Patterns of production: mineralogical report on samples of medieval and post-medieval pottery for the Wells Museum Pottery Study group

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PATTERNS OF PRODUCTION: MINERALOGICAL REPORT ON SAMPLES OF MEDIEVAL AND POST-MEDIEVAL POTTERY FOR THE WELLS POTTERY STUDY GROUP

JENS C. Ø. ANDERSEN, DAVID DAWSON AND GAVYN K. ROLLINSON

SUMMARY

This report aims to explore the mineralogical variations in ceramic samples from the Wells Pottery Study Group, over three sections. Initially, we will synthesise the findings and compare the samples with materials from other locations in Somerset and Devon; then, we present the data for the individual samples that we have studied; finally, we consider the implications of these findings on our interpretation of pottery production in the medieval and post-medieval periods, in particular the understanding that there are five groups of medieval fabric type which are distributed across the study area.

BACKGROUND

The report follows on from investigations into the mineralogical composition of ceramic materials from the excavation of Taunton Castle and reference locations in Somerset and Devon (Andersen *et al.* 2016a; 2016b). For the Taunton Castle report, samples from the excavations were compared with sites across Somerset where pottery production is known to have taken place during post-medieval times. The aim was to explore how variable ceramic samples are across the county, and to establish if any of the sherds found at Taunton Castle could be identified to particular production sites. The study encompassed post-medieval materials from Crowcombe, Donyatt (sites 4 and 13), Langford Budville, Nether Stowey, Wanstrow (samples A and B), and Wrangway. The study identified distinct groupings in the ceramic types based on the mineralogical assemblage of the matrix and inclusion populations, some of which could also be recognised in materials from Taunton Castle. We speculated that the groupings to some extent are controlled by the underlying geology. The study confirmed that the distinct West Somerset types from sites on Triassic bedrock yielded products with very similar mineralogical characteristics (Type A in Table 1). This study also demonstrated that materials from East and South Somerset are distinctly different to Type A in their mineralogical compositions, but the study did not include sufficient materials to establish systematic groupings from these areas.

TABLE 1 MINERALOGICAL TYPES PREVIOUSLY IDENTIFIED FROM TAUNTON CASTLE AND SOMERSET LOCALITIES (Andersen *et al.* 2016a; 2016b; Dawson and Dawson 2015)

Type A	The clay composition of the matrix is dominated by Fe-Al-K silicates with some muscovite/illite. This type has no or little kaolinite. Inclusions are predominantly quartz and K-feldspar. Plagioclase feldspar and calcite are absent from both inclusions and matrix. Glauconite is locally significant. Type A appears to be consistent with post-medieval West Somerset wares from Crowcombe, Langford Budville, Nether Stowey and Wrangway and Taunton Castle fabric types 74, 83 and 89 (Coleman-Smith and Pearson 1970; 1988; Pearson *et al*. 2014).
Type B	The clay composition of the matrix is a mixture of Fe-Al-K silicates and kaolinite (between 1:1 and 2:1) with significant (although less) muscovite/illite. The matrix has significant Fe-Al silicates and plagioclase feldspar. Two subtypes are defined by differences in the inclusions:
Type B_1	Inclusions of quartz and K-feldspar. Glauconite is locally significant but calcite is absent. This subtype includes late medieval production at Donyatt Site 4 and the two post-medieval samples from production waste from near Wanstrow as well as two medieval sherds from Taunton Castle (unclassified and type 14 = Ilchester B) (Coleman-Smith and Pearson 1988; Pearson 1982, 171; Vranch 1988)

Type B_2 Inclusions of quartz and calcite with minor K-feldspar.
This subtype includes four medieval sherds from Taunton Castle fabric types 3, 7B, 8 and 15.

Type C The matrix clay composition of type C is closely similar to type B except the content of kaolinite appears to be slightly less. Inclusions are 60-70% calcite with the remaining being quartz and minor alkali feldspar.
This group includes two medieval sherds from Taunton Castle fabric types 7A and 23.

Type D The clay composition of the matrix is predominantly kaolinite and muscovite/illite with only minor Fe-Al-K silicates. Quartz is below 20% and plagioclase dominates over alkali feldspar. The inclusion population is much more diverse than in all other types. Around 70% is quartz but the remaining 30% include alkali feldspar, muscovite/illite, kaolinite, and Fe-Al silicates
The group includes production at Donyatt Site 13 and a single sherd from Taunton Castle fabric type 62, both of which are post-medieval (Coleman-Smith 2002).

There are no known early medieval production sites in Somerset so that analysis of sherds of this period can only hint at their geological source. Samples included six sherds identified to the Upper Greensands of the Blackdown Hills but another whose source remains unspecified (Allan *et al*. 2010).

The study at Taunton Castle was followed up by investigations of excavated sherds from the pottery production site at Churchill's Farm at Hemyock, which is situated close to the Devon-Somerset border toward the western end of the Blackdown Hills. Further materials were studied from post-medieval production sites at Crowcombe, Donyatt (sites 2 and 3), Nether Stowey, Wrangway, as well as later material from Bridgwater Chandos Glass Cone (Andersen *et al.* 2018). This study confirmed the mineralogical characteristics of the West Somerset types and the difference between these types and materials from Donyatt. It also provided evidence for the distinct composition of materials from the Bridgwater Chandos Glass Cone (Boore and Pearson 2010). The study established a close similarity between Hemyock and the West Somerset types, which is consistent with the Triassic bedrock at Hemyock. These studies laid the basis for better understanding how to differentiate red earthenware sherds from different areas of the county (Dawson *et al*. 2018).

THE PROJECT

The Mendips are a WNW-ESE trending ridge of Devonian and Carboniferous rocks in North Somerset. The ridge is geologically distinctive by the abundance of limestone, which is elsewhere not abundant in Somerset. Triassic and Jurassic sediments lap up against the older rocks but are largely eroded away along the ridge. The Triassic sediments are equivalent to those found in West Somerset, while the Jurassic sediments are continuous with South and East Somerset.

The Wells Pottery Study Group is the informal name of a group of people based at Wells and Mendip Museum and engaged with the archaeological study of pottery from test-pitting and excavation in Axbridge and environs (Axbridge Archaeological and Local History Society (AALHS) – David and Madeleine Roberts and Robin Goodfellow), Bridgwater (Bridgwater and District Archaeological Society – David Baker and Gill Pollack), Chewton Mendip (Community Archaeology on the Mendip Plateau – Pip Osborne, Linda Iveson, Brian Irwin, Rosemary Walker, Jennifer Waters and Kate Weston), Milverton – Julian Dakowski, Wells (Wells and Mendip Museum – the late Barry Lane, Teresa Hall, Linda Iveson and David Dawson), Westbury-sub-Mendip (Westbury Society – the late Barry Lane, Nicky Amos and Pete Missingham) and Winscombe (the Winscombe Project - Teresa Hall). Also associated are Amal Khreisheh, Frances Neale, Gill Davies, Heather Morrisey and Mary Claridge. The group grew out of an initiative of the Archaeology Committee of SANHS in collaboration with AALHS, Wells and Mendip Museum, the Museum of Somerset and the Medieval (and Later) Pottery Research Group. It is dedicated to understanding, interpreting and publishing medieval and later pottery from organised fieldwork and to contributing towards a reliable pottery fabric type series linked to sound chronological benchmarks.

To that end, the group began a process of comparison between the fabric type series that had been developed by members of the group for Winscombe, Axbridge, Westbury-sub-Mendip, Wells and Chewton Mendip and with that, in so far as it can be reconstructed, compiled by Philip Rahtz and David Peacock from the excavations at the Cheddar royal palaces (Rahtz 1979) and further correlated with Gerrard (1987). This was the opportunity to examine pottery from a relatively small area, 12km long at its greatest extent. The pottery that forms the subject of this report was submitted by the group to help resolve some of the issues around the nature of medieval pottery production and use in this area.

METHODOLOGY

The mineralogical composition was explored using the technique described by Andersen *et al*. (2016a). Polished thin sections of each sherd were produced, where possible, to provide cross-sections across the sherds. Individual specimens were photographed and then carbon coated for analysis by QEMSCAN 4300 at Camborne School of Mines, University of Exeter. The QEMSCAN is an automated scanning electron microscope that uses a focused electron beam to generate characteristic X-ray spectra in points on the thin section surface. Automated beam control, movement of the sample holder below the beam and the collection of spectra allows for the collection of information on more than 50,000 points per hour. These spectra are then classified into mineralogical groups by comparison with a spectral database (a species identification protocol, SIP); neighbouring analyses that are similar are interpreted to be part of the same particle. The results include not only information on the amount of each mineral, but also characteristic particle size distributions for each mineral, particle shape information and statistics on the relations between minerals.

The Fieldscan analytical mode allows for the collection of compositional data in a pre-defined grid across the sample surface, yielding visual representations of the distribution of minerals as well as quantitative data. A customised discriminator was introduced to distinguish the sample matrix defined as particles less than 63µm (in geological terms this is the discrimination between sand and silt), which is used as a proxy for the clay material used in the ceramic, and inclusions (particles greater than 63µm) which are used as an approximation of the material used to temper the clay. A further modifier takes into account that many small matrix particles may touch and generate an interconnected framework in the samples. As this material would enclose many particles of other minerals, it will appear to have a very high surface area to a given volume. It must be noted, however, that although this method appears to be robust some cross-over can be expected between the groups. It is particularly noticeable that inclusions composed of fine-grained mixtures of minerals (such as recycled ceramic fragments and consolidated mudstone inclusions) are expected to report to the matrix.

As X-ray spectra are characteristic for the chemical elements rather than minerals, a combination of element signals are used to identify the minerals. However, this means that minerals with similar elements may appear in the same mineral group. Table 2 gives an indication of the mineral groupings used in this report.

TABLE 2 MINERAL GROUPS USED IN THE QEMSCAN ANALYSIS

Fe sulphides	pyrite, marcasite, pyrrhotite (and possibly jarosite)
Pb glaze	Lead-bearing silicates, oxides and sulphides/sulphates
Barite	barite
Chrome spinel	chromite, chrome spinel
Fe Ox/CO3	siderite, hematite, magnetite, goethite, ochre and limonite.
Mn phases	all manganese bearing minerals including pyrolusite, rhodonite, rhodocrosite and umber
Rutile	rutile, anatase, brookite
Ilmenite	ilmenite
Zircon	zircon
REE phases	monazite, xenotime, allanite
Quartz	quartz, opal, chert, flint, chalcedony
Plagioclase feldspar	plagioclase feldspar
K-Feldspar	orthoclase, sanidine, microcline
Muscovite/Illite	muscovite, illite
Fe Al K silicates	iron-bearing (ferruginous) clays (smectite, montmorillonite, nontronite), biotite mica
Glauconite	any phase with Fe,Al,K,Mg,Si,O
Kaolinite	kaolinite, halloysite, dickite, kyanite, sillimanite, andalusite
Tourmaline	tourmaline
Fe Al silicates	chlorite/clinochlore, nontronite, vermiculite
Mg Al silicates	palygorskite, magnesiochloritoid
Mg silicates	asbestos, talc, serpentine minerals
Ca Fe Al silicates	epidote, zoisite, clinozoisite
Calcite	calcite, chalk, limestone, lime, ankerite, dolomite
Ca phosphates	apatite, tooth, bone and bone ash material
Others	any other mineral

THE SAMPLES

The samples (Figures 3-14, below) studied for the Wells Pottery Study Group project are:

WPSG no.	Provenance	Site fabric type no.	Sherd no.	Published reference
01	Cheddar Royal Palaces West Ditches	Peacock B Gerrard 5	MP20	Peacock 1979, 312; Rahtz 1979, 315-6; Allan *et al.* 2010, 176; Gerrard 1987
02	Wells Museum Garden pit 6	WMG 03	1996/10/1108	Dawson *et al.* 2015, 123
03	Chewton Mendip minster precinct	CM 10	CM 11/16/011	‡
04	Westbury-sub-Mendip test pitting	WM 64	WM 01/07	
05	Chewton Mendip minster precinct	CM 01	CM 11/2/05	‡
06	Hope Wood, Axbridge		HW 01	
07	Wells Museum Garden pit 6	WMG 18	1996/10/1016	Dawson *et al.* 2015, 125
08	Westbury-sub-Mendip test pitting	WM 33	WM/E5	
09	Westbury-sub-Mendip test pitting	WM 9	WM/TP06	
10	Cheddar Royal Palaces West Ditches	Peacock C Gerrard 6	MP28, DP77	Peacock 1979, 312; Rahtz 1979, 316; Gerrard 1987
11	Wells Museum Garden pit 6	WMG 05	1996/10/788	Dawson *et al.* 2015, 123
12	Wells Museum Garden pit 6	WMG 10	unnumbered	Dawson *et al.* 2015, 121

‡ The Chewton Mendip pottery fabric type series is published online at https://sites.google.com/view/newchewtonmendiptypeseries

RESULTS

The samples display significant variability both in their matrix and inclusion assemblages (Figs 1 and 2). For clarity, the Pb-glaze has been excluded from the mineralogical comparisons, and minerals appearing at less than 0.25 vol% are considered to be (near) absent.

Samples WPSG 02, 04 and 10 are similar in their compositions and have been assigned to Mendip Group 2. The matrix is dominated by Fe-Al-K silicates and muscovite/illite with around 10% (vol.) quartz and only traces of kaolinite. The feldspars make up 2-5% (vol.) with K-feldspar dominating over plagioclase. The inclusion population is dominated by quartz but has abundant calcite and minor K-feldspar. WPSG 01 is similar to these types, except the proportion of muscovite/illite in the matrix is much higher. It has been assigned to its own distinctive Mendip Group 1.

Samples WPSG 03, 05-09, and 11 have fairly similar matrices but have significant variation in their inclusion populations. The matrix compositions have significant quartz (25-35% (vol.)) and roughly equal amounts of muscovite/illite, Fe-Al-K silicates and kaolinite. The feldspars make up 5-

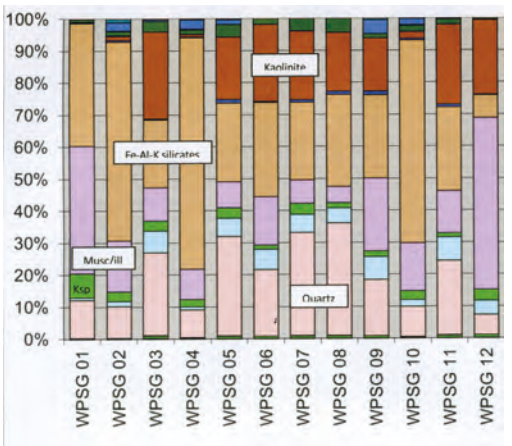

Fig. 1 Comparison of matrix components of the samples. See Fig. 4 for colour codes.

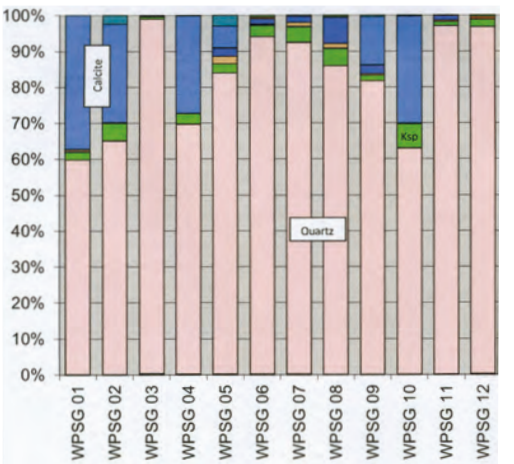

Fig. 2 Comparison of inclusion populations in the samples. See Fig. 4 for colour codes.

Figs 3-14 detailed analyses of samples (follow on pp. 179-202)

15% with plagioclase dominating over K-feldspar. The inclusion population is variable. WPSG 03 has nearly pure quartz while WPSG 05-09 have significant K-feldspar and glauconite. Calcite is present in WPSG 05 and WPSG 09. Minor Ca phosphate in WPSG 05 appears to relate to a partial surface coating (possibly a slip or underglaze of bone ash). WPSG 05 and 09 have been assigned to Mendip Group 3; 06, 07 and 08 to Mendip Group 4; 03 and 11 to Mendip Group 5.

The matrix of WPSG 12 (Redcliff ware) is dominated by muscovite/illite and kaolinite with minor quartz and Fe-Al-K silicates. The feldspars make up around 7% (wt) with plagioclase dominating over K-feldspar. The inclusion population is nearly pure quartz with only minor K-feldspar.

DISCUSSION AND MINERALOGICAL INTERPRETATION

The WPSG samples display some similarities with materials that have been investigated from other locations in Somerset and Devon. However, it is difficult to assign uniquely many of these to the existing mineralogical types.

There is significant mineralogical variation in the sherds from the Wells study. This is not unexpected, as Wells has a long tradition as a cathedral city and important commercial centre. The other locations are assumed to be production centres and are discussed below in the context of their underlying bedrock. The following discussion relates to groups with similar characteristics.

Mendip Group 2 comprising WPSG 02, 04 and 10 encompasses sherds from Cheddar, Westbury-sub-Mendip and Wells. The sherds have matrix compositions that are very similar to the West Somerset types identified as mineralogical Type A, but the abundance of calcite in the inclusion population makes them distinct from this group. The West Somerset Type A fabrics correlate well with localities on Triassic bedrock, and it is notable that the Mendips also have extensive exposures of Triassic bedrock. If the assumed connection between the bedrock and locally produced clays is maintained, these clays are probably locally derived. The calcite bearing inclusion assemblage is consistent with the abundance of limestone in the Mendips. In contrast, West Somerset does not have abundant limestone.

With an equal mix of muscovite/illite and Fe-Al-K silicates, WSPG 01 from Cheddar has a matrix composition not previously encountered. We can only speculate about the origin of this material. Illite-rich sediments are known from the Triassic Mercia Mudstone Group (Mayall 1979), which is exposed near Cheddar and may be locally exposed in the Mendips. The inclusion population is similar to WPSG 02, 04, and 10.

WPSG 12 from Wells also has a clay mix with substantial muscovite/illite, but in this case, the other dominant clay is kaolinite. As for WPSG 01, we have not encountered a matrix composition like this before. The inclusion population is very pure quartz with traces of K-feldspar.

Mendip Group 3, comprising WPSG 05 and 09 from Chewton Mendip and Westbury-sub-Mendip, is broadly similar to Type B2 from Taunton Castle.

No potential source was identified in the Taunton Castle report. The matrix composition is consistent with materials from Donyatt and Wanstrow on a Lias bedrock. Intriguingly, though, while the abundant calcite in the inclusion population is consistent with a source in the Mendips, the presence of glauconite is somewhat puzzling suggesting perhaps a mixed temper that included a component from the Upper Greensand Formation.

Mendip Group 5, comprising WPSG 03, and 11, and Mendip Group 4, comprising WPSG 06-08 from Chewton Mendip, Wells, Hope Wood and Westbury-sub-Mendip, are indistinguishable from Type B1 identified from Donyatt and Wanstrow and also found at Taunton Castle. While Chewton Mendip is on a Lias bedrock, consistent with Donyatt and Wanstrow, intriguingly Westbury-sub-Mendip is on Triassic bedrock.

Glauconite occurs in the inclusion population of WPSG 05-09 and WPSG 11. Glauconite is a commonly used indicator mineral for material sourced from the Cretaceous Upper Greensand Formation that is not widely exposed in the immediate area around the Mendips and Wells. The nearest extensive exposures are in the Blackdown Hills in South Somerset and Devon. Glauconite is not a general constituent of the bedrock geology in the Mendips, which is geologically much older, and it is interesting to consider therefore that the pottery (or the temper) has been transported from South Somerset. Interestingly, a recent paper by Farrant *et al.* (2014) reported a small outcrop of glauconitic sand equivalent to the Upper Greensand Formation at Tadhill (between Frome and Shepton Mallet), suggesting that such materials could theoretically have been locally sourced.

SYNTHESIS

The samples from the WPSG are mineralogically diverse, and while we recognise similarities with previously studied materials, we also see new materials.

The Mendips have extensive areas underlain by the Triassic Mercia Mudstone Group that also underlies large parts of West Somerset. It is therefore not surprising that the clay matrix for the West Somerset types (mineralogical Type A) also appears to match some materials from the Mendips. The differences in inclusion assemblage are consistent with the greater abundance of limestone (calcite) in the Mendips in comparison to West Somerset.

Chewton Mendip lies geologically on a Jurassic bedrock similar to Donyatt, and samples are consistent with the bedrock. Mineralogical Type B2, which was described from Taunton Castle, but, where a potential source was not identified, may correlate with samples 05 and 09 from Chewton Mendip and Westbury-sub-Mendip and therefore may have a source in the Mendips.

Materials from Westbury-sub-Mendip are more variable than would be expected from the Triassic bedrock geology and includes material that appear to be derived from other areas.

Materials from Wells are mineralogically diverse and probably reflect the city being a major administrative centre.

IMPLICATIONS FOR THE INTERPRETATION OF MEDIEVAL POTTERY MANUFACTURE

Manufacture of glazed pottery jugs is relatively well understood in the area of study. They were made at specific production sites, although so far only one medieval kiln has been identified and excavated, that at Ham Green downstream from Bristol, and another deposit of waste pottery at Redcliff Hill outside the Portwall, Bristol. The hand-built repertoire of products from Ham Green has been described and analysed by Ken Barton (1963) and Mike Ponsford (1991) and the wheel-thrown wares made at Redcliff Hill are published by Dawson and Ponsford (2017; Ponsford and Dawson 2018). Sample 12 analysed here shows how distinctive the fabric of Redcliff ware is. Other sources of glazed jugs have been postulated, notably Wells Museum Garden fabric type 30, a distinctive hard-fired red ware possibly from East Somerset (Dawson *et al.* 2015, 118, 123). There is also a soft pink fabric identified by Ponsford (1978) in a highly decorated vessel from Wedmore. Jugs are known to have been made at Bove Town, Glastonbury, but there is little information available about the find and none of its products have been identified elsewhere (Allan *et al.* 2015, 263, 265).

Coarse wares are by comparison little understood. Philip Rahtz published the corpus of Anglo-Saxon pottery based on forms from the excavations of the royal palaces at Cheddar and elsewhere in Somerset including Bristol (Rahtz 1974; 1979). Two of the fabrics from Cheddar characterised by David Peacock have been sampled here: Cheddar B (sample 1) and Cheddar C (sample 10). Sample 1 has been previously investigated by ICP-AES and ICP-MS by Mike Hughes (Peacock 1979, 312; Allan *et al.* 2010, 176). The issues that arose from studying the hand-built wares from the study area are threefold: 1) with the exception of WPSG 11, the wares are commonly dated to the 10th to the 12th century - can that be shown to be so or are some of these fabrics earlier and maybe even backfill the perceived ‘aceramic gap’ c. 650-850 postulated by Rahtz (1974, 103-4)? 2) only a

small number of types of ware appear across different sites – what is the implication of this? 3) what are the implications of the phenomenon that most of the coarse wares seem to be particular to one locality and has this phenomenon been observed elsewhere?

The possible answer to the first issue lies outside the scope of this paper. It has been recognised that more secure stratified and externally dated material needs to be identified to provide benchmarks that do not rely purely on seriation. Such an opportunity has arisen during the excavations of the site at Chewton Mendip by members of Community Archaeology on the Mendip Plateau led by Pip Osborne and will be reported elsewhere.

The QEMSCAN study has confirmed and explained the visual correspondences that were identified for those fabric types that appeared across several locations and that the special natures of Cheddar B and Wells Museum Garden Type 5 is now understood. As reported above, the fabrics fall into five groups:

- Group 1: Cheddar B (WSPG 01);
- Group 2: Wells Museum Garden Type 03 (WSPG 02), Westbury-sub-Mendip Type 64 (WSPG 04), Cheddar C (WSPG 10) – hard fired wares which share similar matrix characteristics to mineralogical Type A and inclusion populations of quartz and calcite mainly in the form of limestone;
- Group 3: Chewton Mendip Type 01 (WSPG 05), Westbury-sub-Mendip Type 9 (WSPG 09) – hard fired wares which share similar matrix characteristics with mineralogical Type B_1 and inclusion populations dominated by fine quartz but with some calcite (the form of WSPG 09 is that of a West Country dish – see Dawson and Payne 2020, 135-6);
- Group 4: Hope Wood (WSPG 06), Wells Museum Garden Type 18 (WSPG 07), Westbury-sub-Mendip 9 (WSPG 08) – soft to medium fired wares with reoxidised orange surfaces. They share similar matrix characteristics with mineralogical type B_1 and inclusion populations dominated by fine quartz but with some calcite. Superficially this fabric is very similar to Roman Severn Valley ware as produced at Shepton Mallet;
- Group 5: Chewton Mendip Type 10 (WSRG 03), Wells Museum Garden Type 5 (WSPG 11) – hard fired wares which share similar characteristics with mineralogical type B_1 and inclusion populations of almost pure quartz.

The reason why these groups appear in several locations must remain a matter of speculation. It is suggested here that this phenomenon is most likely a result of exchange of their contents rather than any intrinsic value they may have had as vessels. WPSG 09 has been submitted for residue analysis but unfortunately has been returned negative. The nature of Group 4 wares suggests these contents could include dry goods. It should be noted that their mineralogical characteristics tend to rule out the possibility they were made by itinerant potters. It was the pots themselves which moved.

The answer to the third issue calls into question why received wisdom generally rules out the possibility that many if not most hand-built jars were made locally for local use as is still a common practice in many parts of the world. It would go some way to explaining why in the study area the majority of fabrics are particular to their location and why for example those from the centre of Taunton differ from those from a site such as Nerrols Farm about 3km away (Dawson and Payne 2020, 138, 140).

ACKNOWLEDGEMENTS

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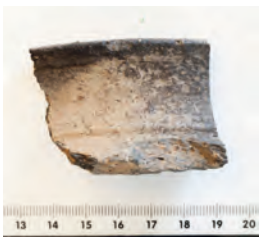
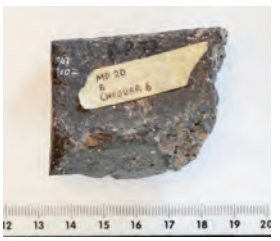
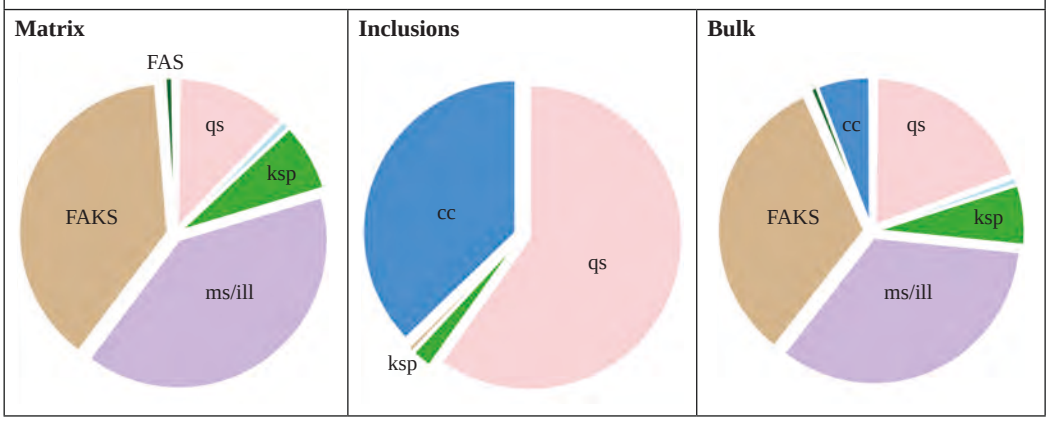
Sample: 1 Wells WPSG 01	**CSM lab code: 17JA1G**


(Scale in centimetres)

Fabric description	**Mineralogical description**
Taylor (in Allan 2010) reports: limestone, white/off-white sub rounded with fine crystalline calcite < 1.00mm; calcite 0.2-2.5mm; quartz, colourless/white transparent to translucent, many polished grains 0.2-0.8mm, much angular .0.1mm; chert, light grey/off-whit angular to subangular 0.3-1.5mm; red limonite particles; mica, sparse muscovite laths <0.2mm; tiny grains of zircon and anatase; one 2mm grain of tourmaline.	The sherd has 85 vol% matrix and 15 vol% inclusions. The inclusion population is a mixture of quartz (60 vol%) and calcite (37 vol%) with minor K-feldspar (2 vol%) and traces of Fe-Al-K-silicates and muscovite/illite. The matrix is composed of muscovite/illite (40 vol%) and Fe-Al-K silicates (38 vol%) with quartz (12 vol%) and K-feldspar (7 vol%). Kaolinite and plagioclase are below 1 vol%. The matrix contains traces of glauconite.
Form	**Mineralogical type**
Sherd MP20: Open jar with everted rim	
Analogues	**Notes**
Cheddar type B (Peacock); Cheddar type 5 (Gerrard)	MENDIP GROUP 1

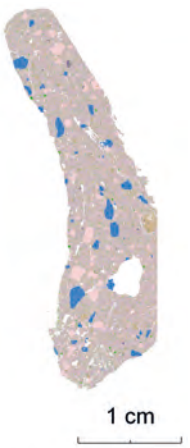
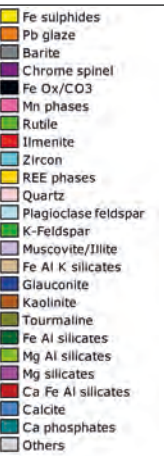
Visual representation of mineralogy[2]



Notes

[1] Mineral groups listed in Table 2.

[2] Pb-glaze has been excluded in these diagrams; FO = Fe-Ox/CO3, qz = quartz, pl = plagioclase, ksp = K-feldspar, ms/ill = muscovite/illite, FAKS = Fe-Al-K silicates, glt = glauconite, kln = kaolinite, FAS = Fe-Al silicates, cc = calcite

Visual appearance of thin section (transmitted light)	Mineralogical map	Key to mineral map[1]
		

Mineralogical composition

	Matrix	Inclusions	Bulk
Fe sulphides	0.00	0.00	0.00
Pb glaze	0.00	0.00	0.00
Barite	0.00	0.00	0.00
Chrome spinel	0.00	0.00	0.00
Fe Ox/CO3	0.02	0.00	0.02
Mn phases	0.03	0.00	0.02
Rutile	0.14	0.01	0.12
Ilmenite	0.01	0.00	0.01
Zircon	0.01	0.00	0.01
REE phases	0.00	0.00	0.00
Quartz	11.97	59.78	19.15
Plagioclase feldspar	0.81	0.07	0.70
K-Feldspar	7.33	2.04	6.54
Muscovite/Illite	39.90	0.20	33.93
Fe Al K silicates	38.39	0.53	32.70
Glauconite	0.14	0.08	0.13
Kaolinite	0.25	0.00	0.21
Tourmaline	0.01	0.00	0.01
Fe Al silicates	0.69	0.09	0.60
Ca Mg Fe silicates	0.02	0.00	0.01
Ca Fe Al silicates	0.00	0.00	0.00
Calcite	0.18	37.20	5.75
Ca phosphates	0.06	0.00	0.05
Fluorite	0.00	0.00	0.00
Others	0.01	0.00	0.01

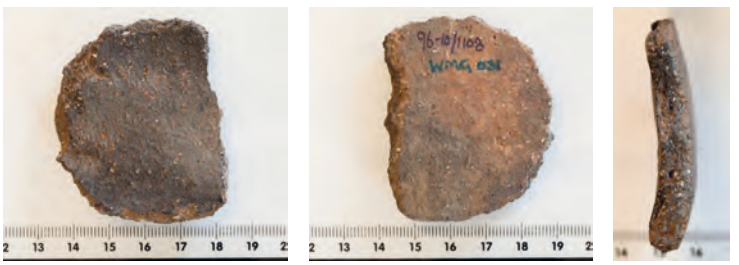
Particle size distribution

Matrix (< 63 µm) = 85.0 vol%
Inclusions (> 63 µm) = 15.0 vol%

Measurement statistics

Total measurement points = 1784343
Measurement spacing = 10 µm

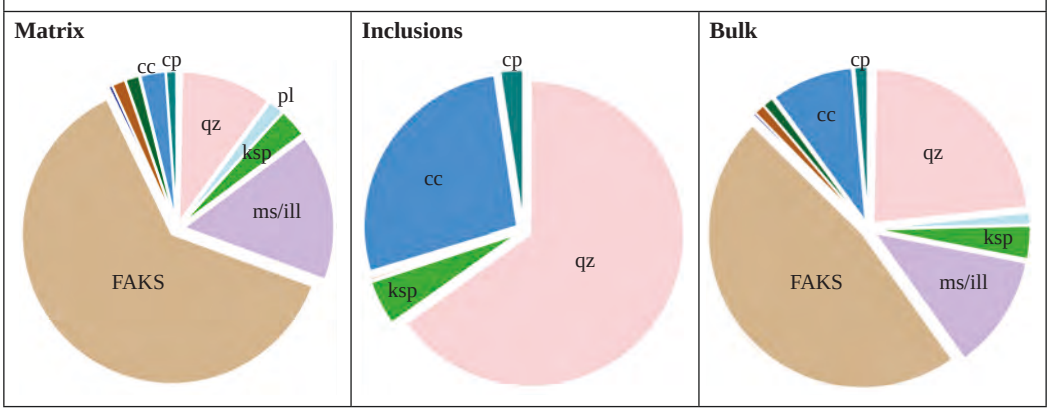
Sample: 2 Wells WPSG 02	**CSM lab code: 17JA1A**



(Scale in centimetres)

Fabric description	**Mineralogical description**
Reduced grey core with patches of reoxidised orange on external surface., soapy texture. Abundant tiny mica platelets; occasional soft iron-rich black particles <0.5mm, spare well-sorted subangular quartz <0.5mm, occasional linear void <0.4mm, sparse rounded voids <1mm.	The sherd has 76 vol% matrix and 24 vol% inclusions. The inclusion population is a mixture of quartz (65 vol%) and calcite (27 vol%) with minor K-feldspar (5 vol%) and Ca-phosphate (2.4 vol%, bone?). The matrix is dominated by Fe-Al-K silicates (62 vol%) with muscovite/illite (16 vol%). K-feldspar (3 vol%) dominates over plagioclase (1.6 vol%), and there are traces of calcite (3 vol%), kaolinite (1.4 vol%) and Ca-phosphates (1 vol%).
Form	**Mineralogical type**
Sherd 1996.10/1108: open jar with everted rim.	Similar to A
Analogues	**Notes**
Wells Museum Garden type 03	MENDIP GROUP 2

Visual representation of mineralogy[2]



Notes

[1] Mineral groups listed in Table 2.

[2] Pb-glaze has been excluded in these diagrams; FO = Fe-Ox/CO3, qz = quartz, pl = plagioclase, ksp = K-feldspar, ms/ill = muscovite/illite, FAKS = Fe-Al-K silicates, glt = glauconite, kln = kaolinite, FAS = Fe-Al silicates, cc = calcite, cp = Ca-phosphate

Visual appearance of thin section (transmitted light)	Mineralogical map	Key to mineral map[1]
		

Mineralogical composition

	Matrix	Inclusions	Bulk
Fe sulphides	0.01	0.00	0.01
Pb glaze	0.00	0.00	0.00
Barite	0.00	0.01	0.00
Chrome spinel	0.00	0.00	0.00
Fe Ox/CO3	0.08	0.00	0.06
Mn phases	0.04	0.00	0.03
Rutile	0.15	0.01	0.12
Ilmenite	0.01	0.01	0.01
Zircon	0.01	0.00	0.01
REE phases	0.00	0.00	0.00
Quartz	9.79	65.00	23.11
Plagioclase feldspar	1.64	0.10	1.27
K-Feldspar	3.06	4.76	3.47
Muscovite/Illite	15.86	0.07	12.05
Fe Al K silicates	62.21	0.31	47.27
Glauconite	0.39	0.00	0.29
Kaolinite	1.44	0.00	1.09
Tourmaline	0.00	0.00	0.00
Fe Al silicates	1.46	0.00	1.11
Ca Mg Fe silicates	0.05	0.00	0.04
Ca Fe Al silicates	0.02	0.00	0.01
Calcite	2.68	27.33	8.63
Ca phosphates	1.07	2.39	1.39
Fluorite	0.02	0.00	0.02
Others	0.02	0.00	0.01

Particle size distribution

Matrix (< 63 µm) = 75.9 vol%
Inclusions (> 63 µm) = 24.1 vol%

Measurement statistics

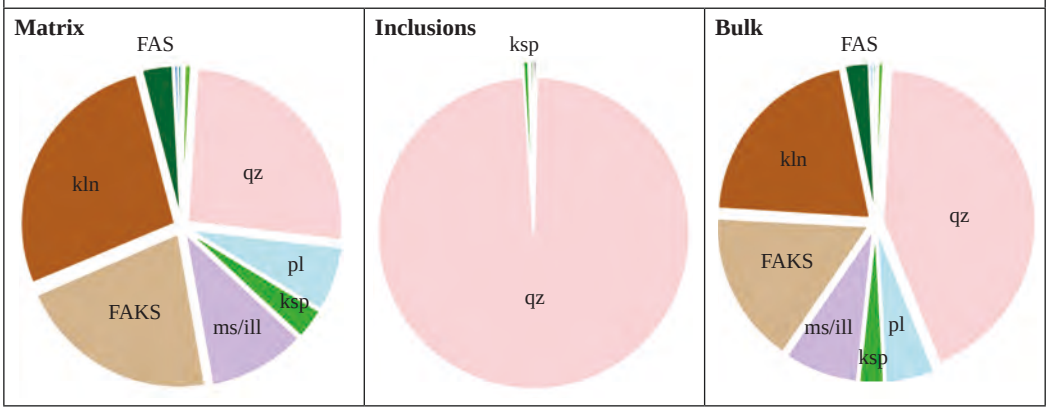
Total measurement points = 1784343
Measurement spacing = 10 µm

Sample: 3 Wells WPSG 03	**CSM lab code: 17JA16**

(Scale in centimetres)

Fabric description	**Mineralogical description**
Reduced patches of reoxidised gey on external surface and small patched of rusty brown. Quartz abundant subangular <2mm; iron oxide sparse irregular <2mm	The sherd has 76 vol% matrix and 24 vol% inclusions. The inclusion population is nearly pure quartz (99 vol%) with only traces of K-feldspar (0.5 vol%), Fe-Al silicates (0.3 vol%) and iron oxides (0.3 vol%). The matrix consists of equal amounts of kaolinite (27 vol%), quartz (26 vol%) and Fe-Al-K silicates with around 10 vol% muscovite/illite. Plagioclase (7 vol%) dominates over K-feldspar (3 vol%) and there are traces of Fe-Al silicates and other minerals.
Form	**Mineralogical type**
Sherd CM 11/16/011, open jar	Similar to B_1
Analogues	**Notes**
Chewton Mendip type 10	MENDIP GROUP 5

Visual representation of mineralogy[2]



Notes

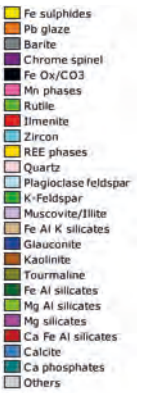
[1] Mineral groups listed in Table 2.

[2] Pb-glaze has been excluded in these diagrams; FO = Fe-Ox/CO3, qz = quartz, pl = plagioclase, ksp = K-feldspar, ms/ill = muscovite/illite, FAKS = Fe-Al-K silicates, glt = glauconite, kln = kaolinite, FAS = Fe-Al silicates, cc = calcite, cp = Ca-phosphate

Visual appearance of thin section (transmitted light)	Mineralogical map	Key to mineral map[1]

Chewton Mendip type 10

MENDIP GROUP



Mineralogical composition

	Matrix	Inclusions	Bulk
Fe sulphides	0.01	0.00	0.00
Pb glaze	0.00	0.00	0.00
Barite	0.00	0.00	0.00
Chrome spinel	0.00	0.00	0.00
Fe Ox/CO3	0.22	0.28	0.23
Mn phases	0.04	0.00	0.03
Rutile	0.66	0.03	0.51
Ilmenite	0.04	0.00	0.03
Zircon	0.05	0.01	0.04
REE phases	0.00	0.01	0.00
Quartz	25.86	98.63	43.07
Plagioclase feldspar	6.82	0.01	5.21
K-Feldspar	3.20	0.54	2.57
Muscovite/Illite	10.30	0.02	7.87
Fe Al K silicates	21.27	0.06	16.25
Glauconite	0.23	0.03	0.18
Kaolinite	27.23	0.07	20.81
Tourmaline	0.03	0.02	0.02
Fe Al silicates	3.20	0.28	2.51
Ca Mg Fe silicates	0.02	0.00	0.01
Ca Fe Al silicates	0.07	0.00	0.05
Calcite	0.38	0.00	0.29
Ca phosphates	0.36	0.02	0.28
Fluorite	0.00	0.00	0.00
Others	0.02	0.00	0.02

Particle size distribution

Matrix (< 63 µm) = 76.3 vol%
Inclusions (> 63 µm) = 23.7 vol%

Measurement statistics

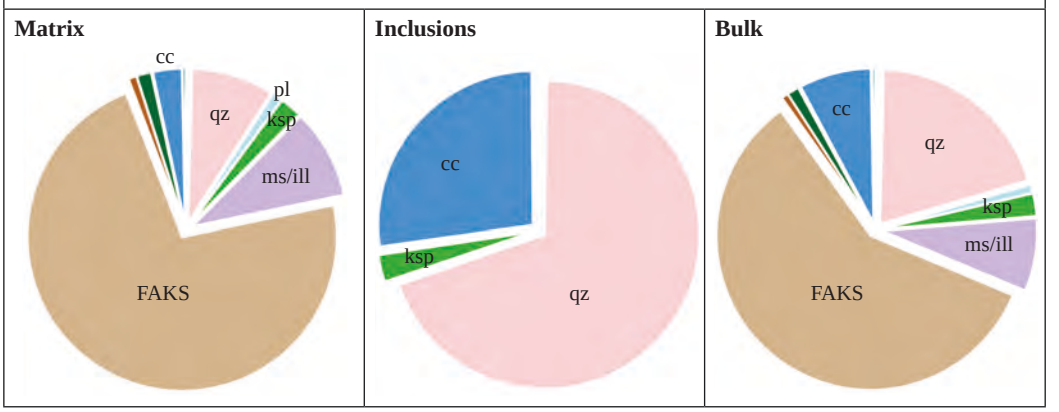
Total measurement points = 2079765
Measurement spacing = 10 µm

Sample: 4 Wells WPSG 04	**CSM lab code: 17JA15**

(Scale in centimetres)

Fabric description	**Mineralogical description**
Reduced with reoxidised buff exterior surface. Quartz abundant subangular particles <1mm; limestone occasional subangular <2mm.	The sherd has 81 vol% matrix and 19 vol% inclusions. The inclusion population is a mixture of quartz (70 vol%) and calcite (27 vol%) with minor K-feldspar (3 vol%). The matrix is dominated by Fe-Al-K silicates (72 vol%) with quartz (9 vol%) and muscovite/illite (9 vol%). Calcite occupies 3 vol%. K-feldspar (2 vol%) dominates over plagioclase (1 vol%) and there are traces of Fe-Al silicates.
Form	**Mineralogical type**
Sherd WM 01/7; open jar	Similar to A
Analogues	**Notes**
Westbury-sub-Mendip type 64	MENDIP GROUP 2

Visual representation of mineralogy[2]

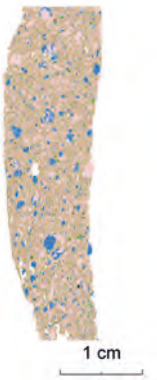


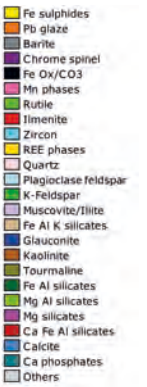
Notes

[1] Mineral groups listed in Table 2.

[2] Pb-glaze has been excluded in these diagrams; FO = Fe-Ox/CO_3, qz = quartz, pl = plagioclase, ksp = K-feldspar, ms/ill = muscovite/illite, FAKS = Fe-Al-K silicates, glt = glauconite, kln = kaolinite, FAS = Fe-Al silicates, cc = calcite

Visual appearance of thin section (transmitted light)	Mineralogical map	Key to mineral map[1]





Mineralogical composition

	Matrix	Inclusions	Bulk
Fe sulphides	0.01	0.00	0.01
Pb glaze	0.01	0.00	0.01
Barite	0.00	0.01	0.00
Chrome spinel	0.00	0.00	0.00
Fe Ox/CO3	0.06	0.15	0.08
Mn phases	0.21	0.02	0.17
Rutile	0.13	0.02	0.11
Ilmenite	0.02	0.00	0.01
Zircon	0.01	0.00	0.01
REE phases	0.00	0.00	0.00
Quartz	8.57	69.52	20.05
Plagioclase feldspar	1.06	0.10	0.88
K-Feldspar	2.25	2.81	2.35
Muscovite/Illite	9.40	0.01	7.63
Fe Al K silicates	72.37	0.11	58.76
Glauconite	0.16	0.01	0.13
Kaolinite	0.84	0.00	0.68
Tourmaline	0.01	0.00	0.01
Fe Al silicates	1.49	0.00	1.21
Ca Mg Fe silicates	0.06	0.05	0.06
Ca Fe Al silicates	0.03	0.00	0.02
Calcite	3.00	27.06	7.53
Ca phosphates	0.32	0.14	0.28
Fluorite	0.00	0.00	0.00
Others	0.01	0.00	0.00

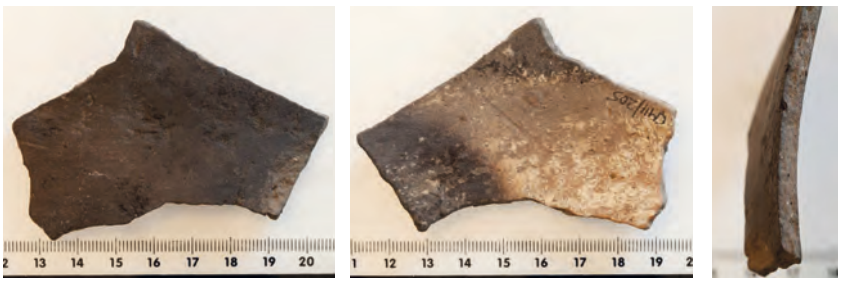
Particle size distribution

Matrix (< 63 µm) = 81.2 vol%
Inclusions (> 63 µm) = 18.8 vol%

Measurement statistics

Total measurement points = 4335296
Measurement spacing = 10 µm

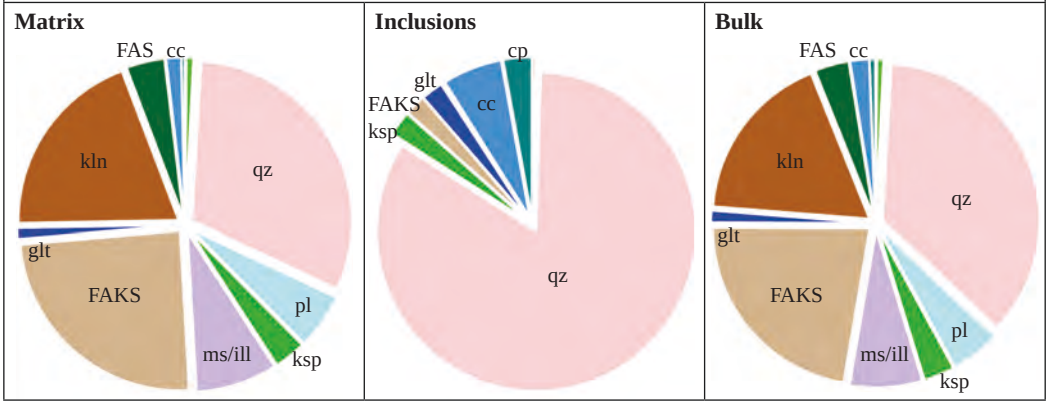
Sample: 5 Wells WPSG 05	**CSM lab code: 17JA19**



(Scale in centimetres)

Fabric description	**Mineralogical description**
Reduced with patchy reoxidation on surfaces. Fine, silty appearance. Visible inclusions quartz, occasional <0.5mm; scarce voids <0.5mm.	The sherd has 90 vol% matrix and 10 vol% inclusions. The inclusion population is dominated by quartz (84 vol%) with calcite (6 vol%), K-feldspar (2 vol%), Fe-Al-K-silicates (2 vol%), glauconite (2 vol%) and Ca-phosphate (3 vol%). The matrix has equal proportions of Fe-Al-K silicates (25 vol%), quartz (31 vol%) and kaolinite (20 vol%). Plagioclase (6 vol%) dominates over K-feldspar (3 vol%) with minor calcite, Fe-Al silicates and muscovite/illite.
Form	**Mineralogical type**
Sherd CM 11/2/05; open jar	Similar to B_1
Analogues	**Notes**
Chewton Mendip type 01	MENDIP GROUP 3

Visual representation of mineralogy[2]

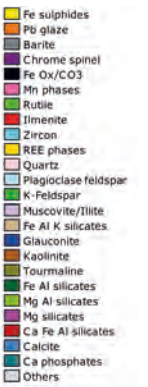


Notes

[1] Mineral groups listed in Table 2.

[2] Pb-glaze has been excluded in these diagrams; FO = Fe-Ox/CO_3, qz = quartz, pl = plagioclase, ksp = K-feldspar, ms/ill = muscovite/illite, FAKS = Fe-Al-K silicates, glt = glauconite, kln = kaolinite, FAS = Fe-Al silicates, cc = calcite

Visual appearance of thin section (transmitted light)	Mineralogical map	Key to mineral map[1]



Mineralogical composition

	Matrix	Inclusions	Bulk
Fe sulphides	0.01	0.04	0.01
Pb glaze	0.04	0.27	0.06
Barite	0.00	0.00	0.00
Chrome spinel	0.01	0.00	0.01
Fe Ox/CO3	0.05	0.10	0.05
Mn phases	0.01	0.00	0.01
Rutile	0.70	0.06	0.64
Ilmenite	0.09	0.00	0.08
Zircon	0.04	0.00	0.03
REE phases	0.00	0.00	0.00
Quartz	31.05	83.60	36.10
Plagioclase feldspar	5.65	0.03	5.11
K-Feldspar	3.24	2.47	3.16
Muscovite/Illite	8.22	0.04	7.43
Fe Al K silicates	24.55	2.05	22.39
Glauconite	1.08	2.19	1.19
Kaolinite	19.52	0.14	17.65
Tourmaline	0.02	0.00	0.02
Fe Al silicates	3.86	0.09	3.50
Ca Mg Fe silicates	0.02	0.00	0.02
Ca Fe Al silicates	0.03	0.00	0.02
Calcite	1.50	6.03	1.93
Ca phosphates	0.33	2.89	0.58
Fluorite	0.01	0.00	0.01
Others	0.01	0.00	0.01

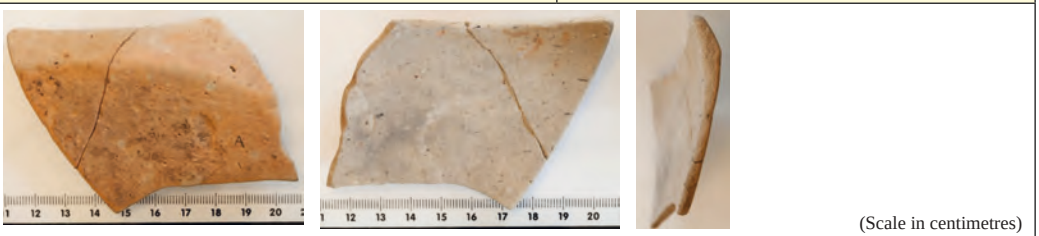
Particle size distribution

Matrix (< 63 µm) = 90.4 vol%
Inclusions (> 63 µm) = 9.6 vol%

Measurement statistics

Total measurement points = 2555991
Measurement spacing = 10 µm

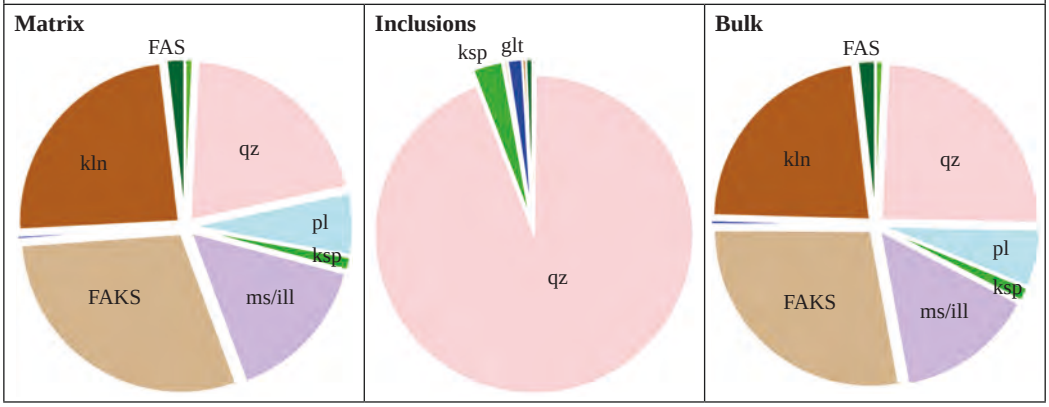
Sample: 6 Wells WPSG 06	**CSM lab code: 17JA17**



(Scale in centimetres)

Fabric description	**Mineralogical description**
Soft-fired, reduced , reoxidised orange external surface. Fine with scarcely any visible inclusions except tiny sparckles of quartz on the surfaces and sparse voids in section <2mm.	The sherd has 95 vol% matrix and 5 vol% inclusions. The inclusion population is nearly pure quartz (60 vol%) with minor K-feldspar (3 vol%) and glauconite (1 vol%). The matrix is composed of equal proportions of quartz (21 vol%), Fe-Al-K silicates (29 vol%) and kaolinite (24 vol%) with significant muscovite/illite (15 vol%. Plagioclase (6 vol%) dominates over K-feldspar (1 vol%). There are minor Fe Al silicates.
Form	**Mineralogical type**
Sherd HW 01; open jar	Similar to B_1
Analogues	**Notes**
Axbridge Hope Wood type	MENDIP GROUP 4

Visual representation of mineralogy[2]

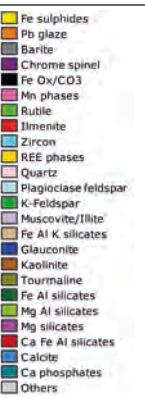


Notes

[1] Mineral groups listed in Table 2.

[2] Pb-glaze has been excluded in these diagrams; FO = Fe-Ox/CO_3, qz = quartz, pl = plagioclase, ksp = K-feldspar, ms/ill = muscovite/illite, FAKS = Fe-Al-K silicates, glt = glauconite, kln = kaolinite, FAS = Fe-Al silicates, cc = calcite

Visual appearance of thin section (transmitted light)	Mineralogical map	Key to mineral map[1]



Mineralogical composition

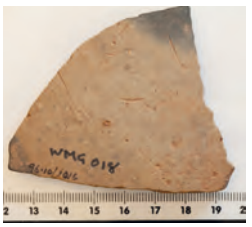
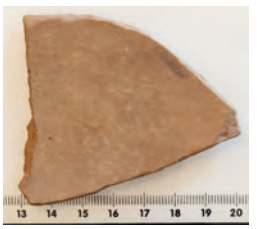
	Matrix	Inclusions	Bulk
Fe sulphides	0.00	0.00	0.00
Pb glaze	0.00	0.00	0.00
Barite	0.00	0.00	0.00
Chrome spinel	0.00	0.00	0.00
Fe Ox/CO3	0.00	0.00	0.00
Mn phases	0.00	0.00	0.00
Rutile	0.73	0.18	0.70
Ilmenite	0.03	0.00	0.03
Zircon	0.02	0.00	0.02
REE phases	0.00	0.00	0.00
Quartz	20.80	93.96	24.58
Plagioclase feldspar	6.28	0.02	5.96
K-Feldspar	1.31	3.00	1.40
Muscovite/Illite	15.19	0.14	14.41
Fe Al K silicates	29.46	0.30	27.95
Glauconite	0.34	1.44	0.39
Kaolinite	23.94	0.34	22.72
Tourmaline	0.08	0.00	0.08
Fe Al silicates	1.79	0.64	1.73
Ca Mg Fe silicates	0.02	0.00	0.02
Ca Fe Al silicates	0.00	0.00	0.00
Calcite	0.00	0.00	0.00
Ca phosphates	0.00	0.00	0.00
Fluorite	0.00	0.00	0.00
Others	0.00	0.00	0.00

Particle size distribution

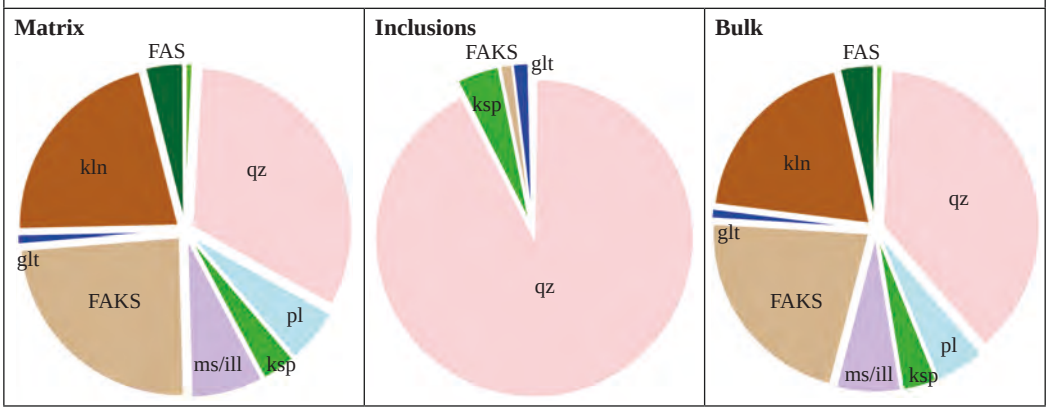
Matrix (< 63 µm) = 94.8 vol%
Inclusions (> 63 µm) = 5.2 vol%

Measurement statistics

Total measurement points = 1889348
Measurement spacing = 10 µm

Sample: 7 Wells WPSG 07	**CSM lab code: 17JA1B**
   (Scale in centimetres)	
Fabric description	**Mineralogical description**
Hard-fired, reduced, reoxidised orange surfaces. Fine, sparse visible inclusions. Quartz rounded <0.5mm tiny sparkling fragments on surfaces.	The sherd has 91 vol% matrix and 9 vol% inclusions. The inclusion population is nearly pure quartz (92 vol%) with minor K-feldspar (4 vol%), glauconite (2 vol%) and Fe-Al-K-silicates 1 vol%). The matrix is a mixture of quartz (32 vol%), Fe-Al-K silicates (24 vol%) and kaolinite (21 vol%). Plagioclase (6 vol%) dominates over K-feldspar (3 vol%). The matrix has minor muscovite/illite and Fe-Al silicates, along with traces of glauconite.
Form	**Mineralogical type**
Sherd 1996.10/1016; open jar	Similar to B_1
Analogues	**Notes**
Wells Museum Garden type 18	MENDIP GROUP 4

Visual representation of mineralogy[2]

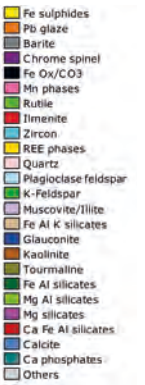


Notes

[1] Mineral groups listed in Table 2.

[2] Pb-glaze has been excluded in these diagrams; FO = Fe-Ox/CO_3, qz = quartz, pl = plagioclase, ksp = K-feldspar, ms/ill = muscovite/illite, FAKS = Fe-Al-K silicates, glt = glauconite, kln = kaolinite, FAS = Fe-Al silicates, cc = calcite

Visual appearance of thin section (transmitted light)	Mineralogical map	Key to mineral map[1]



Mineralogical composition

	Matrix	Inclusions	Bulk
Fe sulphides	0.00	0.00	0.00
Pb glaze	0.00	0.00	0.00
Barite	0.00	0.00	0.00
Chrome spinel	0.01	0.00	0.01
Fe Ox/CO3	0.02	0.00	0.02
Mn phases	0.00	0.00	0.00
Rutile	0.70	0.10	0.64
Ilmenite	0.12	0.00	0.11
Zircon	0.05	0.08	0.05
REE phases	0.00	0.00	0.00
Quartz	32.22	92.25	37.89
Plagioclase feldspar	5.67	0.06	5.14
K-Feldspar	3.44	4.34	3.53
Muscovite/Illite	7.34	0.02	6.65
Fe Al K silicates	24.12	1.21	21.96
Glauconite	0.95	1.58	1.01
Kaolinite	21.40	0.19	19.40
Tourmaline	0.03	0.00	0.02
Fe Al silicates	3.84	0.13	3.49
Ca Mg Fe silicates	0.02	0.00	0.02
Ca Fe Al silicates	0.01	0.00	0.01
Calcite	0.04	0.03	0.04
Ca phosphates	0.01	0.00	0.00
Fluorite	0.00	0.00	0.00
Others	0.01	0.00	0.01

Particle size distribution

Matrix (< 63 µm) = 90.6 vol%
Inclusions (> 63 µm) = 9.4 vol%

Measurement statistics

Total measurement points = 1521092
Measurement spacing = 10 µm

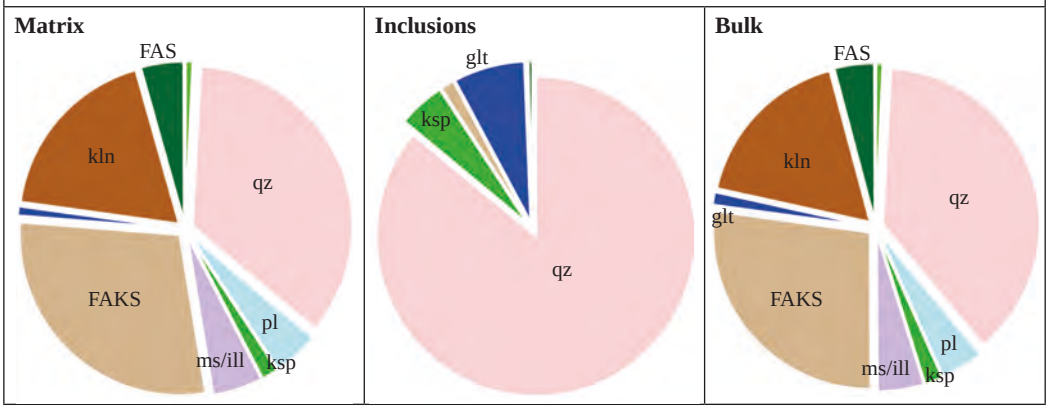
Sample: 8 Wells WPSG 08	**CSM lab code: 17JA1F**



(Scale in centimetres)

Fabric description	**Mineralogical description**
Soft-fired, reduced, reoxidised orange surfaces. No inclusions visible except sparkles of fine quartz on surfaces.	The sherd has 94 vol% matrix and 6 vol% inclusions. The inclusion population is dominated by quartz (86 vol%) with minor K-feldspar (5 vol%), glauconite (7 vol%) . The matrix is a mixture of quartz (35 vol%), Fe-Al-K silicates (29 vol%) and kaolinite (18 vol%). Plagioclase (5 vol%) dominates over K-feldspar (2 vol%). The matrix has minor muscovite/illite (4 vol%) and Fe-Al silicates (4 vol%), along with traces of glauconite.
Form	**Mineralogical type**
Sherd WM/E5; rim of open jar	Similar to B_1
Analogues	**Notes**
Westbury-sub-Mendip type 33	MENDIP GROUP 4
Visual appearance of thin section (transmitted light)	**Mineralogical map** / **Key to mineral map**[1]

Visual representation of mineralogy[2]

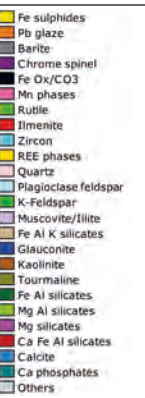


Notes

[1] Mineral groups listed in Table 2.

[2] Pb-glaze has been excluded in these diagrams; FO = Fe-Ox/CO_3, qz = quartz, pl = plagioclase, ksp = K-feldspar, ms/ill = muscovite/illite, FAKS = Fe-Al-K silicates, glt = glauconite, kln = kaolinite, FAS = Fe-Al silicates, cc = calcite

Visual appearance of thin section (transmitted light)	Mineralogical map	Key to mineral map[1]



Mineralogical composition

	Matrix	Inclusions	Bulk
Fe sulphides	0.00	0.00	0.00
Pb glaze	0.00	0.00	0.00
Barite	0.00	0.00	0.00
Chrome spinel	0.00	0.00	0.00
Fe Ox/CO3	0.03	0.00	0.03
Mn phases	0.00	0.00	0.00
Rutile	0.69	0.00	0.65
Ilmenite	0.08	0.02	0.08
Zircon	0.04	0.00	0.04
REE phases	0.00	0.00	0.00
Quartz	35.20	85.96	38.12
Plagioclase feldspar	4.67	0.01	4.40
K-Feldspar	1.63	4.76	1.81
Muscovite/Illite	5.04	0.05	4.75
Fe Al K silicates	28.85	1.36	27.27
Glauconite	0.92	7.20	1.29
Kaolinite	18.42	0.23	17.38
Tourmaline	0.03	0.00	0.03
Fe Al silicates	4.31	0.40	4.09
Ca Mg Fe silicates	0.02	0.00	0.02
Ca Fe Al silicates	0.00	0.00	0.00
Calcite	0.01	0.00	0.01
Ca phosphates	0.00	0.00	0.00
Fluorite	0.00	0.00	0.00
Others	0.01	0.00	0.01

Particle size distribution

Matrix (< 63 µm) = 94.2 vol%
Inclusions (> 63 µm) = 5.8 vol%

Measurement statistics

Total measurement points = 2166153
Measurement spacing = 10 µm

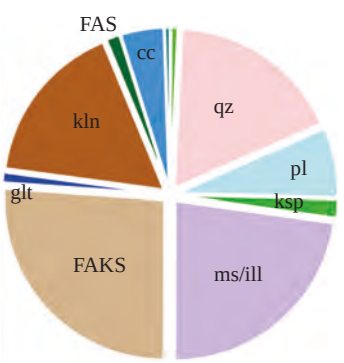
Sample: 9 Wells WPSG 09	**CSM lab code: 17JA1E**

(Scale in centimetres)

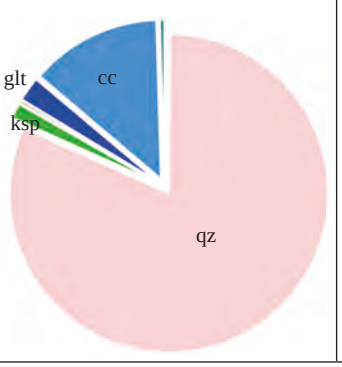
Fabric description	**Mineralogical description**
Reduced, reoxidised buff surfaces. Quartz abundant subangular <0.5mm; limestone/calcite occasional <1mm.	The sherd has 78 vol% matrix and 22 vol% inclusions. The inclusion population is a mixture of quartz (82 vol%) and calcite (13 vol%) with minor K-feldspar (2 vol%) and glauconite (2 vol%). The matrix is composed of roughly equal proportions of quartz (18 vol%), muscovite/illite (23 vol%), Fe-Al-K silicates (26 vol%) and kaolinite (17 vol%). Plagioclase (7 vol%) dominates over K-feldspar (2 vol%). The matrix has 4 vol% calcite and traces of glauconite.
Form	**Mineralogical type**
Sherd WM/TP06; base of West Country dish	Similar to B_1
Analogues	**Notes**
Westbury-sub-Mendip type 9	MENDIP GROUP 3

Visual representation of mineralogy[2]

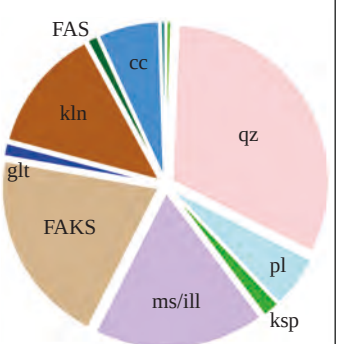
Matrix



Inclusions



Bulk

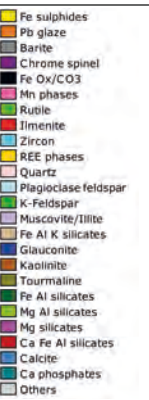


Notes

[1] Mineral groups listed in Table 2.

[2] Pb-glaze has been excluded in these diagrams; FO = Fe-Ox/CO_3, qz = quartz, pl = plagioclase, ksp = K-feldspar, ms/ill = muscovite/illite, FAKS = Fe-Al-K silicates, glt = glauconite, kln = kaolinite, FAS = Fe-Al silicates, cc = calcite

Visual appearance of thin section (transmitted light)	Mineralogical map	Key to mineral map[1]



Mineralogical composition

	Matrix	Inclusions	Bulk
Fe sulphides	0.00	0.00	0.00
Pb glaze	0.00	0.00	0.00
Barite	0.00	0.00	0.00
Chrome spinel	0.00	0.00	0.00
Fe Ox/CO3	0.05	0.02	0.04
Mn phases	0.04	0.00	0.03
Rutile	0.63	0.00	0.49
Ilmenite	0.02	0.03	0.03
Zircon	0.02	0.05	0.03
REE phases	0.00	0.00	0.00
Quartz	17.59	81.59	31.86
Plagioclase feldspar	7.04	0.02	5.48
K-Feldspar	1.82	1.54	1.76
Muscovite/Illite	22.79	0.05	17.72
Fe Al K silicates	26.11	0.35	20.36
Glauconite	1.01	2.48	1.33
Kaolinite	16.64	0.04	12.94
Tourmaline	0.02	0.00	0.01
Fe Al silicates	1.33	0.01	1.04
Ca Mg Fe silicates	0.02	0.00	0.02
Ca Fe Al silicates	0.01	0.00	0.01
Calcite	4.33	13.33	6.34
Ca phosphates	0.49	0.47	0.48
Fluorite	0.01	0.00	0.01
Others	0.01	0.00	0.01

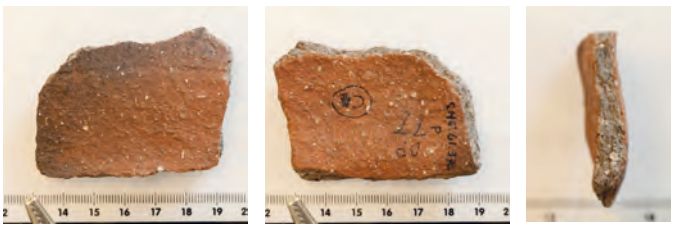
Particle size distribution

Matrix (< 63 µm) = 77.7 vol%
Inclusions (> 63 µm) = 22.3 vol%

Measurement statistics

Total measurement points = 1069894
Measurement spacing = 10 µm

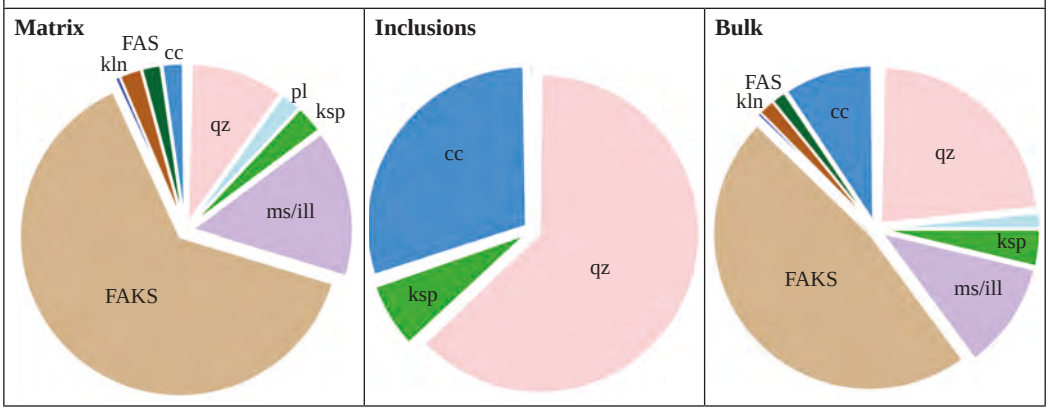
Sample: 10 Wells WPSG 10	**CSM lab code: 17JA12**



(Scale in centimetres)

Fabric description	**Mineralogical description**
Reduced with reoxidised orange surfaces. Taylor reports Limestone white/off-white angular and subrounded 0.5-2mm; calcite angular and cleaved fragments .02-2.75mm; quartz transparent to translucent colourless to white angular to well-rounded 0.1-2.5mm; chert white to pale grey 0.2-2.5mm; silicified shell two fragments 0.5-1.5mm; Sandstone colourless to light mottled 0.5-1.5mm	The sherd has 75 vol% matrix and 25 vol% inclusions. The inclusion population is a mixture of quartz (63 vol%) and calcite (30 vol%) with minor K-feldspar (7 vol%). The matrix is dominated by Fe-Al-K silicates (63 vol%) with muscovite/illite (15 vol%) and quartz (9 vol%). K-feldspar (3 vol%) dominates over plagioclase (2 vol%). The matrix contains traces of kaolinite, Fe-Al silicates, calcite and glauconite.
Form	**Mineralogical type**
Sherd M28; open jar	Similar to B_1
Analogues	**Notes**
Cheddar type C (Peacock); Cheddar type 6 (Gerrard)	MENDIP GROUP 2

Visual representation of mineralogy[2]

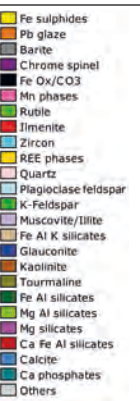


Notes

[1] Mineral groups listed in Table 2.

[2] Pb-glaze has been excluded in these diagrams; FO = Fe-Ox/CO_3, qz = quartz, pl = plagioclase, ksp = K-feldspar, ms/ill = muscovite/illite, FAKS = Fe-Al-K silicates, glt = glauconite, kln = kaolinite, FAS = Fe-Al silicates, cc = calcite

Visual appearance of thin section (transmitted light)	Mineralogical map	Key to mineral map[1]



Mineralogical composition

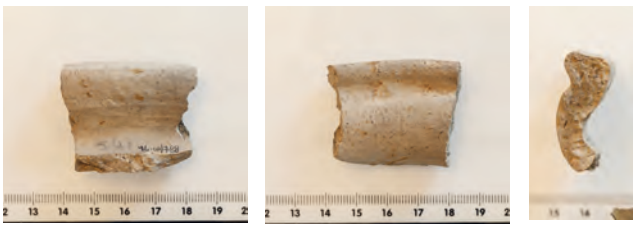
	Matrix	Inclusions	Bulk
Fe sulphides	0.01	0.00	0.00
Pb glaze	0.01	0.00	0.01
Barite	0.00	0.00	0.00
Chrome spinel	0.00	0.00	0.00
Fe Ox/CO3	0.08	0.10	0.08
Mn phases	0.13	0.00	0.09
Rutile	0.18	0.02	0.14
Ilmenite	0.02	0.00	0.01
Zircon	0.02	0.00	0.01
REE phases	0.00	0.00	0.00
Quartz	9.44	62.77	23.03
Plagioclase feldspar	2.08	0.22	1.60
K-Feldspar	2.82	6.56	3.77
Muscovite/Illite	14.94	0.07	11.15
Fe Al K silicates	63.42	0.26	47.33
Glauconite	0.46	0.00	0.34
Kaolinite	2.19	0.00	1.64
Tourmaline	0.00	0.00	0.00
Fe Al silicates	1.89	0.02	1.41
Ca Mg Fe silicates	0.06	0.00	0.04
Ca Fe Al silicates	0.03	0.00	0.02
Calcite	2.07	29.73	9.11
Ca phosphates	0.13	0.26	0.16
Fluorite	0.01	0.00	0.01
Others	0.02	0.00	0.01

Particle size distribution

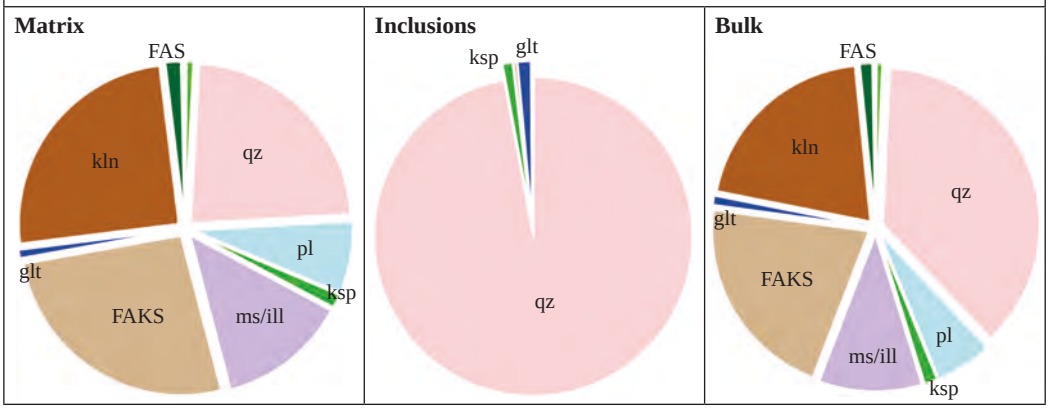
Matrix (< 63 µm) = 74.5 vol%
Inclusions (> 63 µm) = 25.5 vol%

Measurement statistics

Total measurement points = 1964969
Measurement spacing = 10 µm

Sample: 11 Wells WPSG 11	**CSM lab code: 17JA13**
 (Scale in centimetres)	
Fabric description	**Mineralogical description**
Reduced reoxidised light grey. Quartz abundant angular mm, clear rounded <3mm; limestone occasional angular 4mm; occasional iron-rich nodules <2mm, rare angular chert <3mm; occasional linear voids <8mm and rounded <0.5mm.	The sherd has 81 vol% matrix and 19 vol% inclusions. The inclusion population is nearly pure quartz (97 vol%) with traces of K-feldspar (1 vol%) and glauconite (1 vol%). The matrix is a mixture of quartz (23 vol%), Fe-Al-K silicates (26 vol%) and kaolinite (25 vol%) with 13 vol% muscovite/illite. Plagioclase (7 vol%) dominates over K-feldspar (1 vol%). The matrix has minor and Fe-Al silicates and traces of glauconite.
Form	**Mineralogical type**
Sherd 1996.10/788; open jar	Similar to B_1
Analogues	**Notes**
Wells Museum Garden type 05 – date late 13th-14th cent	

Visual representation of mineralogy[2]

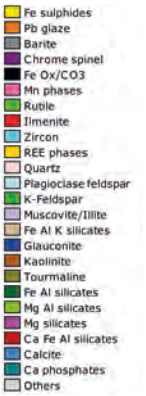


Notes

[1] Mineral groups listed in Table 2.

[2] Pb-glaze has been excluded in these diagrams; FO = Fe-Ox/CO_3, qz = quartz, pl = plagioclase, ksp = K-feldspar, ms/ill = muscovite/illite, FAKS = Fe-Al-K silicates, glt = glauconite, kln = kaolinite, FAS = Fe-Al silicates, cc = calcite

Visual appearance of thin section (transmitted light)	Mineralogical map	Key to mineral map[1]



Mineralogical composition

	Matrix	Inclusions	Bulk
Fe sulphides	0.03	0.01	0.03
Pb glaze	0.00	0.00	0.00
Barite	0.00	0.00	0.00
Chrome spinel	0.00	0.00	0.00
Fe Ox/CO3	0.06	0.01	0.05
Mn phases	0.02	0.00	0.02
Rutile	0.70	0.02	0.57
Ilmenite	0.03	0.01	0.03
Zircon	0.03	0.01	0.03
REE phases	0.00	0.00	0.00
Quartz	23.22	97.00	37.21
Plagioclase feldspar	7.31	0.02	5.93
K-Feldspar	1.39	1.03	1.33
Muscovite/Illite	13.13	0.05	10.65
Fe Al K silicates	26.24	0.36	21.33
Glauconite	0.86	1.34	0.95
Kaolinite	25.03	0.08	20.30
Tourmaline	0.01	0.00	0.01
Fe Al silicates	1.57	0.03	1.27
Ca Mg Fe silicates	0.01	0.00	0.01
Ca Fe Al silicates	0.03	0.00	0.03
Calcite	0.13	0.00	0.10
Ca phosphates	0.18	0.03	0.15
Fluorite	0.00	0.00	0.00
Others	0.01	0.00	0.01

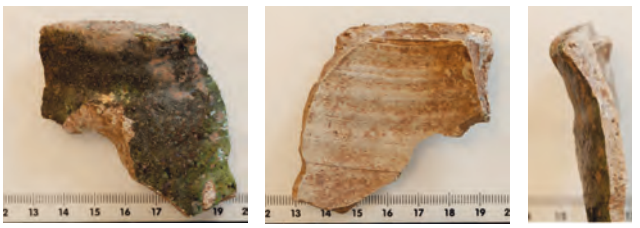
Particle size distribution

Matrix (< 63 µm) = 81.0 vol%
Inclusions (> 63 µm) = 19.0 vol%

Measurement statistics

Total measurement points = 2148927
Measurement spacing = 10 µm

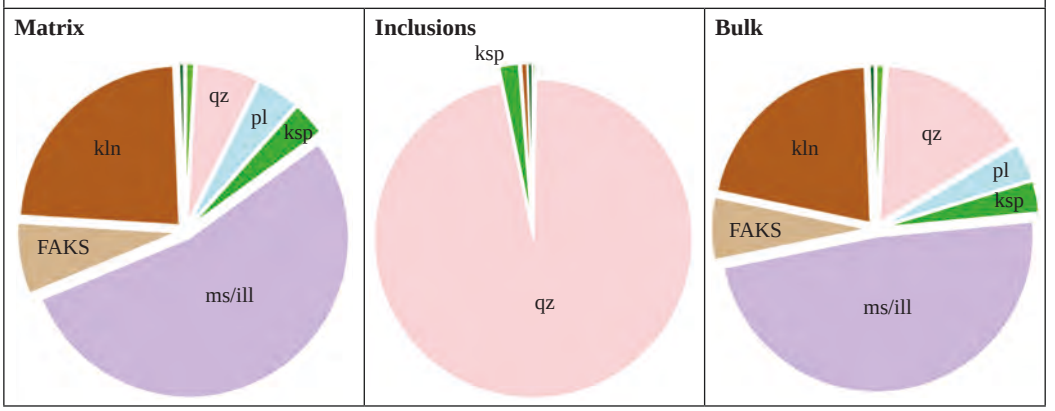
Sample: 12 Wells WPSG 12	**CSM lab code: 17JA14**



(Scale in centimetres)

Fabric description	**Mineralogical description**
Reduced, reoxidised buff surfaces. Sandy texture, quartz moderate angular < 0.5mm, limestone occasional angular <3mm; flint sparse angular <2mm; sparse angular black particles <2mm; sparse angular voids <0.5mm. Reduced green plain lead glaze.	The sherd has 89 vol% matrix and 11 vol% inclusions. When disregarding the Pb-glaze, the inclusion population is nearly pure quartz (97 vol%) with minor K-feldspar (2 vol%). The matrix is dominated by muscovite/illite (54 vol%) and kaolinite (23 vol%) with minor quartz (6 vol%), plagioclase (4 vol%), K-feldspar (3 vol%) and Fe-Al-K silicates (7 vol%).
Form	**Mineralogical type**
Baluster jug late 13th/14th cent.	
Analogues	**Notes**
Wells Museum Garden type 10; Bristol pottery type 117	BRISTOL REDCLIFF WARE

Visual representation of mineralogy[2]

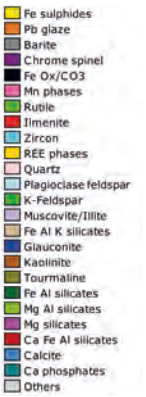


Notes

[1] Mineral groups listed in Table 2.

[2] Pb-glaze has been excluded in these diagrams; FO = Fe-Ox/CO_3, qz = quartz, pl = plagioclase, ksp = K-feldspar, ms/ill = muscovite/illite, FAKS = Fe-Al-K silicates, glt = glauconite, kln = kaolinite, FAS = Fe-Al silicates, cc = calcite

Visual appearance of thin section (transmitted light)	Mineralogical map	Key to mineral map[1]



Mineralogical composition

	Matrix	Inclusions	Bulk
Fe sulphides	0.01	0.00	0.01
Pb glaze	0.02	9.13	1.48
Barite	0.00	0.00	0.00
Chrome spinel	0.00	0.00	0.00
Fe Ox/CO3	0.03	0.00	0.03
Mn phases	0.03	0.00	0.03
Rutile	0.81	0.25	0.74
Ilmenite	0.01	0.00	0.01
Zircon	0.01	0.00	0.01
REE phases	0.00	0.00	0.00
Quartz	6.38	87.67	15.28
Plagioclase feldspar	4.27	0.00	3.78
K-Feldspar	3.42	1.79	3.23
Muscovite/Illite	53.73	0.14	47.60
Fe Al K silicates	7.25	0.00	6.42
Glauconite	0.01	0.00	0.01
Kaolinite	23.40	0.58	20.78
Tourmaline	0.03	0.00	0.02
Fe Al silicates	0.51	0.44	0.50
Ca Mg Fe silicates	0.01	0.00	0.01
Ca Fe Al silicates	0.00	0.00	0.00
Calcite	0.05	0.00	0.04
Ca phosphates	0.01	0.00	0.01
Fluorite	0.00	0.00	0.00
Others	0.02	0.00	0.02

Particle size distribution

Matrix (< 63 µm) = 88.6 vol%
Inclusions (> 63 µm) = 11.0 vol%

Measurement statistics

Total measurement points = 1878306
Measurement spacing = 10 µm

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