THE MORTAR MIXERS

by J H Williams with contributions by F W Anderson, D Barlow, K Langley and C Wapples

Acknowledgements

The excavation, analysis and preservation of the mortar mixers has involved a large number of people. Mr K M J Connor meticulously excavated mixer 3. The Concrete Society through Mr P Baldwin made a grant for the removal of mixer 1 to Northampton Museum for ultimate display. Mr W Curle and Mixconcrete provided sand samples. The Ancient Monuments Laboratory arranged for thin sections to be cut and heavy mineral analyses to be made. I am particularly grateful to Mr L Biek, Mr B Dix and Dr K Langley for discussion on technological and geological aspects.

Introduction

Three Middle Saxon (Phase 3) mortar mixers were found at the south-west of the site. This section is divided into:

a A description and interpretation of the physical remains of the mixers.

b A description and discussion of the various scientific analyses undertaken on the residues in the mixers. Mortars found on the site in dated contexts and selected sand deposits from in and around Northampton were also analysed in an attempt to i) match 'mixer mortars' and ii) locate the source of the materials being used.

c General discussion and conclusions.

Plaster, mortar and concrete, differentiated primarily by their relative coarseness, belong to a single class of building materials formed by the mixing of lime (or similar material) with water and aggregate varying in size from sand to gravel, the mixture on setting becoming hard. Plaster, being fine grained, is essentially used for facing and rendering, mortar is used for bonding and concrete with its fairly large aggregate is used for bulk work such as foundations. The St Peter's Street mixers are referred to as 'mortar mixers' in the text although a weak concrete and plaster were also produced—but not necessarily deliberately.

The production of lime mortar/plaster/concrete can be broken down into four main stages:

a selection and burning of limestone
b slaking of the lime
c selection of the sand/gravel
d actual mixing

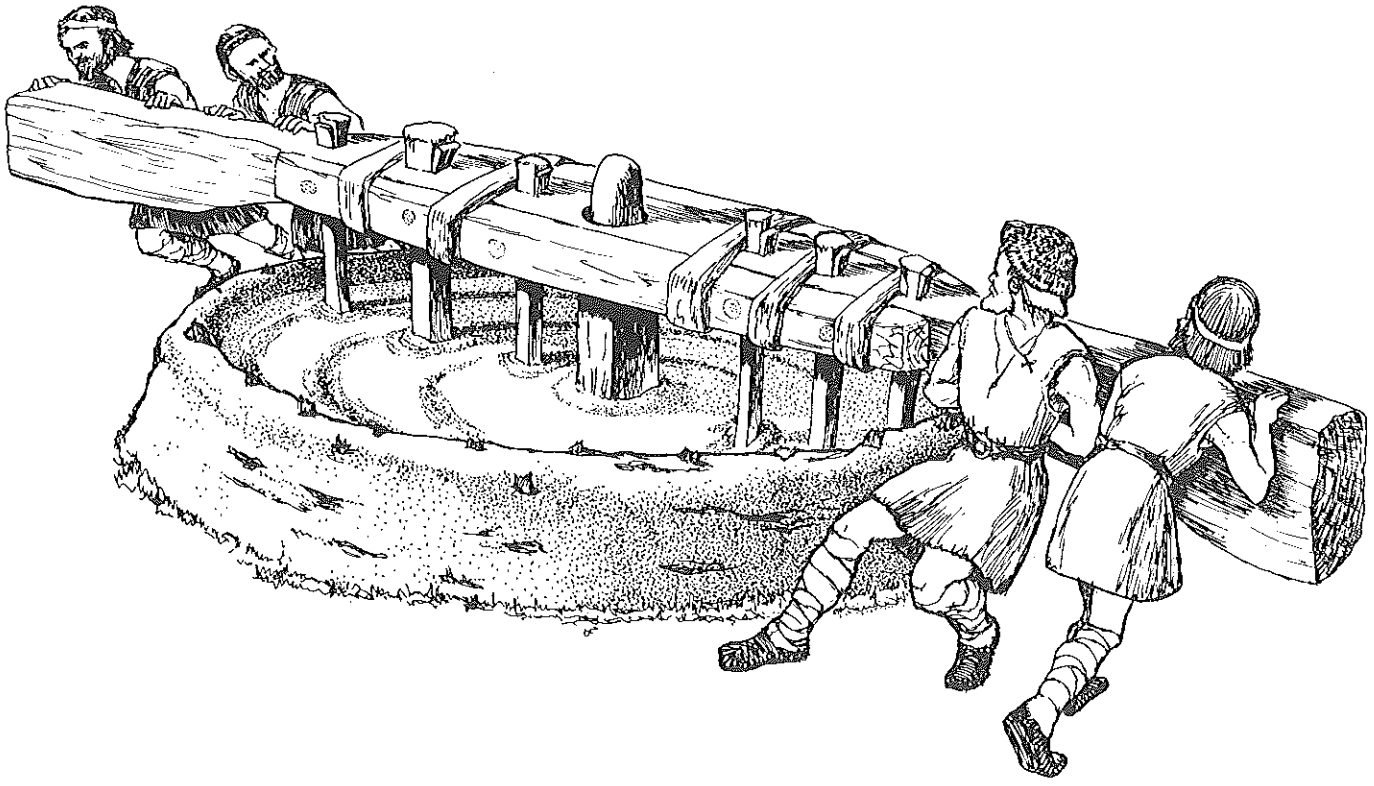
The St Peter's Street evidence is primarily related to d, the actual mixing.

a In historical times quicklime was produced by burning limestone, normally in a kiln, at about 900°C (Davey 1961: 96; Blake 1968: 314; Dix 1973). Different types of limestone produced limes of differing characteristics.

b The quicklime was then slaked with water to give hydrated lime in the form of a 'lime putty'. Great attention was paid in Roman times to the proper slaking of lime for plaster (Blake 1968: 315). The operation was performed in a trough or pit, stirring being carried out with an *ascia* or hoe. Slaking could take a couple of weeks. Such slaking operations are apparently depicted on Trajan's column (Davey 1961: Pl. XIV). A wood-lined rectangular trough found at Chelmsford (Davey 1961: Pl. XLVI) and a roughly circular pit 2ft 9ins (0.83m) diam. × 12ins (0.3m) deep,

Reconstruction of mortar mixer

Fig 67



excavated at Park Street near St Albans (O'Neil 1945: 48), have been interpreted as such slaking pits although the possibility that they were actually used for mixing should not be discounted.

c It would appear from the classical authors that the Romans took great care in the selection of sand, realising the effect this would have on the final mix (Blake 1968: 314).

d The various ingredients were mixed together. This is the stage the St Peter's Street mixers are concerned with. The absence of comment by Vitruvius suggests the lack of any 'mechanical' apparatus in the Roman period and mixing by hand is depicted on a wall painting from a tomb on the Via Latina (MacDonald 1965: 158 and Pl. 130b) and on a mosaic from North Africa (MacDonald 1965: 158 and Pl. 127). Mr B Dix, however, is of the opinion that these representations may refer to lime slaking (pers. comm.). Diderot (1958: Pl. 276) depicts the mixing of mortar with long poles in a round stone-built tub. It is of interest to note that the classical authors advocated for mortar between two and four parts of sand to one of lime (Blake 1968: 315).

Description and commentary

The three mortar mixers, while consistent in terms of their main characteristics, displayed variations of size and shape.

The nature of the evidence and accordingly the method of investigation is most interesting. The mortar deposits, far from being structural, are, in fact, residues or waste material from the mixing process. Different mixes on careful investigation could be distinguished by their different consistencies. Additionally post-holes and stake holes etc. were fossilised where the mortar had set around them, voids being formed as the wood decayed.

In order to understand the description and commentary the reader should first look at the reconstruction drawing (Fig. 67).

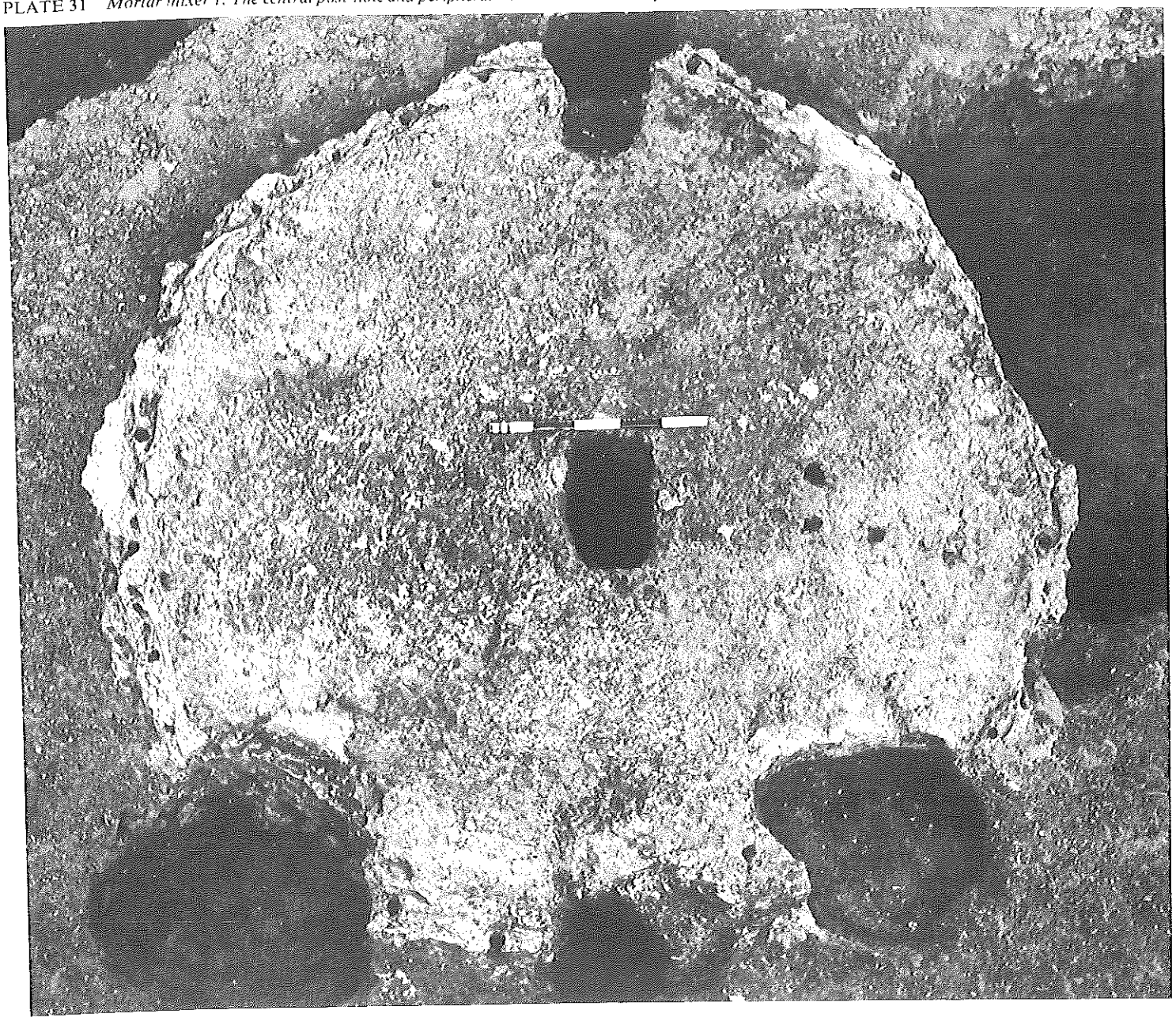
Mixer 1

Fig. 68; Pl. 31

Mixer 1 was 2.15-2.20m in diameter. A single roughly rectangular post-hole, 0.20×0.30m across, was centrally placed and penetrated 0.85m below the top of the latest mortar deposit. The bowl of the mixer had vertical sides and a flat bottom and cut down 0.40m into the weathered ironstone substratum. The hollow had been lined with wattle-work the impressions of which were fossilised around the periphery of layer F362—the wattle-work could not be traced in F363 but this could have been due to the soft nature of F363 which would have allowed holes to fill up as the wood decayed. Circular stakes 0.03-0.04m in diameter had been set 0.15-0.30m apart (generally 0.20-0.25m) and withies intertwined to form a basket-work frame.

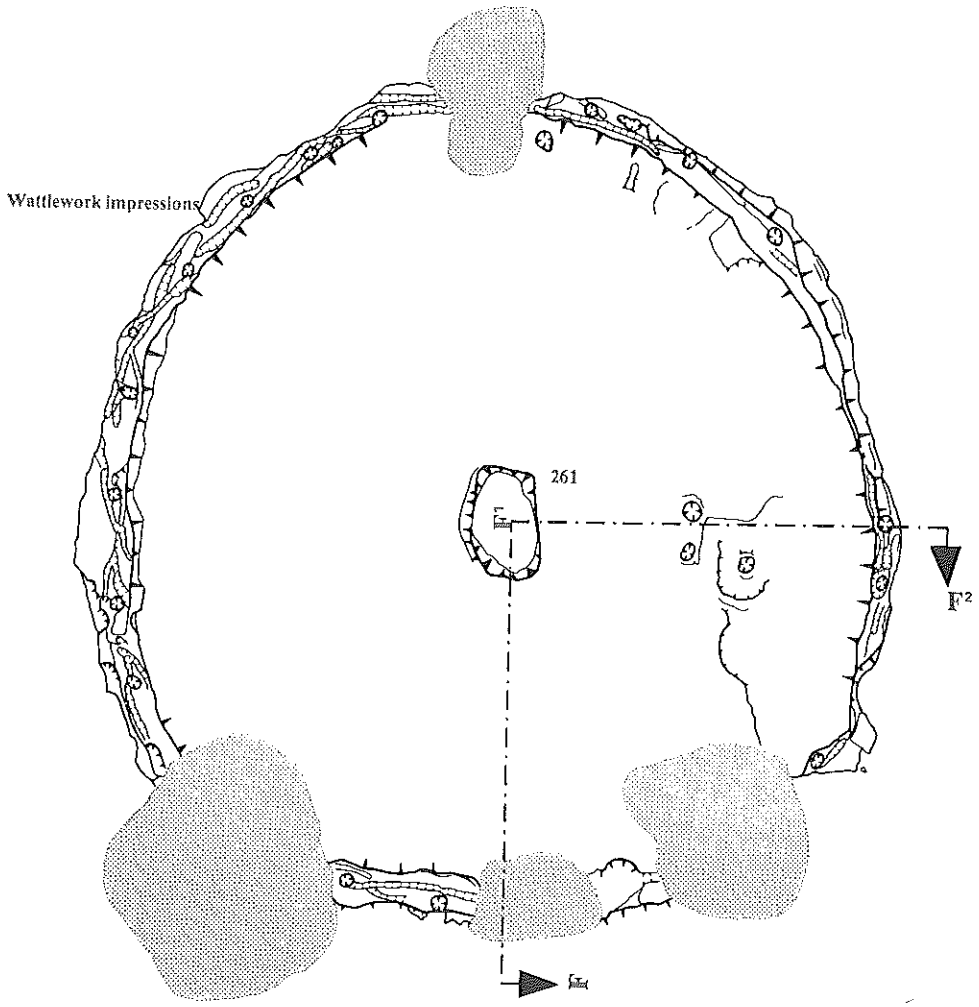
No paddle holes or marks indicative of rotary motion were found in the mixer.

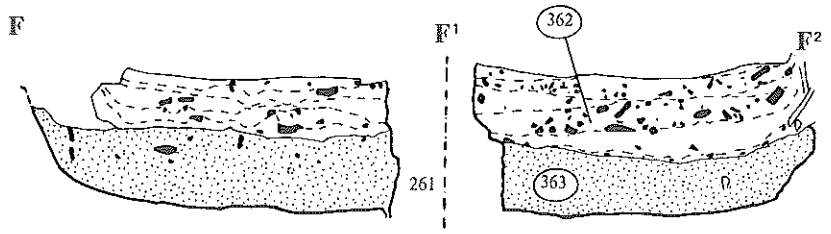
PLATE 31 *Mortar mixer 1. The central post-hole and peripheral wattle-work are clearly visible.*



Mortar mixer 1

Fig 68





Scale 1:20

mm 250 500 1000

The characteristics of the individual subdivisions of the deposits are as follows:

F362.1: Soft lightweight deposit occurring towards the edges only.

F362.2: Stony hard white mortar. Contains some fibrous bone and straw, specks of charcoal and limestone fragments up to 0.02×0.03m.

F362.3: Soft creamy white mortar with charcoal flecks and very few stones. 0.05m thick near middle and very thin towards edge.

F362.4: Pinkish layer *c.* 0.05m thick, much harder than 362.2 but with similar stones including pieces of ironstone.

F362.5: As 362.3. Includes bone.

F362.6: Slightly darker than 362.4, similar hardness and aggregate. Overlies yellow sand of 363.

F363.1: Pale yellow, compact (?) mortar with few stones and a few lumps of white mortar as 362.2. Intermittent crusty layer up to 0.03m thick; thinner towards edge.

F363.2: Soft sandy pinkish yellow mortar, clayey texture.

The upper surface of F362 was hard and as it were, worn smooth but not level. The surface curved upwards towards the periphery and also towards the central post-hole, the mortar presumably congealing against vertical protrusions.

It is most probable that the mixer was never actually used for mixing. The chemical analysis suggests that the bottom layer of F363 (363.2) was pure sand and this is confirmed by the thin sections. A certain amount of lime was present in the upper level of F363 (363.1) but this could have occurred through solution from the lime slurry above. All the sub-divisions of F362 are lime rich. It would appear that sand was laid in the bottom of the mixer and covered with a layer of lime slurry but no mixing appears to have been carried out. Additionally it seems likely that this would have been the first mix of this mixer. No lime or mortar was found in the bowl below sand F363; also the peripheral wattle-work is fossilised in the lime slurry F362 rather than a different earlier mix.

Mixer 2

Fig. 69; Pls. 32-5

Mixer 2 was 3.00m in diameter and 0.40m deep. A central post-hole roughly 0.25m square penetrated 0.65m below the base of the mixer. The evidence for wattle-work around the circumference was clearer than in mixer 1. The upright stakes, roughly circular and 0.02-0.05m in diameter, were set 0.15-0.20m apart. They were not only preserved as voids in the peripheral mortar deposit but could be traced penetrating the natural ironstone substratum. The horizontal withies of whole rather than split stems were also evidenced in the mortar.

Unlike mixer 3 there was no build up of residues in the bottom of the bowl but only a deposit F361 around the edge, perhaps

PLATE 33 *Mortar mixer 2 (southern half) showing build up of deposits within the basin after use.*

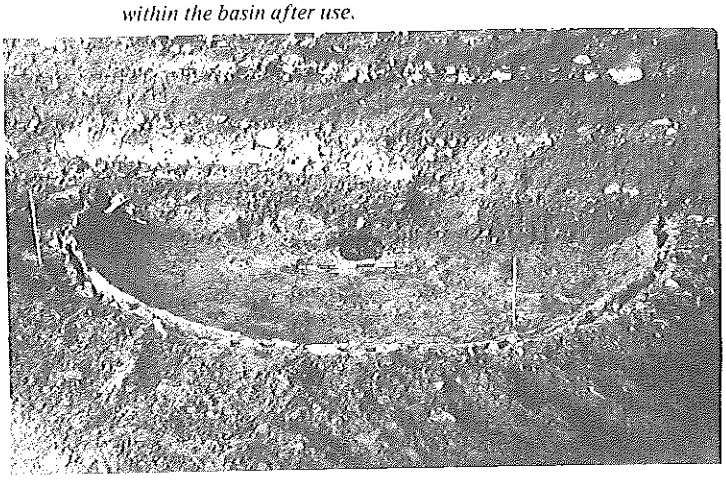


PLATE 34 *Mortar mixer 2 showing longitudinal section through the peripheral wattle-work.*

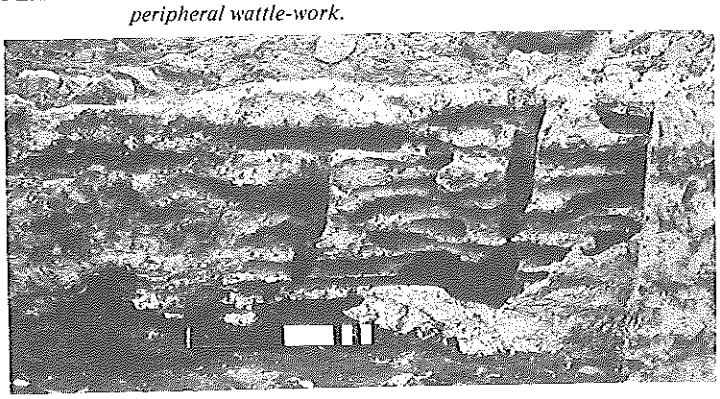
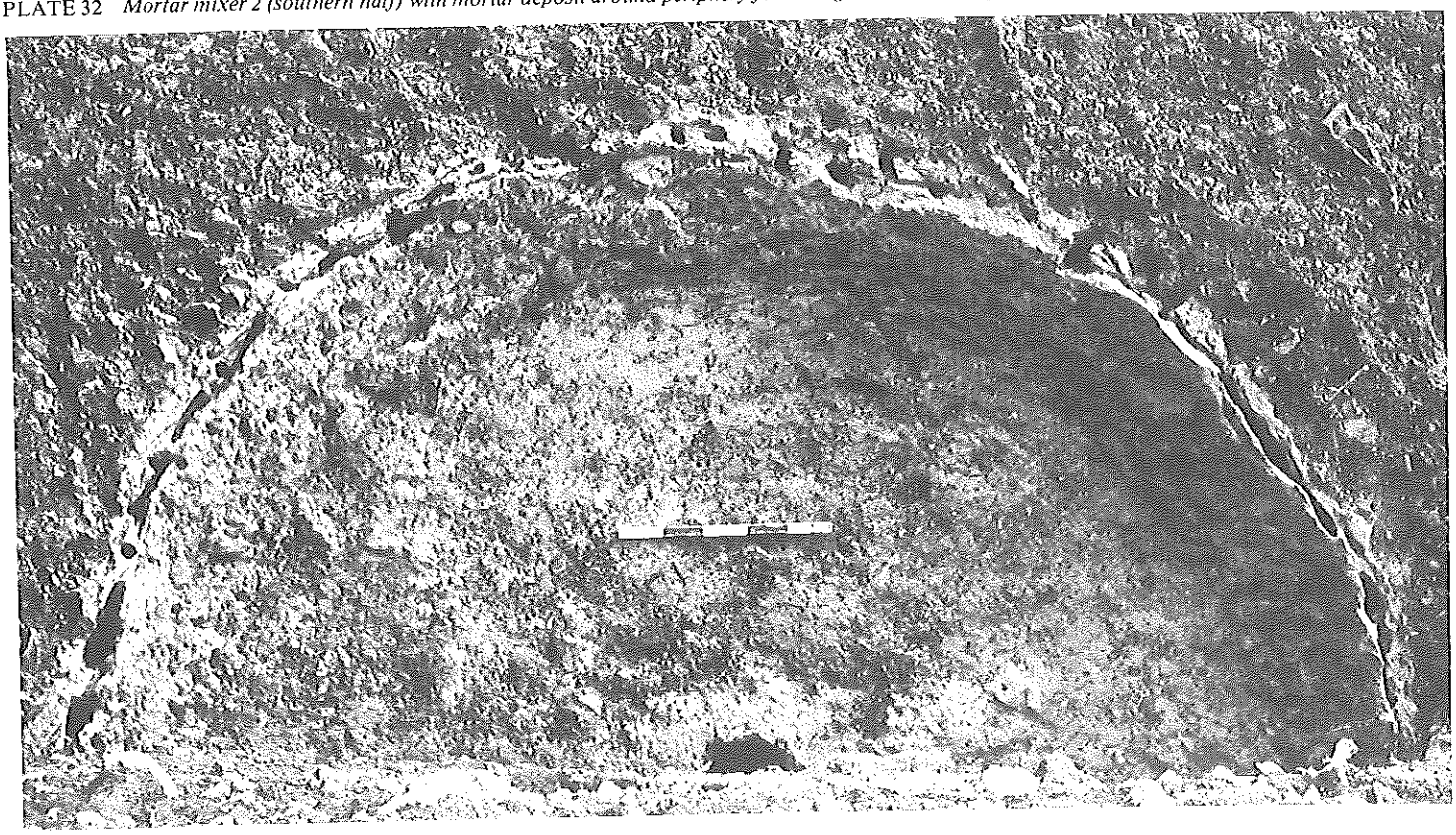
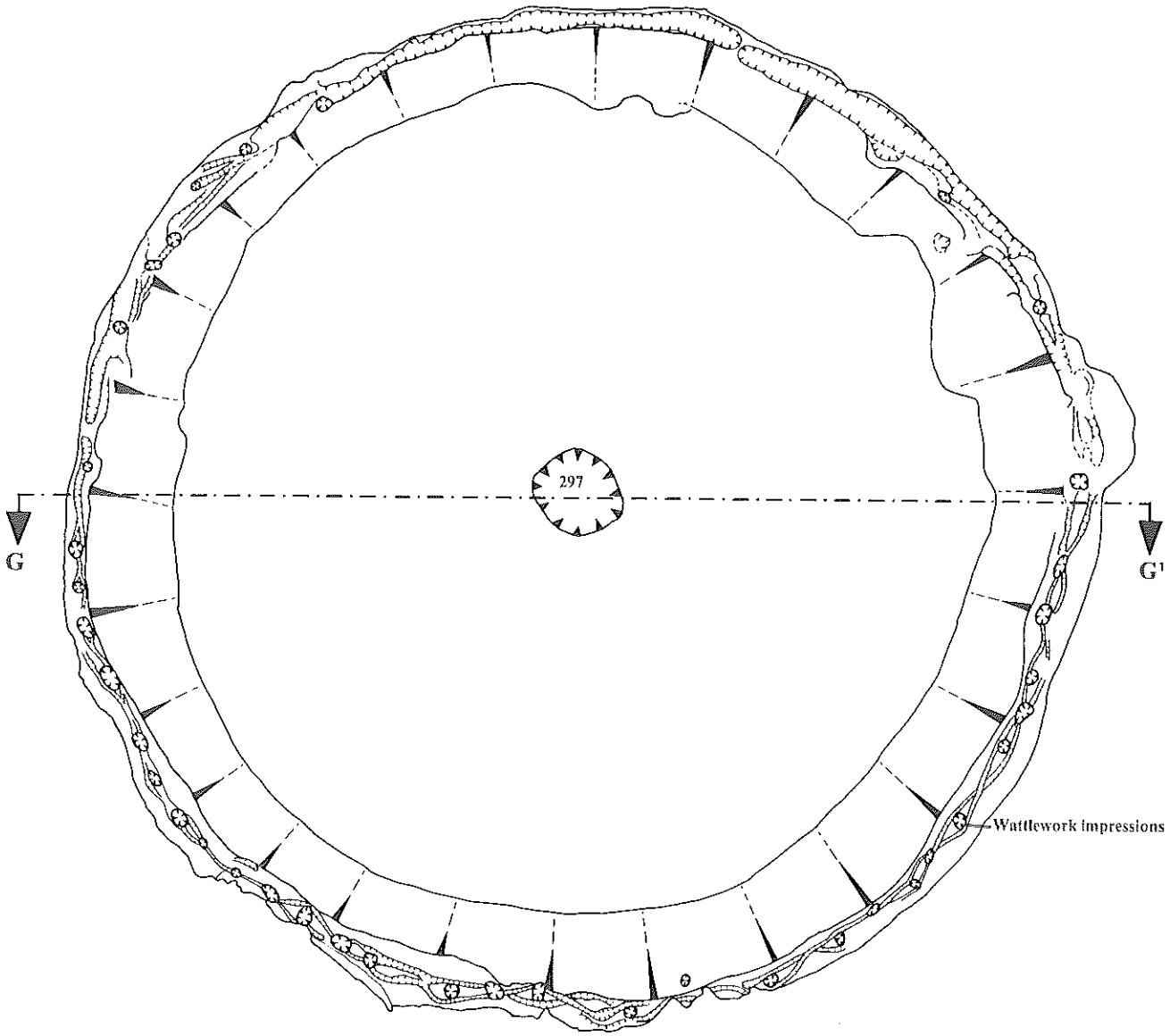


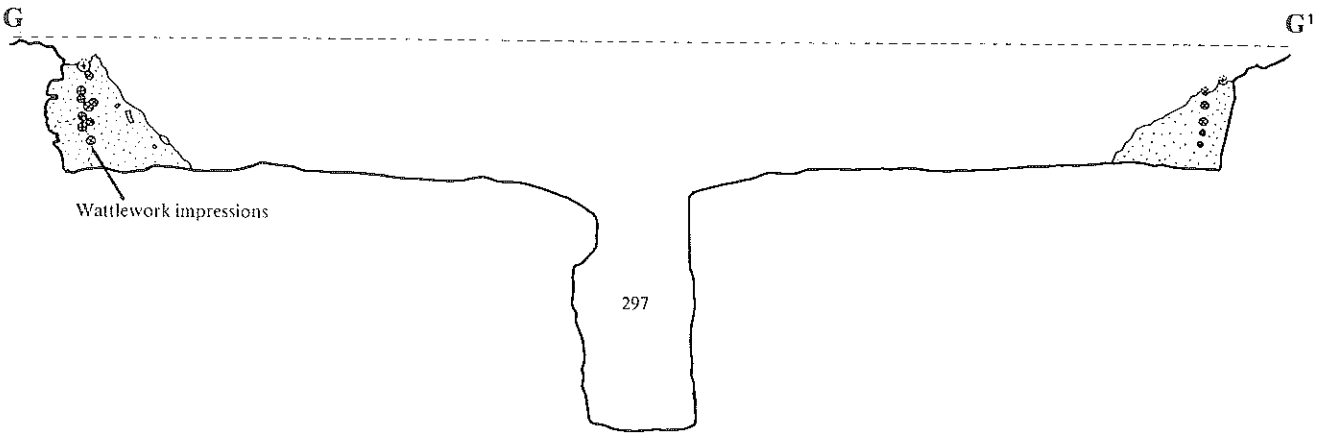
PLATE 32 *Mortar mixer 2 (southern half) with mortar deposit around periphery fossilising wattle-work impression.*



Mortar mixer 2

Fig 69

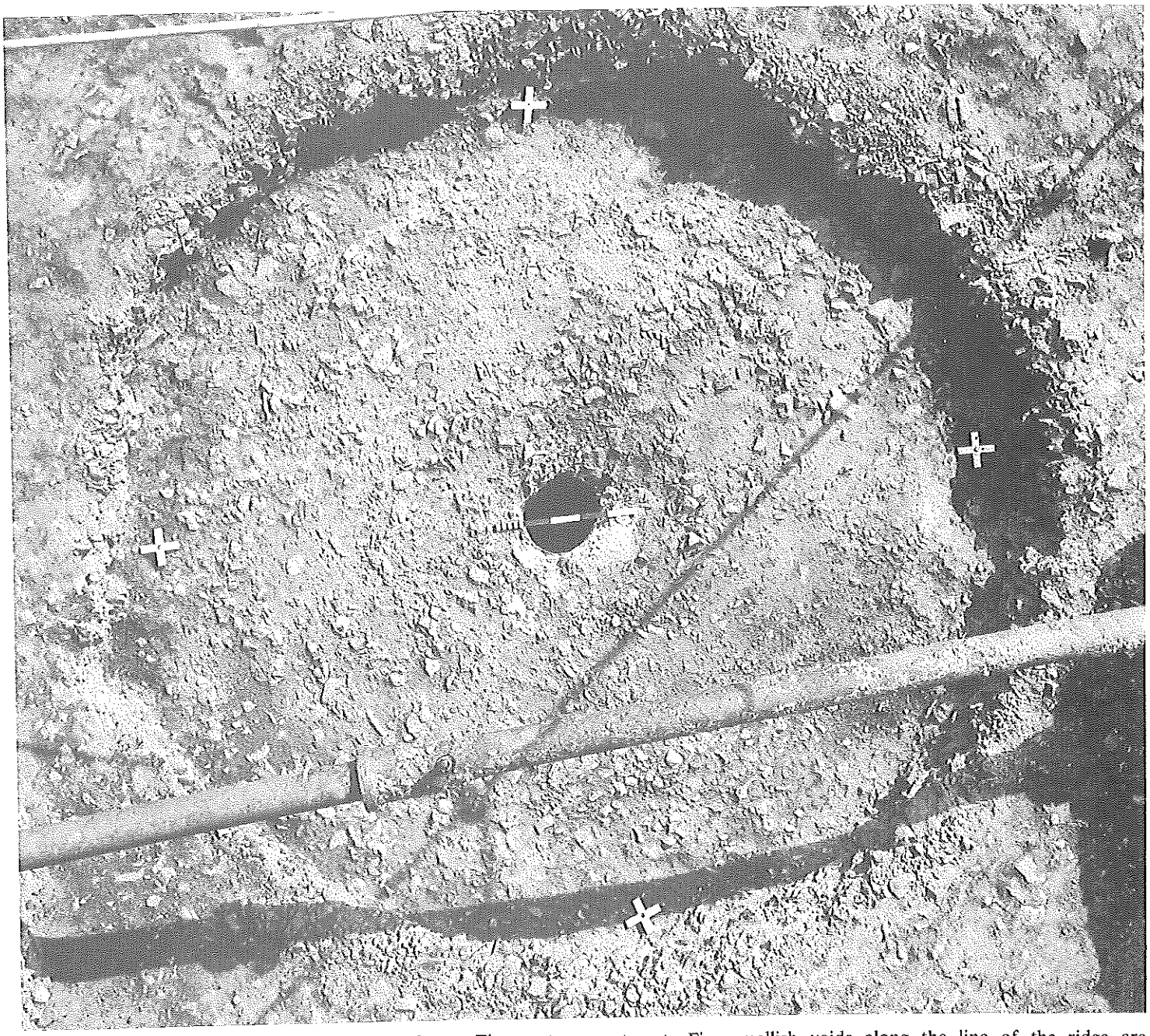




Scale 1:20

mm 0 250 500 1000

PLATE 35 *Mortar mixer 2 after removal of mortar residues and after weathering. Faint concentric grooves can be seen in the floor of the mixer.*



deliberately left to strengthen the basket-work frame. The mortar was fairly sandy with some aggregate but there were a couple of patches of mortar of a type similar to F362 on the floor of the bowl. Above was sandy soil mixed with some mortar (F293) and there were also a few limestone blocks, pottery, brick and tile fragments and bone.

The natural ironstone floor on weathering showed up faint traces of grooves concentrically arranged around the central post-hole (Pl. 35). These are interpreted as paddle marks (see below).

Mixer 3

Figs. 70-1; Pls. 36-42

Mixer 3 provided the main evidence for understanding the working of the mixers. The bowl was 2.20m in diameter with a sub-round central post-hole 0.20-0.25m across. No conclusive evidence was found for a wattle-work framework—only a few possible traces of withies were noted. In the top of the mixer was a layer of sandy soil with several largish blocks of limestone as well as one shaped tufa block. Beneath were the mortar residues as in mixer 1 but whereas the surface of mixer 1 was fairly flat and level here the surface, consistently curving strongly upward towards the edge, was considerably more uneven although in places very smooth. In particular a ridge *c.* 0.10m high ran across the mixer roughly east-west. Five smallish voids along the line of the ridge are interpreted as paddle holes and a subsequent section through the ridge suggested a sixth paddle. The spacing and sizes of the paddles can be seen on plan (Fig. 70).

The top layer of mortar G264 was carefully chiselled away to reveal the situation shown in Fig. 70b (see also Pls. 40-1). Layer G264 was laminated (see Fig. 71 and Pl. 42)—thin sandy beds *c.* 0.005m thick, alternately hard and soft and very contorted. The bottom of the layer was not flat but dipped down into hollows or grooves cut into the underlying mix G265. This was particularly clear in the western half of the mixer where the grooves ran concentrically around the central post-hole and two grooves lined up perfectly with two of the 'paddle holes'. G265 was more solid than G264 but did not extend over the whole area of the mixer. In places there was a layer of sand of variable thickness G268 overlying the substratum and below G264 or G265.

The interpretation is as follows:

1 Sand level G268.
2 Original mix G265.
3 Secondary mix G264. During the mix the paddles cut down into the underlying mix G265 leaving a series of grooves into which the later mix G264 flowed. The differing consistencies of the two mixes preserved the grooves. The east-west ridge was formed

PLATE 36 *Mortar mixer 3 with the latest fill of limestone blocks.*

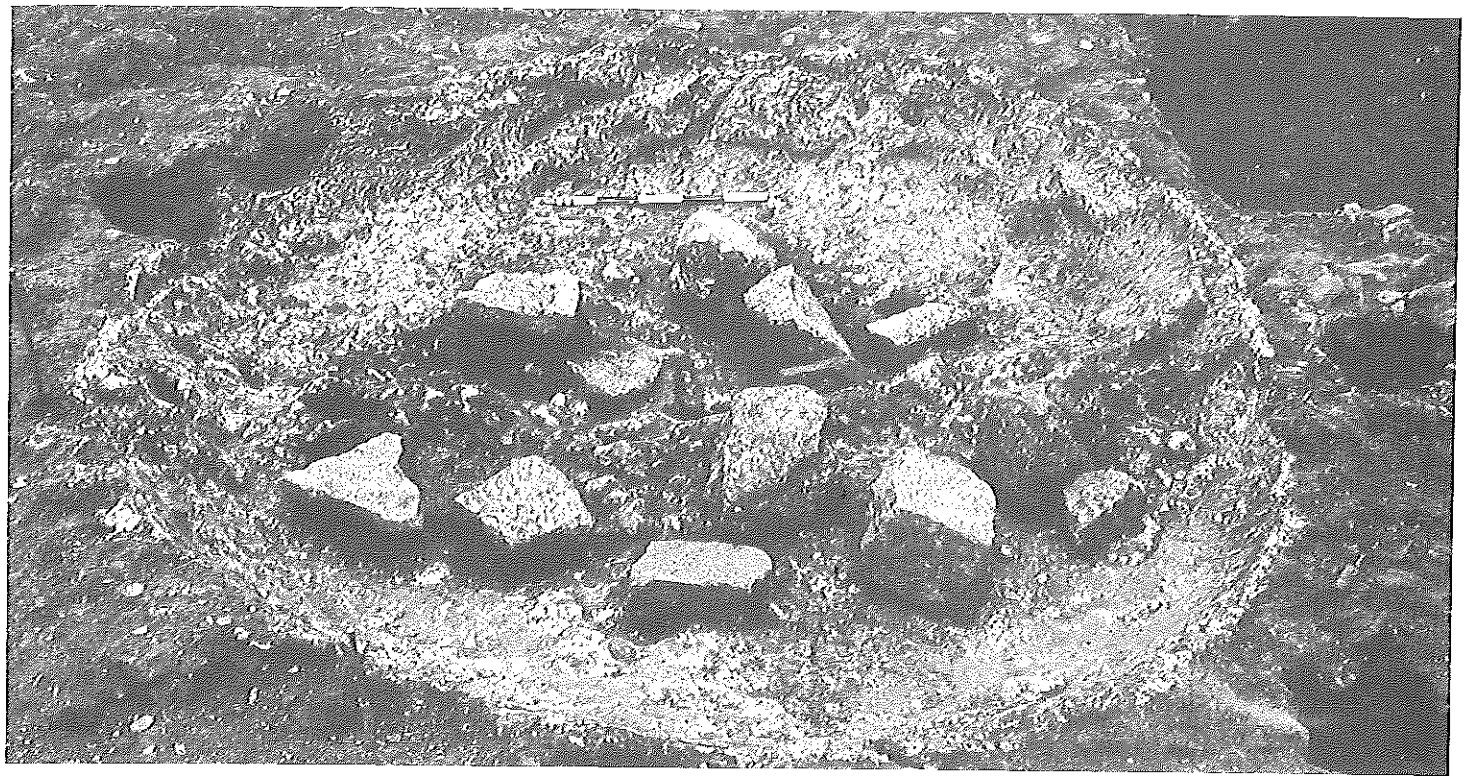


PLATE 37 *Mortar mixer 3 from the north before the removal of the mortar residues. Note the east-west ridge.*

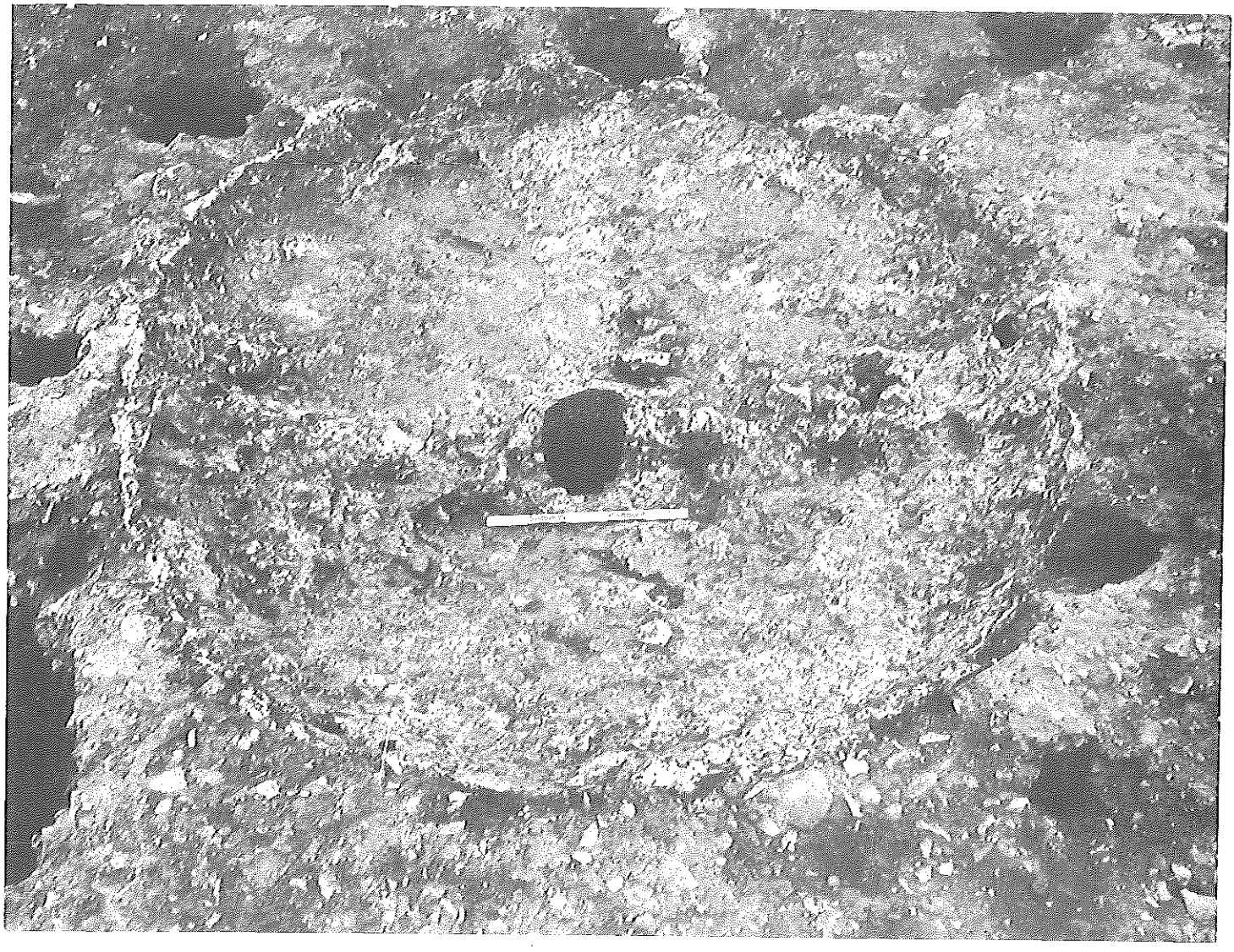


PLATE 38 *Mortar mixer 3 from the east before the removal of the mortar residues. The east-west ridge with paddle holes can be clearly seen.*

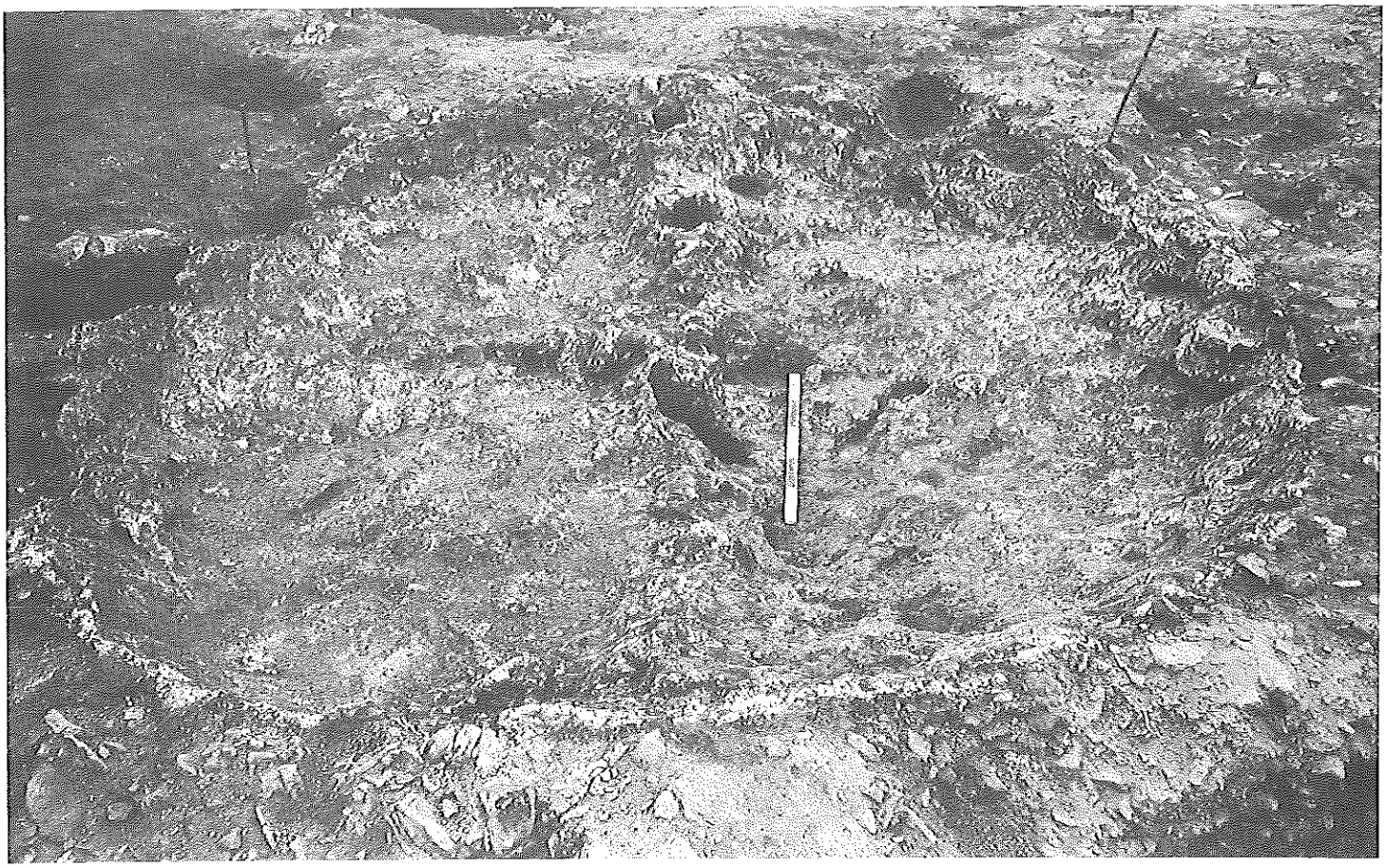


PLATE 39 *Mortar mixer 3 showing the central post-hole and western half of the east-west ridge with paddle holes.*

by mortar congealing against the paddles where they came to rest—the paddles rotted away or were removed leaving voids or post-holes. The way the paddle holes line up with the grooves shows clearly the grooves were formed by the paddles.

The grooves were better defined on the west side than the east. This could have been caused by the paddles on one half of the beam being lower than those on the other and the beam being only rotated through 180° and then reversed although the constant stopping and starting would have been tremendously energy consuming. Alternatively the paddles could have been forced to dip on the west side at some stage during the mixing operation.

The laminated structure of G264 is due to inefficient mixing; its survival, however, enables the turbulence patterns associated with the mixing process to be clearly seen.

The paddles were roughly shaped, rectangular or sub-rectangular. There was no evidence, from the form of the voids in the ridge, of the paddles having been set obliquely so as to increase turbulence.

The re-construction of the mixers

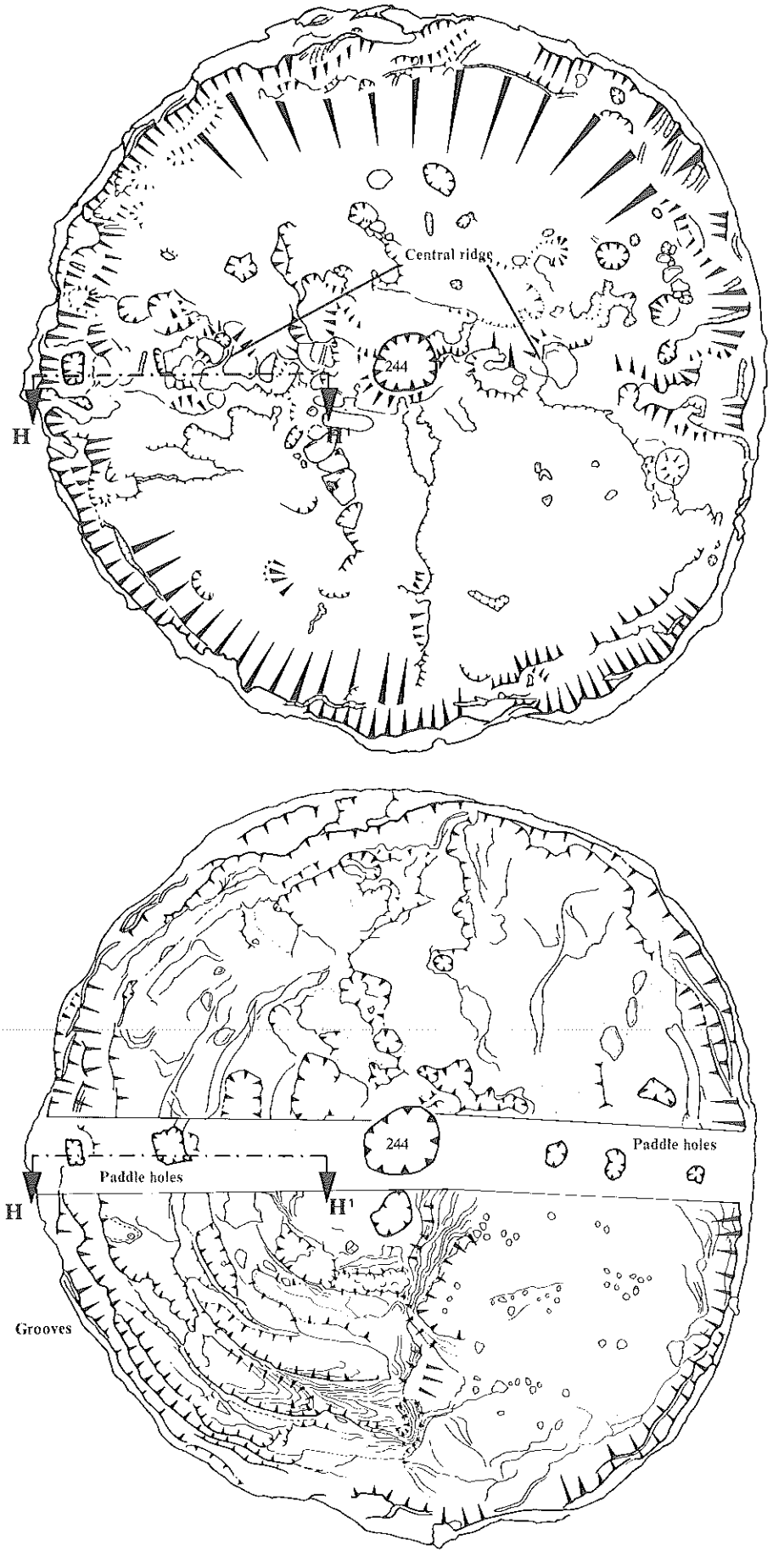
Fig. 67

The essential features of the mixers have been discussed in the descriptions of the individual mixers—the basin of the mixer was a hollow 2-3 metres in diameter cut into the natural ironstone and lined with wattle-work; a central post supported a beam from which were suspended a number of paddles. The beam was rotated by pushing around the central post. It would appear that the central post was fixed and there was some sort of bearing at the top on which the portable paddle mechanism rested (cf. mixer 1 where the position of the central post was clearly fossilised but there was no evidence of rotary motion nor was there any trace of 'paddle holes' as in mixer 3). The central post and the paddles would appear to have been made out of wood, in which case some sort of bracing would probably have been necessary between the paddles and the beam.

It is suggested below (p. 129) that either four people or two animals would have been required to rotate the mixer.

Mortar mixer 3

Fig 70



Scale 1:20

mm 0 250 500 1000

PLATE 40 *Mortar mixer 3 from the south after the removal of the upper mortar level. The paddle holes in the east-west ridge are clear as are the concentric grooves in the lower mortar residue.*

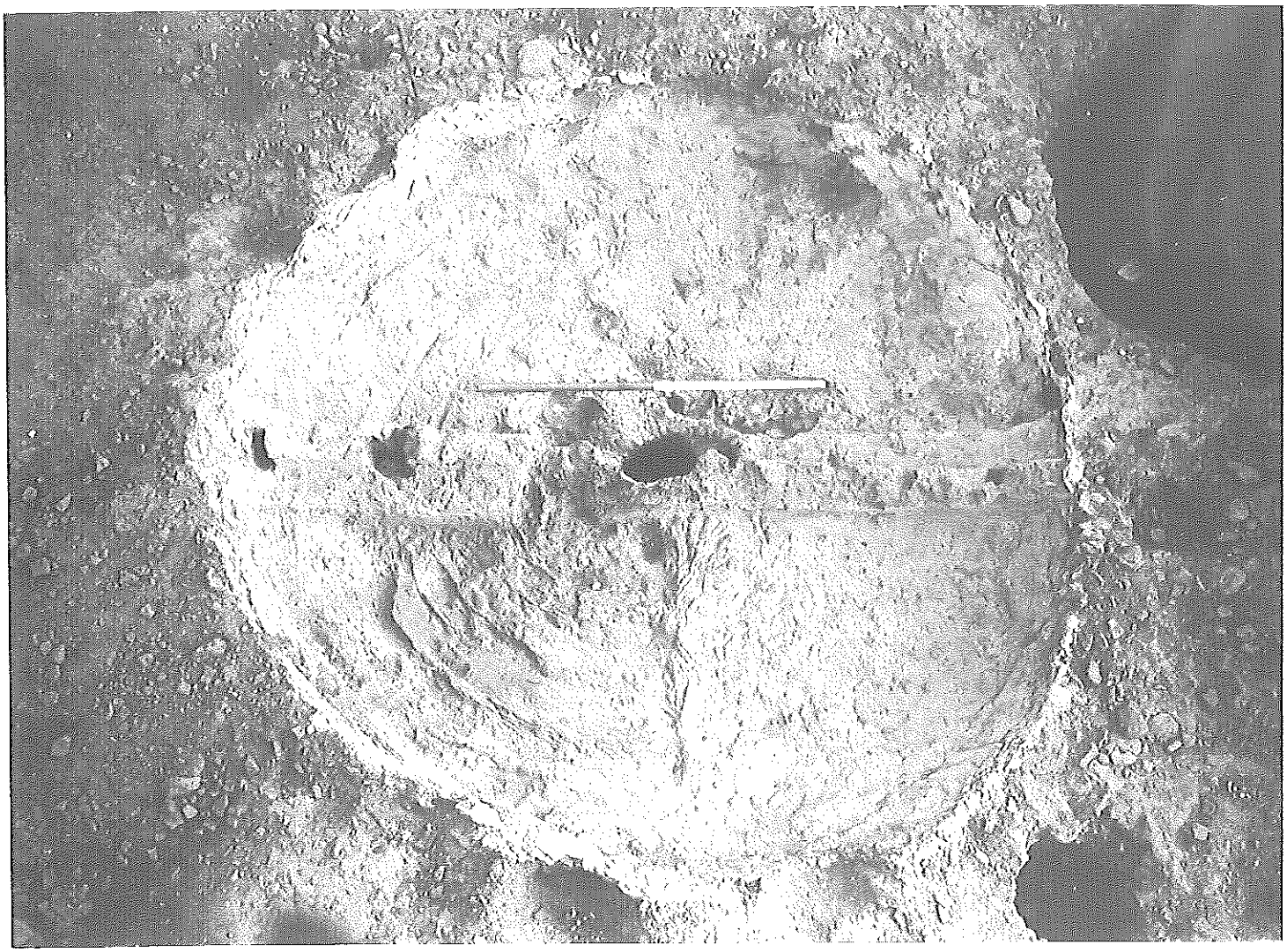


PLATE 41 *Mortar mixer 3, south-west quadrant. Close up of the concentric grooves in the lower mortar mix. The turbulence patterns caused by the paddles can be seen in section.*

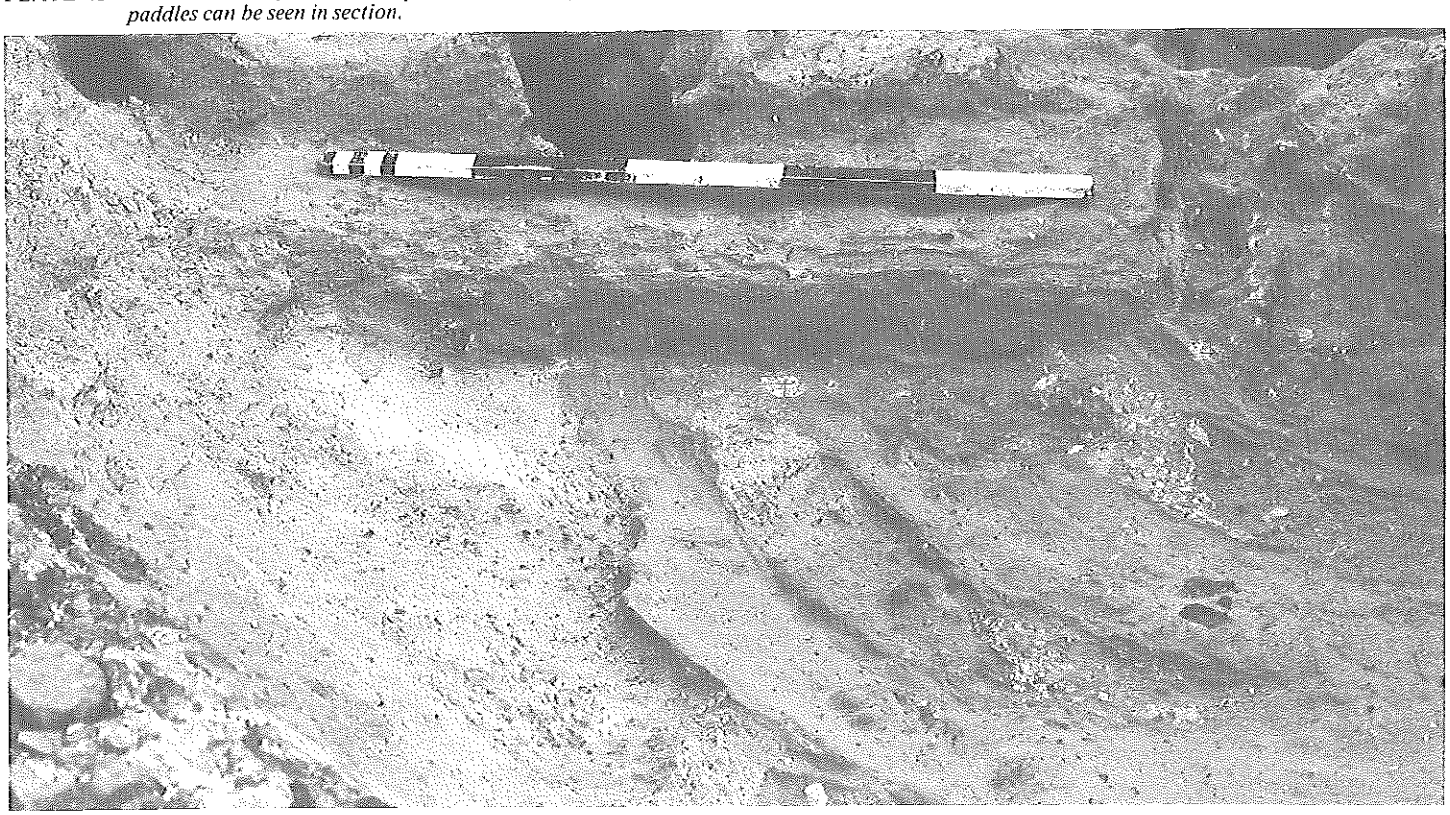
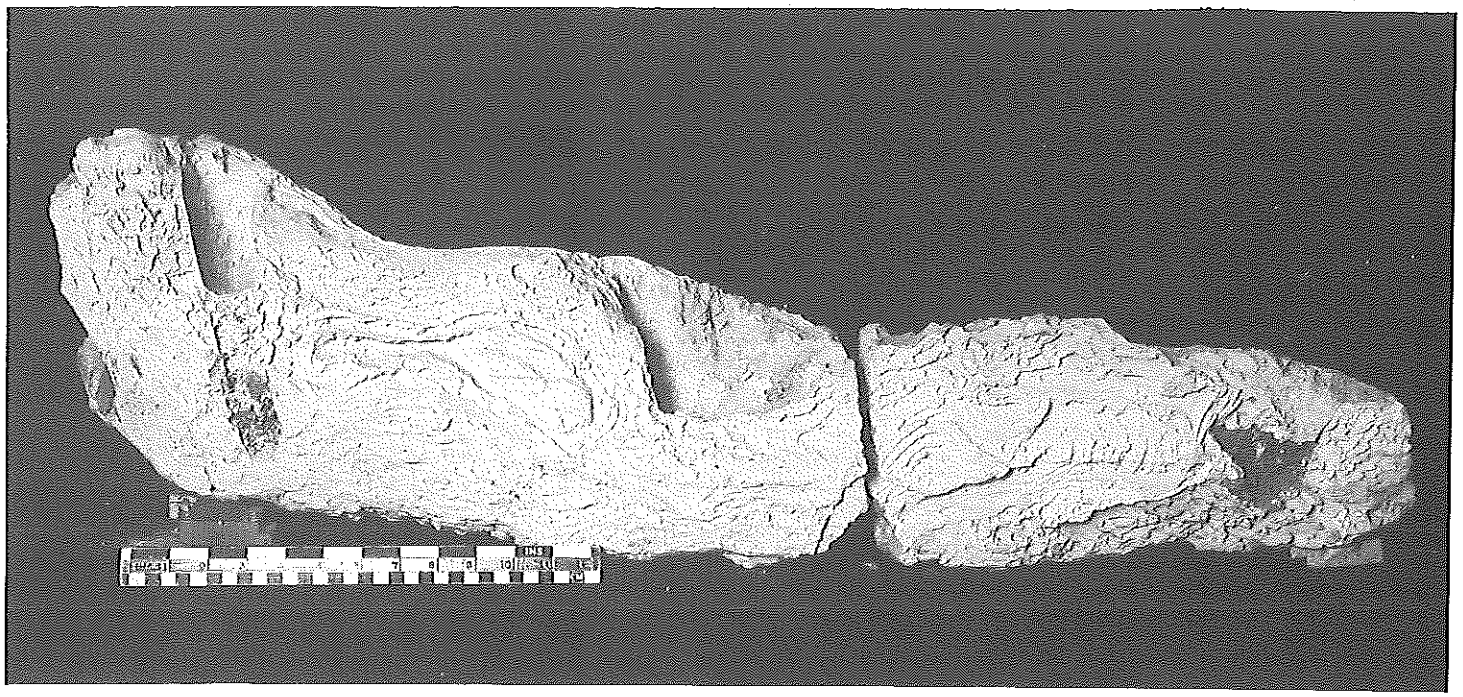
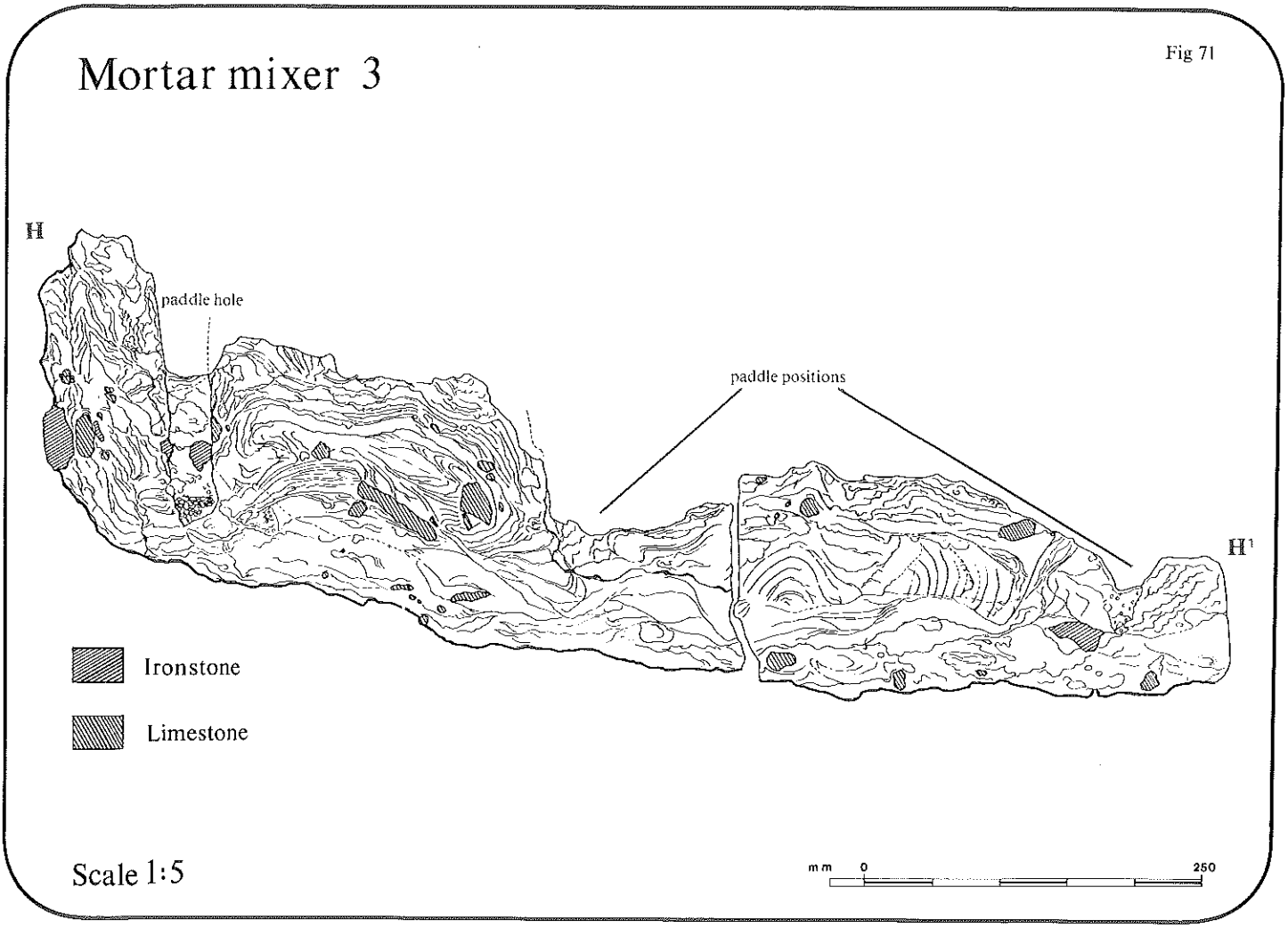


PLATE 42 *Mortar mixer 3. Section through the western half of the east-west ridge showing paddle holes and turbulence patterns formed by mixing.*





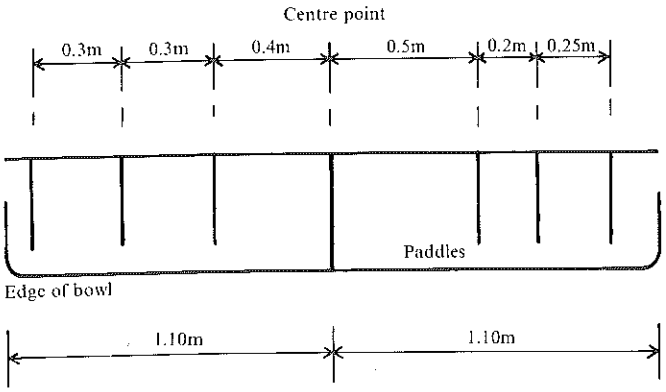
Similar types of machine (i.e. powered by men or animals moving in a circle about a point in a horizontal plane) have been used from earliest times for grinding corn, crushing olives etc. (Major 1978), but to the present author's knowledge no use of such a machine for mixing mortar is recorded in documentary sources.

The only possible parallel for the mixers is Building A from Monkwearmouth (Cramp 1969: 34-6; also pers. comm., Professor Cramp). Although badly disturbed by graves the structure was *c.* 12ft (3.70m) in diameter by 4-8ins (0.10-0.20m) deep and formed of a mass of white mortar. Traces of wattle-work survived around the periphery and semi-circular grooves, arranged roughly concentrically around the central point, were cut into the surface. Although the centre of the structure was disturbed an approximately central hole, packed with stones, may indicate the position of the axial post. Building A was somewhat larger than any of the St Peter's Street mixers. The late 7th century date for Building A is closely comparable with the suggested late 7th or early 8th century date for the St Peter's Street mixers.

Calculation of motive power required to drive mixers

by C Wapples

The reconstruction of the mixers is described above. On the basis of the evidence from mixer 3 it is possible to calculate the motive power necessary to operate the mixer. The measurements below from mixer 3 (with 6 paddles as shown below) are used:



diameter: 2.20m
depth h: 0.35m
paddle radial width w: 0.03m (6 paddles)

Properties of wet concrete (or mortar) — supplied by the Concrete Society:

Two mix consistencies are considered, giving a range of shear strength from low to high.

Apparent cohesion $c = 14$ to 69 kN/m²
Angle of internal friction $\emptyset = 12°$ to 34°
Density $d = 24$ kN/m³

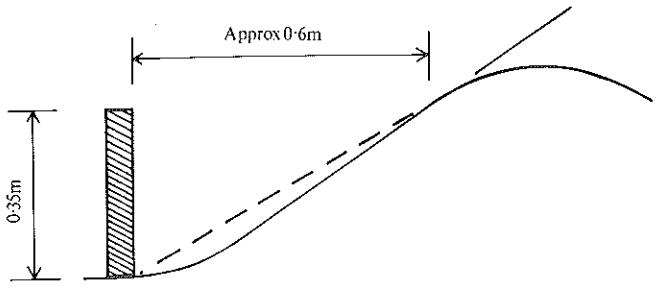
By Coulomb's equation, shear strength $s = c + dh \tan \emptyset$

Therefore minimum $s = 14 + 24 \times 0.35 \times \tan 12° = 15.8$ kN/m²
and maximum $s = 69 + 24 \times 0.35 \times \tan 34° = 74.7$ kN/m²

Two different methods are adopted to calculate the force necessary to drive the mixer beam carrying 6 paddles.

Method 1

Assume that each paddle moves the wedge of mortar immediately in front of it as shown in the diagram below.



Resistance to motion on sides and base of mortar wedge $= \frac{(h \times 0.6 \times 2 + w \times 0.7) \times s}{2}$

$= (0.35 \times 0.6 + 0.03 \times 0.7) \times 74.7 = 17.3$ kN maximum

Torque required $= 17.3 \times (0.415 + 0.515 + 2 \times 0.715 + 0.965 + 1.015)$
$= 75.2$ kNm max.

Assume a lever arm of 1.6m on each side of beam.

Push/lever $= \frac{75.2}{2 \times 1.6} = 23.5$ kN $= 2.4$ tonnes max.

or $\frac{2.4 \times 15.8}{74.7} = 0.5$ tonnes min.

Method 2

Assume the mixer acts in a way similar to the vane test for shear strength of cohesive soil. In this test a cylinder of soil is rotated within the bulk of the soil and the torque acting against the shear force is measured. If an annulus is rotated, then the torque is:—

$$T = \left(2\pi r.h.s.r.\right)_{r_1}^{r_2} + \int_{r_1}^{r_2} 2\pi r.dr.s.r = 2\pi s\{(r_2^2 + r_1^2).h + \tfrac{1}{3}(r_2^3 - r_1^3)\}$$

where r_2 and r_1 are outer and inner radii.

For innermost pair of paddles assume a mean radius $r = 0.45$m.

Then $r_2 = 0.45 + 0.015 = 0.465$m
and $r_1 = 0.45 - 0.015 = 0.435$m
and $T_1 = 2 \times 3.142 \times 74.7\{(0.216 + 0.189) \times 0.35 + \frac{1}{3}(0.101 - 0.082)\}$
$= 69.5$ kN m

For second pair of paddles $r_2 = 0.7 + 0.015 = 0.715$m
and $r_1 = 0.70 - 0.015 = 0.685$m

Then $T_2 = 2 \times 3.142 \times 74.7\{(0.511 + 0.469) \times 0.35 + \frac{1}{3}(0.366 - 0.321)\}$
$= 168.0$ kN m

For third pair of paddles assume a mean radius $r = 0.975$m

Then $r_2 = 0.975 + 0.015 = 0.990$m
and $r_1 = 0.975 - 0.015 = 0.960$m
and $T_3 = 2 \times 3.142 \times 74.7\{(0.951 + 0.922) \times 0.35 + \frac{1}{3}(0.898 - 0.885)\}$
$= 309.7$ kN m

Total torque for 3 rotating annuli $= T_1 + T_2 + T_3$
$= 69.5 + 168.0 + 309.7$
$= 547.2$ kN m

However, the paddles in the mixer do not drive a complete annulus of mortar (or they could not be effective in the mixing operation) and an estimate of the proportion rotating with each pair of paddles must be made.

Assume that $\frac{1}{8}$ of the circumference is being sheared.

Then torque required to rotate mixer beam $= \frac{547.2}{8} = 68.4$ kN m max.

Push/lever $= \frac{68.4}{2 \times 1.6} = 21.37$ kN $= 2.18$ tonnes max.

or $\frac{2.18 \times 15.8}{74.7} = 0.46$ tonnes min.

Conclusion

Both methods produce similar estimates which indicate that the power of two men would be insufficient to drive a mixer. It would seem reasonable to suppose that the mixers were driven either by four men or two animals.

X-Ray diffraction investigation

by D Barlow

17 samples were examined by X-ray diffraction. The work concentrated on the soft matrix rather than the hard aggregate. The air dried samples were crushed gently using a pestle and mortar and the fraction passing a 38 micron sieve used. Where the within sample variation in appearance was high, sub-samples were examined separately.

The results for mixers 1, 2 and 3 are summarised in Table 2.

Calcite is the most common form of calcium carbonate. Its presence in the samples could arise from:

a the coarse aggregate,
b the fine aggregate (sand),
c the reaction of atmospheric carbon dioxide with the lime used in the mortar,
d unburnt limestone from the manufacture of the lime.

Quartz is the main constituent of the silica sand used as fine aggregate, but also occurs in the coarse aggregate.

Kaolinite is one of the common clay minerals and often occurs in conjunction with quartz in silica sand. Some of the samples contained quite large quantities of kaolinite suggesting that the sand was used as dug. This could be deleterious to the strength of the mortar since it could interfere with the lime/aggregate bond.

Illite is another common clay mineral often associated with quartz.

Feldspar was found to be present particularly in samples with a

high quartz content. These occur together naturally so would be expected to be found together in a sand.

Calcium hydroxide ($Ca(OH)_2$) is the main constituent of hydrated lime. It was found only in samples 3019, 3021, 3022 and 3023 and can only have come from the hydrated lime used in the mortar. That this substance was present at all is surprising, since it reacts with atmospheric carbon dioxide readily. The central core of this mixer (1) must have been very effectively sealed from both the atmosphere and ground water.

The samples can be regarded as consisting of three components:—

1 calcite (calcium carbonate) arising from four possible origins.
2 calcium hydroxide, i.e. hydrated lime.
3 sand, consisting of quartz, clay minerals and feldspar occurring possibly in varying proportions, but essentially occurring as one component.

The only other materials detected were calcium aluminate hydrates. These only occurred in the presence of calcium hydroxide and are probably the long term reaction products of calcium hydroxide and kaolinite. Though interesting from a chemical point of view, they are not likely to be of archaeological significance.

Table 2 X-ray diffraction of mortar samples

Sample number	Kaolinite	Quartz	Calcite	Illite	$Ca(OH)_2$	Feldspar
Mixer 1						
3018 F362.1	P	x	xx	o	o	o
3019 F362.2	o	x	xx	o	xx	o
3021 F362.3	o	x	xx	o	xx	o
3021 F362.3 Fibrous material	o	P	xx	o	o	o
3022 F362.4	o	P	xx	o	xx	o
3023 F362.5	o	P	xx	o	xx	o
3024 F362.6 Sandy fraction	xx	xx	xx	o	o	x
3026 F363.1	xx	xx	xx	P	o	x
3027 F363.2	xx	xx	x	x	o	x
Mixer 2						
2986 F361	x	xx	xx	P	o	x
2989 F361	o	x	xx	o	o	o
2992 F361	x	xx	xx	P	o	x
2992 F361 Light fraction	P	xx	xx	o	o	x
Mixer 3						
3035 G264	x	xx	xx	o	o	P
3036 G264	x	xx	xx	o	o	P
3215 G265	x	xx	xx	P	o	x
3066 G265	x	xx	xx	o	o	P
3082 G268	xx	xx	xx	x	o	x
3224 F56	xx	xx	xx	P	o	x

xx Definitely present major constituent
x Definitely present minor constituent
P Possibly present
o Not detected

Chemical analysis

by D Barlow

Chemical analysis was undertaken in an attempt to ascertain the lime/sand ratio in the mix. However, because the carbonation of hydrated lime forms a chemically and crystallographically identical material to that which occurs naturally in the coarse and fine aggregates and because there are no substances which can be used to characterise the three components of the mix individually the results of the analysis alone are not particularly meaningful. Mix ratios can be calculated if assumed values are interpolated for (a) the CaO in the sand and (b) the purity and $CaCO_3$ content of the lime. These ratios must, however, be regarded only as approximate estimates.

The matrices from eight mortar samples and one sand sample were analysed for total CaO and $CaCO_3$ content. Before analysis the samples were lightly crushed and lumps containing visible fragments of the dark coarse limestone were removed and discarded. The analyses therefore refer to the matrix only.

Table 3 CaO and $CaCO_3$ content of mixer mortars

Layer no.	Sample no.	Total CaO(%)	Total $CaCO_3$(%)
Mixer 1			
F362.1	3018	45.7	74.8
.2	3019	42.3	38.4
.3	3021	42.4	37.4
.4	3022	31.3	16.6
.5	3023	44.0	36.9
F363.1	3026	10.5	18.8 (calculated)
.2	3027	1.5	2.7 (calculated)
Mixer 3			
G264	3035	9.0	14.6
Natural sand from site	3224	3.0	

The two mixers analysed (1 and 3) are completely different. The upper layers in mixer 1 are extremely lime rich and the bottom layers sand rich, although at the interface between F362 and F363 (see especially F363.1) there is a more uniform mix. Samples 3026 (F363.1) and 3027 (F363.2) may, in fact, be unmixed sand, the larger quantity of calcite in 3026 being due to solution from above.

In calculating the mix proportions of the original mix as produced in Table 4 (with respect to sand and lime only) many assumptions have to be made, but in several cases the proportions have been calculated using a range of assumed values so that the effect of these on the final proportions can be observed.

For the sand the assumed total CaO of 2% (all as $CaCO_3$) was used for all samples and additionally a value of 4% was substituted for one sample.

With lime two assumptions are necessary, firstly the purity (85 and 90% as $Ca(OH)_2$ were used) and secondly $CaCO_3$ content, as a result of insufficient burning (10 and 15% were used).

The ranges of assumed values do not necessarily include the actual values. Other assumptions which have been made in the calculations are:

a The lime was hydrated lime.
b The sand was dry—this is obviously not likely to be true, but would have complicated the calculation further. Only the results of samples 3035 and 3026 would have been affected and those only slightly.
c No residual coarse aggregate was left in the analysis sample.
d The samples used for analysis were representative of the whole matrix. Because of the necessity to pick out by hand the coarse aggregate it is difficult to assess how true this is. It was impracticable to use the whole of the sample provided.

Table 4 Lime: sand mix proportions

		Assumed values			Proportions (lime:sand)	
Layer no.	Sample no.	Sand CaO(%)	Lime purity (%)	Lime $CaCO_3$ (%)	by weight	by volume
F361.1	3018	2	85	10	79:21	91.9
.2	3019	2	85	10	65:35	84:16
	,,	2	85	15	64:36	84:16
	,,	2	90	10	61:39	82:18
.3	3021	2	85	10	65:35	84:16
.4	3022	2	85	10	44:56	69:31
.5	3023	2	85	10	67:33	85:15
F363.1	3026	2	85	10	13:87	30:70
.2	3027	2	85	10	0:100	0:100
G264	3035	2	85	10	11:89	26:74
	,,	2	85	15	11:89	26:74
	,,	2	90	10	10:90	24:76
	,,	4	85	10	8:92	20:80

Thin section and heavy mineral analysis

With the discovery in area N of the Middle Saxon church which was archaeologically contemporary with the mortar mixers and apparently used mortar visually similar to samples from the mixers it was determined to ascertain whether any firm linkage could be established between the mixers and the church; other structural mortars from the site were similarly examined. Local sands were compared in an attempt to locate the source of the fine aggregate and the coarse aggregate was also analysed.

The thin section analysis

The thin section analysis concentrated on the major sand constituents and largely disregarded the heavy accessory minerals which were separately analysed (see heavy mineral analysis below).

Particular attention was paid to three factors:

i the ratio of 'clean' quartz to quartzite, chert, feldspars etc.

ii the degree of rounding of the particles—while most samples contained sub-angular - sub-rounded quartz some rather more rounded particles were also noted.

iii the particle size distribution—most particles fall in the range 0.1-0.4mm. Variations within this range were not generally regarded as significant, possibly being attributable to local eddying during deposition. More attention, however, was paid to particles falling outside the normal particle size distribution.

The mixers Thin sections were made from samples from the following layers:

Mixer 1 F362.2, F362.4, F362.5 (2 samples), F362.6, F363.1 (2 samples), F363.2 (2 samples), F363.3

Mixer 2 F361 (2 samples)

Mixer 3 G264 (3 samples), G265 (2 samples)

The sand within the various mixers essentially comprised moderately sorted sub-rounded to sub-angular quartz grains mainly 0.1-0.4mm across, other minerals or rock fragments forming less than 5%. Some size variation was noted but the significance of this must be queried on consideration of a single slide from F363.2 where the grains in one area range between 0.2 and 0.5mm and in another area between 0.1 and 0.2mm.

The quantity of sand within the mixers varied considerably. The quartz grains in mixers 2 and 3 were densely packed in a calcite matrix; in the upper levels of mixer 1 (F362.2-.5) the quartz was far more sparsely set within the calcite matrix, but fairly dense in F362.6; in the lower layers of the mixer (F363) the quartz grains were again densely packed but without a calcite matrix, the interstices being heavily iron-stained. It is argued elsewhere that the deposits within mixer 1 were never mixed, F363 and F362 being respectively the unmixed fine aggregate and lime slurry.

On the basis of the thin sections it is quite possible that a single sand source was used for all the mixers.

Structural mortars The various fragments of mortar found scattered over the site had been divided by Miss G Oakley on the basis of visual inspection assisted by a binocular microscope into 12 types. 'Plaster' has here been used to denote function rather than as describing a high lime/low sand content (cf. especially type 7).

Type 1 off-white granular mortar with smooth face—plaster.
House 1, Phases 6Biii, 6Biv; House 5, unstrat; House 10, Phase 7.

Type 2 buff granular mortar similar to type 1.
House 4, Phase 6A; House 5, unstrat; House 7, Phase 6i; House 8, Phases 5-6, 6iii.

Type 3 pink sandy plaster with smooth white facing.
House 1, Phase 5; House 2, garden; Area N, Phase 4/5.

Type 4 pale buff sandy mortar.
House 1, Phase 5; House 2, Phases 2?, 3A?, 3B; House 3, Phases pre-4/5, garden; House 7, Phase 5; House 10, Phases 4, 6B.

Type 5 *opus signinum;* hard buff matrix with frequent tile frags.
House 2, Phase 3A?; House 4, Phase 2; House 8, Phase 3; Area N, Phase 2/3.

Type 6 off white sand/lime mortar.
House 2, Phase 5A-B; House 10, Phase 4.

Type 7 buff sandy plaster with smoothish white facing.
Area N, 178b—facing of (?)church wall; also Area N, Phases 2/3, 3, 4/5.

Type 8 soft white lime 'putty'.
Area N, 188—floor spread in (?)church; also Area N, Phase 2/3.

Type 9 hard, smooth, off-white lime mortar.
Area N, Phase 3.

Type 10 Hard, smooth, off-white lime mortar, similar to 9.
Area N, Phase 3.

Type 11 hard, smooth, off-white lime mortar, similar to 9 and 10 but a little sandier.
Area N, Phases 2/3, 3.

Type 12 yellow loose sand.
Area N, 178a—bedding for church wall.

These mortar types were compared in thin section with the mortar from the mixers. The sand/lime ratio in most cases was reasonably comparable with that in mixer 3. The quartz grains in types 1 and 2 were rather more rounded than those found in the mixers and additionally more non-pure quartz grains were present, particularly quartzite and chert. Type 4 again contained more quartzite etc. Type 5 was clearly distinctive both for the presence of tile fragments and also a large quantity of minute angular quartz grains. The quartz grains in type 6 were also extremely fine. Types 8-10 could not be usefully compared by thin section, being composed almost entirely of calcite. Type 12 was also somewhat more mixed than the sand in the mixers with the presence of some strained quartz and feldspars.

The sand in the other samples (types 3, 7 and 11) is fairly consistent with that used in the mixers although the average particle size of type 7 quartz is fairly small and in one slide very fine grained particles were present.

Visual inspection had suggested a link between mortar mixer 3 and mortar type 7 and also mortar type 8 seemed to match very closely a lime slurry (F(145b) = 131) in the immediate vicinity of mixer 1. Samples of these mortars were examined by Dr F W Anderson who reports below. The mortars were broken up by hand and examined by reflected light.

Mixer 3 (G264 AML No. 767507). Cement with about 70% sand. The sand is fine-grained averaging 0.21mm diameter with a grading of 45% fine, 50% medium, 5% coarse.

Type 7 mortar (N178b, facing of east wall of church. AML No. 767509). Cement with about 60% sand. The sand is very fine grained averaging 0.18mm diameter with a grading of 60% fine, 30% medium, 10% coarse.

Lime slurry adjacent to mixer 1 (F(145b) = 131. AML No. 767508). Cement with about 9% sand and a few small pebbles of sandstone and ironstone. The sand is fine, averaging 0.24mm diameter with a grading of 30% fine, 45% medium, 25% coarse.

Lime slurry within church (N188. AML No. 767510). Cement with about 7% sand and a few small pebbles of sandstone and ironstone. The sand is fine, averaging 0.20mm diameter with a grading of 50% fine, 40% medium, 10% coarse, i.e. a little finer than that of 767508.

Both pairs of samples seem to provide acceptable matches.

Natural sands Natural sand samples were excavated on St Peter's Street and also on Chalk Lane *c.* 150m to the north-west. Additionally seven samples were kindly provided by Mixconcrete from sites around Northampton.

The samples are as follows:

NS1 Hunsbury Hill—*c.* 1.5 miles south of Northampton: Upper Estuarine (Jurassic).

NS2 Duston—*c.* 1.5 miles west of Northampton: Northampton Sands (Jurassic).

NS3 Weedon Road Dry—*c.* 1.5 miles west of Northampton: Top of Nene Valley River Gravel.

NS4 Weedon Road Stone Pit—*c.* 1.5 miles west of Northampton: Lower Estuarine (Jurassic).

NS5 Weedon Road Wet.
NS6 Milton—*c.* 3 miles south of Northampton: Interglacial sand.
NS7 Mears Ashby—*c.* 7 miles east of Northampton: Upper Estuarine (Jurassic).
NS8 Chalk Lane, Northampton (sample 1).
NS9 Chalk Lane, Northampton (sample 2).
NS10 St Peter's Street, Northampton—natural from immediate vicinity of mixers.

The sands were not thin sectioned but were examined under the same petrological microscope as the thin sections.

Samples 1 (fine grained, less than 0.1mm across, well sorted, sub-rounded), 3 (0.1-0.6mm across, poorly sorted, sub-rounded to rounded), 5 (0.2-1.0mm across, poorly sorted, rounded), 6 (0.2-0.6mm across, moderately sorted, sub-rounded to rounded, high sphericity) and 10 (0.1-0.4mm across, poorly sorted, sub-rounded to rounded) were clearly different to the mixer sands.

Samples 2 (0.2-0.4mm across, moderately sorted, sub-rounded) and 4 (0.1-0.3mm across, moderately sorted, sub-rounded) also appeared not to have been used.

Samples 7 (mainly 0.1-0.3mm across, well sorted, sub-rounded to sub-angular), 8 (mainly 0.1-0.2mm across, well sorted, sub-rounded to sub-angular) and 9 (0.1-0.2mm across, well sorted, sub-rounded to sub-angular) provided reasonable matches with the mixer sands. A source for the sand in the Chalk Lane area would seem distinctly possible.

Heavy mineral analysis

Only a limited number of samples from the mixers, structural mortars and sands were large enough to extract a meaningful heavy mineral fraction. The work was undertaken through the Ancient Monuments Laboratory by Bismin (Table 5).

In considering the heavy mineral distributions one must pay particular attention to (i) the considerable and locally variable extent of reworking in the fairly energetic environments of the Jurassic series. (ii) the possibility of the 'fining out' of sands for mortars etc. (iii) the very small quantities of heavy minerals recovered in some cases. Within these limitations it seems possible, nevertheless, to put forward certain suggestions. It is fairly clear that two main types of deposit are represented: (a) heavy minerals, essentially ferruginous, containing a large preponderance of iron oxides and (b) heavy minerals, iron free, dominated by chromite/ilmenite and zircon in about equal proportions. Both types are present in all three groups of material. It should be noted, however, that among the sand samples only that from St Peter's Street itself has a really dominant goethite/limonite component and the effects on the heavy mineral assemblages of the presence of this sand rich in goethite/limonite in the immediate proximity of the mixers must be considered. If non-goethite/limonite sand (e.g. Chalk Lane) was brought on to site but was contaminated by St Peter's Street material during mixing this could account for the goethite/limonite proportions of between 20 and 60% in some Saxon mortars. Such an hypothesis would seem to be supported by the presence in the mortars of actual ironstone lumps but the rounded to sub-rounded St Peter's Street sand is not present in quantity in the Saxon mortar thin sections. The medieval mortar types 1 and 2, however, are both rich in goethite/limonite and were also noted to contain more rounded particles and perhaps St Peter's Street sand was deliberately used in mortars at that time.

Table 5 Heavy mineral analysis of mortar samples

Material	Origin	Reference no.	AML or B/S no.	Size of fraction	Size of particles	Tourmaline	Zircon	Staurolite	Chromite/ Ilmenite	Kyanite	Haematite	Rutile	Mica	Goethite Limonite	Iron-std. quartz	Lucoxene	Epidote
lime (+ some sand)	Mixer 1 mid	3023	13	vas			35		50			5		—			
sand (+ some lime)	Mixer 1 nr. bot.	3026	1	s			20		40-50			5		15-20			
sand	Mixer 1 bot.	3027	9	vs		t	40		50	2		t		—		5	t
sand (+ some lime)	Mixer 2	2986	8	s		2	5		5					75-85			
lime (+ some sand)	Mixer 3 top	3036	2	vs			5	2	40			10		30		2	
wall-render		Type 1	5	es		2	25		30	5				40			
wall-render		Type 2	12	vs	L<30		3		3					*c.* 95			
mortar		Type 3	6	es			10-15		50		20-25	15-20		—			
mortar-render		Type 4	4	es			50		50					—			
mortar	from church area	Type 7	11	vs		t	25	2	30-35			5-10		25			
lime (+ some sand)	church area	Type 10	7	vas	efg		25	t	40	t	2			5		5	
lime (+ some sand)	church area	Type 11	3	vs			1		15-20		10	1		60			
sand	under church wall	3535	10	vs		t	30	5	40			5-10		—		15	t
sand	Hunsbury Hill	NS 1	775655	L	L<20	+	+	+	20	+	30	+	r	M	+		
sand	Duston	NS 2	775656	s	mostly <20	+	+		+		+		+	—			
sand	Weedon Rd—Dry	NS 3	775657	vL	large range co- mi	5	5(corr)	t	25		20	5		5	M		
sand	Weedon Rd—stone	NS 4	775658	L			t	t	40			5		—			
sand	Milton	NS 6	775660	L	mostly >100 —res.fine	t	t		(90)			t			M		
sand	Mears Ashby	NS 7	775661	s	mostly fine <20		40	15	30			5		—			
sand	Chalk Lane	NS 8	775662	s		t	5		40	t		5		—			
sand	Chalk Lane	NS 9	775663	s	mostly <20		t	t	M	t	t	t		—		t	
sand	St Peter's	NS 10	775664	m		t	2		5			½		80	10	½	

Key to Table 5
Number in size column = micron
Number in mineral column = %; (in brackets = % of sub-fraction)

<	smaller than	f	fine	r	rare
>	greater than	g	grain	s	small
+	present	L	Large	t	trace
co	coarse	M	major (quantity)	v	very
corr	corroded	m	medium	va	vanishingly
e	extremely	mi	middle		

Conclusions The thin section and heavy mineral analyses do not provide conclusive evidence that those mortars found in the church were actually mixed in the St Peter's Street mixers. They do not, however, show that they were not.

The sand from the church wall facing matches reasonably well sand in the mixers and also sand naturally found in the Chalk Lane area to the north-west of the site. Nonetheless, the use of local fine aggregate is to be expected and, even if there was a precise match, independent use of the same sand source at different times could still be argued. The case for the match being significant is, however, given some additional weight in that other mortar from the site apparently contained different sand.

If the chronological data both for the mixers and the stone church is also considered it can be reasonably assumed that the mixers were associated with the church.

Identification of aggregates from the mixers

by K Langley

Eight samples of aggregate from mixer 1 were examined in thin section. Four samples belong to the Northampton Sand Ironstone. Four other samples are of limestone consistent with those of local Jurassic origin but due to the variations in Jurassic stratigraphy and the small size of the samples it is not possible to state the exact stratigraphic horizon from which the limestones originated.

General discussion

The presence of the Middle Saxon mixers in St Peter's Street, while extremely interesting technologically, is of added importance for the light it sheds on the status of the site at the time. Some sizeable structure, almost certainly a church, was under construction in a fairly organised fashion. The probable Monkwearmouth parallel is worthy of note in this ecclesiastical context.

There is no archaeological evidence as to whether the lime burning and slaking were carried out on the site or not but it is unlikely that the liquid lime putty would have been transported far in such a state.

The various analyses suggest that the mixers were providing material for the church. The residues in mixers 2 and 3 probably approximated to the intended mix but that in mixer 1 appears to have comprised unmixed deposits of sand and a lime slurry with some aggregate. The production of a bonding mortar may not have been the purpose of the mixers for the few surviving wall courses of the stone church were dry bonded. Traces of a wall rendering did, however, survive *in situ* in area N. A slurry of almost pure lime was present on the floor of the church and may have been laid as a floor. It would not have been hard wearing, however, and may be rather spillage, perhaps from white-washing of the walls. The quantity of coarse aggregate in mixer 1 perhaps suggests concrete was being made but it is by no means certain that the aggregate was a deliberate additive nor has any concrete been found in structural contexts. It is of interest that the approximate 3:1 sand:lime ratio in mixer 3 agrees well with that suggested by classical authors.

THE DEVELOPMENT OF POST-MEDIEVAL ST PETER'S STREET

by R Hunter

As noted elsewhere the post-medieval levels were not generally archaeologically investigated for reasons of time etc., but nonetheless an appreciation of the development of the site in this later period is necessary in order that the story might be complete.

This account is based on

1 the topographical evidence of the town maps and plans, beginning with Speed's plan of 1610, although comprehensive plans do not occur until the mid-18th century onwards (Fig. 72).
2 documentary evidence which is sparse for the period before the fire of 1675 in which many of the town records were destroyed but relatively abundant from the mid-18th century onwards.
3 standing buildings.

From the early 16th century, when St Peter's Street appears to have been largely destroyed by fire, to the ?early 17th century, the history of the area is uncertain. It is probable from the built-up area shown by Speed in 1610 (Figs. 3 and 72) that the north side of St Peter's Street remained waste ground or garden for most of this initial period.

Only two standing buildings certainly pre-date the 18th century. These are St Peter's church, the present structure fundamentally of mid-12th century date but extensively restored in the 1850s (James 1850; Tom 1890; Scott 1904), and Haselrig House, No. 33 Marefair, possibly erected *c.* 1600 on the evidence of its architectural features (VCH Northants 3: 37; *contra* Pevsner and Cherry 1973: 335). Both buildings appear to be shown on Speed's plan of 1610 with Haselrig House sited in a relatively isolated position immediately to the east of the church. The arrangement of the streets on Speed's map also bears a strong resemblance to the current street pattern with Marefair, St Peter's Street, Narrow Toe Lane, Freeschool Street, Green Street, the Green, Tanner Street, Gregory Street and Horseshoe Street all perhaps being recognisable as alignments in 1610. A further prominent feature is the Free School founded in 1541, moved in 1557 to the site of St Gregory's church with the new building clearly incorporating the remains of the church itself (Lees 1947). It is clear from Speed that the area to the south of St Peter's Street and to the west of Freeschool Street (i.e. around the Green) was fairly densely built-up while the block to the north of St Peter's Street was not.

The history of Haselrig House throughout most of the 17th century is obscure although by the last quarter of the century the property was probably in the hands of Sir Robert Hesilrige. A lease and conveyance of 1680 (LRO DE 303/44 and /45) dealing with a capital messuage in Gold Street in the parish of St Peter's (i.e. the present day Marefair) with messuages on its east and west sides, and a garden near Gold Street in the parish of All Saints, may conceivably relate to Haselrig House if the boundary of St Peter's parish shown on Noble and Butlin's plan of 1746 (Fig. 72) was the same in 1680. On this basis the property must lie either on the north side of the present Marefair between Quart Pot Lane and Chalk Lane, or on the south side to the west of Freeschool Street. These documents record the transfer of property to Sir Robert Hesilrige by members of the Reading family of Northampton and it is interesting to note that both the Reading family in the 17th century and the Hesilriges in the 18th century figure prominently as property owners in the western half of the town and especially in the area of the Castle and Gold Street (NRO ZA 2094; NRO ZA 4032; NRO PLD 104; LRO DE 303/42-46, /50, /54-55, /63-65, /80). Significantly, the Hesilriges are absent from the Hearth Tax returns for 1662 for the west ward of the town while a Mr Reading holds a property with eight hearths (NRO M25/2). On the other hand, children born to Sir Robert Hesilrige are recorded in the St Peter's registers in 1667, 1669, 1670, 1673, 1674 and 1675 so evidently his family became resident in this area between 1662 and 1667, quite probably after his marriage in 1664 (Serjeantson 1904: 137).

A survey by G Nunn in 1743 (NRO 4445) is the first unequivocal sign that the Hesilrige family occupied Haselrig House. The estate is shown to include the area of the Castle and other plots to the north of Marefair, and also the great majority of the block bounded by St Peter's churchyard, St Peter's Street, Freeschool Street and Marefair. It is not improbable that all this latter block originally constituted a single property unit (cf. Fig. 72) and that the two smaller properties itemised in this 1743 survey which lie on the Marefair frontage to the west of the main building represent the first stage in the gradual fragmentation of this block that continues through into the 19th century. However, it is apparent from a conveyance of 1756 (LRO DE 303/80) that Sir Arthur Hesilrige was simultaneously buying property in the same area, in this instance a stable and garden in the parish of All Saints lying on the south side of the lane leading from the Free School and adjoining a garden already in his possession. This document perhaps relates to the blocks to the south of St Peter's Street or Gregory Street.

To return to Nunn's survey, it is of relevance to note the large garden area which covered the sites of Houses 1-6 in the 1973-74 excavations and also the presence of structures on the west side of Freeschool Street that may correspond to Phase 7 in House 7. A similar arrangement of buildings along Freeschool Street occurs on Noble and Butlin's plan of 1746 (Fig. 72) and this represents the first detailed plan of the town as a whole, showing also parish boundaries and many street names. Generally speaking, Nunn and Noble and Butlin show that the St Peter's Street area is not densely populated in the mid-18th century although the buildings that may correspond with the Phase 7 structures are shown on the sites of Houses 7 to 10 and in areas E and N.

It is from the second half of the 18th century that documentary and cartographic evidence occur in more comprehensive and regular fashion, and certainly from the early 19th century this coincides with the residential and industrial development of the St Peter's Street area. This is supported by the evidence of the Poll Books for the area from 1768 to 1830 (Table 6) which shows a steady rise in the number of shoemaker voters while the town maps of Dewhurst and Nichols 1836, Durham 1841 and Wood and Law 1847 (Fig. 72) show the development of the St Peter's Street, St Peter's Gardens, Narrow Toe Lane and Freeschool Street frontages.

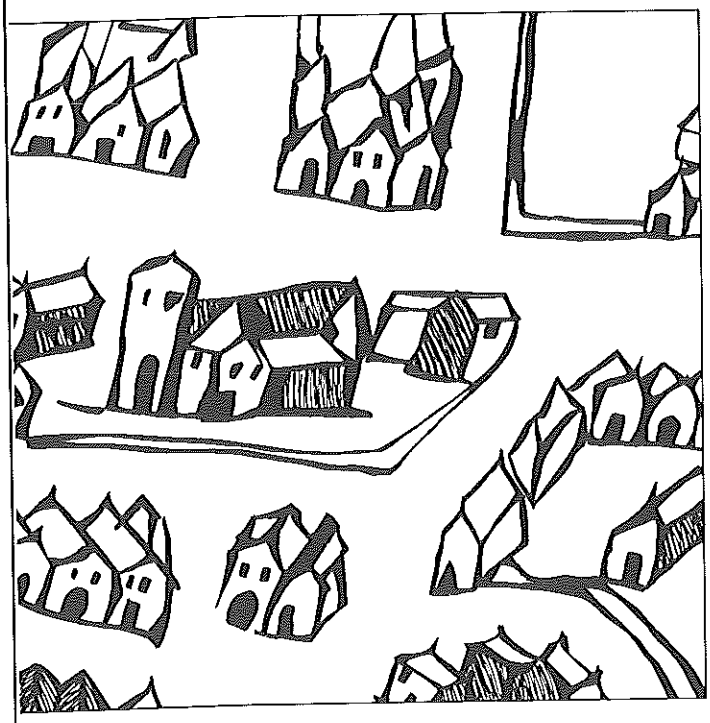
Table 6 Poll books 1768-1830. Voters resident 'behind' or 'back of St Peter's', in Narrow Toe Lane and Freeschool Lane

	Total no. of voters	Shoemaker voters	Other leatherworker voters	Others
1768 Poll Book	13	2	3	8
1790 Poll Book	12	3	1	8
1820 Poll Book	18	5	—	13
1826 Poll Book	26	8	2	10
1830 Poll Book	23	12	2	9

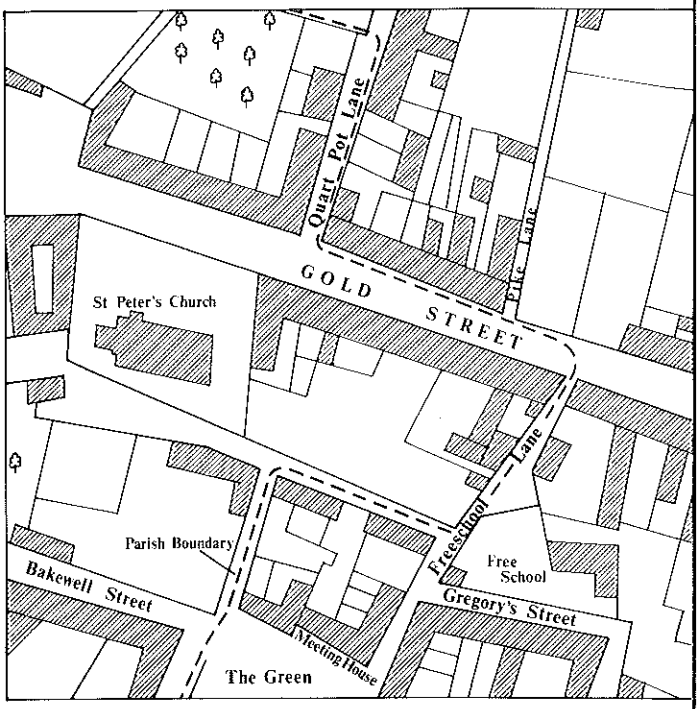
It may be significant with respect to this development that neither St Peter's Street nor Narrow Toe Lane are named as such by Noble and Butlin, and the Poll Book information for 1768, 1774, 1784, 1790 and 1796 refers consistently to 'behind St Peter's' or 'back of St Peter's' or 'the Green' for this general area. Narrow Toe Lane with its shoemaking connotations first appears in the Poll Books in 1818 and St Peter's Street in 1830. It is probable that the development of both these streets and St Peter's Gardens, and also a redevelopment of the south side of St Peter's Street (cf. Fig. 72) commenced as a result of the stimulus of the rising shoe industry in the first half of the 19th century (Hatley 1971: 5, no. 9). It is interesting to note from the Poll Books, however, that a shoe and leather-working tradition (tanners and curriers particularly) already existed in this St Peter's/Green area of the town in the late 18th century.

Fig 72

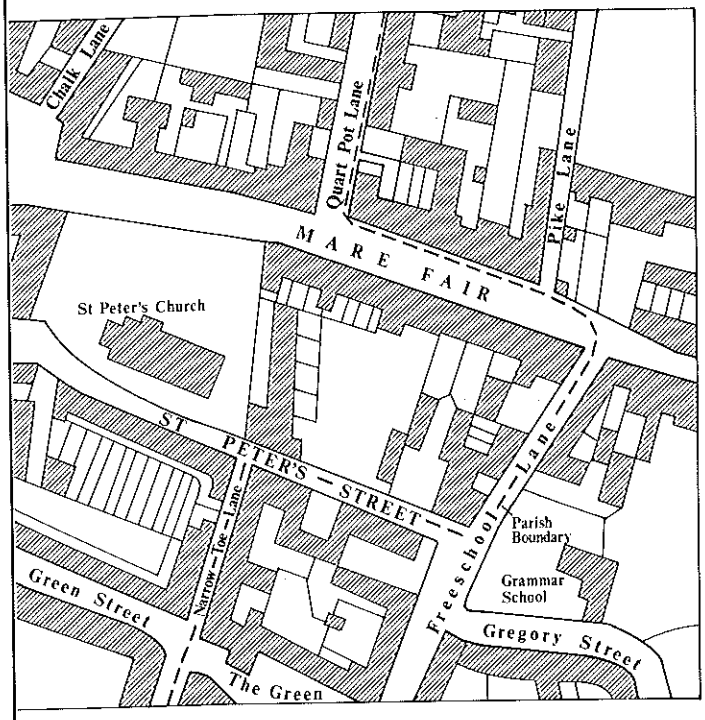
Post-medieval plans of St Peter's Street



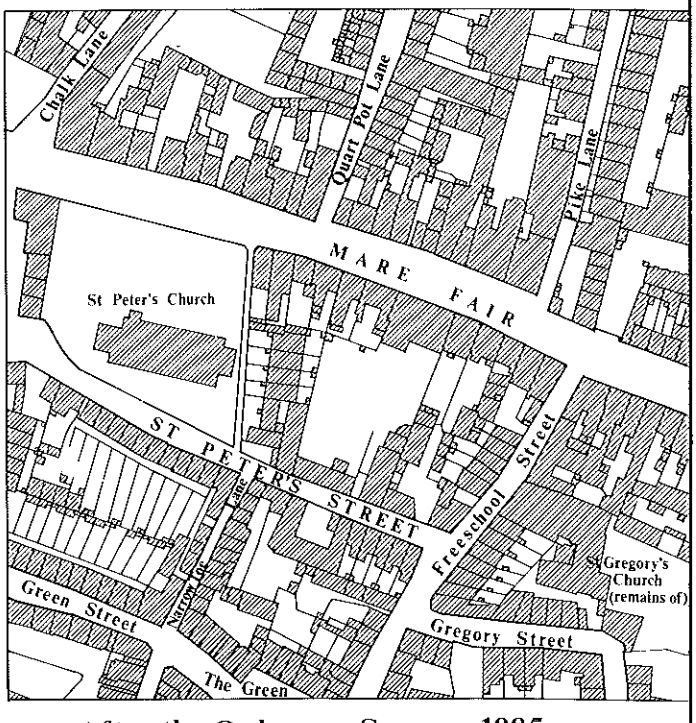
After Speed 1610



After Noble & Butlin 1746



After Wood & Law 1847



After the Ordnance Survey 1885

Concurrent with this development is the fragmentation of the Hesilrige estate. Sir Arthur Hesilrige died in 1763 but the ownership of the estate is uncertain in the latter half of the 18th century and the first quarter of the 19th century. The building was evidently unoccupied during part of this time (Serjeantson 1904: 142; Dryden 1884: 58), and between 1827 and 1835, until in this latter year the property was bought by George Baker, the county historian. By this time the area of the property must certainly have decreased further as the terrace of St Peter's Gardens appears on Dewhurst and Nichols' map of 1836, and probable 18th century buildings still stand on the Marefair frontage to the east of the present Haselrig House.

In an attempt to clarify the patterns of land ownership and occupancy in the mid-19th century, the Improvement Commissioners' Rate Books were examined (NRO ML 2069-2156). It is apparent from this documentary source (Table 7 below, using the Rate Books for November 1844 (NRO ML 2074) as an example) that the ownership of the area is by this period relatively fragmented although single individuals do own blocks of property (e.g. St Peter's Gardens and St Peter's Terrace) and were probably responsible for their development.

Table 7 Improvement commissioners' rate books, November 1844

Parish	Street	No. of occupied properties/occupiers	No. of property owners
All Saints	Freeschool Street	16	10
	St Peter's Street	6	3
	Narrow Toe Lane	9	2
St Peter's	Freeschool Street	4	2
	St Peter's Street	30	11
	St Peter's Gardens	5	1
	St Peter's Terrace	10	1

A total of 80 properties are listed for the area of which 70 are described as houses, the remaining ten being workshops, shops, warehousing, stables or garden land. Interestingly, there was not one owner/occupier while it is also noticeable that George Baker, owner of Haselrig House, held one (a workshop and yard) of the six properties on the south side of St Peter's Street to the east of Narrow Toe Lane (i.e. in All Saints parish). All streets in the area were unpaved at this date.

Finally, in terms of the value of these properties, the great majority of houses are assessed at less than £8 *p.a.*, the threshold above which the occupier rather than the owner pays rates. The terrace in St Peter's Gardens, however, was evidently better quality housing and was assessed at £9 a house. Otherwise, only occasional houses and commercial premises were assessed at over £8.

With the detailed information available in the 1851 and 1871 Census returns (NRO M33 and 34) the picture becomes much clearer (Table 8). By the mid-19th century there is a high proportion of workers in the shoe industry and allied trades: 63% of listed occupations in 1851, 54% in 1871. This period undoubtedly covers the peak development of the St Peter's Street area although by 1871, perhaps partly due to increasing mechanisation of the industry, a decrease in the number of shoe workers should be noted. Thus the 1885 Ordnance Survey map (Fig. 72) is a fair reflection of the area at its most developed and, indeed, in comparing Wood and Law's map of 1847 with the Ordnance Survey map of 1885 (Fig. 72) it is noticeable that the east side of Freeschool Street, the north side of St Peter's Street and the south side of St Peter's Street to the east of Narrow Toe Lane have all been built up or rebuilt within this period.

Table 8 Census returns of 1851 and 1871

	St Peter's Street	Freeschool Street	Narrow Toe Lane	St Peter's Gardens	St Peter's Terrace	Totals
1851 Census						
No. of residents	178	88	32	11	57	366
No. of households	36	21	10	4	12	83
No. of occupations listed	94	47	13	4	27	185
*Shoeworkers (male & female)	59	23	4	—	16	102
**Other leatherworkers (ditto)	7	1	3	—	3	14
1871 Census						
No. of residents	165	128	35	14	47	389
No. of households	40	28	10	4	10	92
No. of occupations listed	77	61	16	12	26	192
*Shoeworkers (male & female)	31	29	5	3	20	88
**Other leatherworkers (ditto)	9	5	1	1	—	16

*Includes boot and shoemakers, cordwainers, clickers, blockers, closers, binders, liners and fitters (1871 only).
**Includes curriers, tanners, leather dressers, leather dyers, leather cutters, skinners, fellmongers.
In 1851, one empty house in Narrow Toe Lane; in 1871, two empty houses in St Peter's Street and one each in Freeschool Street and St Peter's Gardens.

From the mid-19th century through to the mid-20th century, the area retained its links with the shoe industry as can be seen in the various directories (e.g. Roberts 1884; Lea 1900-1; Lea 1914; Marks 1928; Whipple and Martin 1936) although the dominant impression is one of gradual decline and diversification of occupational activity away from the shoe and leather trades. Even so, as late as the 1960s the area still displayed above ground many physical characteristics reflecting its long history: the Norman church of St Peter; Haselrig House, the shrunken capital messuage on Marefair with garden and outbuildings extending back to St Peter's Street; other lesser town houses of mid-18th to early 19th century date also fronting Marefair (by then converted into shop premises); the early 19th century housing terrace of St Peter's Gardens; and the mixed residential and industrial complexion of St Peter's Street and Freeschool Street of the mid- to late 19th century and largely attributable to the shoe industry. Decline since the Second World War, however, has been both rapid and complete; in 1977, as the area awaits redevelopment, there are no residents or standing properties in any of the streets mentioned in Table 8 apart from a handful of business premises on the east side of Freeschool Street.

SYNTHESIS

by J H Williams

Introduction

Fig. 73

The problems of arriving at an overall chronology for the street were discussed in the general introduction and the flexible system of phasing was described (above, p. 10). The development of individual properties, however, must now be fitted into an overall framework. A chronological bar-chart (Fig. 73) attempts to relate the main houses to each other from the Late Saxon through to the medieval period. A solid bar has been employed where the evidence suggests structural use of the individual area. A broken bar has been used in cases where there is evidence of activity or possible activity in the area by way of pits or other rubbish accumulation. Additionally, Phase 4 is introduced by a broken bar to indicate there is some doubt as to its precise beginning and similarly the broken bar between Phases 4 and 5 and Phases 5 and 6, while indicating possible lack of continuity in the way of structures on the site, is also intended to suggest a lack of precision as to the start and finish of the respective phases. Thus it is possible that the structural phases and accordingly the solid lines should be somewhat longer than depicted on the chart. The failure to be more precise is disappointing but represents a true picture of the available evidence.

Because of the flexible phasing the street as a whole could not be discussed by phases and is treated, therefore, by chronological periods of greater or lesser length. Each period is accompanied by a plan. Archaeological features drawn in black almost certainly belong to some time within that period while those drawn in red may or may not have belonged to the relevant time.

The prehistoric to Early Saxon periods

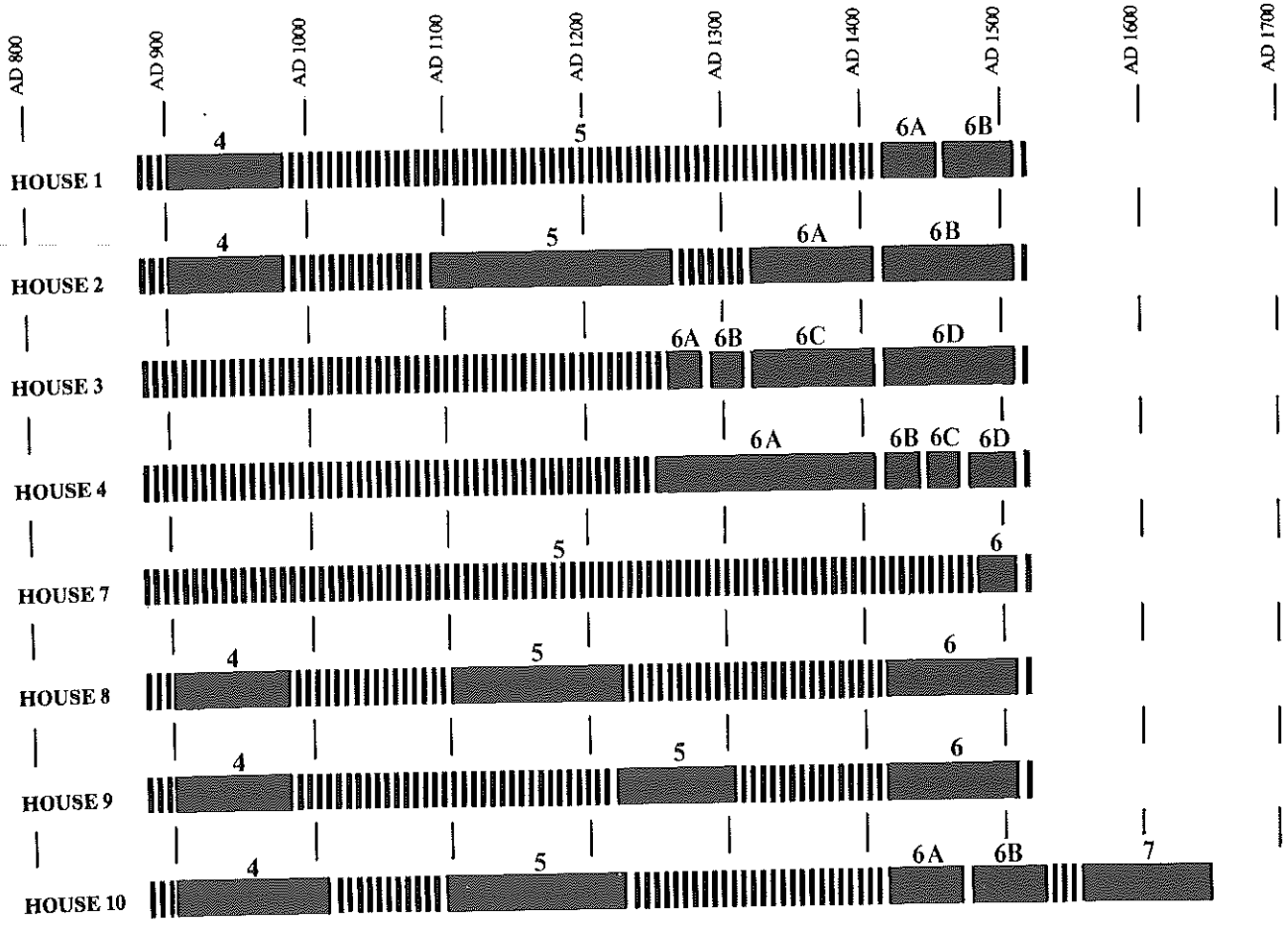
Fig. 74

The only 'structural' archaeological feature clearly belonging to this long time-span is the ditch at the west end of the site but artefactual evidence, while not prolific, seems to indicate at least passing occupation in the area.

The ditch cannot be precisely dated but the absence of pottery and other finds of a later date suggests that it is prehistoric and this would seem to be corroborated by the increased density of the flint scatter in and immediately adjacent to the ditch. Most of the flints are of neolithic type although there is a small mesolithic element and a single palaeolithic scraper. The site, possibly a small defended farm, lay on a well-drained knoll overlooking the probably marshy environs of the river Nene and would have been an attractive site to early settlers. The snail assemblage from the ditch, however, suggests dense scrub or woodland with an absence of grazing animals or arable farming. Somewhat greater concentrations of flints have been excavated immediately to the north-west on Marefair (NDC site no. M178) and Northampton Castle (NDC site nos. M138 and M139 (Chalk Lane)), and indeed on the Chalk Lane site there are also gullies, pits and possible house sites. Extensive flint scatters have also been recorded to the west of Northampton including from the excavation of the Roman settlement at Duston. Such occupation should probably be seen as part of the pattern of wider early occupation on the lighter soils to the north of Northampton (Hall

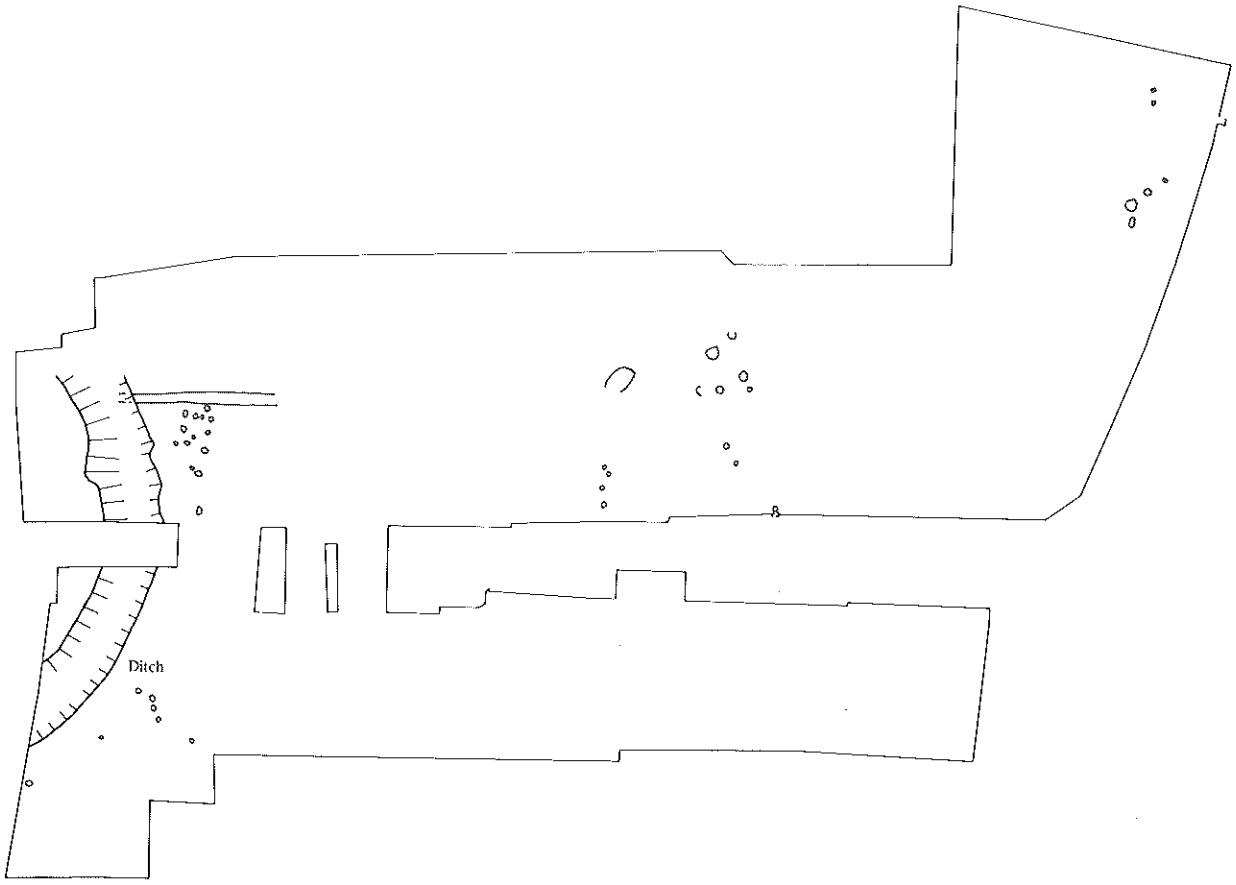
Fig 73

St Peter's Street phasing

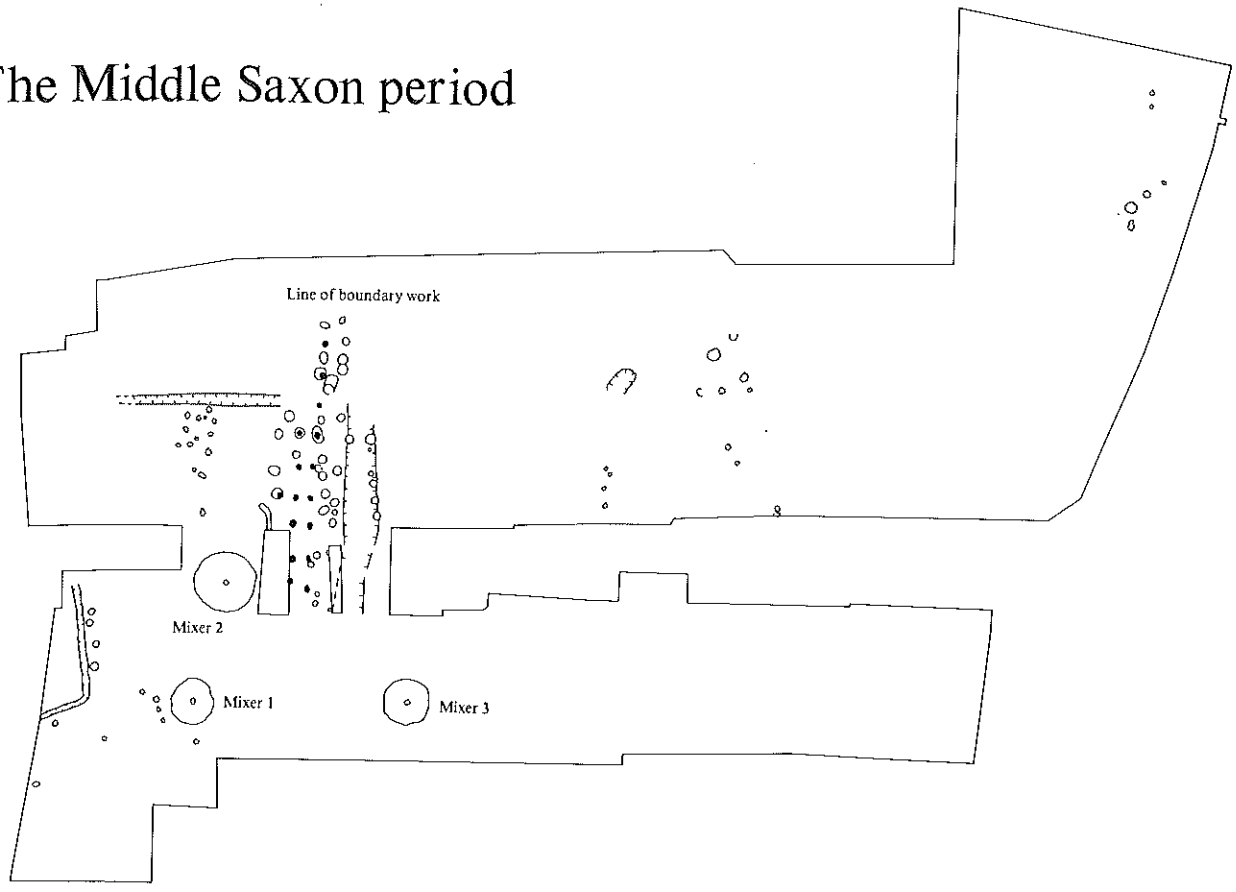


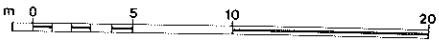
The prehistoric to Early Saxon periods

Fig 74



The Middle Saxon period





1977 citing Hall and Martin forthcoming). The density of the material lends support to the interpretation of the causewayed camp at Briar Hill as some form of focal point.

For the later prehistoric period the evidence is rather sparse being confined to a very few possibly Iron Age pot sherds.

Finds of Roman date are somewhat more prolific and include five coins (Nu1-5), pottery fragments of both Samian and coarse wares and a fair quantity of Roman tile. Two further coins have been found on Chalk Lane together with Romano-British pottery from Marefair. The coins and pottery suggest at least some limited occupation in the area; the possibility of a Roman road (see above p. 4) passing through the site of Northampton should not be discounted. The presence of Roman building materials is somewhat more problematical. Their use on the site is clearly linked to the postulated Middle Saxon church (cf. e.g. Brixworth Church) and while they could derive from a nearby Romano-British building it is equally possible that they could have been transported some distance and in this respect Duston is a likely source. To date, then, there is evidence only of limited occupation on the site of Northampton itself although there was a fairly substantial settlement at Duston and the Nene Valley as a whole was quite densely occupied.

The Early Saxon period is also rather problematical. It has been argued elsewhere that Northampton may well have been a focus of some sort at this time (Williams J 1977: 134ff). Of particular interest is the late 5th/early 6th century disc brooch (Cu1) found in the Late Saxon Grubenhaus 4. The St Peter's Street excavations also produced some minute sherds of Early or Middle Saxon date but it is not possible normally to differentiate between the pottery of the two periods. Considerably more pottery of the same type is currently being recovered from Chalk Lane and this includes several fragments of decorated bossed urn which almost certainly belong to the Early Saxon period. (?)Middle Saxon pottery and a structure have also been found on Marefair. Since Middle Saxon activity on St Peter's Street is also clearly attested the relative intensities of the Early and Middle Saxon occupations must for the time being remain a matter for speculation.

The Middle Saxon period

Figs. 74-5

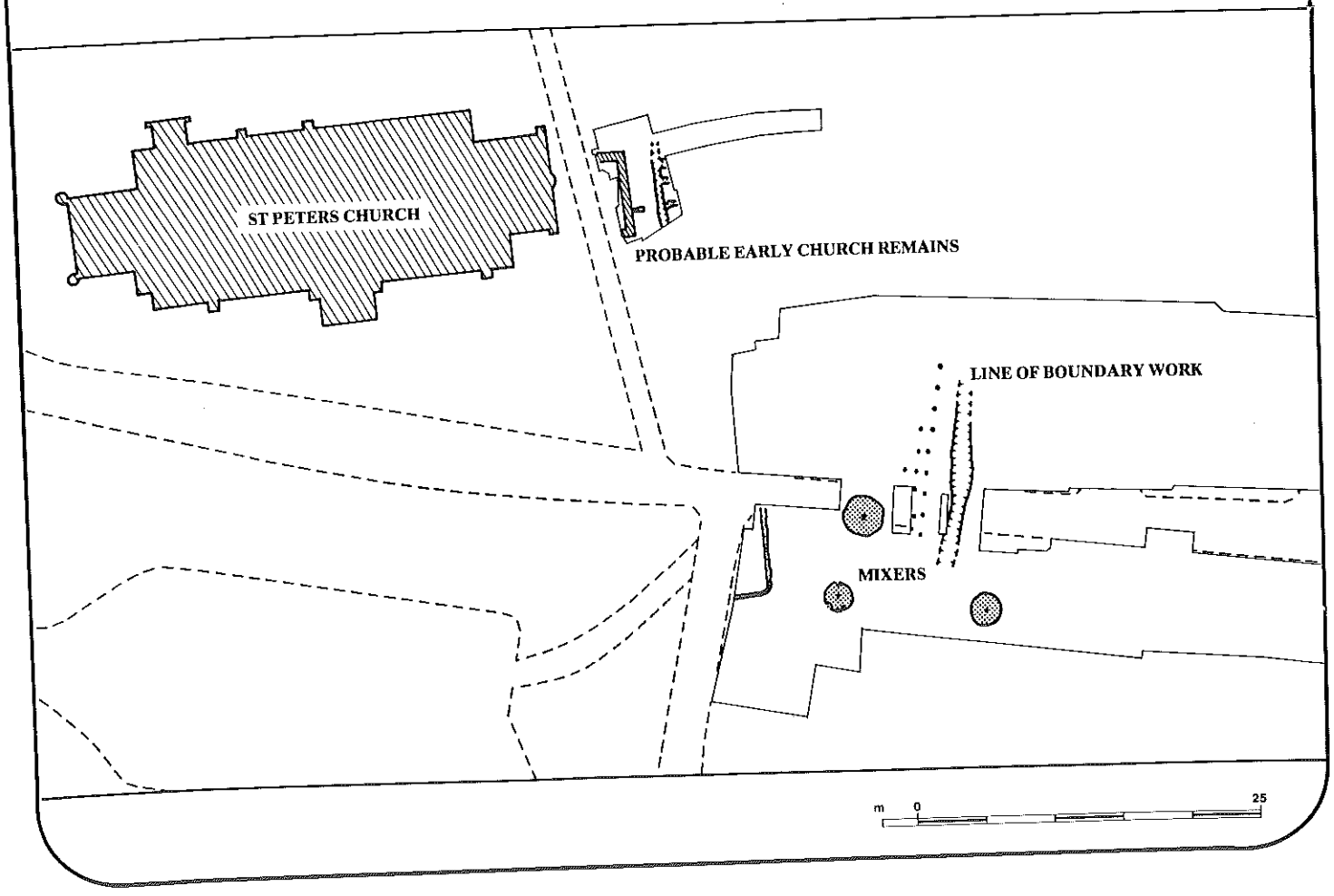
The recognition of the Middle Saxon church (area N) and associated remains (House 1, 2, 8 and 9 areas) is of immense significance, for the hypothesis of Northampton as a focal point, suggested by the concentration of Early and Middle Saxon sites in the surrounding countryside (Williams J 1977), is now given substance.

A precise chronological framework is impossible because of the lack of artefactual material, which in any case is difficult to date, and also the rather interrupted nature of the early stratigraphy. The mortar mixers, however, can probably be associated with the stone church (cf. mortar analyses p. 133; also the radiocarbon dates below) and the posts and gully in the House 2 area fairly clearly belong to the Middle Saxon period.

The environment of the site itself, on the evidence of the snails, seems to have been fairly open. Two phases of timber structures earlier than the stone church have been identified in area N, the earlier of posts set in a continuous slot and the later of individual post-holes. Both structures appear to respect the line of the stone church and it is quite possible that the timber structures also served a religious function although detailed interpretation of the remains is not possible. The Phase 2 timber buildings in House 8 may, perhaps, have been contemporary. In the absence of Roman artefacts all the timber structures should be seen as post-Roman and they clearly pre-date the construction of the stone church; if there is continuity with the stone church they must date to the late 7th or early 8th century, the precise date depending on the date of the stone church.

Fig 75

The Middle Saxon church complex



All that remains of the stone church is the square east-end unless the mortar-filled hollow N 133 is regarded as the robber trench of a rather shallowly founded wall. The width of the church at *c.* 6m is perfectly in keeping with the smallish structures of the period (cf. Cherry 1976: 158ff; Taylor and Taylor 1965: *passim*) but a clearer understanding of the status of the church would be afforded by a knowledge of the length of the east-west axis. The three mortar mixers do, however, imply a not insubstantial structure. The internal wall rendering can be paralleled in Building B at Jarrow (Cramp 1976: 238) and the surviving plaster facing on the walls of the crypts at Hexham and Ripon may be original. The mortar mixers, although so far only paralleled at Monkwearmouth, were probably quite widely used and represent an interesting addition to the study of Anglo-Saxon technology.

Dating for the church and mixers derives from four radiocarbon determinations:—

RC1 AD 670±95
RC2 AD 680±65
RC3 AD 900±70
RC4 AD 740±85

Three of the four determinations are consistent, suggesting a date *c.* AD 700, but the date of AD 900 is rather problematical, although even it is within two standard deviations of AD 740.

Gully A759 (House 2 area) and the associated post-holes cannot be firmly linked stratigraphically with the church and it must be admitted that the mortar mixers lie to either side of it. Structurally, however, the remains can best be interpreted as a boundary work. The associated dating evidence includes a sceat (Nu6), possibly a Berhtwulf penny (Nu7) and two radiocarbon determinations from the silting of the gully:—

RC5 AD 870±85
RC6 AD 940±85

These dates are somewhat later than those for the foundation of the church and we should note that the Phase 3B post-holes are stratigraphically later but assuming a reasonable life-span for the church the boundary work could well be associated with the church. Both the proposed chronology and an ecclesiastical presence seem to be confirmed by the bronze shrine fitting (Cu44), the bronze stylus (Cu100), the decorated bone pin (WB46) and possibly the fragment of glass vessel (GL40). Speculation regarding the 'Irish connection' of the shrine fitting is tempting but fraught with danger and is here avoided.

What then was the status of the site? The church could have been monastic and in this respect we should perhaps note the presence of Wilfrid at Oundle in 709 (Colgrave 1927: 41) as well as the granting to Wilfrid by Wulfhere, King of Mercia of many pieces of land in various places to found monasteries. The rather vestigial traces of the boundary work can then perhaps be seen as a *vallum monasterii* (cf. Cramp 1976: 204).

Alternatively the church could have been attached to a royal or thegnly residence (in fact, there is no reason why a monastery should not have been so attached). If one omitted the salient of the parish boundary of St Peter's which follows Marefair, Freeschool Street and St Peter's Street the parish boundary and the proposed 'boundary work' would be roughly coincident (Fig. 72). The antiquity of the parish boundary cannot be guaranteed, but if it fossilised an early perimeter work, an area of 20-25 acres would have been enclosed. The larger part of this in the early post-Conquest period would have been occupied by the castle and the church. Possibly the castle continued on an existing lordly site as at Goltho (Selkirk 1977) but alternatively it could have replaced townsfolk's dwellings as at Lincoln, Huntingdon, Norwich etc. (Ballard 1904: 67). Current excavations on the site of the castle are, in fact, revealing traces of Middle and Late Saxon occupation although the exact nature of the occupation is still to be determined.

The Late Saxon period

Fig. 76

In the Late Saxon period there was a dramatic intensification of activity on the site witnessed by an increased number of structures and pits and an abundance of pottery and other artefacts. Occupation, evidently of a secular nature, spread to both sides of the now silted-up boundary ditch of the church.

It is possible to isolate limited stratigraphical sequences at both ends of the site but the establishment of an overall chronological framework rests primarily on the interpretation of a mainly horizontal stratigraphy associated with Late Saxon pottery. Further refinement of the phase's development through the pottery has not been possible although it may be that the Grubenhäuser are rather later than the initial occupation of the west end of the site.

In fact, the separation of Phases 4 and 5 is in many areas problematical. Phase 4, however, essentially comprises random, apparently non-street-related buildings associated with Late Saxon material while in Phase 5 a street has been laid down along the present line of St Peter's Street, perhaps formalising an earlier lane, and buildings are closely related to this street. With the horizontal stratigraphy some structures cannot be firmly assigned to either phase.

The earliest Phase 4 feature at the west end of the site was a timber post-built structure, *c.* 7×4m (building 1), lying to the north of a metalled area with possibly further timber structure(s) (building 3) to the south. These buildings may have been grouped around a courtyard entered by a gate represented by posts F80, 195 and 140. The metalling continued to the east where it was flanked by timber buildings to the north and south (buildings 5 and 6) but whether these latter buildings belonged to this early phase or are somewhat later is not clear.

With the replacement of building 1 by building 2 metal-working apparently developed. A460 was certainly a small metal-working furnace and F209 may well have been the same and the partly filled in pit F70 was perhaps a non-slag-tapping furnace. Several pits contained slag (A528, 576; F70, 79, 202, 207 etc.). Indeed it would appear that the whole of the west end of the street was a single metal-working complex. Perhaps a little later further timber buildings were erected in the House 8 area, notably building 4; the large number of post-holes suggests more than one phase of activity but individual buildings cannot be separated out.

In the middle part of the site there was little or no activity. There is a scatter of isolated post-holes but little in the way of pits or Late Saxon pottery and it is perhaps best to consider the post-holes as post-Conquest.

To the east were four Grubenhäuser and a number of pits. (There was a further possible Grubenhaus in area N.) The huts could not all have been contemporary. Grubenhaus 2 clearly had two phases and it is unlikely, because of their close proximity, that Grubenhäuser 2 and 3 were contemporary. Additionally Grubenhaus 4 was cut by pits K158 and K189. No specific functions could be assigned to the Grubenhäuser, although an interesting 'industrial' assemblage of iron and worked bone objects was present in Grubenhäuser 2 and 3. It also seems probable that the floor was the sunken ground level rather than a raised plank floor. The many slots and post-holes at the east end of the site are probably to be associated with a later period and it is possible that the Grubenhäuser themselves were not necessarily contemporary with the post-built structures at the west end of the site. The timber structures straddled the boundary ditch of Phase 3 but there is no reason why a church should not have continued to occupy the site of St Peter's Church although there is nothing in the archaeological record to elucidate its development at this period. Did the church survive the Danish occupation of Northampton in the late 9th century?

The picture gained from the site as a whole is one of concentrations or nuclei of activity whether social or economic. Metalling F138 and G138 follows roughly the line of the later street if in somewhat meandering fashion and it might perhaps be suggested that it was a formally laid out street on the planned town model but the generally random arrangement of buildings does not seem to support the idea of imposed authority. Furthermore the metal-working complex at the west end of the site seems to be disposed around a yard rather than split between two sides of a street. The metalling could,

however, be a lane leading to this complex which was, at least initially, entered by a gate. The small patch of metalling in the north-east corner of House 7 could also relate to an earlier form of Freeschool Street.

The idea of social/economic units formed of clusters of buildings is perhaps further developed through the presence of the Grubenhäuser which should not be considered in isolation but rather be regarded as part of a larger complex. The close association of halls and Grubenhäuser is now generally accepted (cf. Radford 1957; Addyman 1973a: 70). Should the Grubenhäuser, however, be associated with the western complex of buildings or rather with halls in unexcavated areas? The answer is probably not so significant as the recognition of the fairly loosely arranged building groups as basic modules within the urban structure. The limited environmental analyses further suggest an open environment.

At the west end of the site the timber buildings were overlaid by a general green level, certainly in the areas of Houses 1, 2 and 8 and possibly of House 9. Pit A547 was probably contemporary. It must be seriously queried whether this accumulation of soil represents a phase of dereliction when the site was temporarily abandoned and the environmental evidence from pit K189 perhaps supports this idea.

The artefactual evidence is of interest. Metal-working certainly was carried out and there was possibly a bone-working industry as a large number of bone objects and a quantity of antler waste have been found. Pottery also was more plentiful now and included the local fine sandy Northampton ware. It is also possible that there was some pottery imported from the continent (see however p. 165). The commercial and industrial life of Northampton was on the upswing.

The dating of this phase of activity is not easy. Bone from the silting up of the Phase 3 gully (see above p. 247) produced radiocarbon dates of AD 870±85 and AD 940±85. Two Edmund memorial pennies (Nu8,9) were associated with the iron-working at the west end of the site, and a penny of Athelstan (Nu11), probably deposited AD 930-960, was found in pit K160. Radiocarbon dates from the Grubenhäuser were rather unhelpful. Dates of AD 780±80 and AD 1090±80 from Grubenhaus 2 and AD 1250±75 from Grubenhaus 3 (RC7-9) simply confirm their Late Saxon date.

The beginning of the phase dates at the latest to the early part of the 10th century but it is impossible to say whether the phase is earlier or later than 917 and therefore whether the increase of activity is a result of Danish or Saxon initiative; firm archaeological evidence for Northampton during the Danish occupation is unfortunately elusive. If the extremely corroded coin from gully A759 (Nu13) is indeed of 10th century date this would certainly add weight to a late date for Phase 4. The phase certainly continued into the latter part of the 10th century, possibly into the 11th century. The absence of any coins later than Edgar coupled with the green (?)dereliction level mentioned above perhaps suggests a break in occupation before Phase 5 but the precise duration of such a break is, of course, impossible to determine.

How far the organisational pattern as displayed by the St Peter's Street excavation is typical of Late Saxon towns in general is difficult to say. Biddle and Hill (1971) have argued that the burghs of Wessex were founded by Alfred at a single stroke as fortified towns 'in which the rectilinear street plan is a deliberate expression of the organisation and apportionment of land for permanent settlement'. Biddle further saw the earlier Mercian centre of Hereford as planned (1976: 120ff): 'planned in this context implies that the town had been laid out in a regular pattern at one moment in time with the purpose of dividing and apportioning the ground for permanent settlement. It is the deliberate organisation of space that is the critical factor'. The extent to which current thinking finds planned elements within Saxon towns must, however, be questioned as it places the emphasis in town development on political rather than economic considerations.

The main north-south and east-west axial streets of Lee's early enclosure at Northampton (see above p. 5) could be regarded as elements of a rectilinear-planned street pattern but they can equally be demonstrated to have originated as major north-south and east-west route-ways. There is indeed a danger of imposing a planned town on the basis of minimal topographical evidence.

Whether the metalling of Phase 4 is an incipient street or not it certainly lacks the regularity etc. demanded of a planned layout.

Biddle (1976: 133) is less certain of the way the area between the streets was organised but suggests from the Winchester evidence that the land was parcelled out in large blocks of perhaps ½ hectare each. Within these blocks each lord would have enjoyed considerable jurisdiction and may have erected a house, church etc. With time these larger estates may have been subdivided to produce the typically medieval long narrow burgage plots.

The building clusters on St Peter's Street are apparently not primarily dependent on the street although there is little evidence of plot boundaries and excavations on the site of Northampton Castle are currently (1978) uncovering a further fairly extensive building complex which again is apparently not dependent on a street. The complex includes a cellared timber hall, Grubenhaus, yard area, pit area and cultivated land and may belong higher up the social scale than the St Peter's Street buildings. Excavations to the north of Marefair have, however, revealed structures within the Middle Saxon period possibly fronting on to the street.

There is little evidence to date from this country for the whole of the Saxon period and any comments must be tentative. Buildings at Hamwih tended to be disposed along the street frontages but little is so far known on the size of individual properties or their relationship with each other (Addyman 1973b: 223; Holdsworth 1976: 31ff). Charter evidence from Canterbury also suggests a fairly well built up street frontage (Stenton 1971: 527). At the so-called village level regular organisation of properties can be seen at Chalton (Addyman and Leigh 1973) but this contrasts with the more irregular disposition of buildings at West Stow (West 1969) and Catholme (Webster and Cherry 1976: 170). Thetford appears to have been an 'open plan town across which ran a network of arterial roads' (Davison 1967: 191). Most other sites have not had sufficient areas stripped to enable the problems of settlement organisation to be discussed.

The very limited evidence from Thetford and Northampton indicates discrete social or economic units formed of one or more buildings more or less regularly disposed in a yard and set within a fairly informal urban framework. The economic or social units are obviously to be expected and the loose arrangement of buildings may reflect the absence of commercial pressures on street frontage sites either because of the organisation of the Saxon town or because the sites so far excavated are situated away from the Saxon commercial centre. Certainly there is no evidence for imposed planning at the lower level.

The loose agglomeration of social/economic units so far found in Northampton does not affect Northampton's status as a town. Indeed Northampton satisfies extremely well many of the criteria currently accepted for a town (Biddle 1976: 100). The understanding of the organisation of the Saxon town can only be developed, however, by the large scale stripping of multi-property areas.

The late 11th-13th centuries

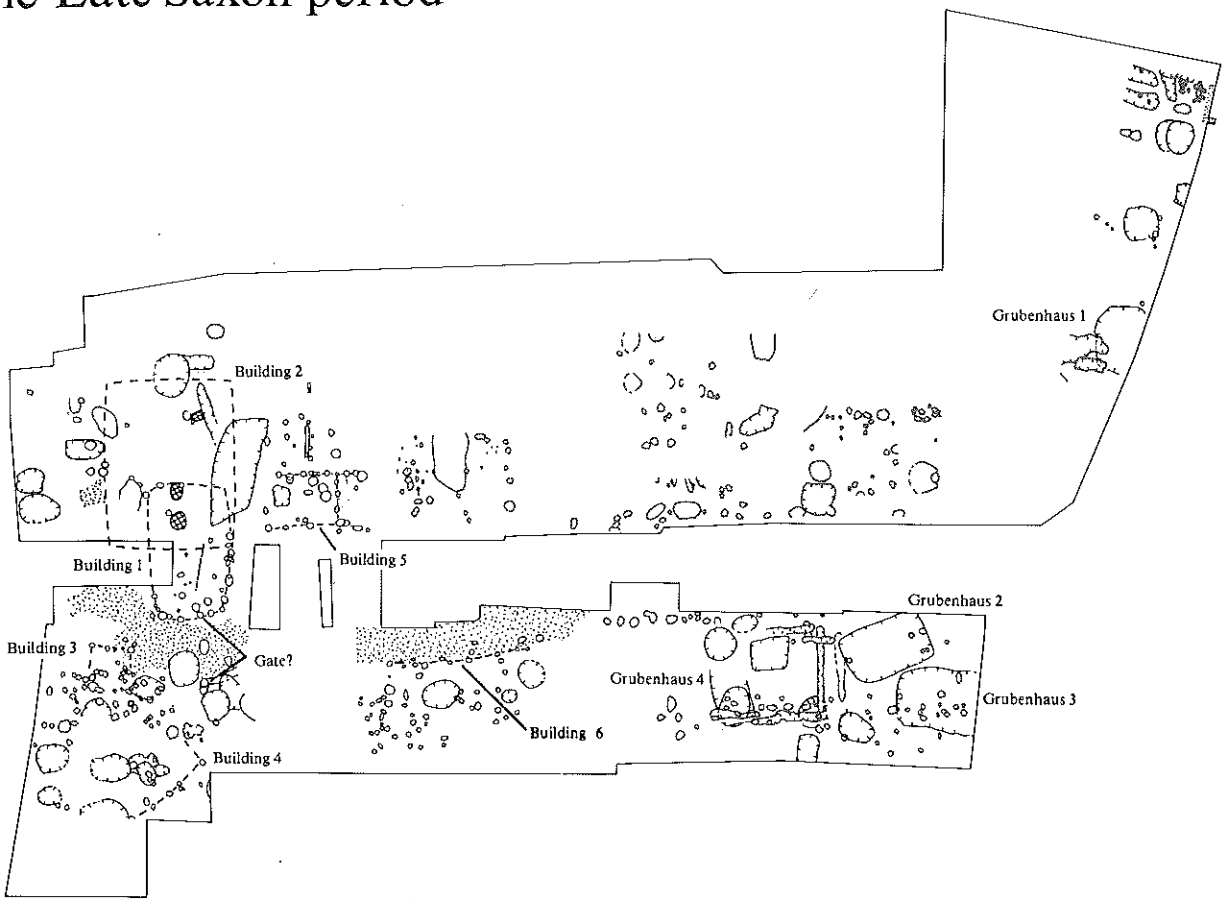
Fig. 76

The development of the site in the centuries immediately succeeding the Norman Conquest is extremely difficult to establish clearly. Timber post-hole structures belonged to this general period but floor levels were largely eroded away and individual buildings can only be identified from post-hole alignments. Coin evidence is virtually non-existent and pottery is not plentiful, nor can it be dated precisely. Furthermore, even where pottery was present in post-holes it is necessary to consider whether it is likely to have been deposited at the time of the building's construction, during its life, at the time of its demolition or decay or whether it found its way in, perhaps through animal action, at some later time.

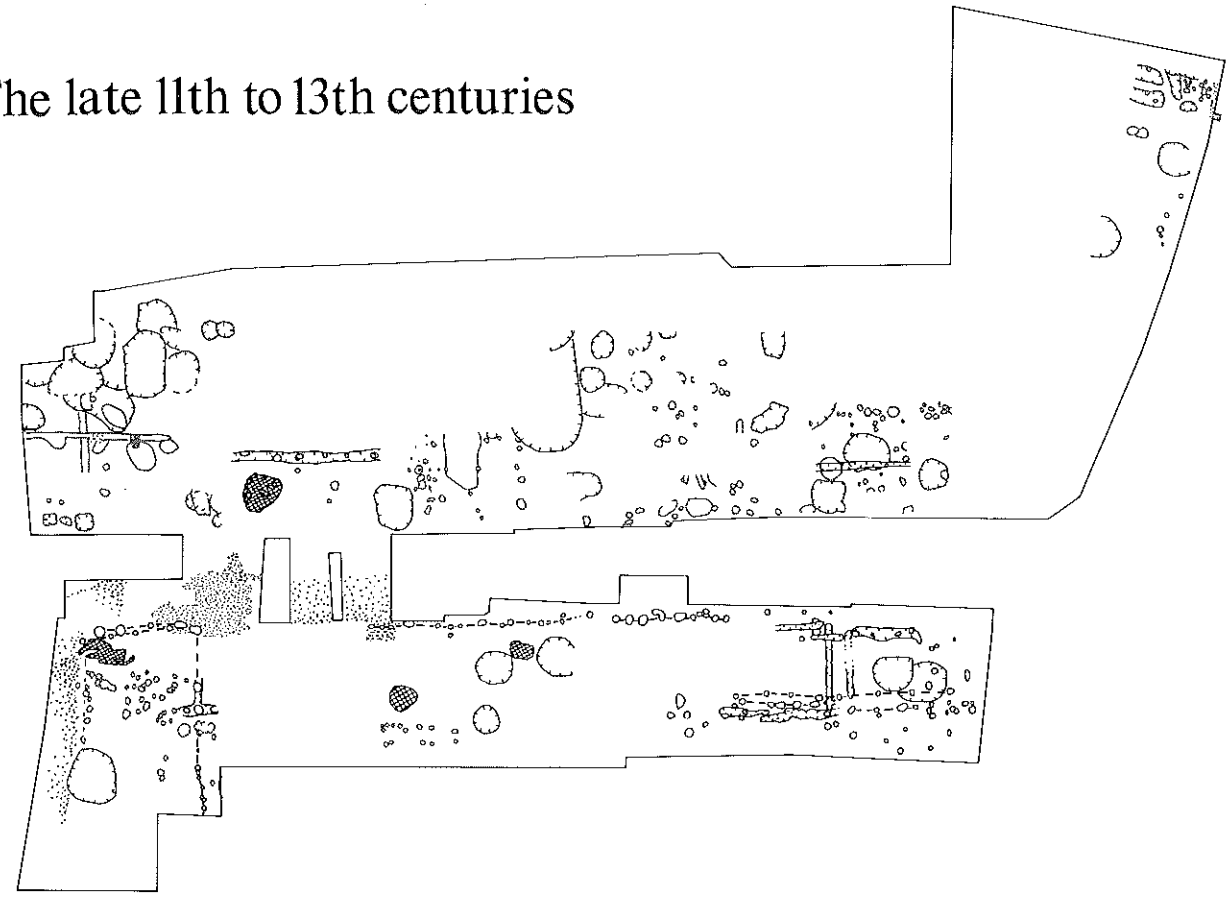
At the west end of the site a metalled surface was laid down over the top of the 10th century buildings and the later green level identified as a possible period of dereliction. The metalling, as far

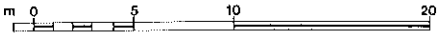
Fig 76

The Late Saxon period



The late 11th to 13th centuries





as can be judged, assumed the line of the later street along the whole of its length and additionally a spur extends south down the present Narrow Toe Lane.

It can be argued that rectangular timber buildings respecting the line of the street were erected along the street frontages to the north and south. Post-holes, 'pier bases' and slots in House 1, perhaps of more than one phase, date to sometime between the late 11th and 14th centuries. Phase 5 in House 2 is probably within the period late 11th to 13th centuries. There is little or no evidence for timber structures for House 3. In Houses 4-6 post-hole alignments suggest timber buildings fronting the street but it is not possible to pick out a single complete building plan. A timber building was possibly present at the north end of House 7. A rectangular timber building fronts the street in House 8 and a line of posts along the frontage in House 9 may be a further building. The post-holes and slots in House 10 seem to indicate at least three sub-phases of timber building. If the post-holes which cut pit K72 belong to these buildings, and this is probable, one at least of the timber buildings must be as late as the 12th century and quite probably the 13th century.

The buildings appear to have been set with their long sides along the street. House 8 may well have measured 6×4m if F77 is taken as an end-wall line. House 10 was *c.* 4m deep from the street if the slots are all regarded as part of a single phase (the general disposition of post-holes in this area would suggest such dimensions anyway). There is little evidence for the length of the houses but since the 4m depth is consistent with the depth of the later stone houses, one wonders whether the end-walls of the houses lay under the later stone end-walls, thus giving timber houses of generally 8m length. Indeed slot A372 in House 2 does not extend into either the House 1 or House 3 areas and, assuming it is the rear wall of a building, confirms the postulated 8m house length.

Assuming timber buildings as suggested along both sides of the street it is still impossible to date precisely their construction or whether all the buildings were contemporary. Apart from House 10 there seems to be little evidence of rebuilding, (although it is possible that there were buildings of which no traces survived), so the problem remains as to the life of individual structures. Was the occupation of the site continuous? Did it start in the late 11th century and carry on into the 13th century or did it start at a later point within the period? Was the construction of the street a single development or was it piecemeal? Again, did the street remain totally built up at any one time?—for a number of pits lay within the areas of the houses themselves and some on the lines of the assumed property boundaries.

The evidence is indeed very fragmentary but there is a contrast with the 10th century layout of the site. At that time there appear to have been discrete clusters of buildings which were non-street-related but the impression now is of individual house plots arranged along the street with buildings set on the street frontage and parallel to the street—in fact a normal pattern within medieval towns. If the House 2 evidence of a timber building occupying exactly the same area as the later stone house is accepted and if this is regarded as typical for the street it would appear that the land on either side of the street was divided up, at least partially, into house plots sometime between the late 11th and 13th centuries. The pit groups suggest activity throughout the period and the coins of Henry I (Nu14) and Stephen (Nu15) perhaps confirm this. It does not seem unreasonable then to suggest that the street as such came into being perhaps in the late 11th or early 12th century. This was a time of expansion for Northampton as is witnessed by the dramatic increase in the farm of the town and is perhaps a result of the economic stimulus provided by the establishment of the castle, St Andrew's priory and the *novus burgus* of French settlers (see above p. 5).

The late 13th century

Fig. 77

The second half of the 13th century probably saw the appearance of stone buildings on the street, namely Houses 3 and 4.

House 4 was set with its gable end on the street and measured 12×5.75m, narrowing to 5m. It was somewhat larger than any subsequent structure on the street and the walls were more substantial and better finished than later work, with neat internal coursing. The absence of mortar in the walls (see also below p. 145) argues against the walls being of great height in stone and the slightly wedge-shaped plan is not ideal for a prefabricated timber superstructure. The walls nonetheless were deeply founded and fairly massive and a two storey structure, presumably with the upper storey in timber, would not seem unreasonable in this instance. The overall size of the property was also rather large for there was a walled yard area containing an oven to the east of the house.

Only limited parts of the lower courses of the foundations survived in House 3 and these were crudely constructed but this need not be any reflection on the superstructure. The house was rather smaller than House 4, measuring 8×6m, with its long side on the street and the case for two storeys is less cogent (see also below p. 145).

House 4 would appear to be the earlier structure for although the junctions between the two houses have been disturbed the west wall (B1) of House 4 seems to be continuing south beyond the point at which the north wall of House 3 would have joined it. Presumably the north wall of House 3 would have abutted the west wall of House 1. No evidence for internal arrangements survived within either house.

Crucial to the dating of the construction of this stone phase is pit B187 which is earlier than both houses. The pit is unlikely to have been earlier than 1250 and it seems reasonable, therefore, to attribute the new stone buildings to the second half of the 13th century.

It is difficult to envisage the contemporary scene on adjacent properties. The problems associated with the layout of the street in the immediately preceding centuries are discussed above and the question must now be asked whether any of these earlier timber buildings continued in existence alongside the new stone structures or whether parts or all of the area became derelict as is argued for the south side of the street in the 14th century. There is however no firm solution although it should be noted again that the west wall of the House 2 timber period is probably the same as the 15th century House 1-2 boundary.

The only indications of the status of the occupants of the new stone houses are the structures themselves. House 3 is fairly modest but House 4 would have been fitting for an artisan of some means.

The 14th century

Fig. 77

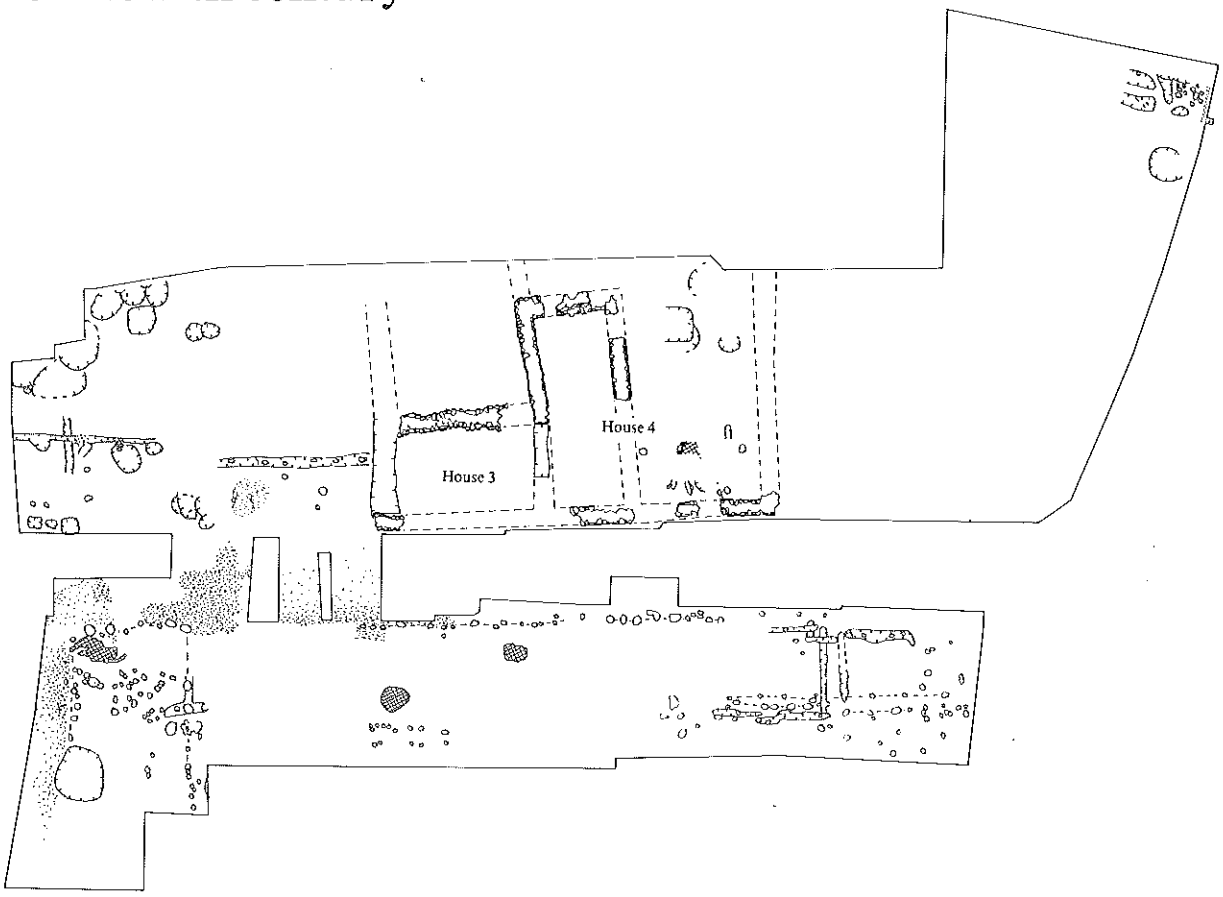
The 14th century was basically one of stability. House 4 remained unchanged although it is probable that the oven was no longer used and soil was accumulating in the yard area.

House 3 was rebuilt and House 2 was constructed in stone. The front wall of House 2 can be seen to be later than the initial House 3 structure and it seems reasonable, on the basis of the coincidence of the rear wall lines of House 2, Phase 6A and House 3, Phase 6C, to suggest that the erection of House 2 was contemporary with the reconstruction of House 3. On initial consideration the dating evidence from the two houses would appear to be at variance with this for the pottery from House 2, Phase 6A is somewhat earlier than that from House 3, Phase 6C. The pottery from House 2, however, is almost entirely from walls and therefore pre-dates the phase whereas the House 3 pottery is from floor levels.

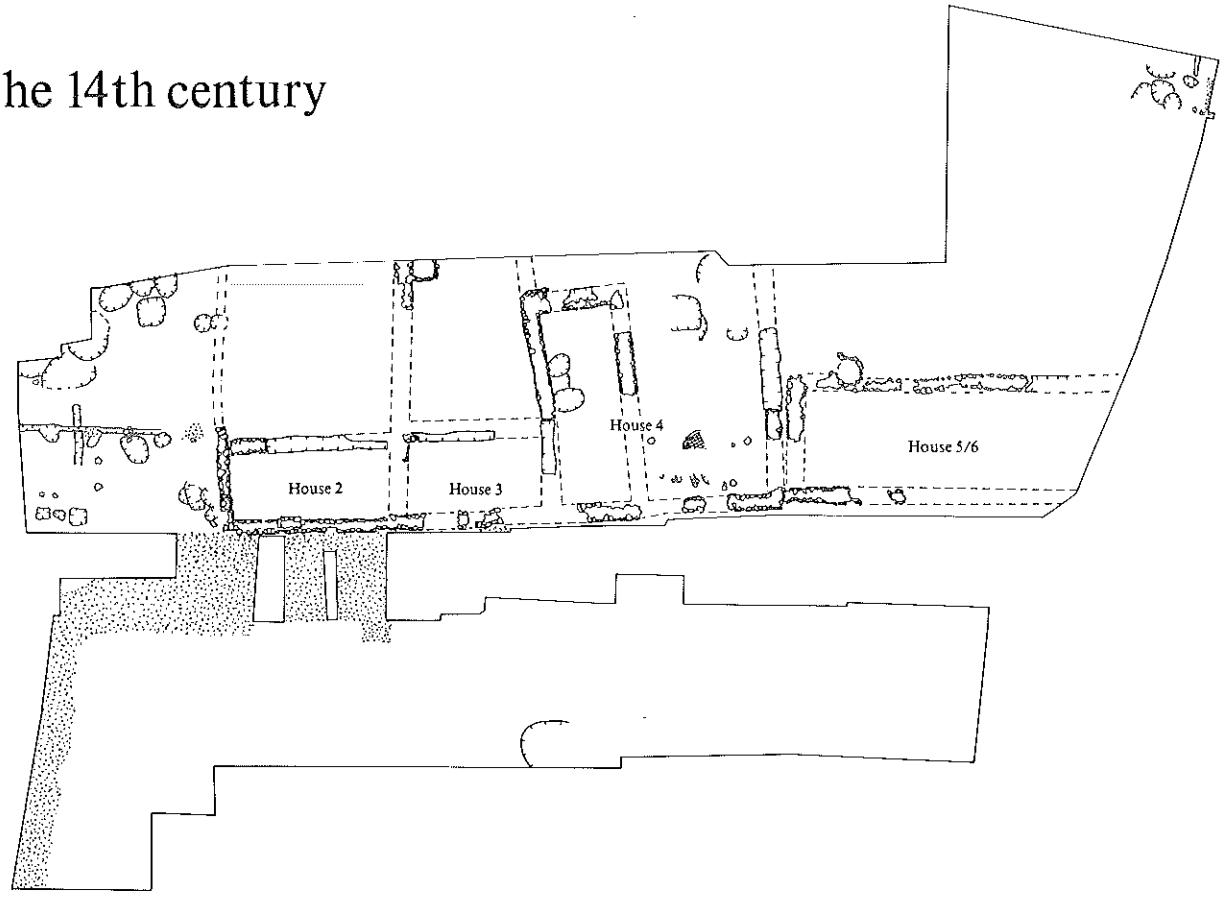
The walls of the two houses varied considerably. The west and north walls of House 3 were very shallow indeed. The south walls of both houses were fairly substantial as was the north wall of House 2. The west wall of House 2, however, although deeply founded was extremely narrow. This variation in foundations poses questions about the above ground character of the buildings although, indeed, one of the claustral ranges of the Greyfriars at Northampton had similarly variable foundations (Williams 1978). Although the houses are somewhat narrower than their successors in the 15th century the problems of the superstructure are similar and the reader is referred below for discussion.

Fig 77

The late 13th century



The 14th century



It is also possible that Houses 5 and 6 were erected in the 14th century but the evidence is so fragmentary that no firm conclusion can be reached.

The area to the south of the street may have lain waste during the 14th century. In House 9 there was a build up of a homogeneous brown soil containing pottery of 14th century date. There was a similar build-up of soil in House 8 but possible tip lines could be made out within the layer and it could be argued that F32 was a deliberate make-up for the Phase 6 structure. No such soil level survived in House 10 but the considerable erosion and deeply cut features in that area could well have been responsible. A period of dereliction leading to the wholesale reconstruction of the street *c.* 1400 is an attractive one as a further example of the cyclical pattern within urban development—namely construction, decay and renewal.

The early 15th century

Fig. 78

The whole of the street was apparently reconstructed in a single action probably early in the 15th century, a *terminus post-quem* being provided by the coins of Edward III (Nu19) and Richard II (Nu20) in House 4, Phase 6A.

With the imprecision of pottery dating and the loss of many key stratigraphical relationships through later robbing the idea of a single concerted operation is dependent on the general uniformity of the building pattern on either side of the street and of particular importance is the rear wall line of the houses to the north of the street. Here the previously variable pattern was now made standard.

House 1 was constructed in stone for the first time and was clearly later than the west wall of House 2 which originally belonged to an earlier phase. Houses 2 and 3 were rebuilt, both with their rear wall lines further north and continuing the line of House 1. House 4 was strikingly converted into an L-shaped house with again one wall continuing the north wall line of Houses 1-3. To the south of the street the houses were of a similar depth to those to the north.

All the houses to the north of the street were basically rectangular boxes 8-12m long by 6m deep and it is quite possible that those to the south were similar in plan. Very shallow walls, which line up with the House 1-2 and House 2-3 property boundaries to the north of the street, possibly defined the eastern limit of House 8 and the western limit of House 9. Houses 1-3 were also consistent in having small outbuildings at their rear, although that in House 1 may have been slightly later than the other two. In other respects, however, the individual houses varied. For example, House 1 had its own oven set inside one room, House 4 retained the rear portion of the previous house and also had a drain running through the property. House 9 had an oven set into its outside wall.

In area N there was certainly some activity at this period, perhaps associated with House 1 but alternatively with a property fronting on to Marefair. In trench E a stone house appears to have been erected for the first time.

Two questions are of particular importance—the precise character of the development as a whole and the nature of the superstructure of the individual buildings—and the latter issue is to some extent dependent on the former.

From the early 14th century terraces began to be erected in York (Raine 1955: 47) and examples of such developments to be found in King's Lynn, Exeter, Winchester and Coventry are discussed by Platt (1976: 66). The building contracts for rather larger developments in London of 20 and 18 shops respectively are contained in Salzman (1967: 441, 443). Individual properties could be as narrow as 3m, which is considerably smaller than the St Peter's Street houses, but the developments tended to be more regular in plan than St Peter's Street, as for example the row of six Wealden houses in Spon Street, Coventry (Jones and Smith 1960-1: 25). It should be noted however that the Coney Street terrace in York was 15ft (4.6m) wide at one end and 18ft (5.5m) wide at the other (Raine 1955: 151; Salzman 1967: 430). The consistent depth of the St Peter's Street houses is most striking and there is no reason why a comprehensive redevelopment should not respect the vagaries of existing property boundaries. If, perchance, the rebuilding of the street was a result of initiatives by several individual householders it still occupied but a very brief period of time.

But how were the St Peter's Street houses constructed? (pers. comm. J T Smith for several comments below). The foundations discovered were fairly massive and would have supported a substantial superstructure but they were unmortared and, as found, fairly level, perhaps suggesting dwarf walls for a half-timbered building. The walls, however, were interrupted in many places by robber trenches and the closeness of the tops of the walls to the modern ground surface would have tended to produce a consistent upper surface to the wall. Furthermore, the extremely deep foundations in areas of soft ground were consistent with stone walls. Were the buildings, then, of one or two storeys? The lack of mortar in the walls, noted above, argues against stone walls being taken up a great height but an upper storey could well have been half-timbered, although the local irregularities of plan perhaps indicate that prefabricated timber framing was not used and this would be consistent with such buildings erected before the middle of the 15th century. The lack of clear chimney structures perhaps favours single-storeyed buildings but an elementary timber chimney could have been employed and the hearths in Houses 4 and 9 could have had such an arrangement.

The Coney Street terrace in York was clearly provided for in this way:

'et quelibet camera habebat unum caminum cont' quinque pedes infra mantellum et hoc de emplastro et unum luvarium similiter.' (Salzman 1967: 430), but no evidence of any chimney structure has survived to the present day (pers. comm. D Black, RCHM, York). Alternatively the house could have had a solar at one end with the 'hall' open to the eaves at the other end where an open fire would have been placed. The Spon Street terrace at Coventry is a fine example of this (Jones and Smith 1960-1).

The integration of industry within residential areas in the medieval period is well established and is further evidenced here. The pits in area N were perhaps connected with tanning and the clay lined trough and horn cores in House 4 may relate to some industrial function. The two drying ovens in House 10 perhaps provide the clearest evidence. Finds of spindle whorls indicate spinning and Oakley (below, p. 248) suggests on the evidence of bronze waste and the artefacts themselves that pins and lace tags may have been manufactured in the House 4 area.

The presence of ovens in only three houses is of interest but it is impossible to determine if there was any communal use.

In spite of the various difficulties discussed the evidence probably favours a wholesale, perhaps speculative, redevelopment of the street. Whether the houses were of one or two storeys it is probable that they represent artisans' dwellings. Certainly they do not aspire to being wealthy merchants' houses and yet they are more substantial than the cottages excavated in St Pancras Lane, Winchester (Biddle 1968: 265).

The late 15th and early 16th centuries

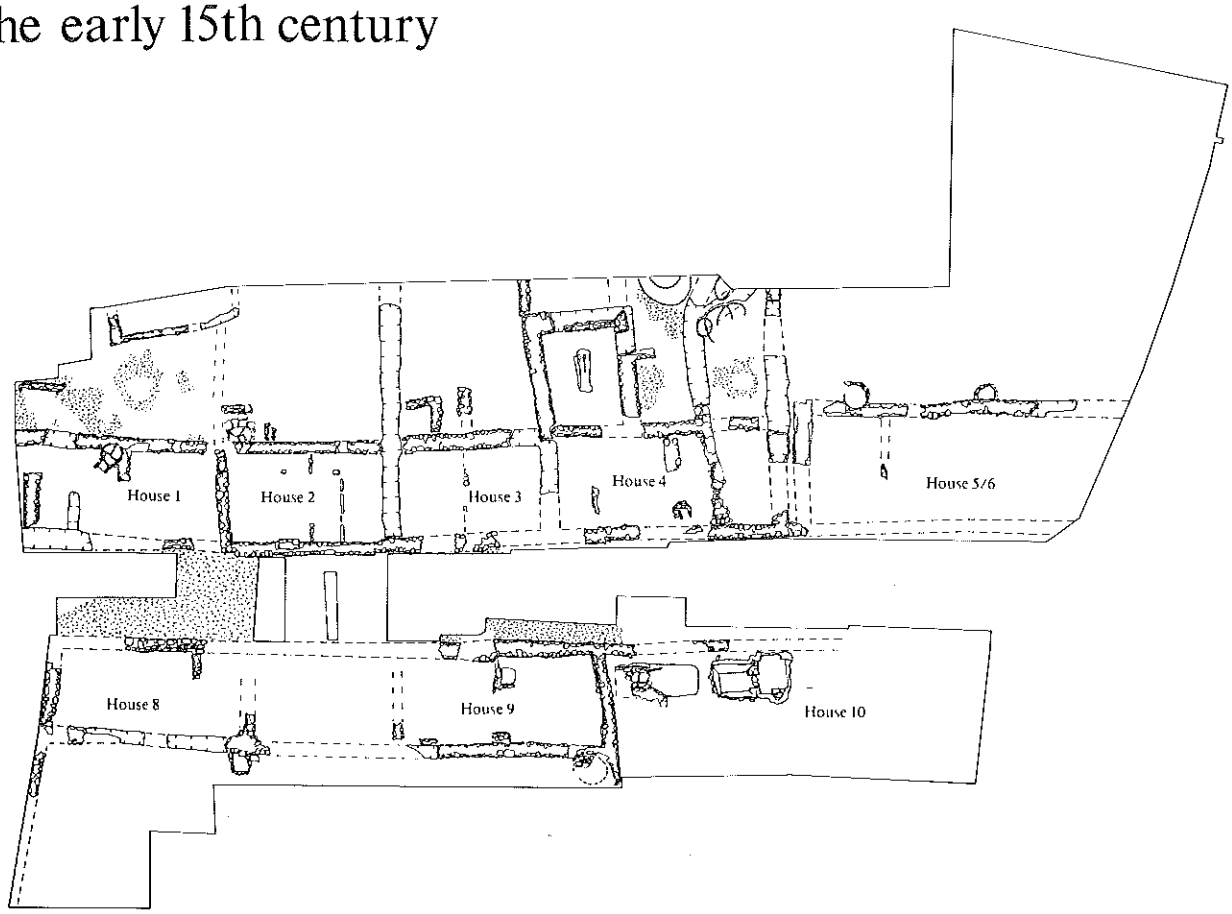
Fig. 78

The street as a whole saw little change during the second half of the 15th century. The houses themselves on either side of the street remained basically as before, with minor internal or external alterations. House 1 had an extra room added to the rear and a fine pitched stone yard was laid down. The internal arrangements within House 3 were altered. The northern end of the original building of House 4 fell into disrepair, the drain was no longer used and the whole of the back yard area was cut by a series of pits. Numerous pits were also cut behind Houses 2 and 3 but it was not felt justified to try to disentangle the individual pits in these areas.

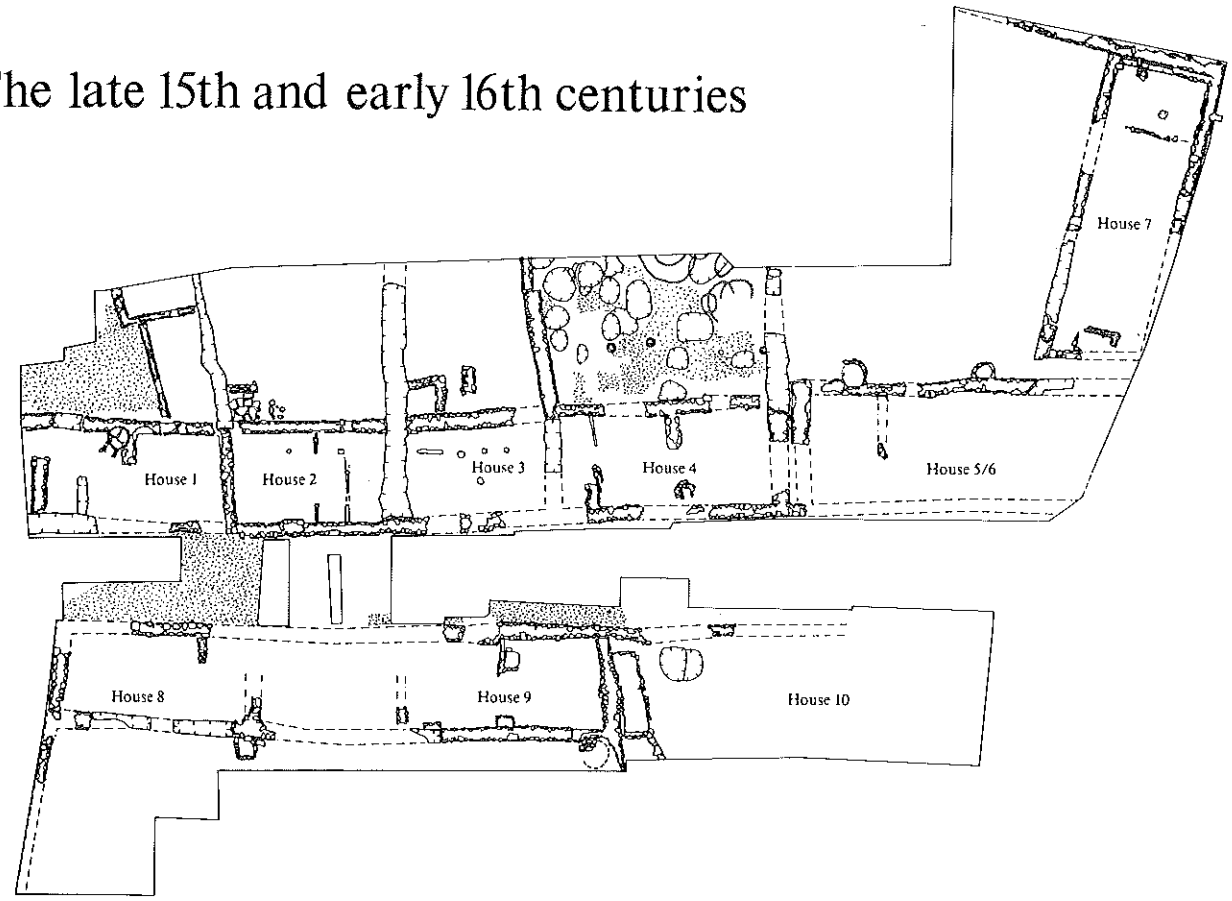
To the south of the street the houses were unaltered but the drying ovens in House 10 went out of use and were filled in to be replaced by a deep stone trough of uncertain function but perhaps connected with tanning.

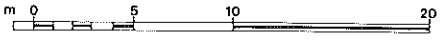
Fig 78

The early 15th century



The late 15th and early 16th centuries





The major change was the erection of House 7 along Freeschool Street. The house was rather longer than those on St Peter's Street but of the same depth. The foundations were also similar and presumably the house was constructed in a similar fashion to those on St Peter's Street itself.

At some time, probably shortly after 1500 (it is impossible to be precise because of the limited dating evidence), the whole of the street was apparently burnt down in a single fire. Burnt debris was particularly noticeable in Houses 2, 3, 4, 7 and 9 and the internal faces of many walls were burnt. Henry Lee (1932: 69) noted that in 1516 there was 'a very great fire which burnt and consumed the greatest part of the town of Northampton'. The houses were not rebuilt and most of the land presumably once more became derelict, the House 10 area alone continuing in use. Robber trenches of the other houses contain a variety of pottery, mainly residual, and also 16th and 17th century wares.

The 16th and 17th centuries

The street was now in decay apart from the skin-dressing workshop in House 10. This is fully discussed on pp. 98ff. Additionally the post-medieval documentary history of the street is treated on pp. 134ff.