2469

Ancient Monuments Laboratory
Report 40/94

THE TREE-RING DATING OF MOLENICK FARMHOUSE, ST GERMANS, CORNWALL

D W H Miles

Ancient Monuments Laboratory Report 40/94

THE TREE-RING DATING OF MOLENICK FARMHOUSE, ST GERMANS, CORNWALL

D W H Miles

Summary

Seventeen samples from fifteen timbers were obtained from Molenick Farmhouse, St Germans, Cornwall (SX 612 335). Of these, four samples matched together to form a sequence of 60 rings. This, as well as the longer individual samples were compared against the reference chronologies but failed to date conclusively. The tree-ring dating did, however, show that the Hall and the Screen appear to be coeval, as is the north-west wing.

Author's address :-

Daniel W H Miles

2 Well Cottages
The Hamlet
Gallows Tree Common
Oxfordshire
RG4 9DD

Table 1: MOLENICK - SUMMARY OF TREE-RING DATING
[for abbreviations see key below]

Sample number		timber & position	dates spanning	H/S bdry	sap-wood	no of rings	mean width mm	std devn mm	mean sens
Hall Roof									
m1	s	Upr W purlin bIII	-		10	30	3.00	1.24	0.184
m2	s	E wall-plate T1-3	-		6	34	3.22	1.16	0.215
m3	s	W arch-brace T2	-		15	57	2.10	0.76	0.255
* m4a	s	Collar T2	6-47			42	3.42	0.87	0.249
b	s	(matched t=10.17)	5-60		13¼	56	2.49	0.97	0.289
m5	s	Purlin (ex-situ)	-		24½	42	2.30	1.93	0.252
m6	s	Princ rafter " "	-		h/s	44	4.08	1.54	0.229
Hall Screen									
* m11	s	Muntin 1st from E	9-52		14	44	1.97	0.94	0.246
m12	s	Plank 1st from E	-			51	3.83	2.07	0.199
* m13	s	Muntin 2nd from E	12-53		15	42	2.27	1.35	0.257
m14	s	Muntin (ex-situ)	-			40	2.29	0.97	0.250
m15	s	Muntin 3rd from E	-		h/s	36	2.18	0.65	0.217
North-east Wing									
m21	c	N princ rafter T2	-		5	30	3.56	1.32	0.198
* m22	c	Collar T2	1-47		h/s	47	2.74	1.37	0.300
m23	c	S princ rafter T1	-		5	45	2.55	1.51	0.291
m24a	c	N princ rafter T1	-		3	51	2.72	1.47	0.257
b	c		-		21C	38	2.31	0.61	0.186

Key: * = sample included in site-master;
c,s,f = core, slice, face measured;
¼,½,C = bark edge present, partial or complete ring: ¼ = spring (ring not measured), ½ = summer/autumn, or C = winter felling (ring measured);
H/S bdry = heartwood/sapwood boundary - last heartwood ring date;
std devn = standard deviation;
mean sens = mean sensitivity

THE TREE-RING DATING OF MOLENICK FARMHOUSE, ST GERMANS, CORNWALL

1. Introduction and objectives

Molenick is a Grade I listed farmhouse of slatestone rubble which consists mainly of a Hall range and a cross-wing to the north. The five-bay roof of the Hall chamber was of exceptional interest in that it is of arched-braced collar construction with two tiers of through purlins, all the elements of the roof being heavily carved and decorated by pendants. A plank and muntin screen at both ground and first floor level separated the Hall from the staircase to the south. The whole of this area was almost entirely destroyed by fire recently.

To the north, the cross-wing is divided into several parts, the NE wing having a truncated one-and-a-half bays of lightly smoke-blackened roof. This has cambered collars notch-lapped onto thin plank-like principals. They are decorated by chamfers with ogee stops. The roof evidently continued to the east and is truncated a few feet into the second bay. The purlins are trenched into the back of the principals and are splayed-scarfed. There is evidence of the roof having had a plaster barrel ceiling inserted below; a fragment of plaster cornice still survives on the western wall.

The purpose of the dendrochronology was to sample timbers from the partly destroyed Hall roof and try to date what has been variously dated between the C15th to the C17th. At the same time, the roof of the NE wing was to also be dated as it too was of particular interest. Whilst visiting the site, the remains of tenons from the screen planks and muntins were found and it was hoped this might provide some useful material to help in dating the other phases.

2. Methods of sample collection, preparation and dating

Normal practice in tree-ring sampling offers a choice of three possible methods: measurements in situ on a well-polished beam end (normally by sanding); cores drilled with a hollow auger; or slices cut from the timbers. At Molenick, a combination of coring as well as by cutting sections from discarded timbers were used to obtain the samples.

The main problem with this site was the few number of rings in the remaining timbers and the lack of sound sapwood. The Hall had been so finely carved and moulded that little sapwood was left on from the outset and the fire managed to destroy what was left. Fortunately, small areas of sapwood were found on some tenons which had been protected during the fire by their respective mortices. All timbers sampled were of oak, Quercus sp.

As all timbers were dry, the samples could therefore be sanded without pretreatment on a linisher through several grades of abrasive paper ranging from 60 grit to 1200 grit. This prepared a sufficiently clean view of the transverse section of the wood for the ring boundaries to be distinguished and for the ring-widths to be measured. Once polished, all samples were measured under a x10/x30 microscope using a travelling stage electronically displaying displacement to a precision of 0.001mm. Where they contained breaks, cores were measured in sections for eventual alignment against other samples.

Dendrochronology is based on the principal that the annual growth rings of trees reflect regional climatic conditions and because of this it is possible to match a sequence of growth rings from a sample of wood against regional reference chronologies to establish the date of the last measured ring in calendar years. If the sample has its sapwood complete, ie to the underside of the bark, then the date of when the tree was felled can be determined to the year and in many instances the season. The usual procedure is to match two or more individual samples from a phase together, make a mean of these, and then try to match any other matched samples, repeating the process of intermediate means until all of the samples from a phase have either been dated together relatively into a floating chronology or have failed to match. The resulting site master or sub-master is then compared with other reference chronologies which have been unequivocally dated in time, thereby dating the floating chronology or sample.

This is accomplished by using a combination of both visual matching and a process of qualified statistical comparison by computer. The ring-width series are recorded on an Amstrad PC2386 computer for statistical cross-matching using a variant of the Baillie and Pilcher (1973) CROS program. A version of this and other programs were written in BASIC by D Haddon-Reece, late of the Ancient Monuments Laboratory. The programs measure the amount of correlation between two sequences and the Student's 't' test is then used as a significance test on the correlation coefficient. Generally a 't'-value of 3.5 or over represents a match, provided that the visual match between the tree-ring graphs is acceptable. In addition to our own databank, the site data has been compared against the databank at the Dendrochronology Laboratory of Sheffield University.

After measurement, the ring-width series for each sample are drawn in the usual fashion as a graph of width against year on log-linear graph paper. This paper is translucent so that graphs ("curves") can be visually compared by overlaying. Samples which originated from the same tree are first combined into a single sequence for the purposes of the analysis. Although there is no precisely defined limit, studies on modern samples suggest that those which cross-match with 't' values over approximately 10.0 are likely to have been derived from the same tree. All pairs of tree-ring curves in the group are then compared visually at the positions indicated by the computer matching and, if found satisfactory and consistent, are averaged to form a mean of the

two. This operation removes 'noise' due to the individual behaviour of the trees such as their response to pollarding or thinning out of their woodland neighbours, and reinforces the common climatic signal.

As previously mentioned, once a tree-ring sequence has been firmly dated in time, a felling date needs to be ascribed. With samples which have sapwood complete to the underside or including bark, this process is relatively simple. In measuring, if the whole ring is complete, ie both spring-wood and summer-wood has been fully formed, then the tree was felled in the winter from the October of the last measured ring date to the March of the following year. If the spring vessels only have formed, signified by a '¼' (this is not measured), then the tree was felled from between March and May of the year following the last measured ring. If there is some summer-wood but this is not complete, then this is signified by a '½' (this is measured) and the tree was felled between June and September of the year of the last measured ring date (Baillie 1982, 46-51). Care must be taken to not misread the 'dates spanned' or 'last measured ring' as a felling date. These are two very different things. Also, months can only be used a guide, as there is considerable variation in the complex relationships between climate and the changes in wood growth.

If the sapwood is partially missing, or if only a heartwood/ sapwood boundary survives, then an estimated felling date range can be given for each sample. The number of sapwood rings can be estimated by using the accepted national sapwood estimate of between 10 and 55 rings. This is within the 95% confidence range for British oaks as determined by J Hillam et al, 1987. If more than one estimated felling date range has been given for a phase, than the area of common overlap of these ranges might be given to effect a reduced felling date range. However, this relies on the assumption that the samples have a common felling year, which may or may not be true. Whilst most structural phases tend to have trees which have been felled within a year or two of each other, this is not always the case and examples of some timbers having been felled ten or fifteen years previous to the main felling date have been known. It should also be noted that no probability estimate which can be advanced for such a reduced felling date range.

As it was common practice to build timber-framed structures with green or unseasoned wood, it therefore follows that construction would generally commence within a year or so of felling. However, dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure which is being sampled. But apart from reuse, a timber can generally be identified as having been fashioned green by the distinctive shakes and deformed surfaces which would have been straight and square when initially cut by the saw. When these characteristics are present, one can be reasonably certain that construction would have taken place prior to seasoning which is generally accepted to be one year per inch in thickness.

3. Timbers sampled and analysis

The samples from Molenick are separated into three groups: those from the hall roof are samples m1 - m6, those from the screen are m11 - m15, and the samples from the NE wing are m21 - m24. The cores were drilled with a 5/8" hollow auger with hardened steel teeth. Figure 2 shows the location of timbers sampled in situ. The building was sampled on the 14th of February 1992, most sections being obtained from the Estate carpenter's shop where the remains of the roof were being repaired, and the other 'ex-situ' samples were found lying outside the house or on the bonfire. The NE wing was cored in-situ. A summary of the timbers sampled and their dating is shown in Table 1.

3a. Hall (samples m1 - m6)

Six samples were taken from the Hall, samples m1 - m4 being from the Estate workshop, while sample m5 was found on the bonfire at the rear of the house and sample m6 was found in the garden to the front of the house. These were all very badly charred but still appeared to retain about 50 rings. The samples found outside were soaked with water and were allowed to dry before polishing. The samples were all compared with each other but from this first group none of them matched each other conclusively. Some of the longer samples were also compared with the regional and national reference chronologies but there was no consistent match at any position.

3b. The Hall Screen (samples m11 - m15)

In the hall, there still remained the horizontal beam at first floor level into which the ground and first-floor Hall screens were jointed. On the upper surface of the beam there were the charred tenons and stubs of the planks and muntins, some only one half inch remaining. The most promising of these were removed and recorded. Another fragment of muntin, sample m14, was found outside and appears to have come from the ground-floor screen. These samples were also very wet and they were left to dry out slowly before being prepared for analysis. Of these five samples, m11 and m13 matched together and also matched sample m4 from the Hall roof. These were combined into a sequence which was then tried against the other samples as well as the reference chronologies but there was still no consistent match at any position. The remaining timbers from the screen failed to match each other or other samples from the site conclusively.

3c. North-east Wing (samples m21 - m24)

Four timbers were sampled from the wing. Unfortunately there were few timbers and what remained was generally very wide ringed and therefore unsuitable for dendrochronology. Of the four timbers sampled, one was sampled twice (m24) to obtain complete sapwood. Despite having come from the same timber, m24a failed to match m24b.

Sample 22, however, did match the sequence of the other three samples from the Hall and these four were now combined again into a new site sequence (see Appendix). This was compared against the other samples from the site as well as the national and regional reference chronologies but again there was no consistent match at any date. The other three samples were similarly tested but again yielded no conclusive result.

Table 2: t-value matrix for site master with overlaps

	m11	m13	m22
	52	53	47
m4	6.62	6.44	4.63
	44	42	43
m11		4.73	4.50
		41	39
m13			3.52
			36

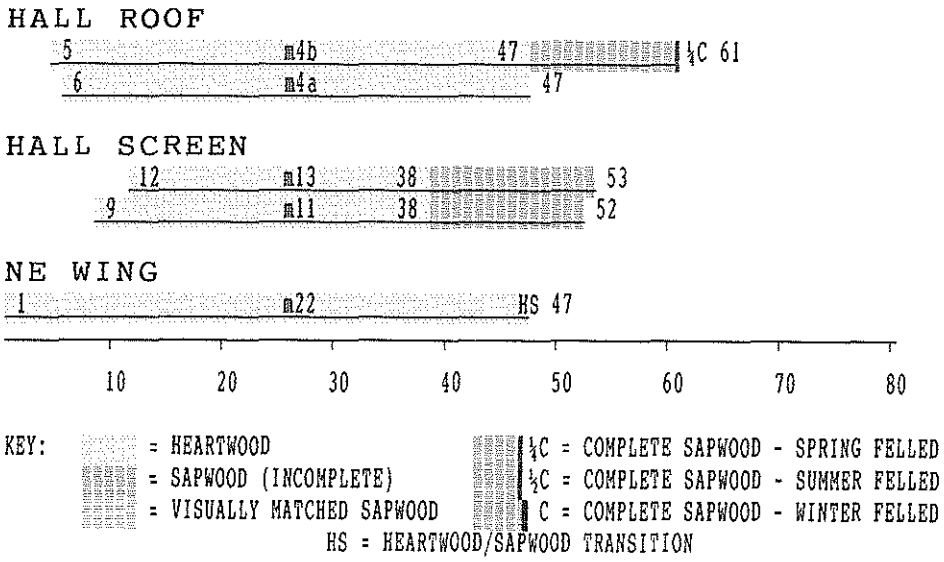


Figure 1: Samples in chronological position

4. Dating results and conclusion

Of the seventeen samples collected from the site, one sample from the hall roof, two samples from the screen, plus one sample from the roof of the NE wing were found to match together as shown in Table 2. Given this, it is most likely that the three elements sampled are roughly coeval although the construction date might vary by a few years.

These four samples were averaged together to form a site sequence which, along with the longer samples individually, were compared against the data banks from both the AML lab at Fortress House as well as at Sheffield, and no consistent dates were found for any of them. We will continue to try this site against future data from this area but it is unlikely that absolute dating will ever be obtained due to the shortness of the ring sequences.

5. Acknowledgements

The author is grateful to Miss Jennifer Hillam and Miss Cathy Groves of the English Heritage funded Sheffield University Dendrochronology Laboratory for practical assistance with the production of this report. Further thanks are given to Mrs Rebecca Child, English Heritage Architect for arranging the dendrochronology and to John Thorp of Keystone Historic Buildings Consultants for providing the plans, also commissioned by English Heritage. Acknowledgements are also given to the Ancient Monuments Laboratory of English Heritage and Sheffield Dendrochronology Laboratory for both published and unpublished data.

6. References

Baillie, M G L, 1982 Tree-Ring Dating and Archaeology, London

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

Hillam, J, Morgan, R A , and Tyers, I, 1987 Sapwood estimates and the dating of short ring sequences, Applications of tree-ring studies: current research in dendrochronology and related areas (ed R G W Ward), BAR Int Ser, 333, 165-85

APPENDIX - RING WIDTH DATA

molenck1 <1001-1060> Molenick m04+11+13+22
60 rings

ring widths (0.01mm)										number of trees per year									
428	310	307	370	456	427	291	341	360	365	1	1	1	1	2	2	2	2	3	3
251	409	581	304	410	391	409	321	277	165	3	4	4	4	4	4	4	4	4	4
254	203	174	179	256	183	205	234	211	146	4	4	4	4	4	4	4	4	4	4
181	222	207	183	247	269	271	208	200	276	4	4	4	4	4	4	4	4	4	4
179	201	209	136	196	141	178	215	190	140	4	4	4	4	4	4	4	3	3	3
161	188	172	179	113	147	199	147	143	136	3	3	2	1	1	1	1	1	1	1

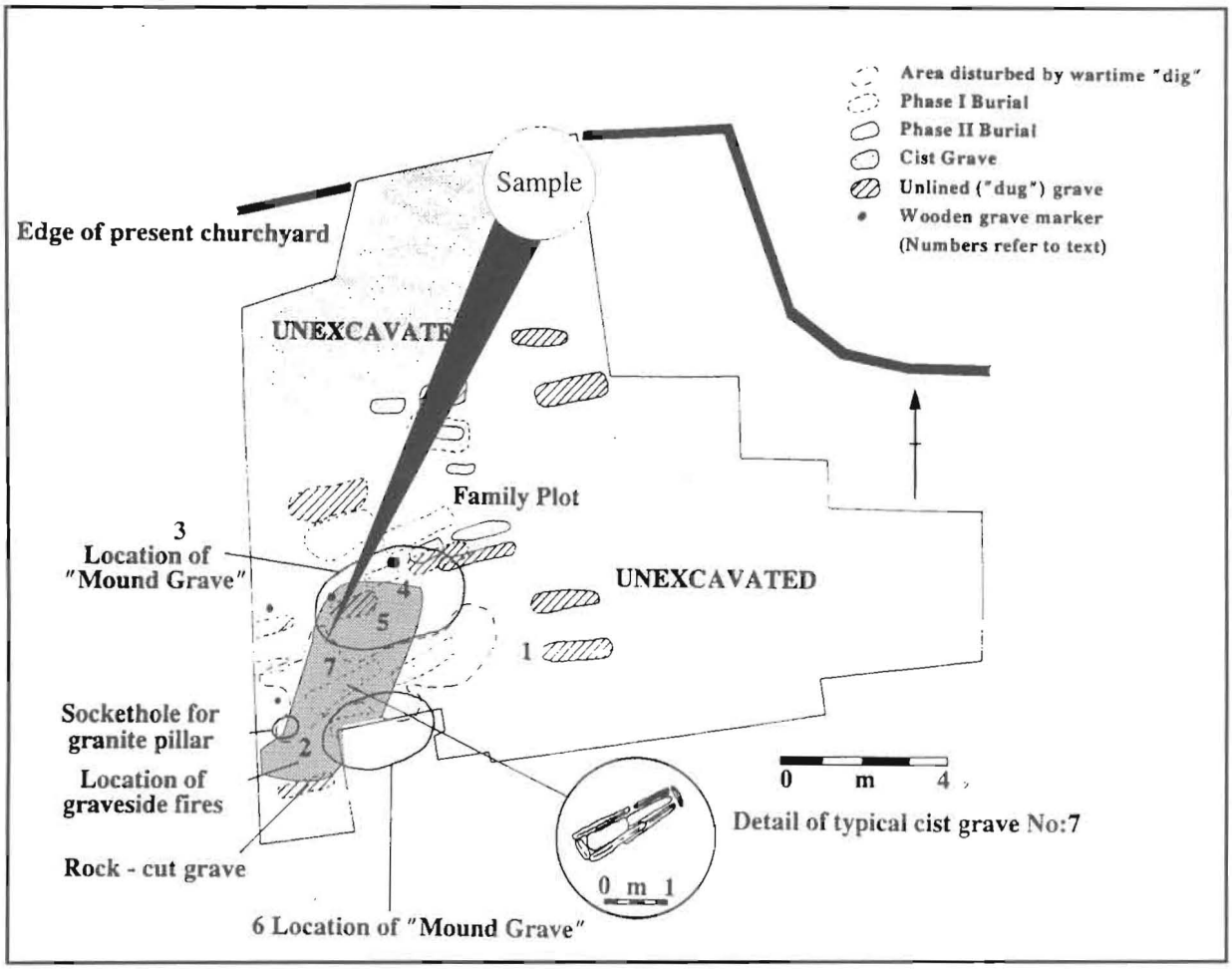


Figure 1. Map of Phases I and II of the excavation (all under Mound C), showing position of sample. Greytoned area shows lateral extent of 1264.

Plate 1. The silt loam is the layer above the ranging rod. The sample was taken beneath the two large lefthandmost stones.

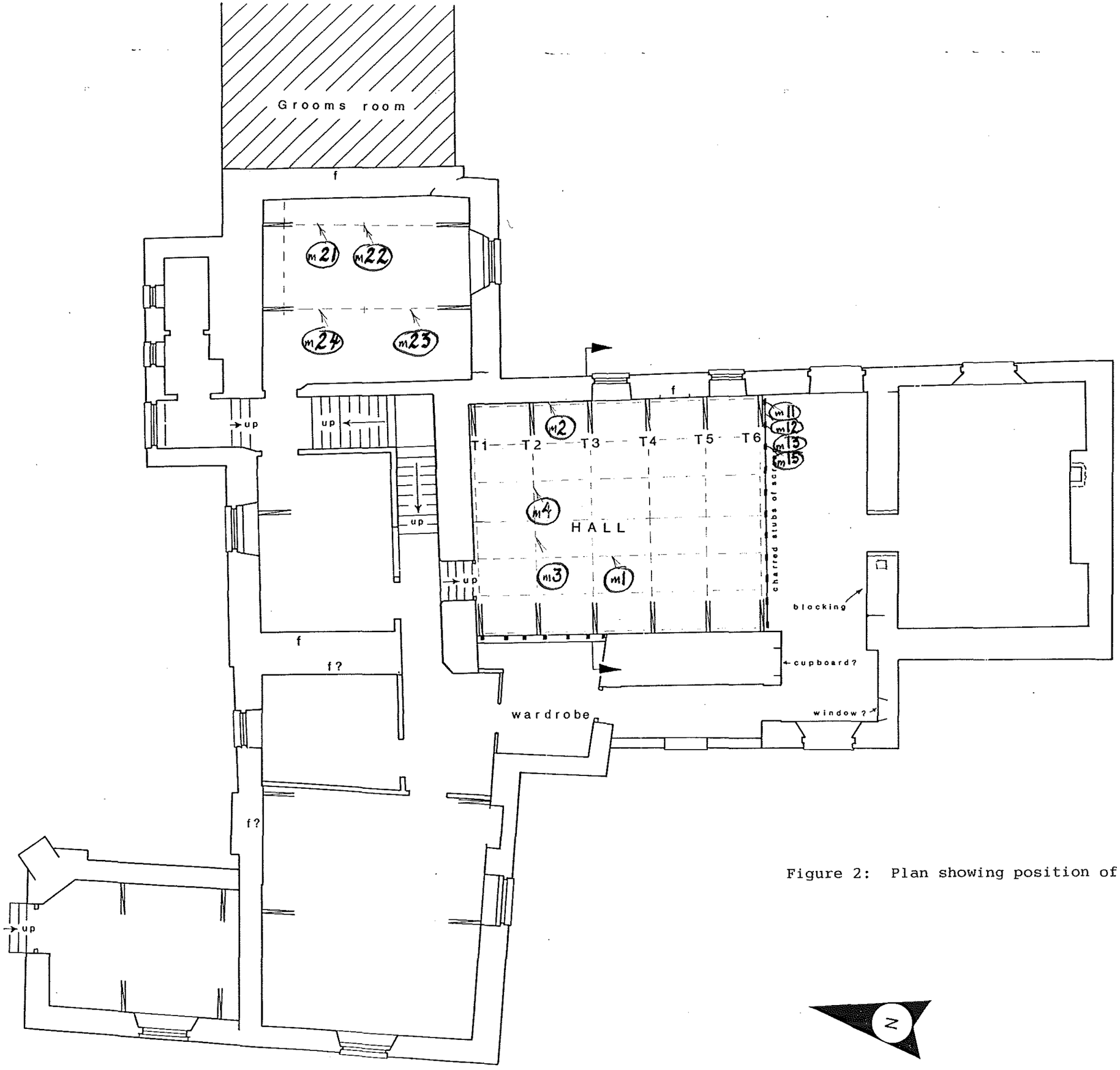
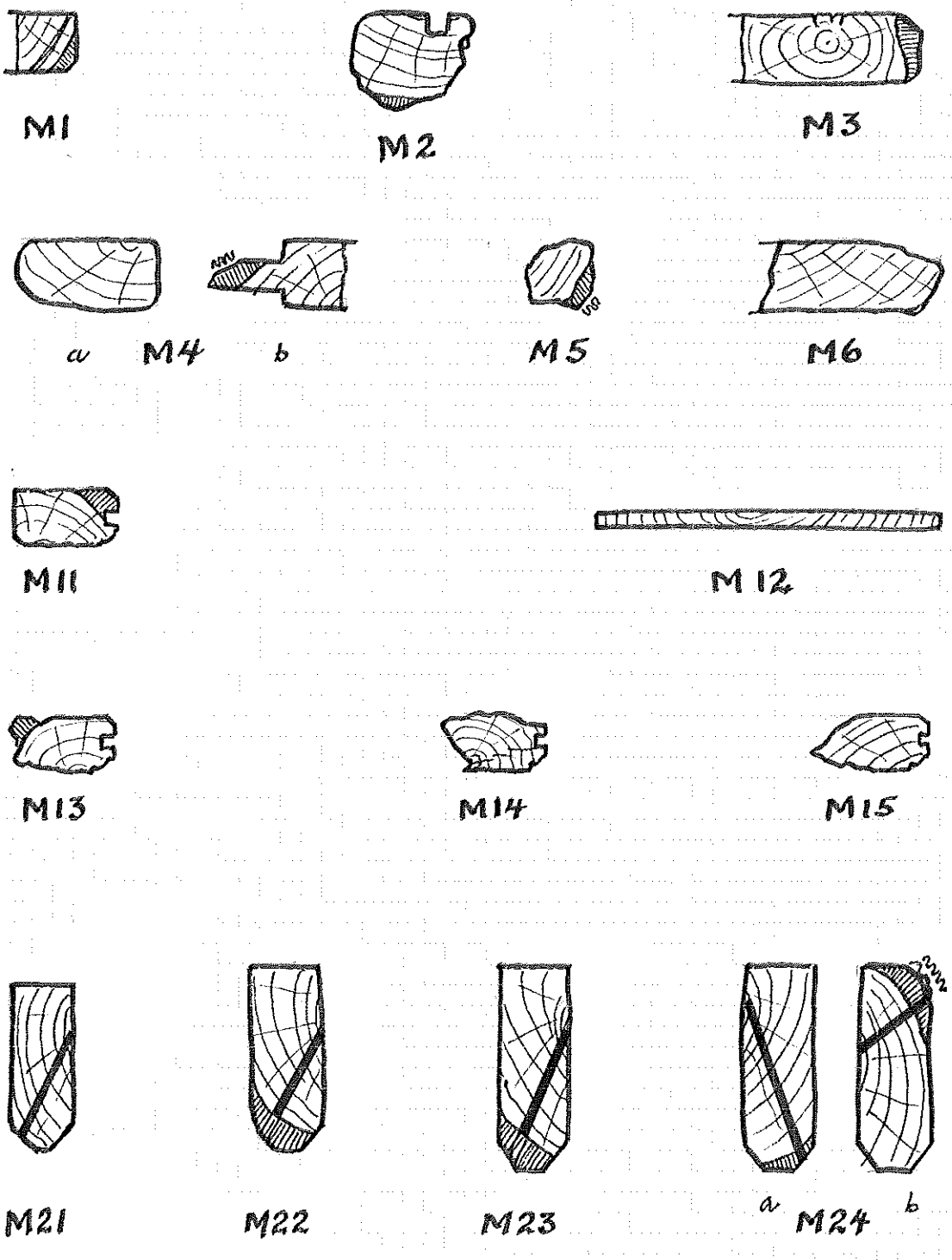


Figure 2: Plan showing position of samples

Figure 3: Sections of timbers sampled at scale of 1:8



Key: Sapwood Bark edge