Centre for Archaeology Report 77/2003

Tree-Ring Analysis of Timbers from St Catherine's Church, Batheaston, Somerset

M C Bridge

ISSN 1473-9224

The Centre for Archaeology Report Series incorporates the former Ancient Monuments Laboratory Report Series. Copies of Ancient Monuments Laboratory Reports will continue to be available from the Centre for Archaeology (see back cover for details).

Centre for Archaeology Report 77/2003

Tree-Ring Analysis of Timbers from St Catherine's Church, Batheaston, Somerset

M C Bridge

Summary

Two possible phases were investigated, the beam across the chancel arch, and the chancel roof. The chancel roof timbers were assessed as very marginal for dendrochronology, having few rings, and the chancel arch beam was difficult to assess because of its mouldings and orientation. Cores were extracted from this beam and five chancel roof timbers, but sampling then stopped as the most promising timbers failed to yield cores with sufficient rings. The longest sequence gained was only 59 rings, none of the sequences matched each other, and they could not be dated independently.

Keywords

Dendrochronology
Standing Building

Author's address

M C Bridge: Institute of Archaeology, University College London, 31-34 Gordon Square, London, WC1H 0PY. Telephone: 020 7679 1540. Email: martin.bridge@ucl.ac.uk

Introduction

This grade II* listed church (NGR SD 928 161; Fig 1) has twelfth-century origins, but was extensively remodelled in the late fifteenth century, with further additions in the eighteenth and nineteenth centuries. Dendrochronological investigation of the chancel arch beam, thought perhaps to have been a rood beam, and the vestigial medieval chancel roof timbers, over built by a later Victorian roof, were requested whilst access was made possible during a programme of English Heritage grant-aided repairs being carried out at the site. The English Heritage Historic Buildings Architect, Arnold Root requested this work to inform the repair programme.

Methodology

The site was visited in June AD 2003. Oak timbers with more than 50 rings, traces of sapwood, and accessibility were the main considerations in the initial assessment. Those timbers judged to be potentially useful were cored using a 15mm auger attached to an electric drill. The cores were glued to wooden laths, labelled, and stored for subsequent analysis.

The cores were prepared for measuring by sanding using an electric belt-sander with progressively finer grit papers down to 400 grit. Any further preparation necessary, eg where bands of narrow rings occurred, was done manually. Suitable samples had their tree-ring sequences measured to an accuracy of 0.01 mm 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. The software used in measuring and subsequent analysis was written by Ian Tyers (1999).

Ring sequences were plotted to allow visual comparisons to be made between sequences on a light table. This activity also acts as a measure of quality control in identifying any errors in the measurements when the samples crossmatch. Statistical comparisons were made using Student's *t*-test (Baillie and Pilcher 1973; Munro 1984). The *t*-values quoted below were derived from the original CROS program (Baillie and Pilcher 1973). Those *t*-values in excess of 3.5 are taken to be indicative of acceptable matching positions provided that they are supported by satisfactory visual matches, and give consistent matching positions.

When crossmatching between samples is found, their ring-width sequences are meaned to form an internal 'working' site mean sequence. Other samples may then be incorporated after comparison with this 'working' master until a final site sequence is established, which is then compared with a number of reference chronologies (multi-site chronologies from a region) and dated individual site masters in an attempt to date it. Individual long series which are not included in the site mean(s) are also compared with the database to see if they can be dated.

The dates thus obtained represent the time of formation of the rings available on each sample. Interpretation of these dates then has to be undertaken to relate these findings to the construction date of the phase under investigation. An important aspect of this interpretation is the estimate of the number of sapwood rings missing. In this instance, the sapwood estimates are based on those proposed for this area by Miles (1997), in which 95% of samples are likely to have from 9 to 41 sapwood rings. Where bark is present on the sample the exact date of felling of the tree used may be determined.

The dates derived for the felling of the trees used in construction do not necessarily relate directly to the date of construction of the building. However, evidence suggests that, except in the re-use of timbers, construction in most historical periods took place within a very few years after felling (Salzman 1952; Hollstein 1965).

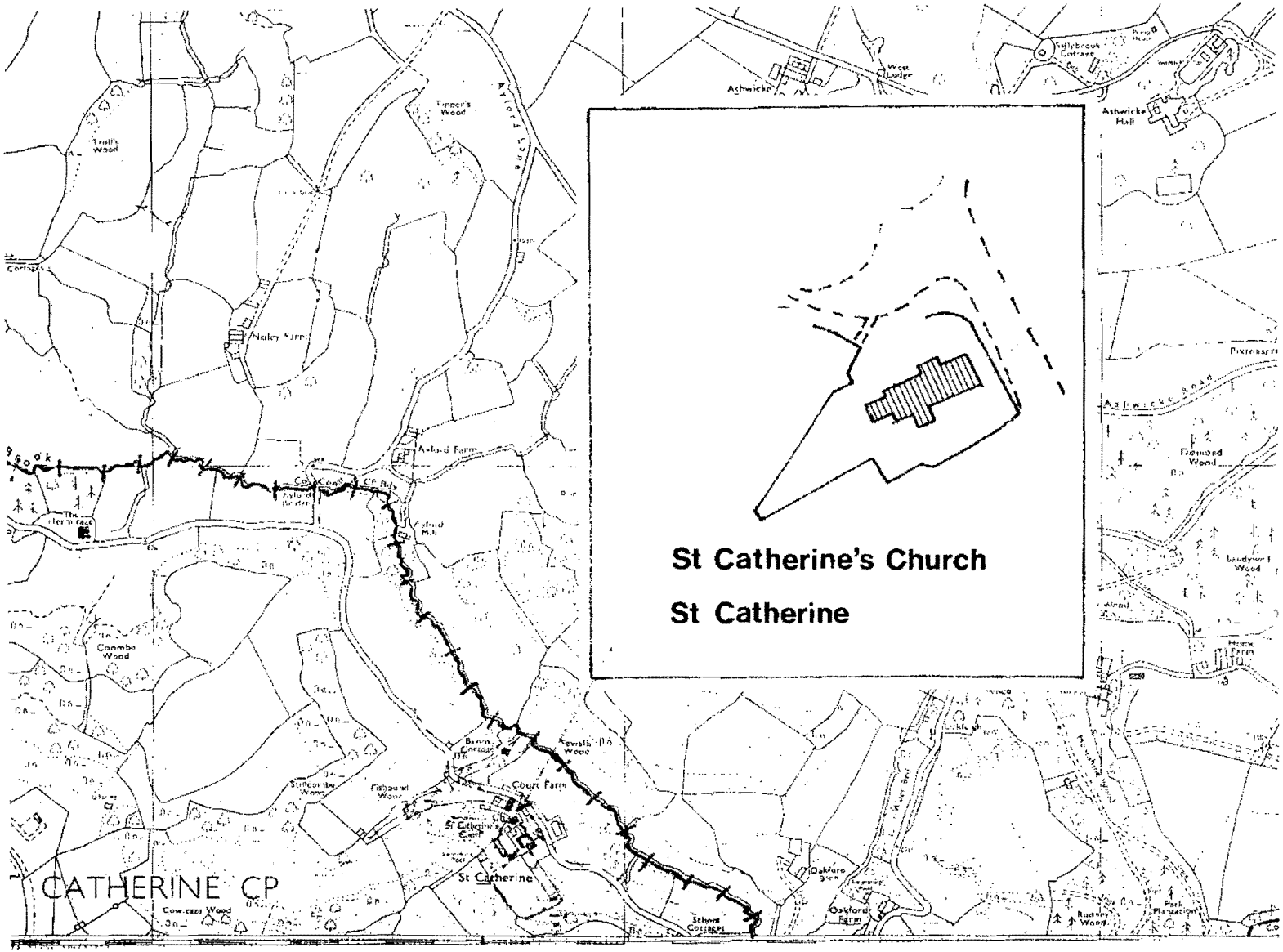

Figure 1: Map showing the general location of St Catherine's Church, Batheaston

Results and Discussion

All the timbers investigated were of oak (*Quercus* spp.). The location of the timbers sampled is described in Table 1, along with other information about the cores, and illustrated in Figures 2-5. Assessing the timbers *in situ* with the more modern roof timbers blocking access to several areas was difficult, and the timbers were judged to be of marginal quality for dendrochronological dating, having too few rings. Nevertheless, following on-site discussions, the decision was made on site to core the more promising looking timbers to see what information could be gained. After extracting five cores from timbers that looked promising, but turned out to have relatively few rings, no further samples were taken.

None of the series derived from the cores described in Table 1 matched each other. The data for the three longest series are given in Table 2. When the longer series were compared individually with dated reference material, none of them gave consistent acceptable matches, and they remain undated. Consequently, in this instance, dendrochronology has been unable to provide any dating evidence for the construction of the chancel roof or the insertion of the possible rood beam.

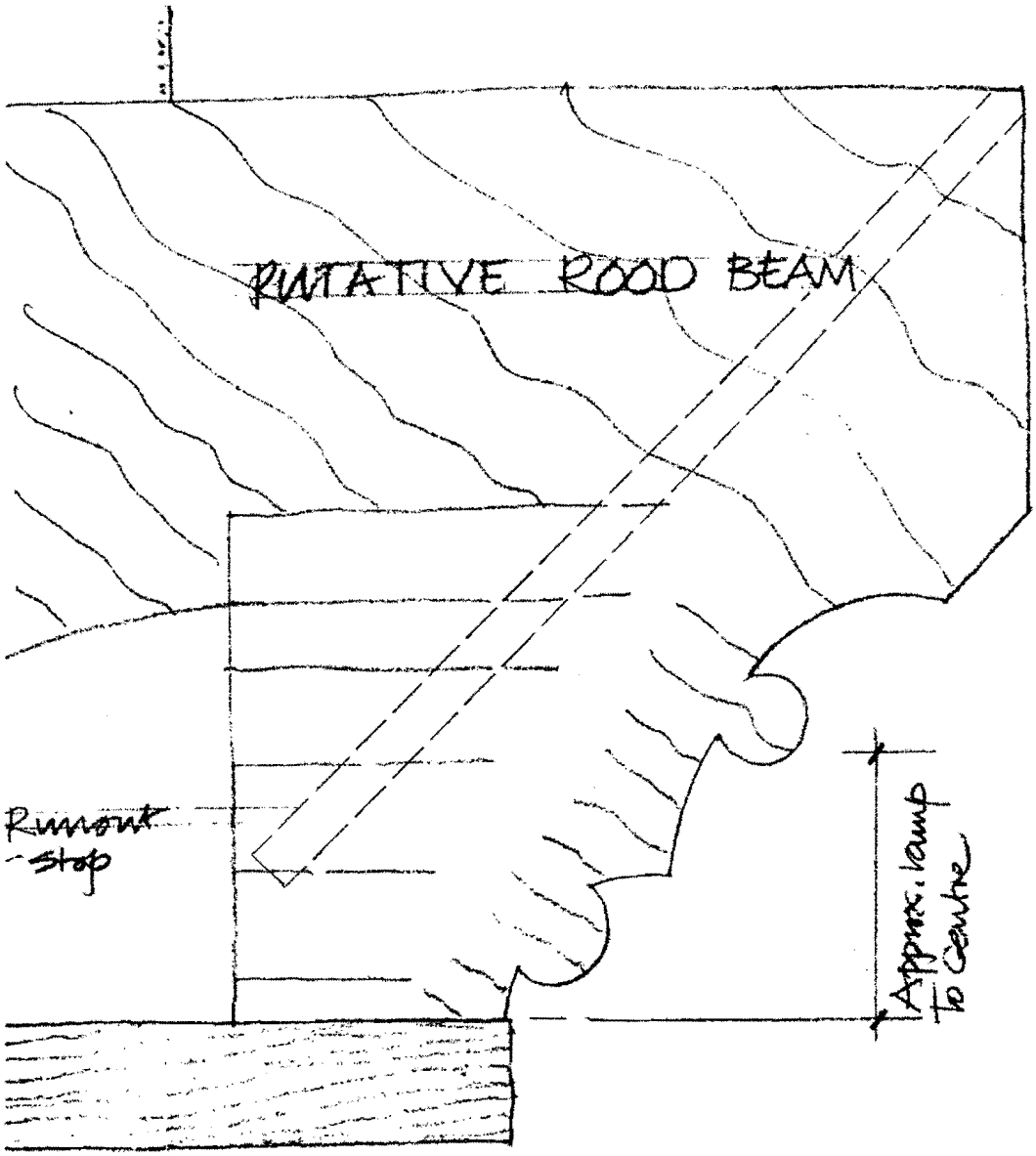

Figure 2: Drawing of the chancel arch beam showing the approximate position of the core extracted for dendrochronology, adapted from an original drawing by John Winstone

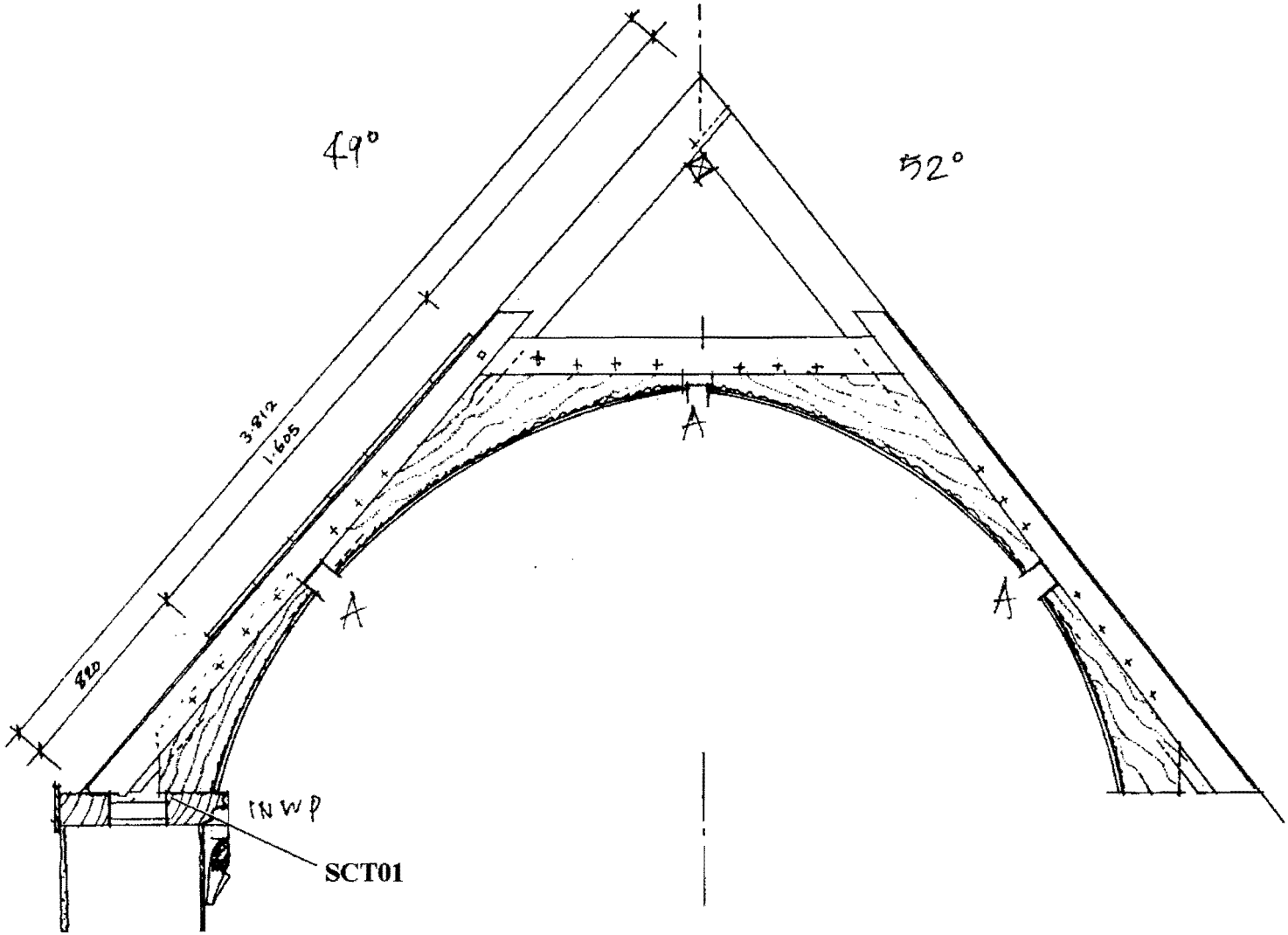

Figure 3: Drawing of the truss form of the chancel roof, showing the position of the inner wallplate sampled for dendrochronology, adapted from an original drawing by John Winstone

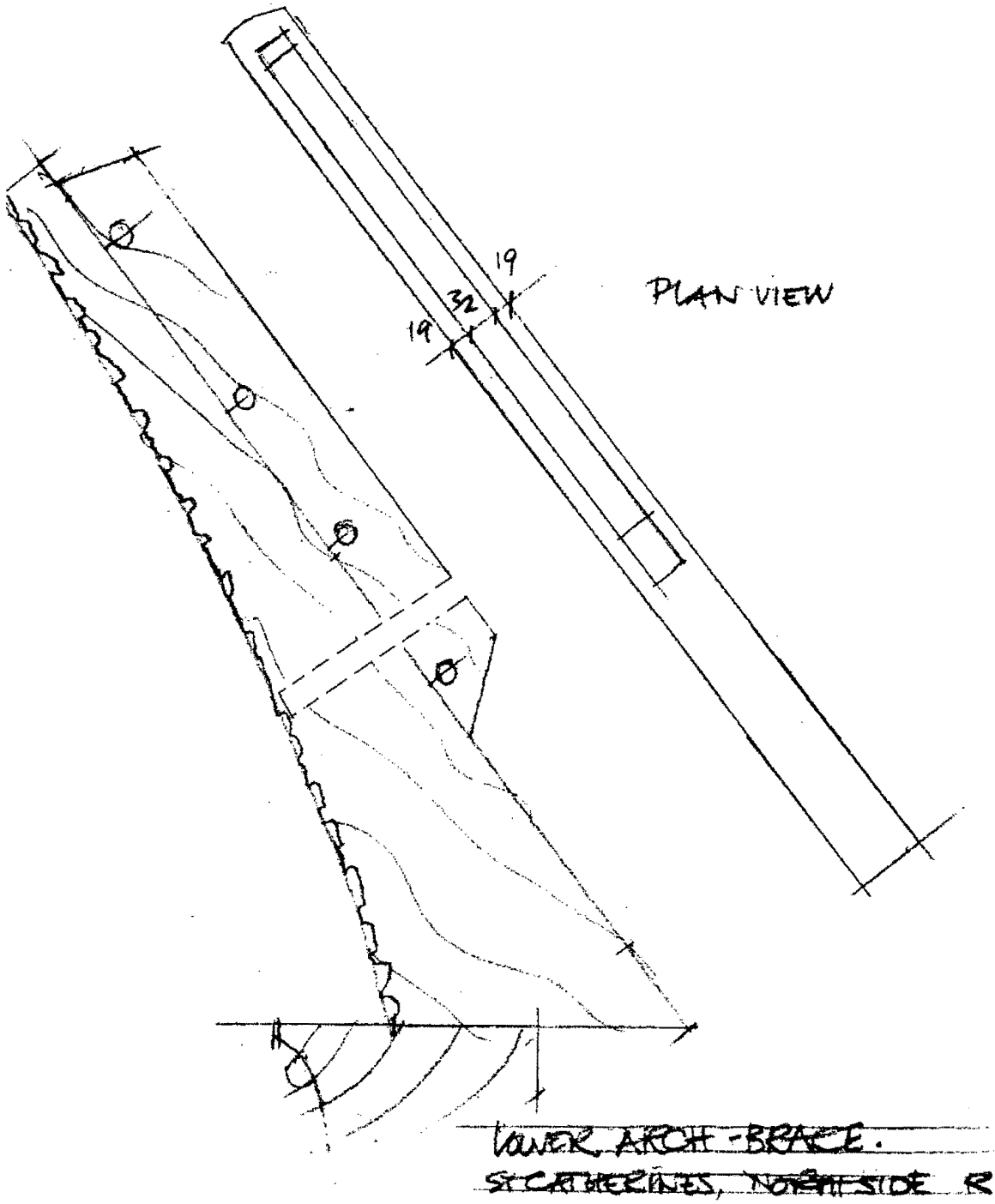

Figure 4: Drawing of a lower arch brace from the chancel roof, showing the approximate position of coring in these timbers, adapted from an original drawing by John Winstone

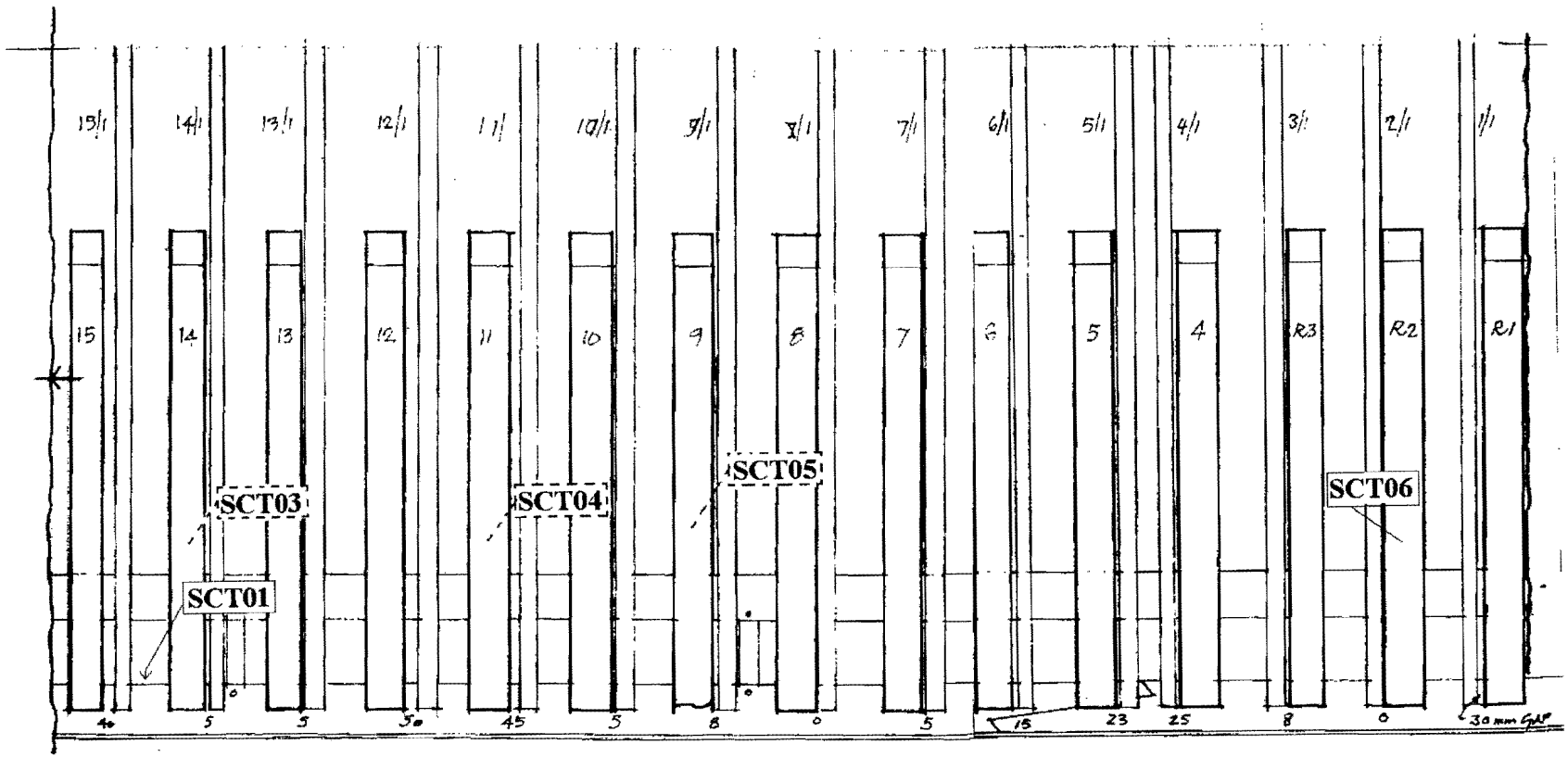

Figure 5: Plan of the chancel roof (south side) showing the dendrochronological sampling positions, those in dashed boxes being in corresponding timbers on the north side. Adapted from an original drawing by John Winstone

Table 1: Oak (*Quercus* spp.) timbers sampled from St Catherine's Church, Batheaston. h/s represents the heartwood-sapwood boundary

Sample number	Origin of core	Total no of years	Average growth rate (mm yr^{-1})	Sapwood details	Date of sequence AD
SCT01	Inner wallplate, south chancel	22	not measured	h/s?	undated
SCT02	Chancel arch beam (Rood Beam?)	47	2.33	2	undated
SCT03	Lower arch brace, truss 14 north	59	2.90	-	undated
SCT04	Lower arch brace, truss 11 north	57	2.15	-	undated
SCT05	Lower arch brace, trace 9 north	*c*30	not measured	-	undated
SCT06	Lower arch brace, truss 2 south	24	not measured	-	undated

Acknowledgements

This work was commissioned by English Heritage, and I would like to thank Alex Bayliss and Peter Marshall for their work in support of my activities. John Winstone arranged access to the site, met me there, discussed the site, supplied the drawings used in this report, and lent practical help during my visit.

References

Baillie, M G L, and Pilcher, J R, 1973 A simple cross-dating program for tree-ring research, *Tree Ring Bulletin,* **33**, 7-14

Hollstein, E, 1965 Jahrringchronologische von Eichenholzern ohne Walkande, *Bonner Jahrb,* **165,** 12-27

Miles, D, 1997 The interpretation, presentation, and use of tree-ring dates, *Vernacular Architect,* **28,** 40-56

Munro, M A R, 1984 An improved algorithm for crossdating tree-ring series, *Tree Ring Bulletin,* **44**, 17-27

Salzman, L F, 1952 *Building in England down to 1540,* Oxford

Tyers, I, 1999 *Dendro for Windows Program Guide 2nd edn*, ARCUS Rep, **500**

Table 2: Data for the undated series SCT 02, 03, and 04 (in units of 0.01mm)

SCT02

181	141	153	171	205	216	226	288	407	275
251	176	223	301	297	375	379	460	461	365
267	193	234	198	222	298	394	349	333	371
412	120	100	81	100	134	134	189	191	109
81	81	113	165	176	215	156			

SCT03

207	285	322	239	312	359	375	370	275	251
244	200	178	316	327	378	326	299	301	257
227	362	407	397	228	205	226	295	390	346
313	276	271	280	265	289	179	255	197	286
258	266	305	242	310	382	298	298	429	324
290	254	326	257	273	315	274	185	296	

SCT04

363	289	204	249	150	115	89	81	97	124
136	242	276	247	286	286	201	297	184	245
213	274	191	203	158	175	135	132	151	223
233	243	244	238	175	280	321	239	185	357
354	352	338	231	141	175	190	173	198	120
196	181	196	274	242	169	218			