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ST JOHN'S CHURCH, OXBOROUGH, NORFOLK TREE-RING ANALYSIS OF TIMBERS FROM THE ROOF OF THE BEDINGFIELD CHAPEL

SCIENTIFIC DATING REPORT

Martin Bridge

ARCHAEOLOGICAL SCIENCE

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ST JOHN'S CHURCH, OXBOROUGH, NORFOLK

TREE-RING ANALYSIS OF TIMBERS FROM THE ROOF OF THE BEDINGFIELD CHAPEL

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SUMMARY

Three *ex situ* timbers were sampled from what was initially thought to be a larger collection of timbers removed from the roofs during repairs. The ring sequences from these samples did not match each other, neither did they match reference data when compared individually, and the timbers therefore remain undated.

CONTRIBUTOR

Dr M C Bridge

ACKNOWLEDGEMENTS

The sampling and analysis of these timbers was funded by English Heritage (EH), and requested by Ian Harper (EH architect). The work was commissioned by Isabelle Parsons (EH). Dr David Watt (Hutton and Rostron Environmental Investigations Ltd) facilitated access through the contractor, John Hogg. The contractor's workmen were very helpful on-site, cutting slices from timbers removed. Cathy Tyers (Sheffield University) and John Meadows (EH) are thanked for their comments on an earlier draft of this report.

ARCHIVE LOCATION

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DATE OF INVESTIGATION

2009

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INTRODUCTION

This grade-I listed church is located adjacent to Oxborough Hall in the heart of the village (Figs 1 and 2). It suffered from the collapse of its tower in 1948, which destroyed the nave and much of the south aisle, now laid to grass, but which spared part of the north aisle, and the Bedingfield Chapel on the south side. The chapel retains its original arch-braced and roll-moulded roof with carved spandrels, and three carved wall posts. It has been undergoing grant-aided repairs and the opportunity to gain access to the original and later covering roofs of the Bedingfield Chapel and its lobby was taken advantage of in order to try and obtain information on the dates of these structures. The original roof structure is thought to be of fifteenth-century origin, the chapel having been founded in AD 1496. There is some slight confusion however, in that it is often stated that the chapel was built as a result of the Will of Margaret Bedingfield, who in AD 1513 requested that her body be buried in a chapel yet to be built (Pevsner and Wilson 1999). The work was requested by the EH Historic Buildings Architect, Ian Harper.

METHODOLOGY

The roofs of the chapel and adjoining lobby were originally assessed in April 2008. Access at this time was quite restricted and reservations were expressed about coring highly decorated timber mouldings with little visible sapwood. It was recommended that the site be reassessed at a later stage in the grant-aided repairs, when the roof covering had been removed, allowing access to the upper surfaces of the main timbers.

The site was revisited in March 2009. Some timbers had been removed and kept on site for further investigation. Access to the remaining *in-situ* timbers was very restricted as much of the roof was still covered, with only small areas being opened at a time for work to proceed. The *ex-situ* timbers were assessed and slices were removed from the most promising looking candidates.

The slices removed were polished on a belt sander using 60 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 (2004). Cross-matching was accomplished 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 to allow visual comparisons to be made between sequences on a light table. 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*-value ranges 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 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, 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 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* (*tpq*) 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. 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.

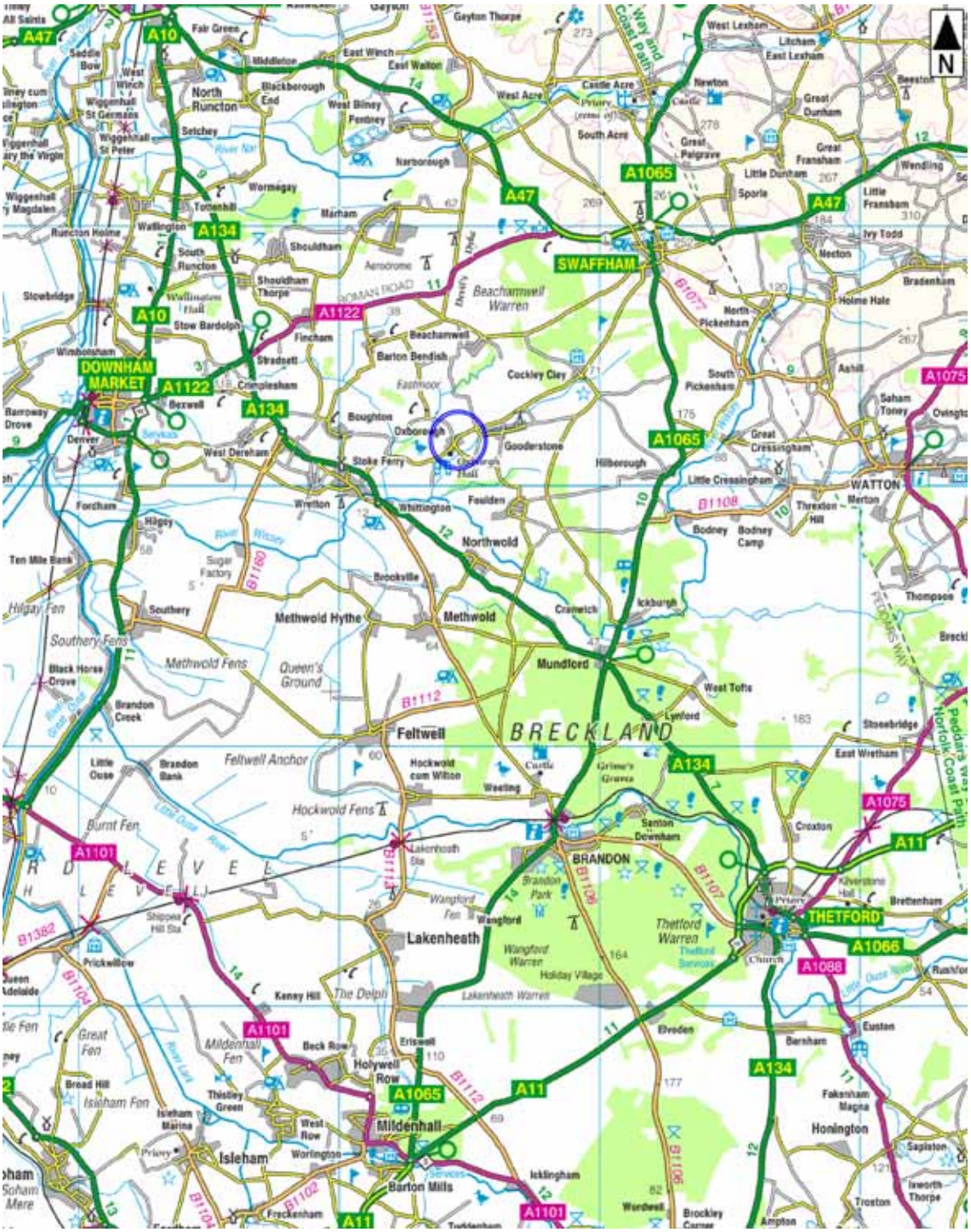

Figure 1. Map to show the location of the church (based on the Ordnance Survey map with permission of the Controller of Her Majesty's Stationery Office, ©Crown Copyright)

Figure 2. Map showing the location of the church within its immediate environs (based on the Ordnance Survey map with permission of the Controller of Her Majesty's Stationery Office, ©Crown Copyright)

RESULTS

Following sampling of various *ex-situ* timber sections, information was obtained on the original positions of these sections in the roofs. It become clear that several of these sections were in fact from the same original timber, and that therefore only three individual timbers had been sampled. All duplicate samples were therefore discarded. Access to other *in-situ* timbers was severely restricted by the original roof covering and safety coverings in place to protect the workers. Hence, bearing in mind the original concerns raised over the decorative nature of the timbers, sampling by coring was not undertaken. The later roofs covering the original roofs over the chapel and lobby were found to be of softwood, and were not therefore investigated further.

Details of the samples taken are given in Table 1, with the timbers sampled being identified in Figure 3, and the tree-ring width data for the series are given in the Appendix.

No acceptable significant matches were found between the three series. When the individual ring sequences were compared with the independent dated reference chronologies, no conclusive matches were found, and the timbers were not therefore dated.

Table 1. Details of the samples taken for dendrochronology

Sample	Description	Rings	Sapwood	Date of measured sequence (AD)	Interpreted felling date (AD)
oxb01	South rafter, central lobby truss	84	h/s (+11NM)	undated	unknown
oxb02	Principal rafter 3	53	-	undated	unknown
oxb03	Purlin in lobby	68	-	undated	unknown

h/s= heartwood-sapwood boundary; NM = not measured

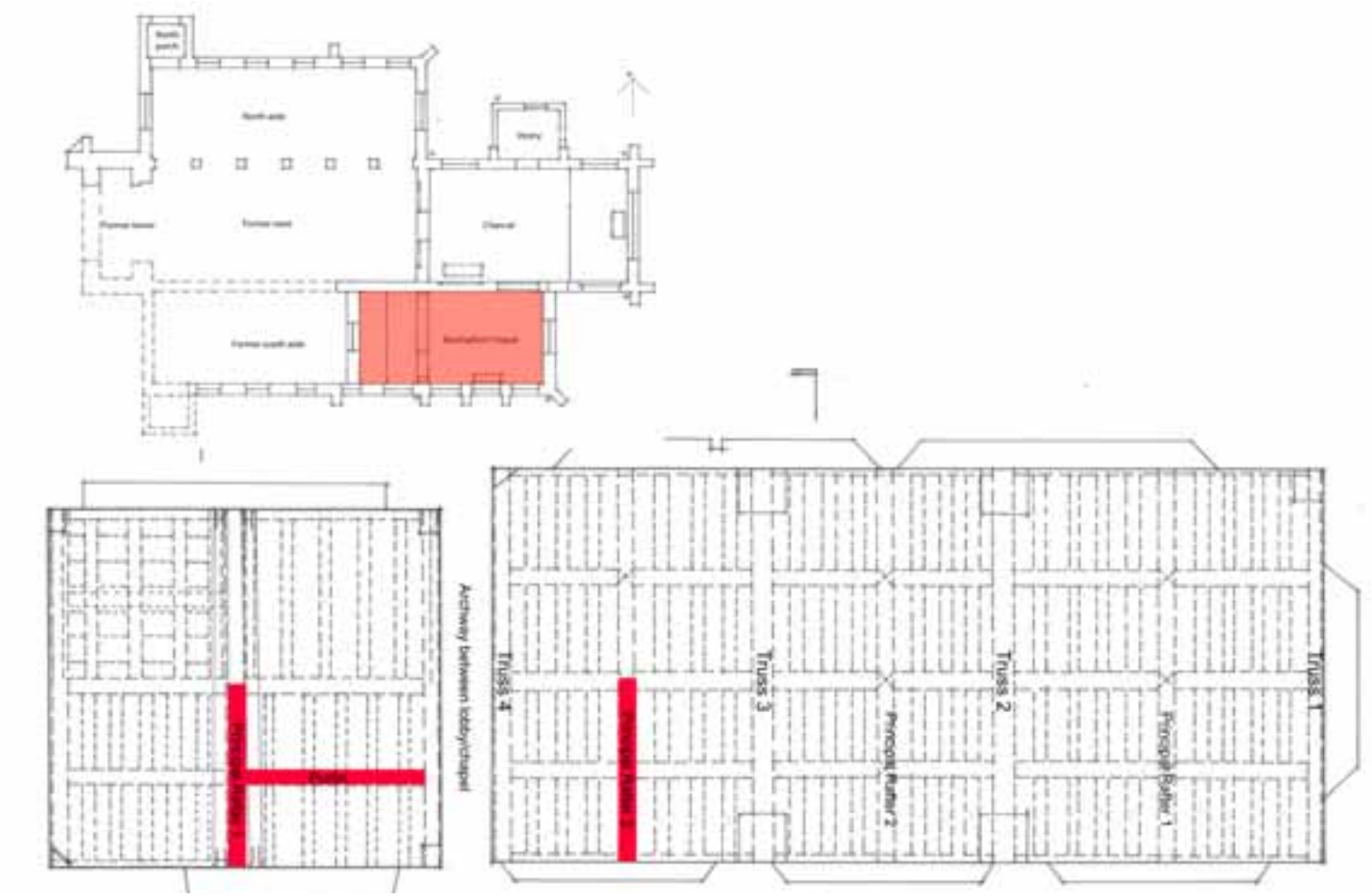

Figure 3. Plan of St John's, Oxborough (above), and detail (below) of the roofs of the Lobby and Chapel showing the timbers identified (coloured red) as the source for the ex situ *timbers sampled. After Hutton + Rostron Environmental Investigations Ltd*

DISCUSSION

It was disappointing that in the end samples were collected from just three timbers, as this clearly adversely affected the likely success of the analysis, particularly considering the problematical nature of dendrochronological analysis previously encountered in this region. That the sequences derived from these samples did not match each other is not too surprising, given the relatively short ring sequences, and underlines the recommendation for at least eight timbers to be sampled from each phase or area under investigation (English Heritage 1998). None of the sequences matched reference material and they remain undated.

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APPENDIX

Ring width values (0.01mm) for the sequences measured

oxb01

261	207	230	193	327	347	334	376	310	304
274	262	348	381	263	257	183	252	305	336
260	157	148	159	301	217	167	140	218	226
215	228	246	215	227	212	307	260	327	222
185	191	153	155	189	225	179	197	182	179
261	362	261	279	261	227	268	287	223	160
243	296	285	142	156	187	174	143	195	209
200	258	136	122	141	239	226	257	224	131
165	176	242	227						

oxb02

551	485	463	235	454	304	332	343	350	359
258	283	202	245	314	232	266	389	258	355
290	254	242	211	346	273	138	77	84	90
115	111	132	147	160	116	167	127	145	182
92	108	136	103	81	115	61	56	75	166
270	150	131							

oxb03

164	109	116	370	219	343	300	340	380	270
272	325	292	184	212	206	193	217	221	180
161	154	179	243	134	141	192	152	144	157
90	118	107	133	211	159	180	143	187	159
141	151	147	244	184	186	185	169	167	151
200	165	248	192	225	187	93	104	115	199
217	211	151	146	145	114	126	229		






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