Characterisation of Medieval Pottery from High Street, Perth, Fife, Scotland: ii. Thin Section Analysis

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In a study of ICPS analyses of 99 samples of medieval pottery from High Street, Perth, chosen by Derek Hall and George Haggarty, it was recommended that certain of the groups would repay further study using thin sections. Consequently, a sub-sample of ** of these samples was thin-sectioned and this paper contains the results of the analysis of these sections, integrated where necessary with a reconsideration of the results of the ICPS study.

Methodology

The samples were submitted to Steve Caldwell, University of Manchester, who produced thin sections of each, stained using Dickson's method (Dickson 1965). The sections were examined by the author and are deposited with the National Museum of Scotland where they can be examined.

Red and Grey-firing Quartz-tempered Earthenwares

Several samples of glazed red earthenwares and unglazed greywares contained inclusions of subangular and rounded quartz, muscovite, rounded iron ore and rare flint. These characteristics are typical of fabrics produced in the Thames Basin using Tertiary clays, perhaps tempered with Quaternary sands. Similar fabrics were also produced on the opposite side of the channel, in Flanders and Holland, and on the east coast of England at Beverley and Tyler Hill, near Canterbury, Kent. In addition, a small number of samples appear to be from vessels made using the same techniques as those used for these lead-glazed red earthenwares but contain small fragments of coarse-grained metamorphic rocks. These appeared at x20 magnification to be of Scottish origin, presumably local copies of the Western European imports.

Putative Scottish Redwares

Six samples of possible Scottish redwares were thin-sectioned (Table 1). Five of these were isolated as a group using ICPS but the sixth was grouped with Scottish East Coast White Gritty Wares (PHS 12). A seventh sample was classified in this group on the basis of its chemical composition (PHS 38) but thin sectioning indicates that it is a Scottish East Coast White Gritty ware (Fabric 1).

Of the six samples isolated by their chemical composition, four have similar characteristics in thin section and are indeed probably of Scottish origin, quite possibly local to Perth (Fabric 1). The fifth sample has a coarser texture (Fabric 2) and a sixth sample has a fine, very

micaceous groundmass, rather different from the other two fabrics but again quite possibly of local origin (Fabric 3).

A re-examination of the ICPS data indicates that the three fabric groups are recognisably different in composition but are closer in composition to each other than they are, for example, to Scottish East Coast White Gritty wares or London-type or Flemish earthenwares.

Table 1 Putative Scottish Redwares

Sample No	Context	Description	Fabric
PHS 12	3135	12- 3135 = Rim = Acc: 4261	Fabric 3
PHS 37	4564	37- 4564 = Rim = Acc: 11412	Fabric 1
PHS 39	5336	39- 5336 = Base = Acc: 010085	Fabric 1
PHS 67	3902	67- 3902 = Base = Acc 12405 (Beverly?) Red	Fabric 1
PHS 68	3622	68- 3622 = Base = Acc: 7367 (Beverly?) Red	Fabric 1
PHS 95	4715	95- 4715 = Body = Acc: 12607 = (C14 Sample 2)	Fabric 2

Perth 12

Thin section reveals a fine-textured fabric with abundant muscovite in the groundmass and sparse rock fragment inclusions which include metamorphic rocks.

The following inclusion types were noted in thin section:

- Quartz. Sparse subangular fragments up to 0.3mm across.
- Rock fragments. Sparse angular fragments of medium-textured rocks, some of which are definitely of metamorphic schistose texture up to 0.3mm across.

The groundmass consists of light brown optically anisotropic baked clay minerals with a variegated texture, abundant biotite and muscovite laths up to 0.1mm long and moderate angular quartz up to 0.1mm across.

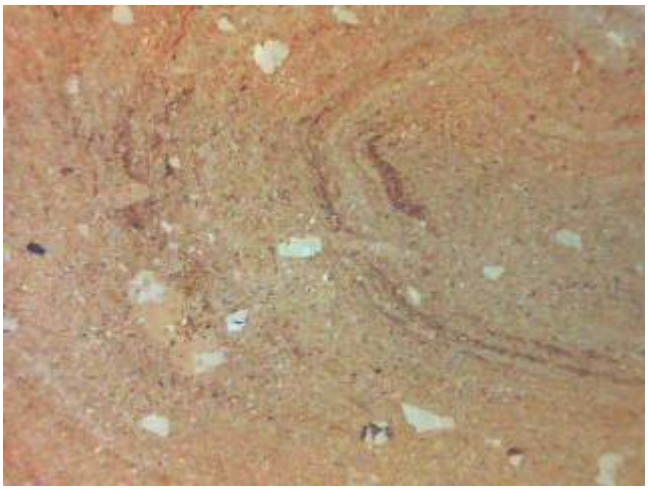

Figure 1 Perth 12

Perth 37

This section contains a quartzose sand composed of: monocrystalline quartz, polycrystalline, mosaic quartz, altered volcanic rock, opaque grains, acid igneous rock and fine-grained metamorphic rock. The sand is a mixture of rounded, sub-rounded and subangular grains, ranging from c.0.2mm to 1.0mm across. The groundmass consists of optically isotropic baked clay minerals and abundant angular quartz and muscovite laths up to 0.05mm across.

The groundmass is finer textured than one might expect in a lacustrine, alluvial or estuarine silt and might have originated as a marine clay. The lack of mudstone fragments might indicate that this clay was unconsolidated. The sand inclusions are probably a deliberately added detrital sand from a river system draining a mixed landscape including granitic and metamorphic rocks.

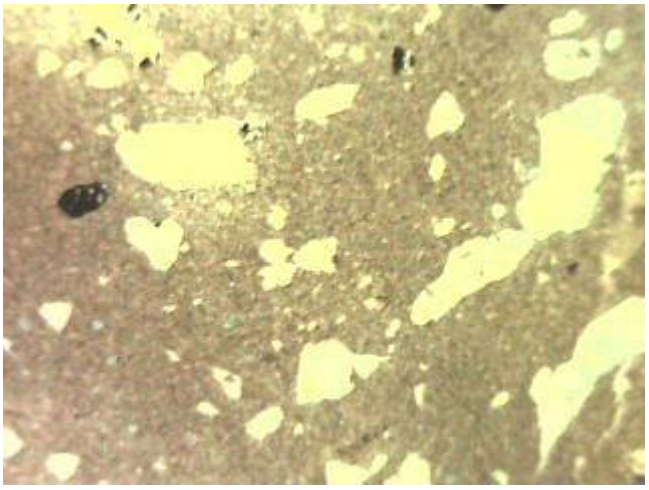

Figure 2 Perth 37

Perth 39

In thin section this sample contains a similar quartzose sand to that in Perth 37, but finer in texture. The groundmass is also similar to Perth 37.

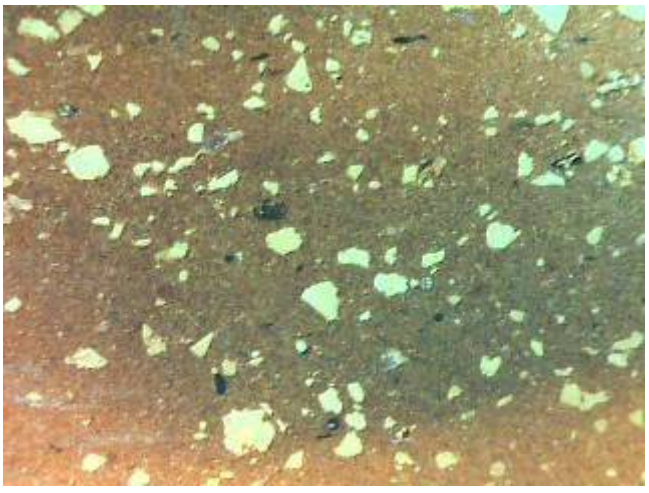

Figure 3 Perth 39

Perth 67

In thin section this sample contains an abundant quartzose sand, similar in character to that in Perth 37 but finer in texture. Laths of muscovite and biotite and grains of acid igneous and basic igneous rock are present. The groundmass is similar to that of Perth 37.

These characteristics suggest a similar source to Perth 37, quite possibly in eastern Scotland.

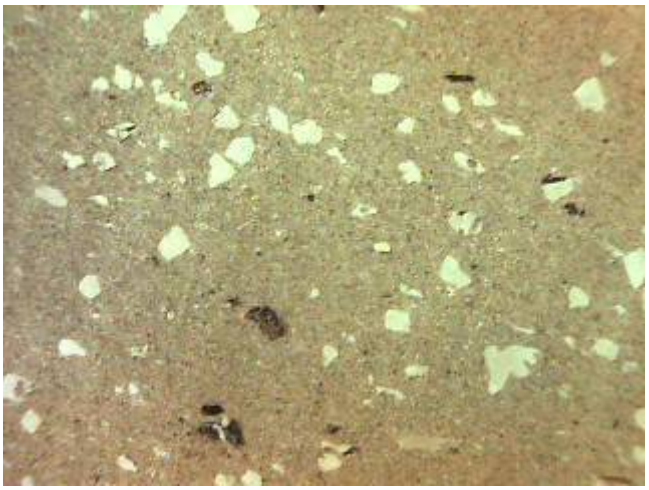

Figure 4 Perth 67

Perth 68

In thin section, this sample is very similar to Perth 67 and probably has a similar origin.

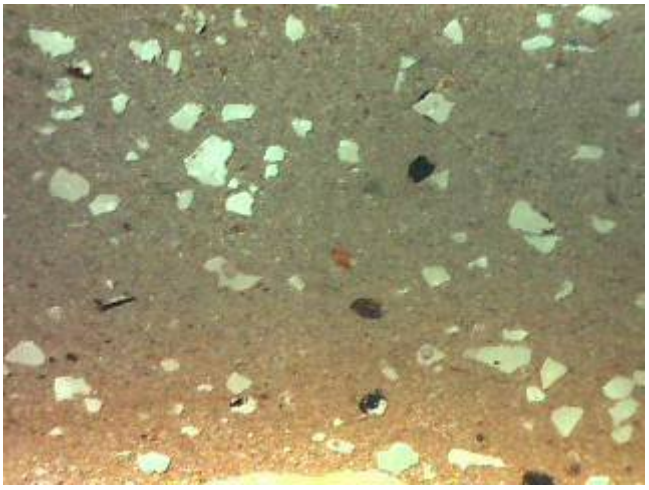

Figure 5 Perth 68

Perth 95

In thin section this sample contains a higher quantity of sand than Perth 67 or Perth 68 and that sand includes a higher proportion of metamorphic rock fragments, which are also coarser-grained that in Perth 37, 67 or 68. The groundmass, however, is similar.

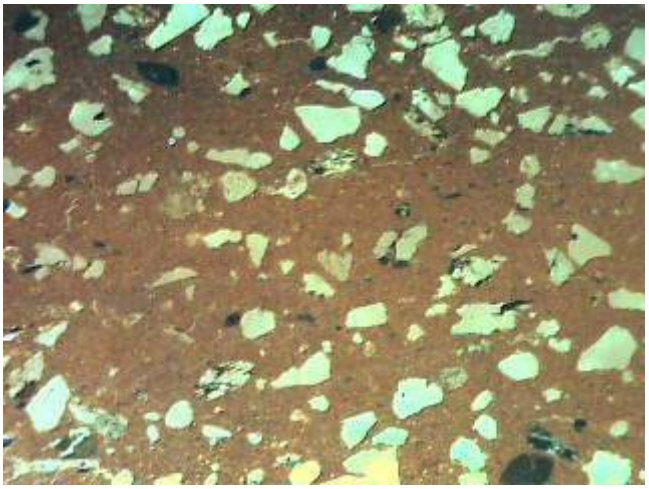

Figure 6 Perth 95

London-type and Flemish Earthenwares

A number of samples were identified as either London-area sandy wares (Coarse London-type ware or London-type ware) or Flemish wares. Fifteen of these were thin-sectioned and using their petrological characteristics these could be divided into eight fabric groups (Table 2), given temporary Fabric numbers 1 to 8 here.

Thin sectioning supports a London source for Fabrics 5 and 6 and in most of the other fabrics a Lower Cretaceous or younger origin for the fabric is confirmed. However, this itself does not discount a source in the Low Countries, East Anglia or even Denmark for fabrics 1 to 4, 6 and 8. The ICPS data confirms the similarity of Fabrics 5 and 6 (omitting calcium and strontium) and indicates that the Fabric 3 samples form a cluster. The remaining samples, however, have disparate compositions which are close to both London-area and Low Countries types. The only exceptional sample in terms of its chemical composition is Fabric 7, which is also made from a rather different clay than the others. However, the thin section suggests that this fabric too might be from the Thames basin.

Table 2 London-type and Flemish Earthenwares

TSNO	Context	REFNO	Fabric	Description
PHS 17	3044	2327	5	17-3044 = Rim = Acc: 2327
PHS 25	3619	7125	3	25-3619 = Rim = Acc: 7125 = Dr No 218
PHS 26	4505	10919	3	26-4505 = Rim = Acc: No 10919 Dr No 24
PHS 27	4506	10395	3	27-4506 = Rim = Acc: 10395 = Dr No 05
PHS 28	4715	12609	5	28-4715 = Fin? = Acc: 12609 (Look for published illus)
PHS 29	5076	11428	4	29-5076 = Rim = Acc: 11428 = Dr No 04
PHS 30	5080	10969	5	30-5080 = Rim = Acc: 10969 = Dr No 40
PHS 31	5098	11461	3	31-5098 = Rim = Acc: 11461 = Dr No 31
PHS 32	5100	11156	7	32-5100 = Base = Acc: 11156 (To be Drawn)/

PHS 33	5160	10217	5	33-5160 = Rim = Acc: 10217 = Dr No 13/14
PHS 35	3770	8769	6	35- 3770 = Body = Acc: 8769
PHS 70	4665	12581	8	70- 4665 = Rim = Acc: 12581(Early English?) Grey everted
PHS 82	4665	12584	1	82- 4665 = Body = Acc: 12584 (Red fabric with dark red vertical band (North French?)
PHS 83	5097	51458	2	83- 5097 = Body = Acc: 51458 (Sandy fabric high fired glazed)
PHS 96	3748	8618	3	96- 3748 = Body Acc: 8618 = (C14 sample 3)

Fabric 1

The distinctive feature of this fabric, compared with others in Table 2, is the fine texture of the quartzose sand. It is visually identical to London-type ware (Pearce, Vince, and Jenner 1985).

The following inclusion types were noted in thin section:

- Quartz. Abundant angular and subangular monocrystalline grains up to 0.2mm across.
- Altered Glauconite. Sparse rounded grains up to 0.2mm across.
- Opaques. Sparse rounded grains up to 0.2mm across.
- Feldspar Sparse fresh prismatic laths up to 0.2mm across.
- Unidentified accessory minerals. Sparse rounded grains with high relief, up to 0.2mm across.

The groundmass consists of optically anisotropic baked clay minerals, sparse angular quartz and altered glauconite up to 0.1mm across.

The glauconite probably indicates the presence of Lower Cretaceous or Tertiary material in the sand.

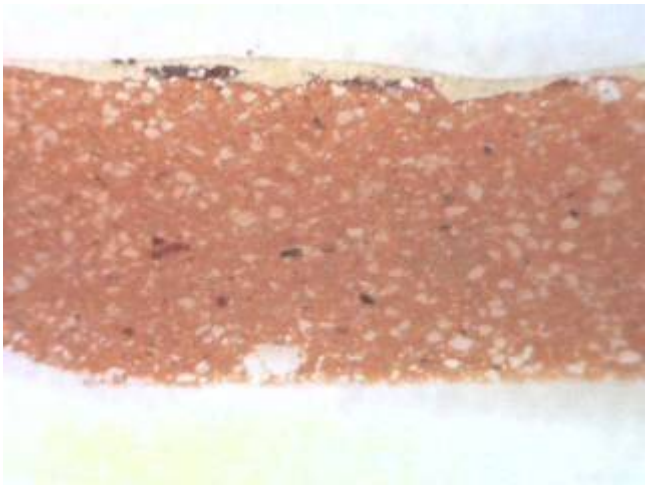

Figure 7 Perth 82

Fabric 2

The distinctive feature of this fabric is the abundance and sorting of the quartz sand, and the high frequency of chert.

The following inclusion types were noted in thin section:

- Quartz. Abundant angular, subangular and rounded grains up to 0.4mm across, with a moderate frequency of polycrystalline grains. The rounded grains have a high sphericity.
- Chert. Moderate rounded grains up to 0.4mm across.
- Microcline. Sparse rounded grains up to 0.4mm across.
- Opaques. Sparse rounded rains up to 0.4mm across.

The groundmass consists of optically isotropic baked clay minerals and sparse angular quartz up to 0.1mm across.

The high incidence of chert and the well-rounded quartz grains suggest that the sand has a Permian or Triassic origin. This is a feature of several areas of lowland England, southeast of a line from Newcastle-upon-Tyne to Bristol. Such sand is the most common constituent of Quaternary sands of the Proto-Thames, occurring in elevated gravel outcrops north of the present-day Thames (1996).

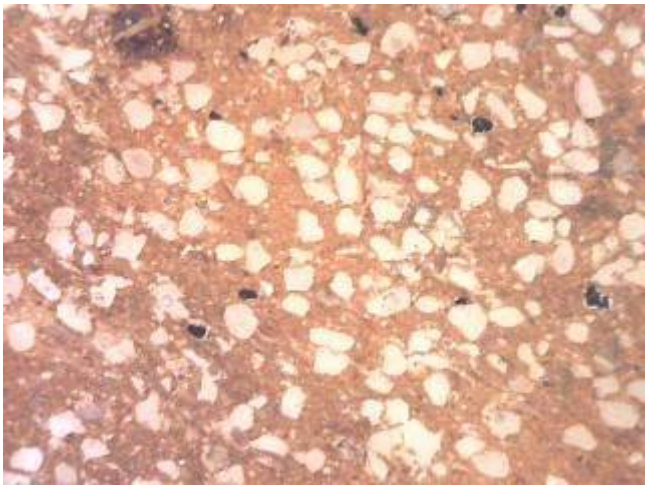

Figure 8 Perth 83

Fabric 3

All four samples of this fabric have a similar quartz sand and groundmass (Figs 9 to 13) but there is no single diagnostic feature which identifies the group.

The following inclusion types are present in thin section:

- Quartz. Abundant subangular monocrystalline grains up to 0.3mm across. Rare rounded grains with poor sphericity, up to 1.0mm across.
- Chert. Sparse rounded grains up to 0.4mm across. A few grains might be flint and include brown-stained chalcedony.
- Plagioclase feldspar. Rare rounded grains up to 0.4mm across.
- Muscovite. Rare sheaves up to 0.5mm long.
- Relict clay. Sparse rounded pellets up to 1.5mm across. Similar in colour and texture to the groundmass and never containing inclusions larger than c.0.1mm across.
- Organics. Spare irregular voids up to 0.5mm long with a blackened halo.
- Opaques. Sparse rounded grains up to 0.4mm across.

The groundmass consists of optically isotropic light grey baked clay minerals, moderate angular quartz and variable muscovite laths up to 0.1mm long.

The larger, rounded quartz grains appear to be of Lower Cretaceous origin but none of the other inclusions can be provenanced. Lower Cretaceous quartz occurs in the British Isles southeast of a line from the Vale of Pickering to East Dorset and also occurs in sands from Jutland to Northern France. Therefore, it confirms that this fabric is not a Scottish or northern English product but otherwise leaves a large number of possibilities.

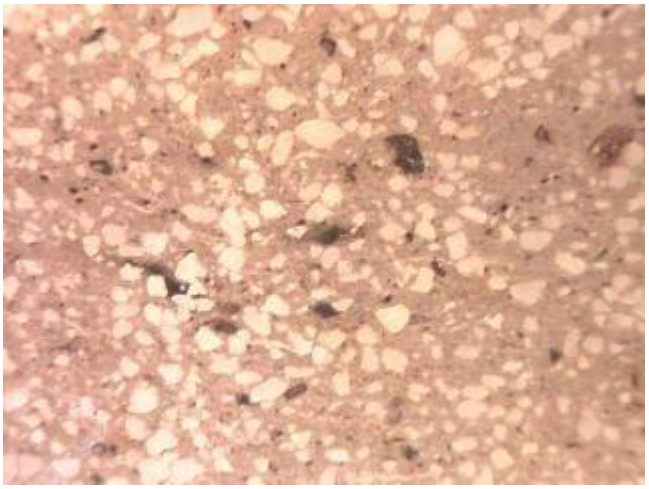

Figure 9 Perth 25

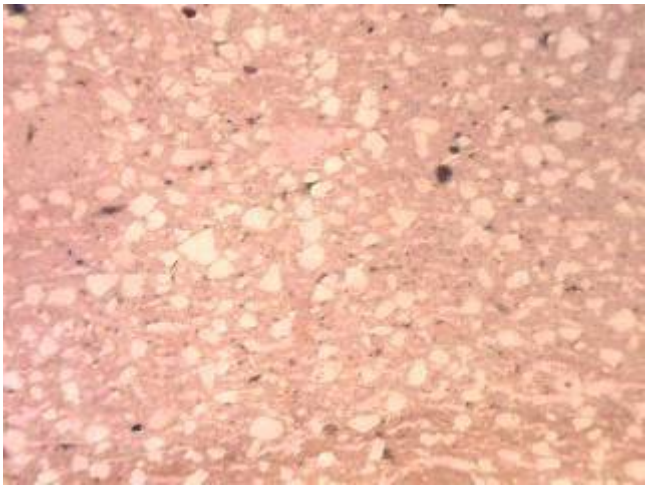

Figure 10 Perth 26

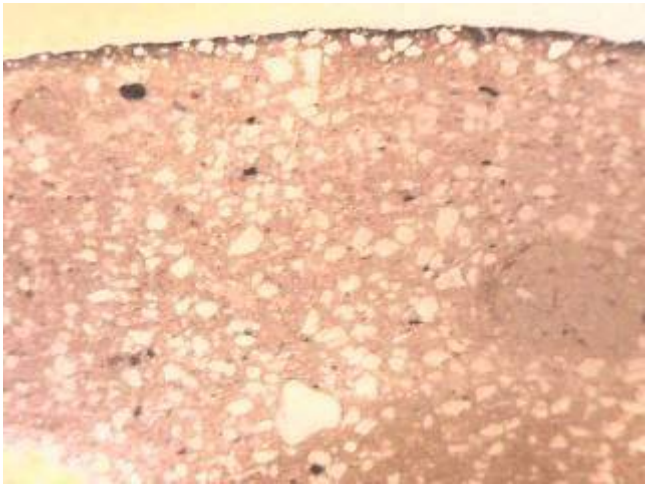

Figure 11 Perth 27

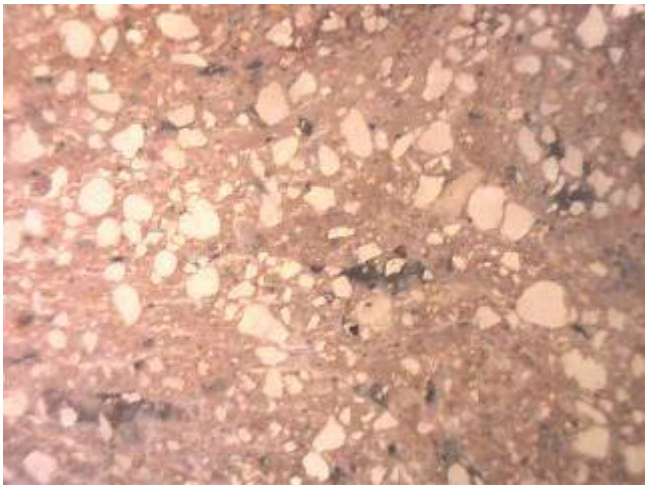

Figure 12 Perth 31

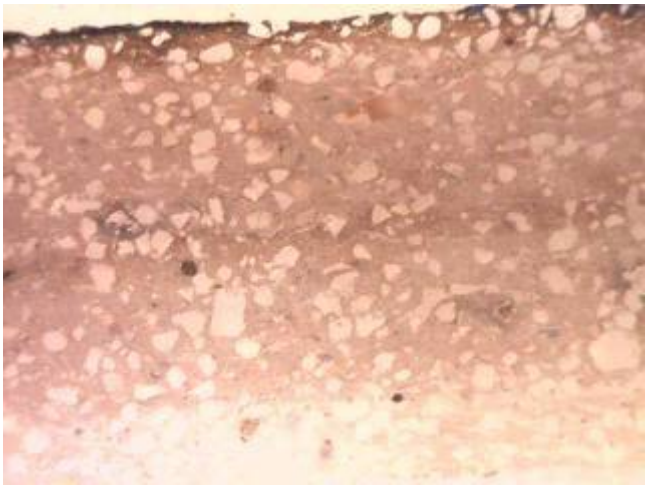

Figure 13 Perth 96

Fabric 4

The following inclusion types are present in thin section:

- Quartz. Abundant subangular grains of unstrained monocrystalline quartz. Well-sorted with a mean size of c.0.2mm, maximum .0.3mm.
- Glauconite. Moderate rounded grains up to 0.3mm across.

- Clay pellets. Sparse rounded grains, darker in colour than the groundmass. Possibly phosphatic, since all are isotropic.
- Organics. Sparse carbonised fragments, c.0.2mm across surrounded by a darkened halo.
- Ferroan calcite. Sparse irregular grains up to 0.2mm across.

The groundmass consists of light grey isotropic baked clay minerals, abundant angular quartz grains up to 0.1mm across and moderate muscovite laths up to 0.1mm long.

The silty, micaceous groundmass is found in several Tertiary clays in the Thames Basin, and is particularly common in parts of Essex (e.g. Mill Green and Noak Hill wares; and Hedingham wares). Glauconite is also present in some Tertiary clays in Essex. However, the Lower Cretaceous Gault clay has similar characteristics and both Tertiary and Lower Cretaceous clays outcrop in the Low Countries (e.g. Flanders) and parts of Denmark (e.g. Jutland).

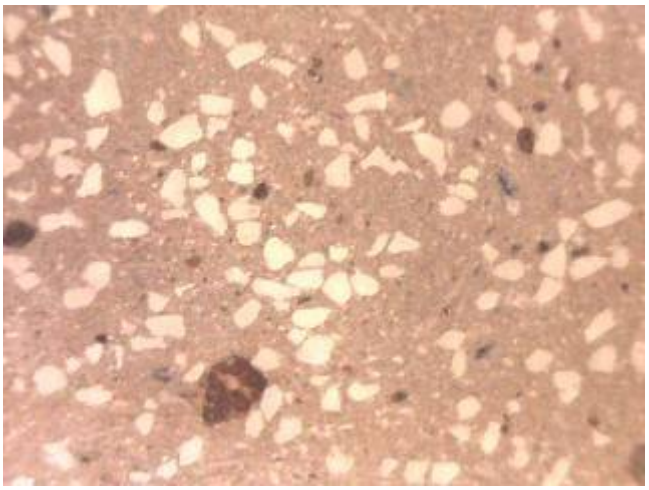

Figure 14 Perth 29

Fabric 5

The following inclusion types were noted in thin section:

- Quartz. Moderate rounded quartz, some with iron-stained veins, up to 0.5mm across.
- Clay pellets. Moderate rounded pellets up to 1.5mm across. Mostly darker than the groundmass.
- Opaques. Sparse well-rounded grains with no inclusions up to 0.5mm across.
- Altered glauconite. Sparse rounded grains up to 0.4mm across.
- Organics. Moderate carbonised fragments up to c.0.2mm across, surrounded by a darkened halo.

- Flint. Sparse subrounded grains up to 0.5mm across.

The groundmass consists of optically anisotropic baked clay minerals, moderate angular quartz and moderate muscovite laths up to 0.1mm long.

Several vessels have a thick white slip, which in thin section is anisotropic and contains no inclusions visible using the petrological microscope.

The groundmass and organic inclusions are consistent with the characteristics of the London Clay and the rounded quartzose sand (quartz, opaques, flint) is consistent with Thames terrace sands in the London area.

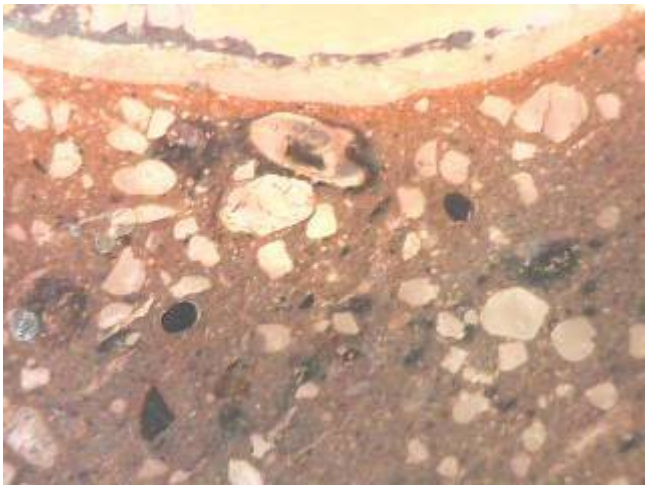

Figure 15 Perth 17

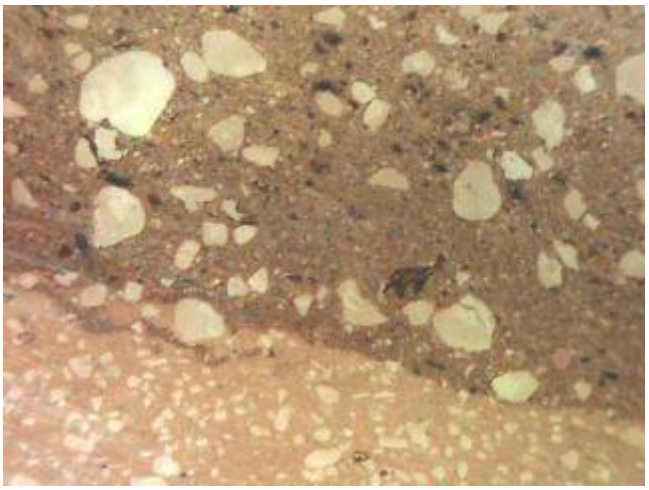

Figure 16 Perth 28

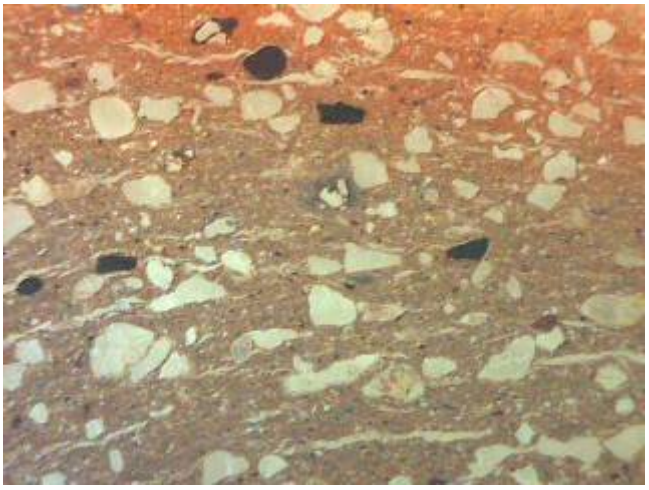

Figure 17 Perth 30

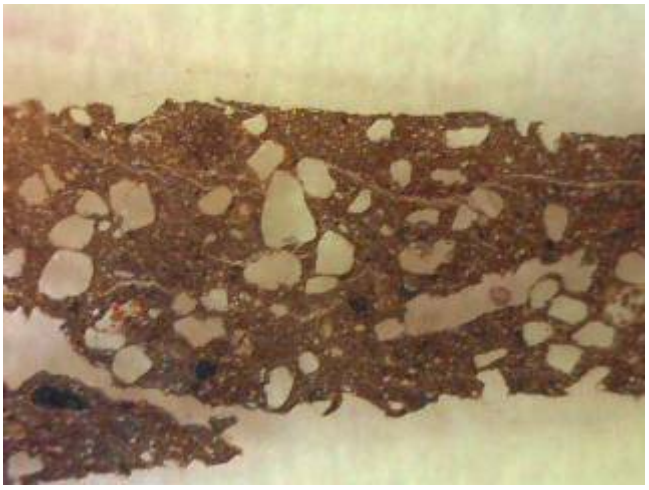

Figure 18 Perth 33

Fabric 6

The following inclusion types were noted in thin section:

- Quartz. As Fabric 5
- Opaques. As Fabric 5
- Altered glauconite. As Fabric 5
- Flint. As Fabric 5
- Organics. As Fabric 5
- Clay pellets. As Fabric 5
- Ferroan calcite. Sparse rounded sparry calcite up to 0.3mm across.
- Calcareous algae. Moderate rounded non-ferroan calcite with typical tube structure.

- Shell. Sparse fragments of non-ferroan calcite up to 0.5mm long. Shell structure not clear.

The groundmass is similar to that of Fabric 5 and a thick white slip, also similar to that found on Fabric 5 vessels, was present.

This is almost certainly produced from the same raw materials as Fabric 5 but with the presence of calcareous sand of mixed origins. The shell and calcareous algae have been noted in other samples thought to have been produced in the London area (e.g. Vince and Jenner 1991, EMS, EMSS). The absence of these grains from Fabric 5 maybe because the sand was decalcified.

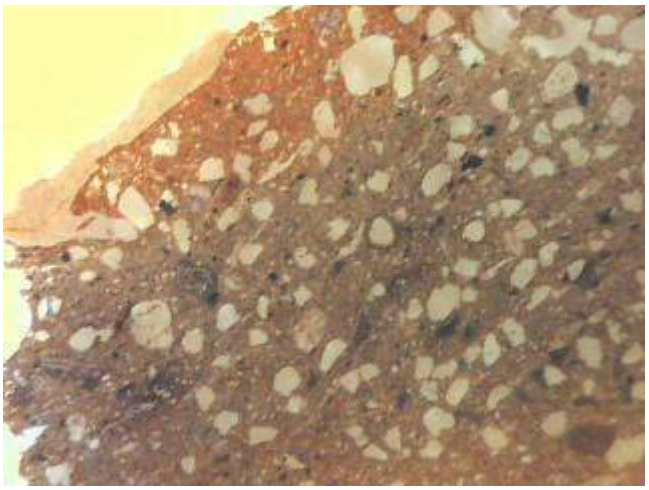

Figure 19 Perth 35

Fabric 7

The following inclusion types were noted in thin section:

- Quartz. Abundant subrounded and rounded grains up to 0.3mm across. Mostly monocrystalline and unstrained.
- Opaques. Sparse well-rounded grains up to 0.2mm across.
- Altered glauconite. Sparse rounded grains, some with an oolitic structure.
- Clay pellets. Sparse rounded grains of similar colour to the groundmass but sometimes with sparse angular quartz inclusions up to 0.1mm across.

The groundmass consists of light brown optically anisotropic baked clay minerals with few inclusions visible at x40 magnification.

The fine quartzose sand is similar to that in Fabrics 3 and 4 but the inclusionless groundmass distinguishes this fabric.

Similar inclusionless, light-firing clays occur in the Thames basin in the Reading Beds (as used by the Brockley Hill potters in the Roman period) and the Bagshot beds (as used by

the Kingston-type ware and Cheam potters in the 13th to 15th centuries). In both cases, there is evidence for the transport of raw clay to London (REFs vince & tomber; Blackmore et al. 2002). However, in both cases the fabrics were whiter than Fabric 6 and it is perhaps unlikely that a clay whose fired colour is so similar to locally-available clays would be transported any distance.

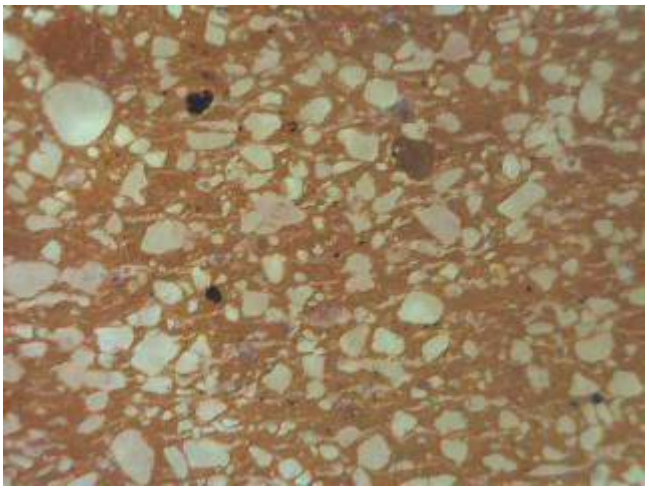

Figure 20 Perth 32

Fabric 8

The following inclusion types were noted in thin section:

- Quartz. Abundant, angular, subrounded and rounded grains, mostly of unstrained monocrystalline quartz, up to 0.3mm across.
- Clay pellets. Moderate rounded grains, varying slightly in colour from the groundmass (both slightly lighter and slightly darker grains). These have fewer inclusions than the groundmass and no inclusions larger than 0.1mm across.
- Organics. Moderate carbonised inclusions up to 0.2mm across, surrounded by a darkened halo.
- Opaques. Sparse well-rounded grains up to 0.5mm across.
- Glauconite. Sparse rounded grains up to 0.3mm across.

The groundmass consists of optically isotropic baked clay minerals, sparse angular quartz up to 0.1mm long and sparse muscovite laths up to 0.1mm long.

Visually, this sample, 70, is very similar to Hertfordshire Reduced wares, produced at a number of centres in Hertfordshire and Middlesex in the later 12th and 13th centuries. Some of these wares have been analysed using thin sections and ICPS and the ICPS data clearly places Fabric 8 with samples from the Low Countries rather than the Thames basin.

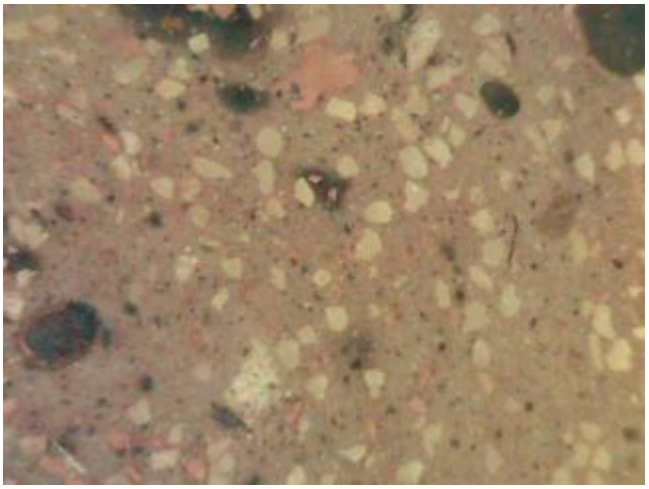

Figure 21 Perth 70

White Earthenwares

Scottish East Coast White Gritty wares

Samples of twenty vessels made from a white-firing clay were thin-sectioned. All contained a coarse sand temper and their ICPS analyses suggested that they were examples of Scottish East Coast White Gritty wares (Jones et al. 2006).

In thin section these samples could be divided into three fabrics: Fabric 1 contains a coarse quartzose sand temper; Fabric 2 contains a mixed quartzose sand temper including rounded volcanic rock fragments; Fabric 3 contains a coarse quartzose sand temper, identical to that in Fabric 1, but with abundant angular quartz sand of fine sand grade

Factor analysis of the ICPS data using these fabric groups indicates that Fabrics 2 and 3 form mutually exclusive clusters but that the Fabric 1 samples have a wider range of compositions, overlapping with both of these groups. When compared with samples from Colstoun, the Perth samples form a single group, together with the Colstoun whitewares when Colstoun redwares and red-firing clay samples are included. If these are excluded then the various samples form groups based on their sample batch, indicating that laboratory errors are greater than any differences within the pottery itself.

Fabric 1

The distinguishing feature of this fabric is that the inclusions are almost entirely of quartz. The groundmass is also distinctive, in that it contains moderate red clay fragments (black in Perth 4 which is reduced. Perth 38 stands out because the inclusions are about twice the size of those in the other samples and Perth 50 contains organic shale fragments, absent in the remaining samples. However, since in neither case do these samples have any

distinctive chemical characteristics and otherwise share the same petrological traits as the remainder they have been included in Fabric 1.

The following inclusion types are present in thin section:

- Quartz. Abundant angular and subangular grains, most up to 0.5mm across but rarely up to 1.5mm across (e.g. Fig 24). There is a high proportion of strained and polycrystalline grains and a high proportion have at least one flat face, indicating overgrowth.
- Clay pellets. Moderate rounded pellets up to 1.5mm long. Some are similar in colour to the groundmass, but most are either lighter in colour or darker.
- Sandstone. Rare to sparse fragments up to 2.0mm long consisting of quartz grains of similar character to the quartz inclusions and sparse microcline fragments with some kaolinite cement partially filling voids.
- Microcline. Rare fragments up to 0.5mm across.
- Muscovite. Rare laths up to 0.5mm long.
- Organic shale. Rare rounded fragments with a dark core and off-white margins

The groundmass consists of optically anisotropic baked clay minerals, moderate angular quartz and muscovite laths up to 0.05mm long.

The quartz, sandstone, microcline and muscovite inclusions are all probably derived from a quartzose grit and are similar or identical to those found in the Millstone Grit. Millstone Grit outcrops to either side of the Firth of Forth, to the west of Edinburgh, as well as to the east of Edinburgh, in the Colstoun area. The closest source to Perth is on the Fife coast, to the northeast of Kirkcaldy. The lack of inclusions from other sources suggests that Fabric 1 was tempered with a sand formed by erosion of the Millstone Grit, close to its outcrop. In West Yorkshire, similar fabrics occur commonly, due to the massive outcrop of the Millstone Grit in the Pennines and the presence of Coal Measures to their east. However, in Scotland, and elsewhere in the British Isles, such fabrics can be more closely provenanced.

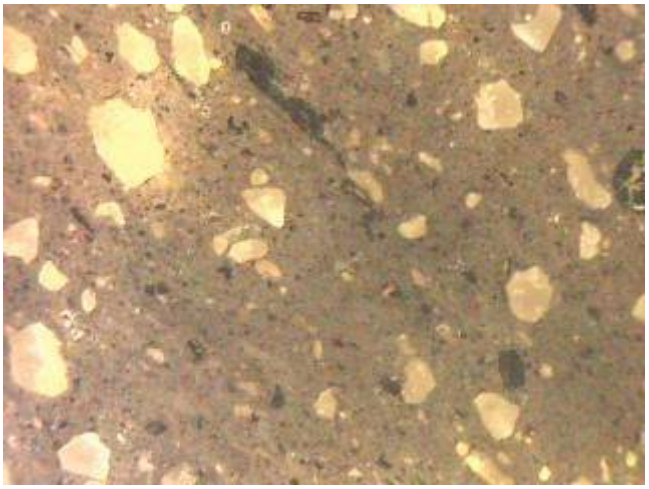

Figure 22 Perth 4

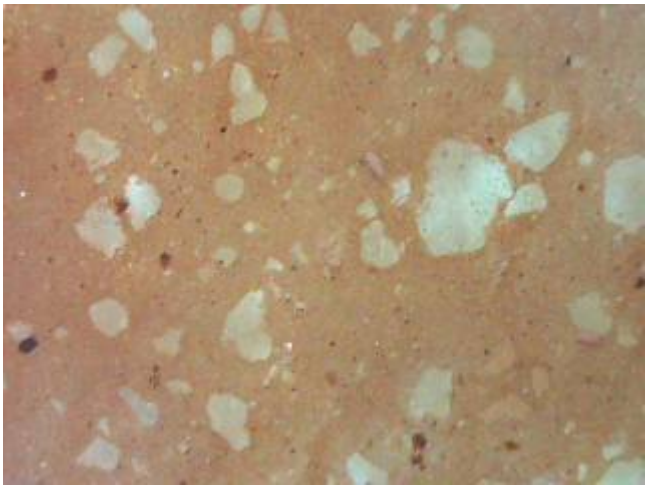

Figure 23 Perth 11

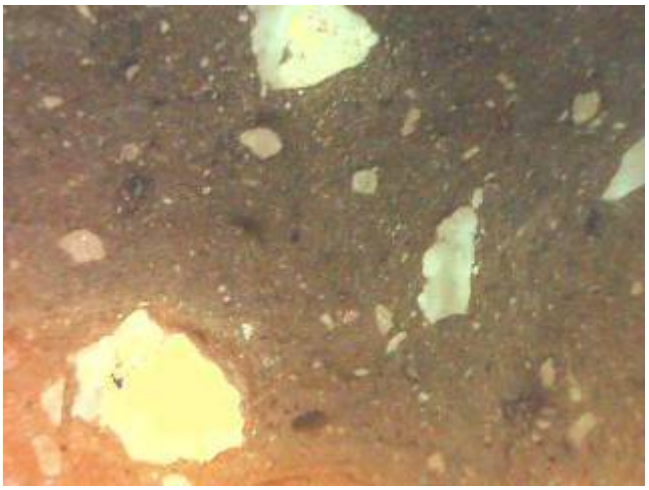

Figure 24 Perth 38

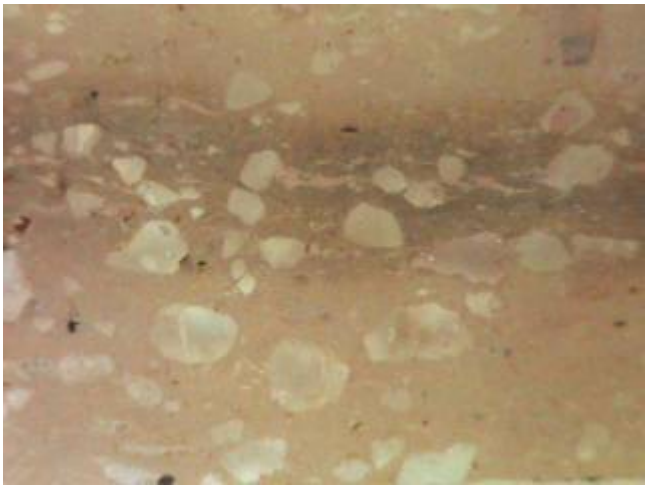

Figure 25 Perth 43

Figure 26 Perth 46

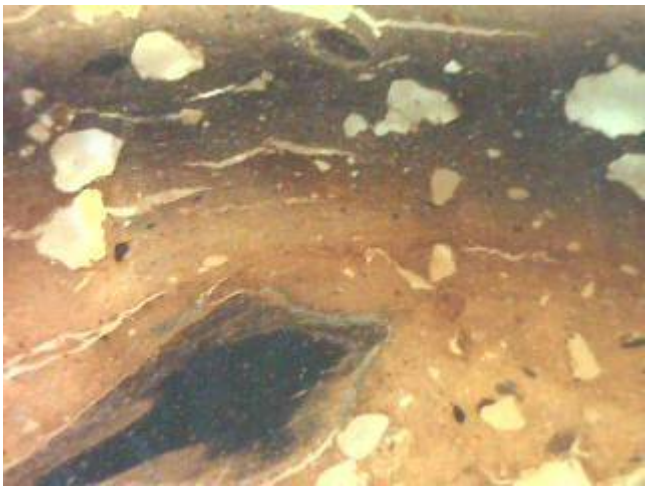

Figure 27 Perth 50

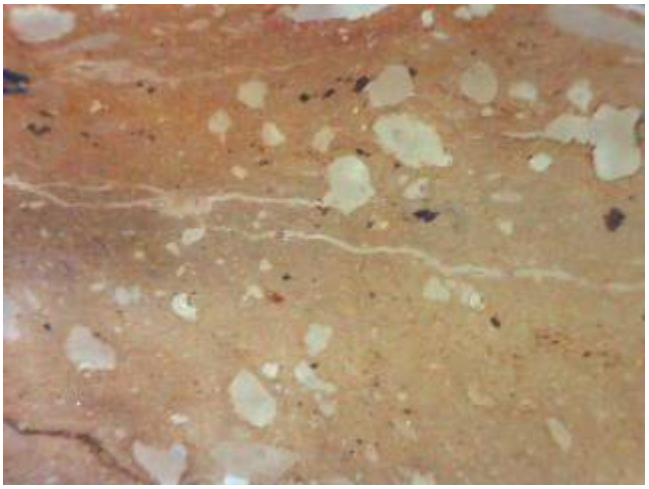

Figure 28 Perth 51

Figure 29 Perth 52

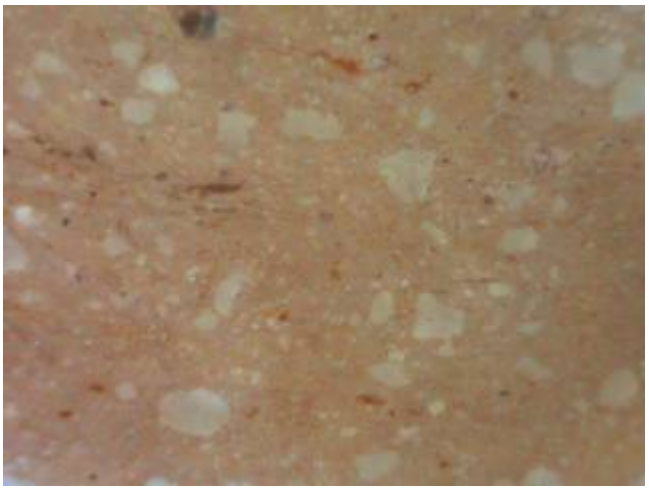

Figure 30 Perth 57

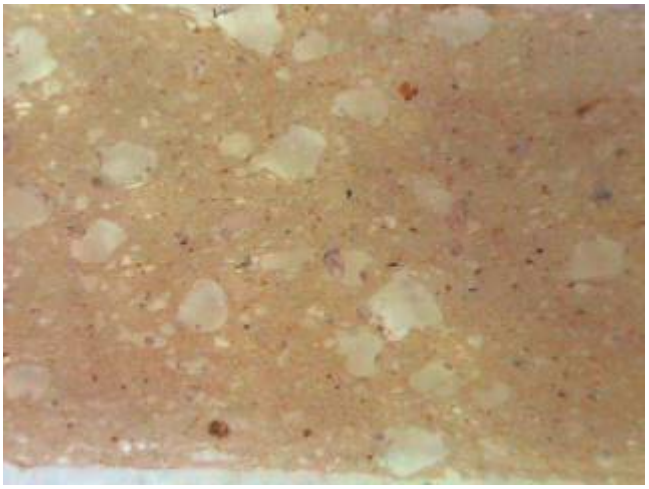

Figure 31 Perth 98

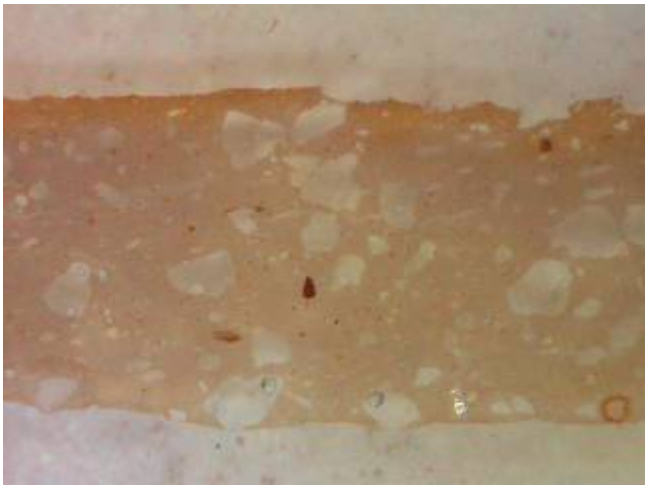

Figure 32 Perth 99

Fabric 2

The distinguishing feature of this fabric is the presence of basic igneous rock fragments. One sample is distinguished by its texture (Fig 36, Perth 80) but the remaining samples have similar textures and inclusions.

The following inclusion types are present in thin section:

- Quartz. Moderate angular grains similar to those in Fabric 1. In addition, rare to sparse well-rounded grains up to 0.5mm across are present.
- Siltstone. Moderate, well-rounded brown siltstone up to 1.0mm across.
- Basic igneous rock. Sparse to moderate rounded fragments up to 1.5mm across of varying lithology: these include rocks with porphyritic texture containing euhedral feldspar grains up to 1.0mm long in a groundmass of brown amorphous material; rocks with abundant feldspar laths up to 0.2mm long in a groundmass of finer

feldspar laths and brown amorphous material and rocks with no large inclusions which are probably composed of altered glass.

- Sandstone. Sparse rounded grains consisting of subangular quartz up to 0.2mm in a groundmass of brown amorphous material.
- Opaques. Sparse well-rounded grains, some cracked, up to 0.5mm across.
- Clay pellets. Sparse rounded fragments up to 1.0mm across similar in composition to those in Fabric 1.

The groundmass is similar to that of Fabric 1

Many aspects of Fabric 2 are identical to Fabric 1 but the tempering is clearly distinguished and does not appear to be due to the use of a mixed sand, some of which is rich in Millstone Grit and some has a more mixed composition.

The well-rounded quartz grains, and probably the well-rounded opaque grains, are probably derived from the Permian desert sands. The closest outcrop of this Permian sandstone to Perth is in Ayrshire, the Mauchline sandstone (1948, 77). However, these well-rounded quartz grains also occur in the volcanic necks of East Fife (1948, 78-9) and one of these, at Lundin Links, is situated in an area of Coal Measures rocks (the remainder, further east, are cutting Carboniferous limestone of the Clackmannan Group and a range of sedimentary rocks, mainly coarse conglomerates, of the Inverclyde Group. No comparable volcanic rocks occur in East Lothian.

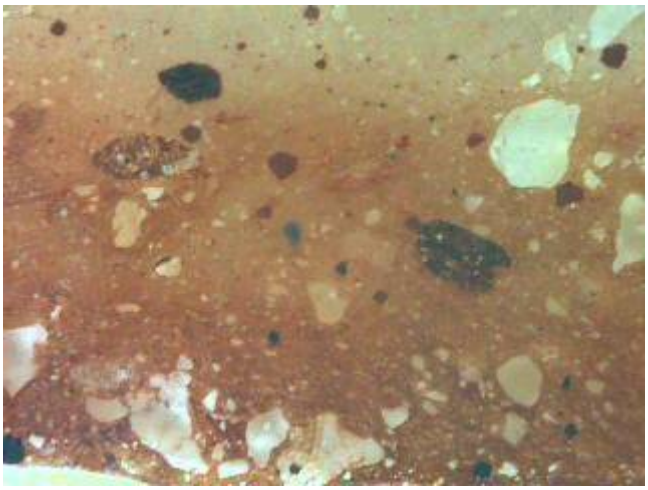

Figure 33 Perth 1

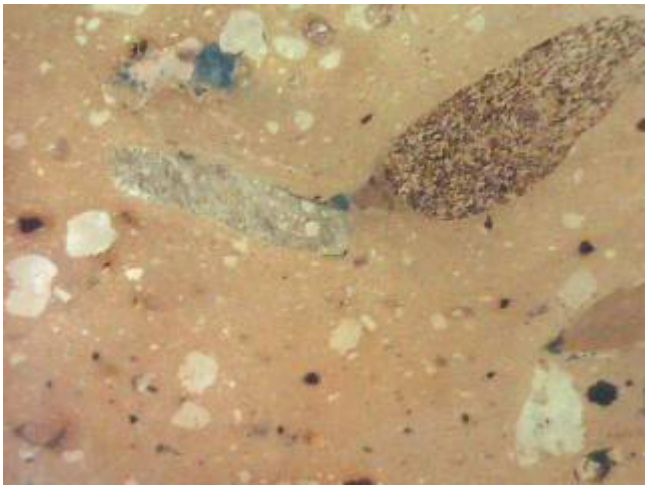

Figure 34 Perth 10

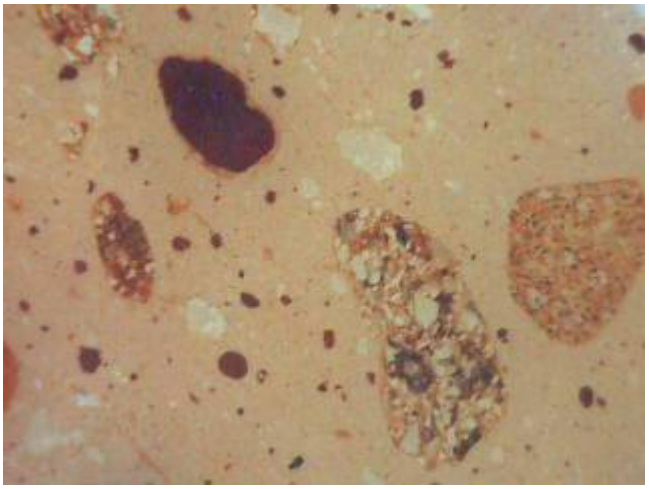

Figure 35 Perth 13

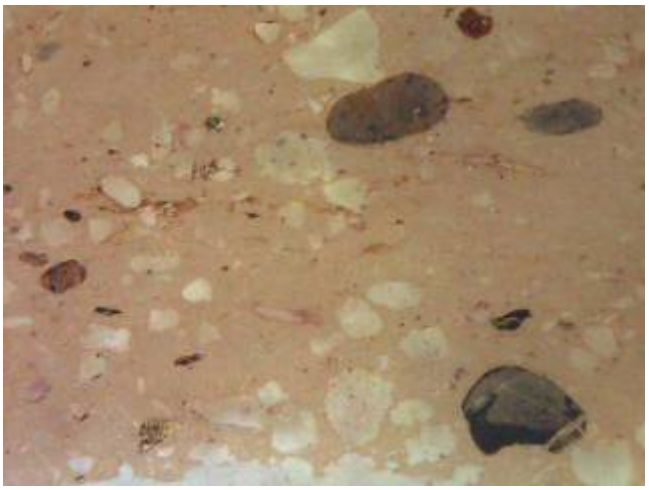

Figure 36 Perth 49

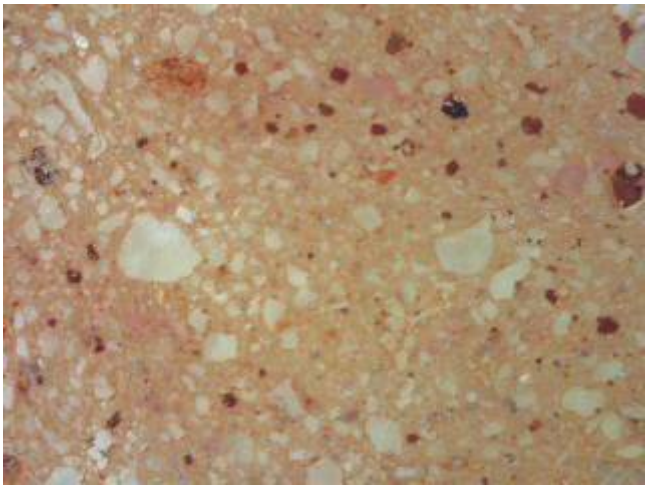

Figure 37 Perth 80

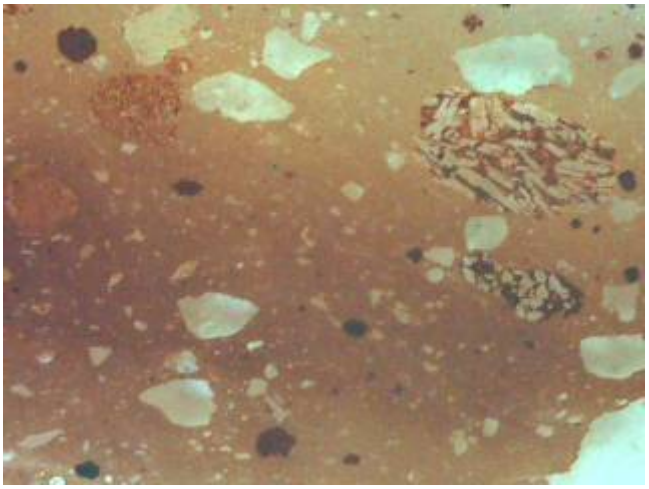

Figure 38 Perth 94

Fabric 3

The distinguishing characteristic of Fabric 3 is the presence of abundant angular quartz of fine sand grade (i.e. just visible to the naked eye). In other respects the inclusions present are similar to those in Fabric 1.

The following inclusion types were noted in thin section:

- Quartz. As fabric 1
- Sandstone. As fabric 1
- Clay pellets. As fabric 1 except that the quartz content is higher and coarser (i.e. mirroring the difference in groundmass)
- Opaques. As fabric 1

The groundmass consists of light brown anisotropic baked clay with abundant well-sorted angular quartz, mean 0.1mm across. Two of the samples have black, carbon-rich cores.

Fabric 3 is probably from the same source as Fabric 1 and the coarser textured clay pellets indicate (a) that the clay pellets are probably relict clay rather than detrital mudstone fragments and (b) that the parent clay contained the fine quartz when dug.

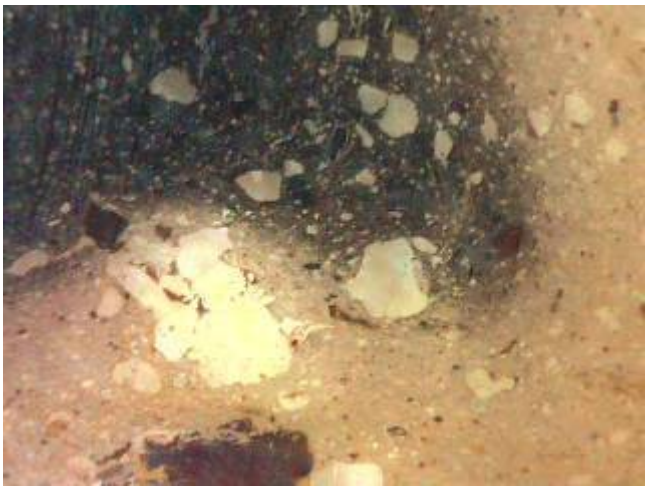

Figure 39 Perth 44

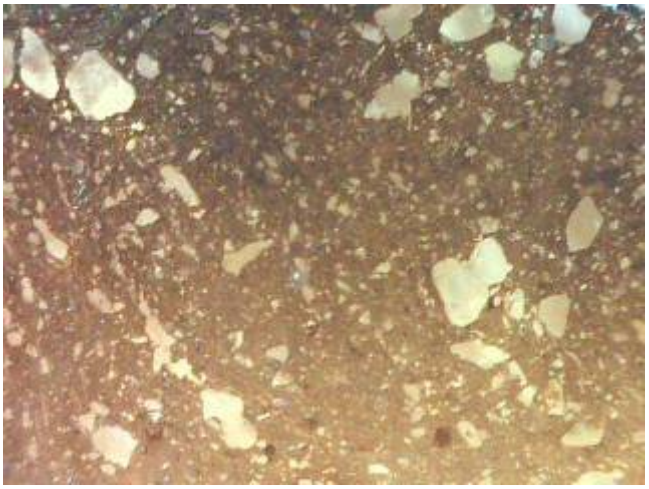

Figure 40 Perth 47

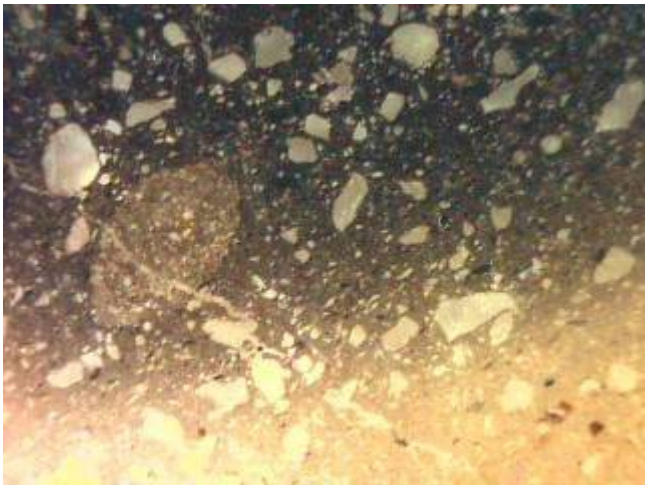

Figure 41 Perth 58

North Yorkshire Whiteware

A single sherd was isolated from the other whitewares by its chemical composition, which placed it with North Yorkshire whitewares such as York Glazed ware and Brandsby-type ware (Jennings 1992; 1978). In thin section, the texture is certainly similar to that of those Yorkshire whitewares but the sample contains a small number of fragments of basic igneous rock, which could be erratics and are not entirely unknown in thin sections of Yorkshire whiteware but do raise the possibility that this is a finer-textured variant of SECWG Fabric 2.

In thin section, the following inclusion types were noted:

- Quartz. Moderate well-sorted subangular grains mean c.0.3mm, showing some signs of overgrowth and some brown amorphous coating.
- Opaques. Sparse rounded grains up to 0.4mm across.
- Chert. Sparse rounded grains up to 0.4mm across.
- Muscovite. Rare laths up to 0.5mm long.
- Basic igneous rock. Rare subangular fragments up to 0.4mm across.

The groundmass consists of light brown optically anisotropic baked clay minerals, moderate angular quartz up to 0.1mm across and sparse muscovite laths up to 0.1mm long.

These characteristics are similar to those of York Glazed ware, made from Middle Jurassic white-firing clay from the Hambleton Hills and tempered with glacial sand derived mainly from Jurassic gritstones (Vince 2004b). Very similar fabrics were found at Byland Abbey, where they appeared to be waste (Vince 2007). The chert and igneous rock fragments could be derived from Triassic rocks and intrusive dykes which cut them, both of which occur immediately to the north of the North Yorkshire production area.

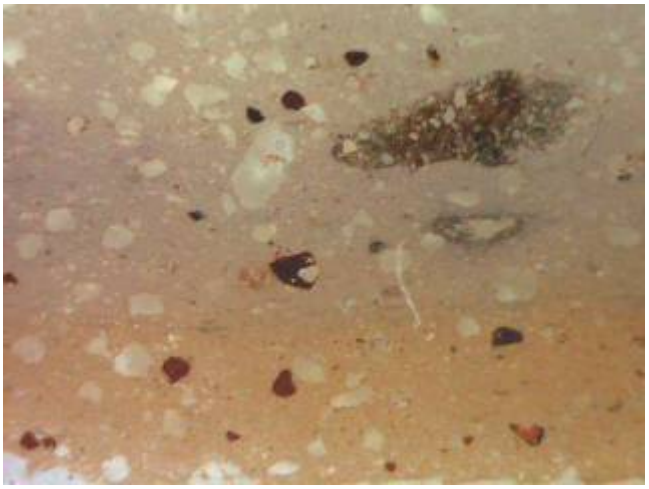

Figure 42 Perth 77

Mixed Sand tempered wares

Ely ware

A single sample, PHS 40, was identified in thin section as Medieval Ely ware (Vince 2008). The ICPS analysis is consistent with an Ely origin, and is similar to that of a vessel (two sherds, both sampled) from the Horse Cross (Vince 2004a).

The following inclusion types were noted in thin section:

- Quartz. Abundant subangular and rounded grains up to 0.5mm across. Some of the larger grains appear to be of Lower Cretaceous origin.
- Bivalve shell. Sparse non-ferroan calcite fragments up to 1.0mm long.
- Limestone. Moderate fragments, some heat-altered but others of fine-grained non-ferroan calcite mudstone, probably chalk, up to 1.0mm across.
- Opaques. Sparse well-rounded grains up to 0.3mm across.
- Flint. Sparse angular grains up to 0.5mm long.

The groundmass consists of optically anisotropic baked clay minerals with few visible inclusions. The core is black with a sharp transition to light brown margins.

Figure 43 Perth 40

Shell-tempered Earthenwares

Lincolnshire shell-tempered ware

A single sample was identified in the hand by Jane Young as being a Lincolnshire shelly ware (Young and Vince 2005). Thin section analysis confirms this identification. Several different groups of shell-tempered ware of medieval date are known in Lincolnshire but can only be distinguished by a combination of studying their manufacturing techniques, surface treatment, typology, petrology and chemical composition. In this case, the sherd is a featureless body sherd from a jar. In this case, the chemical composition favours either LFS (late 10th to late 12th century) or LEMS (late 12th to early 13th century), both of which were produced close to Lincoln, over NLST (late 12th to early 13th century, produced further north and common on sites in South and East Yorkshire).

The following inclusion types were noted in thin section:

- Bivalve shell. Abundant fragments of large nacreous bivalve shells with circular bore holes filled either with dark brown inclusionless clay or with sparry ferroan calcite. Some of the shell fragments have a coating of ferroan calcite.
- Ferroan calcite. Moderate fragments up to 0.5mm across.
- Quartz. Sparse rounded grains up to 0.3mm across.
- Chert. Rare rounded grains up to 0.3mm across.

The groundmass consists of optically anisotropic baked clay minerals with moderate rounded dark brown pellets c.0.05mm across.

Figure 44 Perth 84

London Shelly-Sandy ware

Nine samples identified as London Shelly-Sandy ware visually and from their chemical composition were thin-sectioned. The fabric of London Shelly-Sandy ware was characterised as part of the study of London area imports to the Bryggen, Bergen (Blackmore and Vince 1994) whilst more recently thin section analysis has shown that related shelly-sandy ware vessels were produced in North Kent (NKMS) and South Essex (SESH). The former fabric contains moderate water-polished rounded quartz grains whilst the latter has a more micaceous groundmass (Vince forthcoming).

In thin section, two fabric groups could be identified. The first is typical of samples of London Shelly-Sandy ware from London, Bergen and elsewhere; the second has coarser shell fragments, rounded, polished quartz and rounded flint fragments, all found in NKMS, but with a groundmass identical to the London group.

Fabric 1

The following inclusion types were noted in thin section:

- Bivalve shell. Moderate non-ferroan bivalve shell fragments up to 0.5mm long. Most have a laminated structure and several show signs of rounding and staining. Several fragments have opaque grains embedded in the margins, suggesting the deposition of pyrites.
- Quartz. Moderate subangular grains up to 0.2mm across with sparse rounded grains up to 0.5mm.
- Chert. Rare rounded grains up to 0.5mm across.
- Clay pellets. Rounded pellets up to 1.0mm across. Although similar in iron content to the groundmass, they vary in texture and inclusions and are therefore probably detrital grains.

- Opaques. Sparse rounded grains up to 0.3mm across.
- Ferroan calcite. Probably secondary deposition of ferroan calcite around the edges (including broken edges) of bivalve shells and in some pores.
- Organics. Sparse carbonised fragments, some with a circular cross-section (rootlets?) others amorphous, surrounded by a wide blackened halo (see Figs 45, 46, 48, 49).
- Muscovite. Sparse laths up to 0.2mm long.
- Altered glauconite. Sparse subangular fragments up to 0.2mm across. These do not have the squashed pea profile of intact glauconite grains, nor to they show any zoning, so probably detrital fragments.

The groundmass consists of optically anisotropic baked clay minerals, sparse angular quartz, muscovite laths and dark brown grains all up to 0.1mm across.

These characteristics are identical to those of samples from various sites in the city of London and its environs, Essex and Monkwearmouth. A production site for London-type ware has recently been discovered by Oxford Archaeology at Woolwich and therefore the London-type potters can probably be equated with those recorded in documentary sources in the hundred of Blackheath, a suggestion proposed in 1982 by Anthony Streeten (Streeten 1982; Hanley and Chalkin 1964).

Given a likely Woolwich source, the parent clay is likely to either be London Clay or a more recent formation formed from re-worked London clay. The shell fragments are likely to have been fossil shell from the Woolwich Beds (there is no blackened halo surrounding the fragments, which might be expected if the shell still had a chitin content). The London clay contains sparse wood fragments, perhaps the source of some of the organic inclusions and was formed in reducing conditions, consistent with the opaque inclusions observed in the shell surfaces.

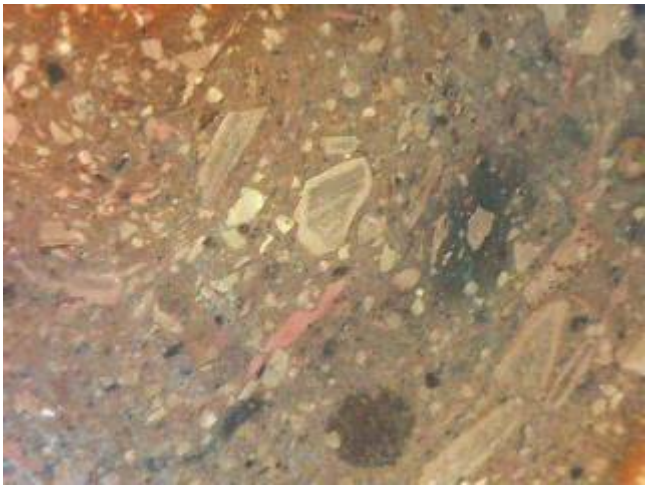

Figure 45 Perth 85

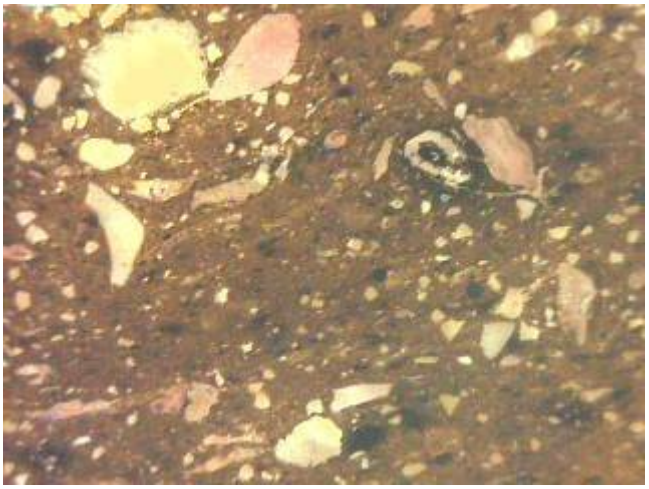

Figure 46 Perth 86

Figure 47 Perth 87

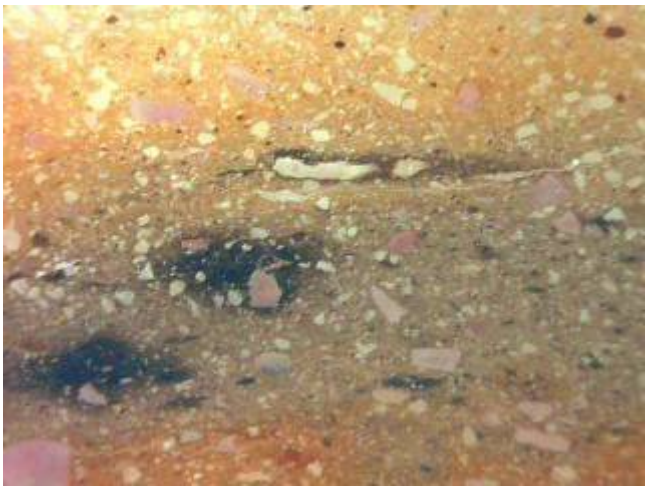

Figure 48 Perth 88

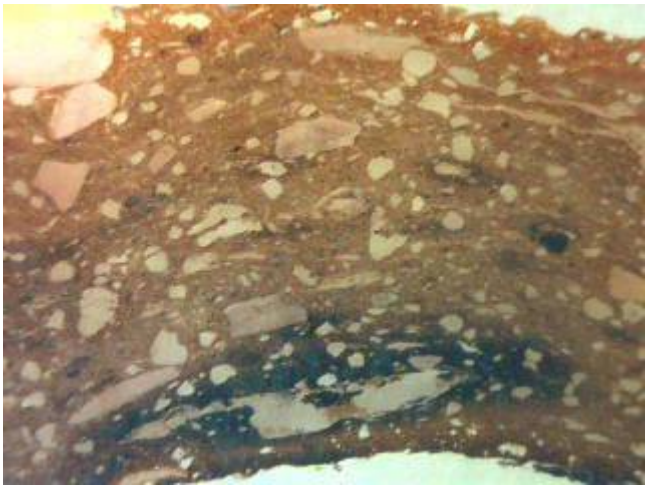

Figure 49 Perth 89

Fabric 2

The three samples of Fabric 2 differ somewhat in their petrological characteristics. PHS 90 contains a higher frequency of shell fragments, which are larger than in the other two samples and PHS91 contains more rounded quartz grains. However, all three samples contain polished rounded quartz grains and flint, absent or rare in Fabric 1.

The following inclusion types were noted in thin section:

- Bivalve shell. Abundant non-ferroan calcite bivalve shell fragments up to 3.0mm across. Some have opaque inclusions embedded in the outer surfaces and most show some signs of rounding. Most of the shell consists of light-brown stained fragments with a laminar structure but some unstained nacreous fragments are present, which show less signs of rounding.
- Quartz. Moderate subangular grains up to 0.3mm across and sparse to moderate rounded grains up to 0.5mm across.
- Chert. Sparse rounded grains up to 0.3mm across.
- Flint. Sparse subangular and rounded fragments up to 1.5mm across.
- Clay pellets. Sparse rounded pellets up to 1.0mm across
- Opaques. Sparse rounded grains up to 0.3mm across.
- Organics. Sparse carbonised inclusions up to surrounded by a darkened halo. As in Fabric 1, the inclusions are either lenticular and usually parallel to laminae in the groundmass or circular cross-sectioned.

The groundmass is identical to that of Fabric 1

Both polished quartz grains and rounded flint fragments occur in quaternary sediments in the Thames valley in the London area and are more common in the coarser sands than

in the finer sands and brickearths. It is likely, therefore, that this fabric is simply a coarser version of Fabric 1 and the similarity of the groundmass, including organic inclusions, supports this interpretation. The absence of altered glauconite is also likely to be a function of the coarser nature of the sand temper. Further south and west, North Kent Medieval Shelly ware (NKMS) has a finer, more micaceous, groundmass and is distinguishable in chemical composition.

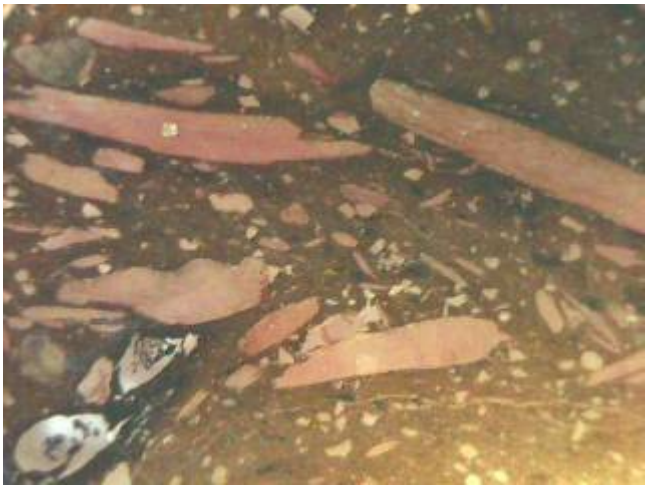

Figure 50 Perth 90

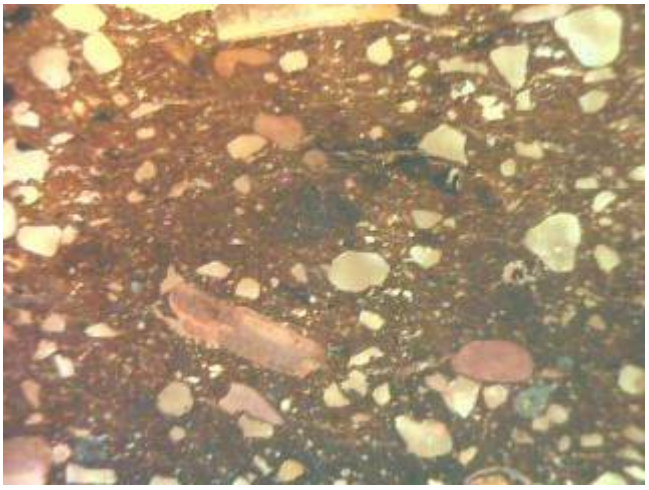

Figure 51 Perth 91

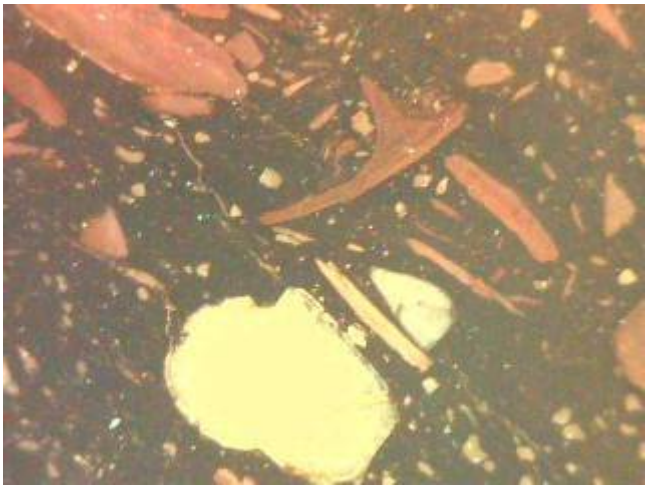

Figure 52 Perth 92

Perth 93

The thin section supposedly of this sample is similar, or identical, to some of the London-type and Flemish earthenwares (Fig 53). However, in the hand specimen the sample contains abundant coarse shell fragments which place the sample in SSW Fabric 2, which is consistent with the chemical composition. It seems that somehow or another there has been a mix-up. There is no sign that either of the two surviving sherds in the Perth 93 bag have been sampled and it is possible that a third sherd of another fabric was accidentally sampled.

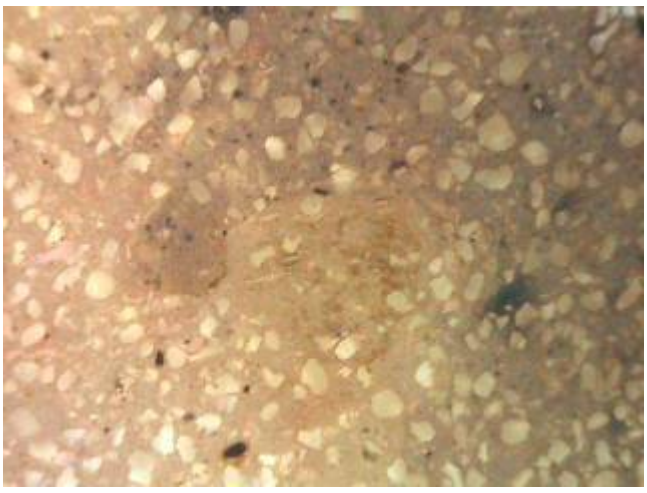

Figure 53 Perth 93

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