Wood Assemblage Report:

Whitland By-pass, DAT Site No. 30298

by

Nigel Nayling with Richard Brunning

Bryndyfan
Derwydd Road
Ammanford
Dyfed
SA18 2TT

Tel: 01269 851505

Summary

This report synthesises data gathered from site wood records, on-site assessment, post-excavation assessment, and subsequent detailed recording and post-excavation analysis of wood held in store at Carmarthen Museum. The wood assemblage includes four major structural groups: each of these are considered separately as analytical units. Appendices detail archive photographs and drawings, dendrochronology results and selected ring-width data, and details of samples by structure.

Introduction

The main author of this report was initially contracted to provide on site advice and limited assistance with the recording and selective recovery of the wood assemblage from the site. Following completion of the excavations, a post-excavation assessment was carried out to determine the potential of this assemblage and its associated record and to make recommendations on an appropriate post-excavation programme of analysis. This report provides a synthesis of the results of this work, complementing an archive comprising wood record sheets, photographs, drawings, tree-ring width data and a database.

Methodology

Two sites visits were made during the course of the excavations. Dendrochronological samples were taken from one 'bog oak' excavated by machine during construction works and another found *in situ* in the river bank on the line of construction works. Poorly preserved, horizontally laid timbers forming the surface of structure 198 were examined and sampled *in situ* before being discarded. A single large plank associated with structure 142 was lifted and sampled and general advice given on the recording and recovery of remaining elements of structures 198 and 125/142.

After the completion of excavations, wood held in store at Carmarthen Museum was examined using a hand lens and the naked eye. All pieces were examined for evidence of conversion from the parent tree and any subsequent woodworking. Oak (*Quercus* Spp.) pieces were identified and notes taken on ring counts, average ring width, presence of bark and season of felling. Where sufficient rings were present (minimum 50) dendrochronological samples were taken. Identification samples which had been taken in the field were not examined in detail.

Post-excavation analysis of the material was guided by the recommendations in the assessment report (Nayling, 1996). Selected pieces were examined for woodworking evidence (point type, cutting angles, toolmarks, jam curves and tool signatures) and data recorded on existing wood record sheets. The shape of the points were classified according to certain established types (Coles and Orme 1985; O'Sullivan 1991). These point types indicate the form of point produced, and indirectly both the style of working and the amount of wood removed during the process. Chisel-ends are cut down one side of the stem only, with the opposing side of the trunk remaining intact. The worked area may be uniformly in one plane or as a chisel-variant with two closely adjacent worked faces. Wedge-ends are cut on opposing sides of the trunk, either directly opposite or as in the case of Wedge Variants on almost adjacent faces. Pencil-ends show the most amount of working, being cut on three or more faces completely around the diameter of the trunk.

The 'cutting angle' denotes the angle of the worked surface to the length of the stem. However a variety of angles can be found on a single piece, so both the minimum and maximum cutting angles were recorded to present the cutting angle range. The means of measuring the angles was by laying the point against a perspex template, graduated into intervals of degrees. A very shallow cutting angle (0-20 degrees) indicates a concern for a sharp point, as well as the ability of the blade to cut into the wood successfully when wielded at steep trajectories. A thin, flat and very sharp blade is required to make successful blows at angles under 10 degrees. Medium to straight cutting angles at timber ends or inside mortises usually result in jam curves, a useful feature of toolmarks to be discussed below. Cutting angles can be referred to in numerical values or as categories. These are 0-20 degrees (very shallow), 21-40 degrees (shallow), 41-60 degrees (medium), 61-80 degrees (steep) and finally 81-90 degrees (straight).

A selection of pieces were drawn at 1:1 on clear acetate, indicating conversion, presence of main natural wood features and working evidence. The assemblage was selectively photographed for archive, publication and educational purposes. Both black and white photographs (with attached contact sheets) and mounted colour slides were produced.

Dendrochronological samples were prepared and analysed as detailed in the dendrochronology appendix.

Samples from non-oak pieces were identified, where possible, by taking thin sections from three planes and examining them at high magnification and comparing them with widely-accepted wood anatomy atlases (eg Schweingruber 1978, Cutler *et al* 1987), and reference collections of stained slides compiled from authenticated wood samples from the Royal Botanic Gardens, Kew. Where samples contained the full ring sequence, including bark, and were well preserved, ring counts and assessment of felling season were attempted.

Minor Contexts

In addition to the main structural groups, a relatively small number of samples and pieces of wood were recovered from a number of contexts.

Dendrochronological samples taken from one 'bog oak' excavated by machine during construction works and another found *in situ* in the river bank on the line of construction works were analysed *gratis* by Jennifer Hillam at the Sheffield Dendrochronology Laboratory as part of an ongoing initiative to extend and consolidate prehistoric chronologies for the United Kingdom. The tree-ring curves produced neither cross-matched with each other nor with dated regional or site chronologies (Hillam pers comm).

Four samples (121-124), from context 023 associated with a basal stone strew, were identified as a compressed roundwood stem of alder (*Alnus* Spp.) and a radial split, half split and roundwood stem of oak (*Quercus* Spp., 3). Preservation was too poor to allow ring counts.

A single sample of a compressed roundwood upright from the northern ditch, context 043, was not identified.

Two pieces were recorded from the upper peat layer at the base of the road, context 111. The identification sample of wood 126, a third split stem, was not located. The other piece, wood 135, was an oak roundwood stem with a pencil point and trimmed sidebranches. The heavily worked point exhibited flat tool facets with surviving widths of up to 29mm. The stem had an off centre heart (possibly indicating it was a branch), no heartwood and 20 sapwood rings. It exhibited slow/medium growth rate (average ring width 1.6mm) and was summer felled.

Two samples from context 122, for which no wood record sheets exist, were identified as oak heartwood (12 rings) and a piece of hazel roundwood with 8 rings and a narrow last ring suggestive of summer felling.

Six pieces (283-288) were found lying outside structure 125 (context 126) and interpreted on site as possible woodworking waste. Two of these were identified as hazel (*Corylus avellana*), both apparently unworked roundwood. One of these, wood 285, exhibited a narrow last ring possibly indicating summer felling. Three poorly preserved pieces were identified as oak, one apparently unworked roundwood, and two apparently tangentially split. One of the latter, wood 288, had over 70 heartwood rings but was so slowly grown that dendrochronological measurement proved impossible. This piece does not appear to be a fragment of plank 152 from structure 142 as its growth rate was significantly lower. Given the poor preservation of this small group, the absence of any woodworking evidence is not surprising, and the tentative

interpretation of this material as woodworking waste associated with construction of structure 125 or 142 could still be valid.

Structure 125

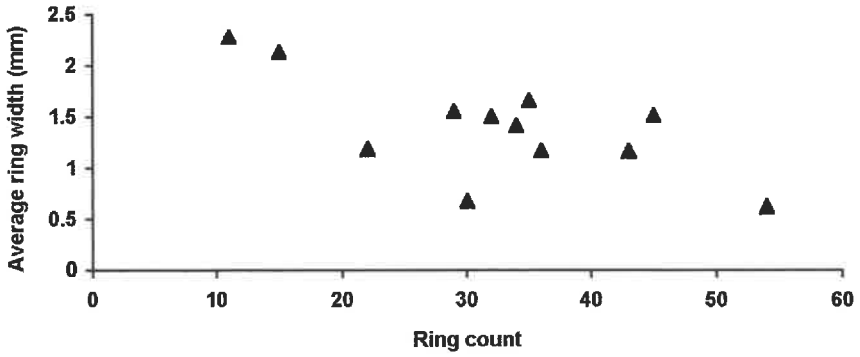
This structure appears to comprise a double line of driven and wattled uprights aligned along the edges of a linear cut feature capped by a cover of cross-bearers and longitudinal timbers which could have acted as a drain crossing beneath the Roman road. Its exact composition is not completely clear as this feature cuts an earlier structure (142) passing along a similar alignment. Some of the wood assigned to structure 125 could have been reused from structure 142.

The 'cover' comprised three poorly preserved oak longitudinals: a tangential plank (156), a half split timber running parallel to it (157), and to the north a half split branch (159). The tangential plank was sampled for dendrochronology but proved too poorly preserved to allow measurement. Estimated ring count (57 heartwood rings and 7 sapwood rings with an average ring width of 1.9mm) suggest it was derived from a tree of moderate growth rate. The very regular surfaces of the dendro sample might suggest conversion by sawing rather than splitting. Timber 157 was very compressed but appeared to be a very fast grown, half split oak with sapwood and bark on its underside. The northernmost part of the cover, 159, was a half-split oak branch with trimmed sidebranches, approximately 100m in diameter. Some or all of the timbers used in this cover may have been reused from structure 142.
Cross bearer 163, a poorly preserved oak tangential plank, was possibly part of a larger tangential plank which had split in two. Its 'inner' face appeared split rather than sawn and its 'outer' face was probably axed and adzed rather than sawn or split. Poorly preserved tool facets had widths of 71mm. These features are reminiscent of plank 152 (structure 142). Interestingly, the surviving heartwood ring sequence of 163 matches visually (and has a *t* value of 4.8 [CROS-73]) with plank 152. This suggests that timber 163 was originally employed in structure 142 and then reused in structure 125. Bearers 164 and 165 were compressed split alder branches (?) and 184 was a very compressed and fast grown split oak branch.

Driven uprights formed the sides of the structure, in some cases with associated wattling. These are considered initially as separate rows.
Of the 25 numbered uprights from the eastern line, one was totally sampled for radiocarbon dating, 4 were not lifted and one could not be found during the assessment. Wood 171, a very compressed piece of oak with 25 heartwood rings, may be a fragment of either an upright or one of the cover timbers.
The remainder can be divided into roundwood and split uprights. The ten roundwood uprights comprised a 13 year old alder stem with a pencil point; five hazel stems with pencil (3), wedge variant and chisel points, three of which had trimmed sidebranches; two oak stems, 10 and 20 years old, both with pencil points; and two, poorly preserved, unidentified uprights. One of the oak uprights was summer felled although one of the hazel stems appeared to have a complete last ring. All the points examined in detail exhibited very shallowly angled, flat tool facets. Maximum facet width ranged from 18 to 29mm. Oak upright 263, probably branchwood with trimmed sidebranches, exhibited a flat jam curve of 23mm.
Eight uprights had been converted to some extent, generally half or quarter split. Six of these were oak including 271, a summer felled, 24 year old stem with two opposite edges trimmed flat, a trimmed sidebranch and a finely cut pencil point. Unusually this point retained slightly concave facets up to 69mm wide. The rest of the oaks were too poorly preserve to provide useful growth data, but had pencil (or in one case wedge) points, two with flat facets of maximum width 23 and 25mm. Two quarter split uprights were hazel and alder stems with wedge variant points, the latter with five rings.

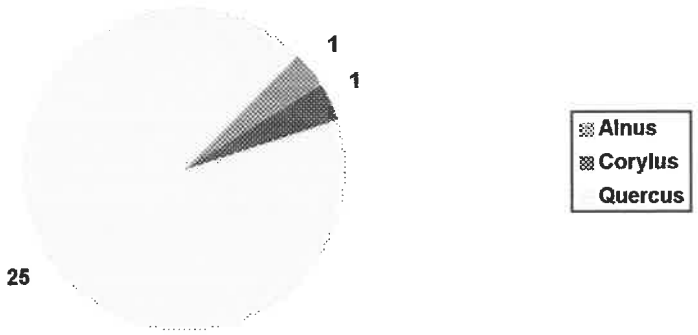
Uprights in the western line were assigned 31 wood numbers. Five uprights were not lifted. Of the nine roundwood uprights, 8 were hazel with between 9 and 14 rings, pencil or wedge variants points and very shallow tool facets with maximum widths of 18-25mm. Two of these had narrow last rings suggestive of summer felling. The remaining roundwood upright was an 13 year old oak stem with a pencil point. In contrast with the eastern line, the majority (18) of the western uprights were made from split oak. These ranged from the large southern terminal upright, 270, with only two opposite edges trimmed flat and parallel like 271 on the opposite row, to off-square stakes produced by cross splitting radial splits. Where average ring widths could be determined, the oak's growth rates were slow to medium (fig #).

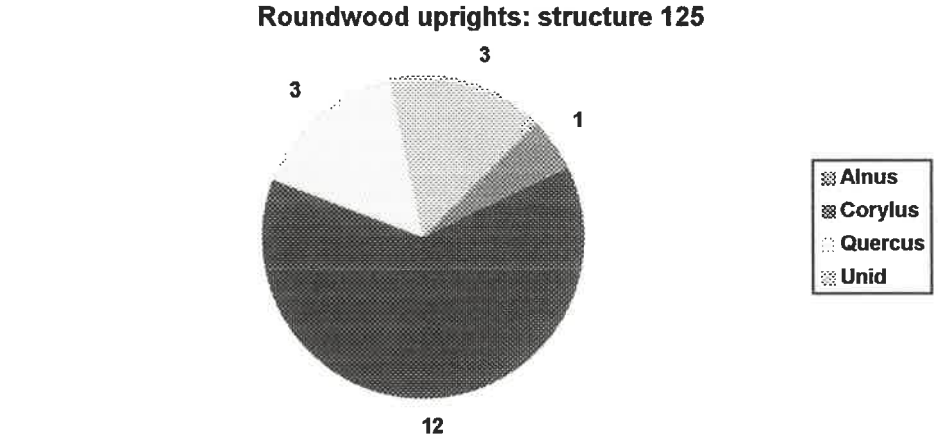
Split oak uprights: western line of structure 125



Points were predominately of pencil type with 4 wedge or wedge variants and a single possible chisel point. Facets angles were very shallow and maximum facet widths 19-52mm. Four pieces exhibited trimmed sidebranches. An eighth-split piece had an incomplete, flat jam curve of 45mm, and the large upright 270 had a flat jam curve of 46mm.
A single upright (W183) from the north end of the structure may be part of structure 125 or 142.

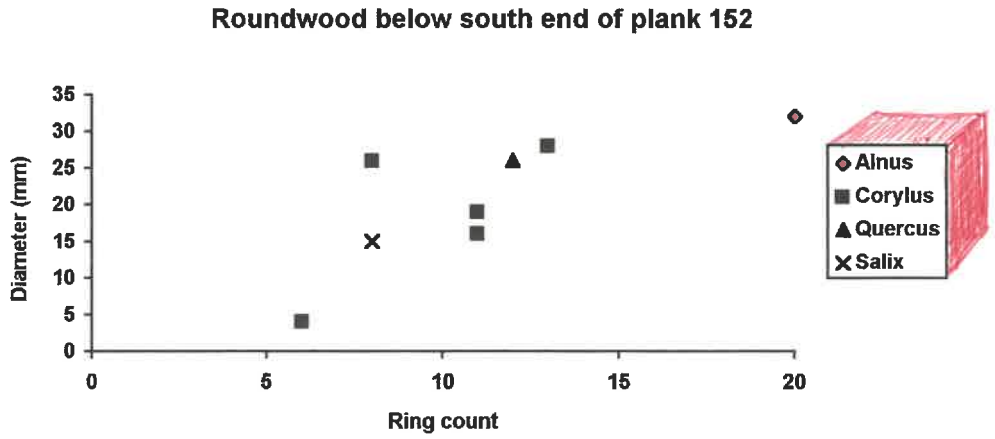
Split uprights structure 125 by species

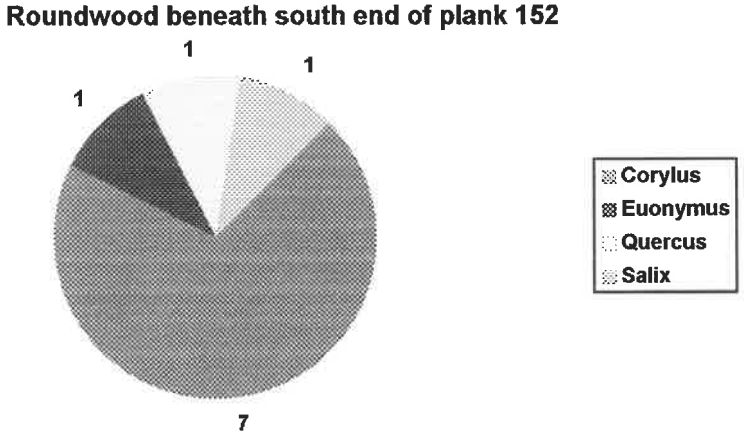




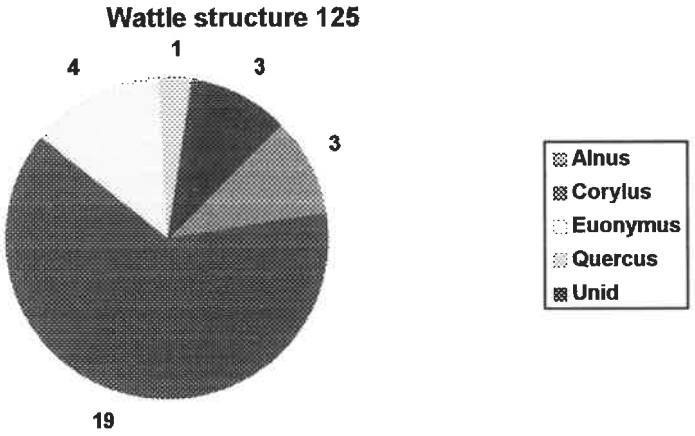
Examined as a whole, the species composition of the uprights from both sides of the structure (fig #) highlights the predominant use of oak for split stakes and hazel for roundwood uprights.

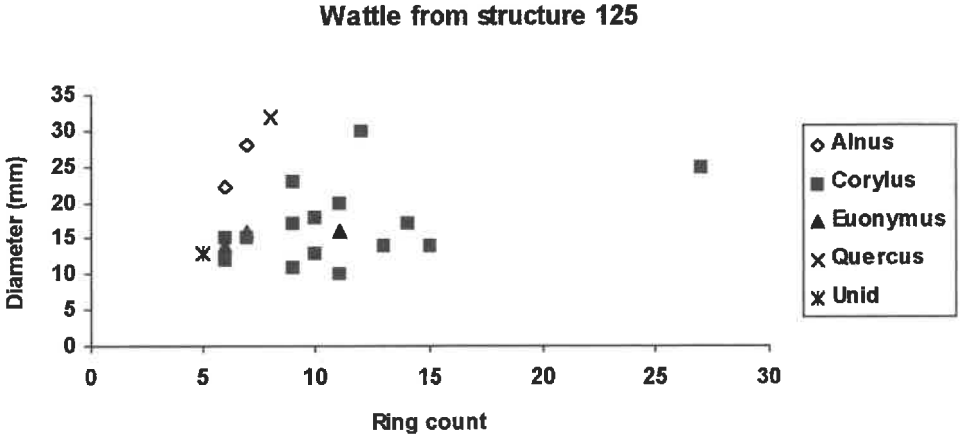
Smaller roundwood lying approximately horizontally in the structure can be divided into two main groups: roundwood located beneath plank 125 and wattle found either woven around or in close association with the driven uprights.
There appears to be a stratigraphic anomaly as plank 152 is assigned to structure 142, predecessor of 125, and yet roundwood 166-168 and 276, from beneath the south end of this plank, is assigned to structure 125. Wood 166-8 are individually numbered roundwood whilst 276 was assigned to a group of roundwood from which eight samples were taken. Hazel dominates this group with single occurrences of alder, oak, spindle (*Euonymus europaeus L.*), and willow (*Salix* spp.) (see fig #). Age and diameter data, available for 10 of the 11 samples (fig #), show a spread of ringcounts between 6 and 13 with the exception of the 20 year old alder stem. Two of the hazel stems (166 and 168) exhibited narrow last rings suggestive of summer felling.





A total of 30 samples from roundwood associated with the uprights and covers of structure 125 were examined. There may be some duplication of individually numbered pieces which may also have been sampled in two transects of wattle, wood numbers 181 and 182, which generated 5 and 8 samples respectively. Hazel dominates the assemblage with lesser quantities of alder, oak and spindle (fig #).





Where age (ring count) and diameter data are available (fig #), ring counts fall within 5-15 with the exception of a single hazel piece. The scatter does not show any close clustering of age which might be associated with exploitation of closely managed coppice. Two hazel stems and

one oak piece had narrow/incomplete last rings indicative of summer felling. Simple wedge of chisel cut ends, noted on three samples probably related to felling, although one sample 181.2 had chisel cuts at both ends (with a length of 190mm). One sample of alder (181.1) had 3 trimmed sidebranches.

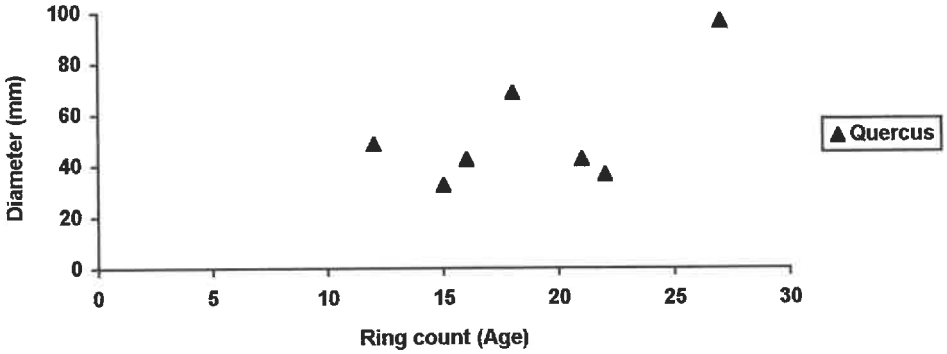
Structure 142

The precursor to structure 125 is a similar construction apparently comprising remnants of a possible cover (horizontal timbers), two lines of driven roundwood uprights along each side of a linear cut feature, and wattling woven between the uprights.

The near horizontal oak plank W152 was tangential in conversion and the underside exhibited numerous facets from secondary hewing. The timber was derived from an oak of at least 75 years but conversion and subsequent trimming had removed any traces of the pith or bark. The timber was probably split tangentially from the parent log and then cut down on its outer face. The *in situ* upper face was eroded and decayed and only one toolmark, of an adze with a width of 71mm, survived. The underside (outer face) was axed and adzed over its whole length. Adze marks, concave facets with maximum widths of 71mm, came in from several directions. One or two straight cut marks (only 35mm in width) suggest the use of an axe or adze to cut vertically into the timber during the process of cutting down the outer, curved face of the log to parallel the split inner face. At one point on the underside, the surface was poorly preserved (see archive drawing 30) possibly where it had become compressed by an underlying cross-bearer. It is recommended that at least part of this timber is conserved.
The other surviving horizontal, cross-bearer 291, was poorly preserved and derived from a 26 year old, summer felled oak tree with moderate growth rate. In addition to 2 trimmed sidebranches, the timber had an apparent half lap cut into one end in which toolmarks, with flat facets up to 67mm wide, survived. The lap may have been cut to take an overlying longitudinal plank, or reflect previous use in a structural context. A radiocarbon sample from this piece gave an uncalibrated date of 2030 $\pm$ 80 BP (BETA-841788). This timber is recommended for conservation.

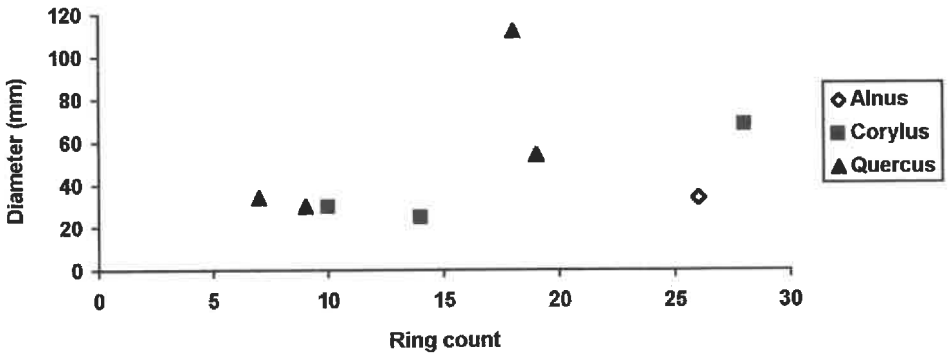
Sharpened uprights with associated wattling were encountered along both sides of the feature. Nine uprights along the eastern edge comprised 7 roundwood oak stems, predominantly young, three of which were summer felled, a single quarter split alder piece, and a roundwood upright identified as Pomoideae. A fragment of oak found on this line, 308, had no clear function. With the exception of terminal (?) upright 310, the oak uprights form a loose cluster in terms of age and diameter, ranging from 32-68mm in diameter and 12-22 years in age. The more substantial upright 310 was 27 years old and 96mm in diameter. All these uprights had been sharpened to pencil points with the exception of a wedge variant on 298. The technology of seven pieces was examined in detail. These pieces all had at least one (and up to five) sidebranches removed in antiquity. The toolmarks were very shallow ($<20^0$) in all cases, indicating care taken to produce well sharpened stakes. Facets visible on both the trimmed sidebranches and worked points were universally flat, up to 38mm wide. Jam curves, indicating the full width of the blade, were observed on the large trimmed sidebranch on 294 (26mm wide) and the point of 309 (18mm wide). Two of the uprights had been driven 'upside down'.

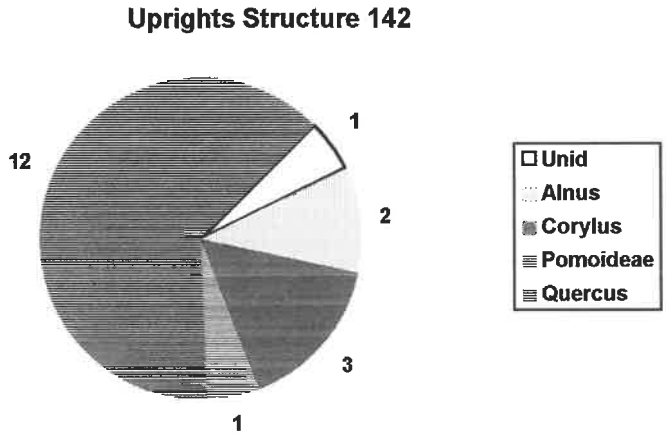
Oak uprights: east side of structure 142



The ten uprights recorded in the western line were more mixed in term of species with 5 oak, 3 hazel and one alder roundwood identified. Upright 301 could not be identified. Ages/ring counts were quite variable although, with one exception, they fell within a diameter range of 25-70mm. Again, the southernmost upright (306) was significantly larger with a diameter of 112mm. Four of the five oak uprights were clearly summer felled whilst one, 292, appeared to be winter felled. In addition, the single alder upright had a narrow last ring suggestive of summer felling. Uprights were sharpened with wedge, wedge variant or more commonly pencil points. The technology of four pieces (300, 303, 305 and 306) was examined in detail. These all exhibited finely cut pencil points with very shallow facet angles, and trimmed sidebranches. All facets were flat with facet widths up to 41mm. Jam curves on the point of 300 (width 23mm), a trimmed sidebranch of 306 (width 23mm), and the point of 306 (width 41mm) suggest the use of more than one blade in preparation of these uprights.

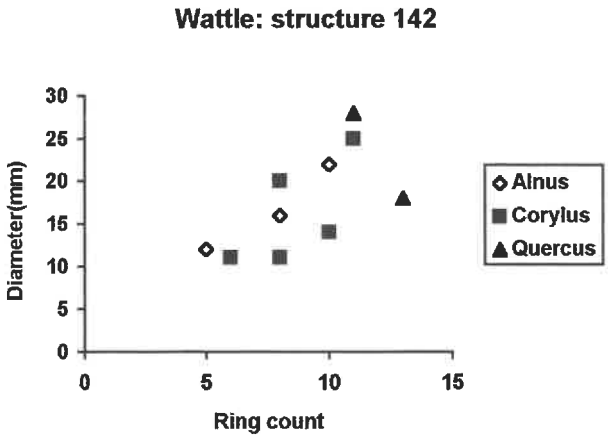
Uprights: west side of structure 142

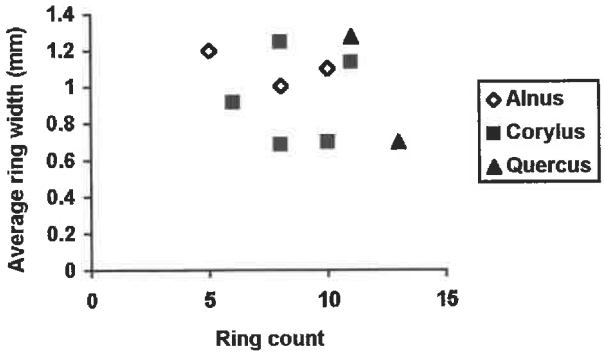




The overall species composition of the uprights from structure 142 (fig #) highlights the preference for oak with secondary selection of hazel and alder. It is recommended that one or more of uprights 294, 309, and 310 are conserved.

Wattle along either side of the structure were assigned overall numbers. Five samples from 289, wattling from the east side were identified (4 hazel, 1 oak). Narrow last rings in the hazel and an absence of latewood growth in the oak stem suggest summer felling. Ring counts ranged from 8 to 11 and growth rates were slow.
Five samples from 290, wattling from the west side, were identified as alder (3), hazel (1) and oak (1). One alder stem and the hazel stem had narrow last rings suggestive of summer felling. Ring counts ranged from 5 to 13 and growth rates were slow.
Plots of ring counts for the wattling against diameter and average ring width do not indicate tight clustering of any species, either in age or size (fig #). The relatively slow growth rates suggest the wattling may have been derived from branch wood rather than regenerating coppice stools.





Context 168

A total of 8 samples from this context were examined. Preservation prevented any ring analysis in all but one instance, and prevented species identification of two pieces. Three pieces of oak and two of alder appeared to derive from young stems, whilst one sample of oak (wood 113) contained 53 heartwood rings. No wood record sheets exist for these wood numbers.

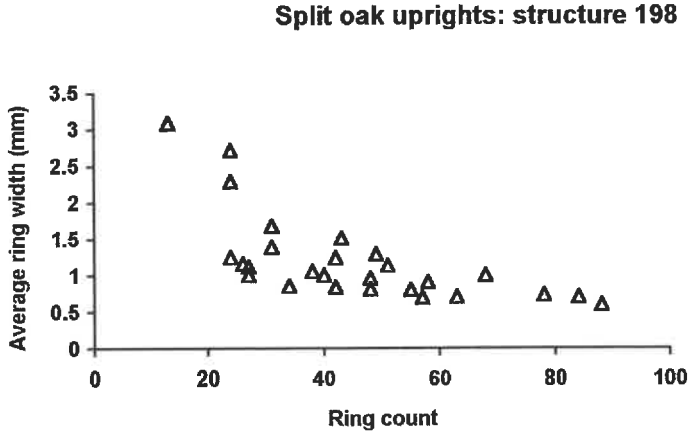
Structure 198

This structure comprised longitudinal oak timbers laid on cross-bearers apparently contained by split oak uprights driven along both sides. Wood record sheets exist for each wood number. *During transport/storage labels became detached from six split uprights. During assessment and analysis, it became clear that six wood numbers from uprights (201, 208, 209, 223, 230, 233) could not be accounted for. The results of analysis of the six unlabelled uprights has been randomly assigned to these six numbers.*

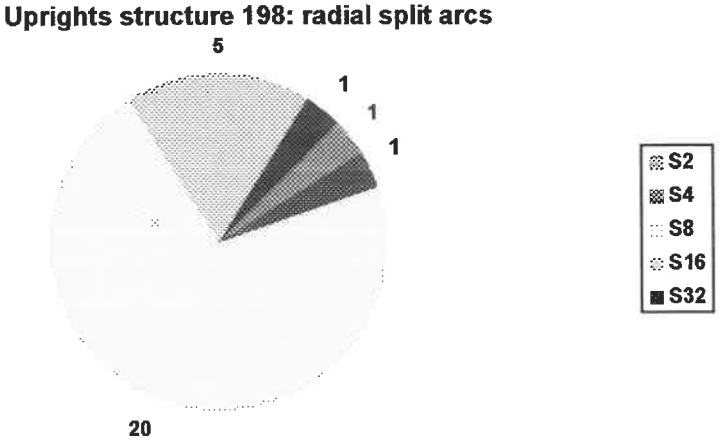
Eleven wood numbers were assigned to longitudinal timbers (6) or fragments (5) of these. All were identified in the field as oak. Poor preservation precluded retention for further analysis, although field examination suggested that five of the six timbers had been split tangentially from the outer part of relatively slow grown trees. This is supported by annual ring width data from the tangentials and fragments (fig #). The sixth timber was a relatively fast grown (average ring width 2.39mm), radially split oak. The five numbered cross-bearers were half or radial split oak with the exception of 149 (bark). Ring width data from two half splits indicates slow growth. A radiocarbon sample comprising wood numbers 149 and 150 gave a date of 2100+80BP (BETA-84187). No evidence of subsequent woodworking survived on this group of poorly preserved timbers.

The driven uprights which ran along each side of the structure are considered as a group. Wood numbers were assigned to 41 individual uprights. With the exception of a single roundwood alder with a wedge variant point (214) and an apparently half split alder (134), all the uprights were split oak. The complete growth sequence of the parent log is rarely retained in such timbers, and compressed sapwood and frequently narrow annual rings made both ring counting and dendrochronology problematic. Nonetheless, average ring width data available for 28 samples, highlights the usually very slow growth of the parent trees (fig#). With few exceptions, growth rates are slow even where ring counts are relatively short. Whilst to some extent this is a reflection of conversion, it also points to parent trees with unusually slow growth for relatively modest girth. Even taking account for compressed sapwood, most of the stakes could have been split from branches or boles with diameters of 200mm or less. In the

three instances where the pith and bark were both present, ring counts were 26+, 27+ and 34, and average ring widths were 1.15 or less: the parent logs must have been 60-100mm in diameter.



Of the 38 oak uprights for which there is data on their conversion, five are tangential in cross section probably through cross splitting of radial splits to form two or more stakes. One of these (224, archive drawing 7) exhibits the only clear evidence from the total wood assemblage for the use of a saw. This seems to have been employed to guide tangential sub-splitting of a radial. The majority of stakes are however simple radial splits of which the majority appear to comprise approximately one eighth splits (fig#).



In the 31 instances where point type was categorised, 11 were pencil points, 9 wedge, 6 chisel and 5 wedge variant. Tool facets were generally well preserved at their points. Working varied from only a couple of cuts to sharpen already thin split ends, to complex pencil points requiring extensive tooling. Maximum facet angles ranged from 8-25^0 , slightly higher than in the uprights of 125 and 142 but still quite shallow, reflecting finishing of predominantly split timber. Maximum facet widths ranged from 12 to 47mm, although only the widest encountered on wood 235 (47mm) may be complete. Facets were universally flat.

9 dendrochronological samples were taken from split uprights (see dendrochronology appendix). Uprights 201 and 221 cross-matches to form a mean curve of 85 years with possible bark edge in relative year 85 for upright 201. Four uprights (202, 208, 209, and 227) cross-matched to form a four timber mean with possible bark edges in relative years 78 and 79 for 209 and 202 respectively. Neither these means nor individual tree-ring curves from this structure cross-matched against other tree-ring sequences from the site, or dated chronologies. Widespread slow growth, and common narrow bands of rings made measurement difficult.

Two dendrochronological samples were taken in the field from two pieces of oak (W161 and W162) from outside the line of the Roman road. These may be outliers of structure 198, or be *in situ* remnants of an oak tree, possibly even one felled for the construction of structure 198. Both samples contained very narrow bands of rings which made measurement very difficult. Although heartwood sequences of 93 (161) and 128 (162) years were generated, cross-matching proved unsuccessful.

Conclusions

Species selection: In the case of all three 'covers' of structures 125, 142 and 198, oak was selected for the majority of timbers with the occasional exception of a split piece of alder. Approximately half of the uprights examined in structure 125, and the vast majority in structure 198 comprised split oak. In contrast, the roundwood uprights from structure 125 were predominantly hazel. The picture for structure 142 is more mixed: although the majority of uprights were unconverted roundwood, 63% of identified samples from these were oak, with lesser percentages of hazel, alder and Pomoideae. Growth rates tend to be slow, aprticualrly from the oak in structure 198.
Small roundwood assemblages were identified from structures 125 and 142, beneath plank 152, and context 168. Species identified comprise oak, hazel, alder, spindle and willow. Hazel is dominant in the groups from structure 125 and below plank 152 whilst oak formed 50% of the group from structure 142 along with lesser quantities of hazel and alder. Growth rates of this material is generally slow and ring counts are quite variable. The data is not consistent with exploitation of managed coppice and is more likely to reflect use of branch wood.
Comparison with contemporary pollen and plant macrofossil data would help in assessing whether only a sub-set of existing woodland resources was exploited.

Conversion: No uprights assigned to structure 142 appear to have been split. In contrast, approximately half of the uprights in 125, and all those in 198 were made from split wood. Usually the parent log has been half, quarter or radially split. In a minority of cases, radials have be cross-split to provide tangential stakes. Tangential splitting also appears to have been employed to produce the longitudinal timbers for 198 (by splitting away the outer faces of slow grown oaks) and plank 152 from structure 142. Cross-bearers are often half-split.

Hewing: The majority of worked points had been carefully sharpened to ensure good penetration during driving, even into resistant sub-strates. Tool facets are usually very shallow, only just exceeding 20^0 on some of the split uprights from structure 198. Limited evidence from wood 152 and 163 point to hewing of tangential splits to form planking rather than sawing. No definite carpentry joints were identified, although the apparent half lap and trimmed sidebranch on cross-bearer 291 may have had a structural function either in drain 142, or an earlier structure.

Tool Usage: Evidence for this is generally confined to tool facets, jam curves and tool signatures on worked points. Saw marks were observed on only one timber (224), a tangential stake from 198. The saw appears to have been used to guide tangential sub-splitting of a radial.

Tool facets are almost universally flat and angled tool signatures point to the predominant use of axes rather than adzes. Jam curves on the worked points are rarely complete: possibly complete blade widths with flat facets range from 18mm to 47mm. Slightly concave jam curves of 71mm width, with associated signatures running at right angles, found on planks 152 and 163 indicate the use of an adze to cut down the outer face of a tangentially split oak. A slightly concave jam curve of 69mm on the large upright 271 might indicate use of an adze here but tool signatures ran at an oblique angle, more usually associated with use of an axe.

Conservation recommendations

Following the selective, detailed examination of the wood assemblage, it is recommended that some, if not all, of the following pieces are actively conserved as a representative sample to form part of the archive and to provide potential display material. Clearly discussions with the receiving museum before proceeding would be in order.

Wood number	Description
152	adzed tangential oak plank, in 3 pieces plus dendro sample: would suggest conserving one section
202	oak split upright from structure 198
219	oak split upright from structure 198
254	small hazel roundwood stem with pencil point
270	oak pencil point with trimmed sidebranch
271	oak pencil point with trimmed sidebranch
291	oak timber with notch and cut sidebranch - possibly reused structural timber
294	oak pencil point with trimmed sidebranch
309	oak pencil point with trimmed sidebranch
310	large, long oak pencil point with trimmed sidebranch

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Appendix: Dendrochronology

Introduction

On site sampling and subsequent sampling of timbers in store generated 14 samples for measurement, one of which was rejected (see table #

Details of samples

Wood no	Context	Species	Rings	Bark	Arw (mm)	Dimensions (mm)	Comment
131	198	oak	53H	N			Sample discarded as too slow grown
152	142	oak	66H+7S	N	1.28	180 x 35	Tangentially split and adzed plank
161	198?	oak	93H	N	0.37	105 x 50	V narrow and difficult bands
162	198?	oak	128H	N	0.69	225 x 100	V narrow bands
163	125	oak	56H	N	1.27	107 x 37	
201	198	oak	54H+30S	B?	0.69	60 x 21	
202	198	oak	25H+26S	B?	1.13	62 x 60	Sapwood crushed next to bark
208	198	oak	41H+37S	N	0.73	62 x 40	
209	198	oak	26H+31S	B?	0.69	50 x 12	
219	198	oak	52H+36S	N	0.63	62 x 32	V slow grown
221	198	oak	57H+1S	N	0.91	75 x 36	Sap v crushed
222	198	oak	41H+22S	N	0.71	51 x 25	
223	198	oak	34H+14S	N	0.81	63 x 25	
227	198	oak	43H+25S	N	0.99	70 x 13	

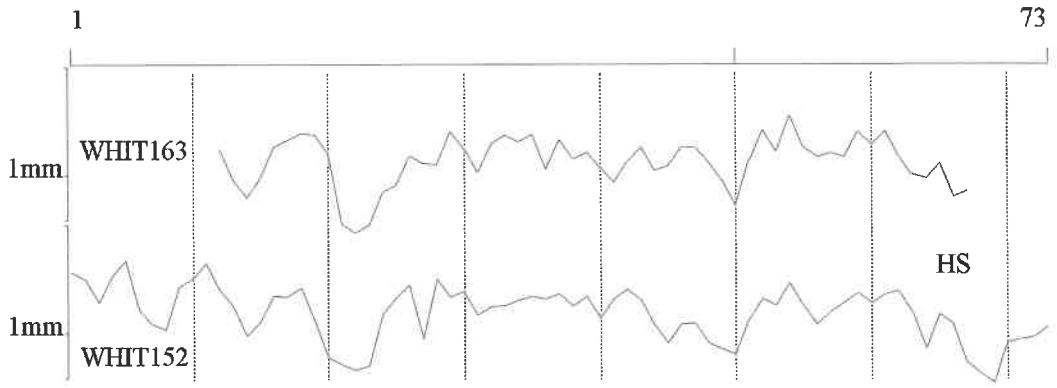
Methodology

Dendrochronological samples were prepared by freezing them for at least 48 hours and then cleaning their cross-sections with a surform plane. Ring widths were measured to an accuracy of 0.01mm on a travelling stage connected to an Atari microcomputer, using the suite of dendrochronology programs written by Ian Tyers (pers comm 1993) at the Dendrochronology Laboratory, University of Sheffield. The measured ring sequences were plotted as logarithmic scale plots. Crossmatching was attempted, first visually by comparing the graphs on a light box, and then by using computer software to measure the amount of correlation between ring sequences. These crossmatching routines are based on the Belfast CROS program (Baillie & Pilcher 1973; Munro 1984). Crossmatch *t* values of 3.5 or above were taken to indicate a match provided that the visual match between the tree-ring graphs was acceptable. Raw and mean curves generated by this process were compared with dated Roman and late prehistoric national, regional and site chronologies in an attempt to generate calendrical dates for the site sequences.

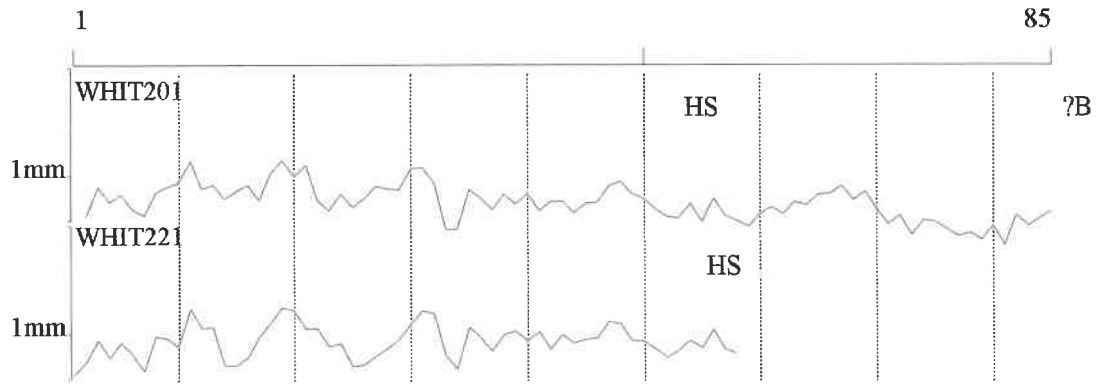
Results

Attempts to cross-match individual tree-ring sequences from site timbers were successful in three instances.

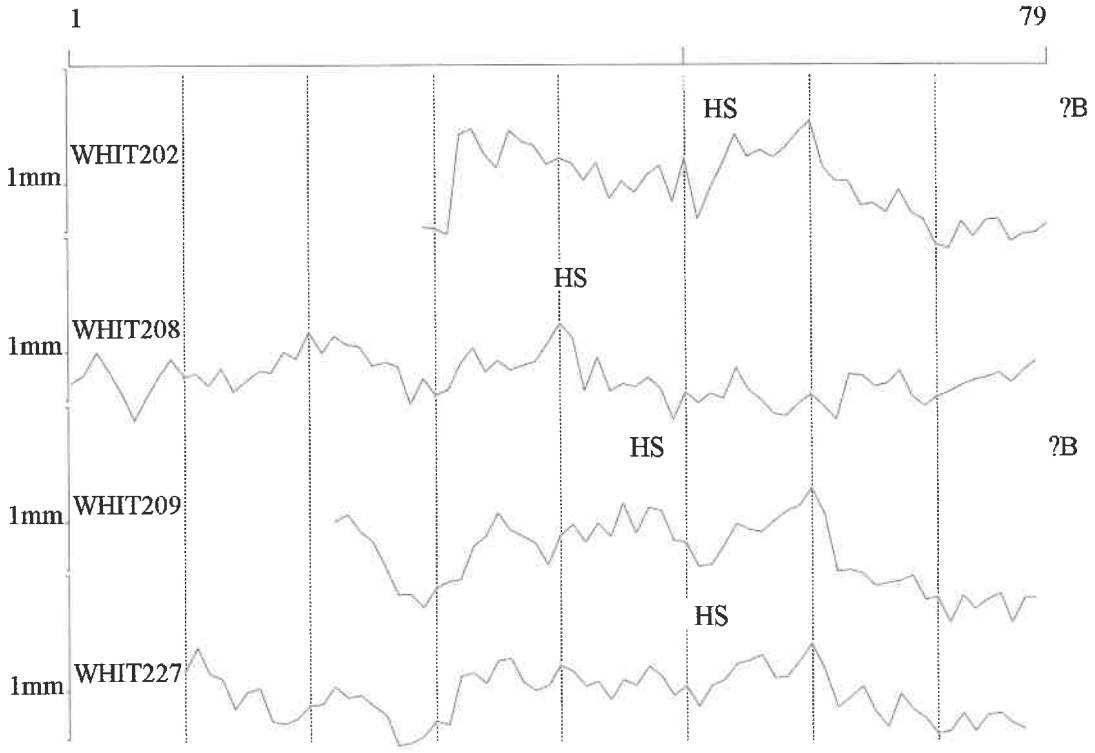
The tangential oak plank from structure 142 (timber 125) cross-matched visually against an oak cross-bearer (163) from succeeding structure 125 (fig #) with a *t* value of 4.84. Given the similarity of technological evidence on the two pieces, timber 163 was probably a reused fragment of plank 152.



The nine samples measured from structure 198 had common narrow bands and generally very slow growth which made measurement difficult. Two split uprights (201 and 221) cross-matched with a *t* value of 7.27 (fig#) and could have derived from the same tree given their very similar raw data.



A further four uprights cross-matched to give a four timber mean, with possible bark edges occurring in relative years 78 and 79 (see fig #)



The ring width and cross-match data for these sequences are presented below (tables #).

Attempts to cross-match individual sequences against these site means were unsuccessful as were attempts to date any site sequences against external dated chronologies.

Comments

The tree-ring sequences produced may reflect local rather than regional/climatic conditions. Certainly the majority of timbers measured from 198 were very slow grown possibly reflecting low nutrient levels or generally poor growing conditions locally. Nonetheless, several cases of internal cross-matching of site sequences were successful. Lack of cross-matches with external dated chronologies could be both a function of local environmental conditions at variance with the wider contemporary climate, and the lack of nearby contemporary tree-ring sequences.

Table: Matrices of t values.
\ = overlap < 15 years
- = t-values less than 3.00
* = empty triangle

4 timber mean, structure 198

Wood no			whit208	whit209	whit227
	start dates	dates end	1 78	22 78	10 77
whit202	29	79	4.47	-	5.54
whit208	1	78	*	-	5.53
whit209	22	78	*	*	5.09

2 timber mean, structure 198

Wood no			whit221
	start date	date end	1 58
whit201	2	85	7.27

2 timber mean, structures 125 (163) and 142 (152)

Wood no	-	-	whit152
- -	start dates	dates end	1 73
Whit163	12	67	4.86

Table: Ring width data

Title : 201/221 2 timber mean
QUSP data of 85 years length
Undated; relative dates - 1 to 85
2 timbers raw data mean
Average ring width 74.81 Sensitivity 0.16

1	55	61	88	69	82	67	57	87	89	87	1	2	2	2	2	2	2	2	2	2
-	133	95	99	67	71	79	82	111	135	119	2	2	2	2	2	2	2	2	2	2
-	112	89	71	82	62	68	79	82	87	113	2	2	2	2	2	2	2	2	2	2
-	126	111	59	53	96	83	69	87	85	83	2	2	2	2	2	2	2	2	2	2
-	81	74	83	72	79	81	103	103	83	80	2	2	2	2	2	2	2	2	2	2
51	70	63	66	78	66	89	68	63	48	57	2	2	2	2	2	2	2	2	1	1
-	63	57	68	65	76	77	86	70	79	61	1	1	1	1	1	1	1	1	1	1
-	49	56	42	52	51	46	41	43	39	48	1	1	1	1	1	1	1	1	1	1
-	36	56	48	54	59						1	1	1	1	1					

Title : WHIT 4 timber mean: 202/208/209/227
QUSP data of 79 years length
Undated; relative dates - 1 to 79
4 timbers raw data mean
Average ring width 84.86 Sensitivity 0.19

1	66	74	100	78	58	40	54	73	91	101	1	1	1	1	1	1	1	1	1	2
-	127	95	99	68	83	90	71	82	79	107	2	2	2	2	2	2	2	2	2	2
-	91	110	104	96	80	70	55	45	52	54	2	3	3	3	3	3	3	3	4	4
-	54	111	129	104	118	131	113	107	100	127	4	4	4	4	4	4	4	4	4	4
-	120	86	109	77	102	85	110	106	72	94	4	4	4	4	4	4	4	4	4	4
51	61	77	92	128	110	113	101	109	130	158	4	4	4	4	4	4	4	4	4	4
-	104	68	79	75	63	59	76	61	52	46	4	4	4	4	4	4	4	4	4	4
-	45	58	50	59	61	50	55	58	58		4	4	4	4	4	4	4	3	1	

Title : 152_163 2 timber mean
QUSP data of 73 years length
Undated; relative dates - 1 to 73

2 timbers raw data mean
Average ring width 138.34 Sensitivity 0.24

1	243	218	156	230	288	140	114	105	197	223	1	1	1	1	1	1	1	1	1	1
-	279	166	121	84	107	160	166	188	149	103	1	2	2	2	2	2	2	2	2	2
-	56	50	55	104	126	166	105	168	178	164	2	2	2	2	2	2	2	2	2	2
-	116	151	163	161	174	136	171	136	154	117	2	2	2	2	2	2	2	2	2	2
-	126	154	154	109	99	130	131	103	85	68	2	2	2	2	2	2	2	2	2	2
51	122	178	143	221	147	120	136	141	181	154	2	2	2	2	2	2	2	2	2	2
-	181	156	116	86	123	92	71	55	48	87	2	2	2	2	2	2	2	1	1	1
-	91	94	109								1	1	1							

Appendix: Archive drawings

Archive drawings of selected pieces were drawn at 1:1 on clear acetate with coloured fine-nibbed markers. Black was used to define outline and cross-sections, red to show facets and tool signatures, and blue to highlight natural features such as sapwood and grain.

Archive	Wood
1	219
2	225
3	202
4	212
5	235
6	236
7	224
8	299
9	270
10	186
11	200
12	248
13	268
14	193
15	300
16	309
17	253
18	294
19	298
20	310
21	183
22	271
23	291
24	306
25	194
26	247
27	249
28	279
29	264
30	152

Appendix: Archive photographs

FILM NO	FRAME Span	TYPE	DESCRIPTION	WOOD NOS	SCALE	DATE
1	0	BW	Code shot	0		18/06/96
1	1-3	BW	Detail of point and trimmed sidebranch	300	10cm	18/06/96
1	4-5	BW	Detail of cut branch	309	10cm	18/06/96
1	6-7	BW	Detail of point	309	10cm	18/06/96
1	8-10	BW	Detail of point	270	10cm	18/06/96
1	11-12	BW	Overall shot	209	10cm	18/06/96
1	13-14	BW	Detail of point and knot	193	10cm	18/06/96
1	15-16	BW	Detail of point	257	10cm	18/06/96
1	17-18	BW	Detail of point	253	10cm	18/06/96
1	19-20	BW	Detail of point	208	10cm	18/06/96
1	21-22	BW	Detail of point	202	10cm	18/06/96
1	23-25	BW	Detail of point	186	10cm	18/06/96
1	26-27	BW	Detail of point	225	10cm	18/06/96
1	28-29	BW	Detail of point	219	10cm	18/06/96
1	30-33	BW	Detail of point	268	10cm	18/06/96
1	34-35	BW	Detail of point	212	10cm	18/06/96
1	36-37	BW	Detail of point	224	10cm	18/06/96
2	1-3	CL	Detail of point and trimmed sidebranch	300	10cm	18/06/96
2	4-6	CL	Detail of point	268	10cm	18/06/96
2	7-9	CL	Detail of point	186	10cm	18/06/96
2	10-12	CL	Detail of point	225	10cm	18/06/96
2	13-15	CL	Overall shot: heartwood/sapwood	219	10cm	18/06/96
2	16-18	CL	Overall	212	10cm	18/06/96
2	19-21	CL	Overall	202	10cm	18/06/96
2	22-24	CL	Detail of point	253	10cm	18/06/96
2	25-27	CL	Overall	208	10cm	18/06/96
2	28-30	CL	Detail of point	257	10cm	18/06/96
2	31-33	CL	Detail of point and former site of knot	193	10cm	18/06/96
2	34-36	CL	Unnumbered piece showing decay of small oak stake at the top	209	10cm	18/06/96
2	37-38	CL	Overall	270	10cm	18/06/96
3	1	CL	Code shot	0		18/06/96
3	2-4	CL	Opposite side to previous shot	270	10cm	18/06/96
3	5-7	CL	Detail of cut sidebranch	309	10cm	18/06/96
3	8-10	CL	Detail of point	264	10cm	18/06/96
3	11-13	CL	Detail of point	254	10cm	18/06/96
3	14-16	CL	Detail of point	303	10cm	18/06/96
3	17-19	CL	Detail of point	247	10cm	18/06/96
3	20-21	CL	Detail of point	188	10cm	18/06/96
3	22-24	CL	Detail of point	298	10cm	18/06/96
3	25-27	CL	Detail of point	249	10cm	18/06/96
3	28-32	CL	Detail of point	271	10cm	18/06/96
3	33-36	CL	Detail of point	306	10cm	18/06/96
3	37-38	CL	Detail of cut sidebranch	306	10cm	18/06/96
4	1	BW	Code shot	0		19/06/96
4	2-3	BW	Detail of point	303	10cm	19/06/96
4	4-5	BW	Detail of point	254	10cm	19/06/96
4	6-7	BW	Detail of point	247	10cm	19/06/96
4	8-9	BW	Detail of point	188	10cm	19/06/96
4	10-11	BW	Detail of point	298	10cm	19/06/96
4	12-13	BW	Detail of point	264	10cm	19/06/96
4	14-15	BW	Detail of point	249	10cm	19/06/96
4	16-19	BW	Detail of point	271	10cm	19/06/96
4	20-21	BW	Detail of point (other side)	271	10cm	19/06/96
4	23-24	BW	Detail of cut sidebranch	306	10cm	19/06/96
4	25-26	BW	Detail of point	306	10cm	19/06/96

FILM NO	FRAME Span	TYPE	DESCRIPTION	WOOD NOS	SCALE	DATE
4	27-28	BW	Detail of point	183	10cm	19/06/96
4	29-31	BW	Detail of point	310	10cm	19/06/96
4	32-35	BW	Detail of notch and trimmed sidebranch	291	10cm	19/06/96
4	36-37	BW	Detail of point	294	10cm	19/06/96
5	1-3	CL	Code shot	0		19/06/96
5	4-7	CL	Detail of point	183	10cm	19/06/96
5	8-11	CL	Detail of point and trimmed sidebranch	310	10cm	19/06/96
5	12-17	CL	Detail of notch and trimmed sidebranch	291	10cm	19/06/96
5	18-20	CL	Detail of point	294	10cm	19/06/96
5	21-22	CL	Detail of point	302	10cm	19/06/96
5	23-25	CL	Detail of point	194	10cm	19/06/96
5	26-27	CL	Overall record shot of section drawn for archive	152	40cm	20/06/96
5	28-32	CL	Detail of jam curve on inner face	152	5cm	20/06/96
5	33-37	CL	Detail of adze marks on inner face near dendro sample	152	5cm	20/06/96
5	38-39	CL	Overall shot of undrawn section	152	40cm	20/06/96
6	1	BW	Code shot	0		19/06/96
6	2-5	BW	Detail of point	302	10cm	19/06/96
6	5-9	BW	Detail of point	194	10cm	19/06/96
6	10-12	BW	Overall shot of undrawn section	152	40cm	20/06/96
6	13-15	BW	Detail of adze marks on inner face	152	5cm	20/06/96
6	16-19	BW	Detail of jam curve on inner face	152	5cm	20/06/96
6	20-22	BW	Overall shot of undrawn section	152	40cm	20/06/96
6	23-26	BW	Detail of area of adze marks on inner face of undrawn section	152	5cm	20/06/96
6	27-30	BW	Detail of jam curve on undrawn piece. Possibly full blade width	152	5cm	20/06/96
6	31-33	BW	Overall shot of piece adjacent to dendro sample	152	10cm	20/06/96
7	2-3	CL	Code shot	0		20/06/96
7	4-7	CL	Detail of area of adze marks on inner face of undrawn section	152	5cm	20/06/96
7	8-13	CL	Detail of jam curve on undrawn piece. Possibly full blade width	152	5cm	20/06/96
7	13-16	CL	Overall shot of piece adjacent to dendro sample	152	10cm	20/06/96

Appendix: Sample details by structure

Structure 125

Wood	Function	Conv	Species	Fell	Point	Rings	ringcount	Comments	diam	arw
129	Plank							Not found during assessment: plank		
153	Wattling in 125 around plank 156		Corylus				13		14	0.53
154	Wattling in 125 around plank 156		unid				0		0	
155	Wattling in 125 around plank 156		Corylus				9		11	0.61
156	Part of Drain Cover	E	Quercus			57H 8S	65			1.92
157	Part of Drain Cover	S2?	Quercus					Too compressed for arw, fast grown		
158	Wattling in 125		Alnus		C1		6		22	1.83
159	Part of Drain Cover	S2	Quercus							
160	Wattling in 125		Corylus				15		14	0.46
163	Cross Bearer	T	Quercus			56H (1.28)	56	Compressed, badly decayed timber, possibly part of larger tangential plank which has split in two. 'Inner' face looks split rather than sawn. 'Outer' face axed and adzed and not sawn or split at all. ARW 1.28		1.28
164	Cross Bearer?	S	Alnus				0		0	
165	Cross Bearer?	S2	Alnus				0		0	
166	Roundwood beneath plank 152		Corylus	S			10		0	0
167	Roundwood beneath plank 152		Corylus				0	V compressed	0	
168	Roundwood beneath plank 152		Corylus	S			13		28	1.07
169	Wattling in 125		Corylus	S			10		0	0
170	Wattling in 125		unid				0		0	
171	Upright E side of 125?	S	Quercus				25		130	2.6
172	Wattling in 125		Euonymus?				11		16	0.72
173	Wattling in 125		Quercus	S	W1+1		8	W 2+1	32	2
174	Wattling in 125		Corylus				10		13	0.65
175	Displaced part of upright W side of 125?	S2	Quercus				0	1/2 split	0	

Wood	Function	Conv	Species	Refit	Point	Rings	ringcount	Comments	diam	arw
176	Wattling in 125		Corylus				11		20	0.9
177	Wattling in 125		Corylus				9		23	1.27
178	Wattling in 125		Corylus				9		17	0.94
179	Wattling in 125		Corylus				14		17	0.6
180	Wattling in 125		Corylus				11		10	0.45
181.1	Wattling in 125		Euonymus?				7		16	1.14
181.2	Wattling in 125		Corylus		C2+C2		6		15	1.25
181.3	Wattling in 125		Euonymus				6		14	1.16
181.4	Wattling in 125		Euonymus?				0		0	
181.5	Wattling in 125		Alnus				0		0	
182.1	Wattling in 125		Alnus				7		28	2
182.2	Wattling in 125		Corylus				12		30	1.25
182.3	Wattling in 125		Corylus				6		12	1
182.4	Wattling in 125		Corylus?				10		18	0.9
182.5	Wattling in 125		Corylus?				0		0	
182.6	Wattling in 125		Corylus				7		15	1.07
182.7	Wattling in 125		unid				5		13	1.3
182.8	Wattling in 125		Corylus				7		15	1.07
184	Cross Bearer		Quercus					V compressed fast grown		
185	Upright E side of 125		Quercus		P8	20+S	20	V long ffs branchwood	62	1.55
186	Upright E side of 125	S2	Quercus		W8+13	?		V s grown. Nice point. Too s to count		
187	Upright W side of 125	S	Quercus		P1+3+2+3	11H	11	Poss cut down from radial split		2.27
189	Upright E side of 125		NF					Not found during assessment		
190	Upright W side of 125	E1?	Quercus		WV2	43H	43			1.16
191	Upright W side of 125		Corylus		P5		14	Tip broken, part eroded	35	1.25
192	Upright W side of 125	S	Quercus		P	34H	34	V compressed		1.41
193	Upright W side of 125	S	Quercus		P8+6+9+8	H		Very knotty, possibly tangential cut down from radial split		
194	Upright W side of 125	S12	Quercus		P2+2+6	15H,20+S	35			1.65
195	Upright W side of 125	T	Quercus		P2+3+6+3	22H+S	22	Only point kept by nn		1.18
196	Wattling in 125		Corylus				27		25	0.46
197	Upright W side of 125		Corylus	S	P 4+10+7		9		24	1.33
198	Upright W side of 125	S2	Quercus		W3	30+H	30	V eroded, s grown, branchwood?		0.66
199	Upright W side of 125		Corylus		P1+3+3+3		13		34	1.3

Wood	Function	Conv	Species	Felli	Point	Rings	ringcount	Comments	diam	arw
200	Upright W side of 125	S8	Quercus		P5+1+2	29H	29	Prob radial latter subdivided tangentially		1.55
239	Wattling W side of 125		Corylus	S			11			
240	Upright W side of 125	S2	Quercus		WV1+1	54H?	54	Eroded & dam point. Unmeasurable		0.61
241	Upright E side of 125		Alnus		P1+3+8+1		13		30	1.15
242	Upright W side of 125	S8	Quercus		P5+1+4	10+H		Cut down from radial split?		
243	Upright W side of 125		Corylus		WV3		12	Tip in poor condition. 3 frags	33	1.37
244	Upright E side of 125	S	Quercus		P4	H+S		V compressed. Complete sap.		
245	Upright E side of 125		Corylus		WV3			Incomplete tip, ffs		
246	Upright W side of 125	S2?	Quercus		P7	?		V compressed		
247	Upright W side of 125		Corylus	S	P1+2+4+3		9	Point slightly damaged	32	1.7
248	Upright W side of 125	S8	Quercus		P7+	6+H,27S	32			1.5
249	Upright W side of 125	T	Quercus		P7+4+5	15H+S	15	Probably radial later subdivided tangentially		2.13
250	Upright E side of 125		Corylus		P7		14	Broken tip	31	1.1
251	Upright E side of 125	S4	Corylus		WV4			V eroded		
252	Upright W side of 125	S	Quercus		P2/3?	16H+S		Sap v compressed. 2 frags		
253	Upright W side of 125		Corylus		C2+0		9		22	1.22
254	Upright E side of 125		Corylus	W	P4+2+2+1		8		24	1.5
255	Upright E side of 125		Unid		P4?			Distorted tip, cap down		
256	Upright W side of 125		Corylus		WV4		10	Cap up, incomplete point	32	1.6
257	Upright E side of 125		Corylus		P2+1+1		0	Eroded point tip crushed by driving	0	
258	Upright E side of 125		Unid		W			Poorly pres point. Cap up?		
259	Upright E side of 125		Corylus		C2+0		13	Cap up	46	1.76
260	Upright W side of 125		Quercus		P6		13	Broken tip	38	1.46
261	Upright W side of 125		NL							
262	Upright W side of 125		NL							
263	Upright W side of 125	E1?	Quercus		P4	45H	45	Unusual conversion		1.51
264	Upright E side of 125		Quercus	S	P5+3+2+4+4	10S	10	Branchwood?	30	2.2
265	Upright E side of 125		NL							
266	Upright W side of 125		NL							
267	Upright W side of 125	T	Quercus		C?			V eroded chunk		
268	Upright W side of 125	S2	Quercus		W7+8	36H	36	Slow grown. Dam tip. V sim 186		1.16
269	Upright W side of 125		NL							
270	Upright W side of 125	CUT	Quercus		P5+2+7+4+			Nice point and conv. Not measured		

Wood	Function	Conv	Species	Felli	Point	Rings	ringcount	Comments	diam	arw
		R			4+1					
271	Upright E side of 125	CUT R	Quercus		P11+3+3+7	9H+15S	24	Well pres point		2.91
272	Upright E side of 125		NL							
273	Upright E side of 125		NL							
274	Upright E side of 125		NL							
275	Upright W side of 125		NL							
276.1	Roundwood beneath plank 152		Corylus				6		4	0.33
276.2	Roundwood beneath plank 152		Alnus				20		32	0.8
276.3	Roundwood beneath plank 152		Corylus				8		26	1.62
276.4	Roundwood beneath plank 152		Corylus				11		19	0.86
276.5	Roundwood beneath plank 152		Quercus				12		26	1.08
276.6	Roundwood beneath plank 152		Euonymus				0		0	
276.7	Roundwood beneath plank 152		Salix				8		15	0.93
276.8	Roundwood beneath plank 152		Corylus				11		16	0.72
277	Upright E side of 125	S	Quercus					Radial frag, v poor cond		
278	Upright E side of 125	S	Quercus		P1+1+2+1+1					
279	Upright E side of 125	S2	Quercus		P7			Eroded		
280	Upright E side of 125		Unid		Y			Roundwood point totally sampled for c14		
281	Upright E side of 125	S4	Alnus		WV3		5	Eroded tip. 2 frags	0	0

Structure 142

Wood	Function	Species	Felling	Point	Pit	Rings	Bark	ringspan	ringcount	arw	Comments	diameter
152	Plank	Quercus				66H+7S	N	93.44	73	1.28	Substantial plank,	
188	Upright E side of cut 124	Pomoidea		P4+1+1+1	C		B	0	0		Eroded broken tip	0
289	Wattling W side of 142											
289.1	Wattling W side of 142	Corylus	S					5.5	6	0.916		11
289.2	Wattling W side of 142	Alnus	S					6	5	1.2		12
289.3	Wattling W side of 142	Alnus						8	8	1		16
289.4	Wattling W side of 142	Quercus						9	13	0.692		18
289.5	Wattling W side of 142	Alnus						11	10	1.1		22
290	Wattling E side of 142											

Wood	Function	Species	Felling	Point	Pit	Rings	Bark	ringspan	ringcount	arw	Comments	diameter
290.1	Wattling E side of 142	Corylus	S					10	8	1.25		20
290.2	Wattling E side of 142	Corylus	S					12.5	11	1.136		25
290.3	Wattling E side of 142	Quercus	S					14	11	1.272		28
290.4	Wattling E side of 142	Corylus	S					7	10	0.7		14
290.5	Wattling E side of 142	Corylus	S					5.5	8	0.687		11
291	Cross Bearer	Quercus	S		C	13H+13S	B?,SF	63	26	2.423	Notch recent? Cut	126
292	Upright W side of 142	Quercus	W	P6?	C	9S	B,WF	15	9	1.666	Cap down, 3 frags	30
293	Upright E side of 142	Quercus		P5	C	22S	B	18	22	0.818	Cap down, slow	36
294	Upright E side of 142	Quercus	S	P7	C	12S	B,SF	24	12	2	Well preserved	48
295	Upright W side of 142	Alnus	S	W1?	C	26	B	17	26	0.653	Eroded tip. 3	34
296	Upright W side of 142	Corylus		Y			B	34	28	1.214	Tip broken:tip	68
297	Upright W side of 142	Quercus	S		C		B,SF				Badly decayed	
298	Upright E side of 142	Quercus	S	WV3+1	C	15S	B,SF	16	15	1.066	Sl eroded tip	32
299	Upright E side of 142	Quercus	S	P2+2+2+1	C	2H+16S	B,SF	34	18	1.888	Cap down?,	68
300	Upright W side of 142	Quercus	S	P2+3+7	C	19S	B,SF	27	19	1.421	Trimmed sidebr. Sl	54
301	Upright W side of 142				C		B				Cap down. Point in	
302	Upright E side of 142	Quercus		P1+5+3	C	21S	B	21	21	1	Tip eroded,broken	42
303	Upright W side of 142	Corylus		P1+1+1+2	C		B	15	10	1.5	Tip distorted, cap	30
304	Upright W side of 142	Corylus		WV3	C		B	12.5	14	0.892	Cap down, num cut	25
305	Upright W side of 142	Quercus	S	P2+4+2+1	C	7S	B,SF	17	7	2.428		34
306	Upright W side of 142	Quercus	S	P3+4+9+2	C	8H+10S	B,SF	56	18	3.111	Large piece with	112
307	Upright E side of 142	Alnus		P			B	0	0		V eroded point	0
309	Upright E side of 142	Quercus		P2+4+2+1	C	16S	B	21	16	1.312	S grown	42
310	Upright E side of 142	Quercus		P7	C	3H+24S	B	48	27	1.777	Large piece. Knotty.	96

Structure 198

Wood	Species	Conv	Pith	Rings	Wdt	Ring	Arw	Bark	Comment	Function	Point
130	Quercus				0	0				Root?	
131	Quercus	T		53H	0	0		N	Samle discarded too sl grown	Upright?	
132	Quercus	S	?	38H+11+S	0	49	1.285	B	Outer sapwood v decayed	Upright	W3+1
133	NF				0	0			Not found during assessment	Upright	
134	Alnus	S2			0	0			Manky frag:need to check id	Upright	
136	Quercus	T	>5	27H+S	0	27	1.111		Assessed in the field and discarded	Longitudinal	
137	Quercus	S			0	0			Assigned to outlying frags e of 136	Longitudinal: fragments of 136	
138	Quercus	T			0	0			V comp poss sl gr brwood ass in	Longitudinal	

Wood	Species	Conv	Pith	Rings	Widt	Ring	Arw	Bark	Comment	Function	Point
139	Quercus	S2	>5	12H+5S	0	17	1.058	B		Longitudinal	
140	Quercus	S2	>5	28H+5S?	0	33	1.25	B		Longitudinal	
141	Quercus	T	>5	17H+S	0	17	0.470	B?		Longitudinal	
142	Quercus	T	>5	H+S	0	0			V compressed	Longitudinal	
143	Quercus	T	>5	H+S	0	0			V compressed	Longitudinal	
144	Quercus	T	>5	14H+S	0	14	1.5	B?	Compressed	Longitudinal	
145	Quercus	T	>5	6H+S	0	6	1.666	B?		Longitudinal	
146	Quercus	S8	>5	28H+S	0	28	2.392	B?	Sapwood compressed	Longitudinal	
147	Quercus	S2	>5	17H+S	0	17	1.352	B?	Compressed	Cross Bearer	
148	Quercus	S2	<5	33H+S	0	33	0.757	B	Sl grown	Cross Bearer	
149	Bark				0	0			Bark. Part of rcd sample 16	Cross Bearer	
150	Quercus	S8?			0	0			Compressed radial split	Cross Bearer	
151	Quercus	S			0	0			Compressed radial split	Cross Bearer	
201	Quercus	S16	?	54H+30S	60	84	0.7	B?		Upright W side of 198	W1+1
202	Quercus	S8	>5	25H+26S	62	51	1.134	B?		Upright W side of 198	P3+1+3
203	Quercus	S4?		SOME	0	0			Badly decayed, possibly incomplete	Upright W side of 198	C?
204	Quercus	S8?			0	0				Upright W side of 198	Y
205	Quercus	S8?			0	0				Upright E side of 198	Y
206	Quercus	S4	?	24H+S	65	24	2.708	B	Med-sl grown,cont198,misplaced	Upright E side of 198	W?
207	Quercus	S8?			0	0			Only frag found: rest prob lost label	Upright W side of 198	Y
208	Quercus	S8	>15	41H+37S	62	78	0.73	N		Upright W side of 198	P5?
209	Quercus	S8	<5	26H+31S	50	57	0.69	B?		Upright W side of 198	WV2
210	Quercus	S			0	0			V poor condition fragment	Upright W side of 198	Y
211	Quercus	S8	C	42H+S	52	42	1.238	?	Poor pres, s grown off	Upright E side of 198	W2
212	Quercus	S32	?	40H+3S	0	43	1.511	N	Fine point. Poss wedge mark	Upright E side of 198	W4+1
213	Quercus	T	>5	13H+14+S	0	27	1.111	B?	Sapwood v poor condition	Upright E side of 198	W1+4
214	Alnus		C		0	0		B	Poor cond	Upright W side of 198	WV2
215	Quercus	T	>5	6H+18S	0	24	1.25	N	V eroded	Upright W side of 198	C?
216	Quercus	S16	C??	13H+13+S	0	26	1.153	B	Sapwood v poor condition	Upright E side of 198	P3+3+1
217	Quercus	S8	>5	13H+S	0	13	3.076	N	Sapwood compressed	Upright W side of 198	W1+1
218	Quercus	S8	?	21H+24S	0	55	0.8	B?	Poorly preserved sapwood	Upright E side of 198	C?
219	Quercus	S8	C	52H+36S	62	88	0.6	N	V slow grown	Upright W side of 198	P2+3+1
220	Quercus	S8	C?	14H+13+S	0	27	1	B	Sapwood v poor condition	Upright E side of 198	P5
221	Quercus	S16	<5?	57H+1S	75	58	0.9	N	Sap v crushed, all sampled	Upright W side of 198	W1+1
222	Quercus	S8	?	41H+22S	51	63	0.7	N	Dend	Upright E side of 198	C?
223	Quercus	S	?	34H+14S	63	48	0.81	N		Upright W side of 198	Y
224	Quercus	T	C	31H	0	31	1.677	N	Saw marks on one side near top-	Upright E side of 198	P3+1+2
225	Quercus	S8	>5	8H+23+S	0	31	1.387	B	Sapwood v poor condition	Upright E side of 198	P2+1+2+1

Wood	Species	Conv	Pith	Rings	Widt	Ring	Arw	Bark	Comment	Function	Point
226	Quercus	S8	?	30H+8S	0	38	1.052	N	V eroded, s grown, loose label	Upright W side of 198	P4
227	Quercus	S16	>5	43H+25S	70	68	1	N	S grown, point function of thin split	Upright E side of 198	
228	Quercus	S8	<5	40H+S	0	40	1	N	V eroded	Upright W side of 198	C1
229	Quercus	S8	C	34S	0	34	0.852	B	V poor condition too sl gr for felling	Upright E side of 198	WV2
230	Quercus	S16	?	27H+S				N		Upright W side of 198	WV2
231	Quercus	T?			0	0		N	V eroded	Upright E side of 198	Y
232	Quercus	S	G	32H+16S?	0	48	0.958	N	V sl grown, sapwood in v poor	Upright W side of 198	C?
233	Quercus	S	?	24H	65	24	2.708			Upright E side of 198	WV3
234	Quercus	S8	?	H+S	0	0		B?	V compressed. Poss jam-curve	Upright W side of 198	P1+1+4+1
235	Quercus	S8	>5	24H	0	24	2.291	N	Poss radial stake cut down	Upright E side of 198	P6+4+1+2
236	Quercus	S8	?	42H+S	0	42	0.833	N	From v small diam c124mm	Upright W side of 198	P2+1+2+2
238	Quercus	S8	?		0	0		B?	V compressed	Upright W side of 198	W1+1