Worked Wood

Matthew Beamish

Introduction

Waterlogged wood was recorded from within the area of Burnt Mound II. The material comprised some thirty-two clearly selected and *in situ* (bar post-depositional slumping) timbers lining a substantial rectangular pit or trough, approximately 2.2m x 1.3m x 0.25m (C4468 Group 4563) and forty-two pieces from two clusters of pieces within an adjacent silted palaeochannel (Channel 4610/M Group 4564) which displayed little formal structure.

The trough was fully excavated whilst areas of the adjacent palaeochannel were sample excavated.

The majority of pieces were recorded on site. Those that showed clear signs of working were sampled for further recording (tool information, wood and species identification, dendrochronological analysis, radiocarbon dating) and removed to wet tanks. Some of these were subsequently frozen or dry frozen depending on their decided fates.

Five samples were submitted for dendrochronological dating but failed to date. This probably stemmed from the timbers being individual prehistoric samples for which there are relatively few reference chronologies with which to compare them. None of the samples were particularly short-lived, and neither did they show distortion or complacency that might make cross-matching and dating difficult (R.E.Howard *et al.* 2002).

Two samples were submitted for radiocarbon dating and were successfully dated (see Scientific Dating Report). Ninety-eight samples were assessed for species identification and age/growth estimations (Table 2). Diameters are presented as those recorded on site, and those recorded during the later analysis, which followed several years of wet storage followed by freeze-drying. A relatively consistent shrinkage is apparent, and the occasional greater variation than this has resulted from a smaller than maximum cross-section of wood being the retained sample.

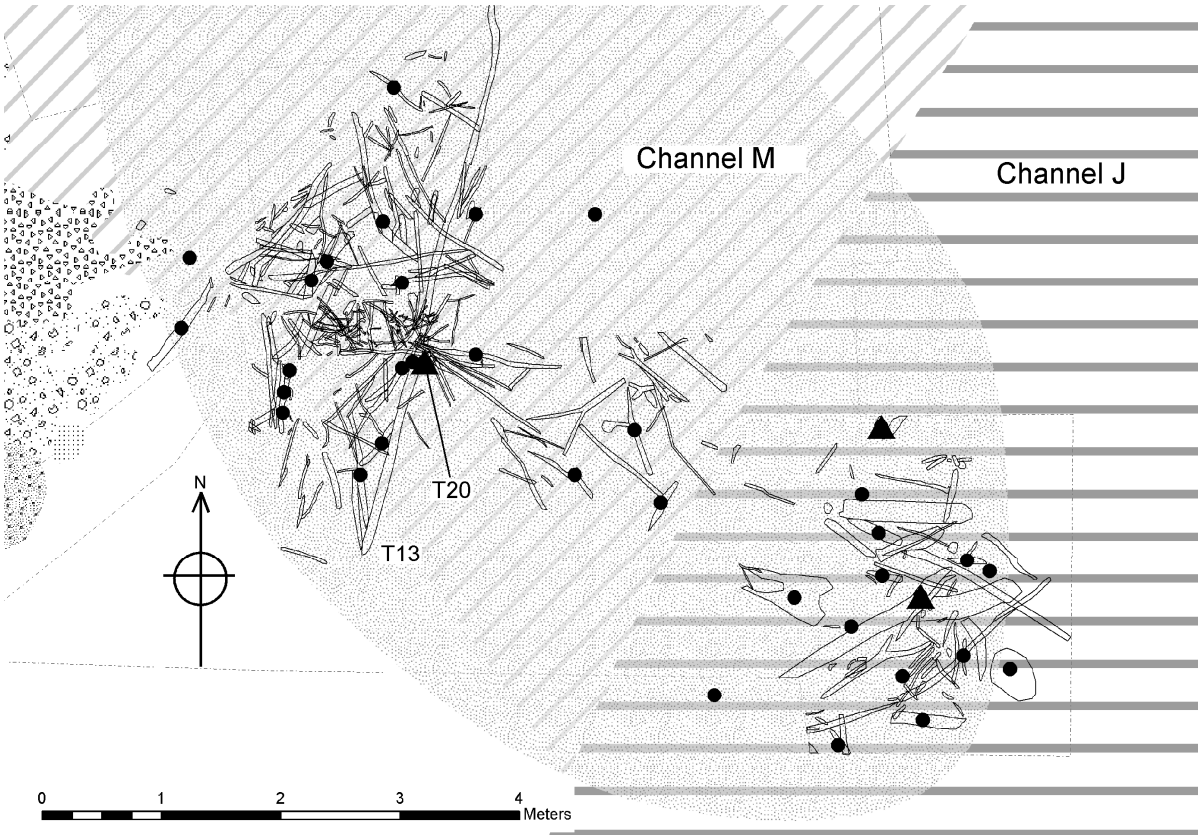

Fig. 1: Chopped (dot) and in situ (triangle) pieces in channel silts

Of 73 pieces individually recorded 61 were in the round, six were half splits, three were radial splits, and three were tangential chips. Twenty seven pieces of wood bearing chop marks were recorded, of which were nineteen were roundwood with cut ends. Virtually all chop marks were on the ends of the pieces .

Of the three tangential chips recorded (T44,52 and 71), one was from the silty peat infill of the trough (T52) and was facially abraded whilst the two others were from palaeochannel contexts: T44, mostly ash bark from the base of 4453 and T71, found upright in the more eastern cluster, and perhaps large enough to be considered more accurately a plank or stave. Another small stake end in this cluster may also have been *in situ*.

All the recorded *in situ* uprights within the channel silts were very short (0.17-0.25m long) and barely embedded at all, indicating that they related to structures that post-dated the silting of the channel and had subsequently eroded away. The broad alignment of the eastern cluster and the presence above of the later intrusive channel of Roman or later date suggests that these timbers may relate to that particular channel and not the Bronze Age channel at all.

The lengths and diameters of the pieces were compiled and plots compared with those for Flag Fen (Taylor 2001 p171). The histograms are similar although at Willington most pieces are in the 400-600m length range, which is slightly longer than that for Flag Fen and there is a notable increase in the 2m roundwood lengths, which is due to the trough lining pieces. Most channel timbers diameters from Willington are in the 20-40mm range (as for Flag Fen) pieces, but with trough lining included the spread of diameters is much more even from 20 to 150 mm which obviously reflects the selection of timber within the trough.

The Willington channel timbers, with the noteable incidence of cut pieces is a selected assemblage, although it is unclear whether these pieces came from immediately adjacent to the site or from a little way upstream. If contemporary with the Burnt Mound site and derived from the bank side it had clearly been rejected as fire-wood.

Both wood and charcoal identifications include substantial numbers of alder. The fuel charcoal identified is noted for the high ratio of narrow roundwood from juvenile growth, and although the channel timbers included some narrow pieces, it is not dominated by them. Perhaps more likely is that the channel wood is an accumulation of by-product (mostly trimmings and some chips) from wood and coppice-work going on a little way upstream (the freshness of the cuts indicates that the pieces had not travelled far) along with a quantity of naturally derived pieces.

Species Identifications, Ring Counts and Wood Size

Graham Morgan

Species identifications and ring estimations were carried out on 98 individual pieces. Identified species from the channel deposits included Alder/Hazel, Ash, Blackthorn, Hawthorn, Maple, Oak, Willow/Poplar and Rowan. Identified species from the trough included Alder/Hazel, Ash, Maple, and Willow/Poplar (Table 2).

The Willow/Poplar is perhaps more likely to be willow in view of the local wet conditions.

Within the trough lining, the poles have perhaps been selected on the basis of their comparative size rather than their species, the trees being laid down as they were cut from the wood. Of the ash poles, four showed evidence of having been cut before the growth of summer wood. The Ash was notably free of buds and side branches particularly when compared with the Field Maple; side branching is possibly less likely in woodland Ash trees than in open areas or hedges, and Ash will possibly grow straighter than other trees. Field Maple may well have more side budding than other trees.

A piece of Field Maple (T21) had rather widely spaced first rings, which suggests coppicing or re-growth.

Wood Technology and Trough Construction

Matthew Beamish

Twenty-four pieces from the Burnt Mound channel (4564) had evidence of cuts or chops. These were recorded on site. Twenty–six trough timbers had clear tooling evidence. Timbers showing cut marks were studied for further details that might indicate the type of tools that had been used for working the timbers, and what processes had been employed in the production of the pieces.

Marks and features were drawn at various scales including 1:1 acetate tracings, and photographed.

Conversion evidence

Within the trough, four timbers were fully or partially halved including two from the same Maple roundwood (T40, T41); these had been laid flat face down just to the north of a nominal centre point reconstructed from a best fit rectangle to the corner posts (Fig. 2). Of the remainder, one piece used longitudinally appeared partly

sharpened at one end (T67) and was either re-used, or perhaps a rejected stake. Two smaller pieces infilling gaps left by other timbers were radial (quarter) splits. All other timbers (including the corner stakes) were in the round. No pieces were jointed. Some timbers retained almost complete bark, whereas others did not; some if not all of this variation was clearly due to post-depositional processes with preservation. Preservation was better on either the undersides or those buried by infilling layers prior to the abandonment and weathering of the structure. There was little suggestion that any timbers had been de-barked prior to their use.

Species	Count
Alder/Hazel	5
Ash	13
Maple	8
Willow/Poplar	4

Table 1: Species counts from trough lining timbers

Split surfaces were undressed, although in two instances light relieving marks were recorded one of which tallied with an area of difficult grain, which had probably caused the splitting to fail. Marks on the end of a halved piece indicated that the split had probably been started with the same wide sharp blade (B4) subsequently used to dress the hewn surface, and not a wooden wedge.

Five timbers had the distinctive obliquely faced ends indicative of felling wedges, indicating that these timbers were from the base of the tree (Fig. 5). Four pieces were similar in showing curving grain just at or below the felled end, indicating that the trees were either growing upon uneven ground such as a stream bank, or that they were growing off a stump at an angle as would occur on a coppice heel (cf Taylor 2004100).

These were T35 and 77 (Alder), 81 (Willow/Poplar) and 87 (Maple)**.** However ring structures did not clearly indicate fast early growth for these pieces which coppicing would cause, although one piece from the channel deposits did (Morgan below p2).

Base timbers

The trough base comprised thirteen timbers of which ten were principal timbers, and a further three appeared to infill the larger gaps left between the first ten. Of the principal ten, every timber had its wider end in the north-east, so all the directions of growth were aligned from north-east to south-west. The result of this was that the ten slightly thinner ends of the timbers lay between the uprights T31 and T86 at the south-western end, but only eight lay between the uprights at the north-eastern end with the two principal flanking timbers (T88 and T61) running from between the uprights in the west, to just short of them in the east.

Side wall timbers

Three timbers survived on southern, and northern linings, whilst a probable fourth timber was found slumped to the north of the northern wall, on a broadly similar alignment, and of similar diameter and type (ash).

The state of preservation of the side wall timbers generally improved from top to bottom although compression distortion was more noteable toward the base. Some choice was again displayed in the placing of the timbers in relation to their thicker and thinner ends.

Timber	Length	Dia(site)	Dia (freeze-dry)	Rings present	Est age	Species	Comms	CutMarks
4	490	35	35	10	10	Maple		yes
5	710	60	50	22	22	Blackthorn		
6	310	60	45	20	20	Maple		yes
13	4850	90	60	15	15	Alder		
14	1080	60	45	8	8	Poplar		yes
15	480	50	40	18	18	Oak		yes
16	1400	60	50	18	18	Blackthorn		yes
17	470	50						
18	600	30						
19	250	40	40	10	14	Alder		yes
20	230	40	40	22	22	Hazel		yes
21	1070	40	35	21	21	Maple	coppiced	yes
22	430	70	60	20	20	Alder		yes
23	1150	90	90	18	18	Alder		
24	1530	50	55	11	11	Oak		yes
25	2100	150	130	42	42	Oak		yes
26	1000	120	40	5	10	Alder		
27	800	40	30	8	8	Oak		yes
28	600	40	40	30	30	Maple		yes
30	470	50	60	24	24	Hawthorn		yes
31	640	60	60	21	21	Ash		yes
32	550	100	90	38	38	Ash		yes
33	1060	100	80	22	22	Maple		yes
34	1080	90	90	25	25	Ash		yes
35	560	90	90	12	12	Alder		yes
36	2030	130	100	12	12	Poplar		yes
37	2030	130	50	13	13	Alder		yes
38	2340	80	65	10	10	Maple		yes
39	2300	90	90	10	10	Maple		yes
40	2200	100	90	10	10	Maple		yes
41	2230	90	90	18	18	Maple		yes
42	2260	150	65	8	8	Poplar		
43	1600	70	65	22	22	Ash		yes
44	60					Ash?	bark	yes
45	550	30	25	21	21	Alder		yes

Timber	Length	Dia(site)	Dia (freeze-dry)	Rings present	Est age	Species	Comms	CutMarks
46	900	30	30	10	10	Hawthorn		yes
47	800	120	50	14	14	Rowan		yes
48	1270	70	65	6	6	Poplar		yes
49	1600	80	50	12	12	Maple		
50	220							
53	730	100	55	14	14	Alder		
57	2320	70	65	22	22	Ash	Junecut	yes
58	2350	80	85	19	19	Ash		yes
59	960	50	60	16	16	Ash	Junecut	yes
60	2320	90	80	12	12	Maple		yes
61	1790	80	75	10	10	Alder		yes
62	2270	90	65	15	15	Maple		yes
63	60	150	15	8	8	Alder		yes
64	270	50	40	20	20	Maple		yes
65	800	70	70	20	20	Ash		yes
66	820							yes
67	1210	90	80	20	20	Ash	Junecut	yes
68	600	100	160	5	30	Ash		
69	340	20	20	9	9	Alder		yes
70	120	30	30	12	12	Ash		yes
71	250		200	35	40	Oak		
72	2010	90	80	14	14	Maple		
73	450	130	120	14	20	Maple		yes
74	170	40	35	15	15	Alder		yes
75	120	40	20	9	9	Alder		yes
76		40	40	8	8	Alder		yes
77	2000	100	90	10	10	Alder		yes
78	500		80	20	20	Maple	knot	
79	450					Alder?	knot	
80	370	60	55	16	16	Maple		yes
81	1030	70	60	10	10	poplar		yes
82	1130	60	50	20	20	Ash		yes
83	2020	100	90	30	30	Ash	Junecut	yes
85	570	50	50	20	20	Ash		
86	700	90	80	23	23	Ash		Yes
87	300	80	80	8	8	Maple		

Table 2: Wood identifications from trough and related palaeochannel. (Emboldened number indicates trough timber). Dimensions in mm.

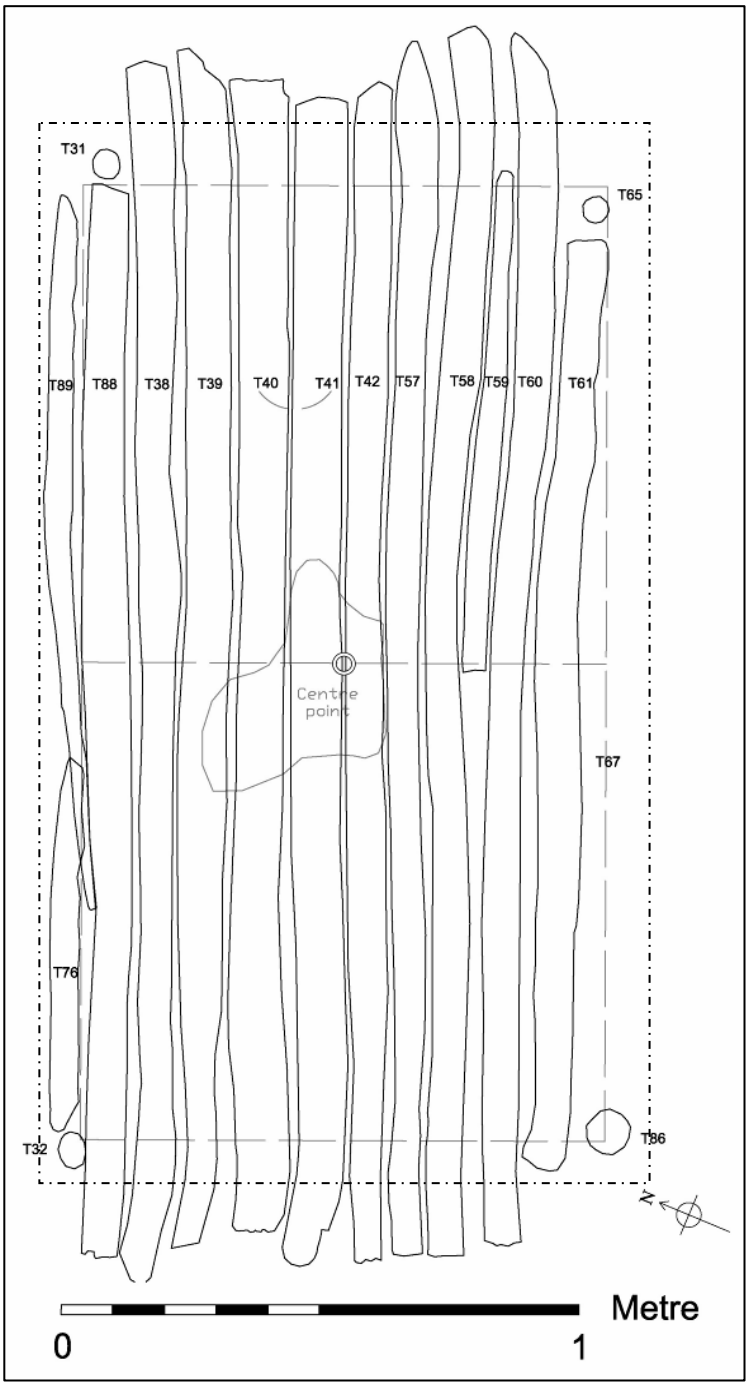

Fig. 2: Construction of trough lining showing notional centre point from best fit rectangle to posts (long-dash), location of side wall timbers (dash-dot), location of base timbers and area of charring

Timber	Element	Course	Butt	Comments
87	Base	1	East	
67		2		June cut
61		3	East	
60		4	East	
59		5	West	June cut
58		6	East	
57		7	East	June cut
42		8	East	
41		9	East	
40		10	East?	
39		11	East	
38		12	East?	
88		13	East	
76		14	West	
89		15	East	
34	East	1	South?	
33		2	unclear	
83	North	1	East	June cut
37		2	East	
36		3	West	
35		4	East?	
77	South	1	West	
62		2	West	
43		3	East	
85		4	unclear	
82	West	1	North?	
81		2	North	
66		3	unclear	

Table 3: Orientation of trough lining timbers

The lining had been laid at least partially in a pit cut. The basal timbers projected beneath the cross-wall linings (Fig. 2). The structure of the trough relied on the side timbers being retained by the four corner stakes. There was clear evidence that the side walls had initially been three timbers high, with some evidence of a fourth timber.

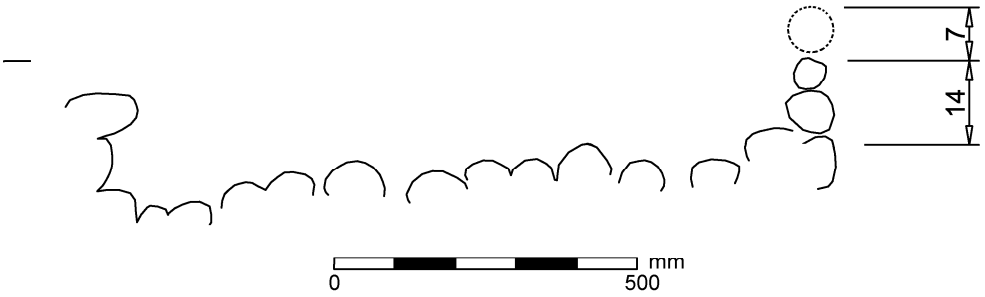

Fig. 3: Transverse section at mid point across emptied trough with recorded and suggested original side wall height.

The pit cut which held the timbers (and was mostly obliterated by post-depositional slumping of the silty peats) was a maximum of 0.20m deep. This would have offered support to only two of the side wall timbers and thus further support either in the form of material packed behind the timbers, or perhaps a binding must have been used to prevent the upper side lining timbers from falling backwards. The later would have failed to maintain the water bearing ability of the structure above a depth of some 14 cm (Fig. 3).

Construction Discussion

The orientation of the base timbers' growth directions clearly indicates that the builders had some preconception when the timbers were being laid out. Bronze Age round houses often display clear symmetry in their construction (Beamish 2005, 8; Guilbert 1982).

The five distinct felling wedge cuts identified perhaps gives a broad indication that the number of trees used in the construction was significantly fewer than the number of timbers used. Four pieces Ash timber had probably been felled in the late spring (T57,T59,T67,T83, 4). Although only one of these displayed a felling wedge (T57) with the possibility that all pieces were derived from the same tree, this timber was of significantly smaller diameter and had fewer rings than another (T83) and at least two trees were felled at this time. The off-centre heart from the southern side-wall, indicates that it was probably branchwood (T43). Interestingly, activity at the Burnt Mound in the late spring has also been suggested from alder cones in the charred plant remains (see Charred Plant Remains).

The use of different species of timber does not appear related to the structural virtues or otherwise of the timbers, as no particular structural strengths were demanded by the lining of the pit. Perhaps of some interest is the distribution of the species, which do appear in distinct clusters and are not distributed at random. This might indicate that felled trees were brought to the site, and cut to size for the lining. It is probable that the corner stakes were the first part of the construction, followed by base timbers, and side wall linings. The lining has been built in a systematic and considered manner.

The identification of spring wood only on a number of the Ash pieces, if interpreted literally, indicates that the trough was built in the late spring or early summer.

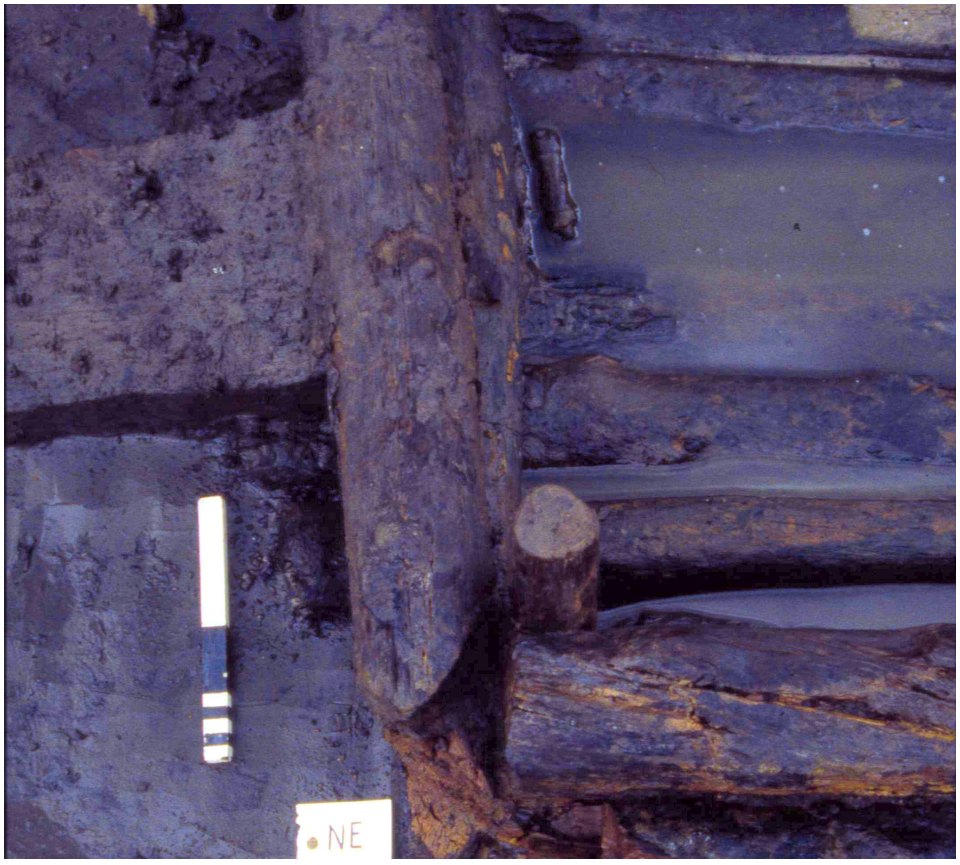

Fig. 4: Trough lining retained by corner post

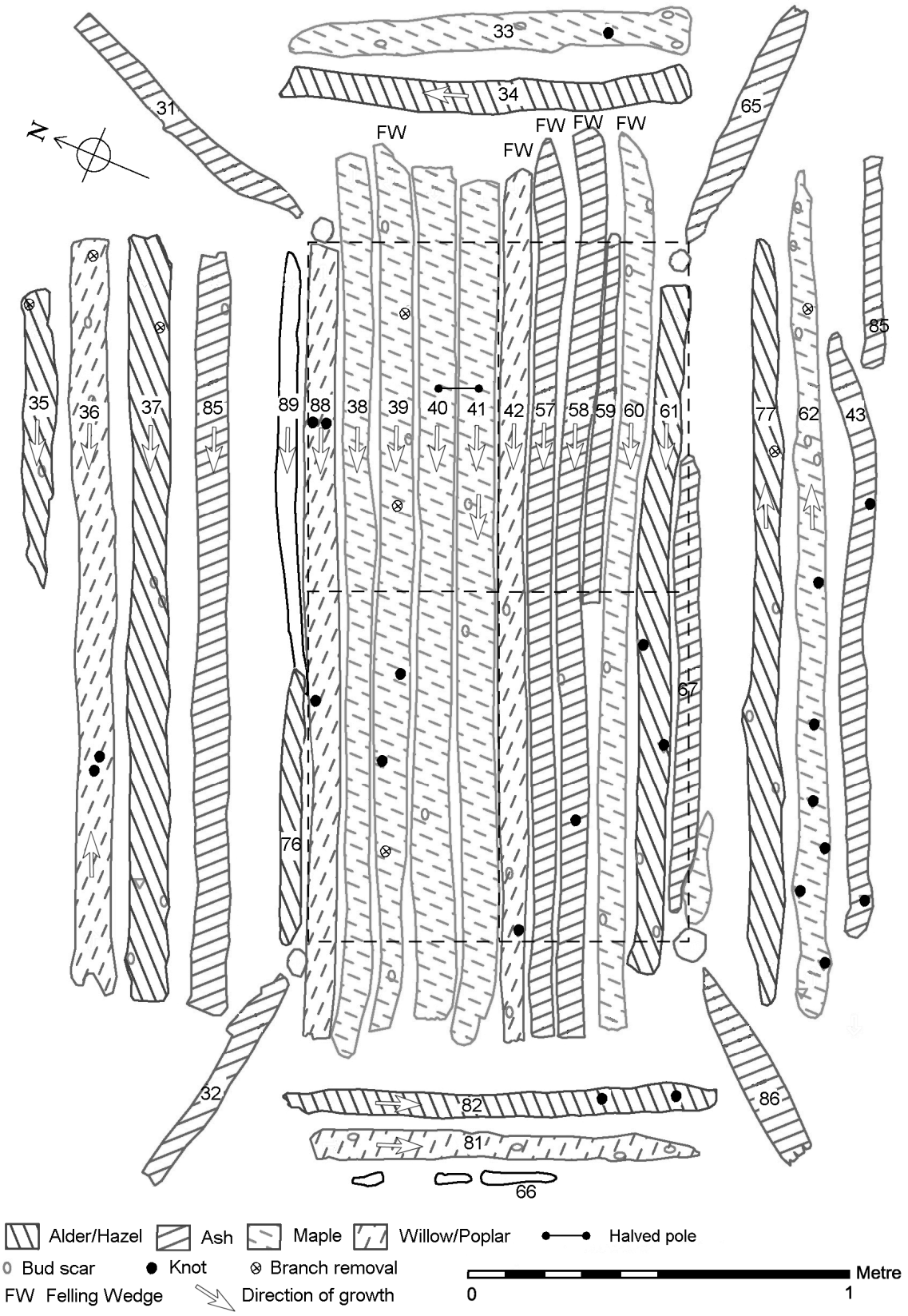

Fig. 5: Trough timber species and growth information

Tooling and blades

All evidence for tooling was from sharp fine blades. Identifiable blade marks varied between 30mm and 45mm. One complete blade profile of 37mm was recorded. All marks were clearly made by metal blades, although no reliable blade signatures were found, so it was not possible to produce any composite profiles.

Two of the blades could be reliably differentiated, a wide mark (B4) found on the cross cut end of timber 39, and an isolated complete narrow mark (B5) found part way up timber 83 where the tool had been embedded in the wood and subsequently removed.

Blade width

The complete recorded blade width of 37mm falls comfortably within the range of those marks recorded for Flag Fen (Taylor 2001,197).

Blade curvature

Blade (B)	Width	Timber	Possibles	Comment
1	30mm+	77	40,42,57	
2	32.5mm+	33		
3	29mm+	4		
4	45mm+	39		
5	37mm complete	83		Palstave?

Table 4: Blade widths (Willington Middle Bronze Age)

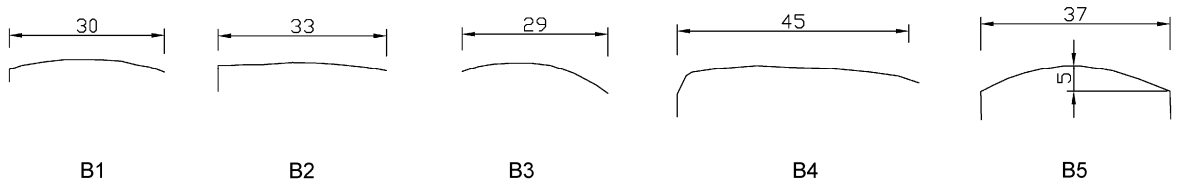

Fig. 6: Blade profiles (Willington Middle Bronze Age). Blade 5 has a curvature index of 13.5

The blade curvature index for B5 (depth expressed as a percentage of width cf. Taylor 2001 p201) is 13.5%. This is very comparable with the 13.52% index for the lower assemblage from Flag Fen blades (Taylor 2001,198). Broadly the curvature is conservative when compared to a broad Bronze Age axe curvature index range of 14.54 to 24.90%.

It is unwise to speculate too far on the types of tool used to process and fashion the lining and associated timbers of the Willington waterlogged deposits, as the assemblage is so limited. On a dataset of some 168 represented axe marks, Taylor found best comparison between the distribution curve of the Flag Fen assemblage blade width (15-55mm), and that for Lincolnshire socketed axes (Taylor 2001,200) although noted that in general the Flag Fen blade widths were all slightly narrower than the widths of recorded axe heads, for which post-depositional shrinkage was probably responsible. The Willington examples could comfortably fall within these ranges, and socketed axes may well have been the types of tool used. Nonetheless, a good match was found between the complete blade profile recorded and that of a narrow palstave type axe held within the University of Leicester metalwork reference collection.