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**Tree-Ring Analysis of Timbers from 39-41 High Street, Kingston
upon Thames, Greater London**

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Tree-Ring Analysis of Timbers from 39-41 High Street, Kingston upon Thames, Greater London

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Summary

The properties comprising 37-41 High Street, Kingston upon Thames have had a complex history. Although no access to number 37 was available, dendrochronological analysis of numbers 39-41 was commissioned to inform other studies of these buildings. Number 41, thought to have been built as a service wing, had a crown-post roof largely of elm (*Ulmus* spp.) and was therefore not sampled. Despite the relatively short ring-width sequences it was possible to date elements of the painted room and carriageway of number 39. The timbers used in the painted room are most likely to have been felled in AD 1459, whilst those in the carriageway were most likely felled in the period AD 1466-88. Abrupt growth changes in some sequences suggest management of some of the timbers used in this building.

Keywords

Dendrochronology
Standing Building

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Introduction

The structure of numbers 39-41 is thought to have once comprised a single house, though it is now split into different units, along with number 37 to the north, which was a separate house but includes part of what is now number 39 (NGR TQ177688; Figs 1 and 2). The whole forms a complex listed as Grade II*. The properties are jettied to the front (west), and whilst number 39 is stuccoed, number 41 is weatherboarded. Although the uses of these properties has led to many changes at ground- and first-floor levels, the roof structures remain largely intact. The proposed phasing which this study was to help elucidate is shown in Figure 2.

The earliest surviving phase was thought to be the roof to number 41, probably built as a service wing to an earlier house, consisting of a tie beam, crown-post, collar-plate, and collar construction.

Number 39 was thought to contain three phases. The first was thought to be the carriageway. A collar on the truss dividing numbers 37 and 39 is inscribed "1471" in Arabic numerals. The remaining parts of number 39 were stylistically dated to the mid-sixteenth century, and include the 'painted room' with the associated rear hall (second phase of number 39), and thirdly, the area between phase two and the carriageway.

Alterations to the existing complex for conversion into a restaurant prompted this investigation as part of a wider study into the history of the site and to inform a Listed Building Consent.

Methodology

The site was visited in January AD 2001. 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. 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 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 meant 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

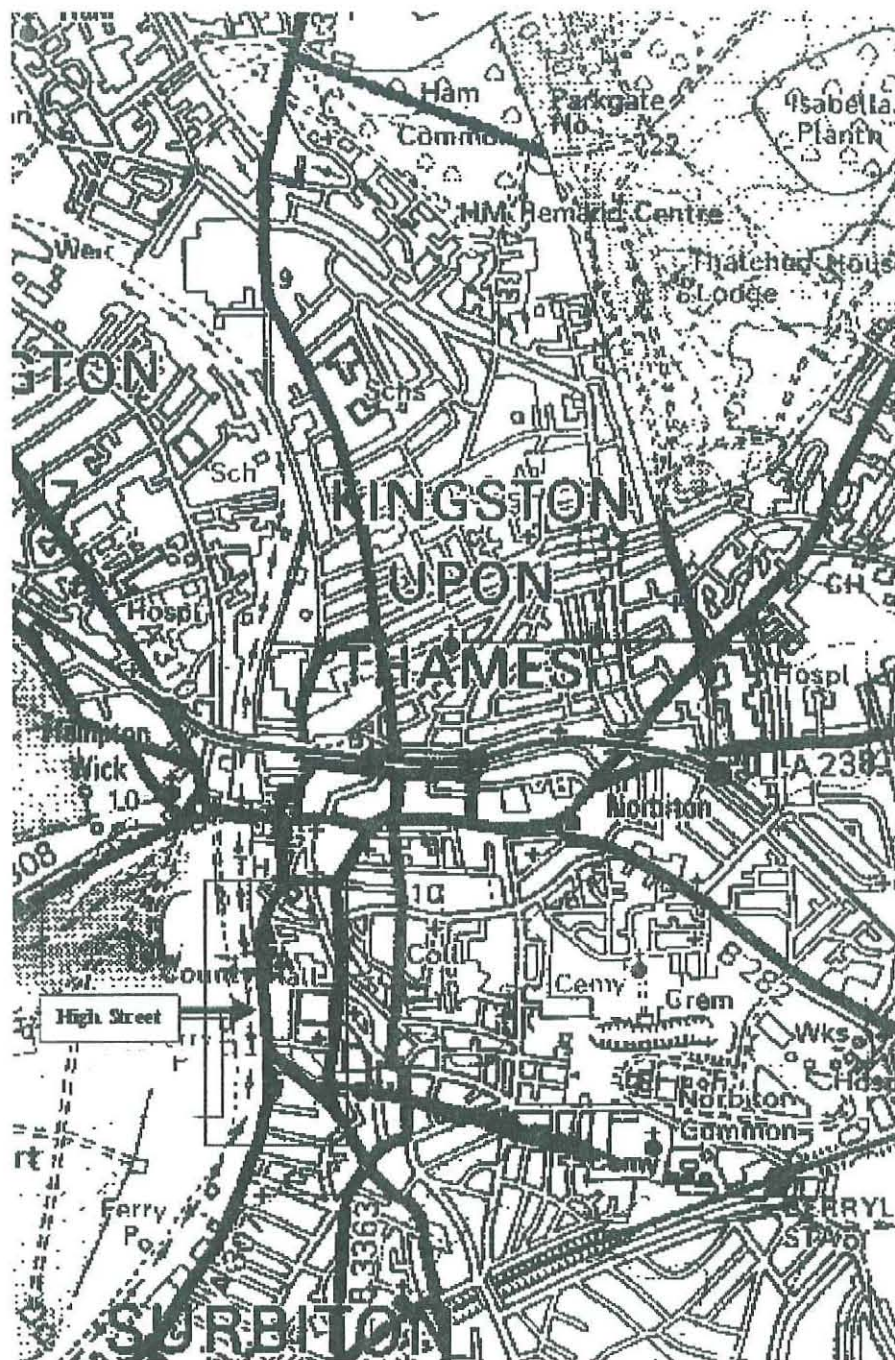


Figure 1: Map to show the general location of High Street, Kingston upon Thames

Figure 2: Sketch of the series of buildings comprising 37-41 High Street, Kingston upon Thames, with vertical lines separating the phases suggested at the outset of this study



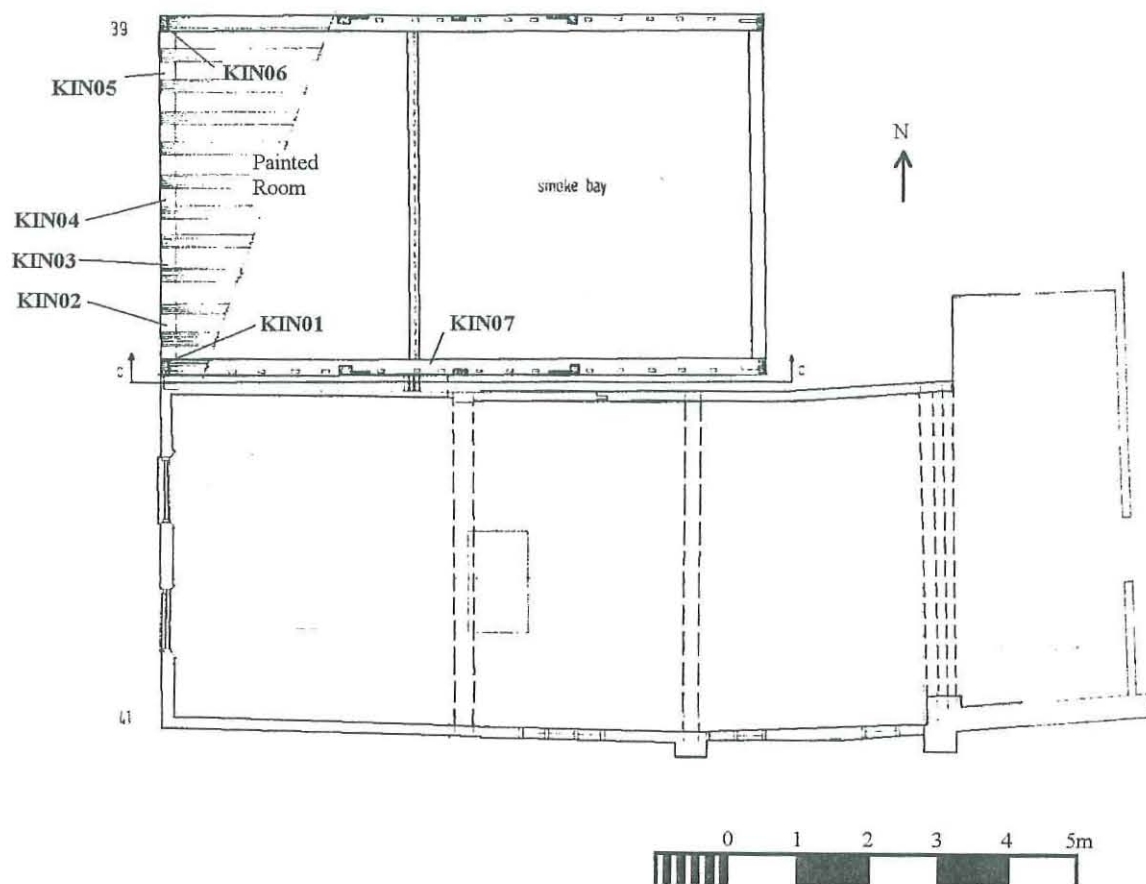


Figure 3: Plan of 39-41 High Street, Kingston upon Thames showing the approximate locations of samples taken for dendrochronology

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).

Results

Much of the structure was rejected as unsuitable for dendrochronological study, either because of the use of elm (*Ulmus* spp.) or because of the lack of rings available in the oak timbers. This was the case in number 41, which had a crown-post and several braces of elm. Most of the rafters, the remaining braces and wallplate were of oak (*Quercus* spp.) but these contained too few rings to be considered for sampling.

Many of the timbers in the accessible parts of number 39 were similarly of fast-grown oak with few rings, and were not therefore sampled. The 'rear hall' to the east of the painted room (labelled phase 3 in Fig 2) did not contain any timbers assessed as being worthy of further investigation. Some of the timbers which were sampled (Table 1; Figs 2, 3, and 4) turned out to contain shorter series than expected from their external appearance. These were excluded from further analysis.

Amongst the series sampled, abrupt growth changes were found in samples KIN 11, 16, and 19. Series KIN 11 and 19 each had two distinct bands of narrow rings during their sequences, whilst KIN16 showed a sudden increase in ring-width towards the outer end of the series.

Crossmatching was found between some of the samples, though the statistical values were rather low (Table 2), reflecting the short overlaps between the series. Consequently, the series were individually compared with reference chronologies as a further check on the construction of the site master. This confirmed the intra-site crossmatching and the seven dated series (Fig 5) were combined into a single series KINGSTON, the dating evidence for which is presented in Table 3, with the series data being given in Table 4.

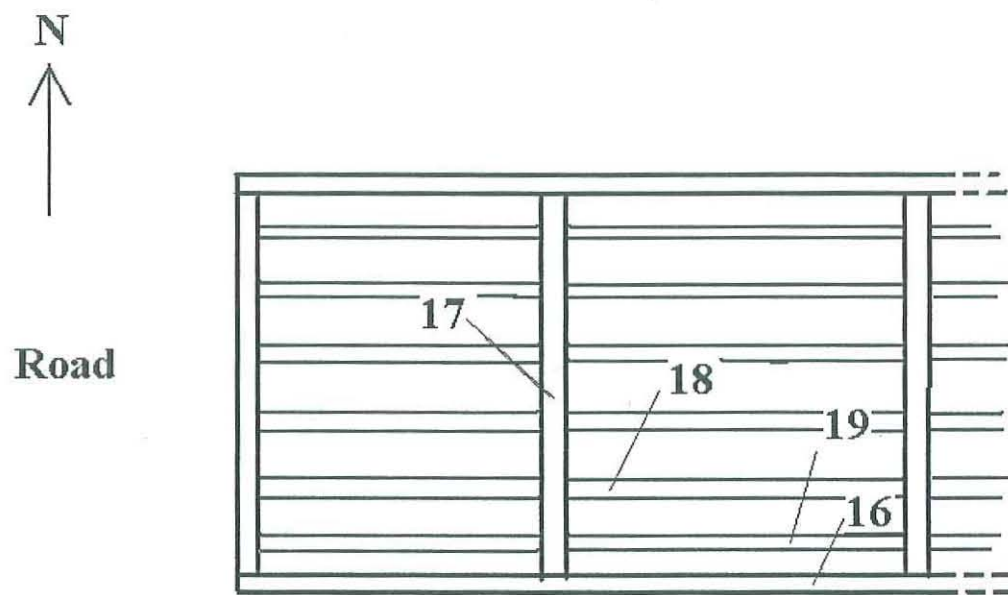


Figure 4: Sketch plan of the carriageway floor showing the approximate locations of the timbers sampled for dendrochronology

Table 1: Oak (*Quercus* spp.) timbers sampled from 39-41 High Street, Kingston upon Thames. 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	Felling date of timber AD
Number 39						
KIN01	South-west post of painted room	62	1.72	7	1385 - 1446	1448 - 80
KIN02	Stud in west wall, south of window	43	unmeasured	-	unknown	undated
KIN03	Stud in west wall, north of window	46	1.85	6	unknown	undated
KIN04	Stud in west wall	33	unmeasured	h/s	unknown	undated
KIN05	Mid-rail in west wall	31	unmeasured	-	unknown	undated
KIN06	North-west post of painted room	46	2.84	h/s	1400 - 45	1454 - 86
KIN07	South tie to painted room	41	1.50	18 + ½ C	1418 - 58	summer 1459
KIN08	Crown post of north truss	<40	unmeasured	-	unknown	undated
KIN09	Collar to north truss	<40	unmeasured	-	unknown	undated
KIN10	West stud to north truss	58	1.95	6	1393 - 1450	1453 - 85
Carriageway bay						
KIN11	North tie	51	unmeasured	-	unknown	undated
KIN12	North-west corner post	56	2.25	12	1411 - 66	1466 - 95
KIN13	Stud in east wall	53	1.76	20	unknown	undated
KIN14	West brace, south truss	61	1.91	h/s	1387 - 1447	1456 - 88
KIN15	South-east post	37	unmeasured	h/s	unknown	undated

Table 1 continued:

KIN16	Main east-west floor beam, south side	85	1.44	2	unknown	undated
KIN17	North-south beam	66	1.94	h/s	1385 - 1450	1459 - 91
KIN18	Floor joist - 2 nd bay	75	2.11	-	unknown	undated
KIN19	Floor joist - 2 nd bay	92	1.73	h/s	unknown	undated

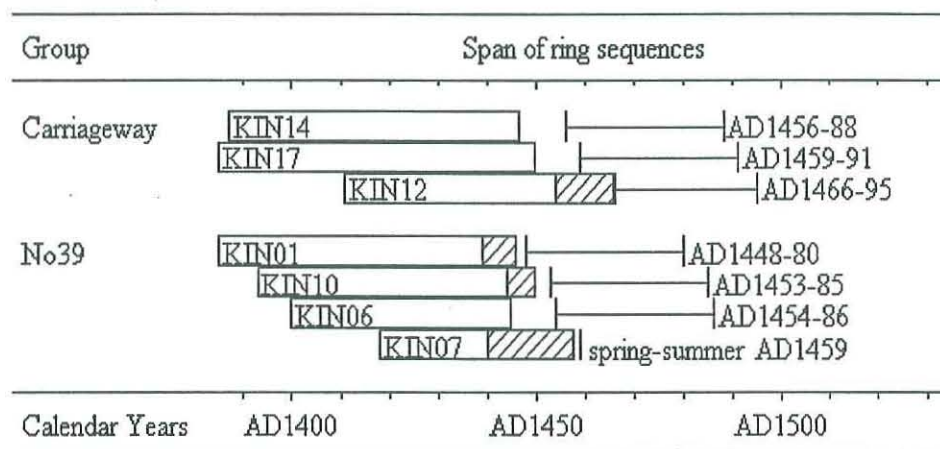
Table 2: Crossmatching between the dated ring-width series. A (-) represents values under 3.0 or insufficient overlap for a value to be calculated

<i>t</i> -value						
Sample number	KIN06	KIN07	KIN10	KIN12	KIN14	KIN17
KIN01	3.0	4.4	9.7	3.6	4.2	4.1
KIN06		-	3.8	-	-	3.4
KIN07			-	-	3.9	5.0
KIN10				3.3	5.0	-
KIN12					-	5.7
KIN14						-

Table 3: Dating of the oak site chronology KINGSTON

KINGSTON AD 1385 - 1466		
Dated reference or site master chronology	<i>t</i> -value	Overlap (yrs)
Hants97 (Miles pers comm)	6.7	82
Oxon93 (Miles pers comm)	6.1	82
London1175 (Tyers pers comm)	5.8	82
Southern England (Bridge 1988)	4.2	82
Winchester Great Hall, Hampshire (Bridge 2000a)	7.9	73
Bramley, Hampshire (Miles and Worthington 1999)	6.6	82
Erlescote, Wiltshire (Bridge 2000a)	6.5	82
Goleigh, Hampshire (Miles and Worthington 1997)	6.3	81
Newdigate1, Surrey (Bridge 1998)	6.3	82
West Meon, Hampshire (Miles and Worthington 1997)	6.2	56
Ford, West Sussex (Bridge 2000b)	6.2	82
Field Place Barn, Sussex (Bridge 1993)	6.0	81

Figure 5: Bar diagram showing the relative positions of overlap and most likely felling date ranges of the dated timbers in the site chronology KINGSTON.



Interpretation and Discussion

The use of elm (*Ulmus* spp.) in the late medieval period is something which has been noted in several properties in the Greater London area. Of the timbers that were assessed as being potentially useful for dendrochronological study, several turned out to have fewer rings than generally considered to be useful (Table 1) but some of these short series did nevertheless date.

The crossmatching evidence (Table 2) suggests that there is a high degree of similarity between the timbers used in the construction of the carriageway and those of the painted room, perhaps indicating a common source. The dating of these timbers does however suggest that they form two distinct groups, those from the painted room in the west of number 39 being felled in the spring or summer of AD 1459 (based on the one sample with complete sapwood, KIN07) whilst the most likely felling period for the carriageway timbers is a decade or so later, AD 1466-88. Caution needs to be taken in this interpretation, based as it is on so few timbers, particularly for the carriageway bay, although the suggested date is in line with the timber bearing the inscription "1471".

The results do show that the carriageway is not the earliest surviving phase as had been previously thought, and the limited results found will allow, along with other studies, a better understanding of the history of this complex range of buildings.

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Table 4: Ring-width data for the site chronology KINGSTON, AD 1385 - 1466

	ring widths (0.01mm)											no of trees				
AD1385					396	427	392	333	214	205		2	2	3	3	3
	208	205	215	253	288	299	266	281	272	282		3	3	4	4	4
AD1401	240	194	253	353	305	344	276	259	261	226		5	5	5	5	5
	311	281	236	257	198	168	177	227	174	242		6	6	6	6	6
	230	186	255	262	200	140	136	194	158	122		7	7	7	7	7
	155	178	134	128	139	146	137	118	123	147		7	7	7	7	7
	152	140	141	159	128	92	118	141	165	168		7	7	7	6	5
AD1451	158	150	180	269	226	218	142	137	190	159		2	2	2	2	2
	114	80	67	99	114	142						1	1	1	1	1