Characterisation Studies of Early Anglo-Saxon Pottery from Lodge Farm, Skendleby (FSPL-07)

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Archaeological investigations on the line of the Fordington to Skendleby pipeline, Lincolnshire, undertaken by Pre-Construction Archaeology (Lincoln) Ltd revealed early Anglo-Saxon settlement at Lodge Farm, Skendleby. Examination of the pottery from this settlement at x20 magnification indicated that the pottery contained abundant oolitic iron-rich grains which suggested a local source, despite the presence of rock and mineral fragments which are clearly not of local origin. Since the status of early Anglo-Saxon pottery production is still unclear and this site appeared to provide evidence for a local origin it was recommended that samples were chosen for analysis using thin sections and Inductively-Coupled Plasma Spectroscopy.

Six samples were chosen and the results indicate that despite variations between the samples all contain abundant well-rounded opaque grains. Two ferruginous oolitic clays are recorded in the neighbourhood of Skendleby, the Roach Formation and the Claxby Ironstone formation (BGS 1:50000 map, Sheet 116) and these are probably the source of the opaque grains.

At x20 magnification a variety of inclusion types are present. These include:

- Quartz. Rounded grains with a polished surface, but without any evidence for iron-rich, calcareous or silica cement.
- Igneous rock. Subangular fragments of dark (grey/black) crystalline rocks, probably basaltic and light (white/pink) crystalline rocks, sometimes with biotite.
- Bivalve shell. Including almost flat fragments with a prismatic structure. These are inoceramids.
- Clay/iron. Well-rounded, usually ovoid shaped grains c.0.2mm across with a shiny red-brown surface and dull red-brown interior.

Thin-Section Analysis

Thin sections were produced of each sample by Steve Caldwell, University of Manchester. They were stained using Dickson's method, to distinguish between ferroan and non-ferroan calcite and dolomite (Dickson 1965). Each section was then examined and a list of inclusion types present was made, together with details of frequency, size, roundness and other characteristics. On this basis of this analysis two subfabrics were identified, based on the presence/absence of calcareous sandstone. With this exception, the same characteristics were noted in each sample.

The following inclusion types were noted in thin section:

- Subangular quartz. Moderate to abundant fragments up to 1.5mm across. Several have kaolinite adhering to them and are clearly derived from a coarse-grained sandstone. Some of the grains have one or more noticeably straight edges, indicating quartz overgrowth. No sign of the original grain boundary is visible.
- Opaques. Abundant well-rounded grains up to 0.5mm across. Most have a high sphericity, rarely with evidence of splitting and subsequent rounding but a small proportion are ovoid. Grains with a “squashed pea” profile are present but rare.
- Calcareous sandstone. Sparse fragments up to 1.0mm across containing mostly illsorted subangular quartz grains up to 0.5mm across in a ferroan calcite groundmass. These are rare or absent in most samples but common in one.
- Igneous rock. Sparse fragments up to 1.0mm across. These include a volcanic glass with phenocrysts of plagioclase feldspar and an acidic rock containing orthoclase feldspar and quartz.
- Coarse sandstone. Sparse fragments up to 1.5mm across containing two or more subangular grains cemented with kaolinite.
- Microcline feldspar. Sparse subangular grains up to 1.0mm across
- Orthoclase feldspar. Sparse subangular grains up to 1.0mm across

The groundmass consists of dark brown optically anisotropic baked clay minerals together with moderate angular quartz grains up to 0.1mm across.

Chemical Analysis

Samples of each sherd were prepared for chemical analysis by mechanical removal of all surfaces and broken edges, to a depth of at least 1.0mm and then crushing the resulting block to a fine powder. This powder was analysed at Royal Holloway College, London, using Inductively Coupled Plasma Spectroscopy (ICP-AES) under the supervision of Dr J N Walsh. The frequency of a series of major elements was measured and expressed as percent oxides (App 1) and the frequency of a series of minor and trace elements was measured and expressed in parts per million (App 2).

This data was examined using the multivariate statistics package, Winstat for Excel (). A test was carried out for each element which determined that no values lay more than 2 SD away from the element mean, indicating that the samples form a homogenous group. Means and standard deviations for each element are given in the appendices.

Silica content was estimated by subtraction of the total measured oxides from 100% and the data were then normalised to aluminium, to take account of the diluting effect of variations in silica content.

Factor analysis was then undertaken to indicate the structure of the data. Four factors were found. High Factor 1 scores are due to rare earth elements (Nd, La, Ce, Dy, Eu, Sm, Yb), manganese, calcium, strontium, vanadium, cobalt, scandium, iron and nickel. High silica values produce strong negative F1 scores. High F2 scores are due to strong Ytterbium values and strong negative F2 scores are due to zinc, lithium, lead, and chromium. A plot of F1 against F2 scores indicates that one sample, V4260, is characterised by negative F1 and F2 scores. In thin section this sample contains the lowest frequency of opaque grains and no calcareous sandstone fragments. Two samples, V4259 and V4262, have high F2 scores and negative F1 scores. In thin section these have high frequencies of opaque grains and sparse calcareous sandstone fragments. The three remaining samples, V4261, V4258 and V4263 have low F2 scores and high F1 scores. All containing high quantities of opaque grains and one, V4261, has moderate calcareous sandstone inclusions, which are sparse in the other two samples. There is, therefore, little obvious correlation between the chemical composition and petrology apart from the fact that low F1 and F2 scores correlate with the lowest frequency of opaque inclusions.

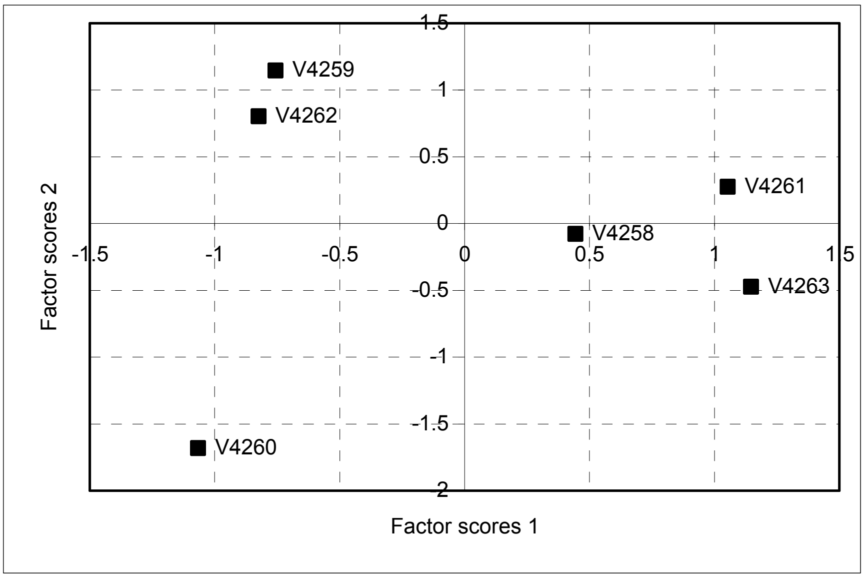

Figure 1

The Skendleby ICPS data were then compared with two other sets of Early Anglo-Saxon pottery analyses, from Dunholme and Barnetby-le-Wold. The first of these produced several fabrics, of which two are relevant, one was characterised by a coarse quartzose sand, similar to that in the Skendleby fabric, but without the opaque inclusions or calcareous sandstone whilst the second contained a mixed quartzose sand including polished quartz grains, which originate in a Lower Cretaceous deposit. The two local sources would be (a) the Lincolnshire

Wolds or (b) local glacial deposits, brought south from the Yorkshire Wolds by ice and glacial outwash. The Barnetby-le-Wold pottery contains a similar range of inclusions to the Skendleby fabric: polished quartz grains; coarse-grained sandstone; basic and igneous rock fragments and calcareous sandstone. The main difference is the relative frequency of the polished quartz and coarse-grained sandstones and the lack of rounded opaque grains in the Barnetby fabric.

Comparison of the chemical composition data, normalised to aluminium to take account of variations in quartz content, indicates differences between the various groups in several elements (Table 1).

Table 1

WARE	CU	CO	YB	V	SC	CR	TIO2	NA20	FE203	MGO
ELFEOL	LOW	HIGH	HIGHER MEAN	HIGH	HIGH	HIGHER MEAN	LOW	LOW	HIGHER MEAN	HIGHER MEAN
ESGS	HIGH	LOW	LOW	LOW	LOW	LOW	HIGH	LOW	LOW	LOW
ESGS BLW	HIGH	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
SST	HIGH	LOW	LOW	LOW	LOW	LOW	HIGH	HIGHER MEAN	LOW	LOW

These differences allow the Skendleby fabric to be identified through its copper, vanadium and scandium values. The Barnetby-le-Wold sample is mostly similar to the Dunholme samples rather than the Skendleby group but has high cobalt and low titanium, both Skendleby characteristics not present at Dunholme. The two sandy groups from Dunholme are mostly indistinguishable, with the exception of the sodium values, which are higher for several of the coarse sandstone-tempered group (SST).

Discussion

The thin sections indicate that the Skendleby samples were all made from similar raw materials, a boulder clay containing a mixture of northern erratics (igneous rock and coarse-grained sandstone) and a calcareous sandstone and ferruginous ooliths. The most likely source of the calcareous sandstones is the Spilsby Sandstone although calcareous sandstones outcrop in the Jurassic of northern Lincolnshire and East Yorkshire and from the small fragments present in thin section it is not possible to discount a Jurassic origin. It is therefore possible that some may be erratics although Spilsby Sandstone remains the most likely identification. Similarly, there are oolitic iron ore deposits in the Lower Jurassic of northwest Lincolnshire and East Yorkshire but the absence of these inclusions in the Barnetby-le-Wold and Dunholme samples makes a local source more likely. Two ferruginous oolitic clays outcrop locally: the Roach Formation and the Claxby Ironstone. Both outcrop as thin bands along the western scarp of the Wolds from Stenigot southwards and become from extensive as one travels south. The Roach formation in fact outcrops in the dry valley immediately southwest of Lodge Farm, although it is masked by boulder clay. Therefore, it is very likely that boulder clay in that valley will be partly composed of redeposited Roach Formation clay.

The Skendleby pottery, therefore, could well have been made very close to the site and was almost certainly produced at within a few miles of the site. This is probably also true at Barnetby-le-Wold and Dunholme, although the geological hinterland of those two sites does not allow us to pinpoint the source so closely.

These results contrast somewhat with the findings from sites in the Trent valley and around Lincoln where pottery was probably being obtained from several sources, some of which were probably not local (Young and Vince 2006). It is worth speculating whether this apparent difference is due to a fundamental difference in the economy of these central and eastern Lindsey sites when compared with those further south-west. If so, then perhaps it is also reflected in the faunal remains and archaeobotany.

Bibliography

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Appendix 1

TSNO	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO
V4258	10.51	15.5	0.97	1.67	0.19	1.92	0.35	0.44	0.035
V4259	11.43	14.94	0.98	1.69	0.15	1.72	0.42	0.89	0.026
V4260	13.12	7.62	0.93	1.48	0.16	1.9	0.48	0.41	0.037
V4261	10.96	17.98	1.09	2.94	0.14	1.66	0.37	0.74	0.045
V4262	10.76	13.73	0.92	1.64	0.16	1.69	0.38	0.62	0.026
V4263	11.14	16.55	0.89	2.7	0.18	1.69	0.41	1.16	0.04
Mean	11.32	14.39	0.96	2.02	0.16	1.76	0.40	0.71	0.03
SD	0.94	3.62	0.07	0.63	0.02	0.12	0.05	0.29	0.01

Appendix 2

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
V4258	516	173	15	41	53	14	101	548	19	79	57	130	58	13	3	5	4	33	95	21
V4259	543	166	21	47	47	14	100	476	20	79	48	107	48	10	2	3	4	45	129	17
V4260	570	91	19	42	44	13	95	205	41	83	45	130	46	9	2	4	3	21	110	20
V4261	412	162	16	37	56	16	108	672	23	88	63	138	64	13	3	5	5	37	110	22
V4262	485	160	15	41	42	13	89	438	17	77	46	102	46	9	2	3	3	64	106	16
V4263	523	176	19	39	46	14	152	549	21	75	66	142	67	14	3	5	4	35	106	19
Mean	508	155	18	41	48	14	108	481	24	80	54	125	55	11	2	4	4	39	109	19
SD	55	32	3	3	5	1	23	157	9	5	9	16	9	2	0	1	1	14	11	2