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27 & 28 High Street, Stratford-upon-Avon, Warwickshire

Tree-ring Analysis of Oak Timbers

Martin Bridge and Cathy Tyers

Scientific Dating

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Summary

Three timbers from the front range are coeval and give a likely felling date in the AD 1430s to AD 1450s, significantly older than previously thought. The rear range was probably built a few decades later, with a likely felling date in the late AD 1470s to early AD 1490s, though with a potentially slightly earlier timber also present. All the timbers appear to be of local origin, with the later group of timbers matching other properties within Stratford-upon-Avon.

Contributors

Martin Bridge and Cathy Tyers

Acknowledgements

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Front cover image

27 & 28 High Street, Stratford-upon-Avon, Warwickshire. [Photograph Martin Bridge]

Archive location

Historic England Archive, The Engine House, Fire Fly Avenue, Swindon SN2 2EH

Historic Environment Record

Warwickshire Historic Environment Record, Archaeological Information and Advice, Communities, Warwickshire County Council, PO Box 43, Shire Hall, Warwick CV34 4SX

Date of investigation

Fieldwork was undertaken in September 2023, and the report written in 2026.

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Introduction

This building was investigated as part of the *StratFire* project, a project proposed by the Stratford-upon-Avon Society and subsequently supported by Historic England.

The project focusses on the impact of two major fires in the late sixteenth century in AD 1594 and AD 1595, as well as taking into account another major fire in AD 1614. Bearman (2000) investigated the two late sixteenth-century fires in detail using documentary sources. Subsequently the Stratford-upon-Avon Society have been highlighting the architectural heritage along the main thoroughfare through on-going volunteer-led research (Historic Spine (stratfordsociety.co.uk)) which has itself led to the development of the *StratFire* project (*StratFire* Project (stratfordsociety.co.uk)) which combines detailed archival research with comprehensive building recording and analysis, as well as dendrochronology. The project summary, as per the final agreed project design (Historic England Project number 8452) is as follows:

"The aim of this project, by means of high-level building recording and analysis, detailed archival research and dendrochronology, is to establish, following Stratford-upon-Avon's town fires of 1594 and 1595, the chronology, extent and nature of the reconstruction of buildings along High Street and Chapel Street, the epicentre of one or both of these fires. Post-fire documentary sources record damage to certain buildings, and architectural appraisal indicates that several timber-framed buildings surviving today date from the post-fire period. However, more needs to be established concerning the scale, nature and speed of this rebuilding, and the impact of the fires, both on the economic well-being of the town and the fortunes of the families most seriously affected. For many buildings there is simply no documentary evidence to draw on. Moreover, even when documentary evidence exists, it is either confusing or only establishes a date by which rebuilding had taken place. Conversely, it may record fire damage to properties that, from surviving architectural features, appear not to have been entirely rebuilt. High-level building analysis and dendrochronological investigation will resolve much of this uncertainty, provide a sound base for the interpretation of the documentary evidence, and throw definitive light on a crucial episode in the evolution of the architectural and cultural heritage of this internationally renowned town."

27 & 28 High Street

The Grade II listed building (National Heritage List Entry Number: 1187815; https://historicengland.org.uk/listing/the-list/list-entry/1187815) sits on the west side of the

High Street (Fig. 1) and comprises a front (Figs 2 & 3) and several rear ranges. The immediate rear ranges were looked at and sampled, but others (not studied on this occasion) bend round to open onto Ely Street to the south. The rear ranges are believed to pre-date the fire of AD 1595, but the front range is thought to have been rebuilt after the fire in *circa* AD 1600.

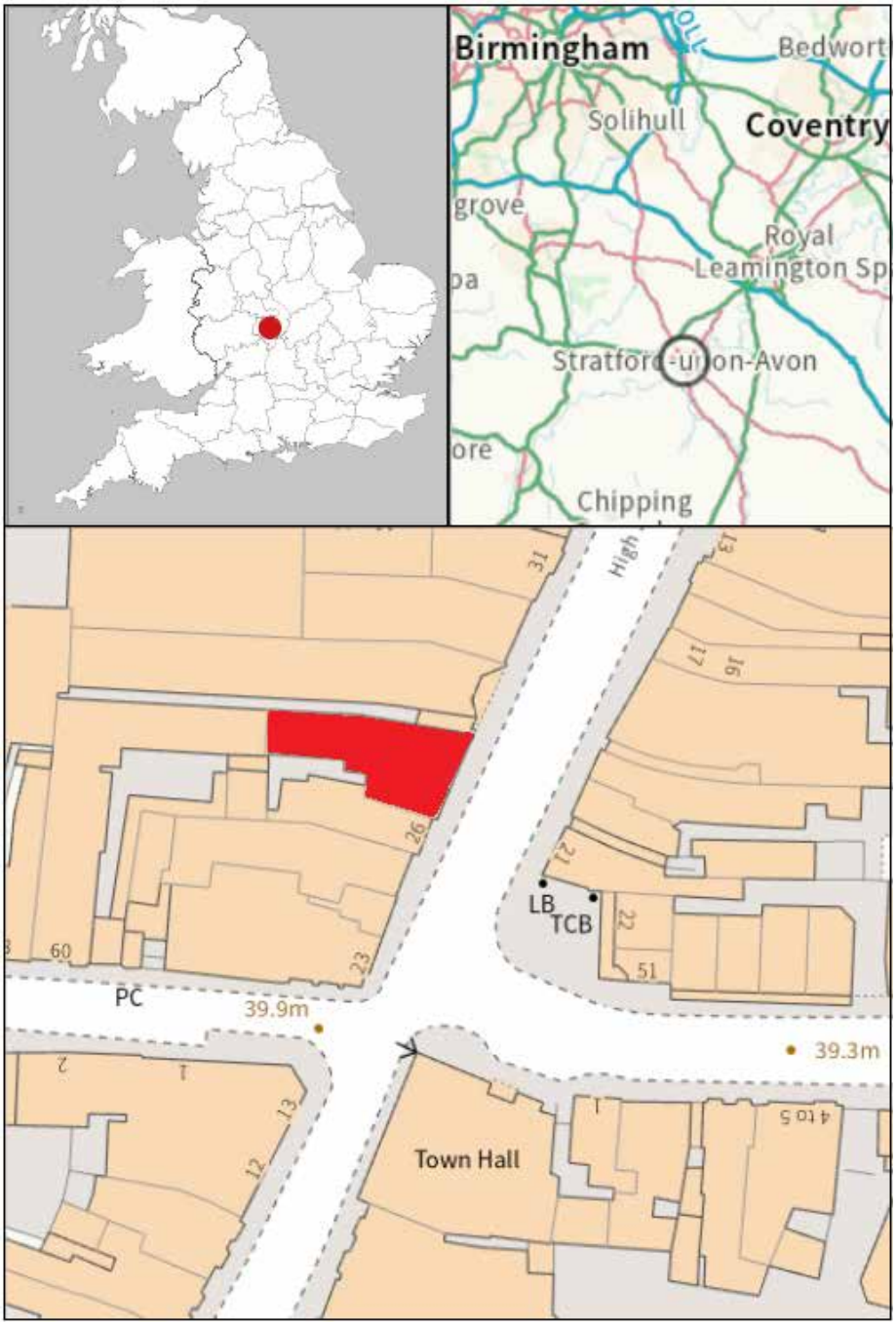

Figure 1: Maps to show the location of 27 & 28 High Street, Stratford-upon-Avon. Scale: top-right 1:1,000,000; bottom 1:1200. [© Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900].

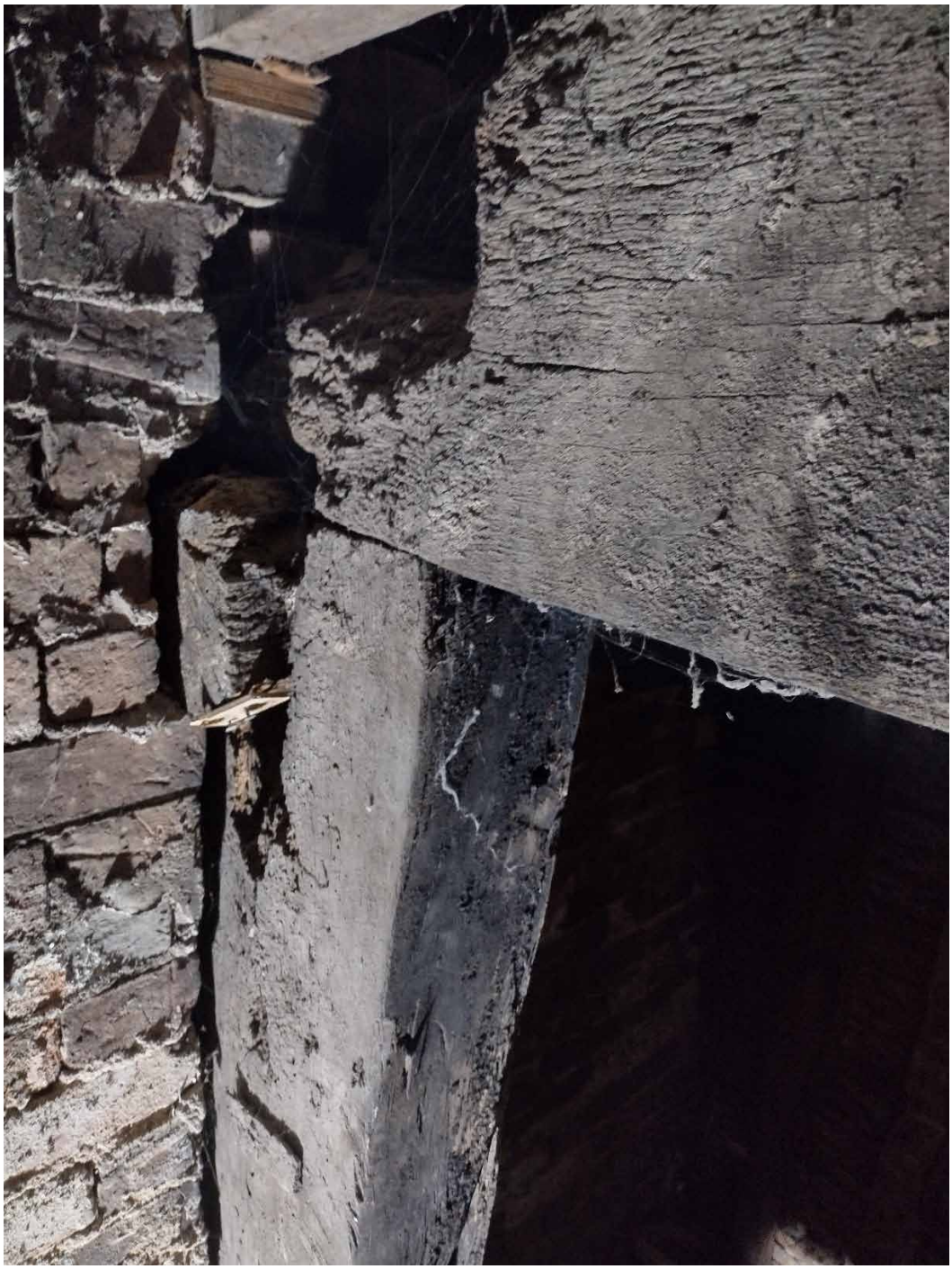

Figure 2: Front range; post and tiebeam at truss 7a, photograph taken from the west [Martin Bridge]

Figure 3: Front range, attic; truss 7b, photograph taken from the east [Martin Bridge]

Methodology

An initial assessment of the timbers for dendrochronological potential sought accessible timbers, preferably with more than 50 rings and, where possible, traces of sapwood, although shorter sequences are sometimes sampled if little other material is available. Those timbers judged to be potentially useful were cored using a 16mm auger attached to an electric drill. The cores were labelled and stored for subsequent analysis.

The cores were polished on a belt sander using 80 to 400 grit abrasive paper to allow the ring boundaries to be clearly distinguished. The samples had their tree-ring sequences measured to an accuracy of 0.01mm, using a specially constructed system utilising a binocular microscope with the sample mounted on a travelling stage with a linear transducer linked to a PC, which recorded the ring widths into a dataset. The software used in measuring and subsequent analysis was written by Ian Tyers (2004a). Cross-matching was attempted by a combination of visual matching and a process of qualified statistical comparison by computer. The ring-width series were compared for statistical cross-matching, using a variant of the Belfast CROS program (Baillie and Pilcher 1973). Ring sequences were plotted on the computer monitor to allow visual comparisons to be made between series. This method provides a measure of quality control in identifying any potential errors in the measurements when the samples cross-match.

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*-values in the range of 5, 6, and higher, and for these to be well replicated from different, independent chronologies with both local and regional chronologies well represented, except where imported timbers are identified. Where two individual samples match together with a t-value of 10 or above, and visually exhibit exceptionally similar ring patterns, they may have originated from the same parent tree. Same-tree matches can also be identified through the external characteristics of the timber itself, such as knots and shake patterns. Lower *t*-values however do not preclude same-tree derivation.

Ascribing felling dates and date ranges

Once a tree-ring sequence has been firmly dated in time, a felling date, or felling date range, is ascribed where possible. With samples which have sapwood complete to the underside of, or including bark, this process is relatively straightforward. Depending on the

completeness of the final ring (i.e. if it has only the spring vessels or early wood formed, or the late wood 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 an 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.

A review of the geographical distribution of dated sapwood data from historic timbers has shown that a sapwood estimate relevant to the region of origin should be used in interpretation, which in this area is 9–41 rings (Miles 1997). 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 or object under study.

Results

Seventeen oak (*Quercus* spp) timbers from the front and rear range of this building were sampled, with details of these samples given in Table 1, and locations of the sampled timbers shown in Figures 4 and 5. The assessment had suggested that timbers of the front range, consisting of a partition and wall framing at first-floor level and roof beams in the attic, might prove to be rather mixed in suitability for secure dating purposes and/or showed signs of reuse. Timber of the rear range, again wall framing and roof timbers, was potentially slightly better but access to part of the roof was deemed unsafe, severely limiting which timbers could be sampled. This assessment was found to be correct with several of the sampled timbers having relatively short ring sequences, five with less than 40 rings. The ring-width measurements of all samples are given in the Appendix 1. Only those series with 30 or more rings were subsequently analysed, although the outer part of sample 11, which had broken into two pieces without a clean break was measured in case it could be matched if the inner part dated. Two groups of cross-matching samples were identified (Table 2).

The ring-width series of the three cross-matched timbers from the front range were combined, producing a site master (SA2728A) which was identified as covering the period AD 1374–1429 when compared to the reference chronologies. The second group comprises the ring-width series of four timbers from the rear, currently unused, range. This site master (SA2728B) dates to the period AD 1399–1469. The strongest matches for the site master chronologies formed from these two groups of timbers are shown in Tables 3a and b. Figure 6 shows the relative positions of overlap of the dated samples, with their likely felling date ranges.

The remaining unmatched series were compared with both site masters and the reference chronology database but to no avail.

Table 1: Details of samples taken at 27 & 28 High Street, Stratford-upon-Avon.

Sample No	Location	Number of rings	Date of sequence (AD)	Sapwood	Mean ring width (mm)	Mean sensitivity	Empirical felling date range (AD)	OxCal-derived felling date range (95.4% probability)
Front range rooms at first floor								
sths01	Head beam to partition wall between north and south rooms	51	1379–1429	-	2.53	0.22	after 1438	after 1437
sths02	Front (east) stud in north wall	41	-	?h/s	2.02	0.21	-	
sths03	Sill beam to partition wall	56	1374–1429	7	1.95	0.20	1431–63	*1431–56*
sths04	North post truss 7a	33	-	-	2.93	0.22	-	
sths05	Wallplate at truss 7a	36	1391–1426	h/s	1.84	0.18	1435–67	*1435–60*
sths06	Tiebeam 7a	33	-	-	3.23	0.20	-	
Attics								
sths07	South purlin in A4	29	-	-	3.41	0.15	-	
sths08	Rear (west) tiebeam in A7/8	60 +7NM	-	-	2.69	0.23	-	
sths09	North purlin (truncated)	30	-	-	3.43	0.25	-	
Rear range F11 and F12								
sths10	North-west corner post room F11	52	1418–69	h/s	3.02	0.19	1478–1510	*1477–99*
sths11i	Mid-rail west wall, inner rings	35	-	-	1.53	0.29	-	
sths11ii	Mid-rail west wall, outer rings	22	-	h/s +17NM	1.10	0.29	-	
sths12	Axial floor beam	45	-	h/s	2.45	0.20	-	
sths13	Common floor joist 5th from west	49	1399–1447	2 +2NM	2.38	0.28	1454–86	*1453–76*
sths14	North post – partition truss	58	-	14	2.63	0.18	-	
sths15	Tiebeam T10	62	1401–62	h/s	2.69	0.16	1471–1503	*1470–93*
sths16	South post T10	74	-	h/s	1.89	0.18	-	
sths17	North queen post T10	61	1408–68	2	1.19	0.18	1475–1507	*1477–1507*

Key: NM = not measured; h/s = heartwood/sapwood boundary

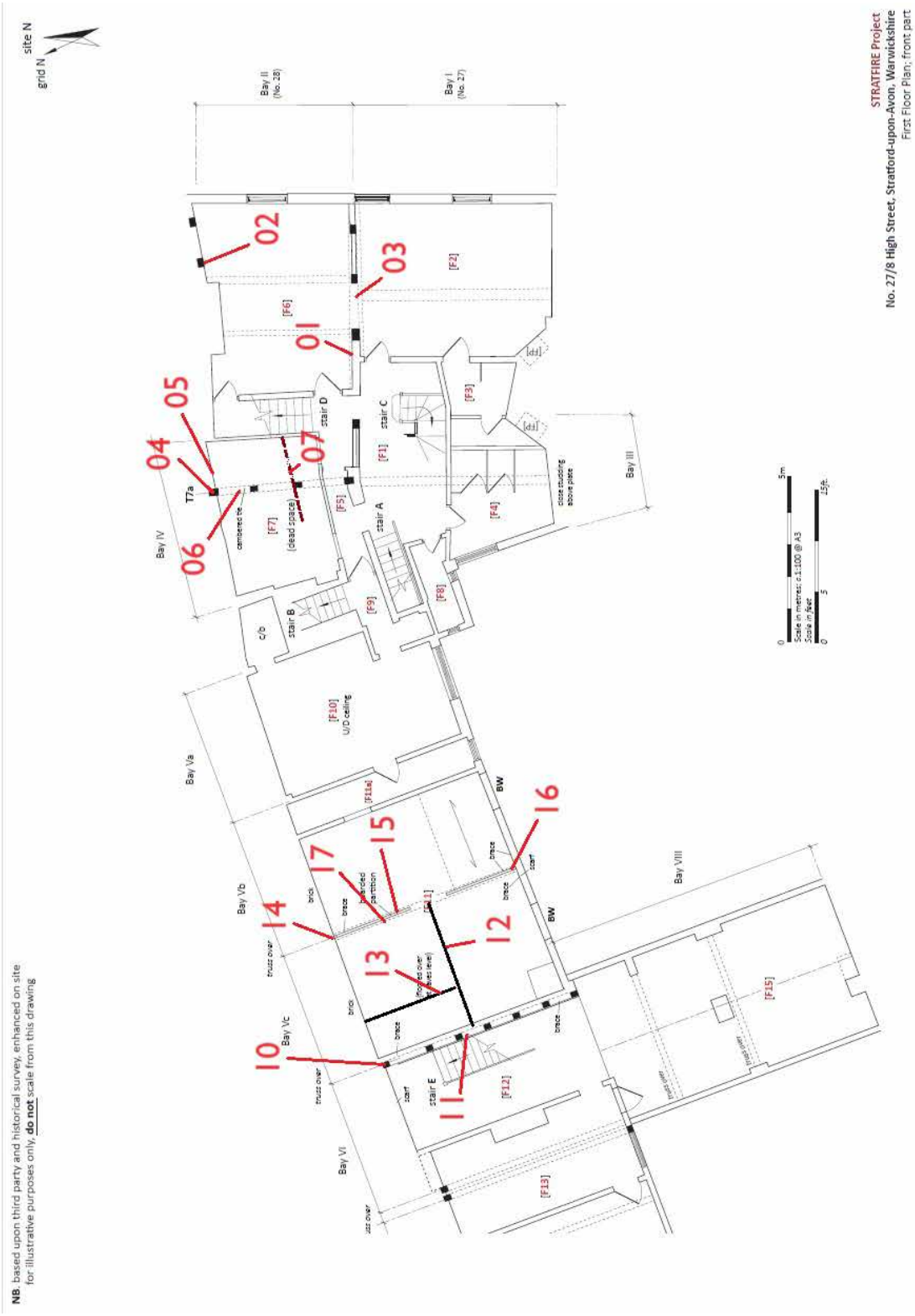

Figure 4: First-floor plan, showing the locations of timbers sampled for dendrochronology [adapted from an original drawing by Ric Tyler]

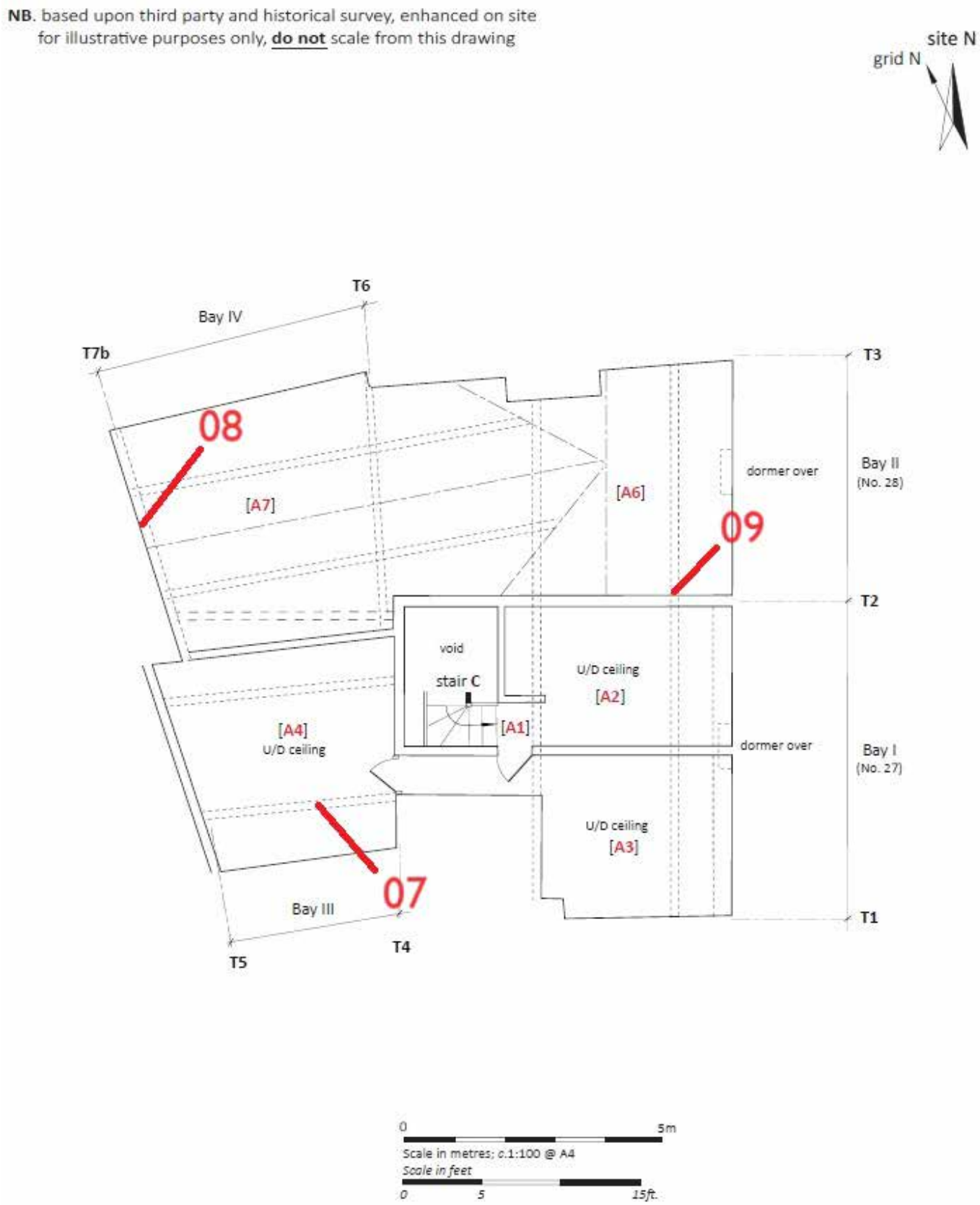

Figure 5: Attic plan, showing the location of timbers sampled for dendrochronology [adapted from an original drawing by Ric Tyler]

Table 2: Cross-matching between dated timbers at 27 & 28 High Street, Stratford-upon-Avon

	t-values					
Sample No	sths03	sths05	sths10	sths13	sths15	sths17
sths01	3.8	4.6	*	<3	<3	<3
sths03		5.1	*	<3	<3	<3
sths05			*	<3	<3	*
sths10				4.2	5.1	4.4
sths13					4.3	3.4
sths15						3.4

Key: * = overlap less than 20 rings, *t*-value not calculated. Two groups are indicated, timbers in the front range highlighted in blue, and those in the rear range highlighted orange

Table 3a: Dating evidence for the site chronology SA2728A, AD 1374–1429

Source region	Chronology:	Publication reference:	Filename:	Span of chronology (AD)	Overlap (years)	*t*-value
Warwickshire	Kenilworth Castle	Howard et al. 2006	KNWESQ01	1354–1532	56	7.5
Warwickshire	Cromwell Cottage, Tile Hill	Arnold and Howard 2007a	COVBSQ01	1345–1575	56	7.2
Warwickshire	The Old Rectory, Clifford Chambers	Miles et al. 2004	CLIFFORD	1344–1433	56	7.1
West Midlands	Barn at New Shipton Farm	Miles and Haddon-Reece 1996	NWSHIPTN	1333–1424	51	6.3
Worcestershire	The Commandery, Worcester	Arnold et al. 2006a	WORDSQ01	1284–1473	56	6.2
Gloucestershire	Tithe Barn, Ashleworth	Bridge 2002	ASHLEWTH	1319–1475	56	6.2
Worcestershire	Barn at Butts Bank, Broadwas	Bridge 2006	BUTTSBNK	1322–1495	56	6.1
Wiltshire	Old Farmhouse, Berwick Bassett	Miles et al. 2008	OFHB	1344–1434	56	6.1
Shropshire	All Saints Church, Berrington	Arnold and Howard 2014	BERASQ01	1368–1449	56	5.9
Gloucestershire	66–68 Westgate Street, Gloucester	Tyers and Wilson 2000	WGATE1	1209–1518	56	5.9

Table 3b: Dating evidence for the site chronology SA2728B, AD 1399–1469

Source region	Chronology:	Publication reference:	Filename:	Span of chronology (AD)	Overlap (years)	*t*-value
Warwickshire	Pedagogue's House, Stratford-upon-Avon	Arnold et al. 2006b	SUABSQ02	1377–1502	71	11.7
West Midlands	Primrose Hill, King's Norton	Arnold and Howard 2008	KGNBSQ01	1354–1593	71	11.6
Warwickshire	Gorcott Hall, Studley	Nayling 2006	GORC_T17	1385–1531	71	9.2
Warwickshire	36 High Street, Stratford-upon-Avon	Bridge and Tyers 2022	SA36HGHt5	1353–1455	57	8.7
Birmingham	Saracen's Head, King's Norton	Tyers 2004b	KINGNOSH	1367–1491	71	7.8
Derbyshire	Hardwick Old Hall	Howard et al. 2002	HDWASQ01	1375–1590	71	7.7
Herefordshire	Barn, Kings Pyon	Groves and Hillam 1993	KINGPYON	1346–1480	71	7.6
Yorkshire	Netherhall Barn, Dalton	Arnold and Howard 2007b	NTHBSQ02	1376–1453	55	7.5
Warwickshire	Kingsbury Hall, Kingsbury	Arnold et al. 2006c	KNGHSQ01	1391–1564	71	7.3
Worcestershire	Seechem Manor, Alvechurch	Miles and Haddon-Reece 1995	SEECHEM1	1365–1474	71	7.2

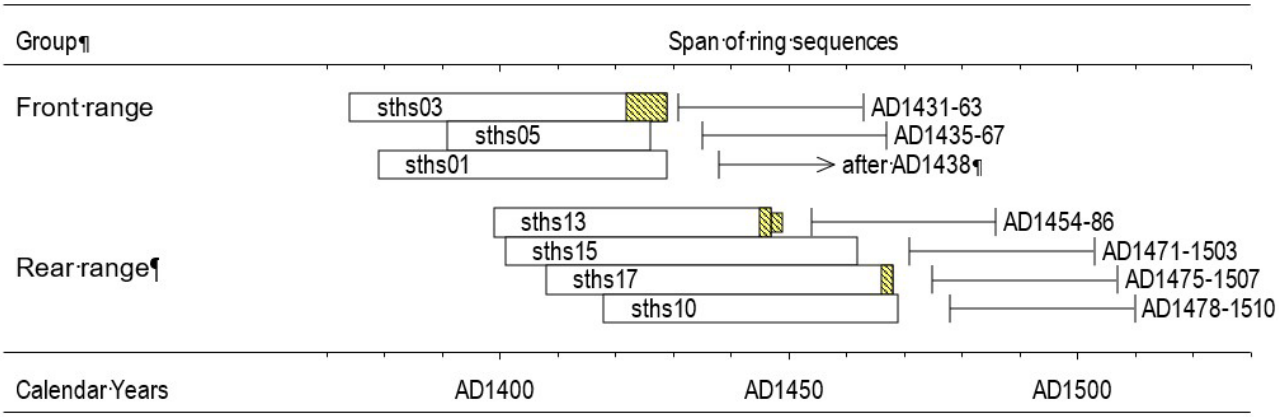

Figure 6: Bar diagram showing the relative positions of overlap of the dated timbers from 27 & 28 High Street, Stratford-upon-Avon. White sections represent heartwood rings, yellow hatched bars represent sapwood rings, narrow sections represent additional unmeasured rings.

Interpretation and discussion

The mean heartwood-sapwood boundary for the two timbers from the front range retaining this boundary is AD 1424, giving a likely felling date range of AD 1433–65. The third sample, noted at the time of sampling as retaining h/s but which could not subsequently be confirmed on the sample itself, has a slightly later outermost measured heartwood ring date and a felled after date of AD 1438. This timber appears likely to be coeval with the two other dated timbers and hence may suggest a slightly later felling date range for this group of three timbers from the front range in the later AD 1430s to AD 1460s.

Three of the rear section timbers form a coherent group with heartwood-sapwood boundary dates varying by only seven years from AD 1462 (sths15) to AD 1469 (sths10) and with a mean heartwood-sapwood boundary of AD 1466, produce a likely felling date range for these three timbers of AD 1475–1507. The fourth timber has a somewhat earlier heartwood-sapwood boundary ring at AD 1445 (sths13), albeit within the expected variation between heartwood-sapwood boundary dates, producing an individual felling date range of AD 1454–86. This clearly overlaps the felling date range obtained for the other three timbers and hence it could be coeval with them. Using a mean (AD 1461) of the dates of all four heartwood-sapwood boundaries shifts the likely felling date range to AD 1470–1502 if all four timbers are coeval.

In the absence of bark edge, and in order to attempt to further refine the estimated felling date ranges for these two groups of timbers, the material was assessed for its suitability with respect to using the methodology developed by Miles (2005) and implemented in OxCal (Bronk Ramsey 2009; Miles 2006). Following the methodology set out by Millard (2002), Bayesian statistical models are used to provide individual sapwood estimates for samples using the variables of the number of heartwood rings present, the mean ring-width of those heartwood rings, the heartwood-sapwood boundary date, and the number of any surviving sapwood rings (including those that can only be counted, not measured, or those lost on sampling). Miles (2005) suggests several such models, of which the one that applies to the timbers in this case is that for ‘England & Wales AD’. This model is based on data from timbers throughout this area, although there is a bias towards data from the densely-dated counties of Shropshire, Somerset, Hampshire, Oxfordshire, and Kent. This model is considered appropriate geographically for historic timbers from buildings in Warwickshire, as well as being compatible with the growth characteristics of this particular assemblage.

Using the above methodology, as implemented in OxCal 4.4, sapwood estimates were produced for both of the dated samples with heartwood-sapwood boundary from the front

range, with these then being combined in order to derive the posterior density estimate for the combined felling date distribution. The distributions have good agreement with the interpretation that these two timbers represent a single felling episode (Acomb: 117.4, An: 50.0, n: 2) and it is estimated that this felling episode occurred in *cal AD 1435–1452* (*95% probability*), estimate not shown. The inclusion of the *terminus post quem* for felling of AD 1437, obtained using the same methodology, for the all heartwood sample sths01 when deriving the posterior density estimate for the combined felling date distribution for all three dated timbers from the front range produces a revised estimated felling date of *cal AD 1436–1451* (*95% probability*; *SA2728HSTfirs*t; Fig 7), again with good agreement (Amodel: 121, Acomb: 116.4, An: 40.8, n: 3), for this group of dated timbers.

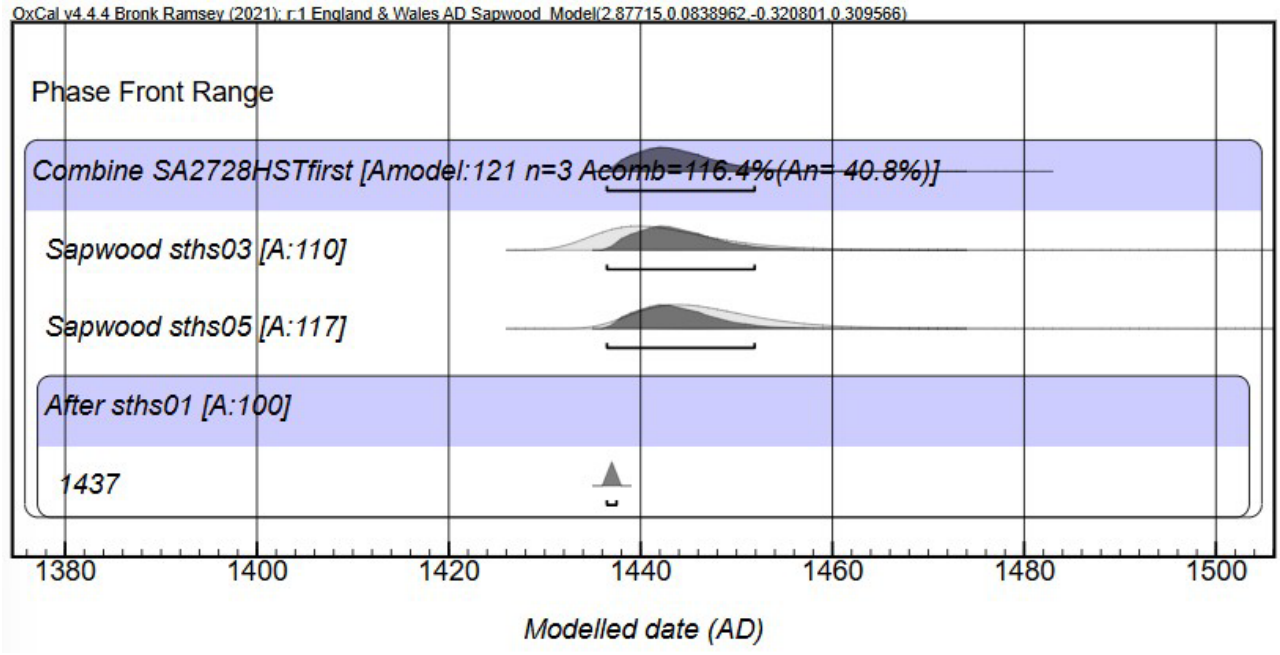

Figure 7: 27 & 28 High Street, Stratford-upon-Avon: combined felling date distribution and individual felling date distributions for dated timbers with heartwood-sapwood boundary in the primary phase and the *terminus post quem* for felling for the dated timber with no trace of sapwood. Individual felling date distributions are shown in outline. The combined felling date distribution is shown in black with the 95.4% probability range bar shown below

Using the same methodology, sapwood estimates were produced for all four dated samples from the rear range, these being combined in order to derive the posterior density estimate for the combined felling date distribution. The distributions have poor agreement with the interpretation that all four timbers represent a single felling episode (Acomb: 25.3, An: 35.4, n:4), with the individual index of agreement for sample sths13 (A: 5) being below the expected threshold (A > 60), estimate not shown. With the exclusion of sths13, the individual felling date distributions have good agreement with the interpretation that the

three remaining timbers represent a single felling episode (Acomb: 112.1, An: 40.8, n: 3) and it is estimated that this felling episode occurred in *cal AD 1478–1491* (*95% probability*; *SA28HSTsecondA*; Fig 8). Sample sths13 on its own gives a felling date range of *cal AD 1453–1476* (*95% probability*).

The CQL2 code for the sapwood estimates discussed above and presented in Figures 7 and 8 is provided in Appendix 2, and the individual felling date ranges (at *95% probability*) are listed in Table 1.

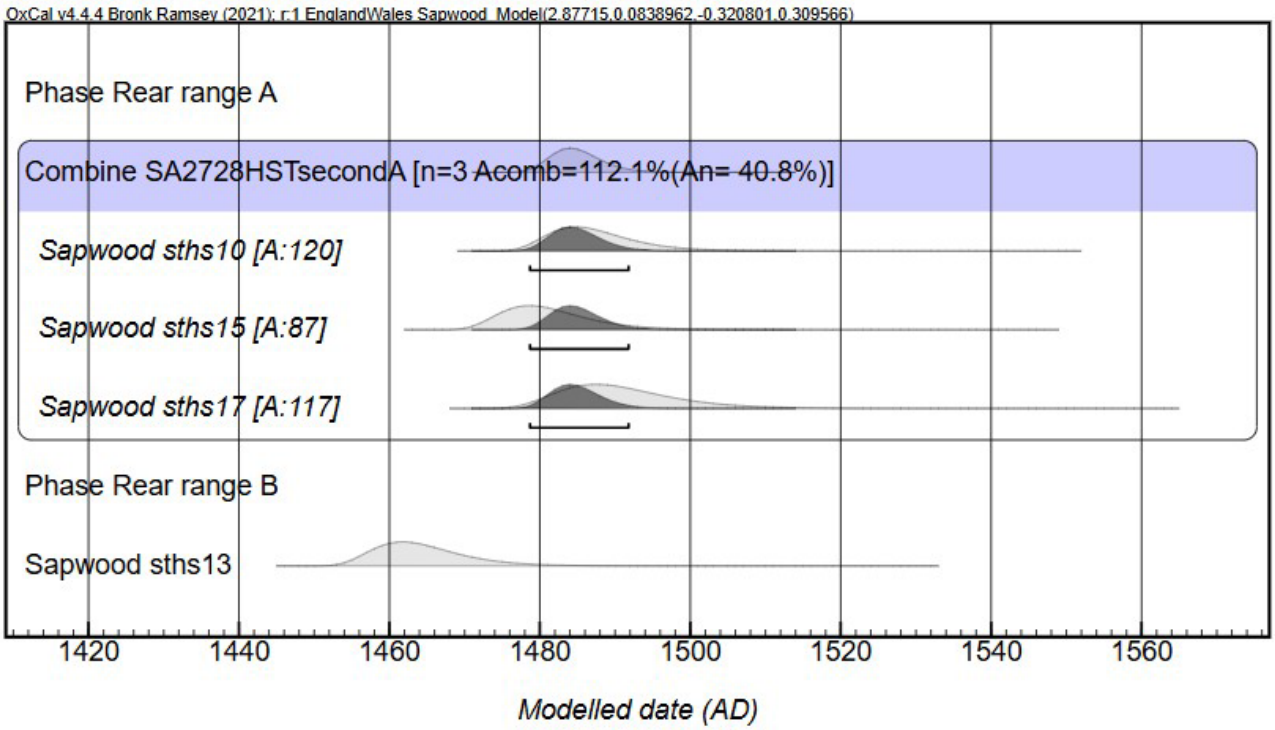

Figure 8: 27 & 28 High Street, Stratford-upon-Avon: combined felling date distribution and individual felling date distributions for dated timbers with heartwood-sapwood boundary in the secondary phase. Individual felling date distributions are shown in outline. The combined felling date distribution for 'A' is shown in black and italic text with the 95.4% probability range bar shown below

The description in the List Entry notes an early rear range that survived the fire of AD 1595 but implies that the shopfront is of around AD 1600. Bearman (2000), in his searches for documentation relating to the plot, has found a reference that "in AD 1460 the cottage in Ely Street, then held by Thomas Magottes, was bounded on the west by the 'door of John Hannys' giving rear access to his property in High Street, i.e. Nos 26–8." The dendrochronological evidence indicates the presence of timbers in the front range immediately behind the façade are of mid-fifteenth century origin, with the timbers in the

rear range being a few decades younger, dating to the later-fifteenth century, although one of the timbers in this rear range is slightly earlier.

Although both site master chronologies appear to represent local timbers (Tables 3a and 3b), with SA2728B matching two other buildings in Stratford-upon-Avon, there is no significant matching between them (t = 0.9), although it should be noted that they only overlap by 31 years. This suggests that different, albeit relatively local, woodland sources have been used.

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Appendix 1

Ring width values (0.01mm) for the sequences measured

sths01

356	425	369	433	298	299	333	471	523	407
369	303	302	177	190	173	182	302	318	374
357	313	267	277	318	273	265	263	239	234
329	176	139	147	116	91	195	121	77	97
123	135	268	187	273	232	217	94	117	165
174									

sths02

418	372	376	321	296	261	163	164	120	130
156	219	281	291	209	281	177	286	259	241
211	212	170	211	260	205	174	122	104	204
112	103	126	101	130	134	115	167	160	101
123									

sths03

283	160	207	202	202	191	195	258	306	346
252	280	336	281	242	206	272	208	135	157
148	187	239	254	259	280	371	261	214	187
202	168	172	132	183	199	206	128	94	106
103	150	83	105	171	148	202	174	138	175
164	162	91	85	131	145				

sths04

212	374	200	452	361	368	361	338	322	372
449	324	404	496	325	345	240	210	155	172
157	112	217	252	213	228	267	258	220	249
312	320	376							

sths05

197	142	136	127	118	190	253	263	299	284
233	169	244	233	219	218	220	233	279	217
159	131	114	118	142	95	73	125	110	152
165	180	193	256	177	144				

sths06

351	393	539	474	423	437	441	356	469	600
607	421	397	378	418	364	303	189	161	162

103 167 133 136 149 130 234 271 265 420
362 265 148

sths07
162 192 213 249 331 335 320 274 330 313
368 354 427 378 459 375 366 319 332 328
378 248 358 503 456 303 378 394 443

sths08
409 230 233 161 149 186 150 150 123 146
80 74 117 204 241 210 370 342 415 379
320 351 252 191 274 226 147 136 143 151
230 385 514 414 392 330 271 180 313 340
386 383 303 428 397 299 299 364 306 327
333 344 248 320 199 347 319 258 190 157

sths09
580 505 560 651 345 313 258 290 275 165
151 114 59 69 132 223 224 328 672 516
359 298 325 335 511 527 434 300 351 421

sths10
136 143 426 282 209 245 261 228 220 183
268 254 258 378 457 258 342 352 243 233
170 229 400 512 379 388 442 362 291 375
346 429 392 487 475 439 431 329 312 290
246 252 295 242 269 332 218 228 235 169
196 187

sths11i
159 162 267 167 171 253 245 162 179 212
169 185 71 41 90 70 108 136 124 199
149 187 147 216 218 191 136 88 168 124
109 127 120 134 75

sths11ii
49 70 68 59 54 64 102 62 80 85
78 106 86 76 62 156 148 118 277 145
274 211

sths12
273 323 202 152 167 254 188 205 182 181

163 122 130 160 231 140 228 272 281 274
420 221 293 285 314 393 264 344 322 283
214 235 285 282 211 182 185 190 213 275
319 351 315 269 221

sths13
356 408 321 340 455 606 527 478 492 439
442 296 270 339 324 291 153 228 247 324
150 400 217 160 241 180 246 134 171 150
138 93 112 223 111 121 133 123 107 90
123 88 179 93 130 126 112 68 85

sths14
546 531 555 448 406 506 570 358 401 243
389 288 207 203 145 164 187 229 177 270
270 306 224 269 291 298 263 253 210 265
265 294 297 314 234 181 201 305 247 262
161 164 200 205 188 181 110 104 129 206
223 256 168 187 216 172 161 163

sths15
410 315 341 415 304 325 313 368 428 410
346 417 446 274 298 306 313 295 248 367
332 276 226 288 300 275 215 239 221 149
183 201 140 150 143 137 93 97 141 204
248 227 255 317 212 191 212 185 258 299
403 375 296 307 277 244 228 293 240 211
221 241

sths16
242 136 109 131 116 135 152 145 143 137
98 119 130 111 162 111 129 121 124 99
127 104 122 133 123 144 117 93 52 93
37 83 93 83 87 120 147 123 78 95
140 122 155 197 216 209 239 263 280 222
213 211 304 303 328 280 288 348 336 269
276 353 334 305 356 333 402 330 269 256
275 306 280 305

sths17
434 355 302 264 265 192 143 128 77 98
128 90 109 111 113 138 145 127 116 156

148	126	85	91	102	73	75	75	59	56
43	53	83	107	84	88	113	103	75	73
49	54	66	103	81	94	63	77	84	94
105	92	127	131	153	148	96	119	114	110
105									

Appendix 2

OxCal Code Figure 5

```
Options()
 {
  Resolution=1;
  Phase("Front Range");
 };
 Plot()
 {
  Sapwood_Model("England & Wales AD", 2.877146, 0.0838962, -0.3208009, 0.3095663);
  Combine("SA2728HSTfirst")
  {
   Sapwood("sths03", 1422, 49, 7, 2.04);
   Sapwood("sths05", 1426, 36, 0, 1.84);
   After("sths01")
   {
    Date(1437);
   };
  };
 };
```

OxCal Code Figure 6

```
Options()
 {
  Resolution=1;
 };
 Plot()
 {
  Sapwood_Model("EnglandWales", 2.877146, 0.0838962, -0.3208009, 0.3095663);
  Phase("Rear range A");
  Combine("SA2728HSTsecondA")
  {
   Sapwood("sths10", 1469, 52, 0, 3.02);
   Sapwood("sths15", 1462, 62, 0, 2.69);
   Sapwood("sths17", 1466, 59, 2, 1.20);
  };
  Phase("Rear range B");
   Sapwood("sths13", 1445, 47, 2, 2.44);
  };
 };
```

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