. BB71/2502

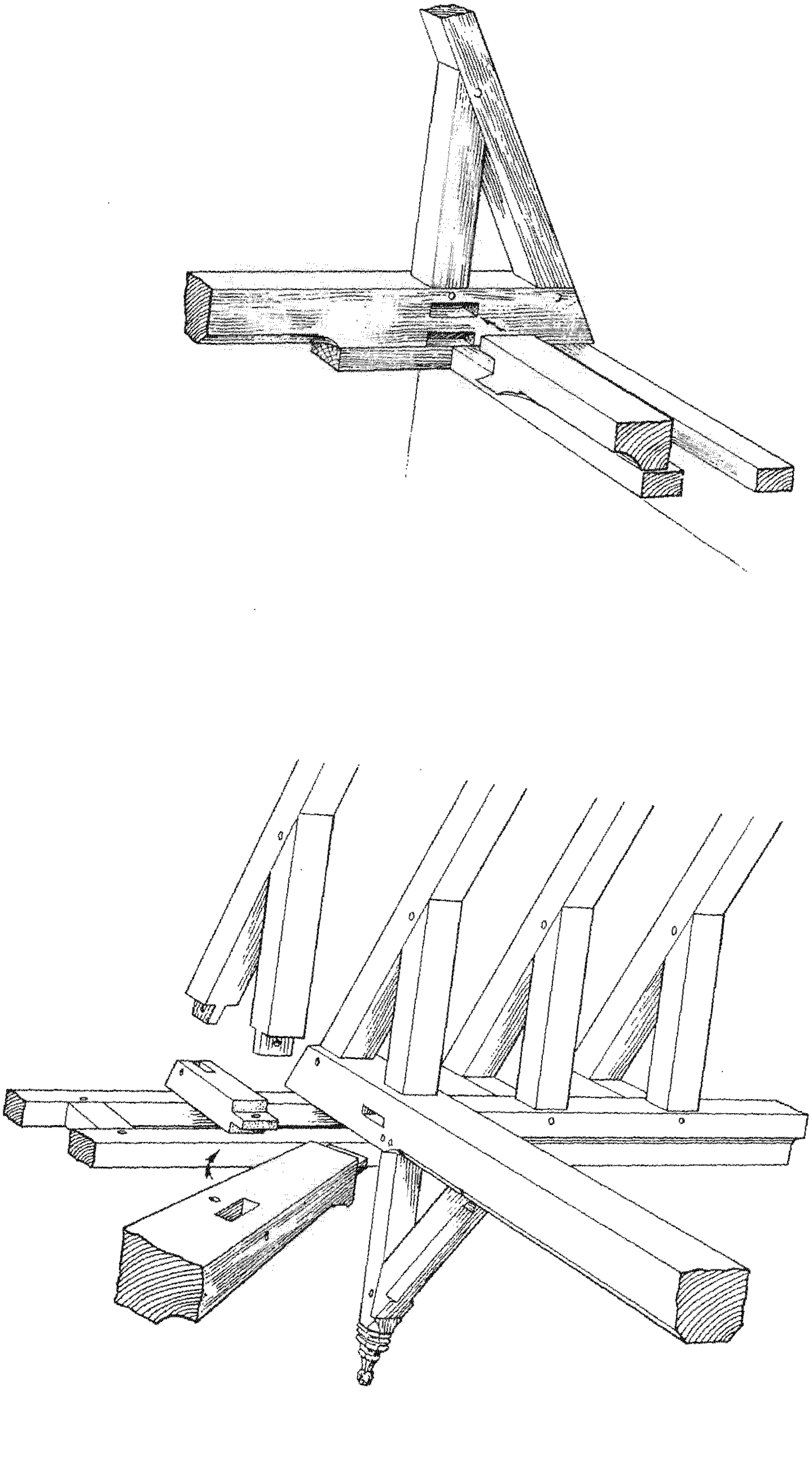


Figure 21: North porch, details of roof assemblies (N Fradgley, RCHME unpubl)

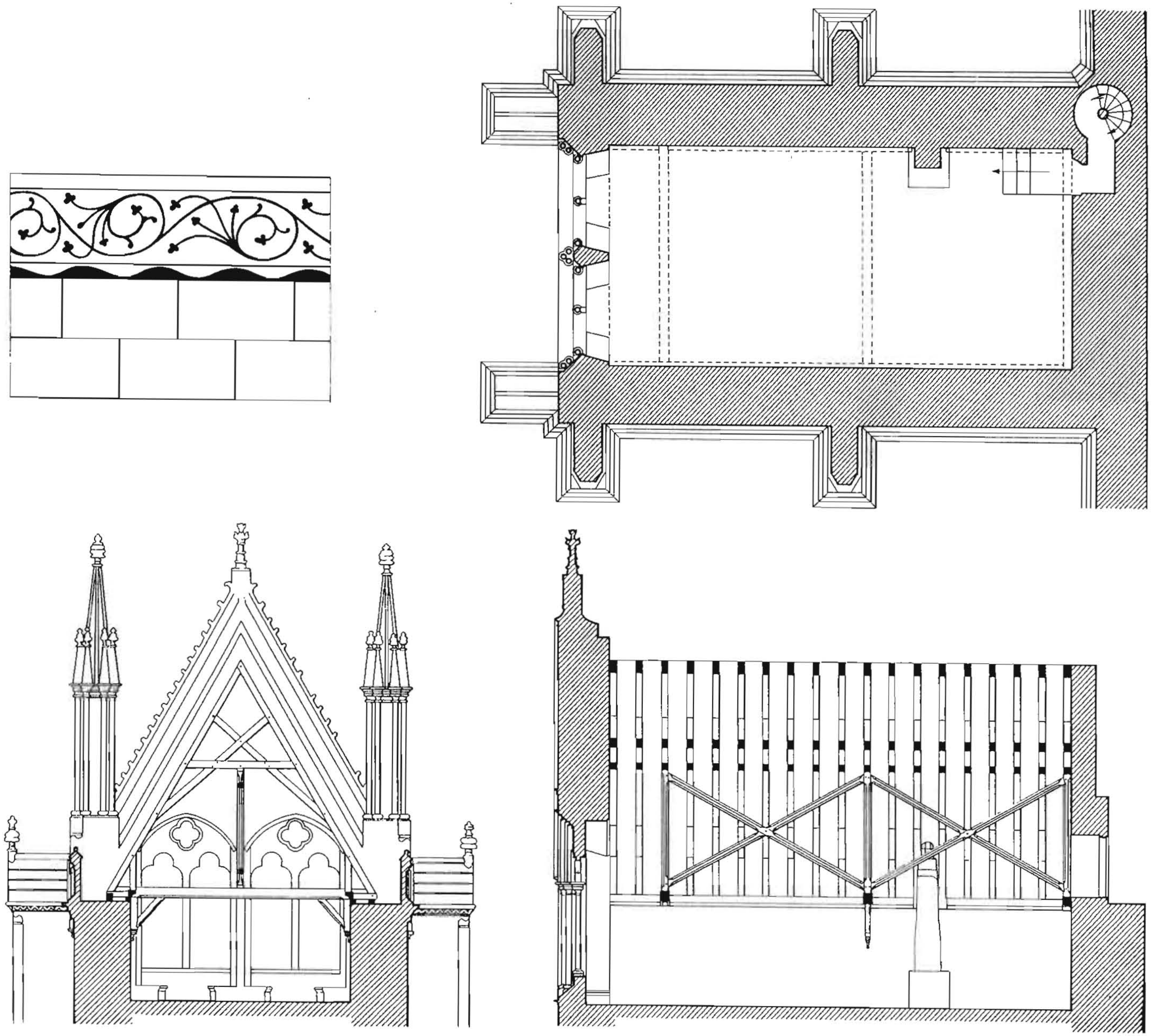


Figure 22: North porch plan, cross-section, and long section (N Fradgley, RCHME unpubl)

Figure 23: Door between Parvis Chamber and north nave triforium (P Marshall 2002 unpubl)

Figure 24: Typical examples of slow-grown Irish timbers - ***scec2b*** (south rafter T7, north chapel) and ***scec62*** (south rafter T19, south chapel) (90%)

Figure 25: Typical examples of faster-grown English timbers - *scec68* (south rafter T21, south chapel) and *scec72* (south solepiece T10, north chapel) (90%)

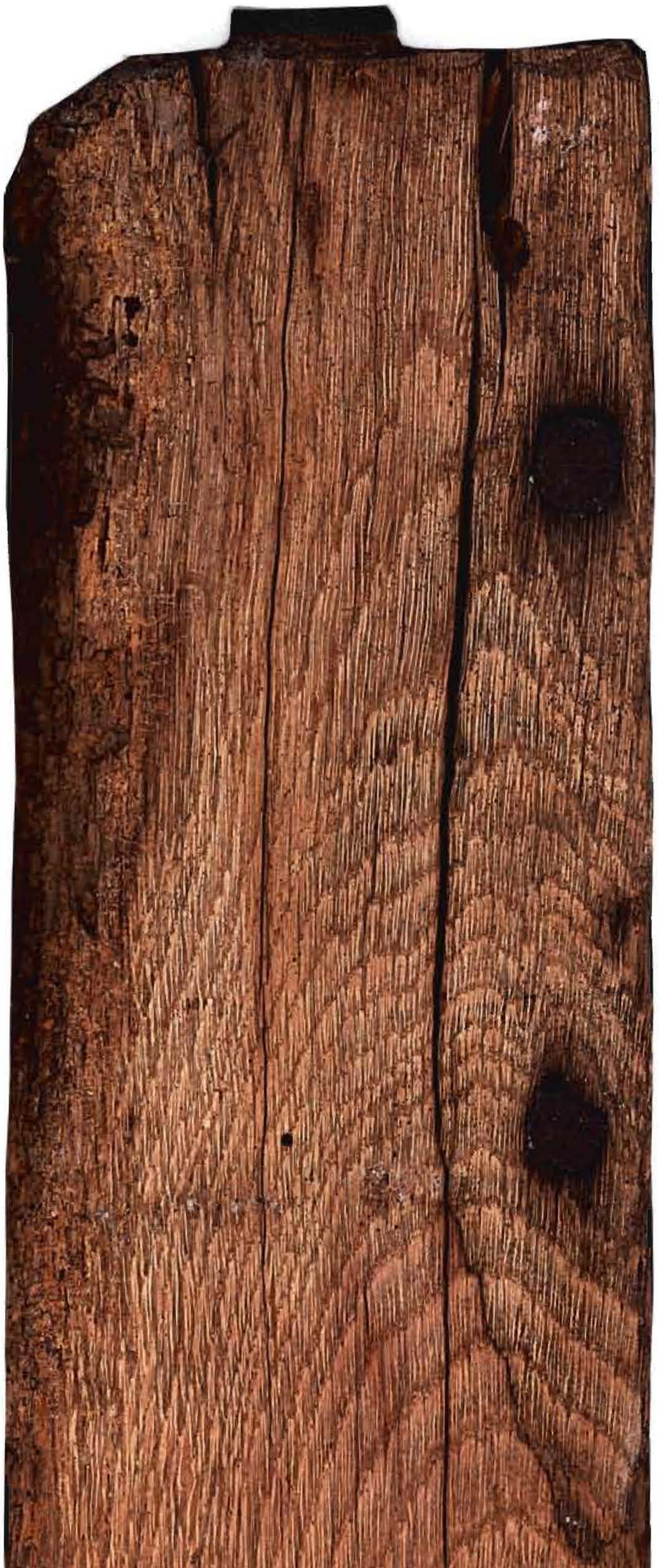


Figure 26: Upper end of south soulace brace of truss 19, St Stephen's (South) Chapel roof, showing two original nails repairing the shoulder damaged during erection (75%)

Figure 27: Typical examples of Irish under-lead sarking boards from north nave triforium roof. Note notches cut in side of boards (1:2)

Figure 28: Typical examples of English under-lead sarking boards from north nave triforium roof dating from 1662 (1:2)

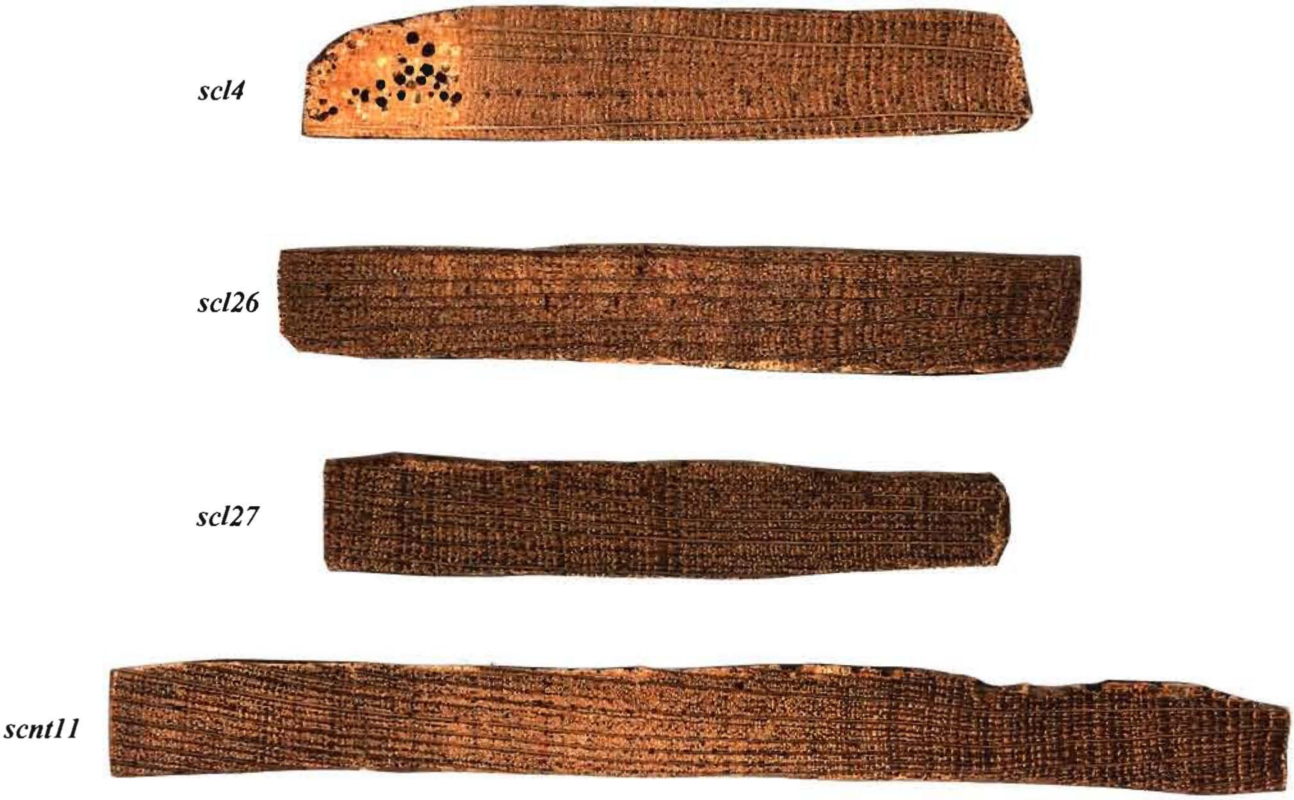


Figure 29: Typical sections of Irish under-lead sarking boards ***scl4***, ***scl26***, and ***scl27***, and packer ***scnt11***, from north nave triforium roof (1:1)

Figure 30: Photograph of roof boards ***scl96***, ***scl97***, ***scl98***, ***scl99***, and ***scl100*** showing conversion from same log (1:1)

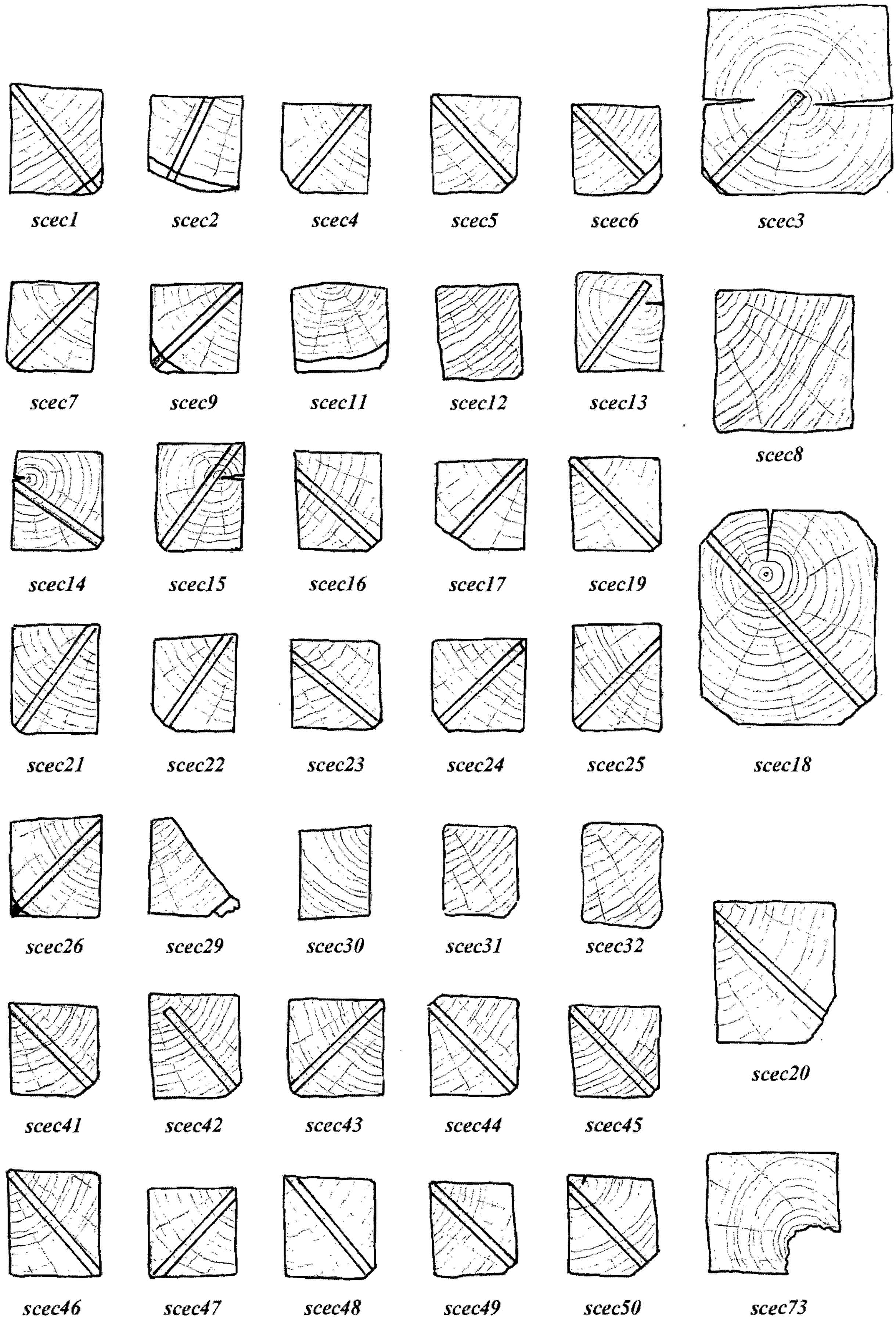


Figure 31: Scale section drawings of timbers sampled (scale 1:8)

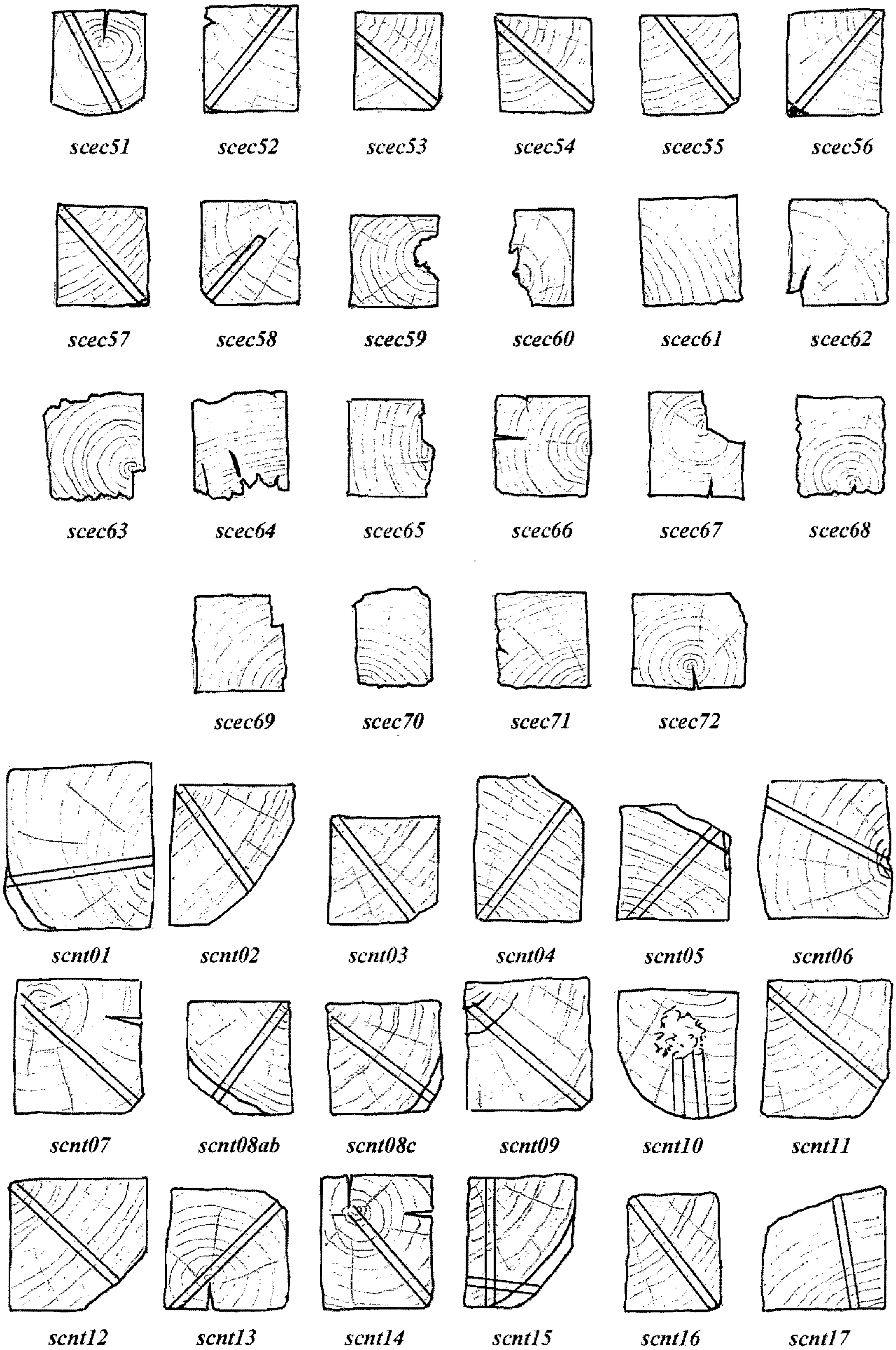


Figure 31 (cont): Scale section drawings of timbers sampled (scale 1:8)

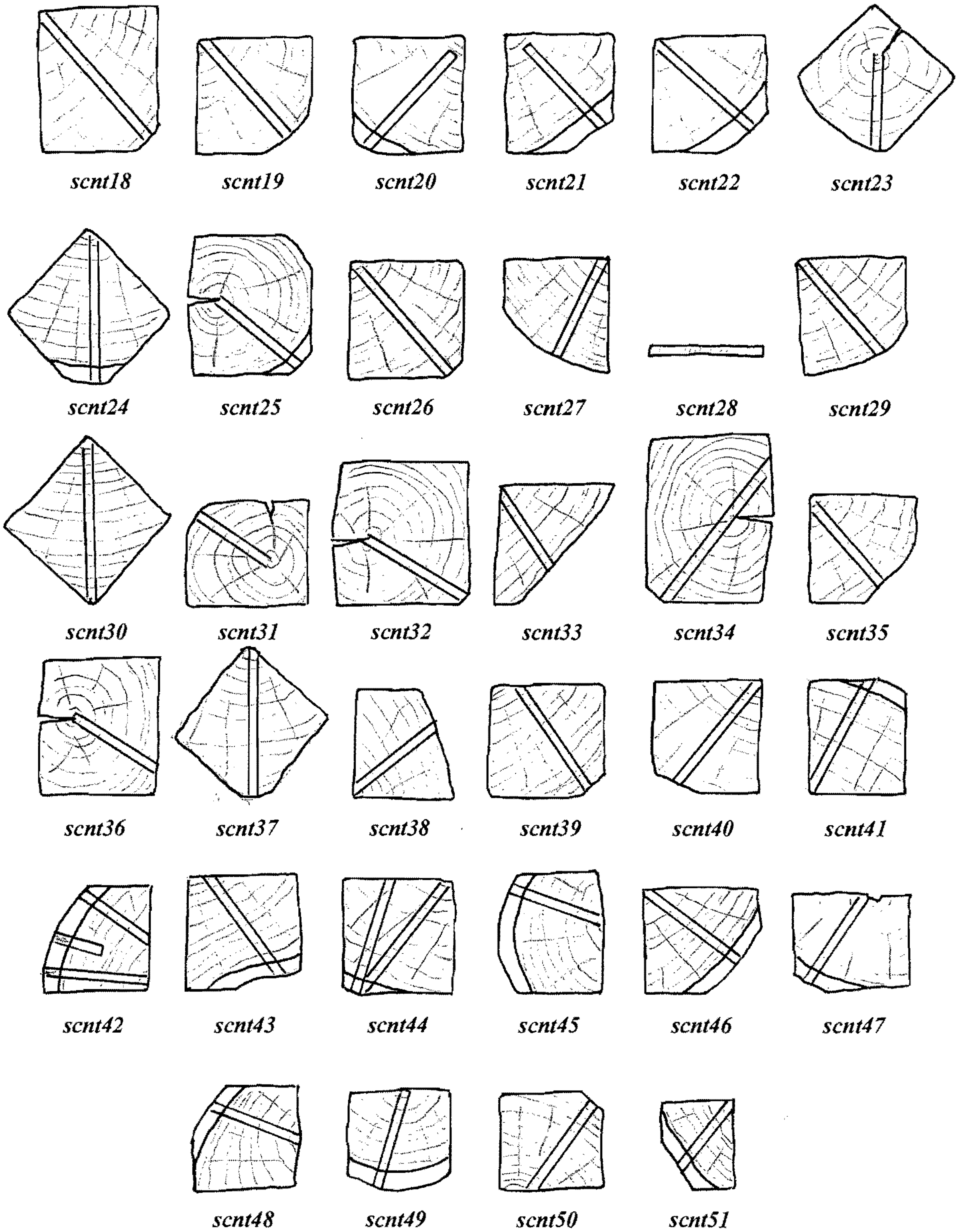


Figure 31 (cont): Scale section drawings of timbers sampled (scale 1:8)

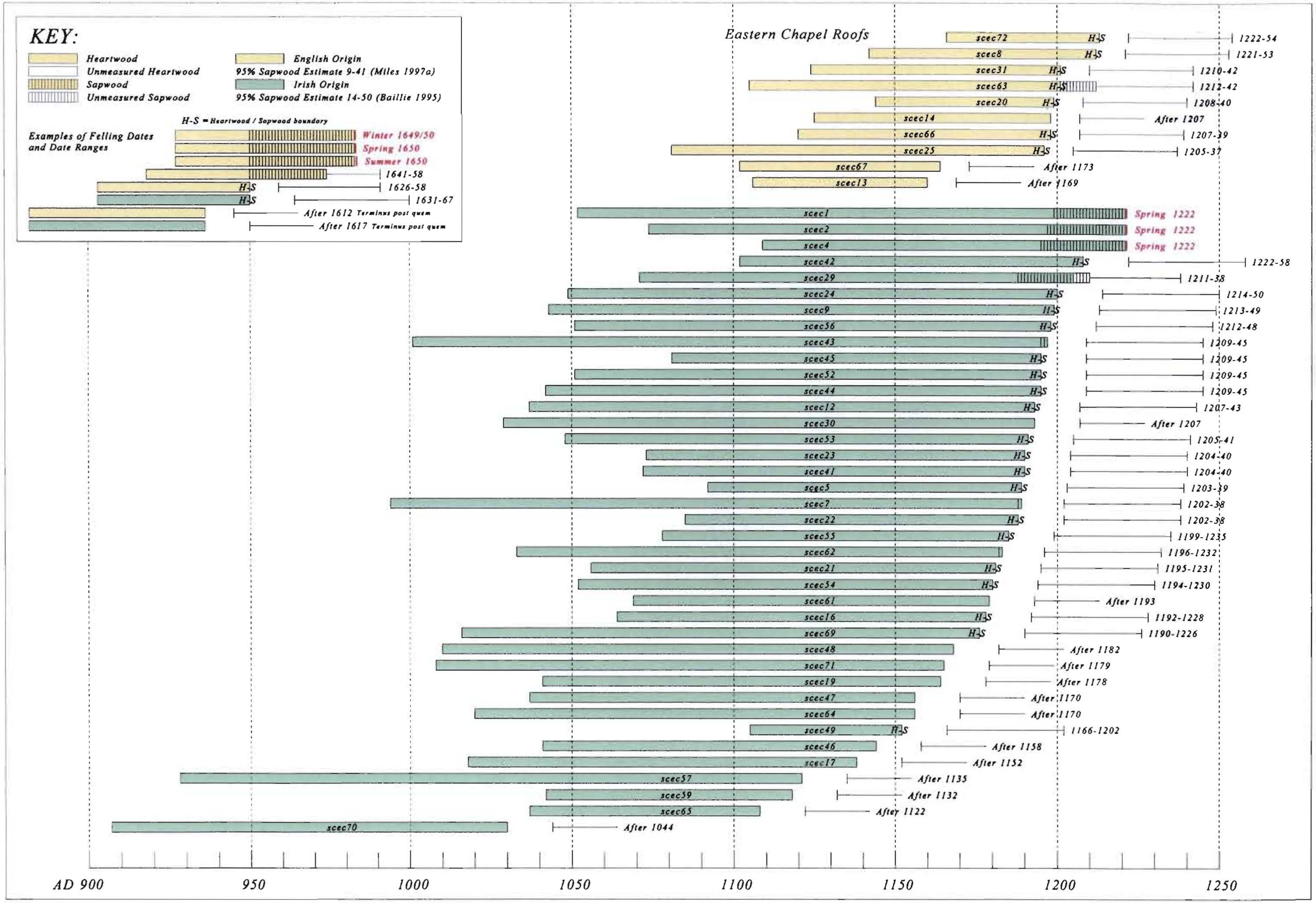


Figure 32: Bar diagram showing dated eastern chapel samples in chronological position

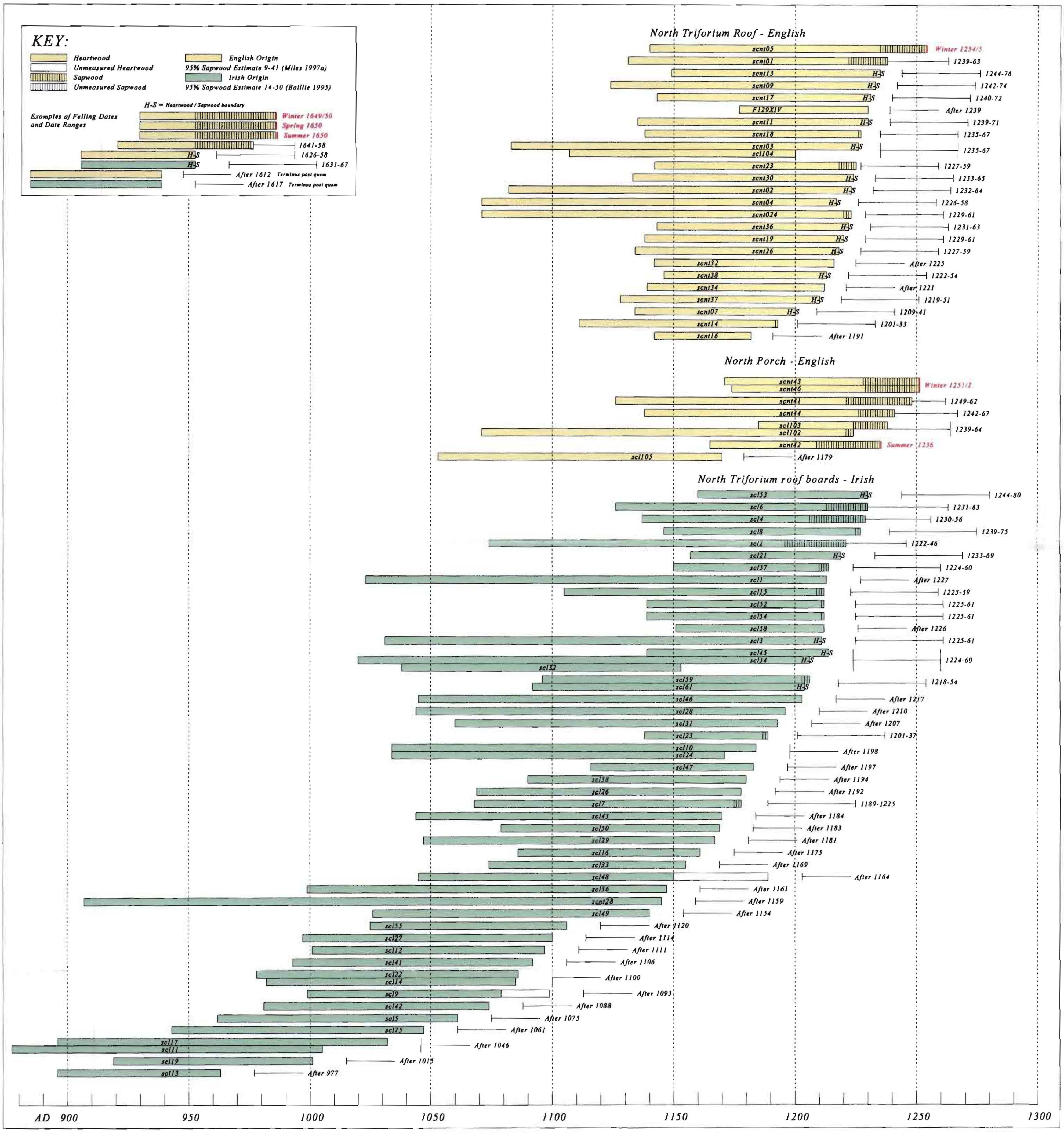


Figure 33: Bar diagram showing dated thirteenth-century north nave triforium and north porch samples in chronological position

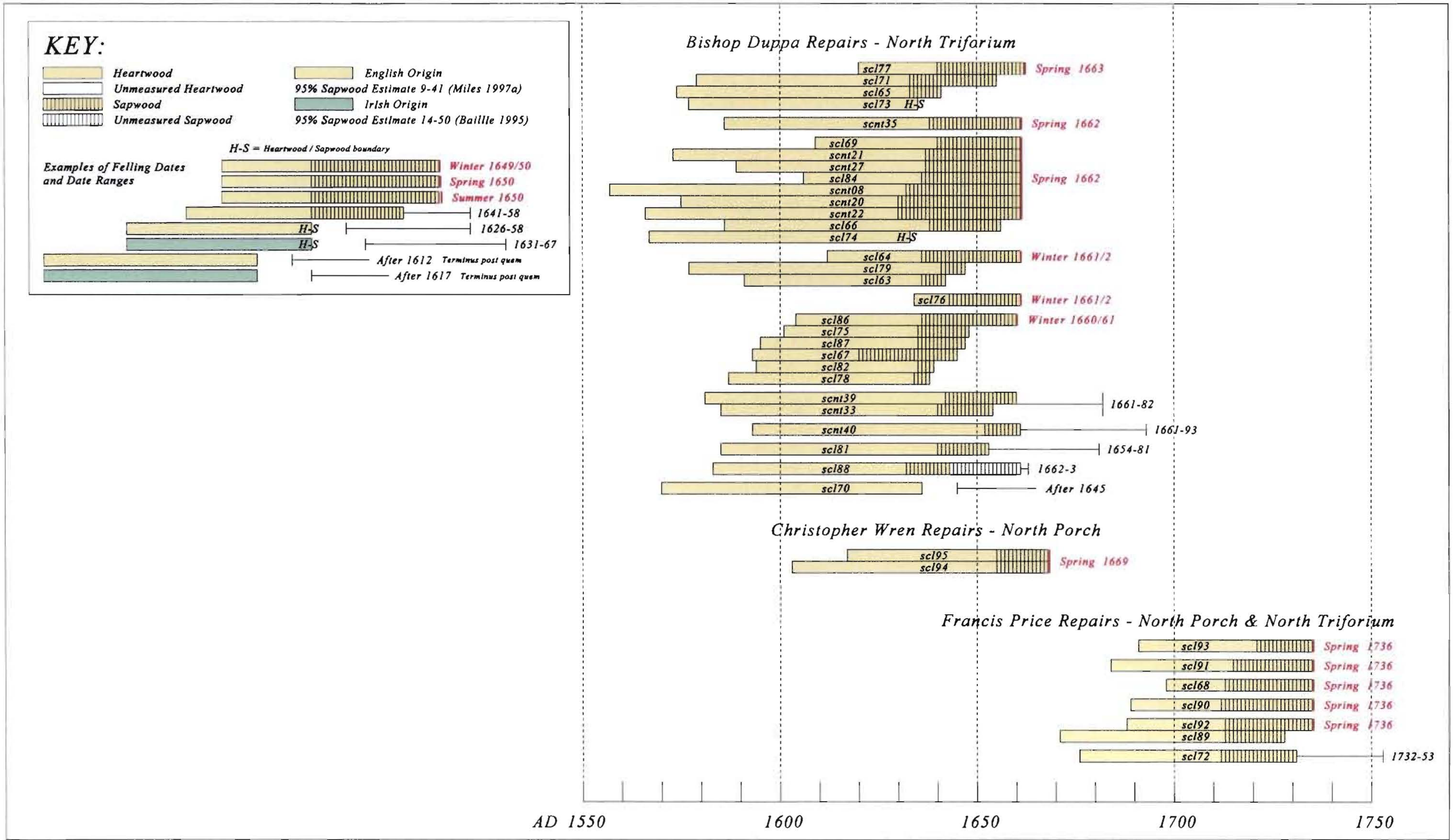
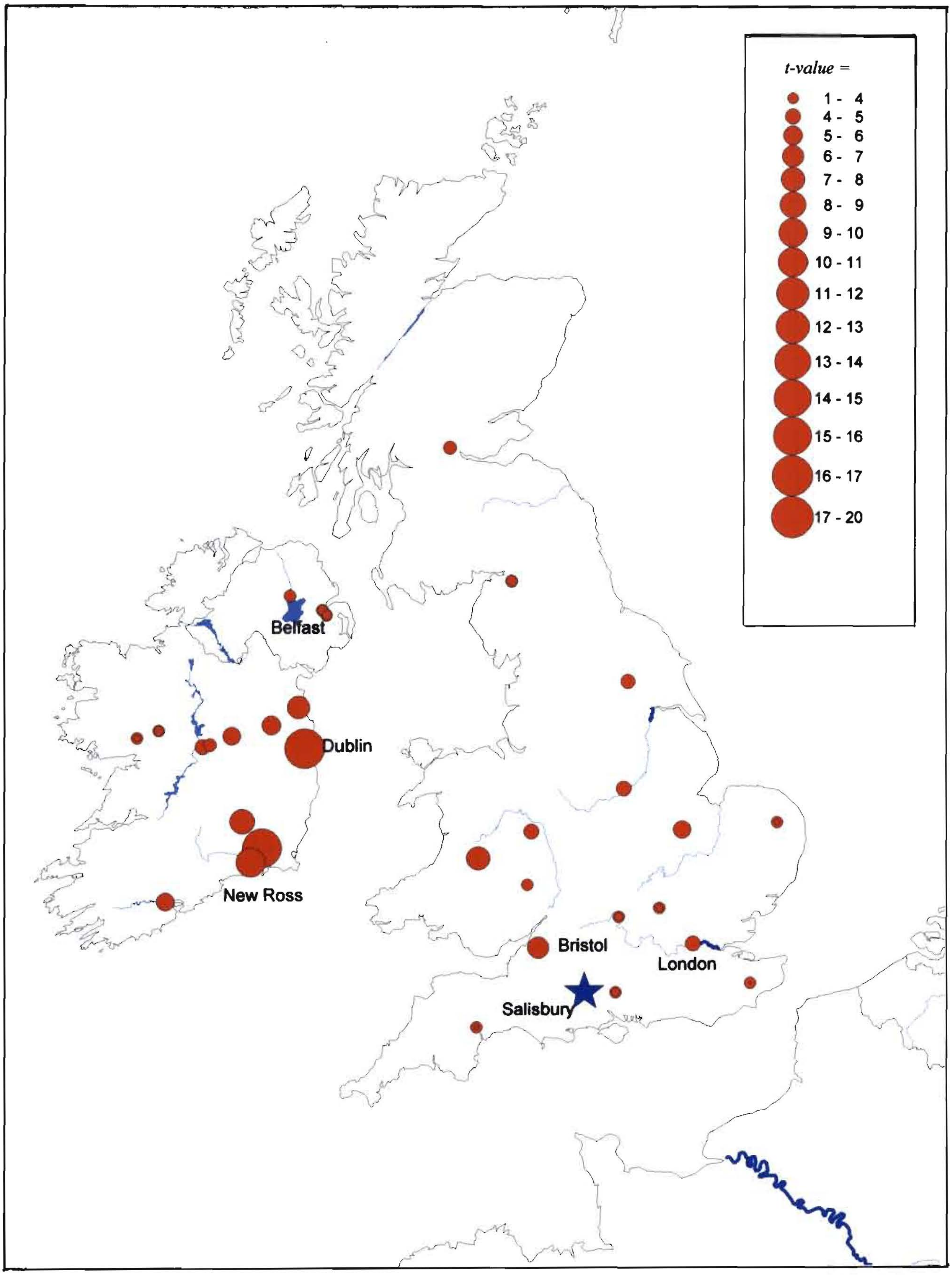


Figure 34: Bar diagram showing dated post-medieval north nave triforium and north porch repair samples in chronological position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9 - 10
10 - 11
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12 - 13
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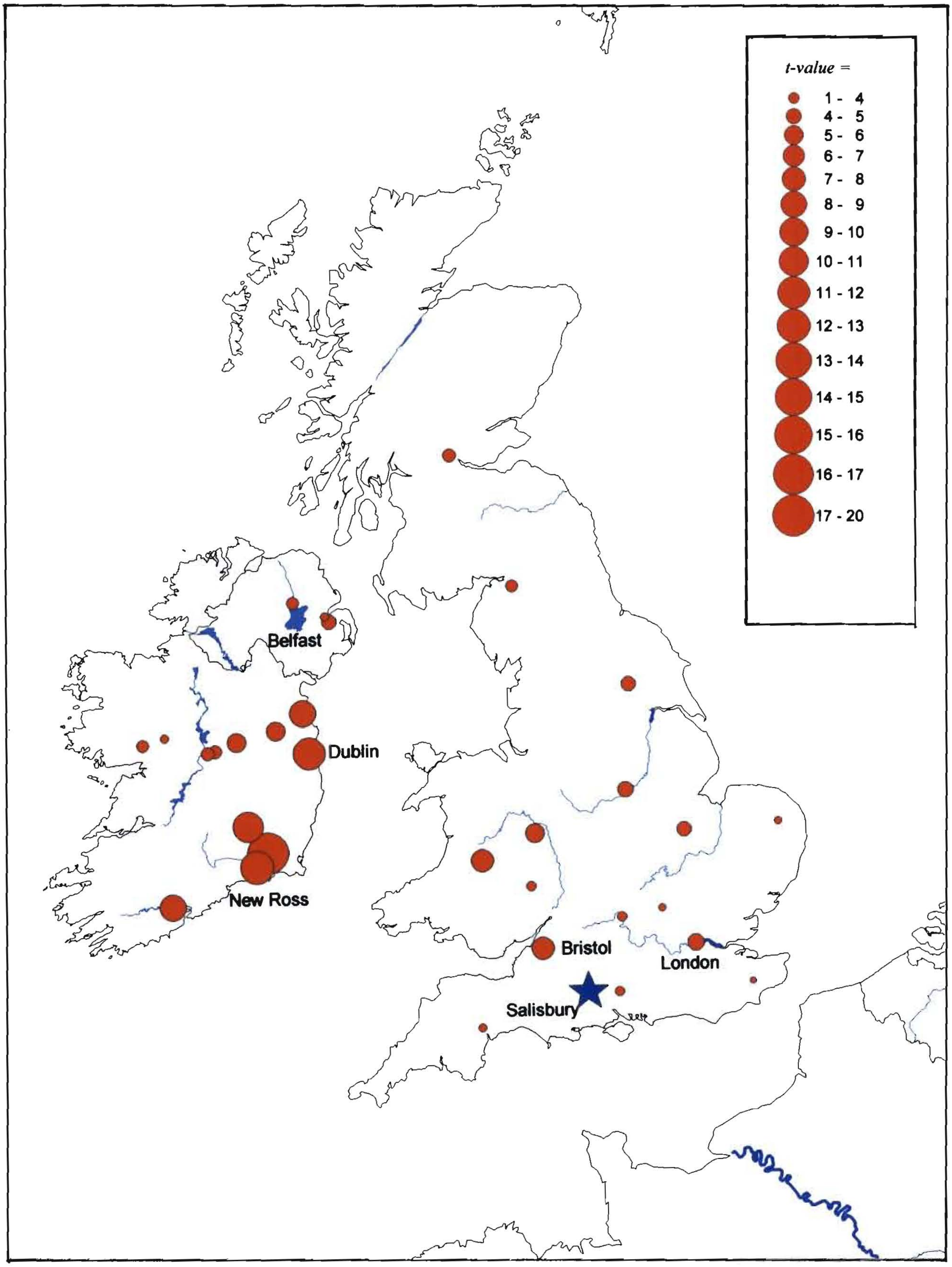
Belfast
Dublin
New Ross
Bristol
London
Salisbury

Figure 35: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14 - 15
15 - 16
16 - 17
17 - 20
Belfast
Dublin
New Ross
Bristol
London
Salisbury

Figure 36:

Table 1: Summary of tree-ring dating

SALISBURY CATHEDRAL - EASTERN CHAPELS

	Sample Number	& type	Timber and position	Dates AD spanning	H/S bdry	Sapwood	No of rings	Mean width mm	Std devn mm	Mean sens mm	Felling seasons and dates/date ranges (AD)
Chapel of St Peter and Apostles (North Chapel)											
	scec1a	c	Collar T6	1053-1199	1198	1	147	1.06	0.46	0.218	
	scec1b	s	ditto	1185-1221	1199	22¼C	37	1.05	0.23	0.181	
*	***scec1***		Mean of ***scec1a*** + ***scec1b***	*1053-1221*	*1199*	*22¼C*	*169*	*1.06*	*0.44*	*0.221*	*spring 1222*
	scec2ai	c	South rafter T7	1075-1108			34	1.25	0.30	0.173	
	scec2aii	c	ditto	1110-1188			79	1.01	0.24	0.175	
	scec2b	s	ditto	1077-1221	1197	24¼C	145	0.98	0.30	0.181	
*	***scec2***		Mean of ***scec2ai*** + ***scec2aii*** + ***scec2b***	*1075-1221*	*1197*	*24¼C*	*147*	*1.00*	*0.29*	*0.164*	*spring 1222*
	scec3a	c	West tiebeam	-		H/S	77	1.88	0.90	0.179	
	scec3b	c	ditto	-		H/S	69	1.72	0.74	0.199	
	scec3c	c	ditto	-		H/S	95	1.93	0.68	0.211	
	scec3		Mean of ***scec3a*** + ***scec3b*** + ***scec3c***	-			*95*	*1.83*	*0.67*	*0.196*	
	scec4a	c	North rafter T10	1110-1195	1195	H/S	86	1.20	0.45	0.236	
	scec4b	s	ditto	1166-1221	1195	26¼C	56	0.83	0.27	0.229	
*	***scec4***		Mean of ***scec4a*** + ***scec4b***	*1110-1221*	*1195*	*26¼C*	*112*	*1.13*	*0.43*	*0.230*	*spring 1222*
	scec5a	c	South rafter T12	1093-1189	1189	H/S	97	1.37	0.41	0.218	
	scec5b	c	ditto	1096-1185	1185	H/S	90	1.47	0.36	0.211	
	scec5c	c	ditto	1096-1185	1185	H/S	90	1.47	0.36	0.205	
*	***scec5***		Mean of ***scec5a*** + ***scec5b*** + ***scec5c***	*1093-1189*	*1186*	*Avg H/S bdy*	*97*	*1.42*	*0.38*	*0.205*	*1203-39*
	scec6	c	North rafter T11	-		H/S	41	1.83	1.11	0.255	
	scec7a	c	North rafter T16	995-1189	1189	H/S	195	0.74	0.27	0.274	
	scec7b	c	ditto	997-1136			140	0.84	0.29	0.274	
	scec7c	c	ditto	1138-1186	1186	H/S	49	0.79	0.25	0.227	
*	***scec7***		Mean of ***scec7a*** + ***scec7b*** + ***scec7c***	*995-1189*	*1188*	*Avg H/S bdy*	*195*	*0.79*	*0.25*	*0.255*	*1202-38*
	scec8	c	North inner wall plate	1143-1212	1212	H/S	70	1.78	0.56	0.194	1221-53
*	***scec9***	c	Unprovenanced north ashlar	1044-1199	1199	H/S	156	0.95	0.37	0.216	1213-49
	scec13	c	South soulace T20	1107-1160			54	2.28	0.63	0.178	after 1169
†	***scec14***	c	Collar T20	1126-1198			73	1.46	0.37	0.193	after 1207
	scec15ai	c	North ashlar T20	2-53			52	0.99	0.35	0.197	
	scec15az	c	ditto	1-62			62	1.01	0.52	0.286	
	scec15bi	c	ditto	13-53			41	1.11	0.36	0.224	
	scec15bz	c	ditto	1-99		H/S	99	1.19	0.47	0.269	
	scec15		Mean of ***scec15ai*** + ***15az*** + ***15bi*** + ***15bz***	*1-99*			*99*	*1.21*	*0.42*	*0.215*	
*	***scec16***	c	Collar T21	1065-1178	1178	H/S	114	1.22	0.43	0.186	1192-1228
*	***scec17***	c	North ashlar T21	1019-1138			120	1.12	0.45	0.213	after 1152
	scec18a	c	Centre tiebeam	5-75		H/S	71	2.66	1.43	0.215	
	scec18b	c	ditto	1-73		H/S	73	3.73	2.19	0.224	
	scec18		Mean of ***scec18a*** + ***scec18b***	*1-75*			*75*	*3.29*	*1.91*	*0.206*	
*	***scec19***	c	South rafter T11	1042-1164			123	1.21	0.58	0.261	after 1178
†	***scec20***	c	North inner wall plate adjacent T12	1145-1199	1199	H/S	55	2.72	0.80	0.196	1208-40
*	***scec21***	c	South soulace T5	1057-1181	1181	H/S	125	1.26	0.34	0.212	1195-1231
*	***scec22***	c	North rafter T17	1086-1188	1188	H/S	103	1.10	0.29	0.214	1202-38
*	***scec23***	c	South rafter T5	1074-1190	1190	H/S	117	0.89	0.39	0.240	1204-40
	scec24a	c	South rafter T6	1050-1176			127	0.96	0.31	0.235	
	scec24ai	c	ditto	1178-1200	1200	H/S	23	1.24	0.49	0.228	
	scec24b	c	ditto	1069-1199	1199	H/S	131	0.95	0.37	0.236	
*	***scec24***		Mean of ***scec24a*** + ***scec24ai*** + ***scec24b***	*1050-1200*	*1200*	*Avg H/S bdy*	*151*	*0.99*	*0.35*	*0.234*	*1214-50*
	scec25	c	South soulace T8	1082-1196	1196	H/S	115	1.18	0.39	0.212	1205-37
	scec26a	c	North rafter T14	-		H/S	45	1.94	0.82	0.366	
	scec26b	c	ditto	-		H/S	46	1.37	0.60	0.261	
	scec26		Mean of ***scec26a*** + ***scec26b***	-			*46*	*1.65*	*0.65*	*0.303*	
*	***scec69***	s	South rafter T18	1017-1176	1176	H/S	160	0.99	0.33	0.236	1190-1226
*	***scec70***	s	South rafter T15	908-1030			123	1.16	0.41	0.234	after 1044
	scec71a	s	South rafter T21	1050-1165			116	0.88	0.16	0.180	
	scec71b	s	ditto	1009-1165			157	1.09	0.42	0.210	
*	***scec71***		Mean of ***scec71a*** + ***scec71b***	*1009-1165*			*157*	*1.09*	*0.41*	*0.200*	*after 1179*
†	***scec72***	s	South solepiece T10?	1167-1213	1213	H/S	47	2.21	0.87	0.270	1222-54
	scec73	s	South inner wall plate T1-5	-			94	1.58	0.55	0.246	
Chapel of the Holy Trinity and All Saints (Lady Chapel)											
	scec31a	c	? Reused rafter south side	1133-1187			55	2.10	0.64	0.240	
	scec31b	c	ditto	1125-1201	1201	H/S	77	1.94	0.63	0.231	
	scec31c	c	ditto	1168-1200	1200	H/S	33	1.57	0.55	0.234	
†	***scec31***		Mean of ***scec31a*** + ***scec31b*** + ***scec31c***	*1125-1201*	*1201*	*Avg H/S bdy*	*77*	*1.96*	*0.67*	*0.219*	*1210-42*
	scec32	c	? Reused rafter south side	-		18C	83	1.76	0.59	0.186	

Table 1 (continued): Summary of tree-ring dating

Sample Number & type		Timber and position	Dates AD spanning	H/S bdry	Sapwood	No of rings	Mean width mm	Std devn mm	Mean sens mm	Felling seasons and dates/date ranges (AD)
Chapel of St Stephen and Martyrs (South Chapel)										
scec11a	c	South soulace T19	3-45			43	1.60	0.53	0.232	
scec11b	s	ditto	1-65		13	65	1.75	0.66	0.297	
scec11c	p	ditto	39-73		21C	35	1.27	0.42	0.243	
scec11		Mean of ***scec11a*** + ***scel1b*** + ***scec11c***	*1-73*		*21C*	*73*	*1.58*	*0.55*	*0.261*	
* ***scec12***	c	North rafter T13	1038-1193	1193	H/S	156	1.02	0.46	0.242	1207-43
* ***scec29***	s	South rafter T6	1072-1205	1188	17 (+5 NM)	134	1.24	0.31	0.239	1211-38
scec30	s	Unprovenanced ashlar	1030-1193			164	0.94	0.29	0.223	1207-43
scec41a	c	North rafter T6	1073-1189	1189	H/S	117	0.92	0.36	0.248	
scec41b	c	ditto	1079-1190	1190	H/S	112	0.91	0.33	0.250	
* ***scec41***		Mean of ***scec41a*** + ***scec41b***	*1073-1190*	*1190*	*Avg H/S bdy*	*118*	*0.94*	*0.36*	*0.226*	*1204-40*
* ***scec42***	c	North rafter T7	1103-1208	1208	H/S	106	1.39	0.48	0.225	1222-58
* ***scec43***	c	North rafter T9	1002-1197	1195	2	196	0.85	0.43	0.254	1209-45
* ***scec44***	c	North rafter T11	1043-1195	1195	H/S	153	1.08	0.45	0.222	1209-45
* ***scec45***	c	North rafter T17	1082-1195	1195	H/S	114	1.23	0.57	0.238	1209-45
* ***scec46***	c	North rafter T16	1042-1144			103	1.57	0.43	0.223	after 1158
* ***scec47***	c	North soulace T7	1038-1156			119	1.28	0.40	0.209	after 1170
* ***scec48***	c	North rafter T19	1011-1168			158	1.04	0.30	0.225	after 1182
scec49a	c	Collar T19	1106-1152	1152	H/S	47	1.26	0.38	0.266	
scec49b	c	ditto	1110-1151	1151	H/S	42	1.12	0.36	0.265	
* ***scec49***		Mean of ***scec49a*** + ***scec49b***	*1106-1152*	*1152*	*Avg H/S bdy*	*47*	*1.21*	*0.37*	*0.268*	*1166-1202*
scec50	c	North rafter T14	-		H/S	48	2.41	1.16	0.204	
scec51	c	North soulace T18	-		H/S	55	1.39	0.69	0.281	
* ***scec52***	c	South soulace T12	1052-1195	1195	H/S	144	1.09	0.38	0.229	1209-45
scec53a	c	South soulace T7	1049-1138			90	1.09	0.25	0.198	
scec53b1	c	ditto	1063-1120			58	1.52	0.31	0.177	
scec53b2	c	ditto	1121-1191	1191	H/S	71	0.84	0.25	0.203	
scec53b	c	ditto	1063-1191	1191	H/S	129	1.15	0.44	0.191	
scec53		Mean of ***scec53a*** + ***53b*** + **53b1** + ***53b2***	*1049-1191*	*1191*	*Avg H/S bdy*	*143*	*1.07*	*0.37*	*0.193*	*1205-41*
* ***scec54***	c	South rafter T13	1053-1180	1180	H/S	128	0.87	0.25	0.219	1194-1230
* ***scec55***	c	South rafter T8	1079-1185	1185	H/S	107	1.43	0.36	0.219	1199-1235
* ***scec56***	c	North rafter T10	1052-1198	1198	H/S	147	1.06	0.41	0.241	1212-48
* ***scec57***	c	South rafter T5	929-1121			193	0.80	0.17	0.191	after 1135
scec58	c	South rafter T2	-		H/S	123	0.91	0.25	0.209	
* ***scec59***	s	South ashlar T19	1043-1118			76	1.22	0.46	0.265	after 1132
scec60a	s	South rafter T15?	1-130			130	0.95	0.50	0.294	
scec60b	s	ditto	4-130			127	0.95	0.49	0.269	
scec60		Mean of ***scec60a*** + ***scec60b***	*1-130*			*130*	*0.95*	*0.49*	*0.238*	
* ***scec61***	s	South ashlar T6	1070-1179			110	1.60	0.40	0.243	after 1193
* ***scec62***	s	South rafter T19	1034-1183	1182	1	150	1.04	0.46	0.250	1196-1232
† ***scec63***	s	South rafter T7	1106-1201	1201	H/S(+11 NM)	96	1.20	0.60	0.211	1213-42
scec64	s	South rafter T3	1021-1156			136	1.02	0.31	0.225	after 1170
scec65	s	South rafter T4	1038-1108			71	1.63	0.60	0.237	after 1122
scec66	s	South rafter T20	1121-1198	1198	H/S	78	1.62	0.48	0.212	1207-39
scec67	s	South rafter T10	1103-1164			62	1.67	0.65	0.314	after 1173
scec68	s	South rafter T21	-			43	2.64	0.68	0.218	
*** = *SARUM1* Site Master (35 trees - Irish)**			**908-1221**			**314**	**1.11**	**0.25**	**0.174**	
† = *SARUM2* Site Master (5 trees - English)			**1106-1213**			**108**	**1.82**	**0.40**	**0.192**	

Table 1 (continued): Summary of tree-ring dating

SALISBURY CATHEDRAL - NORTH NAVE TRIFORIUM and NORTH PORCH

	Sample Number & type		Timber and position	Dates AD spanning	H/S bdry	Sapwood	No of rings	Mean width mm	Std devn mm	Mean sens mm	Felling seasons and dates/date ranges (AD)
	North Nave Triforium Roof										
‡	***scnt01***	c	South-west corner post T 0	1132-1238	1222	16	107	1.75	0.98	0.188	1239-63
	scnt02	c	Inner principal rafter T 2 east	1083-1223	1223	H/S	141	1.13	0.36	0.210	(1229-61)
‡	***scnt024***		Mean of ***scnt02*** + ***scnt04***	*1072-1223*	*1220*	*3 Avg*	*152*	*1.33*	*0.73*	*0.205*	*1229-61*
	scnt03	c	Outer principal rafter T 2 east	1084-1226	1226	H/S	143	1.20	0.54	0.186	1235-67
	scnt04	c	Inner principal rafter T 3	1072-1217	1217	H/S	146	1.37	0.77	0.230	(1229-61)
	scnt05a	c	Outer principal rafter T 3	1141-1232	1230	2	92	1.44	0.57	0.232	
	scnt05b	s	ditto sapwood sliver	1216-1254	1230	24C	39	1.09	0.27	0.212	
	scnt05c	s	ditto sapwood sliver	1226-1245	1238	7	20	1.09	0.31	0.236	
	scnt05d	s	ditto sapwood sliver	1239-1254	1241	13C	16	0.99	0.26	0.223	
‡	***scnt05***		Mean of ***scnt05a*** + ***05b*** + ***05c*** + ***05d***	*1141-1254*	*1235*	*19C Avg*	*114*	*1.35*	*0.54*	*0.217*	*winter 1254/5*
	scnt06	c	South post T5	-		H/S	77	2.32	1.33	0.301	
‡	***scnt07***	c	Inner principal rafter T 5	1135-1200	1200	H/S	66	1.74	0.73	0.230	1209-41
	scnt08a		Inner principal rafter T6 east	1565-1658	1630	28	94	1.88	1.09	0.231	
	scnt08b1	c	Inner principal rafter T6 west	1573-1614			42	2.29	0.94	0.230	
	scnt08b2	c	ditto	1620-1661	1632	29¼C	42	1.16	0.51	0.238	
	scnt08c	c	ditto	1558-1660	1632	28	103	1.64	0.81	0.227	
	scnt08		Mean ***scnt08a*** + ***08b1*** + ***08b2*** + ***08c***	*1558-1661*	*1632*	*29¼C Avg*	*104*	*1.83*	*0.96*	*0.213*	*spring 1662*
	scnt09i	c	Collar T 7	1125-1160			36	2.04	1.35	0.161	
	scnt09ii	c	ditto	1154-1233	1233	H/S	80	1.17	0.33	0.192	
‡	***scnt09***		Mean of ***scnt09i*** + ***scnt09ii***	*1125-1233*	*1233*	*Avg H/S bdy*	*109*	*1.45*	*0.92*	*0.184*	*1242-74*
	scnt10a	c	Inner principal rafter T 8 west	-		H/S	38	1.90	0.97	0.295	
	scnt10b	c	ditto	-		H/S	37	1.79	0.85	0.299	
	scnt10		Mean of ***scnt10a*** + ***scnt10b***	-		*Avg H/S bdy*	*39*	*1.88*	*0.96*	*0.289*	
‡	***scnt11***	c	South post T 9 bay 5	1136-1230	1230	H/S	95	2.20	0.97	0.171	1239-71
	scnt12	c	North-west valley bay 5	-		H/S	53	2.70	0.95	0.213	
‡	***scnt13***	c	2nd strut between principal rafters T 10 W	1150-1235	1235	H/S	86	1.24	0.66	0.234	1244-76
‡	***scnt14***	c	Outer principal rafter T 10 west	1112-1193	1192	1	82	1.39	0.36	0.173	1201-33
	scnt15a	c	Inner principal rafter T10 west	-		H/S	107	1.78	1.19	0.162	
	scnt15b	c	ditto	-		H/S	33	1.09	0.36	0.130	
	scnt15		Mean of ***scnt15a*** + ***scnt15b***	-			*107*	*1.79*	*1.18*	*0.159*	
‡	***scnt16***	c	Outer principal rafter T 11	1143-1182			40	2.50	0.72	0.232	after 1191
	scnt17a	c	South post T 11	1144-1231	1231	H/S	88	1.43	1.23	0.236	
	scnt17b	c	ditto	1149-1211			63	1.70	0.73	0.274	
‡	***scnt17***	c	Mean of ***scnt17a*** + ***scnt17b***	*1144-1231*	*1231*	*Avg H/S bdy*	*88*	*1.55*	*1.20*	*0.247*	*1240-72*
‡	***scnt18***	c	Inner principal rafter T 13	1139-1227	1226	1	89	1.84	0.99	0.217	1235-67
‡	***scnt19***	c	1st rafter east of T 13	1139-1220	1220	H/S	82	2.16	0.90	0.187	1229-61
	scnt20	c	Inner principal rafter T 12 east	1576-1661	1630	31¼C	86	1.44	0.81	0.199	spring 1662
	scnt21	c	3rd rafter east of T 14 east	1574-1661	1637	24¼C	88	1.69	1.14	0.226	spring 1662
	scnt22	c	2nd rafter east of T 14 east	1567-1661	1630	31¼C	95	1.50	0.69	0.238	spring 1662
‡	***scnt23***	c	Lower purlin bay 8	1143-1225	1218	7	83	1.63	1.18	0.235	1227-59
	scnt24	c	East end repair to lower purlin bay 8	-		17¼C	85	1.83	0.56	0.211	
	scnt25	c	Collar T 15	-		5	82	1.42	0.79	0.204	
‡	***scnt26***	c	Upper 2/3rd of 1st rafter east of T15	1135-1218	1218	H/S	84	1.87	0.99	0.289	1227-59
♦	***scnt27***	c	Lower 1/3rd of 2nd rafter east of T 15	1590-1661	1637	24¼C	72	1.64	0.70	0.191	spring 1662
	scnt28	s	Packer beneath lower purlin T15	908-1145			238	0.65	0.34	0.256	after 1159
	scnt29	c	South post T16 east	-		H/S	49	1.99	0.87	0.320	
‡	***scnt30***	c	Lower purlin bay 9	1134-1224	1224	H/S	91	1.98	0.94	0.238	1233-65
	scnt31	c	South solepiece T18 west	-		H/S	51	1.82	0.34	0.159	
‡	***scnt32***	c	Collar T 18 west	1143-1216			74	1.81	0.78	0.174	after 1225
	scnt33	c	Lower 1/3rd of 1st rafter east of T18 east	1586-1654	1640	14	69	1.98	0.71	0.198	(1661-82)
‡	***scnt34***	c	Inner principal rafter T 19	1140-1212			73	2.07	1.02	0.173	after 1221
	scnt35a1	c	Outer principal rafter T 19	1587-1646	1644	2	60	1.68	0.71	0.221	
	scnt35a2	c	ditto	1649-1660		+12	12	1.08	0.20	0.213	
	scnt35b	c	ditto	1621-1657	1644	13	37	1.15	0.36	0.183	
	scnt35c	c	ditto	1646-1661		+16¼C	16	0.74	0.13	0.248	
♦	***scnt35***		Mean of ***scnt35a1*** + ***a2*** + ***b*** + ***c***	*1587-1661*	*1644*	*23¼C Avg*	*75*	*1.53*	*0.71*	*0.214*	*spring 1662*
‡	***scnt36***	c	Collar T19	1144-1222	1222	H/S	79	1.40	0.89	0.203	1231-63
‡	***scnt37***	c	Upper purlin bay 10	1129-1210	1210	H/S	82	2.45	0.83	0.189	1219-51
‡	***scnt38***	c	1st lower rafter east of T 19	1147-1213	1213	H/S	67	1.93	0.59	0.241	1222-54
	scnt39	c	2nd rafter east of T19 (upper)	1582-1660	1642	18	79	2.22	0.99	0.206	(1661-82)
♦	***scnt40***	c	2nd rafter east of T19 (lower)	1594-1661	1652	9	68	1.86	0.53	0.229	1662-93
	F129XI	s	Lower wall plate	-			41	3.54	0.86	0.179	
	F129XIV	s	Ashlar	1178-1230			53	2.80	0.89	0.196	after 1239

Table 1 (continued): Summary of tree-ring dating

Sample Number & type		Timber and position	Dates AD spanning	H/S bdry	Sapwood	No of rings	Mean width mm	Std devn mm	Mean sens mm	Felling seasons and dates/date ranges (AD)
Valley Lay-Boards Bay 1, North Nave Triforium Roof										
scl102a	s	Valley lay boards bay 1	1072-1189			118	1.17	0.45	0.232	
scl102b	s	Valley lay boards bay 1	1181-1224	1221	3	44	0.89	0.31	0.249	(1238-64)
scl103	s	Valley lay boards bay 1	1186-1238	1224	14	53	0.95	0.40	0.282	(1238-64)
‡ ***scl1023***		Mean of ***scl102a + 102b + 103***	*1072-1238*	*1223*	*15 Avg*	*167*	*1.09*	*0.43*	*0.240*	*1238-64*
scl104a	s	Valley lay boards bay 1	1108-1188			81	1.12	0.38	0.182	
scl104b	s	Valley lay boards bay 1	1145-1200			56	0.97	0.22	0.154	
scl104		Mean of ***scl104a + 104b***	*1108-1200*			*93*	*1.11*	*0.34*	*0.162*	*(1235-67)*
‡ ***scl10403***		Mean of ***scl104 + scnt03***	*1084-1226*	*1226*	*Avg H/S bdy*	*143*	*1.19*	*0.52*	*0.171*	*1235-67*
‡ ***scl105***	s	Valley lay boards bay 1	1054-1170			117	1.12	0.46	0.246	after 1179
North Porch (Parvis Chamber) Roof										
scnt41a	c	West soulace T 10 North Porch	1127-1222	1222	H/S	96	1.54	0.68	0.250	
scnt41b	c	West soulace T 10 North Porch	1176-1248	1220	28	73	1.37	0.74	0.280	
‡ ***scnt41***		Mean of ***scnt41a + scnt41b***	*1127-1248*	*1221*	*27 Avg*	*122*	*1.41*	*0.71*	*0.254*	*1249-62*
scnt42a	c	West rafter T II North Porch	1166-1218	1213	5	53	2.10	0.84	0.314	
scnt42b	c	West rafter T II North Porch	1175-1222	1212	10	48	1.68	0.58	0.280	
scnt42c	c	West rafter T II North Porch	1172-1235	1209	26½C	64	1.56	0.65	0.234	
‡ ***scnt42***		Mean of ***scnt42a + scnt42b + scnt42c***	*1166-1235*	*1211*	*24½C Avg*	*70*	*1.77*	*0.81*	*0.250*	*summer/autumn 1236*
scnt43	c	West rafter T V North Porch	1172-1251	1228	23C	80	1.86	1.06	0.231	winter 1251/2
scnt44a	c	East cross-brace T VI North Porch	1139-1233	1226	7	95	1.71	0.72	0.207	
scnt44b	c	East cross-brace T VI North Porch	1145-1226	1226	H/S	82	1.55	0.38	0.175	
scnt44c	c	East cross-brace T VI North Porch	1191-1241	1226	15	51	1.45	0.41	0.241	
‡ ***scnt44***		Mean of ***scnt43a + scnt43b + scnt43c***	*1139-1241*	*1226*	*15 Avg*	*103*	*1.66*	*0.69*	*0.195*	*1242-67*
scnt45	c	West cross-brace TVI	-		H/S	66	1.15	0.47	0.187	
scnt46a	c	West rafter T VI North Porch	1175-1229	1229	H/S	55	2.21	0.83	0.223	
scnt46b	c	West rafter T VI North Porch	1191-1251	1229	22C	61	1.70	0.91	0.202	
scnt46		Mean of ***scnt46a + scnt46b***	*1175-1251*	*1229*	*22C*	*77*	*1.86*	*0.93*	*0.208*	*winter 1251/2*
‡ ***scnt436***		Mean of ***scnt43 + scnt46***	*1172-1251*	*1228*	*23C Avg*	*80*	*1.88*	*0.95*	*0.205*	*winter 1251/2*
scnt47i	c	East cross-brace T VII	-		H/S	37	1.50	0.64	0.226	
scnt47ii	c	ditto	-		32½C	82	0.81	0.33	0.272	
scnt48	c	East rafter T VII	-		1	75	1.42	0.93	0.291	
scnt49	c	West rafter T VIII	-		19C	44	1.91	0.75	0.187	
scnt50i	c	East ashlar T V	-			26	1.40	0.53	0.189	
scnt50ii	c	ditto	-		H/S	101	1.01	0.62	0.253	
scnt51	c	Cleat on north side of east rafter X	-		17½C	89	1.24	0.46	0.223	
‡ = *SARUM3x*		**Site Master (27 trees - English)**	**1054-1254**			**201**	**1.56**	**0.50**	**0.167**	

Table 1 (continued): Summary of tree-ring dating

Sample	Number & type	Timber and position	Dates AD spanning	H/S bdry	Sapwood	No of rings	Mean width mm	Std devn mm	Mean sens mm	Felling seasons and dates/date ranges (AD)
Under-lead boarding - Phase 1										
Ψ ***scl1***	s	Unprovenanced *ex situ* board bay 1 - 3	1024-1213	1213	H/S	190	1.09	0.45	0.195	1227-63
Ψ ***scl2***	s	Unprovenanced *ex situ* board bay 1 - 3	1075-1221	1196	25	147	0.76	0.33	0.234	1222-46
Ψ ***scl3***	s	Unprovenanced *ex situ* board bay 1 - 3	1032-1211	1211	H/S	180	0.56	0.19	0.223	1225-61
Ψ ***scl4***	s	Unprovenanced *ex situ* board bay 1 - 3	1138-1229	1206	23	92	1.04	0.22	0.137	1230-56
Ψ ***scl5***	s	Unprovenanced *ex situ* board bay 1 - 3	963-1061			99	0.99	0.28	0.256	after 1075
Ψ ***scl6***	s	Unprovenanced *ex situ* board bay 1 - 3	1127-1230	1213	17	104	0.89	0.26	0.247	1231-63
Ψ ***scl7***	s	Unprovenanced *ex situ* board bay 1 - 3	1069-1178	1175	3	110	0.76	0.34	0.260	1189-1225
scl8	s	Unprovenanced *ex situ* board bay 1 - 3	1147-1227	1225	2	81	1.18	0.39	0.244	1239-75
Ψ ***scl9***	s	Unprovenanced ex situ board bay 1 - 3	1000-1079			80+24 NM	1.27	0.57	0.220	after 1117
scl10	s	Unprovenanced ex situ board bay 1 - 3	1035-1184			150	0.67	0.35	0.240	after 1198
Ψ ***scl1024***		Mean of ***scl10*** + ***scl24***	*1035-1184*			*150*	*0.67*	*0.35*	*0.233*	*after 1198*
scl11	s	Unprovenanced ex situ board bay 1 - 3	878-1005			128	0.74	0.37	0.307	after 1019
Ψ ***scl117***		Mean of ***scl11*** + ***scl17***	*878-1032*			*155*	*0.70*	*0.28*	*0.279*	
Ψ ***scl12***	s	Unprovenanced *ex situ* board bay 1 - 3	1002-1097			96	0.92	0.35	0.332	after 1111
Ψ ***scl13***	s	Unprovenanced *ex situ* board bay 1 - 3	897- 963			67	1.29	0.41	0.218	after 997
scl14	s	Unprovenanced *ex situ* board bay 1 - 3	983-1085			103	1.11	0.27	0.178	(after 1100)
Ψ ***scl1422***		Mean of ***scl14*** + ***scl22***	*979-1086*			*108*	*1.07*	*0.25*	*0.176*	*after 1100*
Ψ ***scl15***	s	Unprovenanced *ex situ* board bay 1 - 3	1106-1212	1209	3	107	0.82	0.16	0.178	1223-59
Ψ ***scl16***	s	Unprovenanced *ex situ* board bay 1 - 3	1087-1161			75	1.22	0.50	0.249	after 1175
scl17	s	Unprovenanced *ex situ* board bay 1 - 3	897-1032			136	0.71	0.24	0.275	after 1046
scl18	s	Unprovenanced *ex situ* board bay 1 - 3	-		3	84	0.96	0.21	0.198	
Ψ ***scl19***	s	Unprovenanced *ex situ* board bay 1 - 3	920-1001			82	1.08	0.26	0.196	after 1015
scl20	s	Unprovenanced *ex situ* board bay 1 - 3	-			135	0.76	0.22	0.244	
Ψ ***scl21***	s	Unprovenanced *ex situ* board bay 1 - 3	1158-1219	1219	H/S	62	1.33	0.36	0.219	1233-69
scl22	s	Unprovenanced *ex situ* board bay 1 - 3	979-1086			108	1.02	0.26	0.185	after 1100
Ψ ***scl23***	s	Unprovenanced *ex situ* board bay 1 - 3	1139-1189	1187	2	51	1.38	0.56	0.255	1201-37
scl24	s	Unprovenanced *ex situ* board bay 1 - 3	1035-1171			137	0.70	0.35	0.236	(after 1198)
Ψ ***scl25***	s	Unprovenanced *ex situ* board bay 1 - 3	944-1047			104	0.86	0.21	0.254	after 1061
Ψ ***scl26***	s	Unprovenanced *ex situ* board bay 1 - 3	1070-1178			109	0.97	0.34	0.205	after 1192
Ψ ***scl27***	s	Unprovenanced *ex situ* board bay 1 - 3	998-1100			103	0.88	0.29	0.289	after 1114
Ψ ***scl28***	s	Unprovenanced *ex situ* board bay 1 - 3	1042-1196			152	0.60	0.17	0.238	after 1210
Ψ ***scl29***	s	Unprovenanced *ex situ* board bay 1 - 3	1048-1167			120	0.82	0.32	0.220	after 1181
scl30	s	Unprovenanced *ex situ* board bay 1 - 3	-		2	61	0.89	0.26	0.202	
Ψ ***scl31***	s	Unprovenanced *ex situ* board bay 1 - 3	1061-1193			133	0.85	0.24	0.204	after 1207
scl32	s	Unprovenanced *ex situ* board bay 1 - 3	1039-1153			115	1.06	0.45	0.222	(1224-60)
Ψ ***scl3245***		Mean of ***scl32*** + ***scl34*** + **scl45**	*1021-1214*	*1210*	*Avg H/S bdy*	*194*	*1.14*	*0.34*	*0.191*	*1224-60*
Ψ ***scl33***	s	Unprovenanced *ex situ* board bay 1 - 3	1075-1155			81	1.67	0.60	0.264	after 1169
scl34a	s	Unprovenanced *ex situ* board bay 1 - 3	1021-1188			168	1.08	0.29	0.191	
scl34b	s	Unprovenanced *ex situ* board bay 1 - 3	1168-1206	1206	H/S	39	1.38	0.34	0.218	
scl34	s	Mean of ***scl34a*** + ***scl34b***	*1021-1206*	*1206*	*Avg H/S bdy*	*186*	*1.11*	*0.32*	*0.195*	*(1224-60)*
scl35	s	Unprovenanced *ex situ* board bay 1 - 3	-		1	82	1.17	0.30	0.187	
Ψ ***scl36***	s	Unprovenanced *ex situ* board bay 1 - 3	1000-1147			148	0.86	0.33	0.260	after 1161
Ψ ***scl37***	s	Unprovenanced *ex situ* board bay 1 - 3	1151-1214	1210	4	64	1.10	0.36	0.246	1224-60
Ψ ***scl38***	s	Unprovenanced *ex situ* board bay 1 - 3	1091-1180			90	1.29	0.52	0.274	after 1194
scl39	s	Unprovenanced *ex situ* board bay 1 - 3	-			86	1.06	0.41	0.287	
scl40	s	Unprovenanced *ex situ* board bay 1 - 3	-		H/S	170	0.54	0.23	0.270	
Ψ ***scl41***	s	5th from top over rafter 7 bay 4	994-1092			99	0.93	0.28	0.255	after 1106
Ψ ***scl42***	s	10th from top over rafter 8 bay 4	982-1074			93	1.23	0.28	0.177	after 1088
Ψ ***scl43***	s	11th from top over rafter 8 bay 4	1045-1170			126	0.92	0.42	0.299	after 1184
scl44	s	15th from top over rafter 9 bay 4	-		H/S?	58	1.39	0.35	0.201	
scl45	s	7th from bottom T 0 W face North Porch	1140-1214	1214	H/S	75	1.39	0.27	0.168	(1224-60)
Ψ ***scl46***	s	8th from bottom T IIII W face North Porch	1046-1203			158	0.56	0.20	0.215	after 1217
Ψ ***scl47***	s	9th from bottom T V face North Porch	1117-1183			67	1.21	0.38	0.238	after 1197
Ψ ***scl48***	s	14th from bottom T VII W face N Porch	1046-1150			105+39 NM	1.00	0.37	0.249	after 1203
Ψ ***scl49***	s	3rd from top over T XVI W face N Porch	1027-1140			114	1.17	0.48	0.301	after 1154
Ψ ***scl50***	s	4th from top over T XVI W face N Porch	1080-1169			90	0.90	0.33	0.225	after 1183
scl51	s	Unprovenanced *ex situ* board bay 1 - 3	-			103	0.79	0.25	0.186	
scl52	s	Unprovenanced *ex situ* board bay 1 - 3	1140-1212	1211	1	73	1.02	0.28	0.201	1225-61
Ψ ***scl53***	s	Unprovenanced *ex situ* board bay 1 - 3	1161-1230	1230	H/S	70	1.08	0.35	0.206	1244-80
scl54	s	Unprovenanced *ex situ* board bay 1 - 3	1140-1212	1211	1	73	1.12	0.34	0.208	1225-61
Ψ ***scl55***	s	Unprovenanced *ex situ* board bay 1 - 3	1026-1106			81	1.00	0.24	0.192	after 1120
scl56	s	Unprovenanced *ex situ* board bay 1 - 3	-			49	1.68	0.31	0.102	
scl57	s	Unprovenanced *ex situ* board bay 1 - 3	-		H/S	85	0.62	0.19	0.259	
scl58	s	Unprovenanced *ex situ* board bay 1 - 3	1152-1212			61	1.09	0.35	0.221	after 1226
Ψ ***scl5248***		Mean of ***scl52*** + ***scl54*** + ***scl58***	*1140-1212*	*1211*	*1*	*73*	*1.08*	*0.30*	*0.195*	*1225-61*
scl59	s	Unprovenanced *ex situ* board bay 1 - 3	1097-1206	1203	3	110	0.89	0.26	0.202	(1218-54)
Ψ ***scl5961***		Mean of ***scl59*** + ***scl61***	*1093-1206*	*1204*	*Avg H/S bdy*	*114*	*0.88*	*0.23*	*0.179*	*1218-54*
scl60	s	Unprovenanced *ex situ* board bay 1 - 3	-			49	1.06	0.34	0.187	
scl61	s	Unprovenanced *ex situ* board bay 1 - 3	1093-1204	1204	H/S	112	0.88	0.22	0.176	1218-54
scl62	s	Unprovenanced *ex situ* board bay 1 - 3	-			68	0.84	0.25	0.218	
scl101		8th from bottom over T III east face N porch	-			108	0.91	0.32	0.273	
Ψ = ***SARUM4***		**Site Master (41 trees - Irish)**	**878-1230**			**353**	**0.89**	**0.21**	**0.188**	

Table 1 (continued): Summary of tree-ring dating

Sample Number & type		Timber and position	Dates AD spanning	H/S bdry	Sapwood	No of rings	Mean width mm	Std devn mm	Mean sens mm	Felling seasons and dates/date ranges (AD)
Post-medieval repairs to under-lead boarding										
scl63	s	Unprovenanced *ex situ* board bay 1 - 3	1592-1642	1636	6	51	1.42	0.65	0.240	(winter 1661/2)
scl64	s	Unprovenanced *ex situ* board bay 1 - 3	1613-1661	1636	25C	49	1.21	0.34	0.261	winter 1661/2
scl65	s	Unprovenanced *ex situ* board bay 1 - 3	1575-1641	1633	8	67	1.74	0.56	0.179	(spring 1663)
scl66	s	Unprovenanced *ex situ* board bay 1 - 3	1587-1656	1638	18	70	1.32	0.77	0.327	(spring 1662)
scl67	s	Unprovenanced *ex situ* board bay 1 - 3	1594-1645	1620	25	52	2.08	0.71	0.214	(winter 1660/61)
§ ***scl68***	s	Unprovenanced *ex situ* board bay 1 - 3	1699-1735	1713	22¼C	37	1.95	0.61	0.330	spring 1736
scl69	s	Unprovenanced *ex situ* board bay 1 - 3	1610-1661	1640	21¼C	52	1.12	0.40	0.319	very early spring 1662
♦ ***scl70***	s	Unprovenanced *ex situ* board bay 1 - 3	1571-1636			66	1.75	0.65	0.244	after 1645
scl71	s	Unprovenanced *ex situ* board bay 1 - 3	1580-1655	1633	22	76	1.58	0.75	0.191	(spring 1663)
§ ***scl72***	s	Unprovenanced *ex situ* board bay 1 - 3	1677-1731	1712	19	55	1.64	0.63	0.316	1732-53
scl73	s	Unprovenanced *ex situ* board bay 1 - 3	1578-1635	1635	H/S	58	1.87	0.49	0.193	(spring 1663)
scl74	s	Unprovenanced *ex situ* board bay 1 - 3	1568-1633	1633	H/S	66	1.83	0.82	0.292	(spring 1662)
scl75	s	Unprovenanced *ex situ* board bay 1 - 3	1602-1648	1635	13	47	2.03	0.54	0.193	(winter 1660/61)
♦ ***scl76***	s	Unprovenanced *ex situ* board bay 1 - 3	1635-1661	1643	18C	27	1.92	0.48	0.182	winter 1661/2
scl77	s	Unprovenanced *ex situ* board bay 1 - 3	1621-1662	1640	22¼C	42	1.15	0.55	0.184	spring 1663
scl78	s	Unprovenanced *ex situ* board bay 1 - 3	1588-1638	1634	4	51	2.04	0.75	0.245	(winter 1660/61)
scl79a	s	Unprovenanced *ex situ* board bay 1 - 3	1578-1645	1642	3	68	1.60	0.55	0.241	
scl79b	s	Unprovenanced *ex situ* board bay 1 - 3	1591-1647	1639	8	57	1.62	0.64	0.295	
scl79		Mean of ***scl79a*** + ***scl79b***	*1578-1647*	*1641*	*6 Avg*	*70*	*1.60*	*0.56*	*0.255*	*(winter 1661/2)*
scl80	s	Unprovenanced *ex situ* board bay 1 - 3	1-50		22	50	1.92	0.40	0.130	
♦ ***scl81***	s	Unprovenanced *ex situ* board bay 1 - 3	1586-1653	1640	13	68	1.53	0.60	0.186	1654-81
scl82	s	Unprovenanced *ex situ* board bay 1 - 3	1595-1639	1635	4	45	2.13	0.58	0.224	(winter 1660/61)
scl83	s	Unprovenanced *ex situ* board bay 1 - 3	5-39		14	35	2.23	0.55	0.161	
scl8083		Mean of ***scl80*** + ***scl83***	-			*50*	*2.01*	*0.46*	*0.133*	
scl84	s	Unprovenanced *ex situ* board bay 1 - 3	1607-1661	1636	25¼C	55	0.89	0.39	0.279	spring 1662
scl85	s	Unprovenanced *ex situ* board bay 1 - 3	-		23¼C	45	0.89	0.33	0.215	
scl86	s	Unprovenanced *ex situ* board bay 1 - 3	1605-1660	1636	24C	56	1.71	0.62	0.239	winter 1660/61
scl87	s	Unprovenanced *ex situ* board bay 1 - 3	1596-1647	1635	12	52	2.08	0.69	0.226	(winter 1660/61)
♦ ***scl88***	s	10th from top over rafter 3 bay 4	1584-1643	1632	11(+19-20CNM)	60	1.83	0.79	0.187	1662-3
scl89	s	2nd from top over T 6 W face North porch	1672-1728	1713	15	57	1.63	0.53	0.179	(spring 1736)
§ ***scl90***	s	Counter-batten over T 1 W face N porch	1690-1735	1712	23¼C	46	1.39	0.33	0.191	spring 1736
§ ***scl91***	s	10th from top over T 0 W face North porch	1685-1735	1715	20¼C	51	1.32	0.52	0.187	spring 1736
scl92	s	3rd from top over T II W face North porch	1689-1735	1713	22¼C	47	1.71	0.45	0.208	spring 1736
§ ***scl8992***		Mean of ***scl89*** + ***scl92***	*1672-1735*	*1720*	*15¼C Avg*	*64*	*1.74*	*0.52*	*0.190*	*spring 1736*
§ ***scl93***	s	13th from top over T II W face N porch	1692-1735	1721	14¼C	44	1.53	0.62	0.175	spring 1736
♠ ***scl94***	s	15th from top o/r T XVII W face N porch	1604-1668	1655	13¼C	65	1.75	0.56	0.209	spring 1669
♠ ***scl95***	s	16th from top o/r T XVII W face N porch	1618-1668	1655	13¼C	51	1.77	0.65	0.225	spring 1669
scl96	s	3rd from top over T VIII E face N porch	20-48		19¼C	29	2.59	1.12	0.301	
scl97	s	14th from top over T VII E face N porch	16-48		19¼C	33	2.81	1.07	0.293	
scl98	s	15th from top over T VII E face N porch	13-48		18¼C	36	2.86	0.93	0.286	
scl99	s	16th from top over T VII E face N porch	12-47		17	36	3.01	0.95	0.299	
scl100	s	2nd from bottom over T VI E face N porch	1-43		15	43	3.12	0.71	0.223	
scl96100		Mean of ***scl96*** + ***scl97*** + ***scl98*** + ***scl99*** + ***scl100***	-			*48*	*2.93*	*0.83*	*0.236*	
♦ ***sarum5a***		Mean of ***scnt08*** + ***scnt20*** + ***scnt21*** + ***scnt22*** + ***scnt27*** + ***scl66*** + ***scl69*** + ***scl74*** + ***scl84***	*1558-1661*			*104*	*1.82*	*0.86*	*0.197*	*spring 1662*
♦ ***sarum5b***		Mean of ***scl63*** + ***scl64*** + ***scl79***	*1578-1661*			*84*	*1.42*	*0.54*	*0.247*	*winter 1661/2*
♦ ***sarum5c***		Mean of ***scl65*** + ***scl71*** + ***scl73*** + ***scl77***	*1575-1662*			*88*	*1.55*	*0.68*	*0.181*	*spring 1663*
♦ ***sarum5d***		Mean of ***scl67*** + ***75*** + ***78*** + ***82*** + ***86*** + ***87***	*1588-1660*			*73*	*1.89*	*0.80*	*0.244*	*winter 1660/61*
♦ ***sarum5e***		Mean of ***scnt33*** + ***scnt39***	*1582-1660*	*1641*	*19*	*79*	*2.11*	*0.83*	*0.189*	*1661-82*
♦ = *SARUM5* Site Master (11 trees - English)			**1558-1662**			**105**	**1.92**	**0.72**	**0.158**	**winter 1660/6 - spring 1663**
♠ = *SARUM6* Site Master (1 tree - English)			**1604-1668**			**65**	**1.77**	**0.57**	**0.211**	**spring 1669**
§ = *SARUM7* Site Master (6 trees - English)			**1672-1735**			**64**	**1.67**	**0.49**	**0.189**	**spring 1736**

Key: *, †, ‡, §, ♠, Ψ, ♦: = sample included in site master; c = core; s = section; p = photograph; = pith included in sample; = within 5 rings of centre; = pith within 10 rings of centre; ¼C, ½C, C = bark edge present, partial or complete ring: ¼C = spring (ring not measured); ½C = summer/autumn felling (ring not measured); C = winter felling (ring measured); H/S bdry = heartwood/sapwood boundary - last heartwood ring date; std devn = standard deviation; mean sens = mean sensitivity; NM = rings not measured

Table 2: Table of *t*-values and overlaps of individual samples and site masters from eastern chapels dated independently with a selection of regional chronologies

Samples matching best with Ireland, combined to form 28-timber intermediate master ***SCECIRE***

Master / *finishing AD*	*DUBLIN1* 1306	*MC13* 1170	*WALES97* 1981	*SALOP95* 1745	*BRISTOL* 1320	*SOUTH* 1594	*PALACE* 1179	*EASTMID* 1981	*SCOTLAND* 1975
scec4	7.52	8.02	4.56	4.50	5.29	4.97	3.09	3.28	2.22
at AD 1221	112	61	112	112	112	112	70	112	112
scec5	6.54	3.75	3.68	2.38	3.36	3.60	2.74	1.96	1.33
at AD 1189	97	78	97	97	97	97	87	97	97
scec7	10.30	7.93	7.02	3.43	6.10	6.65	4.43	4.88	3.24
at AD 1189	195	176	195	195	195	195	185	195	195
scec12	10.63	8.35	5.09	3.10	4.24	5.46	2.87	3.64	4.95
at AD 1193	156	133	156	156	156	156	142	156	156
scec16	5.08	3.92	2.93	2.57	2.84	2.96	2.14	2.91	1.06
at AD 1178	114	106	114	114	114	114	114	114	114
scec17	6.79	5.95	4.54	3.90	4.75	4.96	5.08	3.90	2.84
at AD 1138	120	120	120	120	120	120	120	120	120
scec19	7.44	7.74	6.10	4.86	6.10	6.67	4.51	5.15	2.22
at AD 1164	123	123	123	123	123	123	123	123	123
scec21	6.71	6.72	4.73	4.11	5.71	5.83	3.06	3.84	3.15
at AD 1181	125	114	125	125	125	125	123	125	125
scec22	5.85	4.00	2.88	2.49	2.16	2.73	1.89	2.65	1.27
at AD 1188	103	85	103	103	103	103	94	103	103
scec23	5.02	4.94	2.80	1.77	2.54	2.62	2.54	2.45	2.50
at AD 1190	117	97	117	117	117	117	106	117	117
scec24	7.34	5.30	4.60	3.28	4.15	5.13	2.18	3.72	3.84
at AD 1200	151	121	151	151	151	151	130	151	151
scec29	6.57	3.95	4.35	2.90	3.84	4.50	1.87	2.92	2.82
at AD 1205	54	54	54	54	54	54	54	54	54
scec42	8.82	7.21	5.63	4.01	6.02	5.29	3.08	3.99	3.55
at AD 1208	106	68	106	106	106	106	77	106	106
scec43	6.58	5.39	2.29	1.42	1.75	2.39	1.47	2.59	3.10
at AD 1197	196	169	196	196	196	196	178	196	196
scec44	8.33	5.89	5.51	3.68	5.56	6.32	2.79	4.54	2.81
at AD 1195	153	128	153	153	153	153	137	153	153
scec45	6.99	4.03	3.50	2.93	3.33	4.07	1.14	2.88	2.18
at AD 1195	114	89	114	114	114	114	98	114	114
scec47	8.51	8.56	5.58	4.20	4.98	5.77	3.77	4.58	2.57
at AD 1156	119	119	119	119	119	119	119	119	119
scec48	10.81	8.00	8.35	5.16	7.45	8.33	4.84	4.17	3.35
at AD 1168	158	158	158	158	158	158	158	158	158
scec49	5.44	3.64	2.60	0.38	2.16	2.43	2.34	1.48	0.56
at AD 1152	47	47	47	47	47	47	47	47	47
scec54	5.52	4.60	3.97	2.64	4.40	4.67	2.34	2.49	0.45
at AD 1180	128	118	128	128	128	128	127	128	128
scec55	6.78	4.13	3.54	2.40	3.60	3.84	1.88	3.21	2.89
at AD 1185	107	92	107	107	107	107	101	107	107
scec56	5.51	6.43	3.02	1.78	2.39	3.04	1.92	2.11	2.60
at AD 1198	147	119	147	147	147	147	128	147	147
scec57	14.11	7.21	10.08	5.81	8.51	9.60	4.29	5.70	4.29
at AD 1121	193	193	193	193	193	193	193	193	176
scec61	5.67	2.41	3.34	1.33	2.80	3.19	2.22	2.02	1.62
at AD 1179	110	101	110	110	110	110	110	110	110
scec62	6.98	6.98	3.19	1.15	2.70	2.93	1.03	3.66	3.49
at AD 1183	150	137	150	150	150	150	146	150	150
scec69	5.58	4.35	2.58	1.32	3.22	2.71	1.60	1.91	1.67
at AD 1176	160	154	160	160	160	160	160	160	160
scec70	8.49	3.40	6.55	3.97	5.66	4.84	3.22	4.29	3.21
at AD 1030	123	123	123	123	123	123	123	123	85
scec71	5.98	4.84	4.32	3.24	4.12	4.14	4.28	1.57	2.37
at AD 1165	157	157	157	157	157	157	157	157	157

Master Chronologies:

DUBLIN1 855-1306 *(Baillie 1977a)*
MC13 811-1170 *(Fletcher 1978)*
WALES97 404-1981 *(Miles 1997b)*
SALOP95 881-1745 *(Miles 1995)*
BRISTOL 770-1320 *(Hillam 1994)*
SOUTH 406-1594 *(Hillam and Groves 1994)*
PALACE 889-1179 *(Haddon-Reece et al 1989)*
EASTMID 882-1981 (Laxton and Litton 1988)
SCOTLAND 946-1975 (Baillie 1977b)

Samples matching equally well with Ireland, Wales or the South of England

Master / *finishing AD*	*DUBLIN1* 1306	*MC13* 1170	*WALES97* 1981	*SALOP95* 1745	*BRISTOL* 1320	*SOUTH* 1594	*PALACE* 1179	*EASTMID* 1981	*SCOTLAND* 1975	*SCECIRE* 28-timber Irish mean	*SARUM2* 5-timber South mean
scec1	5.64	3.96	5.01	3.69	5.27	5.21	0.92	3.98	2.28	8.61	2.02
at AD 1221	169	118	169	169	169	169	127	169	169	169	108
scec2	4.87	4.47	3.38	2.78	2.82	3.93	2.11	4.02	2.20	8.02	2.99
at AD 1221	147	96	147	147	147	147	105	147	147	147	108
scec9	5.41	4.85	5.17	3.96	5.56	5.48	2.62	3.98	3.69	7.75	2.48
at AD 1199	156	127	156	156	156	156	136	156	156	156	94
scec30	7.05	4.82	6.67	5.38	6.95	7.66	2.93	5.52	3.46	8.42	5.87
at AD 1193	164	141	164	164	164	164	150	164	164	164	88
scec41	5.27	2.76	4.33	3.89	4.43	4.55	1.87	2.53	1.51	5.78	4.55
at AD 1190	118	98	118	118	118	118	107	118	118	118	85
scec46	5.82	7.29	4.93	3.92	6.10	6.15	2.76	4.41	3.06	10.88	1.49
at AD 1144	103	103	103	103	103	103	103	103	103	103	39
scec52	6.30	4.30	4.67	3.54	5.28	5.27	1.36	2.76	2.90	9.79	1.85
at AD 1195	144	119	144	144	144	144	128	144	144	144	90
scec53	7.24	5.70	6.89	5.71	7.71	8.12	3.83	5.15	2.75	9.09	4.36
at AD 1191	143	122	143	143	143	143	131	143	143	143	86
scec59	6.91	5.81	6.13	4.39	6.33	7.08	3.06	4.64	5.32	8.58	0.00
at AD 1118	76	76	76	76	76	76	76	76	76	76	13
scec64	6.82	6.11	6.08	4.41	5.15	6.02	2.12	3.83	3.28	6.89	1.43
at AD 1156	136	136	136	136	136	136	136	136	136	136	51
scec65	5.86	5.51	4.29	2.76	5.46	6.12	1.58	2.56	3.68	5.68	0.00
at AD 1108	71	71	71	71	71	71	71	71	71	71	0

Samples matching best with miscellaneous individual samples and chronologies

Master / *finishing AD*	*DUBLIN1* 1306	*MC13* 1170	*WALES97* 1981	*SALOP95* 1745	*BRISTOL* 1320	*SOUTH* 1594	*PALACE* 1179	*EASTMID* 1981	*SCOTLAND* 1975	*SCECIRE* 28-timber Irish mean	*SARUM2* 5-timber South mean
scec8	3.97	2.14	4.84	3.82	2.00	3.61	1.46	3.92	3.77	1.38	3.75
at AD 1212	70	28	70	70	70	70	37	70	70	70	70
scec13	2.81	2.25	2.62	3.15	2.18	2.63	0.77	3.33	0.36	4.39	1.81
at AD 1160	134	99	134	134	134	134	108	134	134	54	54
scec25	3.65	0.75	2.77	3.10	2.91	3.33	0.10	2.01	0.00	4.96	1.94
at AD 1196	115	89	115	115	115	115	98	115	115	115	91
scec66	3.99	3.17	4.60	3.63	3.35	3.93	1.41	3.71	0.86	4.58	4.94
at AD 1198	78	50	78	78	78	78	59	78	78	78	78
scec67	4.12	3.78	3.34	3.51	3.58	4.31	2.89	4.52	0.00	4.86	2.84
at AD 1164	62	62	62	62	62	62	62	62	62	62	59

Samples matching best with the South of England, combined to form 5-timber master ***SARUM2***

Master / *finishing AD*	*DUBLIN1* 1306	*MC13* 1170	*WALES97* 1981	*SALOP95* 1745	*BRISTOL* 1320	*SOUTH* 1594	*PALACE* 1179	*EASTMID* 1981	*SCOTLAND* 1975	*SCECIRE* 28-timber Irish mean	*SARUM2* 5-timber South mean
scec14	3.81	0.93	3.84	3.04	4.14	4.27	1.56	2.19	1.26	3.27	
at AD 1198	73	45	73	73	73	73	54	73	73	73	
scec20	6.47	2.28	7.27	5.79	6.74	7.71	1.15	6.83	3.61	4.33	
at AD 1199	55	26	55	55	55	55	35	55	55	55	
scec31	4.60	2.19	4.87	3.95	5.67	6.34	1.92	4.68	1.11	4.86	
at AD 1201	77	46	77	77	77	77	55	77	77	77	
scec63	4.64	1.97	4.75	3.73	5.06	5.76	3.99	3.71	0.85	3.86	
at AD 1201	96	65	96	96	96	96	74	96	96	96	
scec72	4.90	0.00	4.78	4.22	3.03	5.54	0.00	5.67	2.61	2.09	
at AD 1213	47	0	47	47	47	47	13	47	47	47	

Cross-matching of ***SARUM1*** *and* ***SARUM2*** *site masters with reference chronologies*

Master / *finishing AD*	*DUBLIN1* 1306	*MC13* 1170	*WALES97* 1981	*SALOP95* 1745	*BRISTOL* 1320	*SOUTH* 1594	*PALACE* 1179	*EASTMID* 1981	*SCOTLAND* 1975	*SCECIRE* 28-timber Irish mean	*SARUM2* 5-timber South mean
SARUM1	18.02	9.44	10.38	6.71	9.45	9.64	5.14	7.46	5.86		4.13
at AD 1221	314	263	314	314	314	314	272	314	276		108
SARUM2	5.97	1.47	6.40	4.77	6.92	7.75	2.83	6.17	2.16	3.88	
at AD 1213	108	65	108	108	108	108	74	108	108	108	

Table 3: Matrix of $\frac{t\text{-values}}{\text{overlaps}}$ for samples from the eastern chapels grouped by regions

Samples with best individual matches with DUBLIN1

Sample No:	scec5	7	12	16	17	19	21	22	23	24	29	42	43	44	45	47	48	49	54	55	56	57	61	62	69	70	71
Last ring date AD:	1189	1189	1193	1178	1138	1164	1181	1188	1190	1200	1205	1208	1197	1195	1195	1156	1168	1152	1180	1185	1198	1121	1179	1183	1176	1030	1165
scec4	4.91 / 80	4.99 / 80	7.36 / 84	6.29 / 69	5.78 / 29	4.64 / 55	7.49 / 72	5.98 / 79	4.91 / 81	7.04 / 91	6.50 / 96	6.64 / 99	5.29 / 88	5.77 / 86	5.56 / 86	7.28 / 47	6.41 / 59	4.05 / 43	7.61 / 71	4.54 / 76	5.00 / 89	0.65 / 12	2.89 / 70	2.90 / 74	4.14 / 67	0.00 / 0	2.92 / 56
scec5		4.19 / 97	8.76 / 97	4.95 / 86	5.36 / 46	5.77 / 72	7.58 / 89	9.38 / 96	4.26 / 97	8.87 / 97	8.01 / 97	6.62 / 87	4.93 / 97	6.31 / 97	8.90 / 97	5.50 / 64	3.83 / 76	4.47 / 47	6.70 / 88	12.33 / 93	7.73 / 97	1.42 / 29	7.75 / 87	4.58 / 91	5.88 / 84	0.00 / 0	5.67 / 73
scec7			7.96 / 152	4.31 / 114	5.17 / 120	5.78 / 123	8.10 / 125	2.90 / 103	5.21 / 116	4.74 / 140	4.14 / 118	5.69 / 87	5.13 / 188	5.38 / 147	4.88 / 108	7.86 / 119	8.86 / 158	3.23 / 47	5.44 / 128	5.06 / 107	4.91 / 138	12.23 / 127	4.21 / 110	4.95 / 150	4.78 / 160	3.54 / 36	4.52 / 157
scec12				5.37 / 114	6.50 / 101	6.76 / 123	8.02 / 125	9.53 / 103	9.63 / 117	9.92 / 144	8.33 / 122	8.29 / 91	6.34 / 156	8.06 / 151	12.87 / 112	9.16 / 119	6.79 / 131	8.30 / 47	5.15 / 128	8.83 / 107	8.78 / 142	6.24 / 84	6.55 / 110	11.75 / 146	5.39 / 139	0.00 / 0	6.85 / 128
scec16					3.43 / 74	3.70 / 100	3.97 / 114	5.92 / 93	3.58 / 105	3.25 / 114	6.10 / 107	6.08 / 76	2.82 / 114	3.57 / 114	3.70 / 97	5.58 / 92	5.37 / 104	5.14 / 47	4.45 / 114	2.59 / 100	5.20 / 114	2.82 / 57	4.53 / 109	3.49 / 114	3.80 / 112	0.00 / 0	3.38 / 101
scec17						6.24 / 97	5.10 / 82	5.78 / 53	4.98 / 65	5.36 / 89	5.33 / 67	6.69 / 36	4.62 / 120	5.19 / 96	4.84 / 57	5.46 / 101	5.04 / 120	4.75 / 33	3.68 / 86	6.22 / 60	5.45 / 87	4.73 / 103	3.75 / 69	5.54 / 105	6.26 / 120	0.42 / 12	11.11 / 120
scec19							4.80 / 108	5.36 / 79	3.69 / 91	6.50 / 115	4.50 / 93	6.76 / 62	5.14 / 123	6.41 / 122	4.14 / 83	6.44 / 115	7.28 / 123	5.25 / 47	5.96 / 112	4.84 / 86	7.58 / 113	5.50 / 80	4.87 / 95	6.03 / 123	6.25 / 123	0.00 / 0	6.13 / 123
scec21								5.90 / 96	6.29 / 108	7.14 / 125	7.28 / 110	8.59 / 79	5.53 / 125	5.19 / 125	8.82 / 100	6.72 / 100	4.96 / 112	3.35 / 47	5.08 / 124	7.36 / 103	5.57 / 125	3.85 / 65	5.07 / 110	5.23 / 125	4.59 / 120	0.00 / 0	3.84 / 109
scec22									5.04 / 103	7.49 / 103	6.54 / 103	5.94 / 86	5.43 / 103	6.62 / 103	7.93 / 103	6.76 / 71	4.58 / 83	5.35 / 47	6.39 / 95	7.94 / 100	7.07 / 103	1.05 / 36	5.95 / 94	7.48 / 98	4.82 / 91	0.00 / 0	5.80 / 80
scec23										5.90 / 117	4.18 / 117	4.19 / 88	5.25 / 117	3.81 / 117	8.36 / 109	6.60 / 83	4.13 / 95	4.59 / 47	3.23 / 107	4.50 / 107	4.83 / 117	2.63 / 48	4.27 / 106	7.63 / 110	4.25 / 103	0.00 / 0	4.47 / 92
scec24											8.86 / 129	6.81 / 98	10.72 / 148	7.20 / 146	8.99 / 114	6.88 / 107	4.94 / 119	4.77 / 47	5.63 / 128	9.16 / 107	10.59 / 147	3.82 / 72	6.12 / 110	6.77 / 134	6.40 / 127	0.00 / 0	4.64 / 116
scec29												7.10 / 103	6.78 / 126	4.76 / 124	7.25 / 114	6.21 / 85	3.32 / 97	3.71 / 47	5.93 / 109	6.68 / 107	7.07 / 127	2.77 / 50	11.63 / 108	4.17 / 112	3.70 / 105	0.00 / 0	3.08 / 94
scec42													3.87 / 95	6.40 / 93	6.80 / 93	9.74 / 54	6.84 / 66	4.62 / 47	3.92 / 78	6.41 / 83	4.36 / 96	4.15 / 19	3.95 / 77	3.92 / 81	3.80 / 74	0.00 / 0	6.55 / 63
scec43														5.23 / 153	5.04 / 114	5.09 / 119	4.14 / 158	2.30 / 47	5.03 / 128	4.59 / 107	10.07 / 146	3.37 / 120	4.24 / 110	5.36 / 150	5.97 / 160	0.76 / 29	1.90 / 157
scec44															6.52 / 114	4.93 / 114	5.92 / 126	5.22 / 47	7.11 / 128	6.13 / 107	6.34 / 144	4.24 / 79	6.19 / 110	4.87 / 141	5.60 / 134	0.00 / 0	4.44 / 123
scec45																6.61 / 75	3.95 / 87	5.29 / 47	4.66 / 99	9.28 / 104	5.40 / 114	3.71 / 40	6.68 / 98	8.80 / 102	4.09 / 95	0.00 / 0	4.29 / 84
scec47																	6.94 / 119	5.73 / 47	5.24 / 104	6.16 / 78	6.98 / 105	5.38 / 84	5.32 / 87	6.74 / 119	5.79 / 119	0.00 / 0	5.15 / 119
scec48																		4.28 / 47	7.41 / 116	3.67 / 90	4.36 / 117	9.06 / 111	2.70 / 99	4.92 / 135	5.72 / 152	1.13 / 20	5.99 / 155
scec49																			3.62 / 47	6.36 / 47	7.04 / 47	0.88 / 16	4.23 / 47	5.44 / 47	4.75 / 47	0.00 / 0	6.36 / 47
scec54																				5.16 / 102	5.19 / 128	2.93 / 69	6.00 / 110	2.50 / 128	8.64 / 124	0.00 / 0	2.49 / 113
scec55																					6.60 / 107	3.22 / 43	7.26 / 101	5.77 / 105	3.83 / 98	0.00 / 0	5.96 / 87
scec56																						4.25 / 70	6.92 / 110	6.83 / 132	5.98 / 125	0.00 / 0	3.82 / 114
scec57																							2.31 / 52	5.87 / 88	4.94 / 105	7.86 / 102	4.48 / 113
scec61																								4.57 / 110	4.03 / 107	0.00 / 0	2.27 / 96
scec62																									5.54 / 143	0.00 / 0	5.07 / 132
scec69																										0.00 / 14	4.26 / 149
scec70																											0.95 / 22

Samples matching equally well with Southern England, Wales, and Ireland

Sample No:	1	2	9	30	41	46	52	53	59	64	65
Last ring date AD:	1221	1221	1199	1193	1190	1144	1195	1191	1118	1156	1108
scec4	5.89 / 112	5.44 / 112	5.19 / 90	3.36 / 84	2.98 / 81	7.24 / 35	6.31 / 86	8.11 / 82	2.00 / 9	3.66 / 47	0.00 / 0
scec5	7.55 / 97	7.63 / 97	8.47 / 97	5.78 / 97	4.28 / 97	5.86 / 52	7.22 / 97	6.12 / 97	1.39 / 26	2.59 / 64	2.82 / 16
scec7	5.51 / 137	4.78 / 115	5.09 / 146	6.56 / 160	4.91 / 117	5.97 / 103	3.72 / 138	7.45 / 141	7.12 / 76	6.08 / 136	3.16 / 71
scec12	7.11 / 141	9.32 / 119	6.48 / 150	4.86 / 156	3.98 / 118	7.19 / 103	7.88 / 142	6.75 / 143	6.72 / 76	4.11 / 119	4.12 / 71
scec16	3.87 / 114	5.07 / 104	4.19 / 114	2.66 / 114	2.10 / 106	3.54 / 80	4.11 / 114	7.06 / 114	3.32 / 54	4.06 / 92	0.46 / 44
scec17	5.22 / 86	6.38 / 64	3.99 / 95	4.18 / 109	2.73 / 66	4.46 / 97	5.74 / 90	4.56 / 87	4.60 / 76	3.99 / 118	3.83 / 71
scec19	3.98 / 112	5.70 / 90	2.42 / 121	5.48 / 123	3.66 / 92	7.53 / 103	4.41 / 113	5.93 / 116	4.40 / 76	3.94 / 115	5.82 / 67
scec21	7.02 / 125	5.61 / 107	8.14 / 125	5.21 / 125	3.68 / 109	6.44 / 89	6.47 / 125	6.62 / 125	4.41 / 62	4.40 / 100	1.72 / 52
scec22	6.59 / 103	8.65 / 103	6.11 / 103	3.71 / 103	3.17 / 103	5.60 / 59	6.58 / 103	6.05 / 103	1.33 / 33	1.77 / 71	0.64 / 23
scec23	4.47 / 117	5.75 / 116	4.01 / 117	2.30 / 117	1.45 / 117	6.71 / 71	4.03 / 117	3.29 / 117	3.56 / 45	2.26 / 83	0.96 / 35
scec24	7.02 / 148	8.52 / 126	5.54 / 150	4.80 / 144	3.75 / 118	7.21 / 95	8.29 / 144	5.53 / 142	4.05 / 69	4.93 / 107	4.60 / 59
scec29	6.82 / 134	9.49 / 131	5.22 / 128	4.98 / 122	3.19 / 118	7.51 / 73	7.03 / 124	6.72 / 120	3.71 / 47	2.70 / 85	1.46 / 37
scec42	4.97 / 106	4.15 / 106	5.62 / 97	5.49 / 91	4.24 / 88	4.86 / 42	4.39 / 93	7.23 / 89	4.14 / 16	2.90 / 54	0.00 / 6
scec43	5.28 / 145	5.47 / 123	4.41 / 154	4.53 / 164	2.98 / 118	7.87 / 103	6.75 / 144	3.92 / 143	3.66 / 76	4.86 / 136	1.93 / 71
scec44	5.11 / 143	5.94 / 121	5.48 / 152	10.15 / 151	5.19 / 118	6.22 / 102	5.75 / 144	4.07 / 143	4.21 / 76	3.31 / 114	3.53 / 66
scec45	7.03 / 114	6.84 / 114	6.27 / 114	4.50 / 112	4.23 / 109	5.10 / 63	6.84 / 114	4.70 / 110	3.06 / 37	2.79 / 75	0.81 / 27
scec47	4.89 / 104	6.74 / 82	5.66 / 113	4.39 / 119	4.42 / 84	6.32 / 103	4.97 / 105	6.53 / 108	6.20 / 76	5.12 / 119	3.46 / 71
scec48	4.10 / 116	5.46 / 94	4.47 / 125	4.90 / 139	4.11 / 96	4.88 / 103	5.32 / 117	7.29 / 120	4.38 / 76	9.20 / 136	3.87 / 71
scec49	5.88 / 47	4.32 / 47	3.29 / 47	2.66 / 47	1.26 / 47	4.87 / 39	4.14 / 47	5.16 / 47	3.00 / 13	1.60 / 47	0.00 / 0
scec54	5.69 / 128	6.82 / 106	5.59 / 128	6.72 / 128	7.48 / 108	6.90 / 92	7.32 / 128	6.41 / 128	2.15 / 66	5.44 / 104	3.30 / 56
scec55	8.73 / 107	7.46 / 107	8.55 / 107	5.00 / 107	4.44 / 107	5.76 / 66	6.20 / 107	5.01 / 107	4.68 / 40	2.38 / 78	2.91 / 30
scec56	6.19 / 146	6.98 / 124	5.55 / 147	4.04 / 142	2.16 / 118	9.21 / 93	6.12 / 144	4.37 / 140	4.73 / 67	4.21 / 105	4.52 / 57
scec57	3.41 / 69	3.21 / 47	2.88 / 78	4.10 / 92	2.30 / 49	4.30 / 80	3.45 / 70	6.11 / 73	11.69 / 76	6.40 / 101	5.23 / 71
scec61	5.59 / 110	7.19 / 105	4.81 / 110	7.27 / 110	3.54 / 107	6.25 / 75	4.20 / 110	4.76 / 110	3.35 / 49	2.57 / 87	1.20 / 39
scec62	4.65 / 131	6.25 / 109	3.29 / 140	3.30 / 150	1.55 / 111	6.67 / 103	4.82 / 132	3.65 / 135	5.49 / 76	3.66 / 123	3.27 / 71
scec69	3.82 / 124	3.57 / 102	3.43 / 133	4.97 / 147	4.52 / 104	5.90 / 103	6.29 / 125	5.57 / 128	5.38 / 76	4.98 / 136	6.22 / 71
scec70	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 10	0.00 / 0	0.00 / 0	0.00 / 0
scec71	3.96 / 113	5.31 / 91	3.61 / 122	3.42 / 136	2.00 / 93	3.86 / 103	4.89 / 114	4.88 / 117	3.74 / 76	2.99 / 136	3.97 / 71
scec1		6.89 / 147	12.29 / 147	6.00 / 141	4.46 / 118	7.55 / 92	12.51 / 143	7.41 / 139	3.19 / 66	5.08 / 104	1.95 / 56
scec2			6.63 / 125	5.70 / 119	2.96 / 116	7.12 / 70	7.52 / 121	7.93 / 117	3.85 / 44	2.97 / 82	2.74 / 34
scec9				5.70 / 150	5.83 / 118	5.16 / 101	9.78 / 144	7.44 / 143	3.92 / 75	4.42 / 113	1.42 / 65
scec30					6.58 / 118	7.16 / 103	6.76 / 142	5.85 / 143	4.14 / 76	4.20 / 127	1.27 / 71
scec41						2.69 / 72	4.59 / 118	5.52 / 118	3.41 / 46	3.26 / 84	2.44 / 36
scec46							7.72 / 93	6.17 / 96	4.42 / 76	3.93 / 103	2.65 / 67
scec52								8.16 / 140	3.90 / 67	5.38 / 105	4.93 / 57
scec53									7.85 / 70	5.45 / 108	5.03 / 60
scec59										3.76 / 76	5.62 / 66
scec64											2.92 / 71

Samples with poor individual matches (8–67) | *Samples with best individual matches with Southern English Chronologies* (14–72)

Sample No:	8	13	25	66	67	14	20	31	63	72
Last ring date AD:	1212	1160	1196	1198	1164	1198	1199	1201	1201	1213
scec4	1.89 / 70	2.87 / 51	2.28 / 87	4.77 / 78	4.13 / 55	2.14 / 73	3.51 / 55	3.59 / 77	3.56 / 92	1.98 / 47
scec5	1.16 / 47	3.74 / 54	5.76 / 97	2.63 / 69	2.71 / 62	3.01 / 64	3.08 / 45	5.05 / 65	2.47 / 84	1.45 / 23
scec7	0.86 / 47	2.81 / 54	0.30 / 108	4.17 / 69	3.27 / 62	3.00 / 64	0.73 / 45	3.86 / 65	4.03 / 84	1.36 / 23
scec12	2.16 / 51	4.16 / 54	3.11 / 112	3.90 / 73	3.36 / 62	2.49 / 68	2.78 / 49	3.70 / 69	3.11 / 88	1.92 / 27
scec16	0.00 / 36	5.05 / 54	3.34 / 97	1.43 / 58	3.30 / 62	0.71 / 53	0.89 / 34	2.53 / 54	1.72 / 73	0.93 / 12
scec17	0.00 / 0	1.49 / 32	2.12 / 57	1.33 / 18	2.70 / 36	0.71 / 13	0.00 / 0	2.09 / 14	0.55 / 33	0.00 / 0
scec19	1.01 / 22	3.10 / 54	2.47 / 83	3.16 / 44	5.27 / 62	2.08 / 39	1.87 / 20	4.19 / 40	2.68 / 59	0.00 / 0
scec21	1.03 / 39	2.28 / 54	3.13 / 100	2.73 / 61	2.46 / 62	3.97 / 56	3.28 / 37	3.93 / 57	2.89 / 76	0.86 / 15
scec22	3.03 / 46	4.51 / 54	4.93 / 103	2.78 / 68	4.26 / 62	0.85 / 63	3.92 / 44	1.69 / 64	1.61 / 83	1.29 / 22
scec23	0.85 / 48	4.01 / 54	1.00 / 109	2.52 / 70	3.50 / 62	0.00 / 65	0.09 / 46	2.02 / 66	0.85 / 85	0.63 / 24
scec24	3.17 / 58	1.75 / 54	3.68 / 115	2.55 / 78	2.05 / 62	2.69 / 73	3.22 / 55	3.67 / 76	2.95 / 95	3.79 / 34
scec29	0.76 / 63	1.51 / 54	4.73 / 115	3.40 / 78	1.12 / 62	4.17 / 73	3.63 / 55	4.72 / 77	2.16 / 96	3.27 / 39
scec42	2.40 / 66	2.77 / 54	3.70 / 94	4.28 / 78	3.94 / 62	5.48 / 73	5.68 / 55	3.81 / 77	3.64 / 96	1.96 / 42
scec43	0.92 / 55	1.04 / 54	0.98 / 115	1.91 / 77	1.25 / 62	1.01 / 72	0.75 / 53	0.03 / 73	1.03 / 92	0.23 / 31
scec44	2.36 / 53	2.79 / 54	2.33 / 114	4.41 / 75	4.55 / 62	3.80 / 70	3.99 / 51	3.55 / 71	3.32 / 90	2.06 / 29
scec45	0.53 / 53	3.88 / 54	3.50 / 114	3.42 / 75	4.09 / 62	1.26 / 70	4.22 / 51	2.93 / 71	2.76 / 90	1.24 / 29
scec47	1.19 / 14	3.59 / 50	3.09 / 75	3.81 / 36	4.69 / 54	1.49 / 31	0.44 / 12	2.55 / 32	1.64 / 51	0.00 / 0
scec48	0.69 / 26	3.63 / 54	3.58 / 87	3.52 / 48	5.02 / 62	3.00 / 43	1.57 / 24	3.42 / 44	2.96 / 63	0.00 / 0
scec49	0.40 / 10	2.62 / 46	2.27 / 47	1.69 / 32	2.56 / 47	0.00 / 27	0.00 / 8	1.92 / 28	1.78 / 47	0.00 / 0
scec54	0.00 / 38	3.94 / 54	3.59 / 99	4.30 / 60	4.45 / 62	2.56 / 55	0.91 / 36	3.62 / 56	2.82 / 75	0.12 / 14
scec55	1.49 / 43	3.13 / 54	4.75 / 104	3.01 / 65	2.99 / 62	2.33 / 60	2.61 / 41	3.86 / 61	2.03 / 80	0.87 / 19
scec56	0.92 / 56	2.43 / 54	1.13 / 115	1.91 / 78	2.26 / 62	0.74 / 73	0.00 / 54	1.18 / 74	2.07 / 93	0.29 / 32
scec57	0.00 / 0	1.30 / 15	1.16 / 40	0.00 / 0	0.83 / 19	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 16	0.00 / 0
scec61	0.00 / 37	3.19 / 54	3.17 / 98	3.04 / 59	2.51 / 62	4.26 / 54	1.99 / 35	3.77 / 55	1.16 / 74	1.85 / 13
scec62	0.75 / 41	4.41 / 54	2.19 / 102	1.18 / 63	2.70 / 62	0.00 / 58	0.48 / 39	0.97 / 59	0.00 / 78	0.00 / 17
scec69	0.00 / 34	3.20 / 54	1.48 / 95	1.29 / 56	2.36 / 62	0.75 / 51	0.00 / 32	0.89 / 52	0.00 / 71	0.35 / 10
scec70	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 0
scec71	1.27 / 23	3.36 / 54	3.90 / 84	1.25 / 45	4.46 / 62	1.13 / 40	1.07 / 21	3.16 / 41	2.21 / 60	0.00 / 0
scec1	0.92 / 70	2.78 / 54	5.20 / 115	3.77 / 78	2.27 / 62	2.80 / 73	1.40 / 55	3.43 / 77	2.28 / 96	1.81 / 47
scec2	1.98 / 70	4.53 / 54	4.50 / 115	4.48 / 78	4.03 / 62	2.33 / 73	1.17 / 55	5.60 / 77	2.96 / 96	2.57 / 47
scec9	1.73 / 57	3.37 / 54	5.22 / 115	4.15 / 78	3.10 / 62	3.81 / 73	2.55 / 55	3.33 / 75	2.98 / 94	0.93 / 33
scec30	3.06 / 51	2.39 / 54	3.31 / 112	5.28 / 73	2.89 / 62	6.19 / 68	3.45 / 49	4.47 / 69	4.98 / 88	3.54 / 27
scec41	2.69 / 48	1.63 / 54	1.54 / 109	5.49 / 70	3.71 / 62	5.95 / 65	3.28 / 46	2.84 / 66	3.41 / 85	2.52 / 24
scec46	0.00 / 0	3.30 / 38	2.22 / 63	3.90 / 24	3.18 / 42	1.30 / 19	0.00 / 0	3.01 / 20	1.19 / 39	0.00 / 0
scec52	1.24 / 53	2.16 / 54	5.28 / 114	3.69 / 75	1.57 / 62	2.24 / 70	1.84 / 51	3.56 / 71	2.44 / 90	1.17 / 29
scec53	1.31 / 49	4.11 / 54	4.56 / 110	5.53 / 71	4.77 / 62	3.85 / 66	2.67 / 47	4.22 / 67	4.47 / 86	1.12 / 25
scec59	0.00 / 0	0.46 / 12	0.00 / 37	0.00 / 0	1.32 / 16	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 13	0.00 / 0
scec64	0.00 / 14	2.47 / 50	1.50 / 75	0.81 / 36	2.19 / 54	3.02 / 31	1.74 / 12	1.53 / 32	1.92 / 51	0.00 / 0
scec65	0.00 / 0	0.00 / 0	1.57 / 27	0.00 / 0	0.00 / 6	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 0	0.00 / 0

Samples with poor individual matches (scec13–67) | *Samples with best individual matches with Southern English Chronologies* (14–72)

Sample No:	scec13	25	66	67	14	20	31	63	72
Last ring date AD:	1160	1196	1198	1164	1198	1199	1201	1201	1213
scec8	0.00 / 18	0.75 / 54	2.24 / 56	0.16 / 22	2.31 / 56	2.69 / 55	0.43 / 59	1.78 / 59	4.60 / 46
scec13		3.01 / 54	2.37 / 40	4.22 / 54	0.98 / 35	3.63 / 16	4.05 / 36	1.22 / 54	0.00 / 0
scec25			1.31 / 76	0.88 / 62	2.20 / 71	2.58 / 52	4.35 / 72	1.04 / 91	1.72 / 30
scec66				4.08 / 44	3.83 / 73	3.22 / 54	3.26 / 74	4.63 / 78	1.47 / 32
scec67					1.97 / 39	1.88 / 20	3.14 / 40	2.24 / 59	0.00 / 0
scec14						2.70 / 54	4.22 / 73	4.73 / 73	2.79 / 32
scec20							3.01 / 55	3.67 / 55	2.74 / 33
scec31								4.40 / 77	3.41 / 35
scec63									2.01 / 35

Table 4: Matrix of *t* -values and overlaps for components of ***scec11***

Sample:	***scec11b***	***scec11c***
Last ring date AD:	1065	1073
scec11a	**12.52** **43**	2.45 7
	scec11b	**7.02** **27**

Table 5: Matrix of *t* -values and overlaps for components of ***scec2***

Sample:	***scec2a2***	***scec2b***
Last ring date AD:	1188	1221
scec2a1	0.00 0	**13.49** **32**
	scec2a2	**8.22** **79**

Table 6: Matrix of *t* -values and overlaps for components of ***scec3***

Sample:	***scec3b***	***scec3c***
Last ring date AD:	1222	1222
scec3a	**12.25** **69**	**8.67** **77**
	scec3b	**8.43** **69**

Table 7: Matrix of *t* -values and overlaps for components of ***scec5***

Sample:	***scec5b***	***scec5c***
Last ring date AD:	1185	1185
scec5a	**15.80** **90**	**17.70** **90**
	scec5b	**23.10** **90**

Table 8: Matrix of *t* -values and overlaps for components of ***scec7***

Sample:	***scec7b***	***scec7c***
Last ring date AD:	1136	1186
scec7a	**20.16** **140**	**5.44** **49**
	scec7b	0.00 0

Table 9: Matrix of *t* -values and overlaps for components of ***scec15***

Sample:	***scec15az***	***scec15bi***	***scec15bz***
Last ring date AD:	1066	1067	1099
scec15ai	3.08 49	**4.13** **23**	**9.54** **50**
	scec15az	0.16 27	3.23 53
		scec15bi	**3.50** **28**

Table 10: Matrix of *t* -values and overlaps for components of ***scec24***

Sample:	***scec24ai***	***scec24b***
Last ring date AD:	1200	1199
scec24a	0.00 0	**19.79** **108**
	scec24ai	**10.42** **22**

Table 11: Matrix of *t* -values and overlaps for components of ***scec31***

Sample:	***scec31b***	***scec31c***
Last ring date AD:	1201	1200
scec31a	**16.28** **55**	**3.60** **20**
	scec31b	**5.18** **33**

Table 12: Matrix of *t* -values and overlaps for components of ***scec53***

Sample:	***scec53b1***	***scec53b2***
Last ring date AD:	1120	1191
scec53a	**12.89** **58**	**11.15** **18**
	scec53b1	0.00 0

Table 13: Combining of multiple radii from individual samples to form same-timber means

Samples:	*t - value:*	*overlap:*	*combined mean:*
scec1a + scec1b	6.05	15	***scec1***
scec4a + scec4b	10.98	30	***scec4***
scec18a + scec18b	10.71	69	***scec18***
scec26a + scec26b	5.83	45	***scec26***
scec71a + scec71b	19.72	116	***scec71***
scec41a + scec41b	9.91	111	***scec41***
scec49a + scec49b1	18.91	42	***scec49***
scec60a + scec60b	6.67	127	***scec60***

Table 14: Matrix of *t* -values and overlaps for components of ***scnt05***

Sample:	***scnt05b***	***scnt05c***	***scnt05d***
Last ring date AD:	1254	1245	1254
scnt05a	**3.84** **17**	**4.63** 7	0.00 0
	scnt05b	1.92 20	2.90 16
		scnt05c	**5.01** 7

Table 15: Matrix of *t* -values and overlaps for components of ***scnt42***

Sample:	***scnt42b***	***scnt42c***
Last ring date AD:	1222	1235
scnt42a	**10.23** **44**	**6.71** **47**
	scnt42b	**8.71** **48**

Table 16: Matrix of *t* -values and overlaps for components of ***scnt44***

Sample:	***scnt44b***	***scnt44c***
Last ring date AD:	1226	1241
scnt44a	**8.82** / **82**	**18.61** / **43**
	scnt44b	**14.74** / **36**

Table 17: Combining of multiple radii from individual samples to form same-timber means

Samples:	*t - value:*	*overlap:*	*combined mean:*
scnt09i* + *scnt09ii	3.47	7	***scnt09***
scnt10a* + *scnt10b	16.80	36	***scnt10***
scnt15a* + *scnt15b	2.38	33	***scnt15***
scnt17a* + *scnt17b	15.44	63	***scnt17***
scnt41a* + *scnt41b	9.50	47	***scnt41***
scnt46a* + *scnt46b	12.41	39	***scnt46***
scl104a* + *scl104b	5.84	44	***scl104***

Table 18: Combining of individual samples to form same-tree means

Samples:	*t - value:*	*overlap:*	*combined mean:*
scnt02* + *scnt04	14.07	133	***scnt024***
scnt43* + *scnt46	9.77	77	***scnt436***
scl104* + *scnt03	11.57	93	***scl10403***

Table 19: Matrix of *t* -values and overlaps for components of ***scl1023***

Sample:	***scl102b***	***scl103***
Last ring date AD:	1224	1238
scl102a	1.94 / 9	0.00 / 9
	scl102b	**11.32** / **39**

Table 20: Matrix of *t* -values and overlaps for components of ***SARUM3x***

Sample:	*scl10403*	*scl105*	*scnt01*	*scnt024*	*scnt05*	*scnt07*	*scnt09*	*scnt11*	*scnt13*	*scnt14*	*scnt16*	*scnt17*	*scnt18*	*scnt19*	*scnt23*	*scnt26*	*scnt30*	*scnt32*	*scnt34*	*scnt36*	*scnt37*	*scnt38*	*scnt41*	*scnt42*	*scnt436*	*scnt44*
Last ring date AD:	1226	1170	1238	1223	1254	1200	1233	1230	1235	1193	1182	1231	1227	1220	1225	1218	1224	1216	1212	1222	1210	1213	1248	1235	1251	1241
scl1023 1238	**9.74 / 143**	**6.30 / 99**	1.97 / 107	**9.13 / 152**	**7.49 / 98**	2.21 / 66	1.88 / 109	**3.64 / 95**	2.95 / 86	1.93 / 82	1.02 / 40	**4.33 / 88**	3.07 / 89	1.18 / 82	0.90 / 83	2.12 / 84	**3.60 / 91**	1.90 / 74	1.48 / 73	3.17 / 79	1.18 / 82	0.88 / 67	**3.99 / 112**	1.81 / 70	3.35 / 67	3.37 / 100
scl10403 1226		**7.10 / 87**	**4.79 / 95**	**9.02 / 140**	**7.22 / 86**	3.02 / 66	3.48 / 102	**4.36 / 91**	**3.80 / 77**	3.34 / 82	**3.70 / 40**	**5.87 / 83**	**6.75 / 88**	2.46 / 82	2.42 / 83	1.85 / 84	**4.19 / 91**	**4.24 / 74**	**3.84 / 73**	**4.95 / 79**	**3.67 / 82**	2.94 / 67	**3.91 / 100**	3.03 / 61	**5.15 / 55**	3.01 / 88
scl105 1170			0.00 / 39	14.16 / 99	3.10 / 30	0.00 / 36	2.36 / 46	3.11 / 35	3.56 / 21	2.71 / 59	1.43 / 28	1.49 / 27	1.43 / 32	2.10 / 32	0.00 / 28	0.00 / 36	1.75 / 37	1.11 / 28	1.33 / 31	0.44 / 27	0.74 / 42	0.90 / 24	0.42 / 44	0.00 / 0	0.00 / 0	0.14 / 32
scnt01 1238				3.33 / 92	2.01 / 98	**3.72 / 66**	2.78 / 102	2.26 / 95	1.62 / 86	1.93 / 62	3.04 / 40	**6.27 / 88**	**3.82 / 89**	**3.55 / 82**	**3.77 / 83**	**4.31 / 84**	3.12 / 91	**4.03 / 74**	**3.62 / 73**	**3.87 / 79**	2.65 / 79	3.12 / 67	1.29 / 107	**4.33 / 70**	2.56 / 67	1.11 / 100
scnt024 1223					**7.32 / 83**	1.60 / 66	2.57 / 99	**5.25 / 88**	**6.53 / 74**	**5.67 / 82**	**3.82 / 40**	**4.72 / 80**	**4.03 / 85**	3.37 / 82	1.58 / 81	1.59 / 84	2.38 / 90	**3.62 / 74**	1.49 / 73	2.58 / 79	3.35 / 82	1.15 / 67	1.42 / 97	**4.14 / 58**	2.10 / 52	1.43 / 85
scnt05 1254						1.24 / 60	2.28 / 93	**4.33 / 90**	**3.72 / 86**	2.51 / 53	**3.56 / 40**	**5.09 / 88**	**5.28 / 87**	3.18 / 80	2.27 / 83	3.07 / 78	**4.38 / 84**	**4.22 / 74**	2.40 / 72	**5.01 / 79**	3.25 / 70	3.21 / 67	**3.82 / 108**	**3.93 / 70**	3.47 / 80	**3.94 / 101**
scnt07 1200							**4.36 / 66**	2.78 / 65	0.26 / 51	2.40 / 59	**3.82 / 40**	2.02 / 57	2.90 / 62	2.29 / 62	**3.94 / 58**	2.66 / 66	**3.64 / 66**	**3.68 / 58**	**4.76 / 61**	2.85 / 57	2.31 / 66	**4.45 / 54**	2.58 / 66	1.62 / 35	2.21 / 29	2.84 / 62
scnt09 1233								**4.34 / 95**	2.91 / 84	**3.77 / 69**	**3.52 / 40**	**3.61 / 88**	**4.34 / 89**	**4.40 / 82**	**4.46 / 83**	**3.78 / 84**	2.76 / 91	**4.83 / 74**	**4.70 / 73**	**4.03 / 79**	3.48 / 82	**8.78 / 67**	**4.51 / 107**	**3.70 / 68**	**4.56 / 62**	**4.59 / 95**
scnt11 1230									**4.16 / 81**	**4.19 / 58**	3.10 / 40	**4.68 / 87**	**4.17 / 89**	3.35 / 82	**3.74 / 83**	**3.54 / 83**	2.91 / 89	**4.93 / 74**	**3.64 / 73**	**4.13 / 79**	1.72 / 75	2.99 / 67	1.96 / 95	2.28 / 65	**5.13 / 59**	**4.15 / 92**
scnt13 1235										**3.60 / 44**	2.78 / 33	**4.17 / 82**	2.15 / 78	3.28 / 71	0.41 / 76	0.69 / 69	1.51 / 75	2.01 / 67	0.00 / 63	3.00 / 73	3.41 / 61	1.23 / 64	1.57 / 86	**4.38 / 70**	1.54 / 64	2.73 / 86
scnt14 1193											1.93 / 40	2.53 / 50	3.31 / 55	3.09 / 55	2.53 / 51	1.67 / 59	0.77 / 60	3.38 / 51	1.48 / 54	3.11 / 50	**4.80 / 65**	2.36 / 47	0.49 / 67	**5.68 / 28**	2.20 / 22	3.23 / 55
scnt16 1182												3.48 / 39	**4.54 / 40**	**5.87 / 40**	3.17 / 40	2.43 / 40	3.25 / 40	3.48 / 40	2.21 / 40	1.97 / 39	**4.53 / 40**	**4.40 / 36**	1.72 / 40	0.00 / 0	0.00 / 0	2.05 / 40
scnt17 1231													6.26 / 84	**3.86 / 77**	**3.59 / 82**	2.27 / 75	**4.58 / 81**	**4.29 / 73**	2.58 / 69	**5.89 / 79**	2.84 / 67	2.94 / 67	**4.82 / 88**	3.27 / 66	3.42 / 60	**4.68 / 88**
scnt18 1227														2.52 / 82	**5.33 / 83**	2.77 / 80	**4.85 / 86**	**4.60 / 74**	**4.14 / 73**	**4.98 / 79**	**4.18 / 72**	**4.40 / 67**	**5.06 / 89**	3.45 / 62	**4.26 / 56**	**4.02 / 89**
scnt19 1220															3.34 / 78	3.26 / 80	**3.63 / 82**	**3.76 / 74**	1.64 / 73	1.59 / 77	3.37 / 72	**5.16 / 67**	2.37 / 82	3.38 / 55	2.78 / 49	2.05 / 82
scnt23 1225																**3.72 / 76**	**5.39 / 82**	3.12 / 74	**4.81 / 70**	**4.08 / 79**	2.79 / 68	**6.39 / 67**	2.26 / 83	2.66 / 60	3.23 / 54	**4.05 / 83**
scnt26 1218																	3.18 / 84	0.60 / 74	2.42 / 73	2.58 / 75	1.29 / 76	**5.40 / 67**	1.36 / 84	1.95 / 53	3.15 / 47	**3.92 / 80**
scnt30 1224																		3.15 / 74	**4.09 / 73**	**4.41 / 79**	1.98 / 77	**4.37 / 67**	**4.06 / 91**	2.33 / 59	2.43 / 53	**4.02 / 86**
scnt32 1216																			**3.59 / 70**	**4.13 / 73**	**3.64 / 68**	2.60 / 67	2.81 / 74	2.80 / 51	**3.84 / 45**	2.96 / 74
scnt34 1212																				**4.69 / 69**	0.79 / 71	**4.32 / 66**	2.68 / 73	3.28 / 47	**4.48 / 41**	2.65 / 73
scnt36 1222																					**3.70 / 67**	**3.75 / 67**	**3.75 / 79**	3.38 / 57	**3.98 / 51**	**4.20 / 79**
scnt37 1210																						**3.69 / 64**	2.58 / 82	2.42 / 45	**3.70 / 39**	3.27 / 72
scnt38 1213																							**3.74 / 67**	3.19 / 48	3.05 / 42	**5.50 / 67**
scnt41 1248																								1.99 / 70	3.01 / 77	**4.21 / 103**
scnt42 1235																									1.50 / 64	**3.98 / 70**
scnt436 1251																										3.46 / 70

Table 21: Combining of individual samples to form same-tree means

Samples:	*t - value:*	*overlap:*	*combined mean:*
scl10* + *scl24	18.26	137	***scl1024***
scl11* + *scl17	14.26	109	***scl117***
scl14* + *scl22	16.88	103	***scl1422***
scl59* + *scl61	16.27	108	***scl5961***

Table 22: Matrix of *t* -values and overlaps for components of ***scl3245***

Sample:	***scl34***	***scl45***
Last ring date AD:	1206	1214
scl32	14.02	2.24
	115	14
	scl34	12.58
		67

Table 23: Matrix of *t* -values and overlaps for components of ***scl5248***

Sample:	***scl54***	***scl58***
Last ring date AD:	1212	1212
scl52	17.71	13.15
	73	61
	scl54	11.63
		61

Table 24: Matrix of *t* -values and overlaps for components of ***scnt08***

Sample:	***scnt08b1***	***scnt08b2***	***scnt08c***
Last ring date AD:	1614	1661	1660
scnt08a	**10.60**	**11.38**	**12.90**
	42	**39**	**94**
	scnt08b1	0.00	**6.75**
		0	**42**
		scnt08b2	**9.91**
			41

Table 25: Matrix of *t* -values and overlaps for components of ***scnt35x***

Sample:	***scnt35a2***	***scnt35b***	***scnt35cx***
Last ring date AD:	1660	1657	1661
scnt35a1	0.00 / 0	**7.25** / **26**	0.00 / 0
scnt35a2		2.69 / 9	0.92 / 12
scnt35b			2.26 / 12

Table 26: Matrix of *t* -values and overlaps for components of ***SARUM5***

Sample:	***sarum5b***	***sarum5c***	***sarum5d***	***sarum5e***	***scl70***	***scl76***	***scl81***	***scl88***	***scnt35x***	***scnt40***
Last ring date AD:	1661	1662	1660	1660	1636	1661	1653	1643	1661	1661
sarum5a	**8.54** / **84**	**6.69** / **87**	**5.81** / **73**	**6.44** / **79**	1.55 / 66	**4.02** / **27**	**6.8** / **68**	**4.01** / **60**	**3.99** / **75**	**4.63** / **68**
sarum5b		**3.93** / **84**	**5.40** / **73**	3.37 / 79	1.40 / 59	3.26 / 27	**4.14** / **68**	2.42 / 60	3.00 / 75	**4.37** / **68**
sarum5c			**5.07** / **73**	**4.52** / **79**	3.09 / 62	2.87 / 27	**9.19** / **68**	**6.62** / **60**	**3.67** / **75**	3.46 / 68
sarum5d				**4.27** / **73**	2.73 / 49	0.44 / 26	**5.42** / **66**	**4.99** / **56**	2.99 / 73	3.30 / 67
sarum5e					2.71 / 55	1.93 / 26	**5.05** / **68**	**3.74** / **60**	2.55 / 74	**8.00** / **67**
scl70						0.00 / 0	**4.90** / **51**	3.36 / 53	2.93 / 50	1.62 / 43
scl76							2.88 / 19	0.00 / 9	1.90 / 27	2.76 / 27
scl81								**9.09** / **58**	**4.09** / **67**	3.04 / 60
scl88									**3.65** / **57**	3.06 / 50
scnt35x										3.46 / 68

Table 27: Matrix of *t* -values and overlaps for components of ***scl96100***

Sample:	***scl97***	***scl98***	***scl99***	***scl100***
relative last ring date:	48	48	47	43
scl96	**22.82**	**16.21**	**9.03**	**5.32**
	29	**29**	**28**	**24**
	scl97	**20.01**	**10.21**	**6.88**
		33	**32**	**28**
		scl98	**15.90**	**8.71**
			35	**31**
			scl99	**10.15**
				32

Table 28: Ring-width data for site master curve

SARUM1 AD 908-1221 Eastern Chapel roofs, Salisbury Cathedral - Irish imported material 35-timber mean.

314 rings, starting date AD 908

ring widths (0.01mm)

189	177	155	196	207	193	137	132	117	137
111	165	140	180	149	154	146	92	68	85
128	110	114	94	126	94	128	90	103	109
113	81	115	105	106	82	104	126	129	122
120	94	141	81	90	81	120	148	97	157
132	115	123	99	98	144	130	78	141	88
127	102	88	99	112	81	61	90	83	111
93	111	105	75	99	110	74	64	91	80
66	73	79	98	85	111	92	100	108	131
106	90	88	107	127	114	57	83	88	99
113	127	127	97	68	107	98	139	91	114
139	103	114	116	110	130	108	123	139	115
131	99	134	129	101	122	125	118	112	122
120	109	125	111	147	150	111	143	149	148
145	144	104	146	117	107	63	125	132	117
144	126	164	159	116	113	125	100	143	135
99	115	106	109	129	141	127	142	134	133
157	135	112	108	116	142	106	142	136	117
112	119	102	102	68	92	78	110	98	138
116	127	120	79	98	107	101	138	129	108
137	130	108	106	107	91	90	144	148	139
146	118	123	119	93	64	95	109	112	135
133	91	135	84	56	70	84	126	77	96
123	113	124	111	98	86	93	106	103	95
100	109	108	101	104	109	90	94	120	108
95	93	85	74	85	98	101	89	94	94
100	112	97	83	56	69	78	76	87	71
101	119	84	76	91	87	85	106	91	93
79	87	104	112	108	111	110	136	133	117
102	106	111	105	113	146	90	74	84	87
94	100	116	100	104	96	99	90	77	102
78	95	74	124						

number of samples in master

1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
1	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	3	3	3
3	3	3	3	4	4	4	4	4	4
4	5	5	6	6	6	6	6	6	7
7	8	8	8	8	8	8	8	8	8
8	8	9	8	8	8	9	9	9	9
11	11	11	11	13	15	16	16	16	16
16	16	17	17	19	21	21	21	21	22
22	22	22	22	22	22	22	23	23	23
23	23	24	24	25	25	26	27	27	27
27	28	28	28	29	29	29	29	30	30
30	30	30	30	30	31	31	31	31	31
31	31	31	31	31	32	32	32	33	33
33	33	34	34	34	34	34	34	34	34
34	33	33	33	32	32	32	32	32	32
32	32	32	32	32	32	32	32	32	32
32	31	31	31	31	31	31	30	30	30
30	30	30	30	30	29	29	29	29	28
28	28	28	28	28	28	28	27	26	26
26	25	25	25	25	25	25	25	25	24
24	23	22	21	20	20	19	19	18	18
18	17	15	14	14	14	12	12	9	9
8	7	6	5	5	5	5	5	4	4
4	3	3	3	3	3	3	3	3	3
3	3	3	3						

Table 29: Ring-width data for site master curve

SARUM2 AD 1106-1213 Eastern Chapel roofs, Salisbury Cathedral - English material 5-timber mean.

108 rings, starting date AD 1106

ring widths (0.01mm)

111	241	264	271	207	148	151	190	180	175
129	140	237	282	214	236	286	260	176	191
187	234	209	142	199	197	174	171	147	168
120	135	176	148	215	202	155	123	153	199
161	155	190	199	180	216	189	270	203	195
215	202	198	207	187	165	173	195	218	190
168	163	197	238	152	165	140	179	185	143
179	127	204	227	148	164	194	174	148	189
180	216	131	164	170	131	172	204	188	250
221	166	114	138	116	127	192	235	203	206
123	99	101	148	216	227	184	128		

number of samples in master

1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	2
3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	4
4	4	4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4	4	4
4	5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5	5
5	5	5	4	3	3	1	1	1	1
1	1	1	1	1	1	1	1		

Table 30: Ring-width data for site master curve

SARUM3x AD 1054-1254 North Nave Triforium and North Porch roofs, Salisbury Cathedral - English material 27-timber mean.

201 rings, starting date AD 1054

ring widths (0.01mm)

123	275	122	85	164	143	168	198	177	238
188	100	172	227	172	170	188	161	237	301
220	235	309	264	183	242	245	136	148	173
166	202	169	135	110	164	94	97	141	189
144	116	112	150	157	145	151	121	126	155
111	124	118	115	141	95	110	106	143	142
151	175	129	104	150	132	128	117	133	149
164	216	177	185	207	191	216	185	222	196
173	186	170	191	233	205	270	276	220	238
255	264	222	208	203	202	213	238	234	281
232	218	236	248	208	231	236	182	176	177
188	183	153	137	158	190	184	189	173	188
188	164	200	128	183	182	122	117	131	107
97	114	130	153	111	156	166	129	149	161
147	157	168	133	96	121	132	152	130	127
110	140	114	97	136	127	156	133	108	98
95	100	111	112	115	127	132	142	118	126
116	119	133	97	108	134	127	90	90	104
116	127	82	105	103	131	139	109	89	92
99	81	80	98	79	90	72	76	105	133
121									

number of samples in master

1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	3	3
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4	5	5
5	5	5	5	5	5	5	5	5	5
5	6	6	7	7	8	8	8	9	9
10	12	13	13	13	16	17	18	18	21
23	23	23	24	24	24	25	25	25	25
25	25	25	25	25	25	25	25	25	25
25	25	26	26	26	26	26	25	26	26
26	26	26	26	26	26	26	26	26	25
25	25	25	25	25	25	25	25	25	25
24	24	24	24	24	24	24	23	23	23
23	23	23	23	23	23	23	22	22	21
20	20	20	19	19	18	18	17	17	16
15	14	13	12	11	11	11	10	9	9
8	8	6	6	6	4	4	4	3	3
3	3	3	3	3	2	2	2	1	1
1									

Table 31: Dating of ***SARUM3x*** (AD 1054-1254) against reference chronologies at AD 1254

	Reference chronology	Spanning	Overlap	t-value
	SARUM4	878-1230	177	5.02
♣	DUBLIN1 *(Baillie 1977a)*	895-1306	201	5.98
	EASTMID *(Laxton and Litton 1988)*	882-1981	201	6.02
	SALOP95 *(Miles 1995)*	881-1745	201	6.11
	EXCATH1 *(Mills 1988)*	1137-1332	118	6.16
	SARUMBP1 *(Miles and Worthington 2000)*	1160-1301	95	6.29
	DOULTING *(Miles and Worthington 2000)*	1154-1287	101	7.19
	SARUM2 *(Miles and Worthington 2000)*	1106-1213	108	7.88
	HANTS97 *(Miles 1997c)*	1041-1972	201	8.75
	MCHLMRSH *(Miles and Worthington forthcoming)*	1155-1321	100	8.98
	WALES97 *(Miles 1997b)*	404-1981	201	9.22
	ENGLAND *(Baillie and Pilcher 1982)*	404-1981	201	9.32
	RIVRSDWN *(Miles and Worthington 2001)*	1074-1326	181	9.64
	SENG98 *(Bridge 1998)*	944-1790	201	10.07
	SOUTH *(Hillam and Groves 1994)*	406-1594	201	10.24
	LONDON *(Tyers pers com)*	413-1728	201	11.47

Chronology names in **bold** are composite regional masters
♣ Component of WALES97

Table 32: Matrix of *t* -values and overlaps for components of ***SARUM4***

Sample:	*scl02*	*scl03*	*scl04*	*scl05*	*scl06*	*scl07*	*scl09*	*scl1024*	*scl117*	*scl12*	*scl13*	*scl1422*	*scl15*	*scl16*	*scl19*	*scl21*	*scl23*	*scl25*	*scl26*	*scl27*	*scl28*	*scl29*	*scl31*	*scl3245*	*scl33*	*scl36*	*scl37*	*scl38*	*scl41*	*scl42*	*scl43*	*scl46*	*scl47*	*scl48*	*scl49*	*scl50*	*scl5248*	*scl53*	*scl55*	*scl5961*	*Sample:*
Last ring date AD:	1221	1211	1229	1061	1230	1178	1079	1184	1032	1097	963	1086	1212	1161	1001	1219	1189	1047	1178	1100	1196	1167	1193	1214	1155	1147	1214	1180	1092	1074	1170	1203	1183	1150	1140	1169	1212	1230	1106	1206	*Last ring date AD:*
scl01	**8.43**	**5.16**	**5.22**	3.12	**6.55**	2.67	0.63	**6.98**	0.00	2.98	0.00	3.12	**7.13**	**4.90**	0.00	**3.99**	**4.22**	2.74	**5.43**	2.82	**4.74**	**6.75**	**5.58**	**8.27**	**4.83**	2.99	**4.24**	**5.25**	1.85	**4.08**	**4.31**	**5.02**	**4.23**	**6.59**	**5.30**	**8.26**	**5.38**	2.87	2.64	**5.73**	*scl01*
1213	**139**	**180**	**76**	38	**87**	110	56	**150**	0	74	0	63	**107**	**75**	0	**56**	**51**	24	**109**	77	**155**	**120**	**133**	**190**	**81**	124	**63**	**90**	69	**51**	**126**	**158**	**67**	**105**	**114**	**90**	**73**	53	81	**114**	1213
scl02		**5.34**	**4.13**	0.00	**5.19**	**3.74**	0.00	**5.59**	0.00	2.72	0.00	0.00	**6.03**	3.19	0.00	**4.54**	3.23	0.00	**3.57**	2.96	**5.35**	**5.27**	**5.68**	**4.62**	**3.54**	3.37	**3.94**	**4.74**	1.48	0.00	**4.92**	**5.30**	**5.06**	**6.21**	**5.91**	**5.68**	**5.15**	**4.32**	1.46	**9.27**	*scl02*
1221		**137**	**84**	0	**95**	**104**	0	**110**	0	23	0	0	**107**	75	0	**62**	51	0	**104**	26	**122**	**93**	**119**	**140**	**81**	73	**64**	**90**	18	0	**96**	**129**	**67**	**76**	**66**	**90**	**73**	**61**	32	**114**	1221
scl03			2.02	1.04	2.20	1.47	2.58	2.70	0.00	2.38	0.00	**4.80**	**4.06**	1.82	0.00	1.86	**3.95**	3.27	2.70	**7.49**	**5.69**	1.83	1.48	2.47	1.24	3.32	**4.54**	2.38	3.45	2.48	**3.51**	**5.93**	2.82	**5.13**	**3.77**	1.63	**4.57**	2.61	**3.61**	**3.80**	*scl03*
1211			74	30	85	110	48	150	0	66	0	**55**	**106**	75	0	54	**51**	16	109	**69**	**155**	120	133	180	81	116	**61**	90	61	43	**126**	**158**	67	**105**	**109**	90	**72**	51	**75**	**114**	1211
scl04				0.00	**6.28**	2.08	0.00	0.30	0.00	0.00	0.00	0.00	**5.50**	1.95	0.00	1.11	3.05	0.00	1.60	0.00	2.76	0.84	**4.85**	**3.62**	0.32	0.00	2.76	3.01	0.00	0.00	3.02	2.30	**3.61**	0.00	0.00	1.93	**5.32**	3.35	0.00	**3.55**	*scl04*
1229				0	**92**	41	0	47	0	0	0	0	**75**	24	0	62	51	0	41	0	59	30	**56**	**77**	18	0	64	43	0	0	33	66	**46**	0	0	32	**73**	69	0	**69**	1229
scl05					0.00	0.00	1.73	1.20	**5.32**	**5.46**	0.00	**7.02**	0.00	0.00	**3.78**	0.00	0.00	**6.32**	0.00	**5.13**	0.56	0.00	0.00	0.01	0.00	3.73	0.00	0.00	1.99	3.27	0.00	0.00	0.00	0.00	2.98	0.00	0.00	0.00	0.00	0.00	*scl05*
1061					0	0	62	27	**70**	**60**		**83**	0		**39**	0	0	**85**	0	**64**	20	0	0	41	0	62	0	0	68	80	0	0	0	0	35	0	0	0	36	0	1061
scl06						1.78	0.00	1.30	0.00	0.00	0.00	0.00	5.13	**4.52**	0.00	**4.62**	**4.83**	0.00	1.61	0.00	**4.57**	2.42	**3.51**	**4.27**	2.43	1.24	**5.18**	2.93	0.00	0.00	1.96	2.68	3.39	**3.89**	0.00	2.39	**4.06**	**5.86**	0.00	2.90	*scl06*
1230						52	0	58					86	**35**	0	**62**	**51**	0	52	0	**70**	41	**67**	**88**	29	21	**64**	54	0	0	44	77	57	**24**	0	43	**73**	**70**		80	1230
scl07							0.00	**4.05**	0.00	**6.89**	0.00	2.42	3.43	1.06	0.00	1.10	2.42	0.00	1.76	3.34	**5.54**	**4.50**	**4.02**	0.94	3.09	**4.54**	0.66	**4.66**	2.71	0.00	**5.26**	2.65	3.44	**5.02**	**6.16**	4.37	0.00	0.00	3.17	2.51	*scl07*
1178							0	**110**	0	**29**	0	18	73	75	0	21	40	0	109	32	**110**	**99**	**110**	110	81	**79**	28	**88**	24	0	**102**	110	62	**82**	**72**	90	39	0	38	86	1178
scl09								2.57	0.22	3.24	0.00	2.81	0.00	0.00	0.00	0.00	0.00	2.69	0.00	**4.03**	**3.52**	2.91	1.76	3.36	0.00	2.41	0.00	0.00	**6.37**	**4.03**	0.00	1.95	0.00	2.25	**3.90**	0.00	0.00	0.00	2.45	0.00	*scl09*
1079								45	33	78	0	80	0	0	0		0	48	0	**80**	**38**	32	19	59		80	0	0	**80**	**75**	35	34	0	34	**53**	0	0	0	54	0	1079
scl1024									0.00	**4.18**	0.00	3.27	3.20	**4.73**	0.00	0.00	0.23	0.00	**5.82**	**3.71**	**4.86**	**8.10**	**3.90**	**7.83**	**5.27**	**4.81**	0.34	2.72	3.27	**4.01**	**4.82**	3.08	3.26	**4.66**	**5.10**	**8.20**	1.87	1.21	1.68	**4.42**	*scl1024*
1184									0	**63**	0	52	79	**75**	0	27	46		**109**	**66**	**143**	**120**	**124**	**150**	**81**	**113**	34	90	58	**40**	**126**	139	67	**105**	**106**	**90**	45	24	72	**92**	1184
scl117										0.88	**5.63**	3.27	0.00	0.00	**6.94**	0.00	0.00	**4.80**	0.00	0.42	0.00	0.00	0.00	0.00	0.00	2.07	0.00	0.00	0.69	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*scl117*
1032										31	**67**	54	0	0	**82**	0	0	**89**	0	35	0	0	0	0	0	33	0	0	39	51	0	0	0	0	0	0	0	0	0	0	1032
scl12											0.00	**4.63**	0.00	0.00	0.00	0.00	0.00	**4.17**	0.93	**5.69**	3.44	3.19	1.53	2.34	0.92	**6.08**	0.00	0.00	2.71	**5.53**	2.67	1.07	0.00	3.26	**8.05**	0.00	0.00	0.00	2.30	0.00	*scl12*
1097											0	**85**	0	0	0	0	0	**46**	28	**96**	56	50	37	77	23	**96**	0	0	91	**73**	53	52	0	52	**71**	0	0	0	72	0	1097
scl13												0.00	0.00	0.00	2.60	0.00	0.00	**3.76**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*scl13*
963												0	0	0	44	0	0	**20**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	963
scl1422													0.00	0.00	3.80	0.00	0.00	**4.57**	0.00	**8.22**	4.42	**4.20**	1.69	2.21	0.00	**6.03**	0.00	0.00	**4.88**	**4.46**	2.57	2.43	0.00	**6.39**	**6.41**	0.00	0.00	0.00	**4.65**	0.00	*scl1422*
1086													0	0	23	0	0	**69**	0	**89**	45	**39**	26	66	0	**87**	0	0	**93**	**93**	42	41	0	**41**	**60**	0	0	0	**61**	0	1086
scl15														2.91	0.00	2.26	2.52	0.00	2.82	0.00	6.37	3.13	3.38	3.88	2.86	**5.74**	**3.53**	**3.59**	0.00	0.00	4.72	**3.58**	**4.74**	**4.70**	**3.66**	**3.69**	**3.54**	1.70	0.00	**4.41**	*scl15*
1212														56	0	55	51	0	73	0	91	62	88	107	50	**42**	**62**	**75**	0	0	65	**98**	**67**	**45**	**35**	**64**	**73**	52	0	**101**	1212
scl16															0.00	0.00	2.93	0.00	**4.05**	0.00	2.33	2.72	1.99	**7.68**	3.19	1.58	0.00	2.83	0.00	0.00	3.25	**4.06**	2.70	**4.82**	2.30	**4.91**	3.24	0.00	1.02	2.52	*scl16*
1161															0	0	23	0	**75**	0	75	75	75	**75**	69	61	0	71	0		75	**75**	45	**64**	54	**75**	22	0	20	69	1161
scl19																0.00	0.00	**5.35**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*scl19*
1001																0	0	**58**	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	1001
scl21																	0.95	0.00	0.00	0.00	1.65	0.00	2.13	1.88	0.00	0.00	2.09	0.13	0.00	0.00	0.00	0.79	0.76	0.00	0.00	0.00	1.96	3.10	0.00	1.02	*scl21*
1219																	32	0	21	0	39	0	36	57	0	0	57	23	0	0	0	46	26	0	0	0	55	59	0	49	1219
scl23																		0.00	2.59	0.00	3.23	2.38	3.24	2.43	1.29	0.00	**4.34**	3.11	0.00	0.00	2.51	3.23	**4.57**	0.00	0.00	1.22	3.12	2.64	0.00	2.53	*scl23*
1189																		0	40	0	51	29	51	51	17	0	**39**	42	0	0	32	51	**45**	0	0	31	50	29	0	51	1189
scl25																			0.00	**4.27**	0.00	0.00	0.00	1.54	0.00	**4.82**	0.00	0.00	1.26	1.07	0.00	0.00	0.00	0.00	**3.78**	0.00	0.00	0.00	0.00	0.00	*scl25*
1047																			0	**50**	0	0	0	27	0	**48**	0	0	54	66	0	0	0	0	**21**	0	0	0	22	0	1047
scl26																				2.28	**3.77**	**4.73**	**4.11**	**5.42**	3.11	2.45	1.82	**3.77**	2.13	0.00	**3.67**	**4.37**	2.89	3.11	**3.64**	**6.45**	2.97	0.00	2.16	3.00	*scl26*
1178																				31	**109**	**98**	**109**	**109**	81	78	28	**88**	23	0	**101**	**109**	62	81	**71**	**90**	39	0	37	86	1178
scl27																					**5.14**	**3.93**	2.91	2.91	2.78	**6.34**	0.00	0.00	**4.17**	**6.69**	2.94	**5.87**	0.00	**8.30**	**7.63**	2.64	0.00	0.00	4.70	0.00	*scl27*
1100																					**59**	**53**	40	80	26	**101**			**95**	**77**	56	**55**	0	**55**	**74**	21	0	0	75	0	1100
scl28																						**6.14**	**3.72**	**4.13**	**3.51**	**3.63**	**4.71**	**6.15**	**6.12**	2.83	**4.43**	**4.06**	**4.73**	**5.77**	**6.74**	**4.76**	1.97	2.87	**3.93**	**5.20**	*scl28*
1196																						**120**	**133**	**155**	**81**	**106**	**46**	**90**	**51**	33	**126**	**151**	**67**	**105**	**99**	**90**	57	36	**65**	**104**	1196
scl29																							**6.91**	**5.96**	**5.48**	2.79	0.00	**4.30**	**3.56**	2.83	3.00	3.29	2.10	**5.58**	**5.80**	**7.20**	1.36	0.00	2.12	**3.51**	*scl29*
1167																							**107**	**120**	**81**	100	0	**77**	**45**	27	120	120	51	**103**	**93**	**88**	28	0	59	**75**	1167
scl31																								3.44	**4.20**	1.95	2.75	**5.20**	1.21	0.00	**3.66**	**3.77**	1.79	3.48	1.90	**5.46**	2.66	3.28	0.44	**3.72**	*scl31*
1193																								133	**81**	87	43	**90**	32	0	**110**	**133**	67	90	80	**90**	54	33	46	**101**	1193
scl3245																									**4.87**	2.13	1.92	**3.68**	3.16	**5.62**	2.84	2.89	3.02	**4.13**	**3.76**	**7.30**	1.86	2.34	1.36	**4.21**	*scl3245*
1214																									**81**	127	64	**90**	72	**54**	126	158	67	**105**	**114**	90	73	54	81	**114**	1214
scl33																										**3.52**	0.00	**4.38**	1.94	0.00	**5.81**	**3.76**	3.19	**5.26**	3.24	**4.62**	0.00	0.00	2.55	2.73	*scl33*
1155																										**73**	0	**65**	18	0	**81**	**81**	39	**76**	66	**76**	0	0	32	63	1155
scl36																											0.00	3.18	1.84	**4.16**	**5.58**	**4.35**	**5.24**	**6.03**	**6.83**	3.18	0.00	0.00	3.16	3.20	*scl36*
1147																											0	57	93	**75**	**103**	**102**	**31**	**102**	**114**	68	0	0	81	55	1147
scl37																												4.26	0.00	0.00	0.94	**3.56**	**3.85**	0.00	0.00	0.00	**4.23**	2.67	0.00	**4.17**	*scl37*
1214																												30	0	0	20	**53**	**33**	0	0	19	**62**	54	0	**56**	1214

Sample:	*scl41*	*scl42*	*scl43*	*scl46*	*scl47*	*scl48*	*scl49*	*scl50*	*scl5248*	*scl53*	*scl55*	*scl5961*	*Sample:*
Last ring date:	1092	1074	1170	1203	1183	1150	1140	1169	1212	1230	1106	1206	*Last ring date:*
scl38	0.00	0.00	**4.16**	**4.77**	**3.98**	3.44	**4.79**	**5.27**	1.87	1.16	1.34	**4.68**	*scl38*
1180	0	0	**80**	**90**	**64**	60	**50**	**79**	41	20	16	**88**	1180
scl41		**4.32**	0.06	3.28	0.00	3.24	**5.63**	0.00	0.00	0.00	3.16	0.00	*scl41*
1092		**81**	48	47	0	47	**66**	0	0	0	67	0	1092
scl42			1.17	1.73	0.00	3.20	**4.43**	0.00	0.00	0.00	2.53	0.00	*scl42*
1074			30	29	0	29	**48**	0	0	0	49	0	1074
scl43				**4.51**	**8.39**	**5.63**	**5.72**	**5.45**	1.58	0.00	2.18	**4.14**	*scl43*
1170				**125**	**54**	**105**	**96**	**90**	31		62	**78**	1170
scl46					**3.63**	**7.23**	**5.79**	**4.34**	1.97	1.59	**5.28**	3.08	*scl46*
1203					**67**	**105**	**95**	**90**	64	43	**61**	111	1203
scl47						3.01	**3.76**	3.01	2.54	2.03	0.00	**3.81**	*scl47*
1183						34	**24**	53	44	23		**67**	1183
scl48							**6.88**	**4.65**	0.00	0.00	**6.93**	2.68	*scl48*
1150							**95**	**71**	0	0	**61**	58	1150
scl49								**4.64**	0.00	0.00	**5.05**	**3.95**	*scl49*
1140								**61**	0	0	**80**	**48**	1140
scl50									1.15	0.00	1.17	**5.41**	*scl50*
1169									30	0	27	**77**	1169
scl5248										**3.84**	0.00	**4.75**	*scl5248*
1212										**52**	0	**67**	1212
scl53											0.00	3.19	*scl53*
1230											0	46	1230
scl55												0.00	*scl55*
1106												0	1106

Table 33: Ring-width data for site master curve

SARUM4 AD 878-1230 North Nave Triforium roof, Salisbury Cathedral - Irish imported material: roof boards 41-timber mean

353 rings, starting date AD 878

ring widths (0.01mm)

60	44	52	55	38	47	55	18	31	44
40	28	61	54	83	72	97	77	94	149
158	149	140	135	104	106	108	114	112	125
136	113	115	109	141	122	156	112	89	129
111	85	70	86	118	119	96	85	50	82
107	111	118	103	122	106	115	84	96	109
79	65	107	90	71	59	77	77	93	78
102	90	89	62	81	92	112	112	66	103
96	102	89	104	92	136	98	84	102	84
114	82	95	111	106	62	66	86	85	116
85	105	128	89	110	135	88	81	117	117
97	105	118	135	103	112	83	88	119	126
114	115	119	126	131	101	69	101	92	105
104	106	108	84	72	92	86	103	82	107
122	89	93	92	89	100	82	97	107	104
107	85	119	105	82	91	125	128	103	113
105	92	110	92	122	88	73	104	102	118
99	94	84	119	94	85	54	91	95	77
93	80	104	118	84	79	94	77	91	94
82	100	105	86	82	99	96	131	118	94
125	116	100	87	88	108	74	109	86	94
104	86	76	76	85	127	96	103	86	117
96	94	78	60	63	72	62	97	101	84
88	90	74	81	67	56	67	115	107	118
129	85	100	106	96	76	74	81	84	105
109	72	111	95	68	63	63	96	81	84
103	93	121	107	101	87	90	113	110	93
101	121	95	107	99	109	97	86	113	109
88	84	80	78	77	90	102	86	91	95
97	106	95	90	95	81	83	79	97	70
112	151	111	96	115	99	74	97	87	97
73	83	86	94	93	93	91	104	98	82
87	87	93	89	96	104	67	81	82	80
80	91	134	119	109	108	102	99	92	96
90	94	87	99	84	105	87	99	116	92
107	122	130							

number of samples in master

1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	2
2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2
2	2	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	4	4	4	4
4	4	4	4	4	4	4	4	4	4
4	4	4	4	4	5	4	4	4	4
4	4	4	4	4	4	4	4	4	4
4	5	5	5	6	6	6	6	6	6
6	6	6	6	6	6	7	7	7	7
8	8	10	10	10	10	10	10	10	10
10	10	10	10	10	10	10	10	10	10
10	10	10	11	11	11	12	12	13	14
14	14	14	14	15	14	14	15	15	15
15	15	15	15	16	16	16	17	19	19
19	19	19	19	19	19	19	19	19	19
19	19	19	20	19	19	19	19	19	19
19	20	21	21	21	21	21	22	22	22
22	22	22	22	22	22	22	22	22	22
22	22	22	23	23	23	23	23	23	23
22	22	22	21	21	21	21	21	22	21
21	21	21	21	21	21	21	21	21	22
22	22	22	22	22	22	22	22	22	23
23	23	23	23	23	23	23	23	23	23
24	25	26	25	25	25	25	25	25	25
24	24	24	24	24	24	24	24	23	23
24	24	24	25	24	24	24	24	24	24
23	23	22	21	21	21	21	21	21	21
21	19	19	18	18	18	17	16	16	16
16	16	15	15	15	15	14	14	14	13
13	13	13	13	13	13	12	12	12	11
11	11	11	11	10	8	7	5	5	5
5	5	4	4	3	3	3	3	3	3
3	3	2							

Table 34: Dating of the Irish chronologies ***SARUM1*** and ***SARUM4*** against English and Irish reference chronologies at AD 1221 and AD 1230 respectively

English chronologies		*SARUM1 at 1221*		*SARUM4 at 1230*	
Reference chronology	**Spanning**	**Overlap**	***t*-value**	**Overlap**	***t*-value**
LONDON *(Tyers pers com)*	413-1728	314	6.75	353	7.50
EASTMID *(Laxton and Litton 1988)*	882-1981	314	7.08	349	7.11
SALOP95 *(Miles 1995)*	881-1745	314	6.71	350	9.05
WALES97 *(Miles 1997b)*	404-1981	314	10.37	353	10.80
SOUTH *(Hillam and Groves 1994)*	406-1594	314	9.63	353	11.32
ENGLAND *(Baillie and Pilcher 1982)*	404-1981	314	9.76	353	12.94

Irish chronologies		*SARUM1 at 1221*		*SARUM4 at 1230*	
Reference chronology	**Spanning**	**Overlap**	***t*-value**	**Overlap**	***t*-value**
LIGONIEL *(Brown pers comm)*	919-1072	154	4.00	154	3.63
SUMMERVI *(Brown pers comm)*	851-1001	94	4.02	124	3.87
TOOME *(Baillie 1982)*	936-1598	286	5.21	295	5.34
ATHLONE *(Brown pers comm)*	872-1138	231	3.20	261	5.39
CLONLONA *(Brown pers comm)*	984-1117	134	5.80	134	5.84
BELFAST *(Baillie 1977c)*	1001-1970	221	4.40	230	6.49
KILMAINH *(Brown pers comm)*	949-1273	273	4.80	282	6.58
BLOOMHIL *(Brown pers comm)*	1059-1194	136	6.80	136	6.36
CRO-INIS *(Brown pers comm)*	938-1075	138	8.04	138	8.72
TRIM_CAS *(Condit 1996)*	974-1203	230	8.69	230	9.15
CORK1 *(Brown forthcoming)*	957-1249	265	8.15	274	12.28
DROGHEDA *(Sweetman 1994)*	921-1194	274	10.14	274	12.23
ABBEY *(Brown pers comm)*	936-1240	286	10.98	295	14.32
WATERFOR *(Brown 1997)*	839-1216	309	13.10	339	15.29
SARUM1 *(Miles and Worthington 2000)*	908-1221			314	17.99
SARUM4 *(Miles and Worthington 2001)*	878-1230	314	17.99		
DUBLIN1 *(Baillie 1977a)*	895-1306	314	18.02	353	14.92
EARLYAD *(Brown pers comm)*	400-1600	314	17.54	353	16.92
NEWROSS *(Brown pers comm)*	907-1278	314	17.24	324	19.18

Chronology names in **bold** are composite regional masters

Table 35: Grouping of thirteenth-century timbers from Eastern Chapels (*scec*) and North Triforium (*scnt* and *scl*) using the Litton-Zainodin Grouping Procedure (after Litton *pers comm*)

IRISH TIMBERS — *ENGLISH TIMBERS*

$t > 10$

Group	Timbers
A	*scl52, scl54, scl58*
B	*scl59, scl61*
C	*scl11, scl17*
D	*scec7, scec48, scec57, scec59, scl14, scl22, scl27, scl40, scl48*
E	*scl32, scl34, scl45*
F	*scec17, scec71*
G	*scec30, scec44*
H	*scl10, scl24*
I	*scec1, scec9, scec52*
J	*scec2, scec5, scec12, scec22, scec23, scec24, scec27, scec29, scec43, scec45, scec46, scec55, scec56, scec61, scec62*
K (English)	*scnt02, scnt04, scl105*
L (English)	*scl104, scnt03*

$t > 8$

Group	Timbers
(B+C+D+E+F+G+H+I+J)+M	*scec4, scec5, scec19, scec21, scec42, scec47, scec53, scec54, scec69, scec70, scl1, scl2, scl3, scl5, scl12, scl15, scl25, scl28, scl29, scl36, scl40, scl43, scl47, scl49, scl50*
N	*scnt09, scnt38*
K+O	*scnt05*
P	*scnt43, scnt46*

$t > 6$

Group	Timbers
(A+B+C+D+E+F+G+H+I+J)+Q	*scec16, scec25, scec38, scec41, scec42, scec46, scec49, scec64, scl4, scl6, scl19, scl33, scnt28*
R	*scec8, scnt30*
N+S	*scec31, scnt19*
(K+O+L)+T	*scnt01, scnt14, scnt16, scnt17, scnt18, scnt32*

$t > 5$

Group	Timbers
U	*scl9, scl41, scl56*
(A+B+C+D+E+F+G+H+I+J+Q)+V	*scec63, scec65, scec66, scec72, scl8, scl13, scl16, scl23, scl26, scl37, scl55, scnt13, scnt36, scnt42, scnt44*

IRISH TIMBERS — *ENGLISH TIMBERS*

Table 36: Combining of multiple radii from individual sample *scl79* to form same-timber mean

Samples:	*t - value:*	*overlap:*	*combined mean:*
scl79a + scl79b	14.49	55	***scl79***

Table 37: Combining of individual samples to form same-tree means

Samples:	*t - value:*	*overlap:*	*combined mean:*
scl80 + scl83	6.25	35	***scl8083***
scl89 + scl92	10.33	40	***scl8992***

Table 38: Matrix of *t* -values and overlaps for components of ***sarum5a***

Sample:	***scnt20***	***scnt21***	***scnt22***	***scnt27***	***scl66***	***scl69***	***scl74***	***scl84***
Last ring date AD:	1661	1661	1661	1661	1656	1661	1633	1661
scnt08	14.47 **86**	12.16 **88**	16.36 **95**	13.20 **72**	14.60 **70**	9.83 **52**	12.90 **66**	7.12 **55**
scnt20		7.17 **86**	10.90 **86**	8.72 **72**	11.61 **70**	10.68 **52**	9.94 **58**	9.57 **55**
scnt21			9.04 **88**	12.79 **72**	7.52 **70**	5.76 **52**	6.59 **60**	3.74 **55**
scnt22				10.99 **72**	11.04 **70**	8.46 **52**	8.84 **66**	6.84 **55**
scnt27					9.21 **67**	6.63 **52**	6.43 **44**	4.77 **55**
scl66						16.32 **47**	19.72 **47**	10.47 **50**
scl69							10.77 **24**	11.05 **52**
scl74								7.86 **27**

Table 39: Matrix of *t* -values and overlaps for components of ***sarum5b***

Sample:	***scl64***	***scl79***
Last ring date AD:	1661	1647
scl63	7.73 **30**	9.47 **51**
scl64		11.11 **35**

Table 40: Matrix of *t* -values and overlaps for components of ***sarum5c***

Sample:	***scl71***	***scl73***	***scl77***
Last ring date AD:	1655	1635	1662
scl65	10.75 / **62**	11.56 / **58**	6.55 / **21**
	scl71	10.33 / **56**	8.25 / **35**
		scl73	2.81 / 15

Table 41: Matrix of *t* -values and overlaps for components of ***sarum5d***

Sample:	***scl75***	***scl78***	***scl82***	***scl86***	***scl87***
Last ring date AD:	1648	1638	1639	1660	1647
scl67	13.22 / **44**	15.36 / **45**	14.02 / **45**	17.18 / **41**	8.43 / **50**
	scl75	9.22 / **37**	14.68 / **38**	13.15 / **44**	8.33 / **46**
		scl78	10.48 / **44**	14.20 / **34**	7.08 / **43**
			scl82	14.04 / **35**	7.60 / **44**
				scl86	11.15 / **43**

Table 42: Matrix of *t* -values and overlaps for components of ***sarum5e***

Sample:	***scnt39***
Last ring date AD:	1660
scnt33	11.65 / **69**

Table 43: Ring-width data for site master curve

SARUM5 AD 1558-1662 Structural timbers and roof boards - North Nave Triforium roof, Salisbury Cathedral

105 rings, starting date AD 1558

ring widths (0.01mm)

320	276	364	302	361	362	420	290	198	181
207	296	303	297	297	265	268	224	204	227
212	181	235	199	197	202	227	262	215	232
240	282	188	222	280	337	311	226	184	158
159	109	139	175	182	204	212	177	261	212
204	171	174	165	144	200	170	201	205	248
235	181	173	163	161	162	145	165	174	138
156	185	137	109	163	142	105	128	156	155
166	136	154	141	126	111	104	109	124	103
182	120	123	95	109	101	110	104	109	133
120	93	106	124	94					

number of samples in master

1	1	1	1	1	1	1	1	1	1
1	1	1	2	2	2	2	3	3	3
4	4	4	4	5	5	6	6	7	8
9	9	9	9	9	9	10	10	10	10
10	10	10	10	10	10	10	10	10	10
10	10	10	10	10	10	10	10	10	10
10	10	10	10	10	10	10	10	10	10
10	10	10	10	10	10	10	11	11	10
10	10	10	10	10	10	9	9	9	9
9	9	9	9	9	9	8	8	8	8
8	8	8	6	1					

Table 44: Dating of ***SARUM5*** (AD 1558-1662) against reference chronologies at AD 1662

Reference chronology	Spanning	Overlap	t-value
EASTMID *(Laxton and Litton 1988)*	882-1981	105	4.86
WALES97 *(Miles 1997b)*	404-1981	105	5.90
LONDON *(Tyers pers com)*	413-1728	105	6.16
OXON93 *(Haddon-Reece et al 1993)*	632-1987	105	6.23
MC16 *(Fletcher 1978)*	1314-1636	79	6.44
THEVYNE3 *(Miles and Worthington 1997)*	1543-1653	96	6.93
MARLBORO *(Miles and Haddon-Reece 1995)*	1576-1655	80	7.37
YATTON 2 *(Tyers and Wilson 1999)*	1564-1691	99	7.64
SHPTNMLT *(Miles 2002)*	1518-1677	105	7.72
WILBURY2 *(Miles and Worthington 1999)*	1581-1657	77	8.15
SARUMBP7 *(Miles and Worthington 2000)*	1562-1661	100	11.19

Chronology names in **bold** are composite regional masters

Table 45: Matrix of t -values and overlaps for components of ***SARUM6***

Sample:	***scl95***
Last ring date AD:	1668
scl94	**11.31** **51**

Table 46: Ring-width data for site master curve

SARUM6 AD 1604-68 Roof boards - North Porch roof, Salisbury Cathedral

65 rings, starting date AD 1604

ring widths (0.01mm)

256	179	229	174	172	159	211	172	120	230
150	138	152	197	168	132	162	299	222	217
205	361	338	265	276	247	210	154	222	223
127	157	127	134	264	219	227	168	224	205
145	149	161	130	201	158	161	148	113	108
113	127	127	122	153	100	113	129	123	156
115	103	114	114	211					

number of samples in master

1	1	1	1	1	1	1	1	1	1
1	1	1	1	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2
2	2	2	2	2					

Table 47: Dating of ***SARUM6*** (AD 1604-68) against reference chronologies at AD 1668

	Reference chronology	**Spanning**	**Overlap**	**t-value**
	BRADNM1 *(Miles and Worthington 1998)*	1553-1652	49	4.15
	grtn11 *(Miles and Worthington forthcoming)*	1587-1685	65	4.48
	SARUMBP7 *(Miles and Worthington 2000)*	1562-1661	58	4.79
*§	NEWING *(Haddon-Reece et al 1987)*	1540-1678	65	5.21
	SARUM5	1558-1662	59	5.25
*	DEVIZESB *(Haddon-Reece et al 1990)*	1447-1647	44	5.40
	SHPTNMLT *(Miles 2002)*	1518-1677	65	5.57
	HILLHAL2 *(Bridge 1999)*	1525-1681	65	5.66
	YATTON2 *(Tyers and Wilson 1999)*	1564-1691	65	5.71
	THEVYNE3 *(Miles and Worthington 1997)*	1543-1653	50	5.96
	MASTERAL *(Haddon-Reece and Miles 1993)*	404-1987	65	6.31
	OXON93 *(Haddon-Reece et al 1993)*	632-1987	65	6.41

Chronology names in **bold** are composite regional masters

* Component of MASTERAL

§ Component of OXON93

Table 48: Matrix of *t* -values and overlaps for components of ***SARUM7***

Sample:	***scl72***	***scl8992***	***scl90***	***scl91***	***scl93***
Last ring date AD:	1731	1735	1735	1735	1735
scl68	**8.32** **33**	**3.54** **37**	**3.61** **37**	**5.12** **37**	**4.22** **37**
	scl72	**5.03** **55**	3.35 42	**5.85** **47**	**5.44** **40**
		scl8992	**5.94** **46**	**3.94** **51**	**3.89** **44**
			scl90	**4.18** **46**	**4.24** **44**
				scl91	**8.23** **44**

Table 49: Ring-width data for site master curve

SARUM7 AD 1672-1735 Roof boards - North Nave Triforium and North Porch roofs, Salisbury Cathedral

64 rings, starting date AD 1672

ring widths (0.01mm)										number of samples in master									
139	208	184	247	291	338	223	207	254	200	1	1	1	1	1	2	2	2	2	2
173	126	103	99	158	190	154	163	194	215	2	2	2	3	3	3	3	3	4	4
164	152	145	118	128	162	168	151	186	152	5	5	5	5	5	5	5	6	6	6
93	105	135	93	111	133	107	144	101	109	6	6	6	6	6	6	6	6	6	6
167	187	122	124	127	131	101	105	155	204	6	6	6	6	6	6	6	6	6	6
196	162	245	165	186	219	167	169	197	192	6	6	6	6	6	6	6	6	6	6
220	213	212	193							5	5	5	5						

Table 50: Dating of ***SARUM7*** (AD 1672-1735) against reference chronologies at AD 1735

	Reference chronology	Spanning	Overlap	t-value
	EASTMID *(Laxton and Litton 1988)*	882-1981	64	4.22
	SENG98 *(Bridge 1998)*	944-1790	64	4.90
	OXON93 *(Haddon-Reece et al 1993)*	632-1987	64	5.28
*	**MC19** *(Fletcher 1978)*	1399-1800	64	5.41
	THEHOVEL *(Miles and Worthington 1999)*	1671-1811	64	5.49
*§	BARN *(Haddon-Reece et al 1987)*	1658-1739	64	5.51
	HANTS97 *(Miles 1997c)*	1041-1972	64	5.63
	MASTERAL *(Haddon-Reece and Miles 1993)*	404-1987	64	5.64
	MDM17b *(Miles and Haddon-Reece 1995)*	1664-1776	64	5.82
	SARUMBP8 *(Miles and Worthington 2000)*	1616-1735	64	6.31
	STEPCOTT *(Miles and Worthington 1998)*	1688-1809	48	6.44
‡	**BAREFOOT** *(Barefoot 1975)*	1635-1972	64	6.54
	HWC01 *(Bridge 2000b)*	1734-1783	52	7.59
	MDM15c *(Miles and Worthington 2000)*	1658-1739	64	8.59

Chronology names in **bold** are composite regional masters
* Component of MASTERAL
§ Component of OXON93
‡ Component of HANTS97

APPENDIX 1: Drawings showing location of samples (after Jones)

Eastern Chapels:
St Peter's (Northern Chapel)

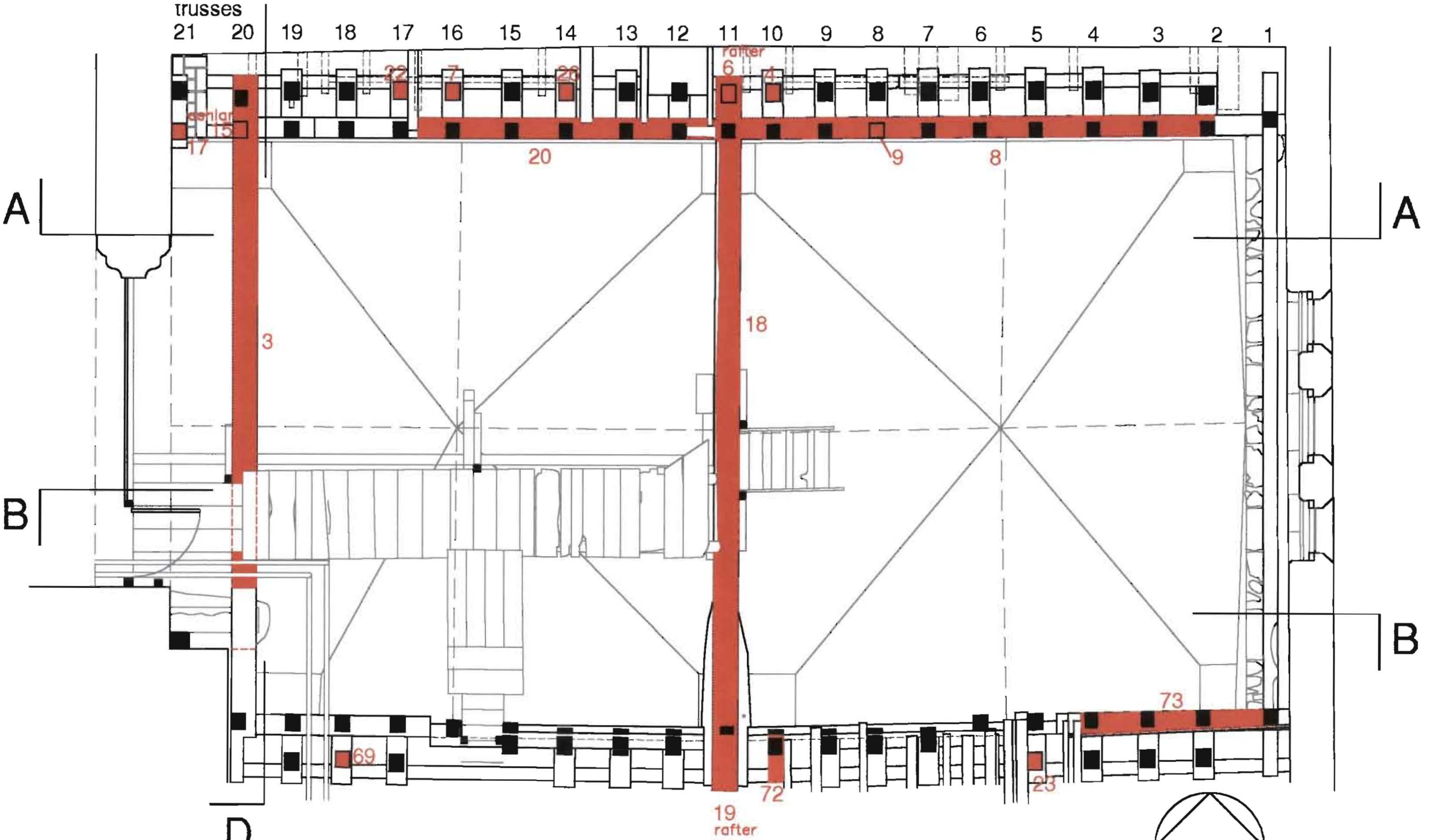
page 95	Plan at wallplate level	Samples *scec3, 4, 6, 7, 8, 15, 17, 18, 19, 20, 22, 23, 26, 69, 72, 73*
page 96	Section A-A looking north	Samples *scec1, 3, 4, 6, 7, 8, 14, 15, 16, 17, 18, 22, 26*
page 97	Section B-B looking south	Samples *scec2, 3, 5, 13, 14, 16, 18, 19, 23, 24, 25, 69 70, 71, 73*
page 98	Section D-D looking west	Samples *scec3, 13, 14, 15*

St Stephen's (Southern Chapel)

page 99	Plan at wallplate level	Samples *scec12, 29, 41, 42, 43, 44, 45, 46, 48, 50, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68*
page 100	Section K-K looking north	Samples *scec12, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 56*
page 101	Section L-L looking south	Samples *scec29, 49, 52, 53, 54, 55, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68*
page 102	Section N-N looking west	Sample *scec68*

North Nave Triforium Roof

page 103	Nave NW Triforium Plan	Samples *scnt01, scnt06*
page 104	Truss No 1 (diagonal) east face	Sample *scnt01*
page 105	Truss No 2E east face	Samples *scnt02, 03*
page 106	Truss No 3 west face	Samples *scnt04, 05*
page 107	Truss No 5 west face	Samples *scnt06, 07*
page 108	Truss No 6W west face	Samples *scnt08b, 08c*
page 109	Truss No 6E east face	Sample *scnt08a*
page 110	Truss No 7 west face	Samples *scnt09*
page 111	Truss No 8W west face	Sample *scnt10*
page 112	Nave Triforium (centre) Plan	Samples *scnt11, 12*
page 113	Truss No 9 west face	Sample *scnt11*
page 114	Nave NE Triforium Plan	Samples *scnt19, 21, 22, 26, 27, 33, 38, 39, 40*



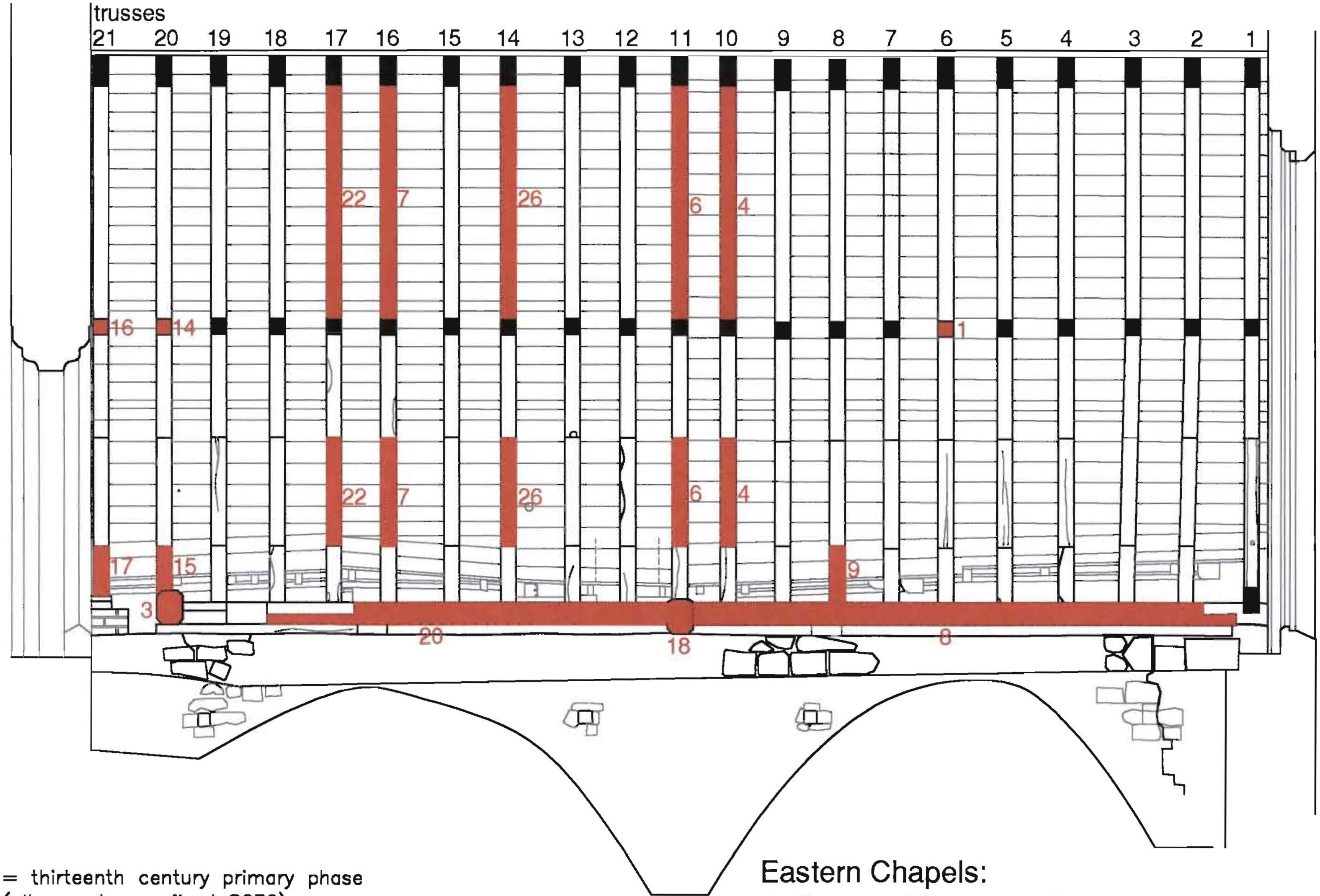
= thirteenth century primary phase (all samples prefixed SCEC)

0 1 2 3 4 metres

Eastern Chapels:
St Peter's (Northern Chapel) Roof

Plan at wallplate level (Jones 1998 & 2002)

revised October 2002

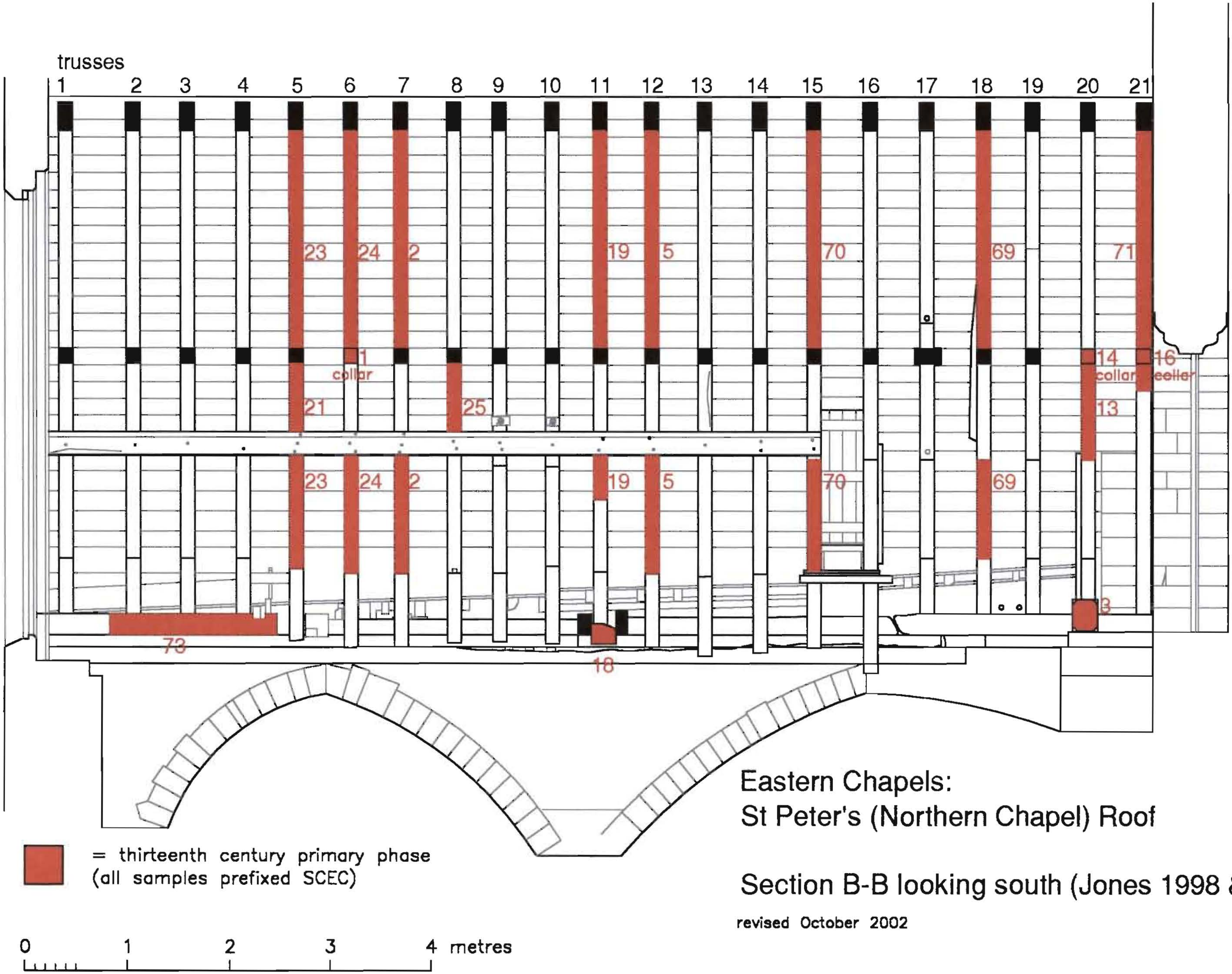


= thirteenth century primary phase
(all samples prefixed SCEC)

Eastern Chapels:
St Peter's (Northern Chapel) Roof

Section A-A looking north (Jones 1998 & 2002)

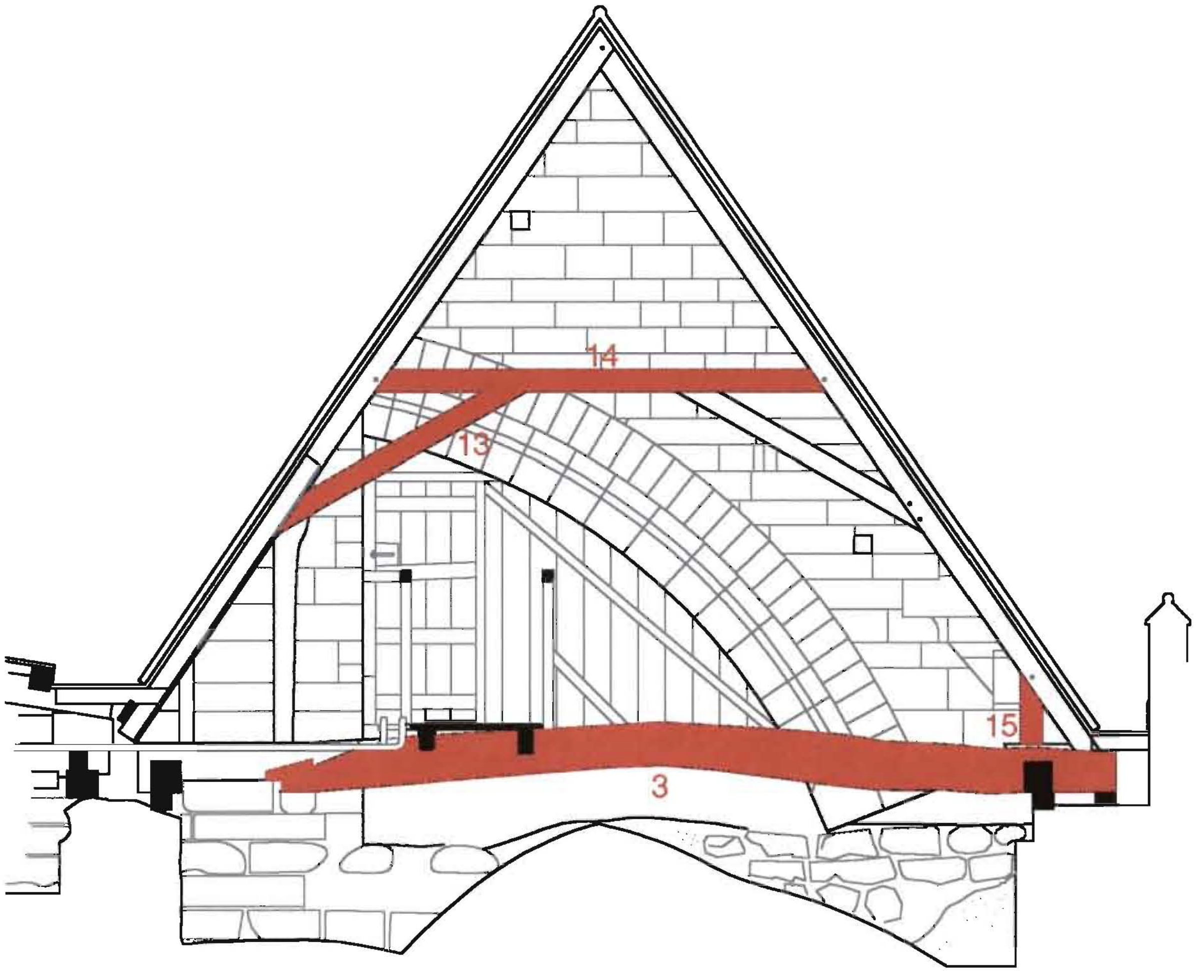
revised October 2002



Eastern Chapels:
St Peter's (Northern Chapel) Roof

Section B-B looking south (Jones 1998 & 2002

revised October 2002

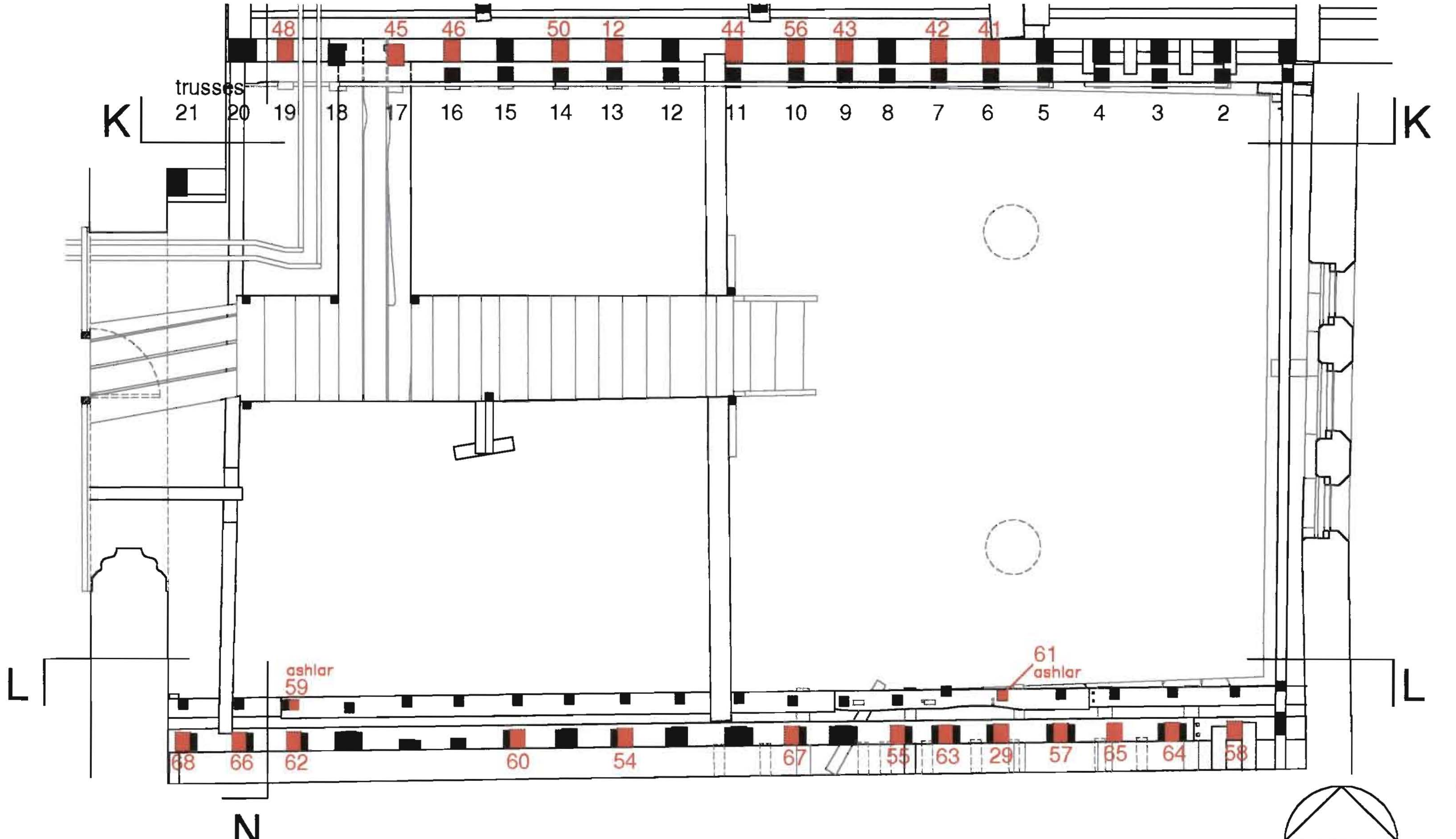


= thirteenth century primary phase
(all samples prefixed SCEC)

0 1 2 3 4 metres

Eastern Chapels:
St Peter's (Northern Chapel) Roof

Section D-D looking west (Jones 1998 & 2002)



= thirteenth century primary phase (all samples prefixed SCEC)

0 1 2 3 4 metres

Eastern Chapels:
St Stephen's (Southern Chapel) Roof

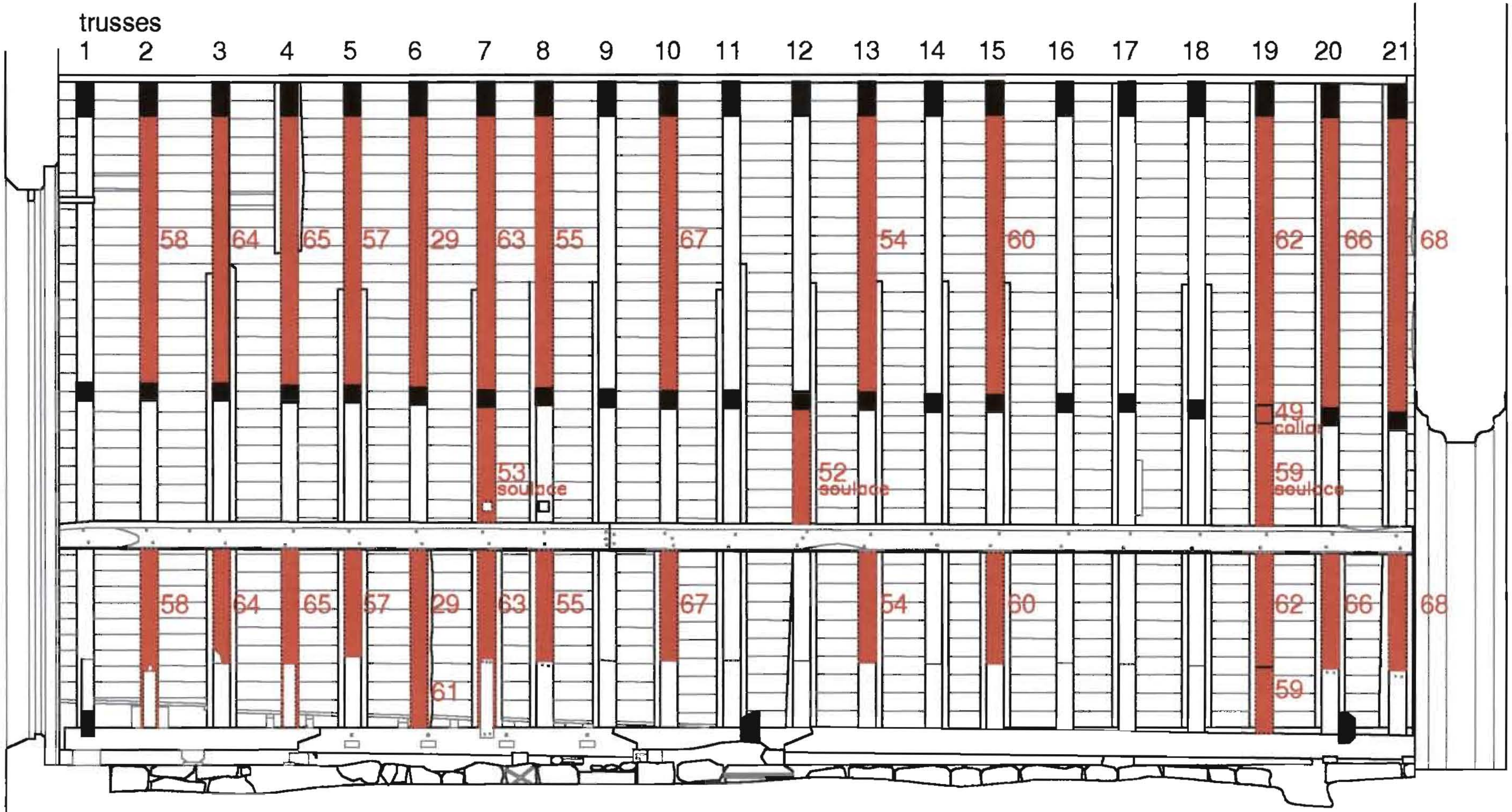
Plan at wallplate level (Jones 1998 & 2002)

revised October 2002

Eastern Chapels:
St Stephen's (Southern Chapel) Roof

Section K-K looking north (Jones 1998 & 2002)

revised October 2002



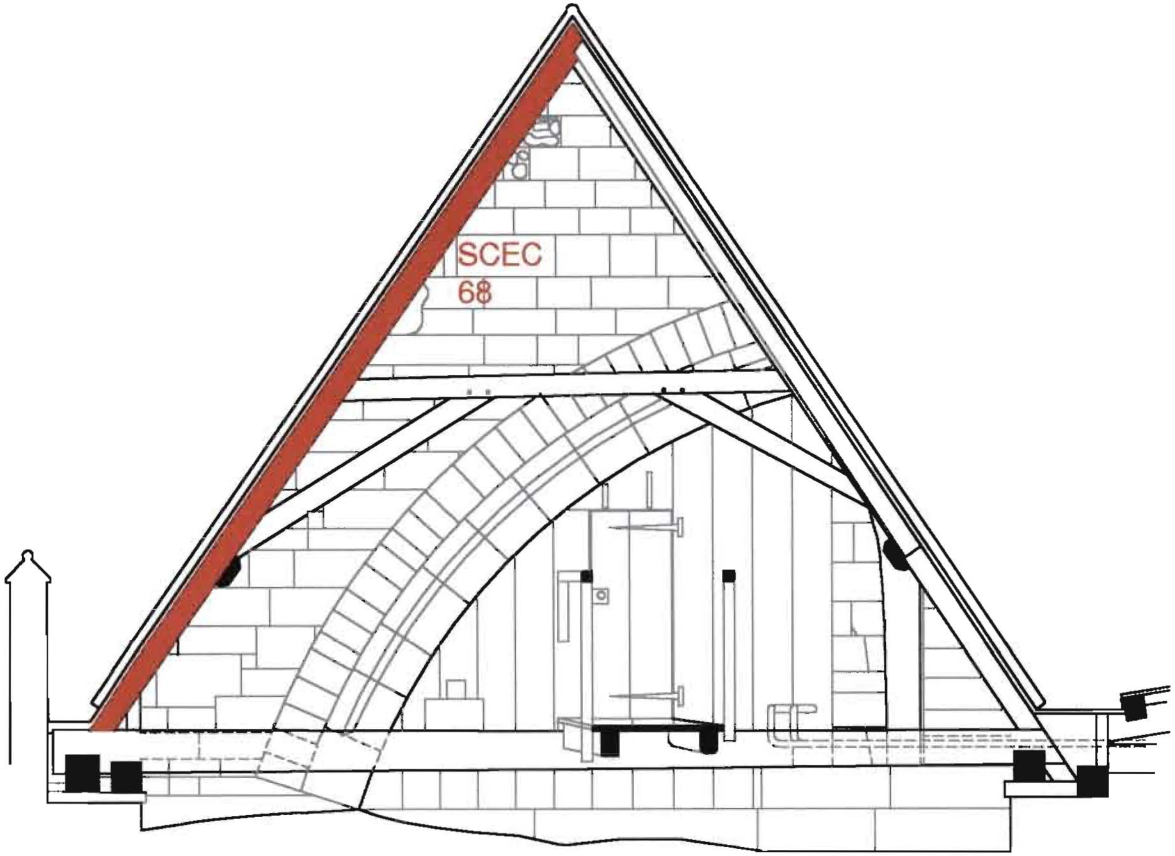
= thirteenth century primary phase
(all samples prefixed SCEC)

0 1 2 3 4 metres

Eastern Chapels:
St Stephen's (Southern Chapel) Roof

Section L-L looking south (Jones 1998 & 2002)

revised October 2002

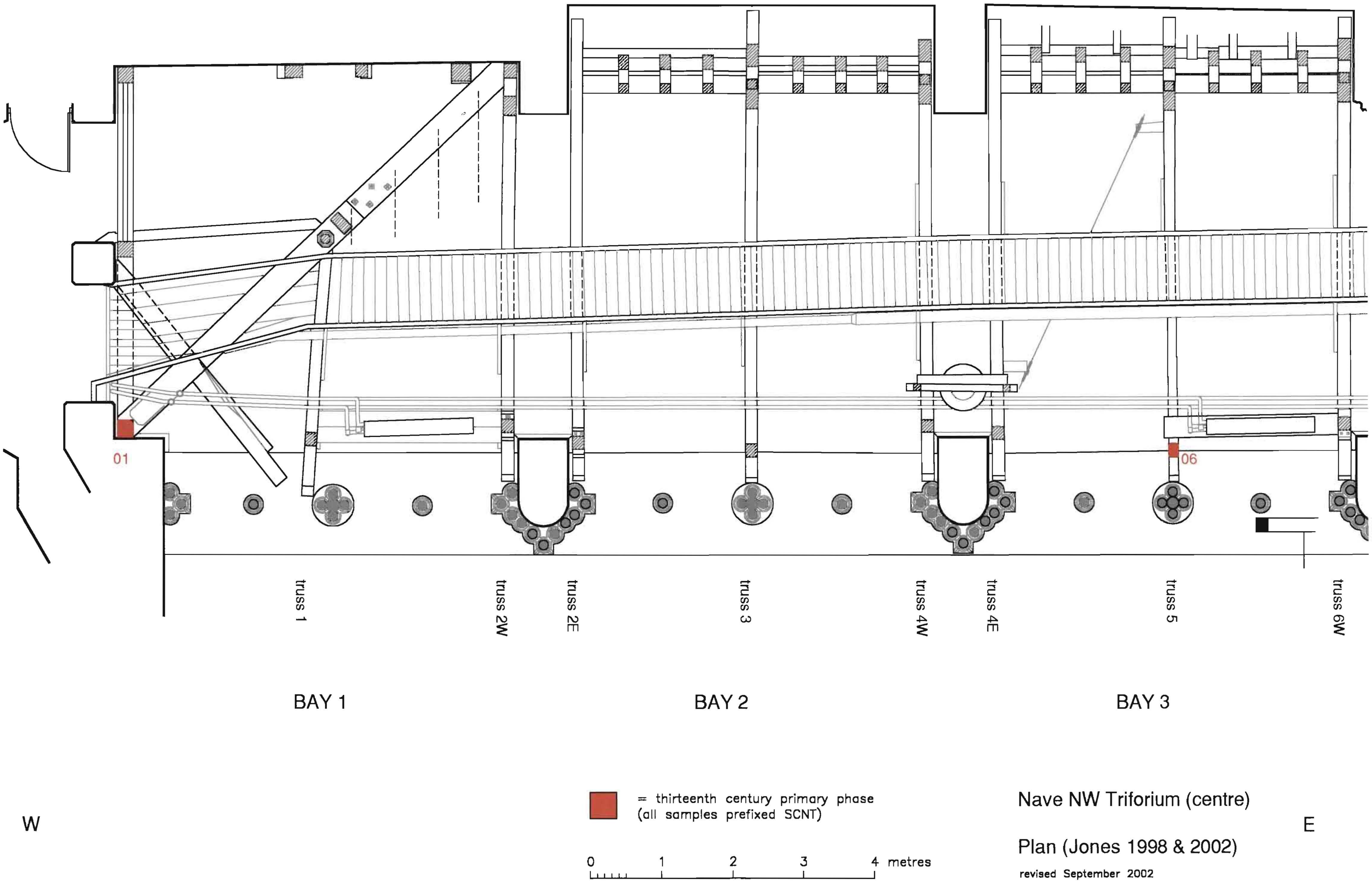


= thirteenth century primary phase
(all samples prefixed SCEC)

0 1 2 3 4 metres

Eastern Chapels:
St Stephen's (Southern Chapel) Roof

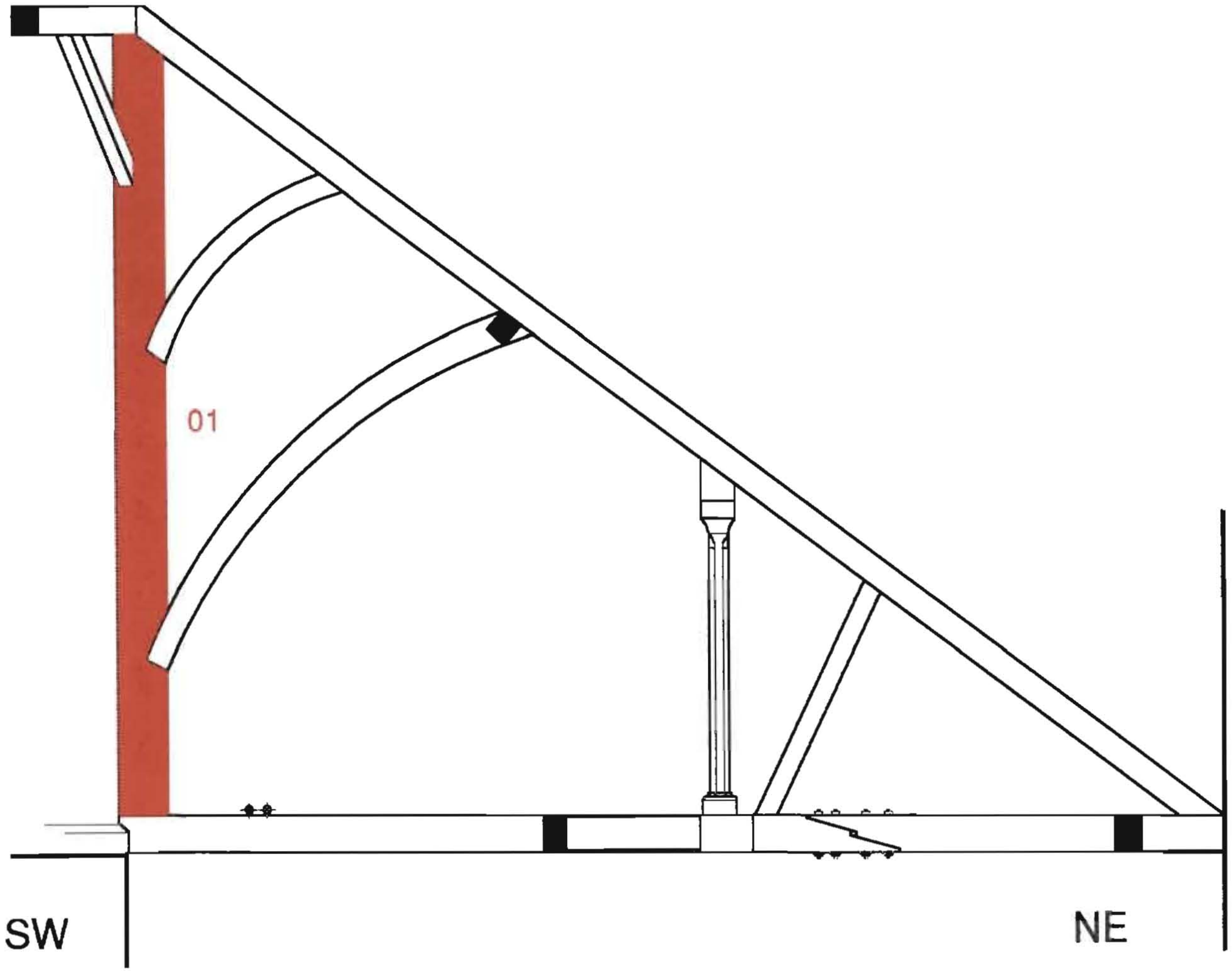
Section N-N looking west (Jones 1998 & 200



Nave NW Triforium (centre)

Plan (Jones 1998 & 2002)

revised September 2002

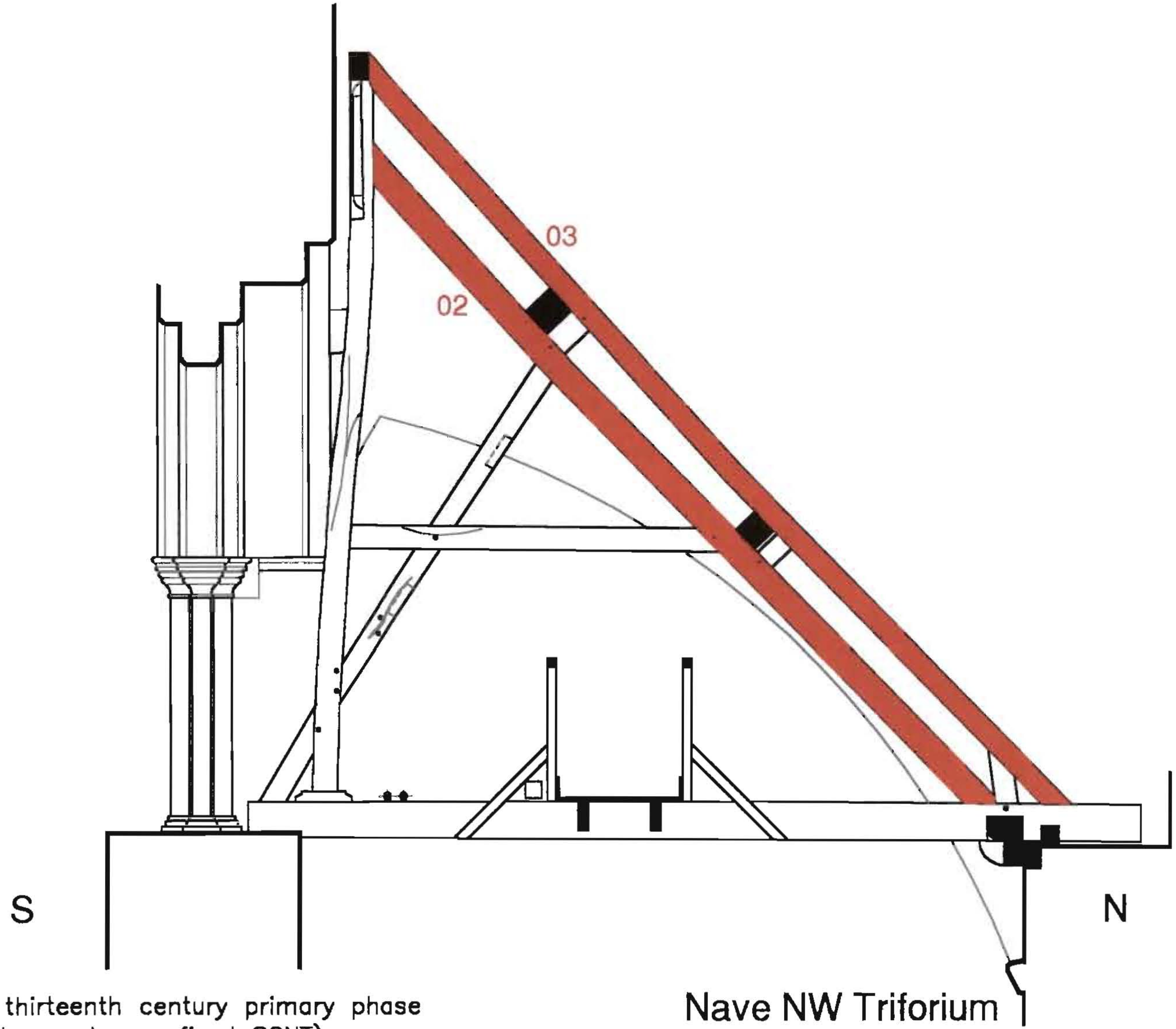


= thirteenth century primary phase (all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NW Triforium

Truss No 1 (diagonal) east face (Jones 1998 & 2002)

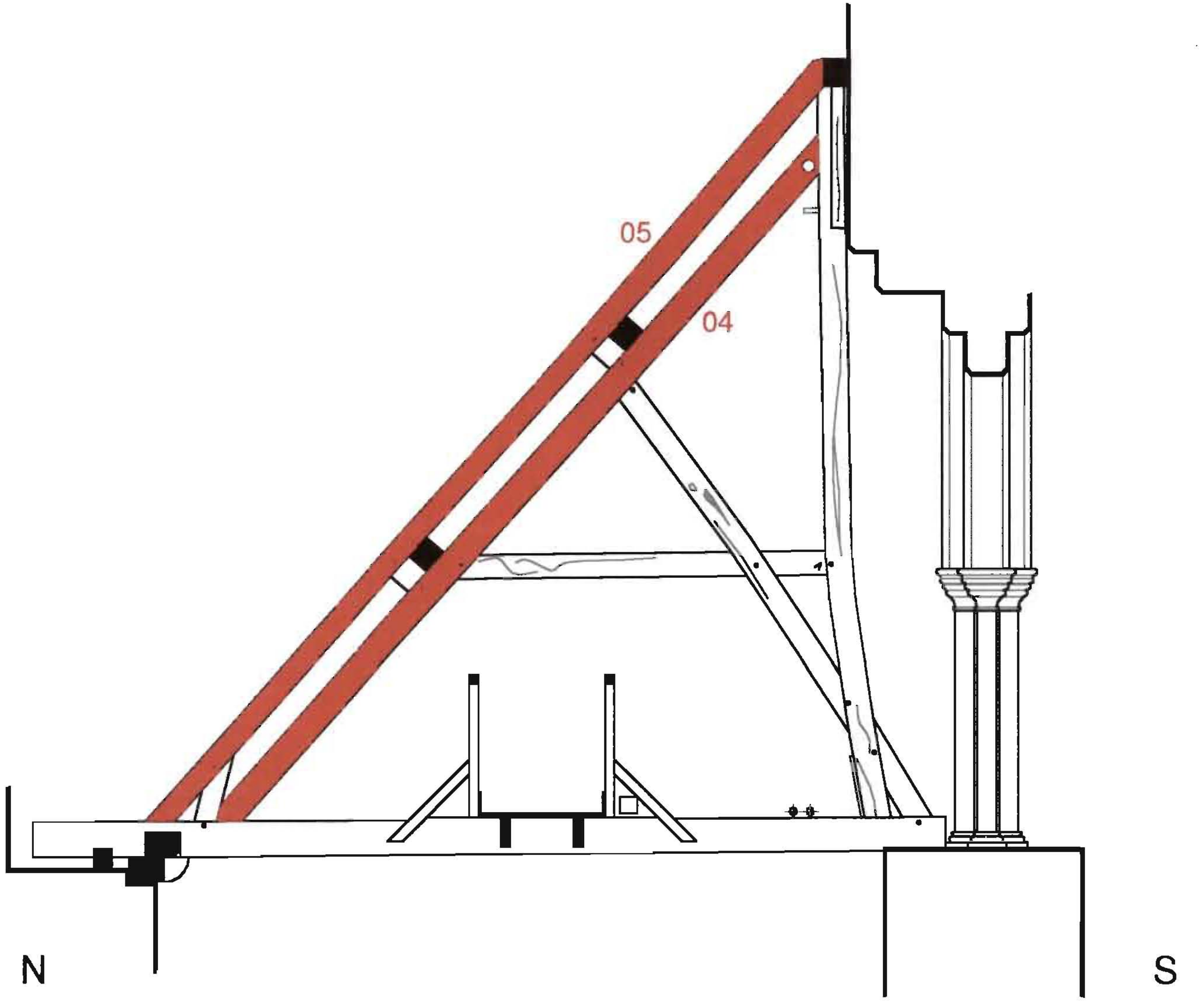


= thirteenth century primary phase
(all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NW Triforium

Truss No 2E east face (Jones 1998 & 2002)

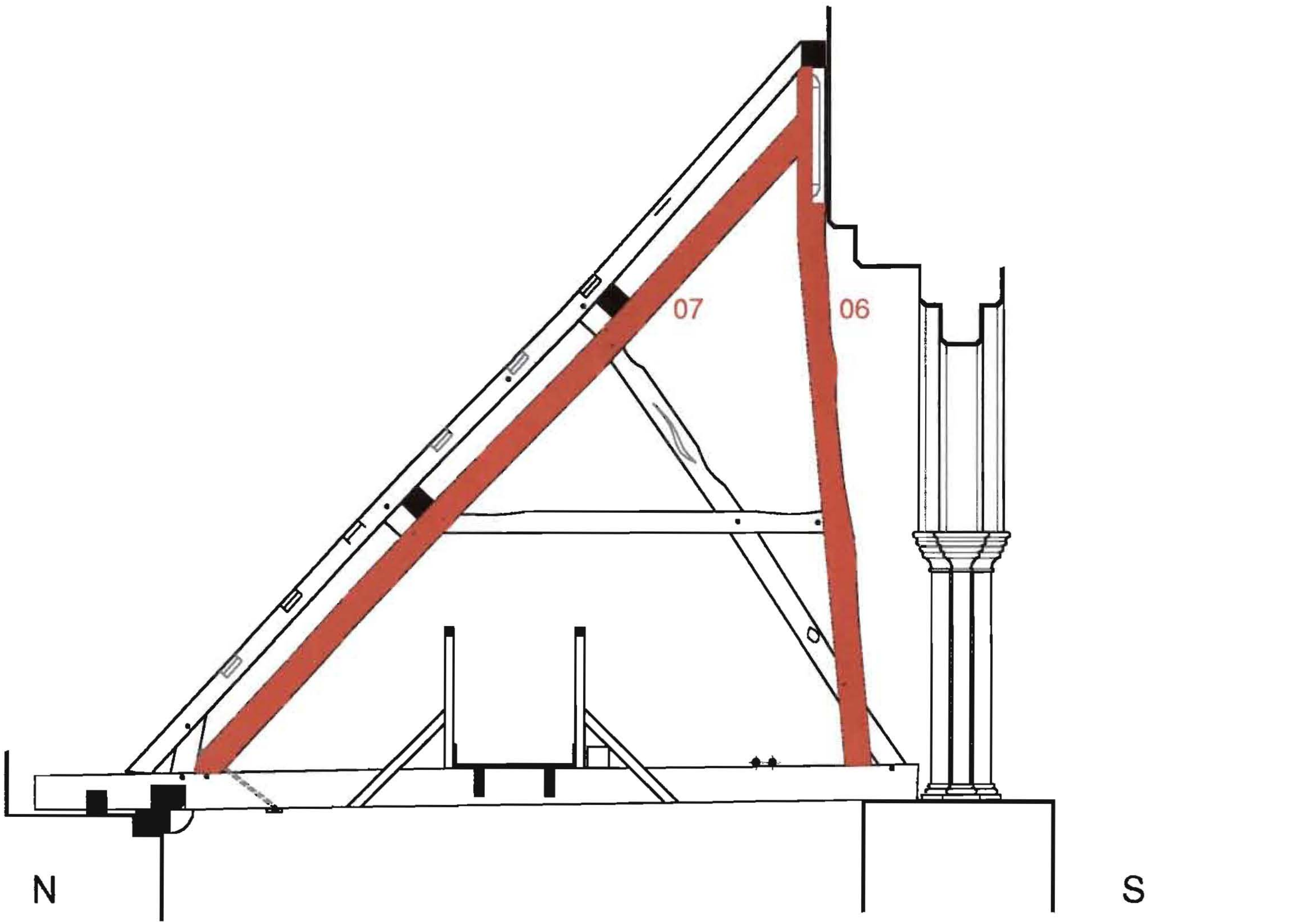


= thirteenth century primary phase (all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NW Triforium

Truss No 3 west face (Jones 1998 & 2002)



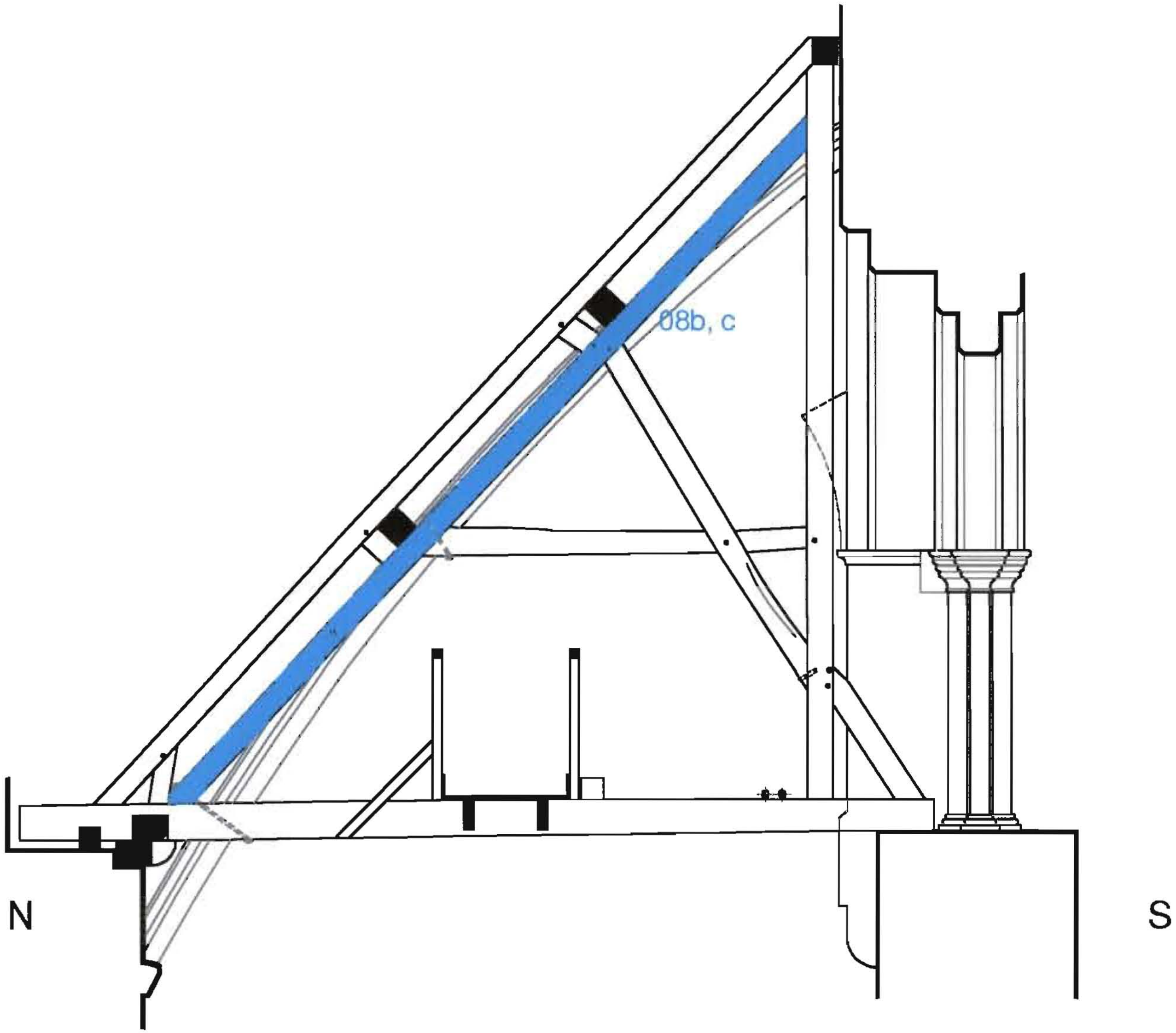
= thirteenth century primary phase (all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NW Triforium

Truss No 5 west face (Jones 1998 & 2002)

revised September 2002

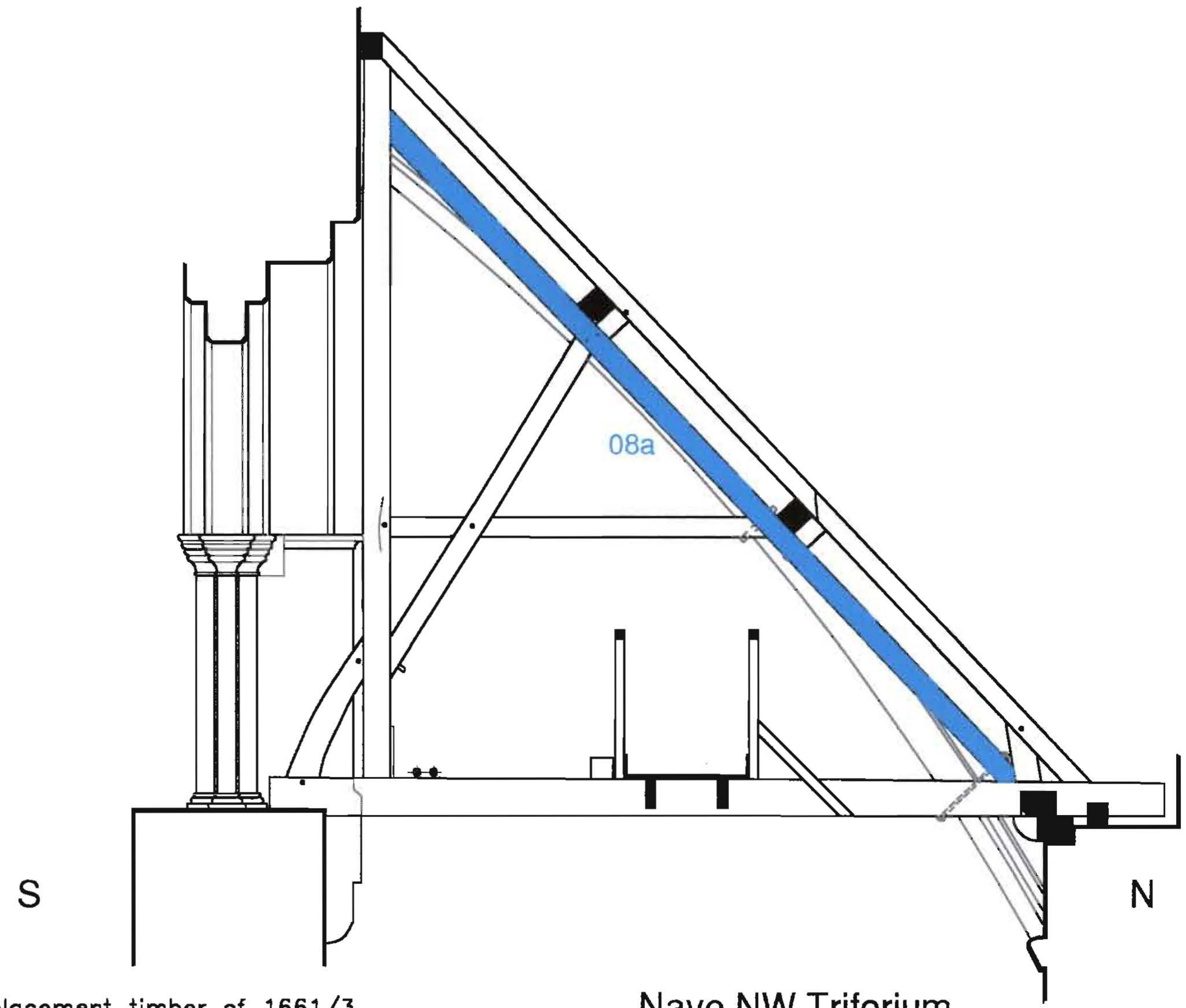


= replacement timber of 1661/3
(all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NW Triforium

Truss No 6W west face (Jones 1998 & 2002)

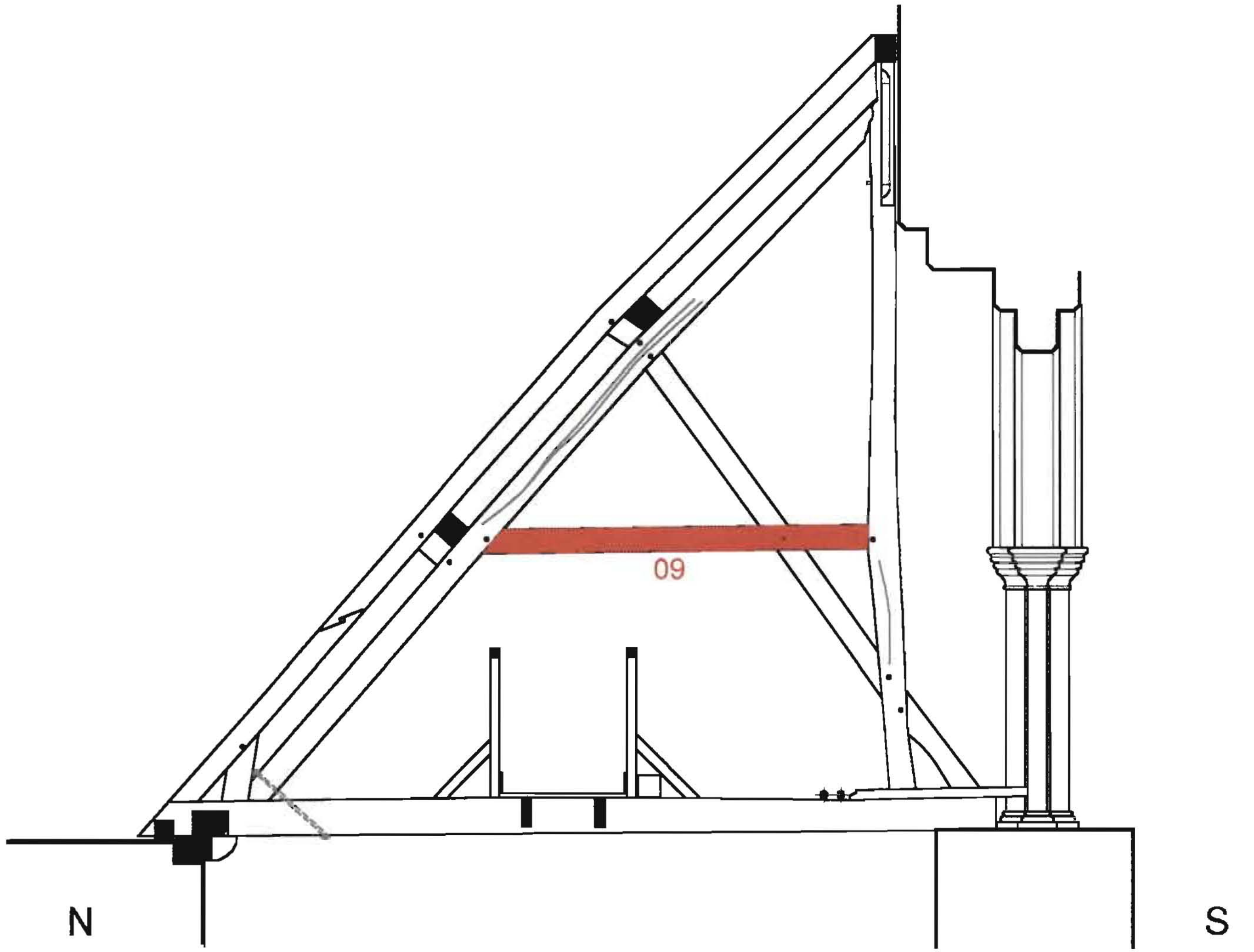


= replacement timber of 1661/3
(all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NW Triforium

Truss No 6E east face (Jones 1998 & 2002)

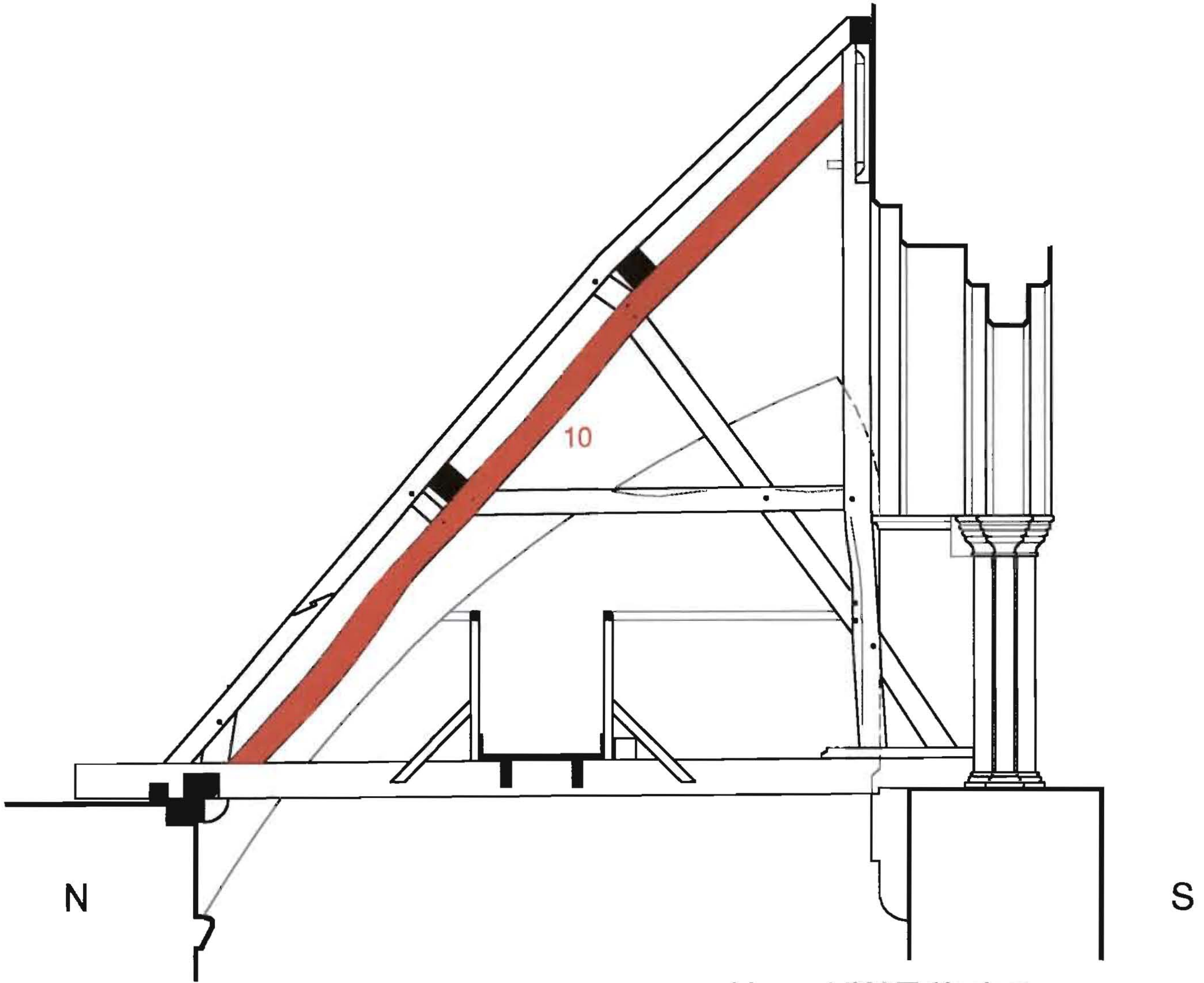


= thirteenth century primary phase
(all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NW Triforium

Truss No 7 west face (Jones 1998 & 2002)



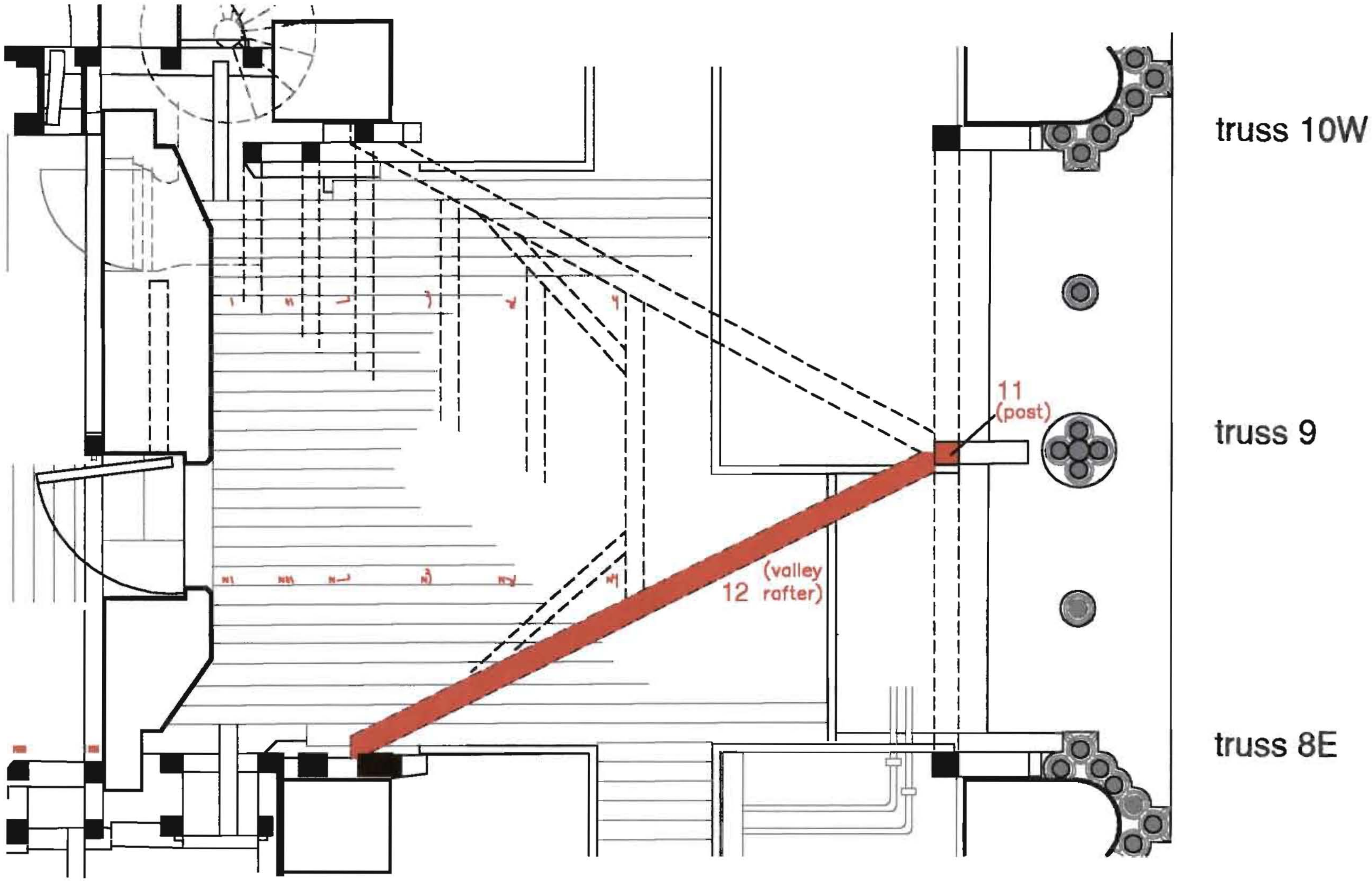
= thirteenth century primary phase
(all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NW Triforium

Truss No 8W west face (Jones 1998 & 2002)

revised September 2002



= thirteenth century primary phase
(all samples prefixed SCNT)

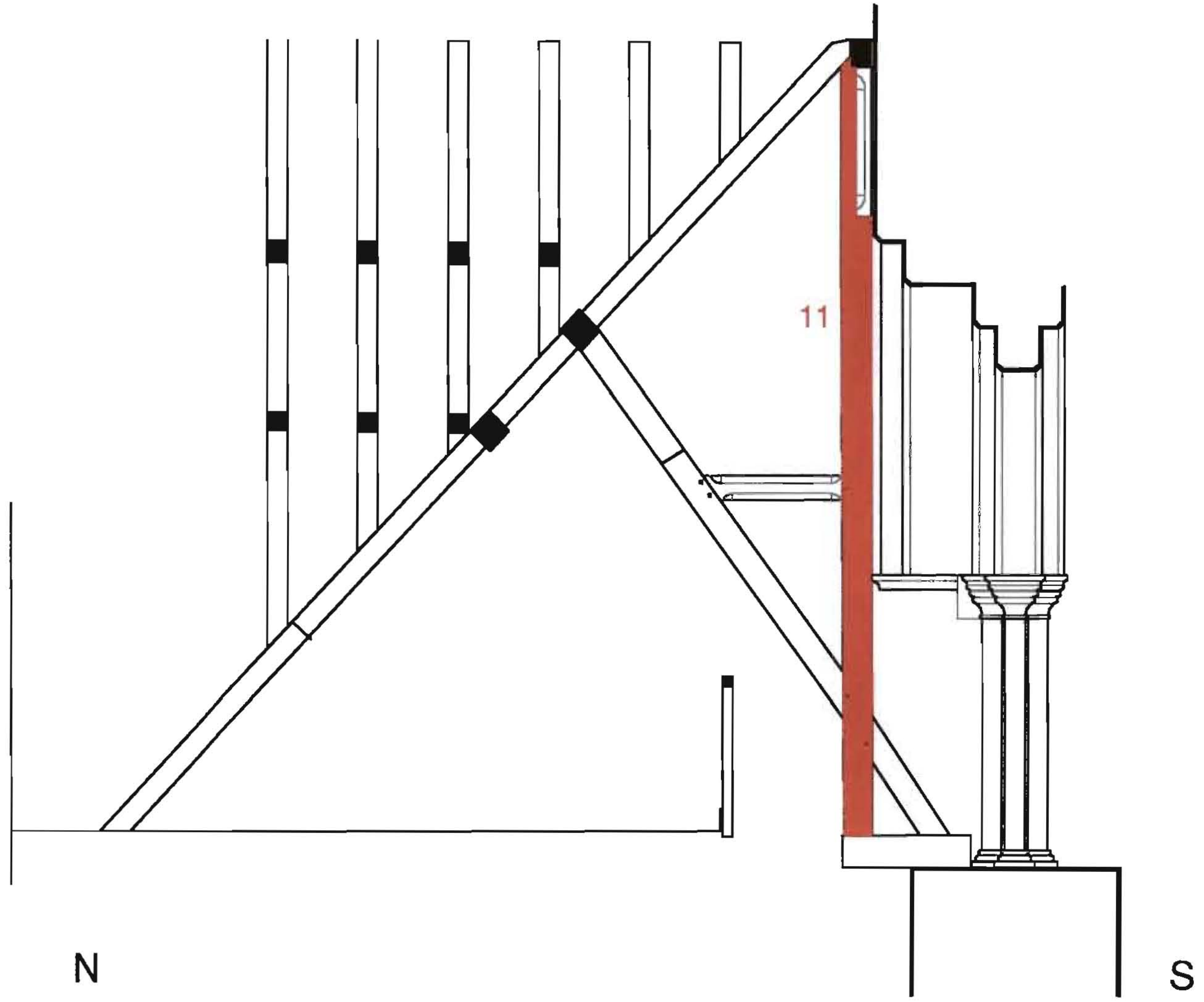
S N

0 1 2 3 4 metres

Nave Triforium (centre)

Plan (Jones 1998 & 2002)

revised September 2002

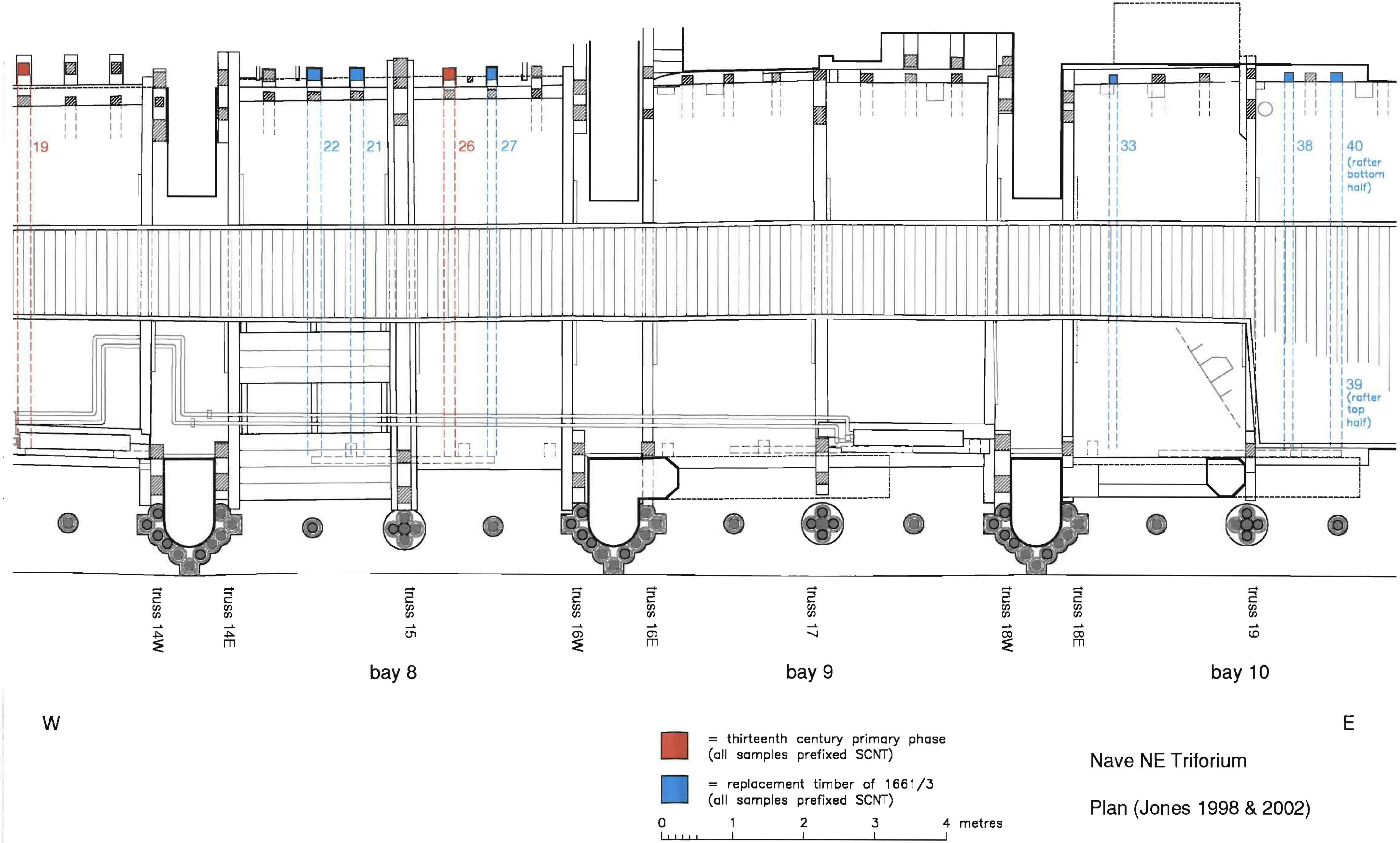


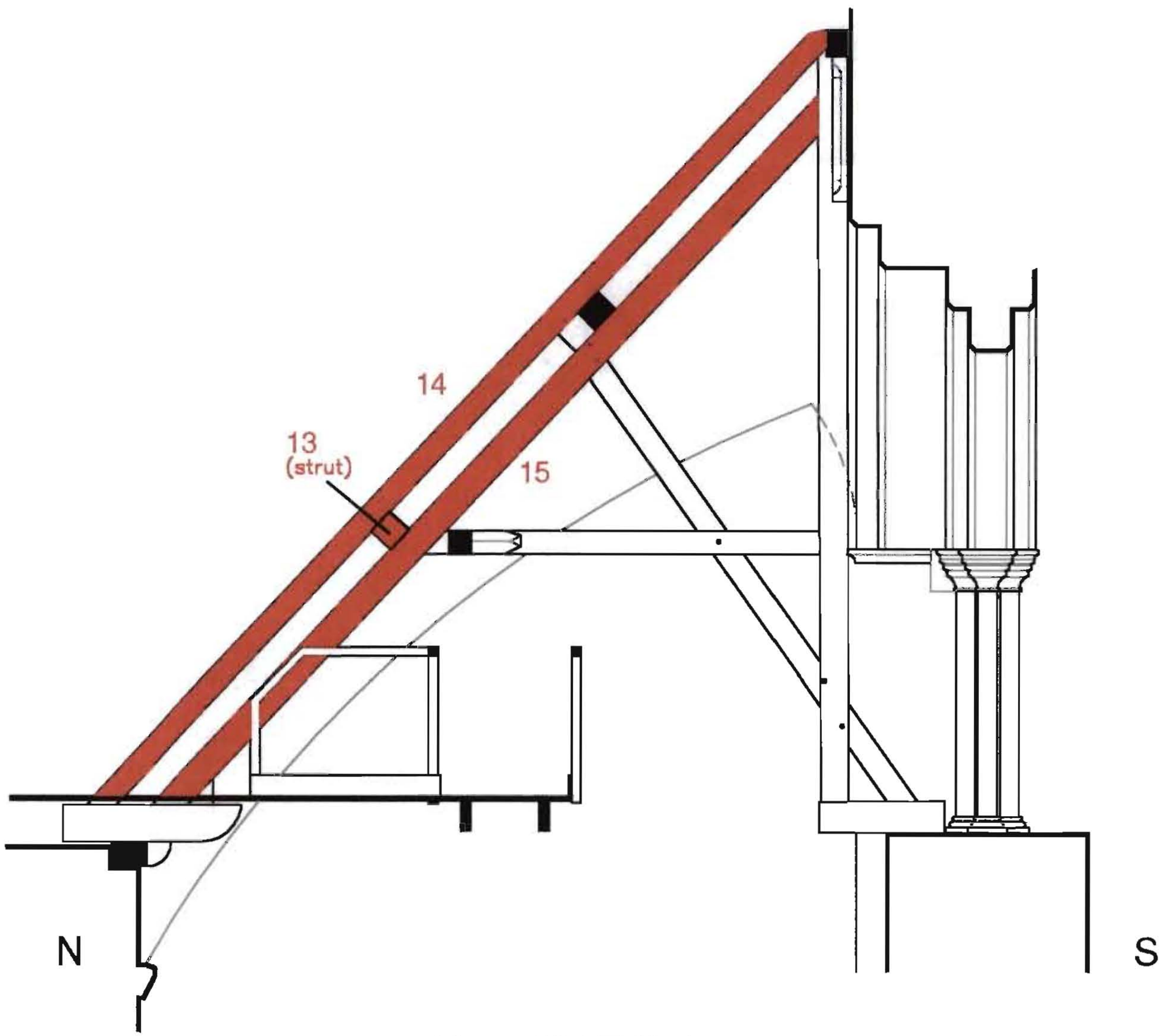
= thirteenth century primary phase
(all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NE Triforium

Truss No 9 west face (Jones 1998 & 2002)


19
22
21
26
27
33
38
40
(rafter bottom half)
39
(rafter top half)
truss 14W
truss 14E
truss 15
truss 16W
truss 16E
truss 17
truss 18W
truss 18E
truss 19
bay 8
bay 9
bay 10
W
E
= thirteenth century primary phase (all samples prefixed SCNT)
= replacement timber of 1661/3 (all samples prefixed SCNT)
0 1 2 3 4 metres
Nave NE Triforium
Plan (Jones 1998 & 2002)



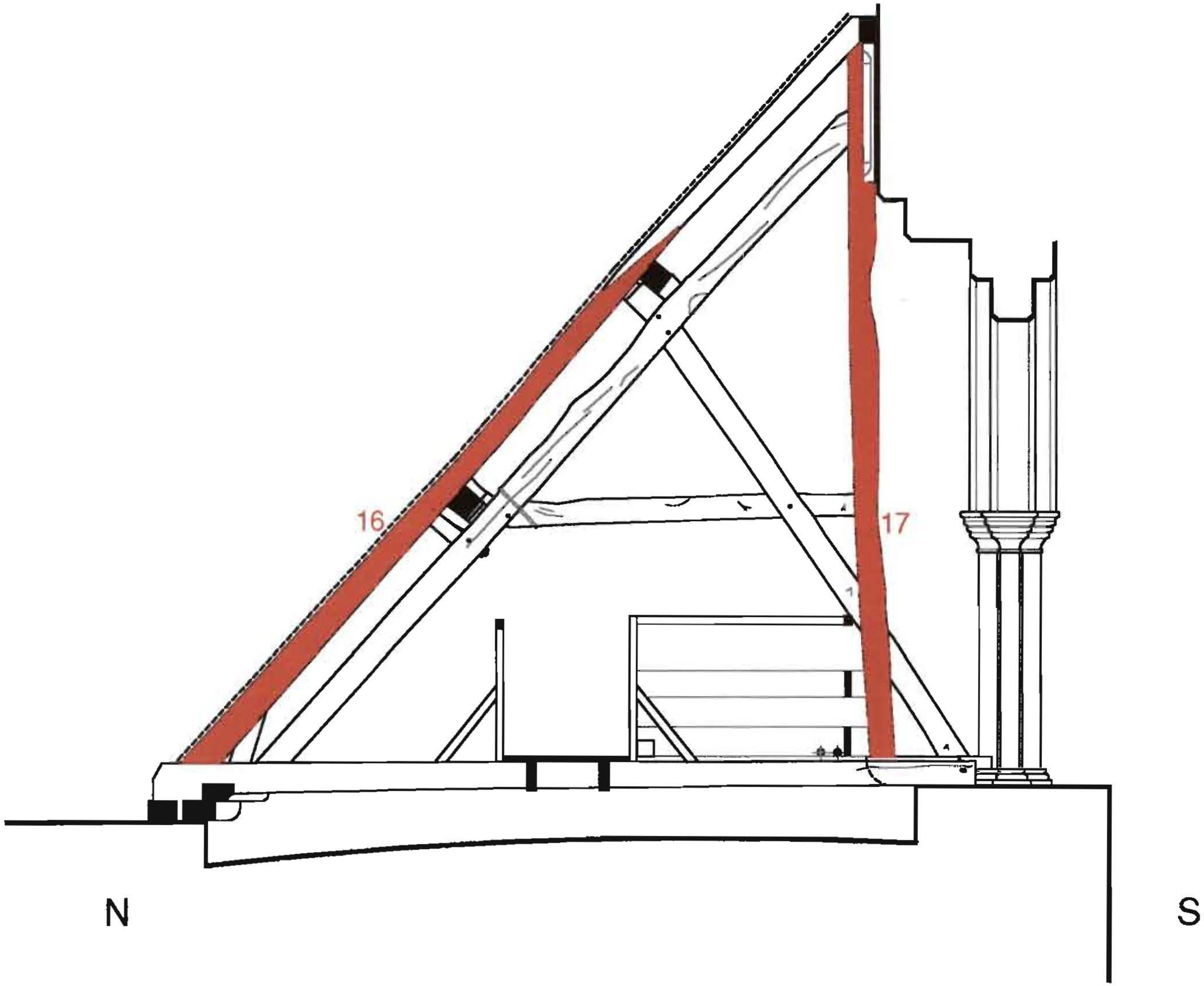
= thirteenth century primary phase (all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NE Triforium

Truss No 10W west face (Jones 1998 & 2002)

revised October 2002

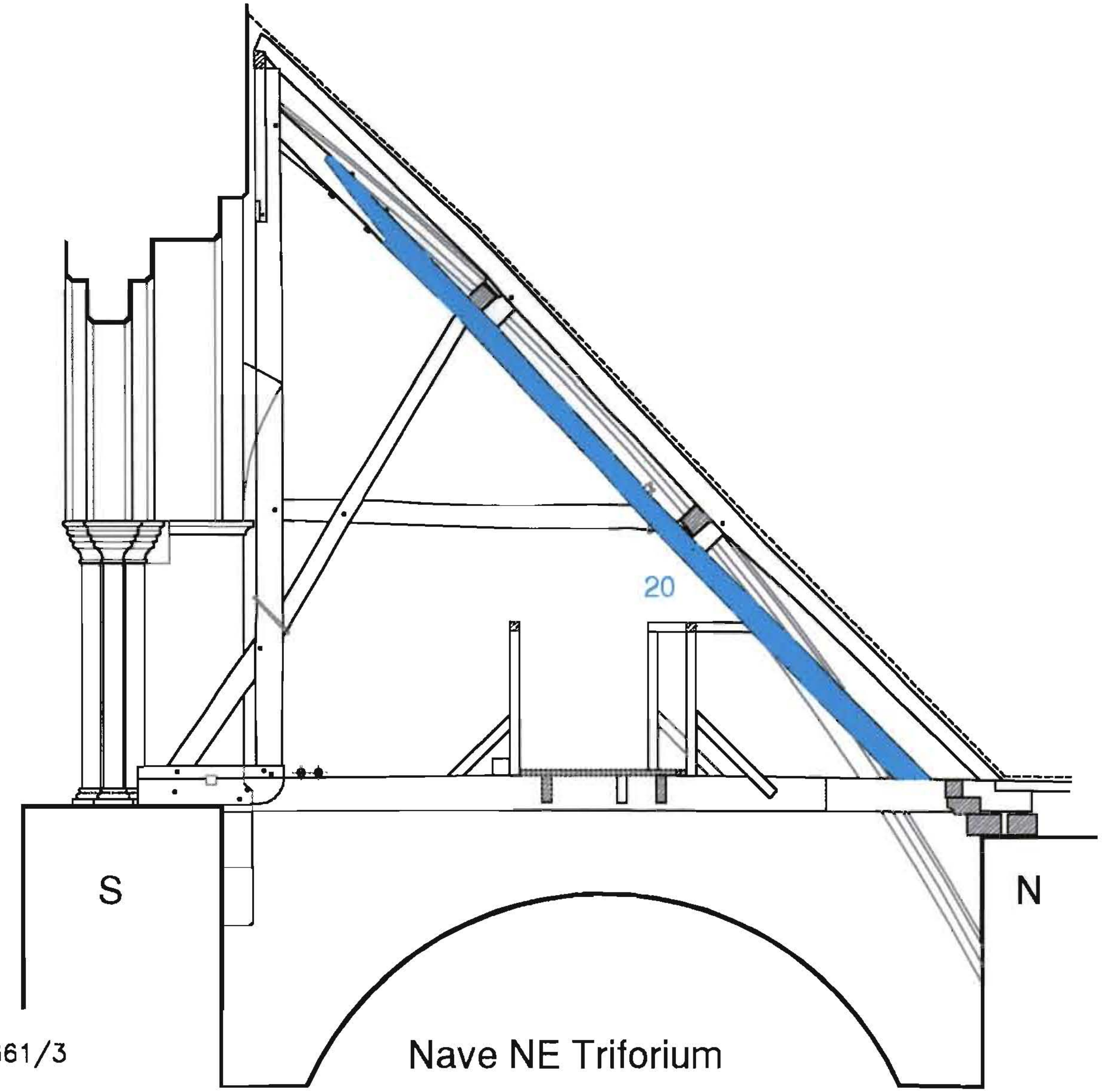


= thirteenth century primary phase (all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NE Triforium

Truss No 11 west face (Jones 1998 & 2002)



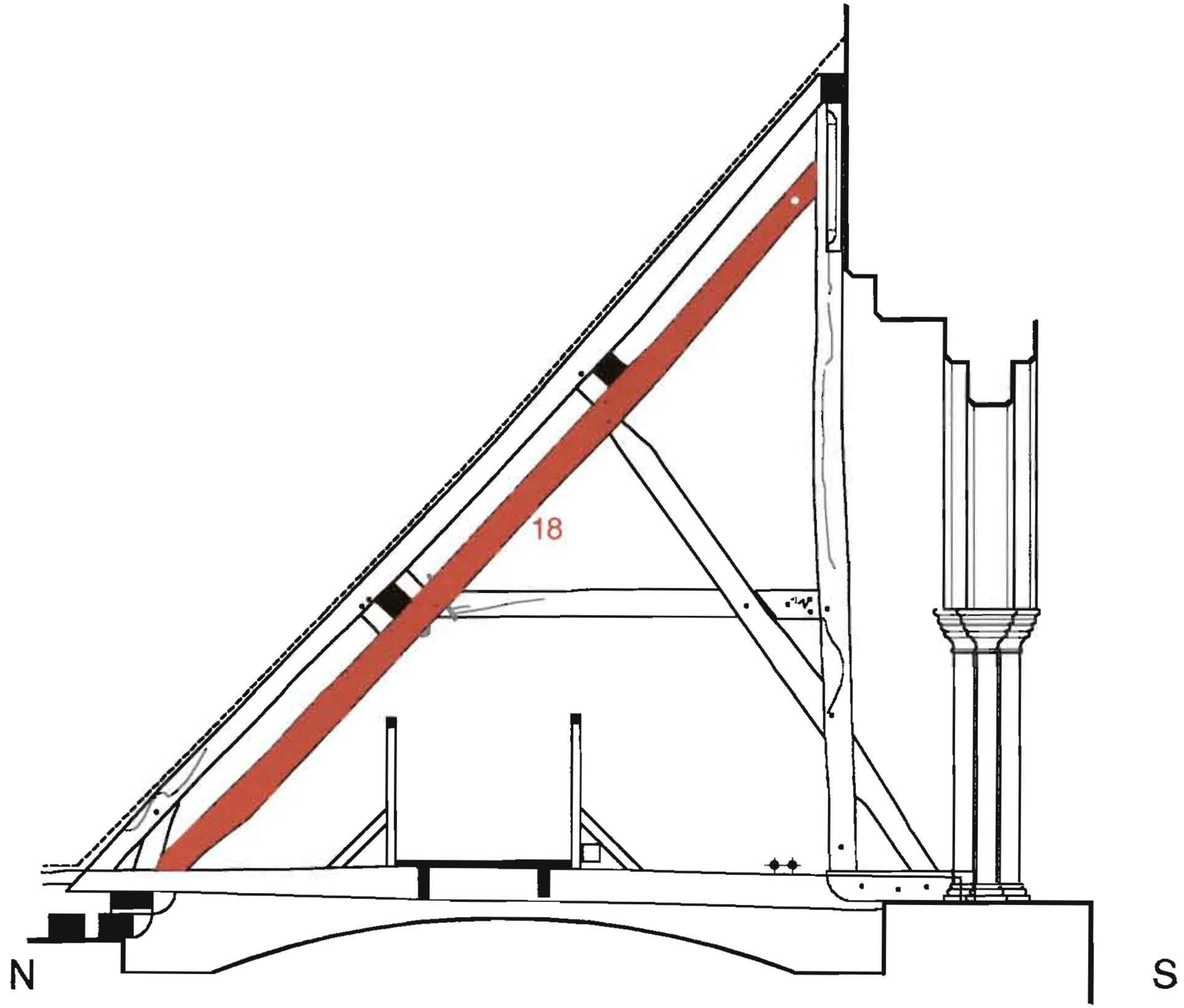
Nave NE Triforium

= replacement timber of 1661/3
(all samples prefixed SCNT)

0 1 2 3 4 metres

Truss No 12E west face (Jones 1998 & 2002)

revised October 2002

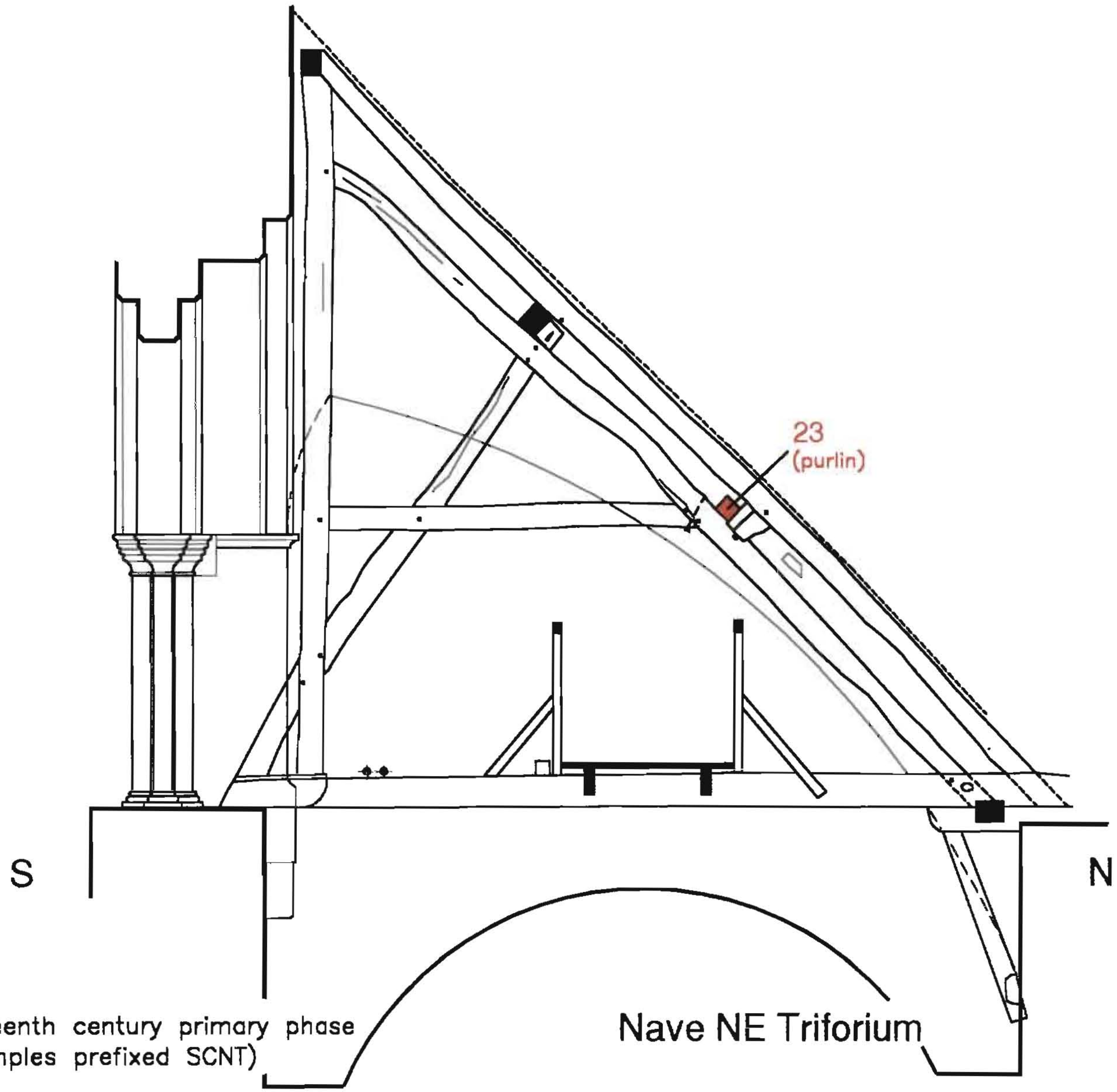


= thirteenth century primary phase (all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NE Triforium

Truss No 13 west face (Jones 1998 & 2002)

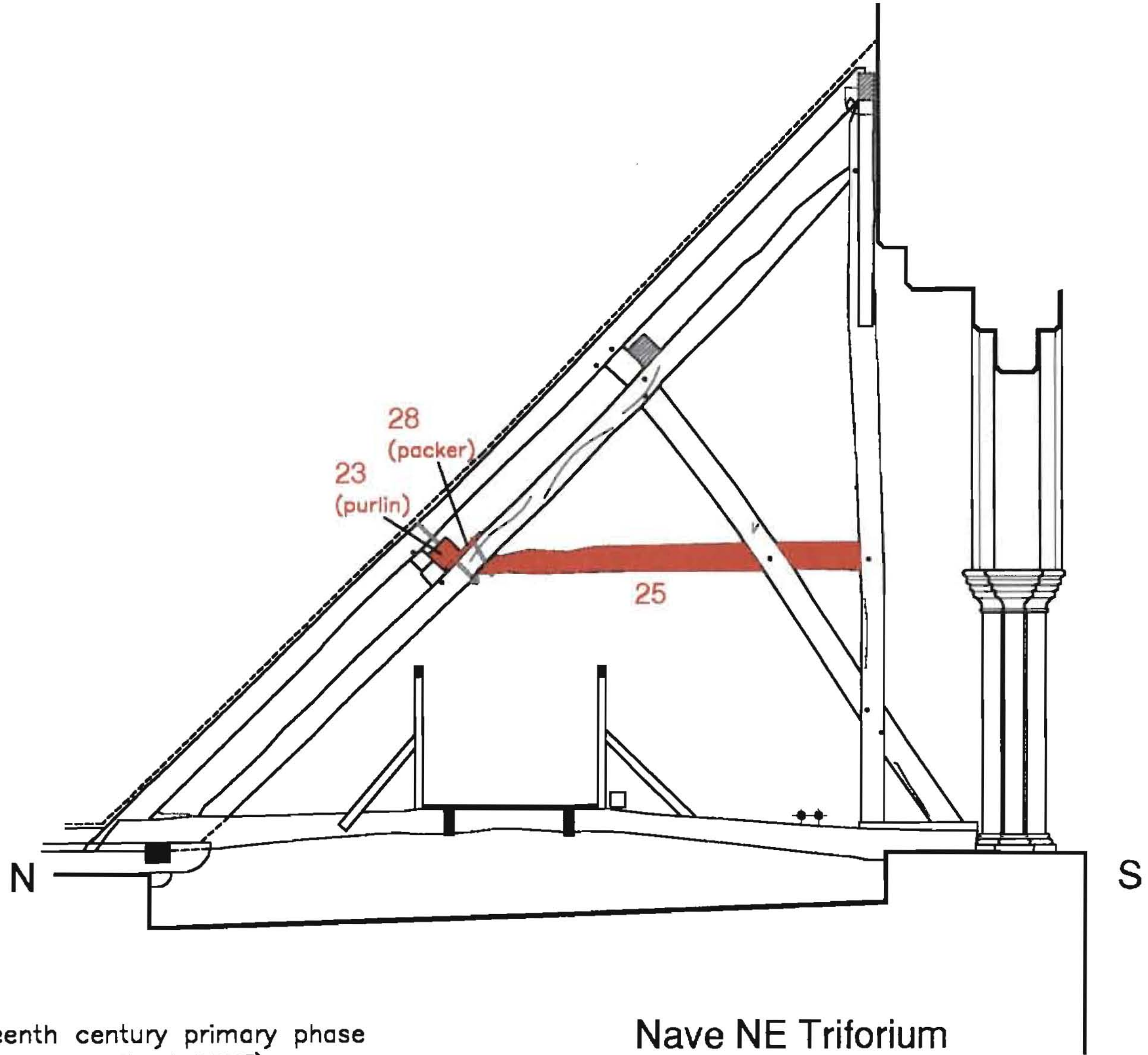


= thirteenth century primary phase
(all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NE Triforium

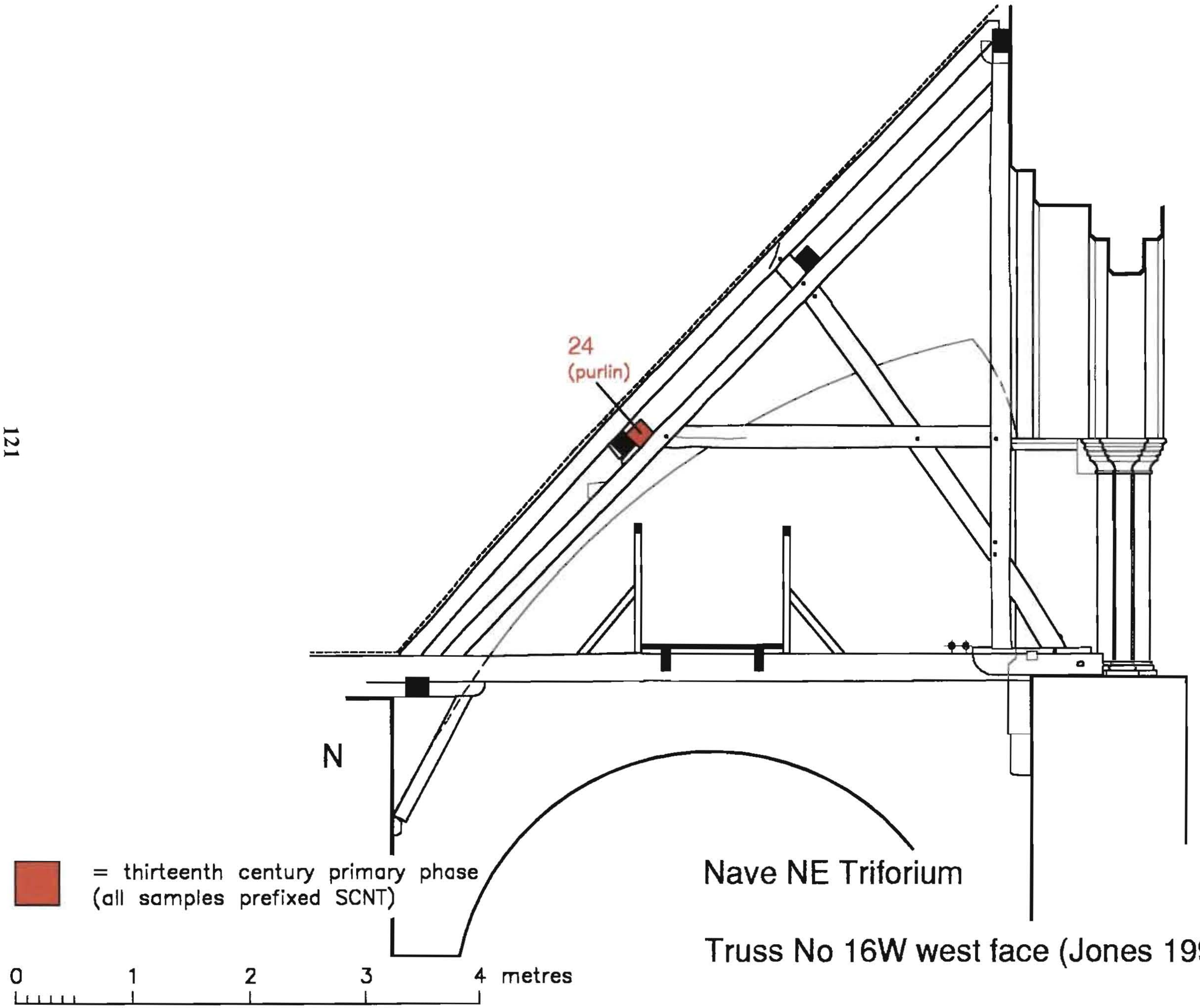
Truss No 14E east face (Jones 1998 & 2002)



= thirteenth century primary phase
(all samples prefixed SCNT)

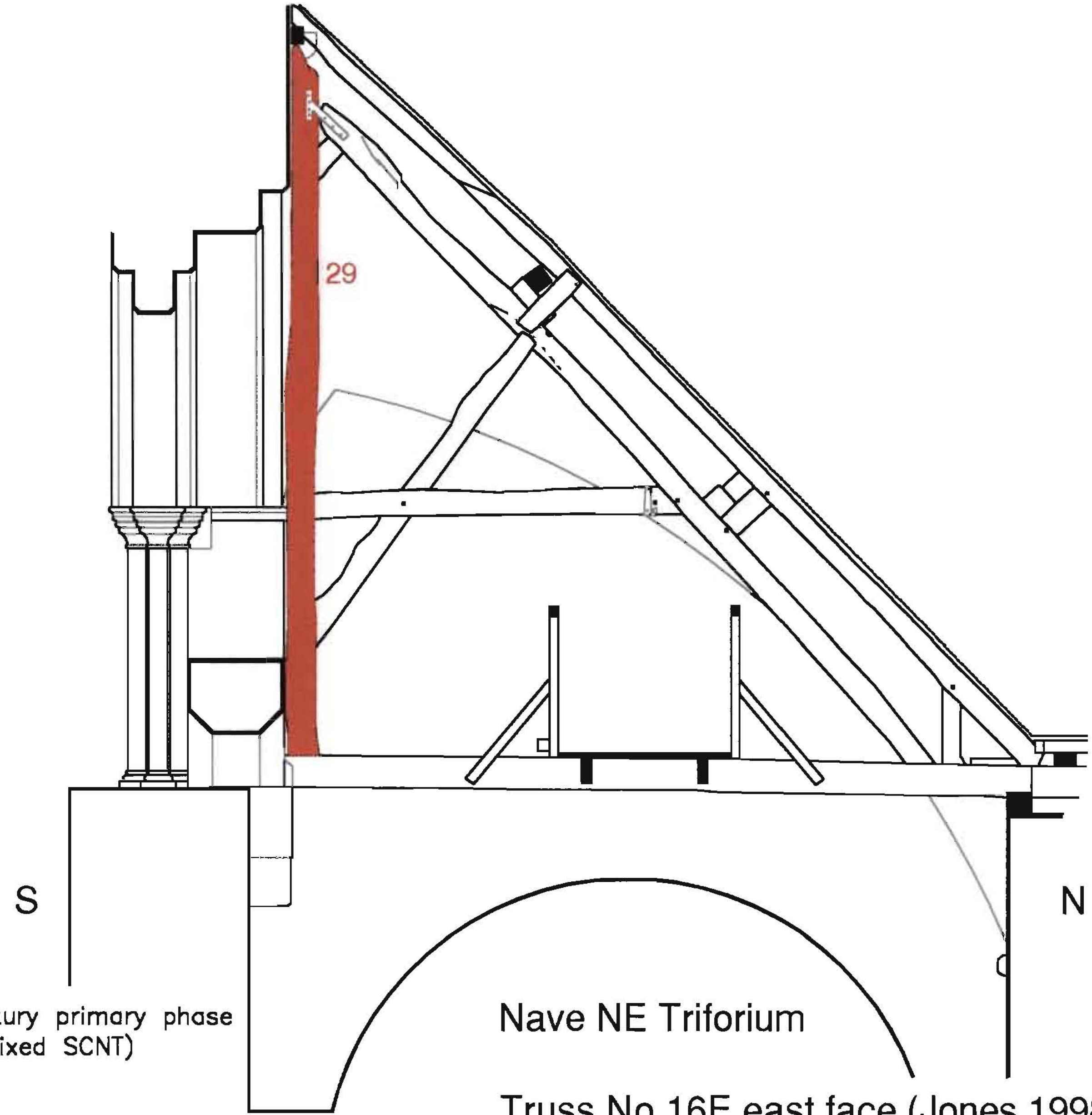
Nave NE Triforium

Truss No 15 west face (Jones 1998 & 2002)



Nave NE Triforium

Truss No 16W west face (Jones 1998 & 2002)



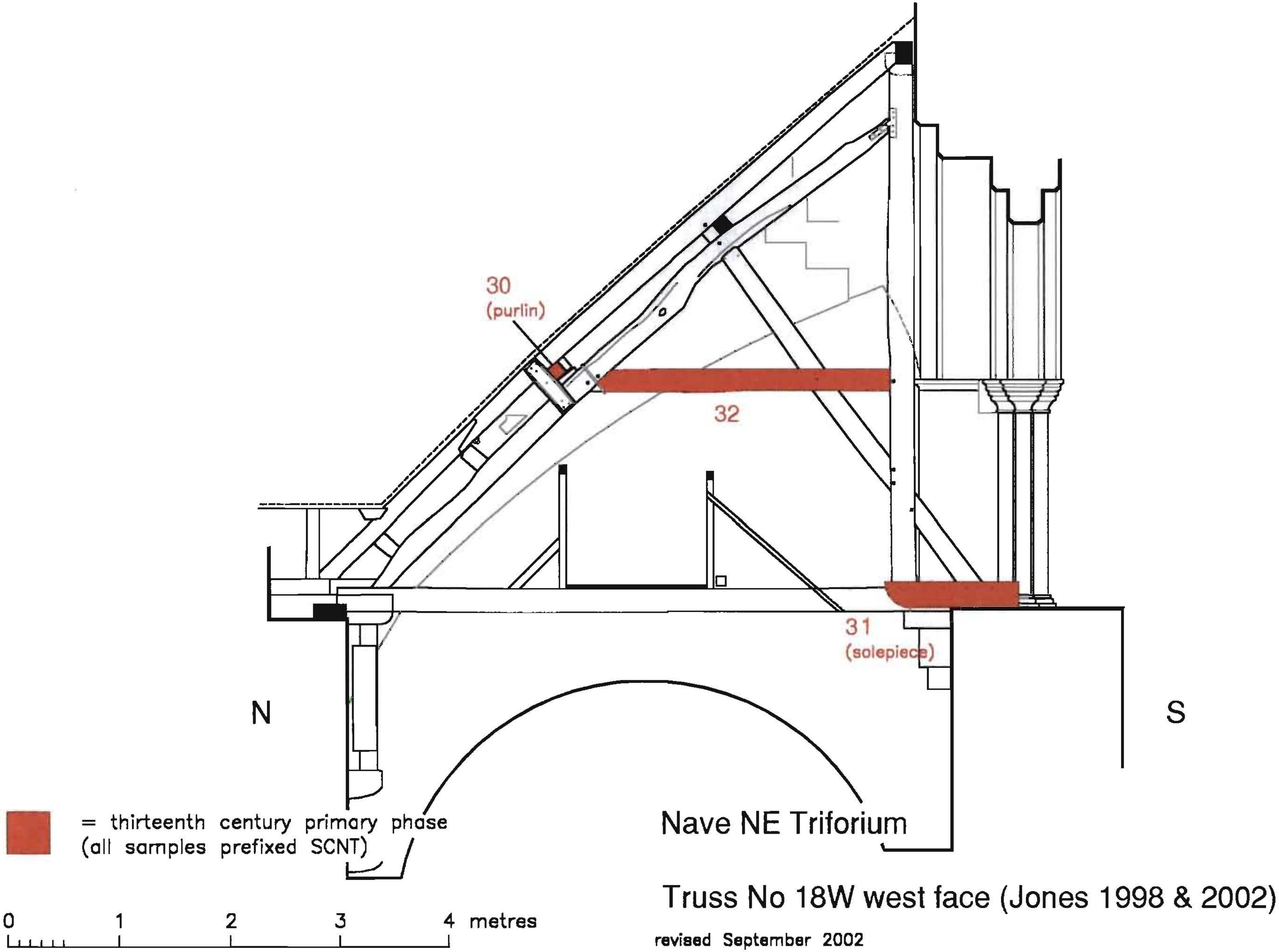
= thirteenth century primary phase
(all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NE Triforium

Truss No 16E east face (Jones 1998 & 2002)

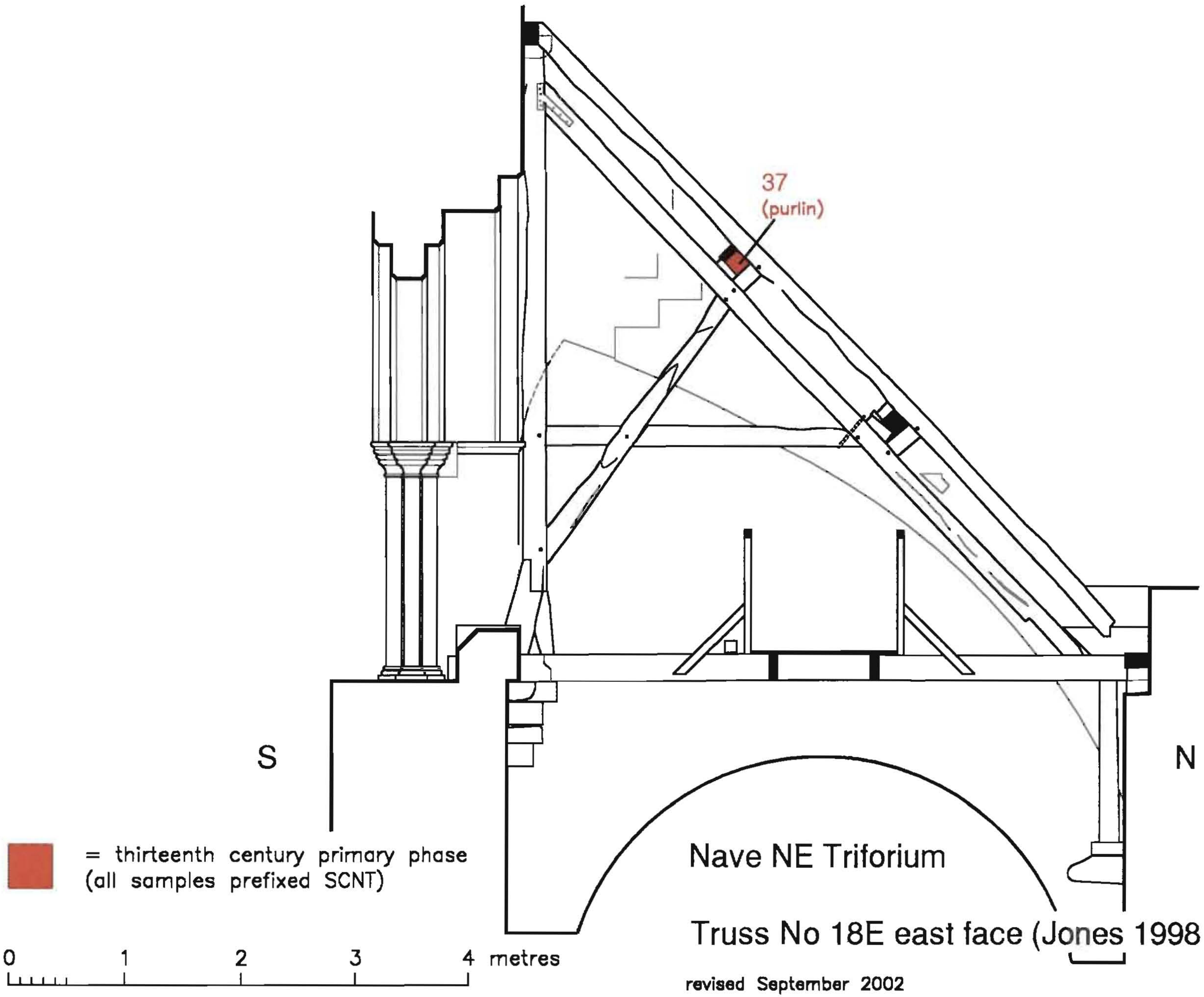
revised October 2002



Nave NE Triforium

Truss No 18W west face (Jones 1998 & 2002)

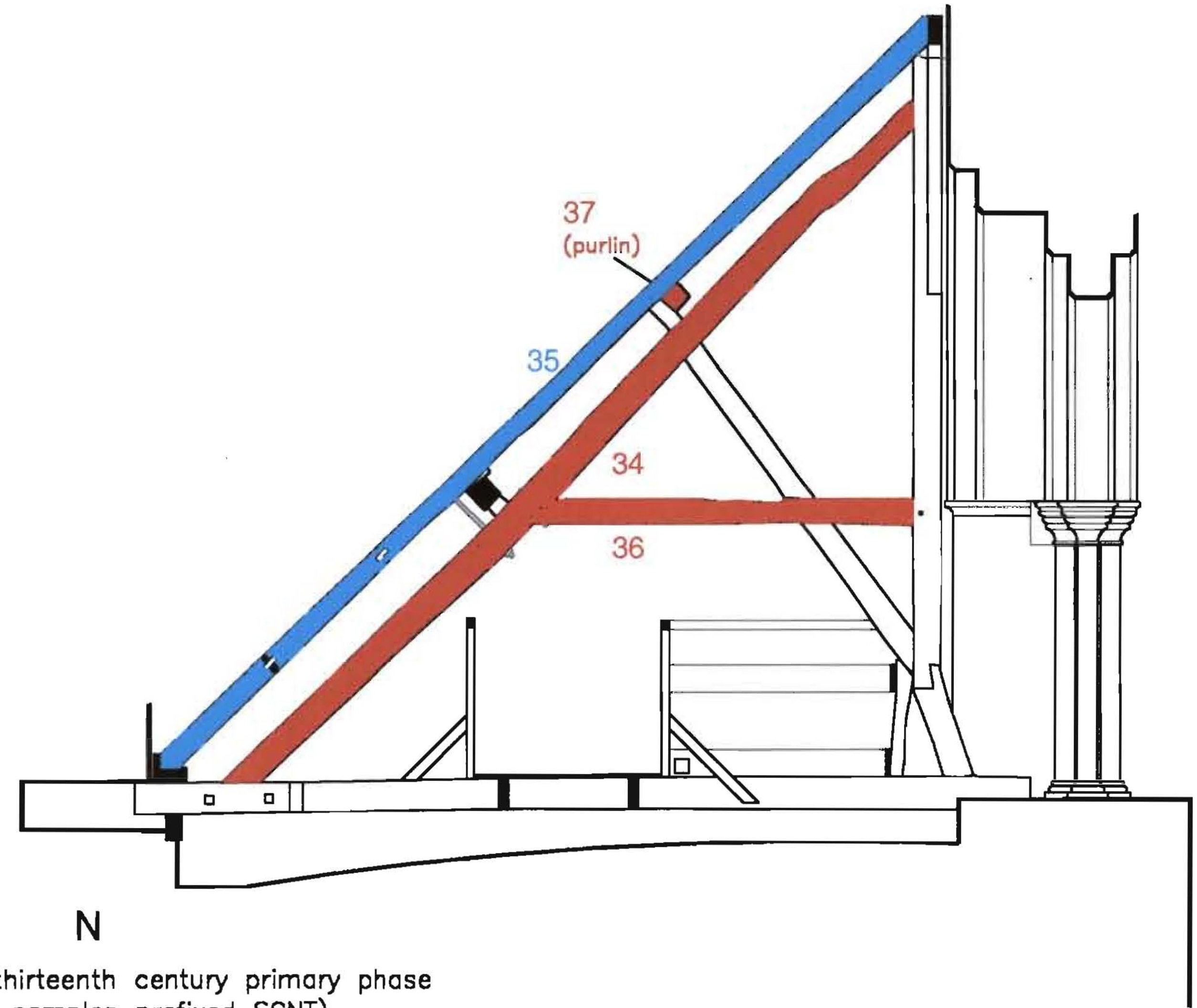
revised September 2002



Nave NE Triforium

Truss No 18E east face (Jones 1998 & 2002)

revised September 2002



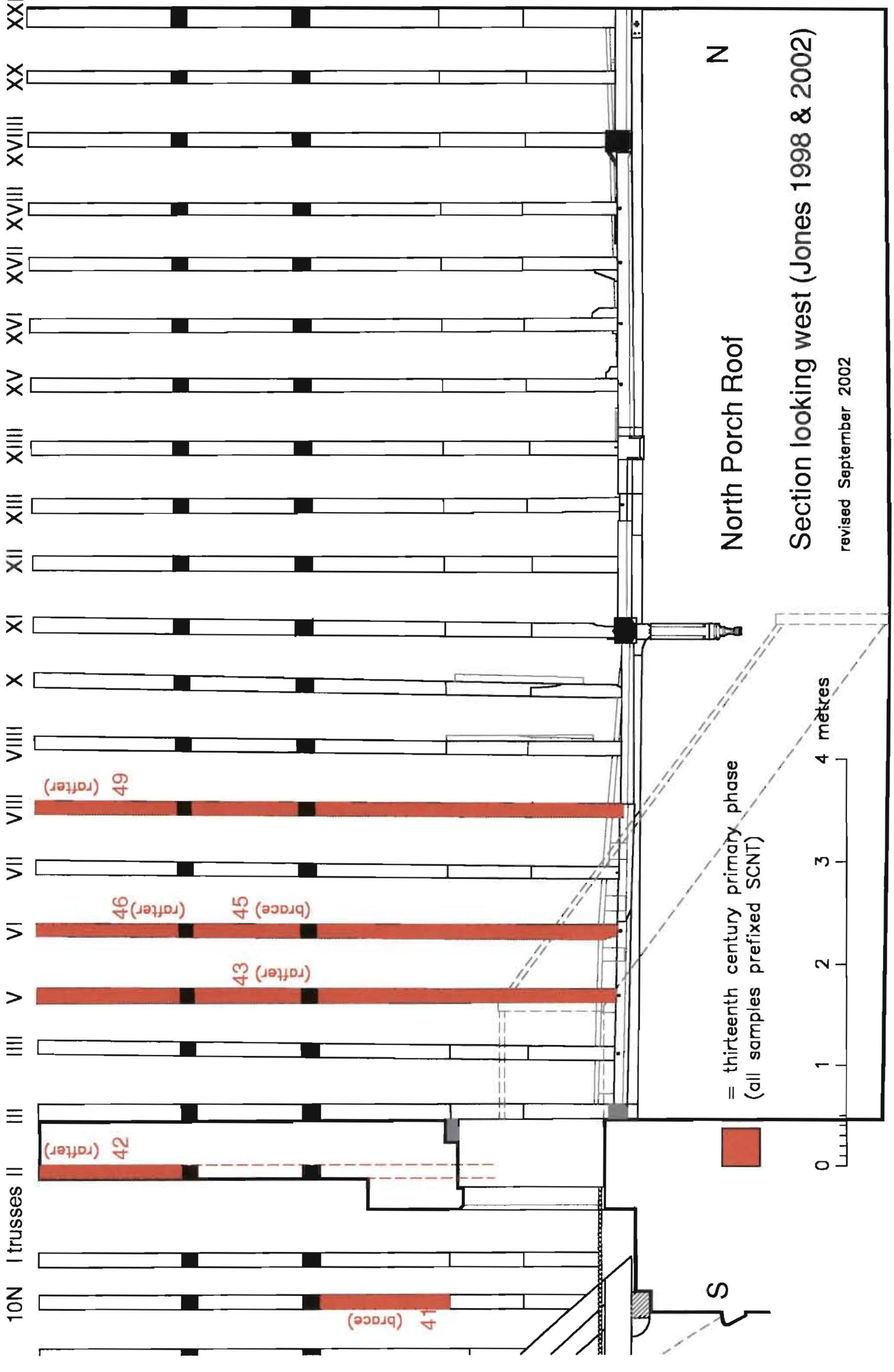
= thirteenth century primary phase (all samples prefixed SCNT)

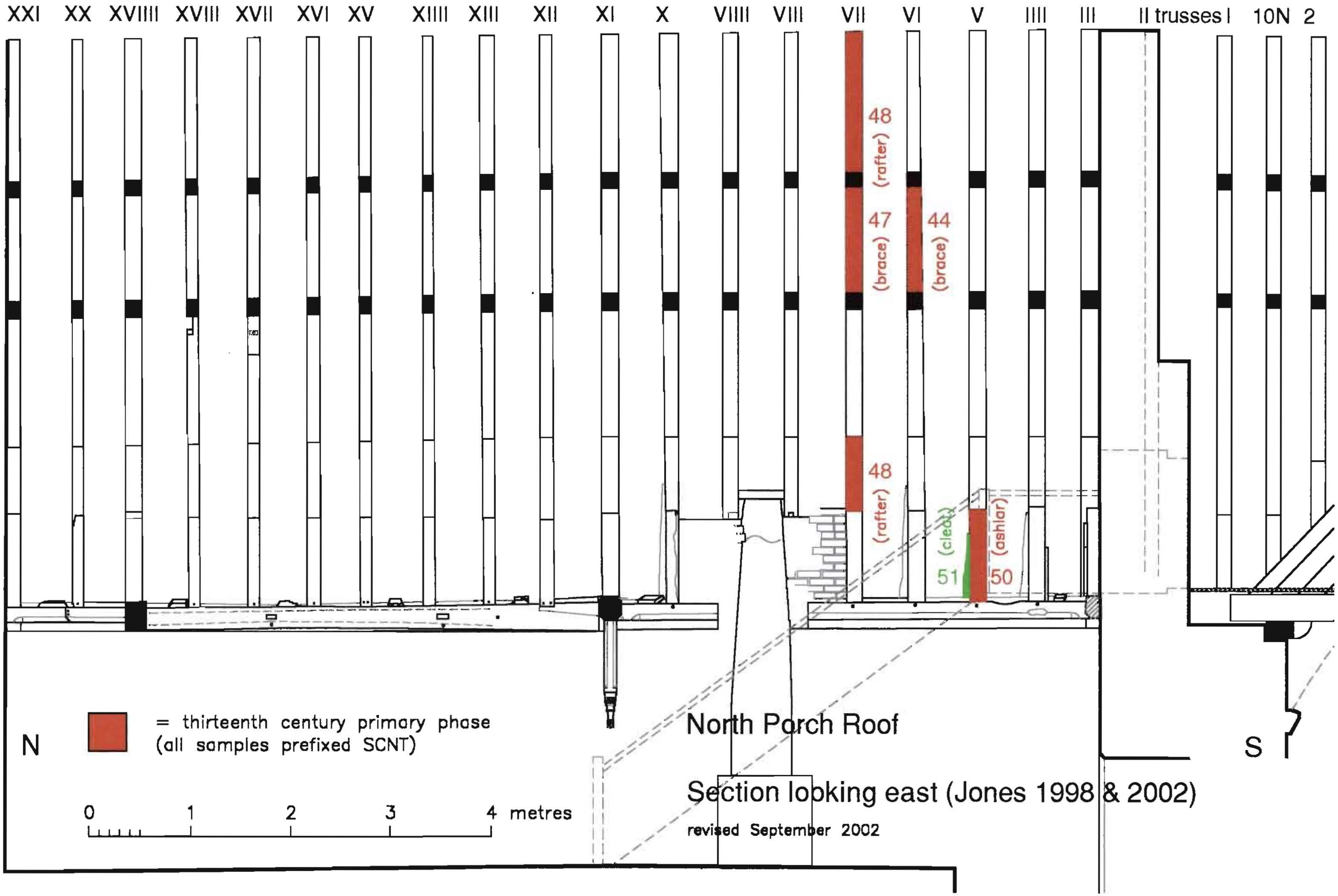
= replacement timber of 1661/3 (all samples prefixed SCNT)

0 1 2 3 4 metres

Nave NE Triforium

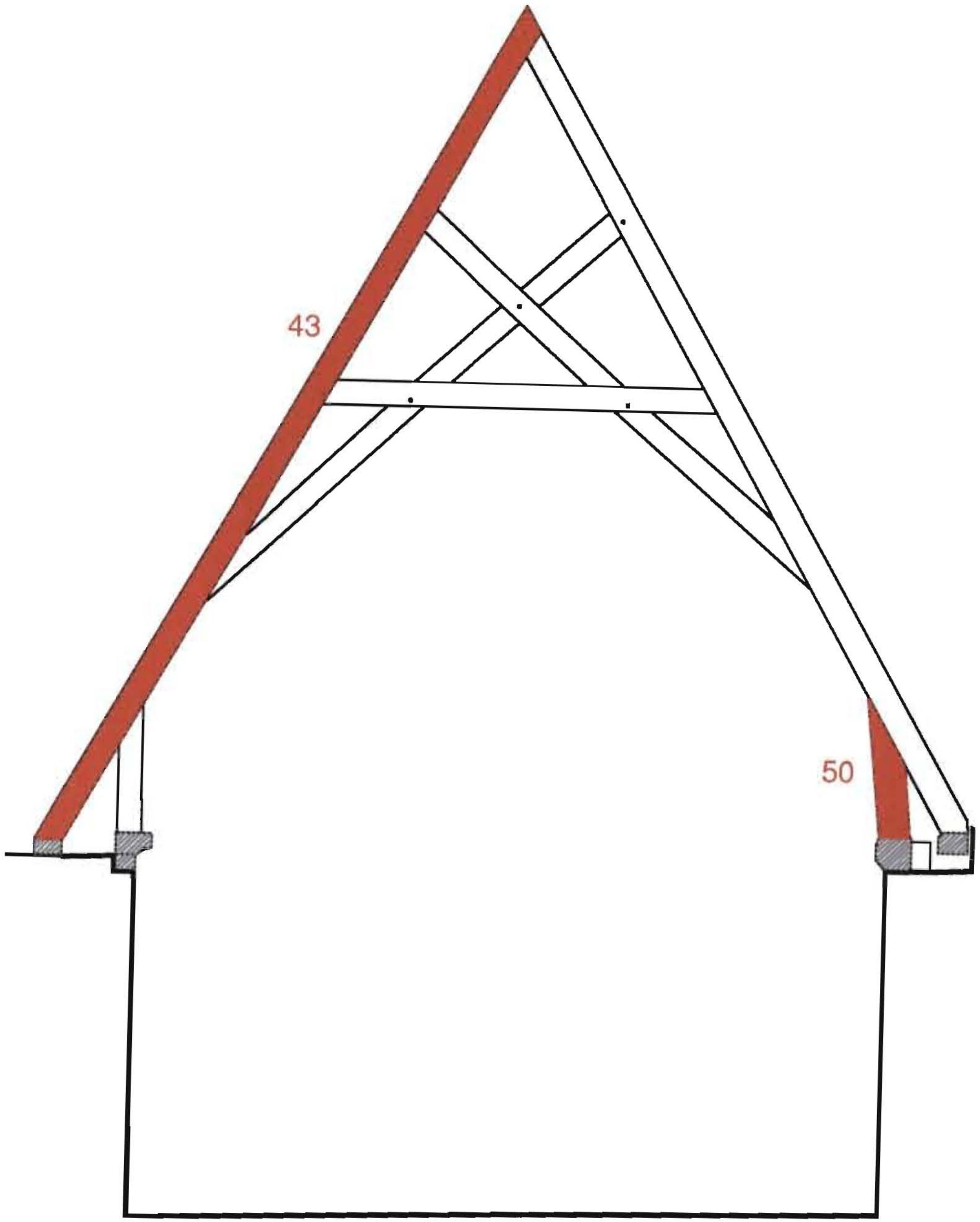
Truss No 19 west face (Jones 1998 & 2002)


North Porch Roof
Section looking west (Jones 1998 & 2002)
revised September 2002
10N
I trusses II
III
IIII
V
VI
VII
VIII
VIIII
X
XI
XII
XIII
XIIII
XV
XVI
XVII
XVIII
XVIIII
XX
XXI
41 (brace)
42 (rafter)
43 (rafter)
45 (brace)
46 (rafter)
49 (rafter)
= thirteenth century primary phase
(all samples prefixed SCNT)
0
1
2
3
4 metres
S
N


XXI
XX
XVIIII
XVIII
XVII
XVI
XV
XIIII
XIII
XII
XI
X
VIIII
VIII
VII
VI
V
IIII
III
II trusses I
10N
2
48
(rafter)
47
(brace)
44
(brace)
48
(rafter)
(cleat)
51
(ashlar)
50
N
S
= thirteenth century primary phase
(all samples prefixed SCNT)
0
1
2
3
4 metres
North Porch Roof
Section looking east (Jones 1998 & 2002)
revised September 2002

North Porch Roof

Truss V south face (Jones 1998 & 2002)



= thirteenth century primary phase (all samples prefixed SCNT)

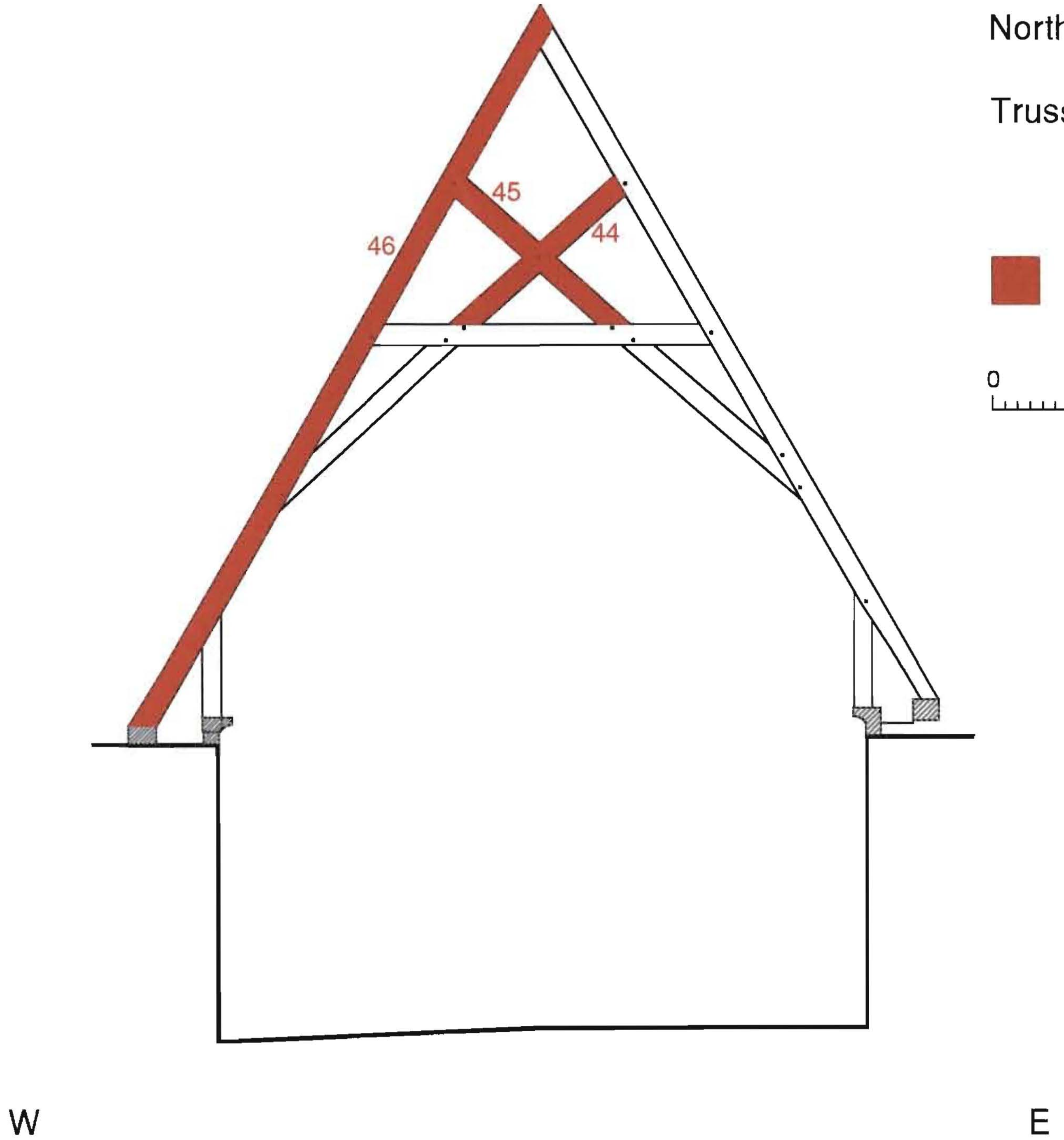
0 1 2 3 4 metres

W

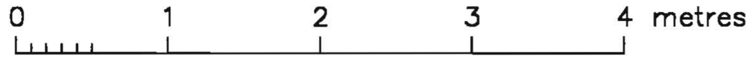
E

North Porch Roof

Truss VI north face (Jones 1998 & 2002)

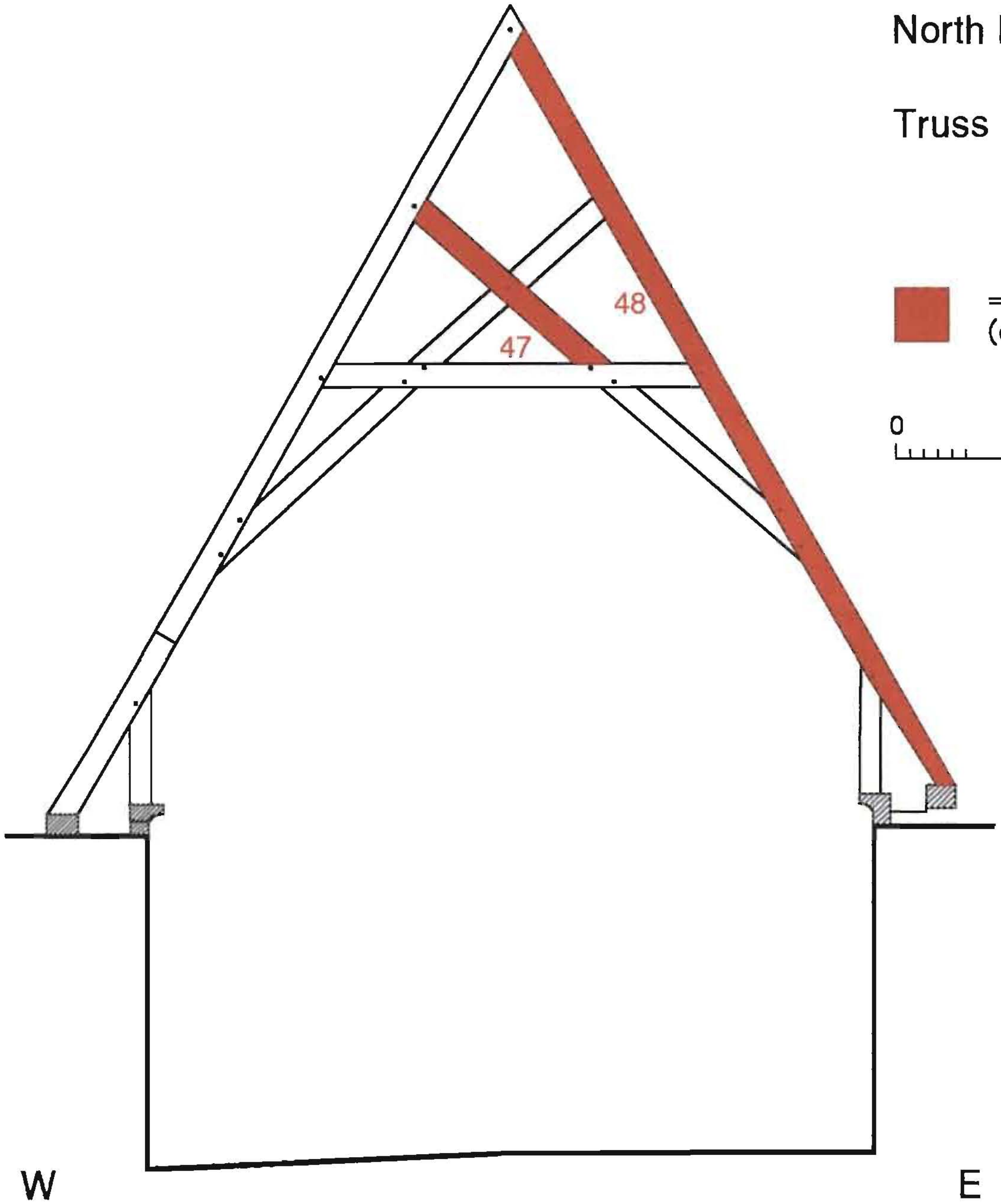


= thirteenth century primary phase
(all samples prefixed SCNT)



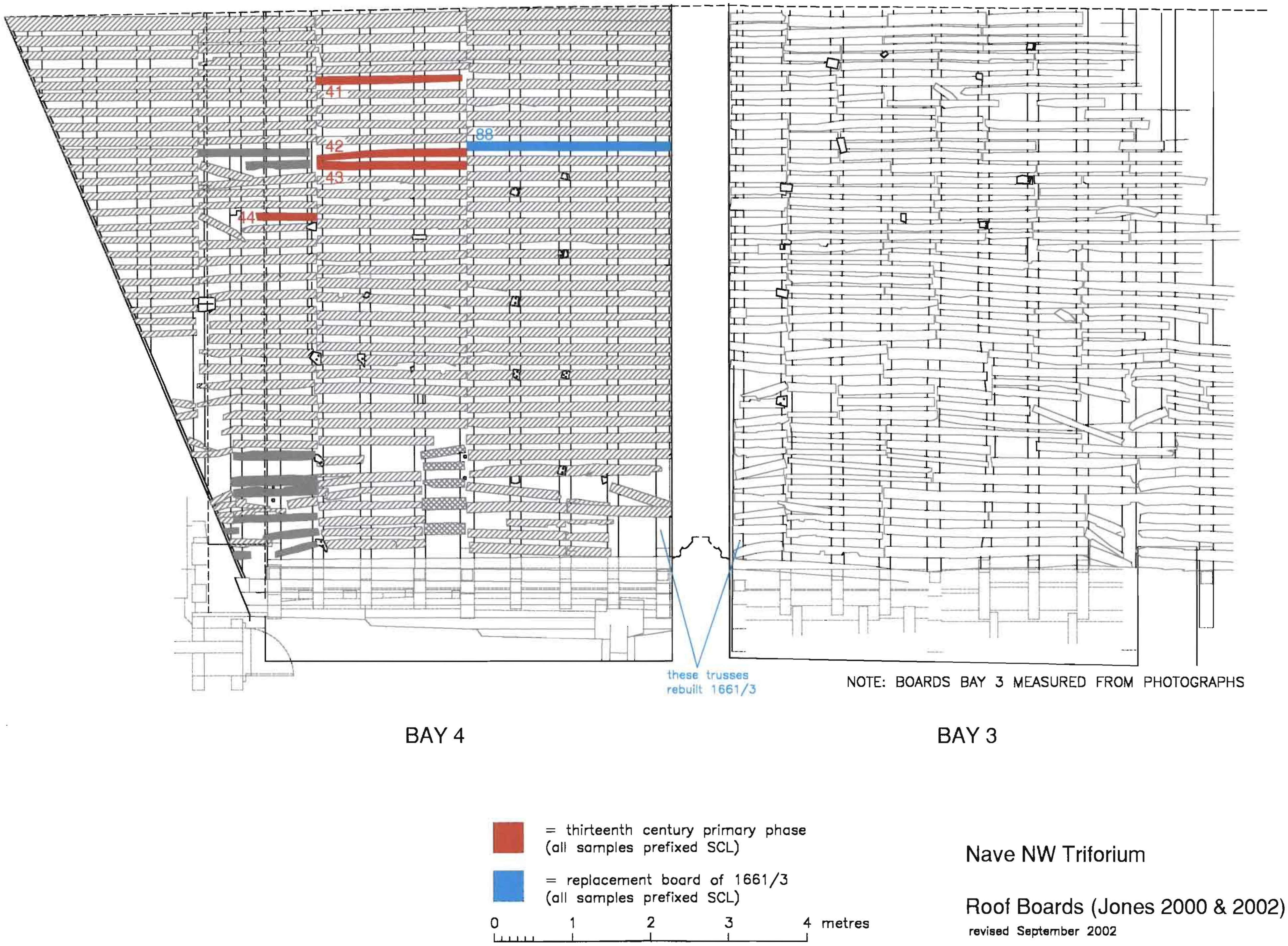
North Porch Roof

Truss VII north face (Jones 1998 & 2002)



= thirteenth century primary phase (all samples prefixed SCNT)

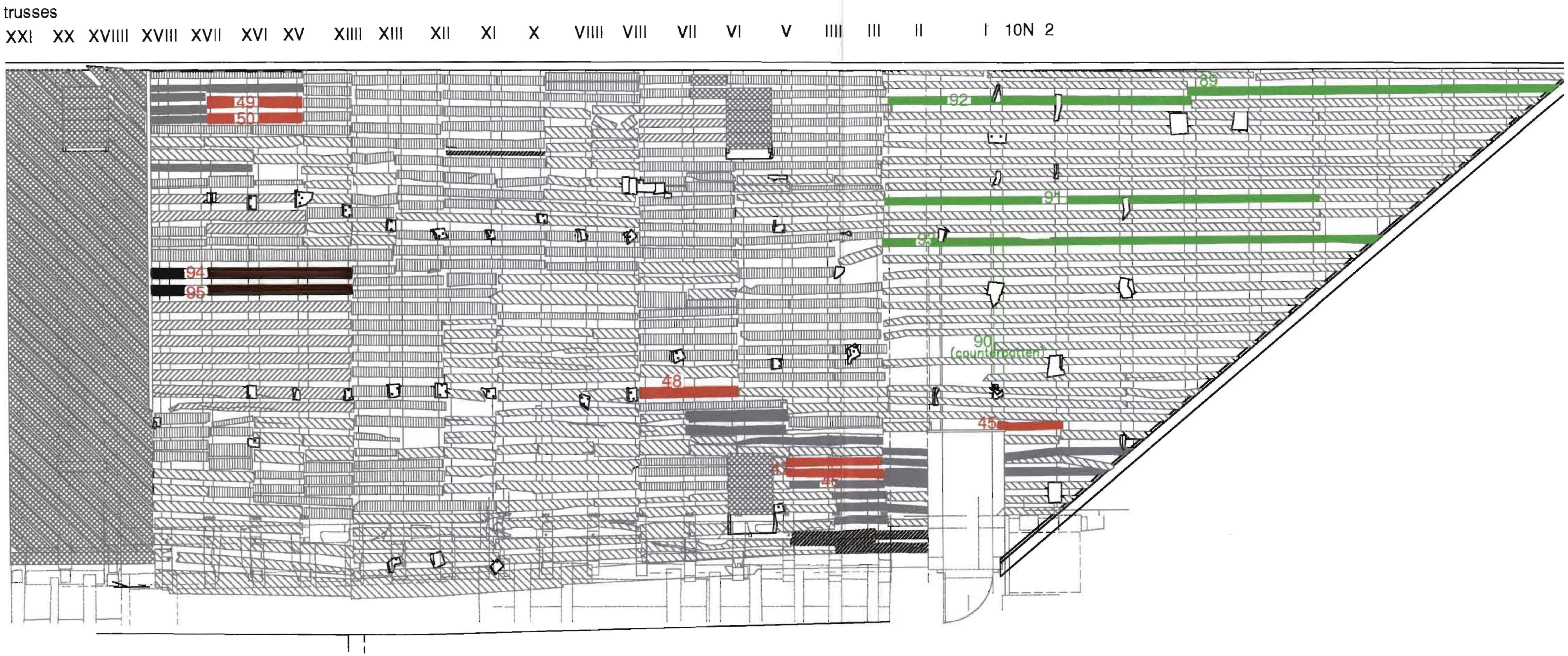
0 1 2 3 4 metres



Nave NW Triforium

Roof Boards (Jones 2000 & 2002)

revised September 2002



= thirteenth century primary phase (all samples prefixed SCL)

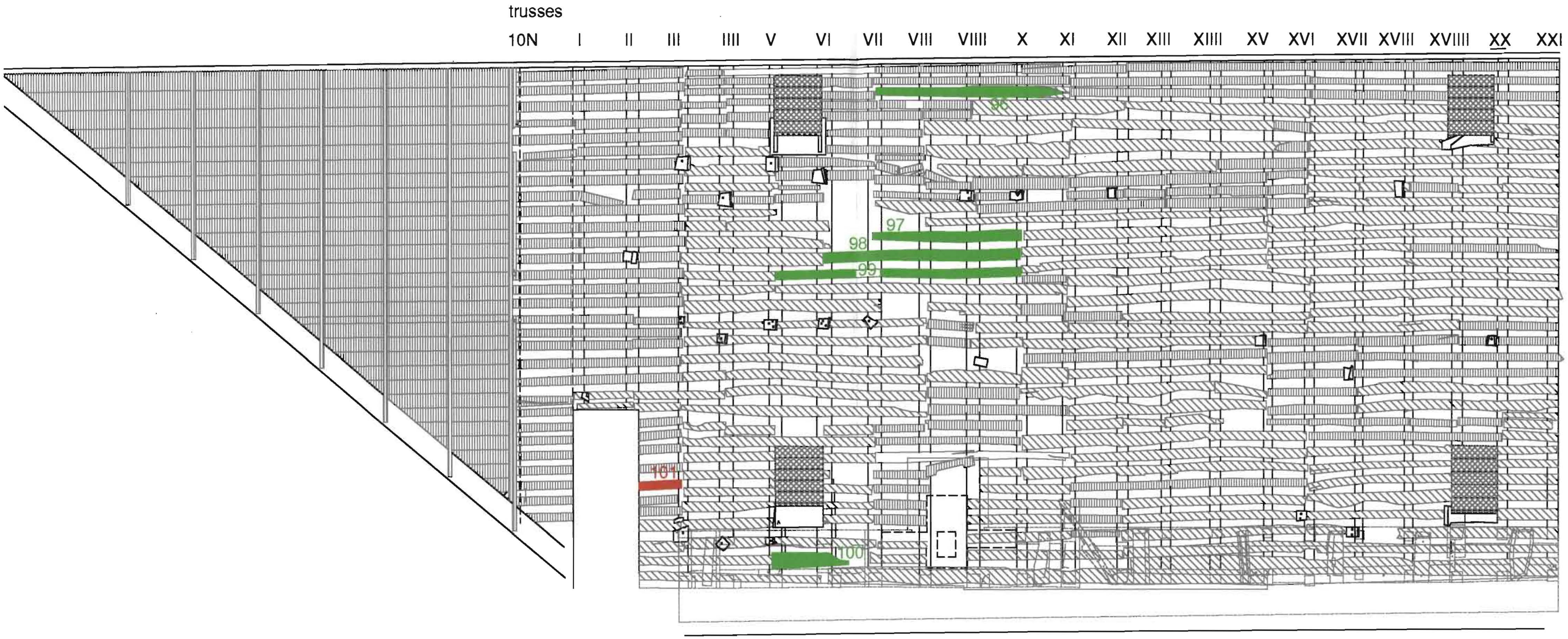
= replacement board of 1661/3 (all samples prefixed SCL)

= replacement board of c.1736 (all samples prefixed SCL)

0 1 2 3 4 metres

North Porch
Roof Boards west elevation

(Jones 2000 & 2002)



= thirteenth century primary phase (all samples prefixed SCL)

= replacement board of 1661/3 (all samples prefixed SCL)

= replacement board of c.1736 (all samples prefixed SCL)

0 1 2 3 4 metres

North Porch
Roof Boards east elevation

(Jones 2000 & 2002)