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Cathy Groves[1], Christine Locatelli[1] and Dr Martin Bridge[2]

## Summary

Dendrochronological analysis was undertaken on samples from 29 timbers of which 21 have been successfully dated. The analysis shows that the dated timbers were all associated with a single period of felling, which may have occurred over as little as six months or as much as 18 months during the period covering the winter of AD 1378/9 and the winter of AD 1379/80. The hall range, cross-wing, and dividing wall are therefore contemporaneous. This late fourteenth-century construction date is later than generally expected for this type of raised aisled hall construction, though the construction type is also unusual for the area.

## Keywords

Dendrochronology
Standing Building

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## Introduction

This document is a technical archive report on the tree-ring analysis of timbers from Wymondleybury, Little Wymondley, Hertfordshire (TL 21682706; Figs 1 and 2). It is beyond the dendrochronological brief to describe the building in detail or to undertake the production of detailed drawings. This analysis is a component part of a wider study of the building to be undertaken by Adrian Gibson and thus the conclusions presented here may be modified in the light of other architectural or historical evidence.

The following information is summarised from Gibson (pers comm) and Mercer (1975). The name of the building is usually given locally as one word (Gibson pers comm) even though both Mercer (1975) and Pevsner (1953) use two words. Wymondleybury is a grade I listed building. It is a raised aisled hall with in-line two storey parlour at the west end and a two storey cross-wing at the east end (Figs 3 – 5). The end walls of the hall have herring-bone bracing. The roofs of the hall range and cross-wing are of crown-post construction with the west bay of the hall range hipped. Mouldings on the crown-post and upper arcade posts in the hall range are consistent with those in the cross-wing. Stylistic evidence suggests an early fourteenth-century date but the construction is unusual in the area and a later fourteenth-century date was thought possible. Documentary information suggests that the building was previously called Somerhalle and was erected after AD 1373 but before AD 1400 by either John de Argentein or his son William de Argentein. The hall has subsequently had a floor and chimney inserted in the sixteenth century. The building was encased in red brick and a west wing added in the twentieth century.

Whilst the hall range and cross-wing are stylistically the same, there are a number of constructional anomalies that will be discussed in detail by Gibson (pers comm). The indications are that the structure was meant to carry on as an in-line bay as evidenced by the arcade plates having been crudely cut off at the junction between the hall and cross-wing and the crown-plate having been cut to accommodate the roof of the cross-wing. However the tiebeam of truss 4 is also the wall plate of the cross-wing, which would suggest that the hall and cross-wing are of the same date.

Dendrochronological analysis was commissioned by English Heritage. It was undertaken with the aim of providing independent dating evidence for the construction of the hall range and cross-wing and to ascertain whether they are contemporary. This would allow the distinctive mouldings to be dated and hence used for reference in the local area. It would also facilitate comparison between the dates of this and a group of raised aisled halls found in Suffolk with the highly decorated medieval halls of western and northern England.

## Methodology

The general methodology and working practises used at the Sheffield Dendrochronology Laboratory are described in English Heritage (1998). The following summarises relevant methodological details used for the analysis of the samples from Wymondleybury.

A brief assessment was undertaken immediately prior to sampling in order to identify the presence of timbers suitable for analysis and to allow an appropriate sampling strategy to be formulated. Oak (*Quercus* spp.) is currently the only species used for routine dating purposes in the British Isles, although research on other species is being undertaken (Tyers 1998a; Groves 2000). Timbers with less than 50 annual growth rings are generally considered unsuitable for analysis as their ring patterns may not be unique (Hillam *et al* 1987). Thus oak timbers were sought, which had at least 50 rings and if possible had either bark/bark edge or some sapwood surviving as this is important in the production of precise dating evidence (see below). The sampling strategy was designed to take in as wide a range of structural elements as possible within the dendrochronological brief and was discussed on site with Adrian Gibson in order to ensure that there were no obvious omissions with respect to the current understanding of the building. The initial assessment and sampling were undertaken by Christine Locatelli under the guidance of Martin Bridge. Further sampling was subsequently undertaken by Christine Locatelli.

In standing buildings samples are generally removed from selected timbers in the form of either cross-sectional slices or cores. Slices are taken from timbers that are either wholly or partially replaced during restoration, whereas cores are removed from timbers that will remain *in situ*. The cores are taken, using a 15mm diameter corer attached to an electric drill, in a position and direction most suitable for maximising the numbers of rings in the sample, whilst ensuring the presence of sapwood and bark edge whenever possible.

The ring sequence of each sample was revealed by a combination of sanding and paring until the annual growth rings were clearly defined. Any samples that fail to contain the minimum number of rings or have unclear ring sequences are rejected. The sequence of growth rings in suitable samples was measured to an accuracy of 0.01mm using a purpose-built travelling stage attached to a microcomputer-based measuring system (Tyers 1999a). The ring sequences were plotted onto semi-logarithmic graph paper to enable visual comparisons to be made between them with the aid of a lightbox. In addition, cross-correlation algorithms (Baillie and Pilcher 1973; Munro 1984) were employed to search for positions where the ring sequences were highly correlated. The Student's *t*-test is then used as a significance test on the correlation coefficient. The *t*-values quoted below are derived from the original CROS algorithm (Baillie and Pilcher 1973). A *t*-value of 3.5 or over is usually indicative of a good match (Baillie 1982), provided that high *t*-values are obtained at the same relative or absolute position with a series of independent sequences and that the visual match is satisfactory.

Dating is usually achieved by comparing, or crossmatching, ring sequences within a phase or structure and combining the matching patterns to form a phase or site master curve. This master curve and any remaining unmatched ring sequences are then tested against a range of reference chronologies, using the same matching criteria as above. The position at which all the criteria are met provides the calendar dates for the ring sequences. A master curve is used for absolute dating purposes whenever possible as it enhances the common climatic signal and reduces the background 'noise' resulting from the local growth conditions of individual trees.

During the crossmatching stage an additional potentially important element of tree-ring analysis is the identification of 'same-tree' timber groups. The identification of 'same-tree' groups is based on very high levels of similarity in year to year variation, longer term growth trends, and anatomical anomalies. Such information ideally should be used to support possible 'same-tree' groups identified from similarities in the patterns of knots/branches during detailed recording of timbers for technological and woodland characterisation studies. Timbers originally derived from the same parent log generally have *t*-values greater than 10.0, although lower *t*-values do not necessarily exclude the possibility. It is a balance of the range of information available that provides the 'same-tree' link.

The crossdating process provides precise calendar dates only for the rings present in the timber. The nature of the final (youngest) ring in the sequence determines whether the date of this ring also represents the year the tree from which the timber was derived died. Oak consists of inner inert heartwood and an outer band of active sapwood. If the sample ends within the heartwood of the original tree, a *terminus post quem* for the felling of the tree is indicated by the date of the last ring plus the addition of the minimum expected number of sapwood rings that are missing. This is the date after which the timber was felled but the actual year of felling may be many decades later depending on the number of outer rings removed during timber conversion. Where some of the outer sapwood or the heartwood/sapwood boundary survives on the sample, a felling date range can be calculated using the maximum and minimum number of sapwood rings likely to have been present. The sapwood estimate applied throughout this report is a minimum of 10 and maximum of 46 rings, where these figures indicate the 95% confidence limits of the range and are applicable to oak trees of all periods from England and Wales (Tyers 1998b). Alternatively, if bark-edge survives, then a felling date can be directly obtained from the date of the last surviving ring. In some instances it may be possible to determine the season of felling according to whether the ring immediately below the bark appears to be complete or incomplete. However the onset of growth can vary within and between trees and this, combined with the natural variation in actual ring width, means that the determination of felling season must be treated cautiously. The delicate nature of sapwood increases the likelihood of damage/degradation to the outermost surface of the sample and hence increases the difficulties of positive identification of bark-edge.

The felling dates produced do not by themselves necessarily indicate the construction date of the structure from which they are derived. At this stage, factors such as seasoning, reuse, and stockpiling have to be considered. Evidence suggests that seasoning of timber for structural purposes was a fairly rare occurrence until relatively recent times, and timber was generally felled as required and used whilst green (Hollstein 1980; Rackham 1990; Charles and Charles 1995). However, the reuse of timber has been a common practice since prehistoric times and stockpiling, albeit potentially short-term, may occur. Therefore, although the production of tree-ring dates is an independent process, the interpretation of these dates may be refined by drawing on other archaeological evidence.

## Results

Eight timbers associated with the primary construction phase of the hall range, 19 from the cross-wing, and two from the wall between the cross-wing and hall were selected as the most suitable for sampling. Access to the roof structure over the hall range was severely restricted so sampling was mostly confined to the lower parts of the structure. Sampling in the cross-wing was more extensive than usual, although by necessity it concentrated on the rafters. This was due to a combination of the preponderance of timbers with only borderline numbers of rings and the recurrent presence of a band of narrow rings rendering a number of samples unusable even though they clearly contained more than the minimum number of rings required. The approximate location of each sampled timber is indicated on Figure 5. Details of the samples are given in Table 1.

Seven samples were rejected as unsuitable for analysis: two from the cross-wing which had too few rings for reliable dating purposes; one from the cross-wing which had fragmented; and one from the hall range and three from the cross-wing which contained bands of very narrow rings, and therefore could not be reliably measured (Table 1).

All 22 measured ring sequences were compared with each other in order to determine whether similarities in the growth patterns could be found, which might indicate contemporaneity. Twenty-one of these were found to crossmatch (Fig 6; Table 2). These were combined to produce a 196-year site master chronology, WYMNDBRY (Table 3).

The site master chronology and the single unmatched individual ring sequence (**11**) were compared with an extensive range of dated reference chronologies spanning the last millennium from the British Isles and elsewhere in northern Europe. Consistent results were obtained for WYMNDBRY when it spans the period AD 1184-1379 inclusive (Table 4). Each individual ring sequence included in the site master chronology was therefore assigned a date, which indicates when the tree from which the timber was derived was growing (Table 1). No reliable results were obtained for the unmatched individual ring sequence (**11**), which therefore remains undated by dendrochronology.

## Interpretation/Discussion

Twenty-one timbers have been successfully dated from the hall range and cross-wing of Wymondleybury. These were combined to form a single site master chronology, which matches extremely well with a range of reference chronologies from Hertfordshire and the surrounding counties indicating that the timbers are all likely to have been derived from a local woodland source.

The high *t*-value, supported by an excellent visual match, suggests that the timbers represented by samples **18** and **21**, a brace and a rafter from the cross-wing, may have been derived from the same parent tree (Fig 7; Table 2). The ring sequences from samples, **02**, **04**, and **05**, also show very good similarity (Table 2). These could potentially represent three timbers derived from the same-tree. However the overall growth trends are sufficiently different to imply that this may not be the case. Sample

**05** for instance shows a very clear overall decrease in growth rate, with the outer approximately 80-90 rings remaining unmeasured as they were too narrow for reliable measurement, which is not apparent in either **02** or **04** (Fig 8).

The location of the dated timbers is highlighted on Figure 9. Five of the seven dated timbers from the hall range had retained bark edge (Fig 6). The outermost ring of sample **29** appeared to be complete with both spring and summer wood present, which indicates that this timber was felled during winter dormancy in AD 1378/9. Three samples, **01**, **02**, and **04**, have a partially formed growth ring for AD 1379. The amount of growth varies indicating that **02** and **04** were felled in spring AD 1379, whilst **01** was felled in summer AD 1379. The outermost ring of **03** appeared to be complete with both spring and summer wood present which indicates that this timber was felled during winter dormancy in AD 1379/80. One of the two samples from the dividing wall between the hall range and cross-wing had retained bark edge but the outermost edge was slightly damaged resulting in a felling date of *c* AD 1378-80. Four of the 12 dated samples from the cross-wing had retained bark edge. These were all rafters and were felled during winter dormancy in AD 1378/9. This therefore indicates that all of these timbers are associated with a single felling period spanning as little as six months or as much as 18 months during the period covering the winter of AD 1378/9 and the winter of AD 1379/80. The felling date ranges for the remaining dated samples are all consistent with felling during the period AD 1378-80.

These results indicate that the hall range and cross-wing are contemporary. However as the only precise felling dates in the cross-wing are derived from rafters and, apart from two other structural elements, all other dated timbers from the cross-wing were rafters, the question was raised as to whether the rafters could feasibly have been re-used from an in-line bay on the east end of the hall range that was subsequently replaced by the cross-wing. Further inspection of the rafters confirmed that there was no physical evidence of re-use or re-setting of these rafters. Consequently it appears most likely that there was a change of design during construction, and that the hall range and cross-wing were both constructed shortly after felling during AD 1378-80. This is somewhat later than the early fourteenth century date initially anticipated from the architectural detail, though this was with the proviso that the style of construction was unusual for the area and it thus might be of a different date. The construction date for Wymondleybury lies within that identified for the building known as Somerhalle from documentary evidence and thus lends support to these two buildings being one and the same.

## Conclusion

The dendrochronological analysis has shown that the timbers associated with the initial construction of both the hall range and cross-wing were probably all felled in the period AD 1378-80. If, as seems likely, they were used whilst green a construction date shortly after this is indicated. The anomalous construction details appear most likely to be explained by a change of design during the construction process.

The raised aisled hall construction is unusual in this area and it appears to be approximately half a century later than those further to the east in Suffolk. The dating of the distinctive mouldings to the later fourteenth century may also prove to be a

valuable piece of information when assigning dates on typological grounds in the area.

**Acknowledgements**

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**Figure 1** Approximate location of Little Wymondley within England and Wales

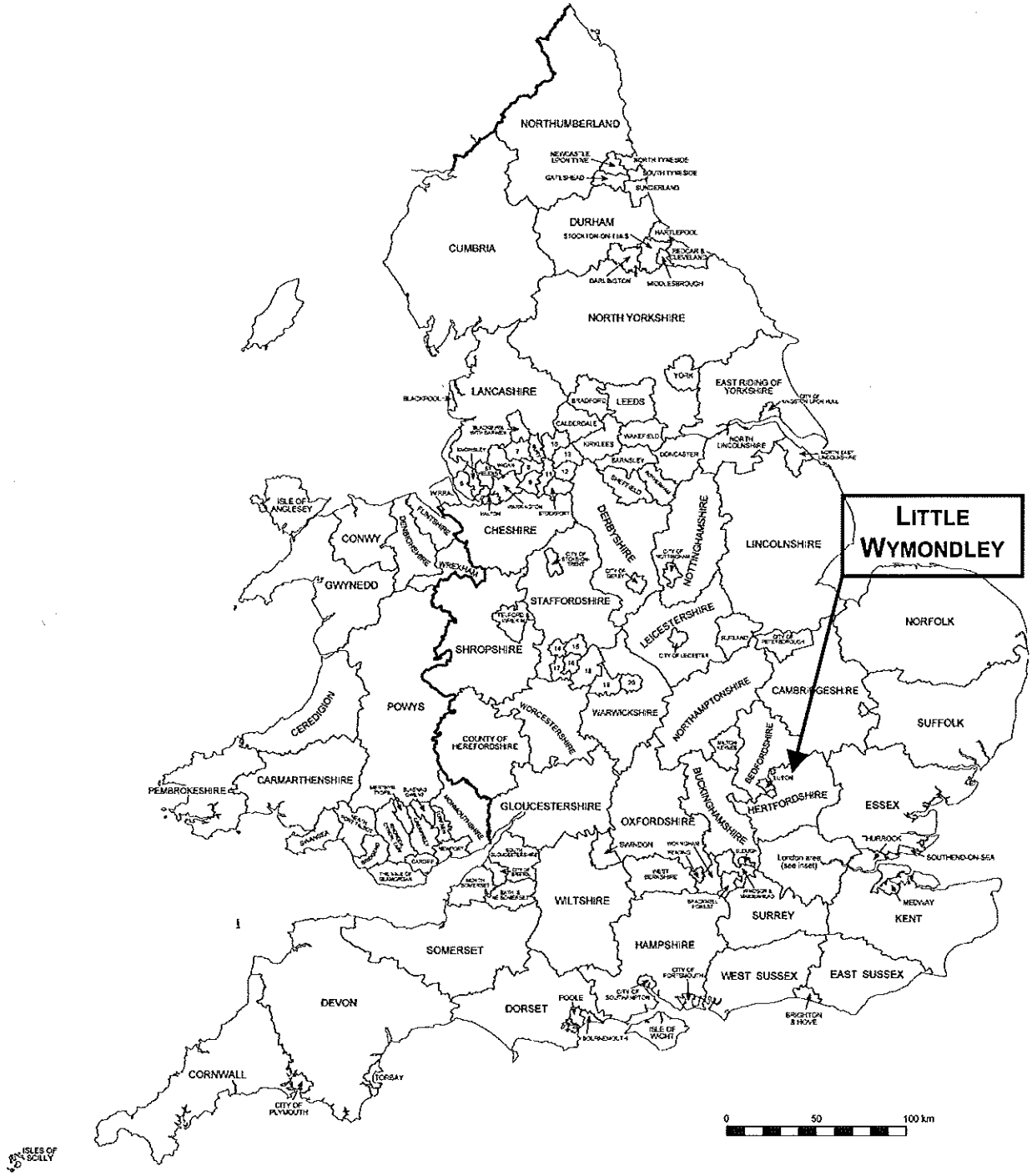


**Figure 2** Location of Wymondleybury, Little Wymondley, Hertfordshire

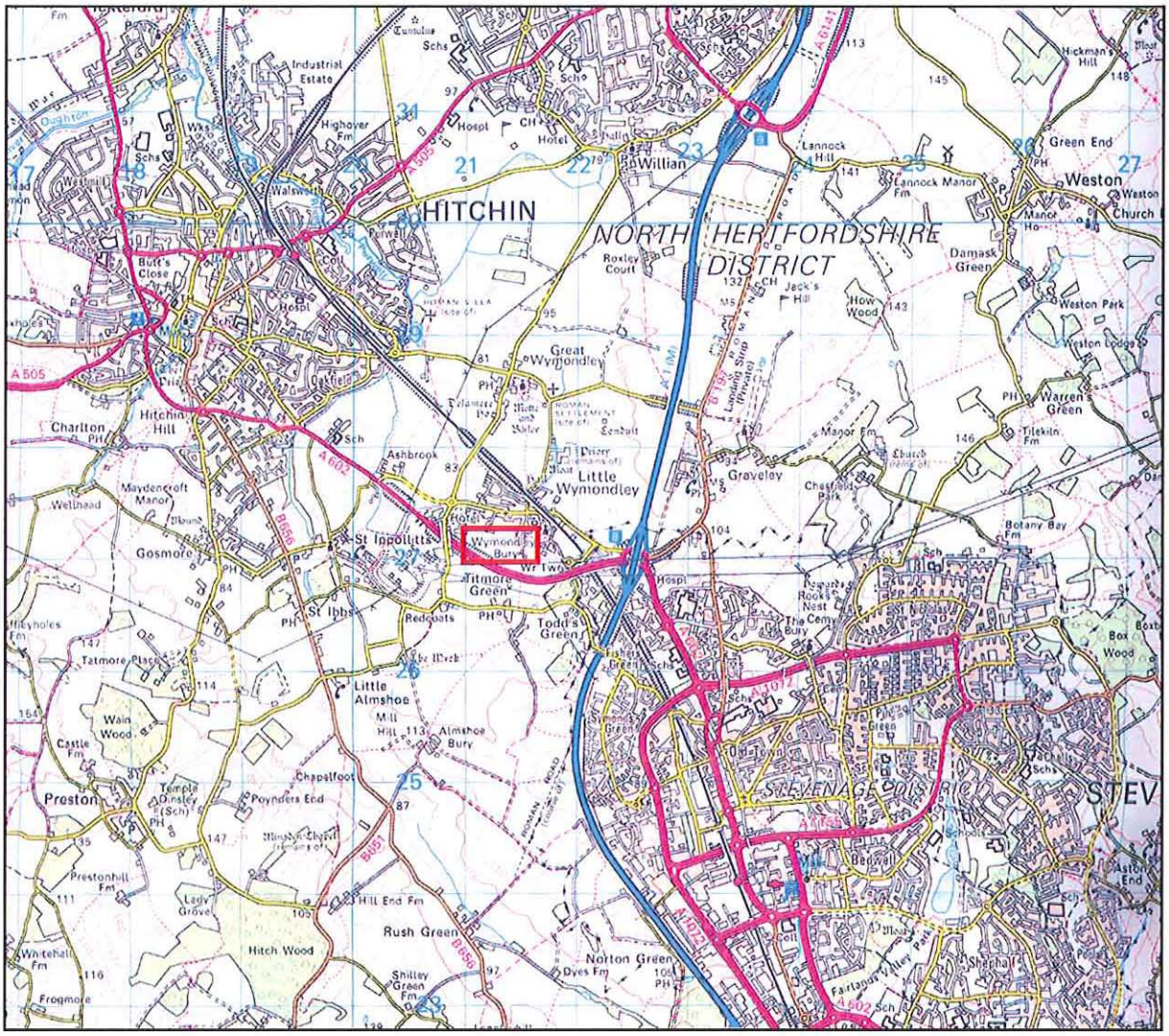


**Figure 3** The north face of Wymondleybury (photograph C Locatelli)

**Figure 4** The north-east corner of Wymondleybury (photograph C Locatelli)

**Figure 5** Plan of Wymondleybury (after Mercer 1975) showing the approximate location of the sampled timbers. Trusses and bays have been numbered in the hall range from west to east and in the cross-wing from north to south.

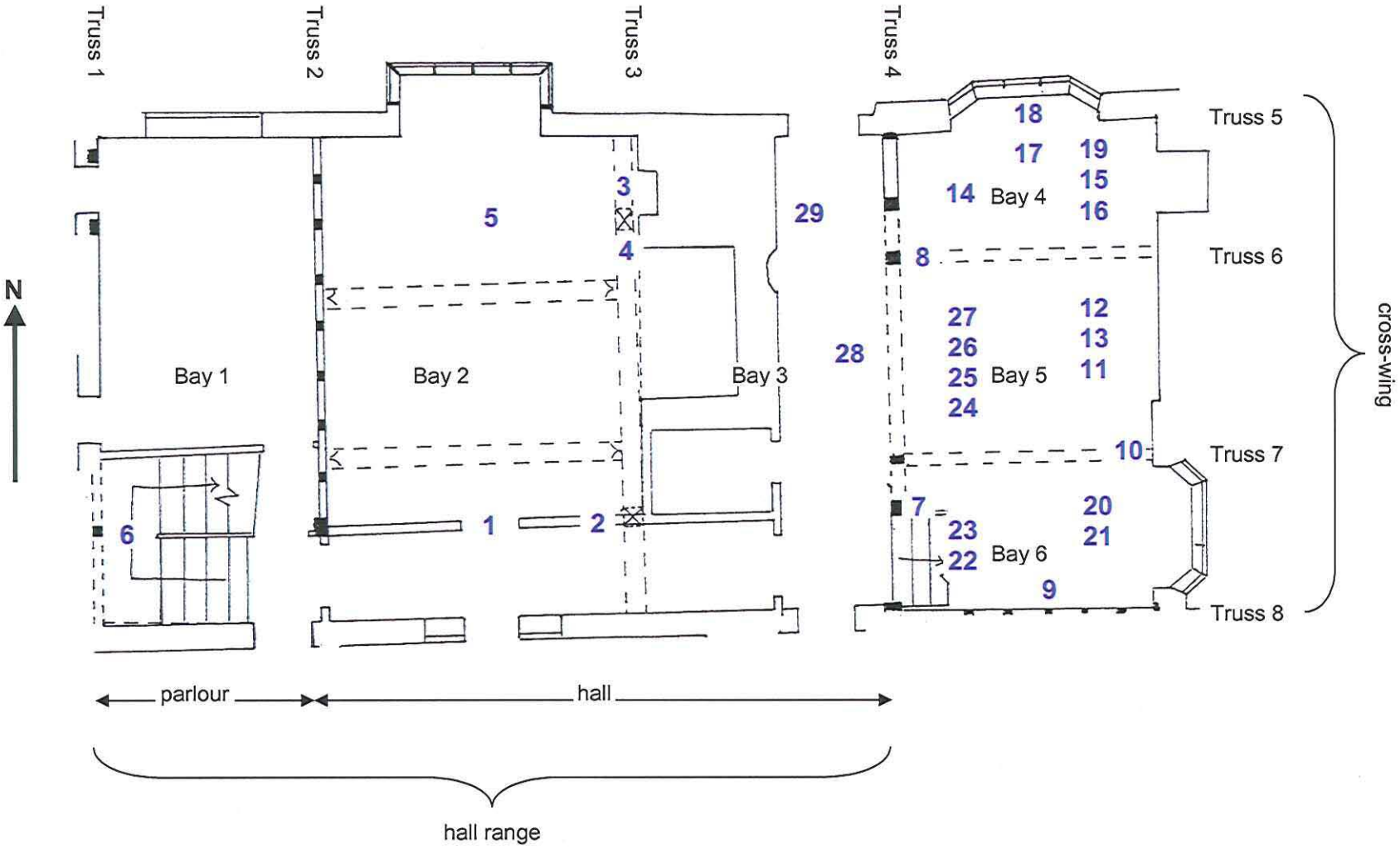
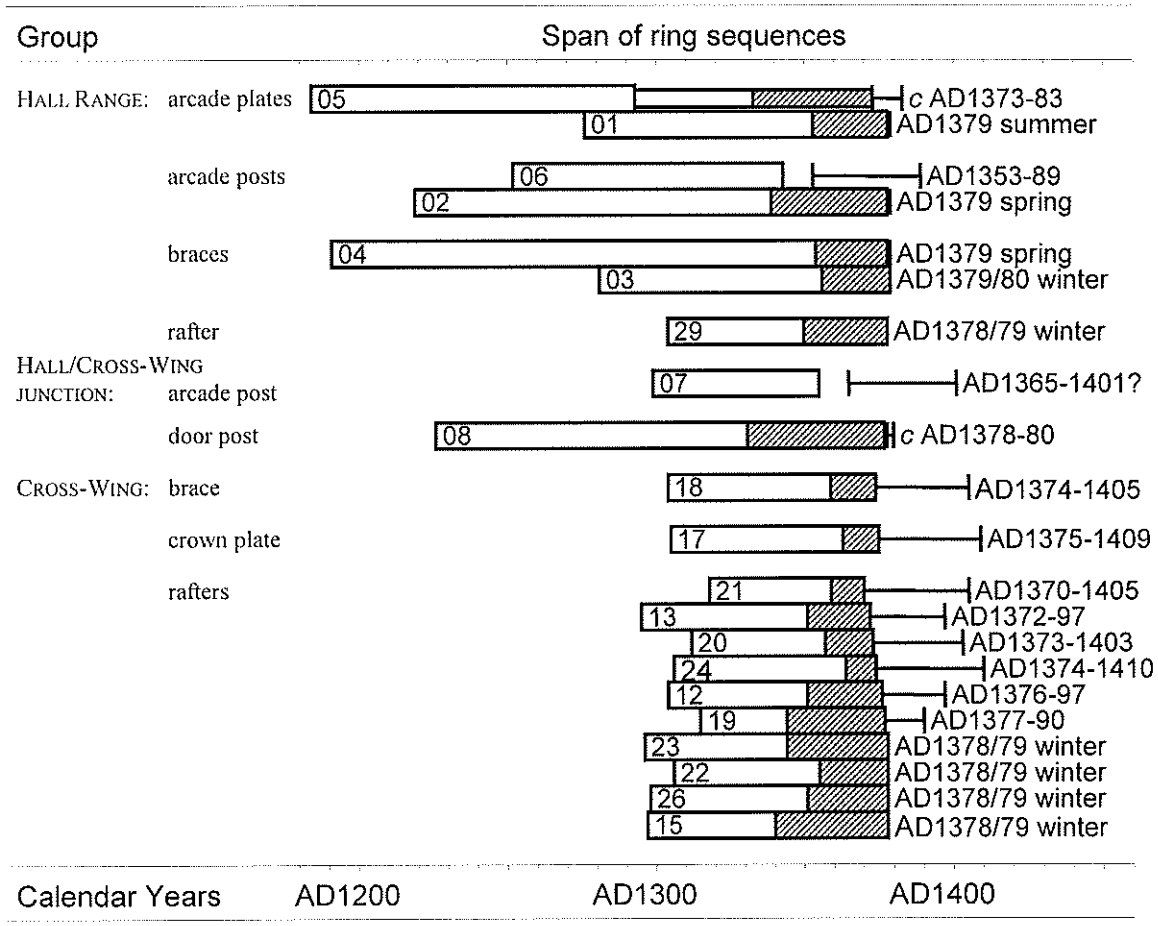


**Figure 6** Bar diagram showing the relative positions of the dated ring sequences from Wymondleybury and their felling dates




KEY

heartwood
sapwood
unmeasured heartwood

**Figure 7** Diagram showing the ring sequences derived from samples **18** and **21**

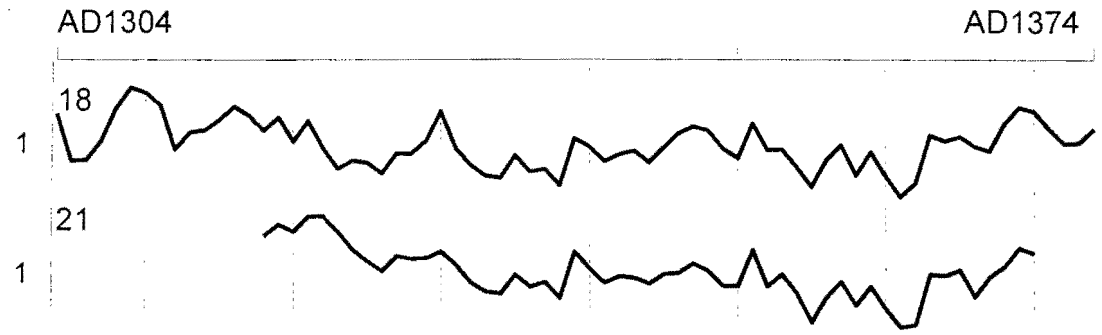



**Figure 8** Diagram showing the ring sequences derived from samples **02**, **04**, and **05**. The decrease in growth rate with age is very clear in sample **05**

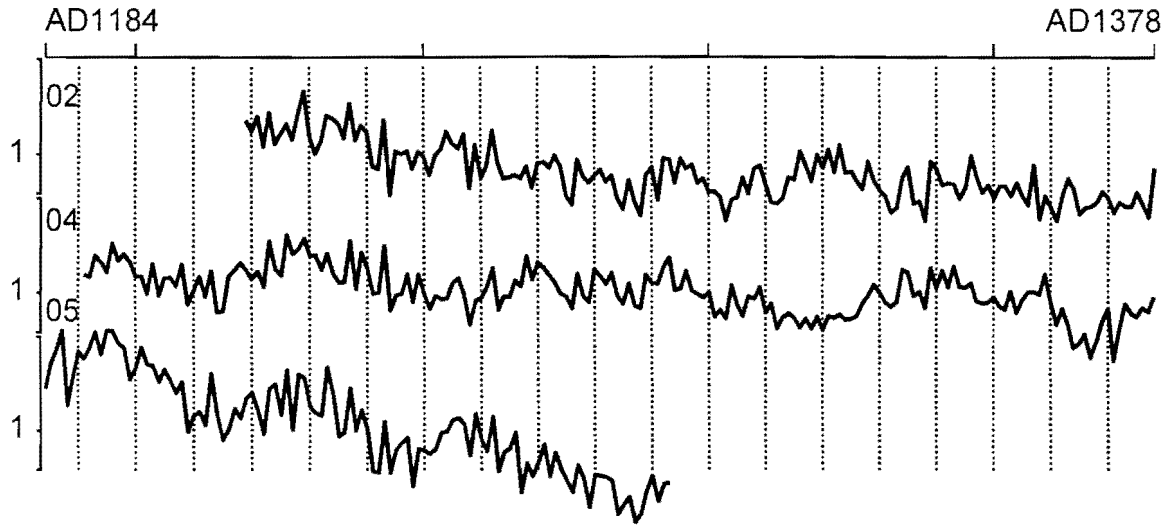


**Figure 9** Drawing of Wymondleybury (after John Walker 2003) highlighting the dated timbers. Neither the individual rafters nor the ground sill at the south end of the cross-wing are represented on the drawing thus the location of dated rafters is indicated by an R

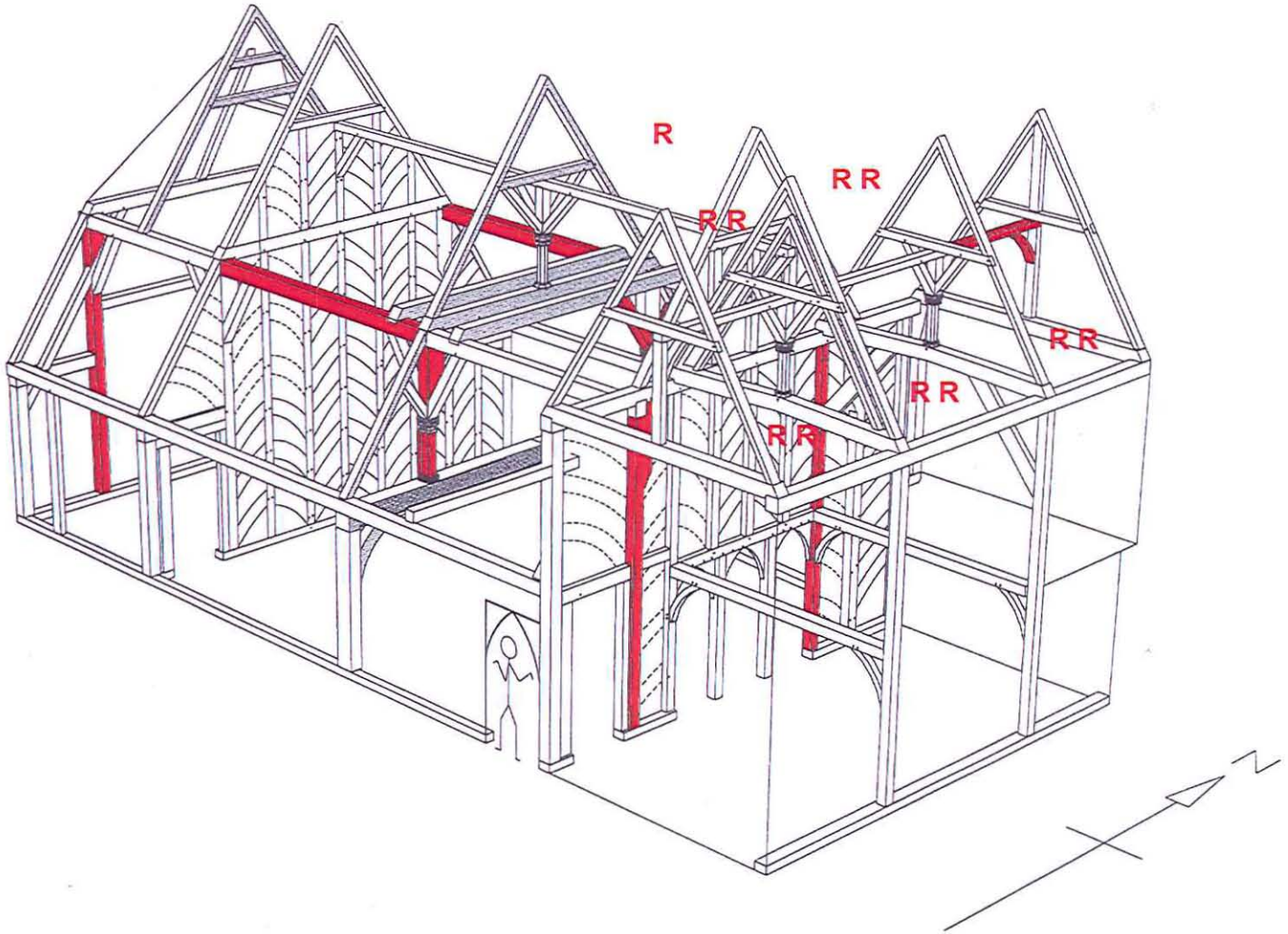


**Table 1** Details of the samples from Wymondleybury, Little Wymondley, Hertfordshire

| Sample number | Timber location and function | Number of rings | Sapwood rings | ARW | Cross-section type | Cross-section dimensions | Date of measured sequence | Felling date | Comment |
|---|---|---|---|---|---|---|---|---|---|
| HALL RANGE | | | | | | | | | |
| 01 | Bay 2, south arcade plate | 103 | 25 bs | 1.57 | whole | 200 x 180 | AD1276-1378 | AD 1379 summer | - |
| 02 | Truss 3, south arcade post | 160 | 39 bs | 0.82 | whole | 340 x 200 | AD1219-1378 | AD 1379 spring | - |
| 03 | Truss 3, north brace from north arcade post | 99 | 23 bw | 1.47 | halved | 290 x 140 | AD1281-1379 | AD 1379/80 winter | - |
| 04 | Truss 3, south brace from north arcade | 188 | 24 bs | 1.10 | halved | 280 x 190 | AD1191-1378 | AD 1379 spring | - |
| 05 | Bay 2, north arcade plate | 110 *+80-90* b | - | 1.52 | halved | 250 x 220 | AD1184-1293 | *c* AD 1373-83 | outermost rings too narrow for accurate measurement |
| 06 | Truss 1, south arcade post | 92 | hs | 1.90 | whole | 330 x 220 | AD1252-1342 | AD 1353-89 | - |
| 28 | Bay 3, crown plate | ~50 | ~10 | 1.66 | whole | 120 x 100 | - | - | rejected: unmeasureable rings |
| 29 | Bay 3, north rafter, 3rd from east | 75 | 28 bw | 1.16 | whole | 140 x 120 | AD 1304-1378 | AD1378/79 winter | - |
| HALL/CROSS WING JUNCTION | | | | | | | | | |
| 07 | Truss 4, south arcade post | 57 | ?hs | 1.96 | whole | 320 x 230 | AD1299-1355 | AD 1365-1401? | - |
| 08 | Truss 4, doorway, north post | 152 | 46 | 0.87 | quartered | 190 x 190 | AD1226-1377 | *c* AD 1378-80 | very close to bark edge but outer surface slightly damaged |

**Table 1** (cont)

| Sample number | Timber location and function | Number of rings | Sapwood rings | ARW | Cross-section type | Cross-section dimensions | Date of measured sequence | Felling date | Comment |
|---|---|---|---|---|---|---|---|---|---|
| CROSS-WING | | | | | | | | | |
| 09 | Truss 8, ground sill | 29 | - | - | unknown | unknown | - | - | rejected: too few rings |
| 10 | Truss 7, west brace from east post | 44 | hs | - | unknown | unknown | - | - | rejected: too few rings |
| 11 | Bay 5, east rafter, 12th from north | 59 | 25 | 1.02 | whole | 140 x 100 | - | - | - |
| 12 | Bay 5, east rafter, 7th from north | 73 | 25 | 1.26 | whole | 140 x 100 | AD 1304-1376 | AD 1376-97 | - |
| 13 | Bay 5, east rafter, 8th from north | 78 | 21 | 1.02 | whole | 140 x 100 | AD 1295-1372 | AD 1372-97 | - |
| 14 | Bay 4, west rafter, 4th from north | ~70 | ~35 | - | whole | 120 x 90 | - | - | rejected: core fragmented |
| 15 | Bay 4, east rafter, 3rd from north | 82 | 38 bw | 1.08 | whole | 140 x 100 | AD 1297-1378 | AD 1378/79 winter | - |
| 16 | Bay 4, east rafter, 4th from north | ~50 | ~10 | - | whole | 120 x 90 | - | - | rejected: unmeasureable rings |
| 17 | Bay 4, crown plate | 71 | 12 | 1.45 | whole | 120 x 100 | AD 1305-1375 | AD 1376-1409 | - |
| 18 | Truss 5, south brace from crown post | 71 | 15 | 1.21 | unknown | unknown | AD 1304-1374 | AD 1374-1405 | - |
| 19 | Bay 4, east rafter, 2nd from north | 63 | 33 | 1.18 | whole | 120 x 100 | AD 1315-1377 | AD 1377-90 | - |
| 20 | Bay 6, east rafter, 15th from north | 62 | 16 | 1.26 | whole | 130 x 90 | AD 1312-1373 | AD 1373-1403 | - |
| 21 | Bay 6, east rafter, 17th from north | 53 | 11 | 1.27 | whole | 120 x 90 | AD 1318-1370 | AD 1370-1405 | - |

**Table 1** (cont)

| Sample number | Timber location and function | Number of rings | Sapwood rings | ARW | Cross-section type | Cross-section dimensions | Date of measured sequence | Felling date | Comment |
|---|---|---|---|---|---|---|---|---|---|
| 22 | Bay 6, west rafter, 15th from north | 73 | 23 bw | 1.26 | whole | 120 x 90 | AD 1306-1378 | AD1378/79 winter | - |
| 23 | Bay 6, west rafter, 14th from north | 83 | 34 bw | 1.13 | whole | 140 x 90 | AD 1296-1378 | AD1378/79 winter | - |
| 24 | Bay 5, west rafter, 12th from north | 69 | 10 | 1.26 | whole | 130 x 80 | AD 1306-1374 | AD 1375-1410 | - |
| 25 | Bay 5, west rafter, 11th from north | ~65 | ~20 | - | whole | 140 x 120 | - | - | rejected: unmeasureable rings |
| 26 | Bay 5, west rafter, 10th from north | 81 | 27 bw | 1.30 | whole | 120 x 100 | AD 1298-1378 | AD1378/79 winter | - |
| 27 | Bay 5, west rafter, 8th from north | ~80 | ~35 | - | whole | 120 x 100 | - | - | rejected: unmeasureable rings |

**Number of rings** - total number of measured rings including both heartwood and sapwood; + - indicates the presence of unmeasured rings; ~ - indicates the approximate number of rings on samples that contain unmeasureable bands of narrow rings
**Sapwood rings** – number of measured sapwood rings only; hs – heartwood/sapwood boundary present; ?hs – possible heartwood/sapwood boundary present; bw – bark edge present with an apparently complete outermost ring; bs – bark edge present but the outermost ring is incomplete and not measured
**ARW** – average ring width in millimetres
**Cross-section type** - guide to conversion type
**Cross-section dimensions** – maximum dimensions of the cross-section in millimetres

**Table 2** Matrix showing the *t*-values obtained between the matching ring sequences included in the site master chronology WYMNDBRY. (– indicates *t*-values less than 3.50; \ - indicates overlap of less than 30 years)

| | 05 | 02 | 06 | 03 | 04 | 29 | 07 | 08 | 18 | 17 | 12 | 13 | 15 | 19 | 20 | 21 | 22 | 23 | 24 | 26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **01** | 4.73 | 4.49 | 4.73 | 5.20 | 3.65 | - | 4.14 | 3.62 | - | - | 3.53 | - | - | - | - | - | - | 3.92 | - | 3.52 |
| **05** | | 9.55 | 4.00 | \ | 10.43 | \ | \ | 8.01 | \ | \ | \ | \ | \ | \ | \ | \ | \ | \ | \ | \ |
| **02** | | | 6.63 | 7.16 | 9.28 | 4.28 | 6.04 | 6.89 | 4.50 | 4.24 | 5.10 | 7.61 | 7.47 | 6.15 | 4.80 | 3.76 | 5.91 | - | - | 5.77 |
| **06** | | | | 6.34 | 4.54 | - | - | 4.23 | - | - | - | 4.45 | 6.36 | \ | - | \ | 5.92 | 4.12 | - | 4.96 |
| **03** | | | | | 4.54 | - | - | 5.85 | 6.16 | 4.07 | - | 5.98 | 6.71 | 3.87 | - | 4.08 | 4.56 | - | 4.88 | 6.74 |
| **04** | | | | | | - | - | 6.38 | 3.55 | 3.82 | - | 3.64 | - | 4.43 | - | - | - | - | - | 5.04 |
| **29** | | | | | | | - | - | 5.36 | - | 4.79 | 4.77 | 6.97 | 5.74 | 4.95 | 5.60 | 5.80 | 4.23 | 3.67 | - |
| **07** | | | | | | | | - | - | 3.65 | 3.90 | - | 4.66 | 4.96 | - | - | - | 5.06 | - | - |
| **08** | | | | | | | | | - | - | - | 4.40 | 3.60 | - | - | - | - | 3.60 | - | 5.35 |
| **18** | | | | | | | | | | 3.77 | 3.83 | 5.61 | 5.41 | 5.31 | 4.11 | 11.82 | 7.06 | 3.51 | 5.80 | 6.09 |
| **17** | | | | | | | | | | | 5.03 | 4.17 | 4.88 | 6.34 | - | 5.11 | 4.23 | 3.54 | 5.04 | 5.27 |
| **12** | | | | | | | | | | | | 3.78 | 4.27 | 6.73 | 3.71 | 6.37 | 4.42 | - | 4.22 | 3.94 |
| **13** | | | | | | | | | | | | | 6.68 | 6.77 | - | 5.16 | 5.61 | - | - | 6.05 |
| **15** | | | | | | | | | | | | | | 5.74 | 5.35 | 4.53 | 6.00 | 5.06 | 5.20 | 6.28 |
| **19** | | | | | | | | | | | | | | | 3.70 | 5.00 | 7.80 | - | - | 7.07 |
| **20** | | | | | | | | | | | | | | | | 4.30 | 4.94 | - | - | - |
| **21** | | | | | | | | | | | | | | | | | 6.01 | 3.71 | 6.39 | 4.46 |
| **22** | | | | | | | | | | | | | | | | | | 5.13 | 4.26 | 7.47 |
| **23** | | | | | | | | | | | | | | | | | | | 3.61 | 4.96 |
| **24** | | | | | | | | | | | | | | | | | | | | 3.65 |

**Table 3** Ring width data from the site master chronology **WYMNDBRY**, dated AD 1184-1379 inclusive

| Date | Ring widths (units of 0.01mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| AD1184 | | | | 200 | 306 | 384 | 535 | 154 | 246 | 376 |
| | 234 | 263 | 354 | 262 | 337 | 378 | 302 | 293 | 201 | 207 |
| AD1201 | 266 | 200 | 228 | 162 | 201 | 180 | 150 | 192 | 91 | 116 |
| | 134 | 102 | 201 | 102 | 80 | 118 | 145 | 144 | 165 | 154 |
| | 157 | 107 | 213 | 162 | 136 | 214 | 143 | 236 | 276 | 163 |
| | 132 | 120 | 219 | 175 | 146 | 107 | 224 | 122 | 157 | 140 |
| | 89 | 74 | 153 | 66 | 110 | 110 | 115 | 66 | 107 | 102 |
| AD1251 | 101 | 139 | 250 | 222 | 189 | 196 | 189 | 150 | 161 | 131 |
| | 145 | 198 | 136 | 134 | 148 | 156 | 113 | 139 | 111 | 114 |
| | 133 | 104 | 103 | 76 | 81 | 93 | 135 | 139 | 101 | 165 |
| | 154 | 174 | 193 | 127 | 142 | 128 | 84 | 100 | 161 | 192 |
| | 155 | 217 | 201 | 179 | 206 | 138 | 140 | 133 | 191 | 187 |
| AD1301 | 151 | 215 | 142 | 176 | 207 | 189 | 210 | 246 | 246 | 214 |
| | 185 | 140 | 142 | 180 | 201 | 211 | 175 | 158 | 177 | 160 |
| | 184 | 170 | 174 | 142 | 125 | 95 | 116 | 115 | 117 | 100 |
| | 92 | 86 | 84 | 113 | 137 | 102 | 82 | 74 | 125 | 119 |
| | 102 | 102 | 100 | 82 | 91 | 115 | 110 | 95 | 96 | 94 |
| AD1351 | 130 | 90 | 89 | 79 | 69 | 69 | 90 | 65 | 74 | 64 |
| | 47 | 60 | 94 | 72 | 70 | 67 | 61 | 87 | 111 | 101 |
| | 84 | 89 | 91 | 102 | 81 | 80 | 69 | 95 | 171 | |

**Table 4** Dating the site master chronology WYMNDBRY, dated AD 1184-1379 inclusive. Example *t*-values with some relevant regional and site reference chronologies

| Area | Reference chronology | Date span | *t*-values |
|---|---|---|---|
| England | London region multi-site (Tyers pers comm) | AD 413-1782 | 11.26 |
| England | South East region multi-site (Tyers pers comm) | AD 435-1811 | 10.40 |
| England | East Anglia region multi-site (Tyers pers comm) | AD 406-1899 | 14.93 |
| Bedfordshire | Chicksands Priory (Howard *et al* 1998) | AD 1175-1541 | 11.92 |
| Bedfordshire | St Georges Church, Toddington (Bridge 2001) | AD1226-1392 | 8.74 |
| Berkshire | Reading Abbey Waterfront (Groves *et al* 1997) | AD1168-1407 | 7.40 |
| Essex | Netteswellbury Barn Harlow (Tyers 1997) | AD 1245-1439 | 10.42 |
| Essex | Normans Hall, Wakes Colne (Tyers *et al* 2003) | AD 1229-1368 | 9.75 |
| Essex | Navestock Church (Tyers 1999b) | AD 1201-1355 | 7.87 |
| Gloucestershire | Court Farm Barn, Winterbourne (Miles 2001) | AD1177-1341 | 8.20 |
| Hampshire | Old Church House, Odiham (Miles *et al* 1996) | AD 1177-1365 | 9.90 |
| Hampshire | Rookley Farmhouse, Up Somborne (Miles *et al* 1997) | AD 1154-1387 | 8.00 |
| Hertfordshire | Clothall Bury Barn, nr Baldock (Arnold *et al* 2003) | AD 1253-1367 | 9.93 |
| Hertfordshire | Croxley Hall Farm Barn, Rickmansworth (Bridge 2000a) | AD 1298-1397 | 6.28 |
| Hertfordshire | Presbytery Roof, Abbey Church of St Albans (Howard *et al* 2000) | AD 1151-1262 | 8.88 |
| Hertfordshire | Ware Priory (Howard *et al* 1997) | AD 1223-1416 | 7.83 |
| London | Millennium Bridge (Tyers 1999c) | AD 999-1389 | 8.63 |
| London | Trig Lane (Tyers 1992) | AD 1130-1407 | 7.55 |
| Suffolk | Abbas Hall, Great Cornard (Bridge 2000b) | AD 1150-1289 | 7.81 |