Characterisation Studies of Cambridgeshire Anglo-Saxon and Medieval Pottery: St Neots-type and Developed St Neots-type wares

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This paper is one of a series produced for CAM ARC, Cambridgeshire County Council's Archaeological Field Unit. Samples of the major Anglo-Saxon and medieval pottery fabrics found in the county were submitted to establish their petrological and chemical characteristics; the natural clay and sand resources used to produce them and distinguishing features which separate one fabric from another.

Ten samples of St Neots type ware and six samples of Developed St Neots type ware were submitted for analysis and compared with five samples of St Neots type ware and three samples of developed St Neots type ware previously analysed from Botolph Bridge, nr Peterborough (App 1).

Methodology

Offcuts of selected sherds were taken for thin section analysis. The thin sections were produced by Steve Caldwell, University of Manchester, and stained using Dickson's method (Dickson 1965). Offcuts of each of the samples were then prepared for chemical analysis. The outer few mm of each offcut were mechanically removed and the resulting block was crushed to a fine powder and submitted to Royal Holloway College, London, where Inductively Coupled Plasma Spectroscopy was carried out under the supervision of Dr J N Walsh. The analysis produced a series of determinations of a range of major elements, expressed as percent oxides (App 2) and of a range of trace elements expressed in parts per million (App 3).

Thin Section analysis

St Neots-type ware

In general the St Neots type ware samples have a finer texture than the Developed St Neots type ware samples but there is a gradation within the group and five of the samples have a coarser texture than the remainder (V4336, V43337, V4338, V4345 and V4356).

The following inclusion types were noted in thin section:

- Bivalve shell. Abundant fragments of varying structure, including shells with nacreous structure and those with two or more bands parallel to the surface (some varying in composition, with a thick non-ferroan layer and thinner ferroan calcite layers. The fragments range up to 0.5mm long.

- Echinoid shell. Rounded fragments up to 0.5mm across, mainly of ferroan calcite but including some non-ferroan calcite with dark brown infilling of pores. Several of these are surrounded by amorphous ferroan calcite cement.
- Punctate brachiopod shell. Sparse to moderate rounded fragments up to 0.5mm long, mainly of non-ferroan calcite with ferroan calcite infilling of pores.
- Echinoid spines. Sparse fragments, mostly not complete cross-sections, up to 0.3mm across, composed of ferroan calcite.
- Ammonite shell. Rare fragments of non-ferroan calcite shell up to 0.5mm across were identified as ammonite because of their oval cross section.
- Ferroan calcite. Sparse to moderate rounded fragments of ferroan calcite up to 0.5mm across, mostly without clear crystal structure. Such fragments are more common than shell in the fraction of inclusions less than 0.3mm across.
- Wood. Sparse rounded fragments up to 0.5mm across.
- Subangular quartz. Sparse subangular fragments of monocrystalline quartz up to 0.3mm across.
- Fine-grained sandstone. Rare rounded fragments of fine-grained sandstone up to 0.3mm across, composed of interlocking quartz grains up to 0.2mm across.
- Rounded quartz. Rare well-rounded fragments up to 0.3mm across.

The groundmass consists of optically anisotropic baked clay minerals with abundant, mostly rounded, dark brown to opaque inclusions, less than 0.1mm across. Quartz and muscovite silt are absent, as is calcareous material.

Developed St Neots-type ware

Developed St Neots type ware vessels contain the same range of inclusions as the St Neots type ware, with the exception that no wood was noted. However, the inclusions were consistently coarser, ranging in many cases up to 1.0mm across and in rare cases up to 2.0mm across. Some of the ferroan calcite fragments enclosed fossil fragments (mainly but not exclusively punctate brachiopod shell) and a complete cross section of a possible ammonite was present, with ferroan calcite filling the body cavity.

Two sub-fabrics were identified within Developed St Neots type ware, identified here as Subfabrics F and S.

Developed St Neots type ware. Subfabric F

Two samples, V4349 and V4355, contain a similar range of inclusions to other Developed St Neots type sherds but include moderate rounded opaque grains and sparse ooliths, both absent in the standard fabric. The following inclusion types were noted:

- Fossiliferous limestone. Angular fragments up to 2.0mm across. These contain fragments of non-ferroan calcite shell and rare bone in a matrix of ferroan calcite containing moderate rounded opaque grains c.0.1mm across. In some instances the opaque grains in the matrix have coalesced to give a predominantly opaque matrix.
- Quartz. Sparse subangular grains up to 0.2mm across.
- Bivalve shell. Abundant fragments up to 1.0mm long. Mostly nacreous but including some with a laminated structure. Several show dark staining around the edges. There appear to be a higher proportion of hinge fragments than would be expected if the whole shell was represented.
- Echinoid shell. Moderate rounded fragments of ferroan calcite up to 0.5mm across.
- Echinoid spine. Sparse fragments up to 0.3mm across.
- Punctate brachiopod shell. Moderate fragments up to 1.0mm long.
- Opaques. Moderate rounded elongate grains.
- Organics. Sparse rounded voids surrounded by a darkened halo and sometimes containing carbonised material.
- Ooliths. Sparse rounded ooliths with a non-ferroan calcite micrite core and a single non-ferroan calcite coating. The grains are c.0.3mm across and show no signs of an adhering cement.

Developed St Neots type ware. Subfabric S

The two subfabric S samples contain a similar range of calcareous inclusions to that found in DNEOT but have a much higher quartz content, mainly well-sorted angular grains c.0.1mm to 0.2mm across. One of the samples, V4352, has a texture more similar to NEOT than DNEOT and lacks the fossiliferous limestone fragments.

- Bivalve shell. Abundant nacreous shell fragments.
- Echinoid shell. Sparse rounded fragments up to 0.5m across/
- Punctate brachiopod shell. Moderate fragments up to 1.0mm long.
- Foramenifera. Sparse multi-chambered non-ferroan calcite tests up to 0.2mm across.
- Angular Quartz. Abundant angular fragments c.0.1mm to 0.2mm across.
- Rounded quartz. Rare grains up to 0.4mm across.
- Opaques. Sparse rounded grains up to 0.3mm across.
- Fossiliferous limestone. Moderate (in V4354 only) consisting of ferroan calcite with punctate brachiopod, bivalve shell, echinoid shell and rare ostracods

- The groundmass consists of optically anisotropic baked clay minerals, sparse angular quartz less than 0.05mm across, sparse ferroan calcite less than 0.05mm across and sparse rounded dark brown grains less than 0.1mm across.

Interpretation

It is likely that both NEOT and DNEOT were made from the same, or very similar, raw materials, probably a shelly marl. The rounding of some of the calcareous inclusions, even where cemented by ferroan calcite, indicates that they came from a shell sand whilst the concentration of hinge fragments in some sections is also characteristics of a winnowed shell sand. Thus the difference in texture within the NEOT group and between the NEOT and DNEOT groups is probably due to variations in current in the Jurassic sea and these probably varied both over time and space and probably have yet to be mapped.

The iron content of the limestone/marl also clearly varies and that in subfabric S has noticeably higher iron content than the other groups. This is matched by Romano-British shell-tempered pottery analysed from a site at Tower Works, Fengate whose chemical composition matched that of pottery produced at Haddon (Vince Fengate). Both Fengate and Haddon are situated on or close to the Cornbrash. A feature of the Cornbrash is the quantity of echinoid fossils found in it. Similarly, the Roman and medieval potteries at Harrold, Bedfordshire, and Olney Hyde, Buckinghamshire, lie on the same beds. All of these potteries produced wares with a distinctive quartz-free, soapy fabric. However, the Roman kiln at Earith also produced shell-filled pottery with an almost identical list of inclusion types. The only obvious difference is the presence of weathered-out selenite, recognisable through their distinctive euhedral voids (Vince Earith). This pottery was made from an outcrop of Ampthill Clay.

Other Romano-British shell-tempered pottery from Earith contained sparse well-rounded, polished quartz grains, derived from the Lower Cretaceous and present as a result of contamination of the clay with the overlying cover sand. No similar grains are present in the NEOT and DNEOT samples and where rare quartzose inclusions occur they are probably derived from Triassic deposits. In the absence of either selenite or lower Cretaceous quartz an easterly origin, utilising an outcrop of Ampthill clay is unlikely.

The fine quartz sand found in subfabric S can be paralleled in the Kellaways beds at the base of the Oxford Clay and sandy strata also occur in the upper Cornbrash (Chatwin 1961, 10).

The balance of probabilities suggests a Cornbrash/lower Oxford Clay origin for the clay used to produce these fabrics but given the wide extent of the Jurassic strata and the generally similar conditions under which many were laid down it is not possible using thin sections alone to pin point a source or even say for certain whether the four petrological groups found in these samples represent four separate sources or one variable one.

Chemical Analysis

Silica content

Silica was not measured directly but was estimated by subtracting the total measured oxides from 100%. There was little variation in the mean silica content for any of the petrological groups whilst the range found in the DNEOT samples is greater than that for any other group. This indicates that the variations in quartz content seen in DNEOT S are dwarfed by the variations in the frequency of calcareous inclusions. Because of this wide range of estimated silica values the ICPS data was normalised to aluminium and those normalised values are used in further analyses.

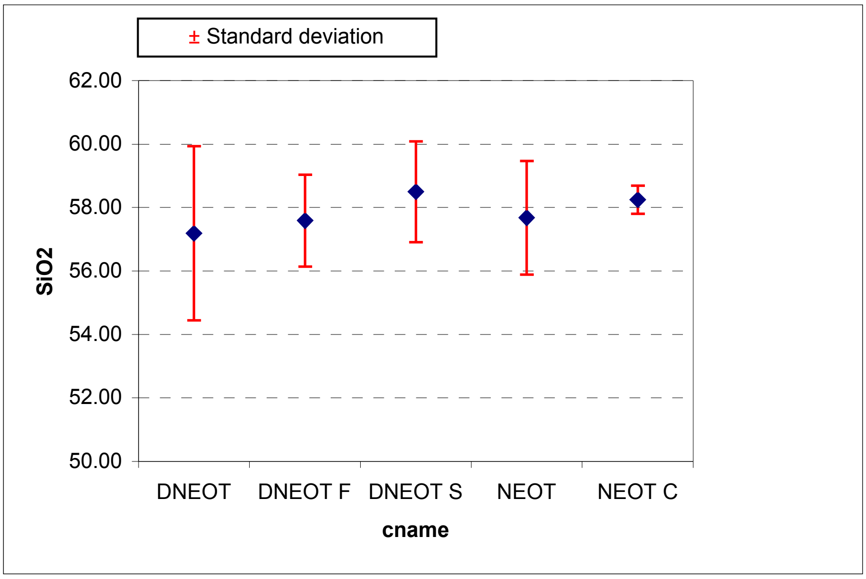

Figure 1

Post-burial alteration

Since the samples come from different sites, located on different geological substrates, any correlation of chemical composition with findspot is suspect. Certain elements are extremely mobile either through concretion (e.g. iron, manganese, phosphorus, calcium and strontium) or through leaching (e.g. calcium and strontium). In the case of iron and manganese it is reasoned that the amount of concretion is likely to be a small fraction of the original iron and manganese contents but in the three other elements leaching can have a major effect. Therefore these elements were omitted from analysis. The rare earth elements are subject to complex processes depending on the organic content and pH value of the burial environment, which is of course not known in detail. However, Rare Earth elements are likely to be helpful in distinguishing Jurassic clays, since they should occur in much higher frequencies in the black, organic clays (such as facies of the Kimmeridge Clay and Oxford Clay and, again, it may be that these original differences show through any post-burial alteration. Nevertheless, they have been omitted from initial analysis.

The remaining elements were included in a Factor Analysis of the data from Botolph Bridge, Peterborough, Huntingdon and Hinxton. This found three main factors and a plot of the first two (Fig 2) shows no clear separation of the samples by findspot.

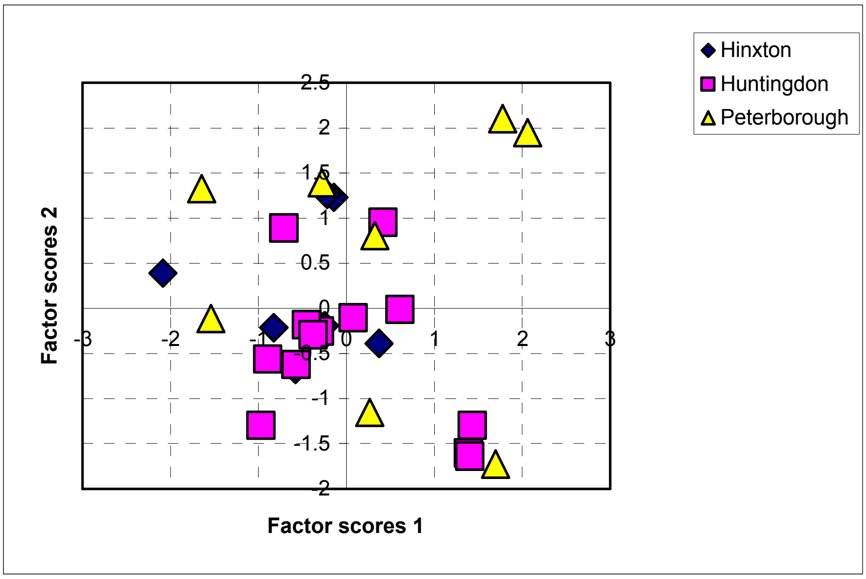

Figure 2

Correlation with Petrological Groups

A presentation of the same data by petrological grouping (Fig 3) indicates that the NEOT samples (i.e. the finer textured NEOT samples) have a higher mean F2 score than the remainder.

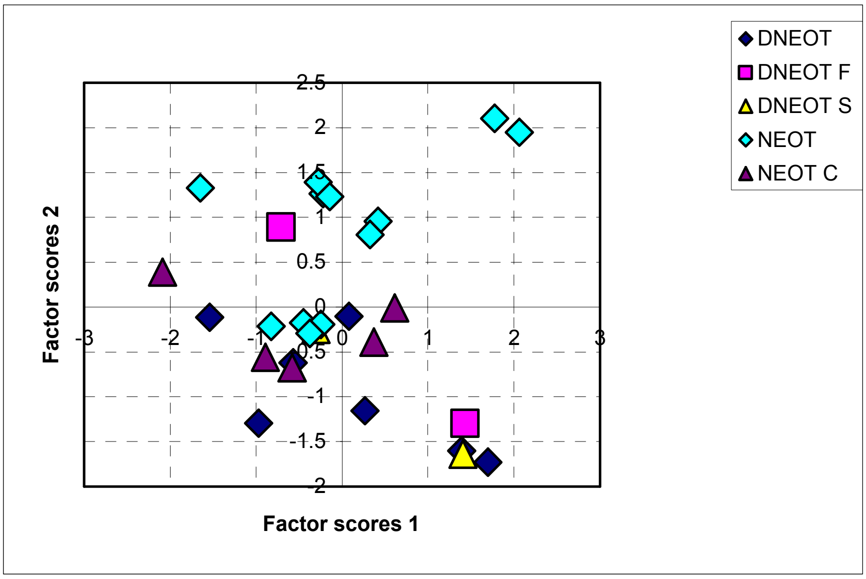

Figure 3

Examination of the element weightings calculated by the Factor Analysis software indicates that zirconium and cobalt are the main discriminatory elements. A plot of the normalised values for these two elements indicates that the NEOT samples do have higher zirconium and cobalt values (Fig 4) but that these high values only occur in samples from Botolph Bridge, which were analysed as a separate batch to the remainder (Fig 5). However, although the absolute values may be enhanced in the BB batch even there the NEOT samples have higher values than the DNEOT ones and this is also true for the second batch. The difference, however, is, at most, slight.

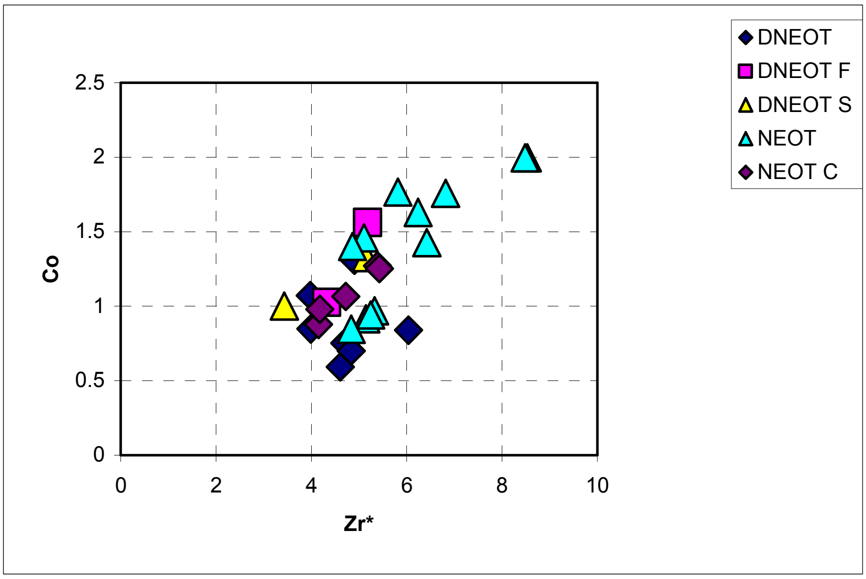

Figure 4

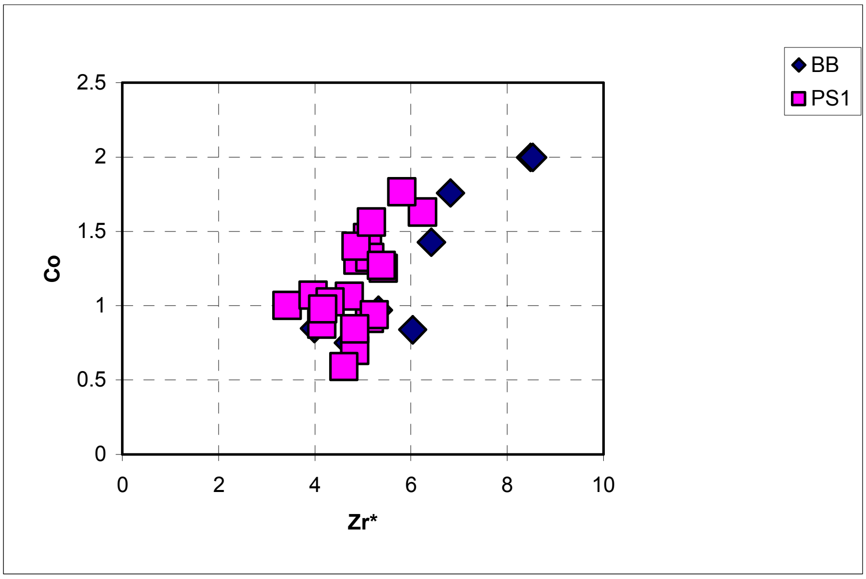

Figure 5

Comparison with other shelly wares

The data for NEOT and DNEOT could be compared with that from a range of other shell-tempered wares from the east midlands (Table 2). Many of these types could be distinguished with greater or lesser difficulty and the closest in composition to the various NEOT and DNEOT groups were the Romano-British Haddon kiln, LEMS, NLST and PSHW. Of these, the Haddon and PSHW groups were either certainly or probably produced in the northwest of Cambridgeshire, to the west of Peterborough. The two Lincolnshire wares are from unknown sources although lower Jurassic origins north of Lincoln have been postulated.

Table 1

Group	Description	Comments
Haddon	Samples from the Romano-British kiln	Thought to have been made from Cornbrash or Oxford Clay
Harrold	Samples of medieval waste from Harrold Middle School	Similar in petrological composition to NEOT and DNEOT. Probably made from Cornbrash
LEMS	Samples of Lincolnshire Early Medieval Shelly ware from various consumer sites	Thought to have been produced using Lower Jurassic clays north of Lincoln
LFS	Samples of Lincolnshire Fine-Shelled ware from various consumer sites	Thought to have been produced using Middle Jurassic clays to the east of Lincoln
LKT	Samples of Lincoln Kiln Type ware from production sites in Lincoln	Thought to have been produced from an Upper Lias clay with added shell from a Great Oolite formation
LSS	London Late Saxon Shelly ware	Thought to have been made from Oxford Clay, although this is disputed
MAXA-C	Samples of Northern Maxey ware of fabrics A, B and C	Thought to have been produced from a shelly marl from the Great Oolite formation in central Lincolnshire
NLST	Samples of North	Thought to have been

	Lincolnshire Shell-tempered ware from various consumer sites	produced using Lower Jurassic clays north of Lincoln
PSHW	Peterborough examples of Cambridge SHW, medieval shell-filled ware	Source unknown but common in northwest Cambridgeshire
RMAX	Samples of Southern Maxey-type ware from various consumer sites	Similar in petrological composition to NEOT and DNEOT

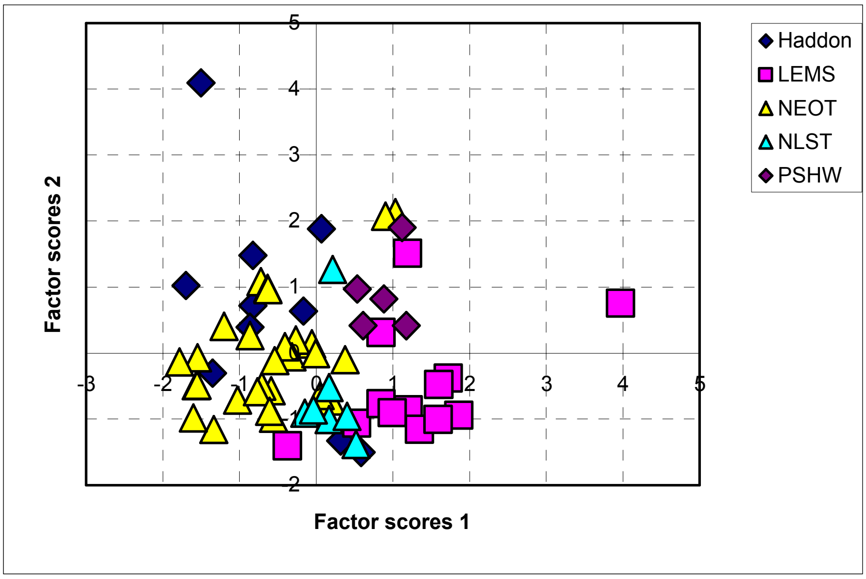

Figure 6 For clarity all NEOT and DNEOT groups have been combined as NEOT.

Discussion

Thin section analysis distinguishes three groups on the basis of the presence/absence of rounded opaque grains and fine angular quartz sand. In addition, textural differences can be found which distinguish a coarser and finer NEOT group from a DNEOT group. However, it would be difficult to reliably place any new sample into one of these textural groups and they appear to have no chemical correlates.

The analysis of the ICPS data indicates that the NEOT and DNEOT groups can be distinguished from a range of other shelly wares including that produced at Harrold, which is very similar in petrological characteristics. The closest comparisons are with two Lincolnshire wares, LEMS and NLST, Peterborough SHW and the products of the Haddon kiln. Of these groups, only the Haddon kiln fabric contains echinoid shell and punctate brachiopod shell in addition to the nacreous bivalve shell which occurs in all the groups. Since no samples of shell-filled wares produced between Harrold and Haddon have been included in the analysis it is not possible to say that St Neots type ware was produced on the outskirts of Peterborough and in fact a source somewhere between Northampton and Peterborough close to the outcrop of the Cornbrash is probably the closest which can be given at present.

Bibliography

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Appendix 1

Action	TSNO	cname	Sitecode	Context	subfabric	Form	Description
TS;ICPS	V3324	NEOT	orlbb00	1059	NEOT	DISH/BOWL	Inturned rim
TS;ICPS	V3335	DNEOT	orlbb00	543	DNEOT	JUG	STRAP HANDLE;UNGLAZED;STABBED
TS;ICPS	V3336	DNEOT	orlbb00	631	DNEOT	JAR	WT
TS;ICPS	V3343	NEOT	orlbb00	870	NEOT	JAR	
TS;ICPS	V3344	NEOT	orlbb00	1059	NEOT	DISH/BOWL	Inturned rim
TS;ICPS	V3345	NEOT	orlbb00	1066	NEOT	DISH/BOWL	Inturned rim
TS;ICPS	V3346	NEOT	orlbb00	1066	NEOT	JAR	
TS;ICPS	V3358	DNEOT	orlbb99	229	DNEOT		WT
TS;ICPS	V4335	NEOT	HINHH93	2038	NEOT	BOWL	Inturned rim bowl; mid-brown/grey
TS;ICPS	V4336	NEOT	HINHH93	1618	NEOT	BOWL	Flat-topped clubbed bowl rim; mid-brown/grey
TS;ICPS	V4337	NEOT	HINHH93	2106	NEOT	BOWL	Flanged rim of top hat bowl; mid-brown
TS;ICPS	V4338	NEOT	HINHH93	2652	NEOT	JAR	Finger-impr. Jar rim; buff and less shell
TS;ICPS	V4339	NEOT	HINHH93	1043	NEOT	BOWL	Inturned rim bowl; l. brown with larger and less-aligned shell
TS;ICPS	V4340	NEOT	HINHH93	2150	NEOT	BOWL	Inturned rim bowl; l. brown; less shell, larger fragments
TS;ICPS	V4341	NEOT	HINHH93	2107	WAS SSHW	JAR	Jar rim. mid-brown/grey/black. Common med shell and common fine-medium quartz
TS;ICPS	V4345	NEOT	hunol94	1093	NEOT	LAMP	Lamp. mid-brown/grey standard fabric
TS;ICPS	V4346	NEOT	hunol94	56	NEOT	JAR	Jar rim. Dk brown/black/dk grey; standard fabric
TS;ICPS	V4347	NEOT	hunol94	1008	NEOT	JAR	Jar rim. Black. V smooth surfaces and less shell
TS;ICPS	V4348	NEOT	hunol94	1001	NEOT	BOWL	Inturned rim bowl. mid-brown/grey; possibly quartz added to standard fabric
TS;ICPS	V4349	DNEOT	hunol94	57	DNEOT F	JAR	Piecrust jar rim. mid-brown/grey. Standard fabric.
TS;ICPS	V4350	DNEOT	hunol94	56	DNEOT	JAR	Rolled jar rim. mid-brown/grey. Less shell, possibly ooliths.
TS;ICPS	V4351	DNEOT	hunol94	U/s	DNEOT	BOWL	Flat-topped hammerhead bowl rim. Mid-brown/grey. Standard fabric
TS;ICPS	V4352	DNEOT	hunol94	1084	DNEOT S	JAR	Cordoned jar rim. mid-brown/grey/black. Less shell and smoother surfaces
TS;ICPS	V4353	DNEOT	hunsr99 stu 96	246	DNEOT	JAR	Jar bs; red-brown/grey; abundant fine-v coarse shell
TS;ICPS	V4354	DNEOT	hunsr99 stu 96	245	WAS SHW;DNEOT S	JAR	Jar rim; mid-brown; common fine-v coarse shell
TS;ICPS	V4355	DNEOT	hunsr99 stu 96	18	DNEOT F		BS with rough surfaces; black, abundant fine-coarse
TS;ICPS	V4356	NEOT	hunsr99	5	NEOT	JAR	Jar rim; mid-brown/dk grey/black;

			stu 96				abundant shell
TS;ICPS	V4357	DNEOT	hunsr99 stu 96	11	DNEOT	BOWL	Angle-sided bowl profile; brown/grey; common shell

Appendix 2: ICPS Data for St Neots-type ware. Major elements expressed as percent oxides

TSNO	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	TiO_2	P_2O_5	MnO
V3324	16.52	4.95	0.90	16.28	0.40	2.10	0.59	1.97	0.054
V3343	14.23	5.30	0.90	19.78	0.26	2.06	0.56	0.65	0.053
V3344	12.02	7.11	1.09	17.69	0.19	1.87	0.51	1.52	0.094
V3345	11.02	8.64	1.26	20.64	0.19	1.83	0.45	0.55	0.065
V3346	14.01	5.79	1.01	16.67	0.39	2.12	0.54	0.62	0.064
V4335	12.14	5.13	0.72	20.81	0.20	1.25	0.49	1.51	0.038
V4336	11.97	4.83	0.85	19.86	0.18	1.34	0.50	2.15	0.031
V4337	15.04	5.26	0.85	15.82	0.19	1.53	0.58	1.71	0.026
V4338	17.11	4.57	0.89	15.13	0.43	2.23	0.63	0.95	0.030
V4339	9.63	4.53	0.72	23.97	0.17	1.01	0.43	1.44	0.043
V4340	11.05	5.53	0.78	19.26	0.19	1.13	0.54	0.67	0.054
V4341	12.05	4.78	0.86	20.87	0.26	1.31	0.53	1.26	0.033
V4345	15.34	4.67	0.89	16.86	0.16	1.83	0.57	1.79	0.033
V4346	13.03	4.40	0.82	21.21	0.28	1.87	0.58	1.21	0.070
V4347	12.78	5.17	0.85	16.29	0.31	1.93	0.57	1.30	0.037
V4348	10.97	4.91	0.81	22.90	0.19	2.06	0.48	1.81	0.066
V4356	13.36	6.71	1.10	16.94	0.20	1.87	0.55	1.15	0.045
Mean	13.07	5.43	0.90	18.88	0.25	1.73	0.54	1.31	0.049
SD	2.07	1.11	0.14	2.64	0.09	0.38	0.05	0.50	0.018

Appendix 3: ICPS Data for St Neots-type ware. Trace elements expressed as parts per million

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
V3324	602	75	33	27	39	14	471	92	29	88	38	71	42	9	2	6	3	28	83	16
V3343	269	81	29	25	62	14	397	115	33	97	82	166	83	16	3	7	3	19	97	25
V3344	478	66	27	23	56	13	468	95	39	102	76	169	79	19	3	9	4	19	124	24
V3345	263	63	24	27	59	11	434	90	33	94	55	125	58	14	2	7	4	18	84	22
V3346	368	71	26	31	52	13	418	92	30	90	57	114	60	13	2	7	3	24	92	20
V4335	250	71	22	28	40	12	517	96	32	59	47	94	49	10	2	5	4	22	66	17
V4336	223	70	28	32	38	12	573	90	35	65	48	99	51	12	3	6	4	17	75	15
V4337	214	84	28	34	42	14	526	105	28	71	56	114	57	11	2	5	3	22	73	16
V4338	402	80	22	37	41	14	460	98	24	71	41	87	42	8	2	4	3	18	69	15
V4339	325	57	21	23	36	9	500	76	29	56	48	95	50	11	2	5	3	17	64	17
V4340	389	69	22	29	47	10	460	87	35	69	36	69	38	6	2	5	3	17	81	18
V4341	307	70	22	60	29	11	519	82	26	62	38	85	40	9	2	4	3	19	61	11
V4345	202	78	28	46	39	13	455	105	28	64	32	59	35	8	2	5	3	22	73	15
V4346	317	74	23	67	37	12	463	86	23	63	36	74	38	8	2	4	2	14	89	11
V4347	344	76	25	61	36	12	390	93	22	67	35	69	36	8	1	3	3	14	70	12
V4348	362	65	28	27	37	10	545	85	30	56	50	105	52	11	2	5	3	18	79	16
V4356	413	78	24	55	51	13	451	93	35	72	62	142	65	15	3	7	4	24	92	17
Mean	337	72	25	37	44	12	473	93	30	73	49	102	51	11	2	6	3	20	81	17
SD	103	7	3	15	9	2	51	9	5	15	14	33	14	4	1	1	0	4	15	4

Appendix 4: ICPS Data for Developed St Neots-type ware. Major elements expressed as percent oxides

TSNO	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO
V3335	15.96	7.06	0.94	11.54	0.25	2.42	0.67	0.61	0.041
V3336	16.72	7.24	0.95	13.46	0.22	1.81	0.86	0.44	0.045
V3358	16.55	7.55	1.18	12.01	0.36	2.51	0.67	1.47	0.046
V4349	13.65	7.94	0.87	17.15	0.21	2.08	0.59	0.88	0.062
V4350	15.19	3.63	0.75	18.30	0.16	1.91	0.59	0.53	0.042
V4351	12.24	4.88	0.84	25.74	0.22	1.74	0.52	0.89	0.061
V4352	12.82	4.64	0.84	18.57	0.28	2.00	0.59	0.60	0.035
V4353	15.86	9.95	1.02	15.58	0.25	2.05	0.68	0.60	0.049
V4354	13.99	6.67	0.98	17.56	0.27	1.96	0.59	0.55	0.056
V4355	14.08	7.86	0.85	13.55	0.42	2.01	0.71	1.83	0.077
V4357	15.71	3.86	0.89	18.40	0.22	1.40	0.61	0.65	0.073
Mean	14.80	6.48	0.92	16.53	0.26	1.99	0.64	0.82	0.053
SD	1.52	1.98	0.12	4.02	0.07	0.30	0.09	0.44	0.014

Appendix 5: ICPS Data for Developed St Neots-type ware. Trace elements expressed as parts per million

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
V3335	342	99	25	39	51	16	211	109	27	75	48	91	49	9	2	4	2	126	109	12
V3336	324	104	26	39	31	15	289	161	24	101	53	95	54	9	2	4	3	76	87	14
V3358	336	113	39	49	64	18	268	118	36	66	46	90	48	9	2	5	3	20	138	14
V4349	296	85	24	42	48	14	345	102	30	59	36	76	38	8	2	4	3	23	149	14
V4350	161	84	24	38	27	15	260	103	26	70	29	57	31	6	1	4	3	6	46	9

V4351	251	76	21	36	43	12	625	102	36	60	49	92	52	12	3	6	4	20	73	16
V4352	231	79	22	43	38	12	471	97	33	66	51	114	54	12	3	6	4	22	90	17
V4353	301	105	33	58	57	16	370	132	35	63	46	96	48	10	2	5	3	19	153	17
V4354	362	99	29	54	52	15	308	99	41	48	53	123	56	12	3	6	3	19	111	14
V4355	594	110	28	36	39	14	425	177	28	73	37	72	39	7	2	4	3	24	91	22
V4357	375	67	30	89	40	16	340	94	27	76	31	68	33	7	2	5	3	13	67	11
Mean	325	93	27	48	45	15	356	118	31	69	44	89	46	9	2	5	3	33	101	15
SD	109	15	5	16	11	2	116	28	5	13	9	19	9	2	0	1	0	35	35	3