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Tree-Ring Analysis of Timbers from Berwick Manor, Rainham, London Borough of Havering

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Summary

An investigation of both *in situ* and *ex situ* timbers was made at this grade II listed property. The building had suffered a severe fire some years previously, during which the roof timbers had collapsed, but the remains had been carefully stored on site. The vast majority of timbers looked at were of fast-grown oak assessed as of little use for dendrochronological study because of the lack of rings. Nine samples were taken from the most suitable looking timbers and crossmatching was found between some of the series. No consistent matching was found when comparing with dated reference material and the site therefore could not be dated dendrochronologically. Stylistically the timbers were thought to belong to the early-seventeenth century and the data gathered therefore gives some information about timber supplies in this area in that period.

Keywords

Dendrochronology
Standing Building

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Introduction

Berwick Manor (NGR TQ 5450 8330; Fig 1) is a grade II listed timber-framed house. It is thought to have been constructed in the early seventeenth century, on or near the site of another structure which is illustrated on an estate map dated AD 1575. The property has been considerably altered in each of the succeeding centuries, with at least four phases being recognised. Its last use was as a nightclub, before the building was severely damaged by fire, which resulted in the collapse of the roof timbers. These had been kept in store on-site. A dendrochronological study of the surviving timber frame and *ex situ* timbers was requested by the English Heritage Historic Buildings Inspector (Ray Rogers) as part of a wider archaeological evaluation and assessment of the site in response to a recent application for redevelopment. The extant posts had substantial jowels and were thought on stylistic grounds to date to the early-seventeenth century.

Methodology

The site was visited in May AD 2001, in the company of Andy Wittrick (English Heritage), who gave a background history of the building and made the drawings used in this report. The timbers were assessed for their potential use in dendrochronological study. Oak timbers with more than 50 rings, traces of sapwood, and accessibility were the main considerations in the initial assessment. The timbers assessed included the surviving frame and floors, and a large collection of *ex situ* timbers, mostly from the roof, rescued after the fire and stored on-site. 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. Sometimes cores have less than 50 rings when extracted; those with over 40 rings are analysed.

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 utilizing 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.

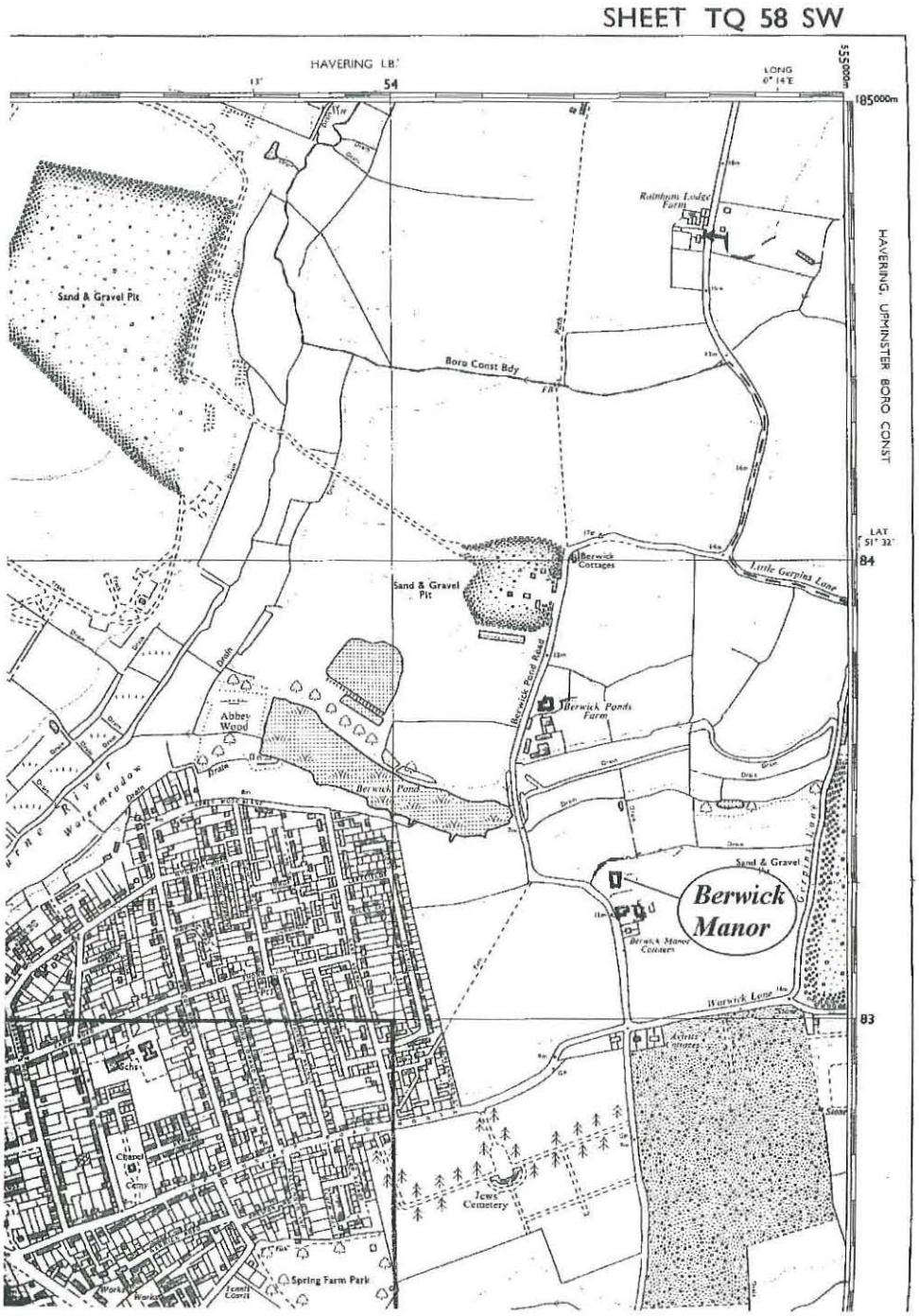

Figure 1: Map to show the general location of Berwick Manor, Rainham (based on the Ordnance Survey map

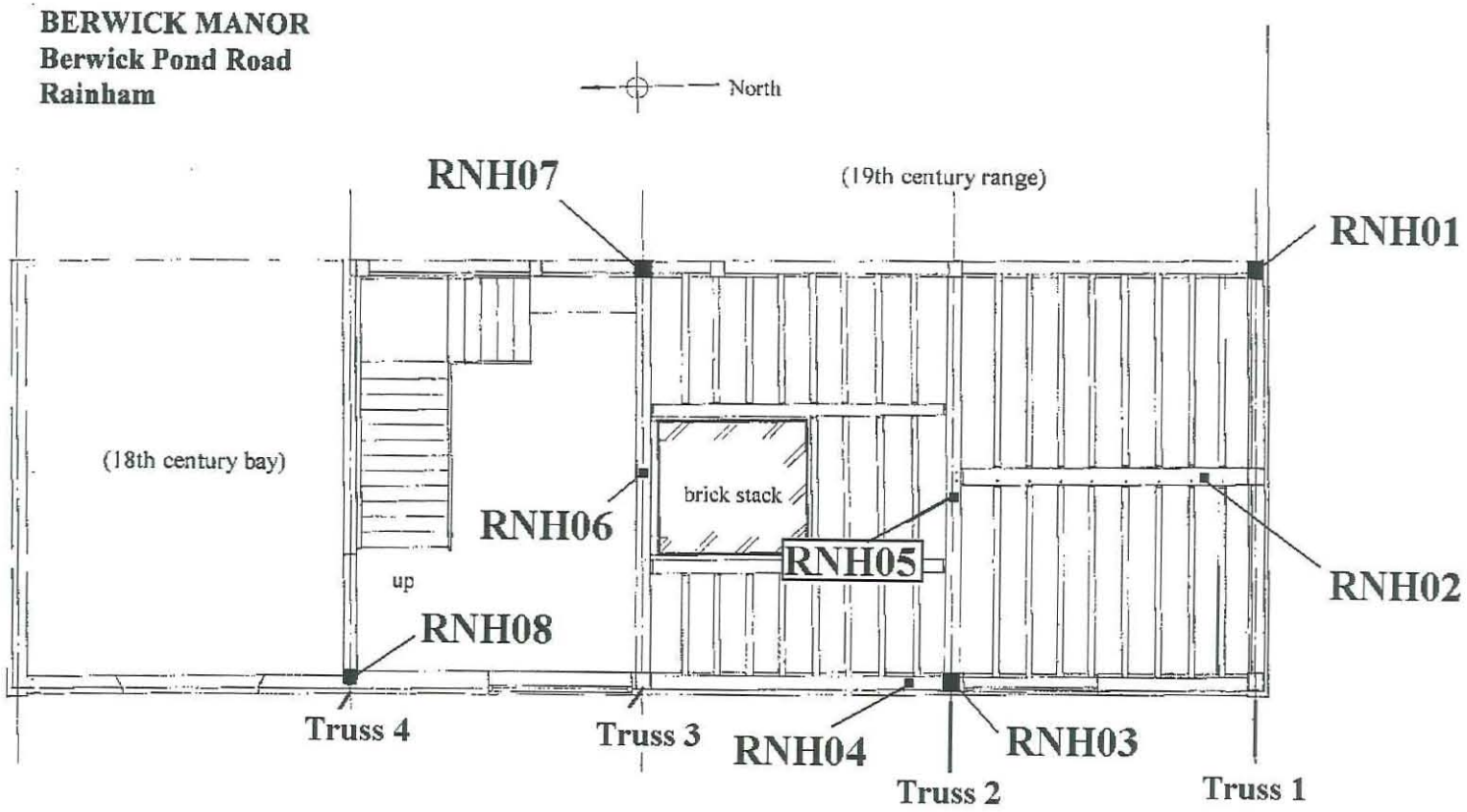

Figure 2: Plan of Berwick Manor, showing the *in situ* timbers sampled for dendrochronology. Adapted from an original drawing by Andy Wittrick

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).

Results

All the timbers looked at were of fast-grown oak (*Quercus* sp.). Only nine timbers were judged to be worthy of further study, including only a single *ex situ* timber, a large bridging beam. Details of the samples taken are given in Table 1, with the locations of the eight *in situ* timbers illustrated in Figure 2.

Crossmatching was found between some of the samples. RNH02 and RNH07 crossmatched (t = 5.1, 50 years overlap) and were combined into a single series RNH0207m. The crossmatching between samples RNH03, 04, 05, and 06 is detailed in Table 2, these series being combined into a single series, RNH3456m. The data for both these series are given in Tables 3 and 4. Series RNH08 (62 years) did not give consistent matches with any of the other series.

Table 2: Crossmatching between series RNH03, 04, 05, and 06

	***t* values**		
Sample no	RNH04	RNH05	RNH06
RNH03	5.8	5.9	3.4
RNH04		6.3	4.2
RNH05			3.6

The ring width data were compared with a range of regional and individual site chronologies, but no consistent matches were found for any of the series.

Discussion

The timbers investigated were all fast-grown, adequate building timbers often being made from young trees rarely over fifty years of age. Those timbers from which cores were taken were found to have large growth rings. Although it was possible to produce short replicated ring width sequences, none of these gave consistent matches when compared with the wide range of dated series now available. If it is assumed that the

Table 1: Oak (*Quercus* spp.) timbers sampled from Berwick Manor, Rainham. h/s = heartwood-sapwood boundary

Sample number	Origin of core	Total no of years	Average growth rate (mm yr^{-1})	Sapwood details	Date of sequence AD
RNH01	South east corner post	<40	unmeasured	-	unknown
RNH02	North-south floor beam	51	2.82	18	unknown
RNH03	West post, truss 2	67	3.35	11	unknown
RNH04	West wallplate, south section	69	2.44	h/s	unknown
RNH05	West-east floor beam, truss 2	47	3.23	-	unknown
RNH06	West-east floor beam, truss 3	51	3.14	6	unknown
RNH07	East post, truss 3	58	2.55	15 + bark(?)	unknown
RNH08	West post, truss 4	62	2.34	3	unknown
RNH09	*ex situ* bridging beam	<40	unmeasured	-	unknown

Table 3: Ring-width data for the sequence RNH0207m

ring widths (0.01mm)										no of trees									
468	378	387	64	372	511	484	523	403	362	1	1	1	1	1	2	2	2	2	2
360	356	397	382	460	413	344	304	283	303	2	2	2	2	2	2	2	2	2	2
160	232	305	266	289	287	207	205	278	214	2	2	2	2	2	2	2	2	2	2
277	258	209	166	268	272	206	154	155	160	2	2	2	2	2	2	2	2	2	2
186	172	204	123	217	269	182	211	177	325	2	2	2	2	2	2	2	2	2	2
179	157	181	186	165	194	136	164			2	2	2	2	2	2	1	1		

Table 4: Ring width data for the sequence RNH3456m

ring widths (0.01mm)										no of trees									
613	388	336	423	292	554	556	394	165	139	1	1	1	1	1	1	1	1	1	1
123	241	231	278	354	130	248	294	172	169	1	1	1	1	1	1	1	1	1	1
368	379	439	339	434	396	372	429	301	296	4	4	4	4	4	4	4	4	4	4
327	444	426	345	335	293	355	407	394	474	4	4	4	4	4	4	4	4	4	4
319	277	322	324	328	262	263	294	318	301	4	4	4	4	4	4	4	4	4	4
271	287	141	318	371	300	237	234	231	247	4	4	4	4	4	4	4	4	4	4
194	273	222	224	154	189	202	180	171	170	4	4	4	4	4	4	4	3	3	2
188	227	249	374	297	286	238	279	238	244	2	1	1	1	1	1	1	1	1	1
175	265	223	211	171	162	294				1	1	1	1	1	1	1			

stylistic dating is broadly correct, this gives a small insight into timber supplies in the area in the early-seventeenth century. Whilst quite adequate for the purpose for which they were used, this assemblage of timbers suggests that only young trees were available. Although of little immediate use in informing us about the history of this site, the accumulation of such information can give a broader picture of timber history in the region when a large number of sites are considered.

Acknowledgements

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