Instrumental Neutron Activation Analysis of Ceramic Materials from Fort Bragg

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Introduction

One hundred and nineteen samples of clay, rock, sand, and pottery from the various drainages in and around the North Carolina Sandhills were analyzed by instrumental neutron activation analysis (INAA) at the University of Missouri Research Reactor Center. Here we report the analytical methods and describe some of the chemical patterning identified in the dataset. As with most smaller INAA projects, the interpretation offered herein is only one explanation of several possible scenarios. The overall low number of samples analyzed, and the low number of samples analyzed from each site preclude any significant conclusions to be made regarding this project. Consequently, it seems probable that the interpretations made herein will change as additional samples from this area are analyzed and as petrographic data are made available.

Sample Preparation

Pottery samples were prepared for INAA using procedures standard at MURR. Fragments of about $1cm^2$ were removed from each sample and abraded using a silicon carbide burr in order to remove adhering soil and exterior surfaces, thereby reducing the risk of measuring contamination. The samples were washed in deionized water and allowed to dry in the laboratory. Once dry, the individual sherds were ground to powder in an agate mortar to homogenize the samples. Archival samples were retained from each sherd (when possible) for future research. Clay, rock, and sand samples were fired in laboratory furnace to 700 degrees Celsius for one hour. Each sample was then ground into powder using an agate mortar.

Two analytical samples were prepared from each specimen. Portions of approximately 150 mg of powder were weighed into clean high-density polyethylene vials used for short irradiations at MURR. At the same time, 200 mg of each sample was weighed into clean high-purity quartz vials used for long irradiations. Individual sample weights were recorded to the nearest 0.01 mg using an analytical balance. Both vials were sealed prior to irradiation. Along with the unknown samples, Standards made from National Institute of Standards and Technology (NIST) certified standard reference materials of SRM-1633a (coal fly ash) and SRM-688 (basalt rock) were similarly prepared, as were quality control samples (e.g., standards treated as unknowns) of SRM-278 (obsidian rock) and Ohio Red Clay (a standard developed for in-house applications).

Irradiation and Gamma-Ray Spectroscopy

Neutron activation analysis of ceramics at MURR, which consists of two irradiations and a total of three gamma counts, constitutes a superset of the procedures used at most other NAA laboratories (Glascock 1992; Neff 1992, 2000). As discussed in detail by Glascock (1992), a short irradiation is carried out through the pneumatic tube irradiation system. Samples in the polyvials are sequentially

irradiated, two at a time, for five seconds by a neutron flux of 8 x 10^{13} n cm^{-2} s^{-1} The 720-second count yields gamma spectra containing peaks for nine short-lived elements aluminum (Al), barium (Ba), calcium (Ca), dysprosium (Dy), potassium (K), manganese (Mn), sodium (Na), titanium (Ti), and vanadium (V). The samples are encapsulated in quartz vials and are subjected to a 24–hour irradiation at a neutron flux of 5 x 10^{13} n cm^{-2} s^{-1}. This long irradiation is analogous to the single irradiation utilized at most other laboratories. After the long irradiation, samples decay for seven days, and then are counted for 1,800 seconds (the "middle count") on a high-resolution germanium detector coupled to an automatic sample changer. The middle count yields determinations of seven medium half-life elements, namely arsenic (As), lanthanum (La), lutetium (Lu), neodymium (Nd), samarium (Sm), uranium (U), and ytterbium (Yb). After an additional three- or four-week decay, a final count of 8,500 seconds is carried out on each sample. The latter measurement yields the following 17 long half-life elements: cerium (Ce), cobalt (Co), chromium (Cr), cesium (Cs), europium (Eu), iron (Fe), hafnium (Hf), nickel (Ni), rubidium (Rb), antimony (Sb), scandium (Sc), strontium (Sr), tantalum (Ta), terbium (Tb), thorium (Th), zinc (Zn), and zirconium (Zr).

The element concentration data from the three measurements are tabulated in parts per million using the EXCEL spreadsheet program. Descriptive data for the archaeological samples were appended to the concentration spreadsheet. The data are also stored in a dBASE/FOXPRO database file useful for organizing, sorting, and extracting sample information. The data file enclosed with this report contains the sample database in EXCEL format.

Interpreting Chemical Data

The analyses at MURR described previously produced elemental concentration values for 32 or 33 elements in most of the analyzed samples. Data for As, Ni, Sr, in many samples was below detection limits and was removed from consideration. The analysis of data was subsequently carried out on base-10 logarithms of concentrations on the remaining 30 elements. Use of log concentrations rather than raw data compensates for differences in magnitude between the major elements, such as calcium, on one hand and trace elements, such as the rare earth or lanthanide elements (REEs). Transformation to base-10 logarithms also yields a more normal distribution for many trace elements.

The interpretation of compositional data obtained from the analysis of archaeological materials is discussed in detail elsewhere (e.g., Baxter and Buck 2000; Bieber et al. 1975; Bishop and Neff 1989; Glascock 1992; Harbottle 1976; Neff 2000) and will only be summarized here. The main goal of data analysis is to identify distinct homogeneous groups within the analytical database. Based on the provenance postulate of Weigand *et al.* (1977), different chemical groups may be assumed to represent geographically restricted sources. For lithic materials such as

obsidian, basalt, and cryptocrystalline silicates (e.g., chert, flint, or jasper), raw material samples are frequently collected from known outcrops or secondary deposits and the compositional data obtained on the samples is used to define the source localities or boundaries. The locations of sources can also be inferred by comparing unknown specimens (i.e., ceramic artifacts) to knowns (i.e., clay samples) or by indirect methods such as the "criterion of abundance" (Bishop *et al*. 1992) or by arguments based on geological and sedimentological characteristics (e.g., Steponaitis *et al*. 1996). The ubiquity of ceramic raw materials usually makes it impossible to sample all potential "sources" intensively enough to create groups of knowns to which unknowns can be compared. Lithic sources tend to be more localized and compositionally homogeneous in the case of obsidian or compositionally heterogeneous as is the case for most cherts.

Compositional groups can be viewed as "centers of mass" in the compositional hyperspace described by the measured elemental data. Groups are characterized by the locations of their centroids and the unique relationships (i.e., correlations) between the elements. Decisions about whether to assign a specimen to a particular compositional group are based on the overall probability that the measured concentrations for the specimen could have been obtained from that group.

Initial hypotheses about source-related subgroups in the compositional data can be derived from non-compositional information (e.g., archaeological context, decorative attributes, etc.) or from application of various pattern-recognition technique to the multivariate chemical data. Some of the pattern recognition techniques that have been used to investigate archaeological data sets are cluster analysis (CA), principal components analysis (PCA), and discriminant analysis (DA). Each of the techniques has it own advantages and disadvantages which may depend upon the types and quantity of data available for interpretation.

The variables (measured elements) in archaeological and geological data sets are often correlated and frequently large in number. This makes handling and interpreting patterns within the data difficult. Therefore, it is often useful to transform the original variables into a smaller set of uncorrelated variables in order to make data interpretation easier. Of the above-mentioned pattern recognition techniques, PCA is a technique that transforms from the data from the original correlated variables into uncorrelated variables most easily.

PCA creates a new set of reference axes arranged in decreasing order of variance subsumed. The individual PCs are linear combinations of the original variables. The data can be displayed on combinations of the new axes, just as they can be displayed on the original elemental concentration axes. PCA can be used in a pure pattern-recognition mode, i.e., to search for subgroups in an undifferentiated data set, or in a more evaluative mode, i.e., to assess the coherence of hypothetical

groups suggested by other criteria. Generally, compositional differences between specimens can be expected to be larger for specimens in different groups than for specimens in the same group, and this implies that groups should be detectable as distinct areas of high point density on plots of the first few components.

It is well known that PCA of chemical data is scale dependent (Mardia *et al.* 1979), and analyses tend to be dominated by those elements or isotopes for which the concentrations are relatively large. As a result, standardization methods are common to most statistical packages. A common approach it to transform the data into logarithms (e.g., base 10). As an initial step in the PCA of most chemical data at MURR, the data are transformed into log concentrations to equalize the differences in variance between the major elements such as Al, Ca and Fe, on one hand and trace elements, such as the rare-earth elements (REEs), on the other hand. An additional advantage of the transformation is that it appears to produce more nearly normal distributions for the trace elements.

One frequently exploited strength of PCA, discussed by Baxter (1992), Baxter and Buck (2002), and Neff (1994, 2002), is that it can be applied as a simultaneous R- and Q-mode technique, with both variables (elements) and objects (individual analyzed samples) displayed on the same set of principal component reference axes. A plot using the first two principal components as axes is usually the best possible two-dimensional representation of the correlation or variance-covariance structure within the data set. Small angles between the vectors from the origin to variable coordinates indicate strong positive correlation; angles at 90 degrees indicate no correlation; and angles close to 180 degrees indicate strong negative correlation. Likewise, a plot of sample coordinates on these same axes will be the best two-dimensional representation of Euclidean relations among the samples in log-concentration space (if the PCA was based on the variance-covariance matrix) or standardized log-concentration space (if the PCA was based on the correlation matrix). Displaying both objects and variables on the same plot makes it possible to observe the contributions of specific elements to group separation and to the distinctive shapes of the various groups. Such a plot is commonly referred to as a "biplot" in reference to the simultaneous plotting of objects and variables. The variable inter-relationships inferred from a biplot can be verified directly by inspecting bivariate elemental concentration plots. [Note that a bivariate plot of elemental concentrations is not a biplot.]

Whether a group can be discriminated easily from other groups can be evaluated visually in two dimensions or statistically in multiple dimensions. A metric known as the Mahalanobis distance (or generalized distance) makes it possible to describe the separation between groups or between individual samples and groups on multiple dimensions. The Mahalanobis distance of a specimen from a group centroid (Bieber *et al.* 1976, Bishop and Neff 1989) is defined by:

$$D^2_{y,X} = [y - \overline{X}]^t I_x [y - \overline{X}]$$

where y is the 1 x m array of logged elemental concentrations for the specimen of interest, X is the n x m data matrix of logged concentrations for the group to which the point is being compared with $\overline{X}$ being it 1 x m centroid, and I_x is the inverse of the m x m variance-covariance matrix of group X. Because Mahalanobis distance takes into account variances and covariances in the multivariate group it is analogous to expressing distance from a univariate mean in standard deviation units. Like standard deviation units, Mahalanobis distances can be converted into probabilities of group membership for individual specimens. For relatively small sample sizes, it is appropriate to base probabilities on Hotelling's T^2, which is the multivariate extension of the univariate Student's t.

When group sizes are small, Mahalanobis distance-based probabilities can fluctuate dramatically depending upon whether or not each specimen is assumed to be a member of the group to which it is being compared. Harbottle (1976) calls this phenomenon "stretchability" in reference to the tendency of an included specimen to stretch the group in the direction of its own location in elemental concentration space. This problem can be circumvented by cross-validation, that is, by removing each specimen from its presumed group before calculating its own probability of membership (Baxter 1994; Leese and Main 1994). This is a conservative approach to group evaluation that may sometimes exclude true group members.

Small sample and group sizes place further constraints on the use of Mahalanobis distance: with more elements than samples, the group variance-covariance matrix is singular thus rendering calculation of I_x (and D^2 itself) impossible. Therefore, the dimensionality of the groups must somehow be reduced. One approach would be to eliminate elements considered irrelevant or redundant. The problem with this approach is that the investigator's preconceptions about which elements should be discriminate may not be valid. It also squanders the main advantage of multielement analysis, namely the capability to measure a large number of elements. An alternative approach is to calculate Mahalanobis distances with the scores on principal components extracted from the variance-covariance or correlation matrix for the complete data set. This approach entails only the assumption, entirely reasonable in light of the above discussion of PCA, that most group-separating differences should be visible on the first several PCs. Unless a data set is extremely complex, containing numerous distinct groups, using enough components to subsume at least 90% of the total variance in the data can be generally assumed to yield Mahalanobis distances that approximate Mahalanobis distances in full elemental concentration space.

Lastly, Mahalanobis distance calculations are also quite useful for handling missing data (Sayre 1975). When many specimens are analyzed for a large number of elements, it is almost certain that a few element concentrations will be missed for some of the specimens. This occurs most frequently when the concentration for an element is near the detection limit. Rather than eliminate the specimen or the element from consideration, it is possible to substitute a missing value by replacing it with a value that minimizes the Mahalanobis distance for the specimen from the group centroid. Thus, those few specimens which are missing a single concentration value can still be used in group calculations.

Results and Conclusions

We identified six ceramic groups using prior knowledge about the petrography of the samples and by inspection of various projections of the data. Groups 1, 2A, 2B, and 3 correspond (more or less) to petrographic groups identified by Smith (Herbert and Smith 2004); it is not at present if Groups 5 and 6 have a petrographic counterpart.

The basic group structure is documented in ten figures and six tables accompanying this report. A variance-covariance matrix plot of principal component 1 and 2 derived from PCA (Table 1) of the entire ceramic and clay dataset is shown in Figure 1. Although, the group separation is marginal in this figure, it appears that Ca, and Na contribute significantly to separating the groups. Better separation of the groups can be seen in the Figures 2 and 3 which project the 1st and 4th principal component scores. Although, the group separation in Figures 2 and 3 is somewhat less ambiguous than that illustrated in Figure 1, the separation marginal nonetheless.

Possible explanations for the inability to effect clear separation of the groups in PCA space lie in the fact that most of the larger groups are represented by fewer than ten samples (which oftentimes represent a significant temporal span), and there is significant heterogeneity within some groups. This heterogeneity is illustrated in Figures 4 and 5. A bivariate plot of cesium and samarium suggests that although Group-1 is petrographically similar (and chemically similar in many projections), that chemical differences may be significant enough to warrant division of this small group into two subgroups (1A and 1B). Similarly, Group-2B which represent pottery production in the Haw and Yadkin drainages exhibit substantial variation (e.g., Figures 1–3), and there is the suggestion that multiple subgroups (possibly relating to different production locales) may occur within this group (e.g., Figure 5). However, testing this idea will require the analysis of significantly larger sample (ca. 100 samples) from sites in the drainages in question.

Despite problems with small group sizes and group heterogeneity, it is possible to show clear separation of the groups in elemental space (Figure 6). And,

when the PCA scores are recalculated using a reduced set of variables (Lu, Yb, Cr, Eu, Sc, Th, Ba, Ca, Mn, Na) (Table 2), it is possible to effect clear separation of these groups using scores derived from the first and third components (Figures 7–9). Although, this approach gives the appearance of providing gratuitous results, such approaches to data reduction are not generally recommended given that the variable retained (or rejected) are done so in an *ad hoc* fashion.

As discussed above, Mahalanobis distance can be used to calculate probabilities for a specimen's membership in a given group. Mahalanobis distance probabilities based on the first seven principal components derived from PCA using all elements (Table 1) do not support the proposed subgroup structure (Table 3). Specifically, the multivariate distributions of Group-3 overlaps significantly with most of the other groups. This most likely is a combined consequence of the small group sizes and heterogeneous nature of the groups. When probabilities are re-calculated using PCA scores derived from the abbreviated dataset (Table 2) the group assignments are supported.

Table 5 lists Mahalanobis distance probabilities calculated for untempered clays. Membership probabilities for Group-2B are probably inflated due to the heterogeneous nature of the group, and may be lower than expected for other groups because they have not been mathematically tempered with data generated from the analysis of the sands and rocks. Using information derived from the petrographic component of this project, it might be advisable to "mathematically temper" the clays with the appropriate temper and percentage of temper and recalculate the Mahalanobis distance probabilities. This can be accomplished using the Gauss applications developed at MURR which are available for download at: www.missouri.edu/~reahn/download.htm.

Raw data, final group assignments and descriptive information are listed in Table 6.

Although significant progress has been made in identifying compositional groups that may be indicative of specific drainages/geomorphologically distinct regions in and around the Fort Bragg area of North Carolina, we cannot stress the preliminary nature of the data. Any conclusions regarding these data should be considered carefully and supported by other lines of evidence, such as the petrographic component of this project. Future research should focus on refining the preliminary groups identified in this study.

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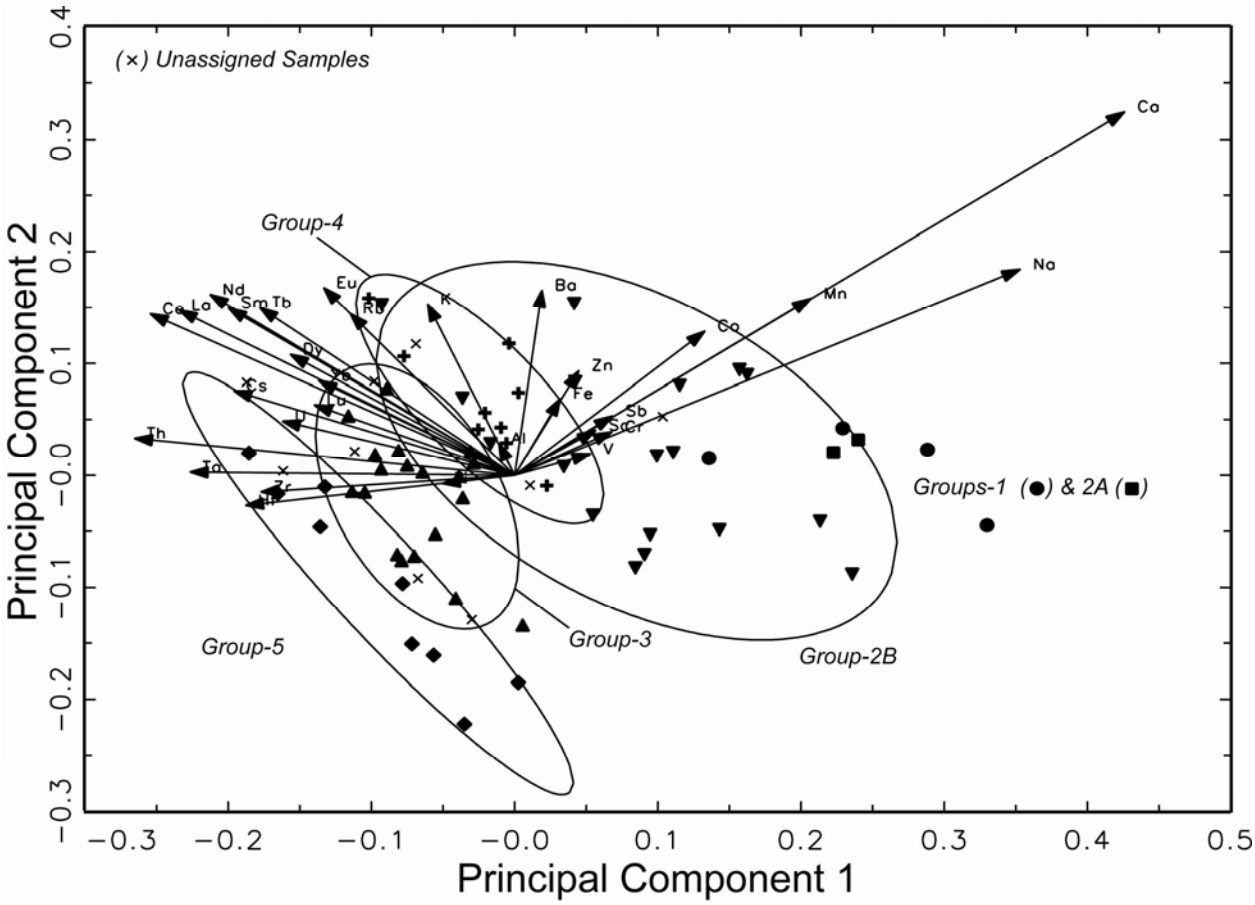

Figure 1. Variance-covariance matrix plot of principal component 1 and 2 derived from PCA of the Fort Bragg pottery and clay samples. Ellipses are drawn at the 90% confidence interval.

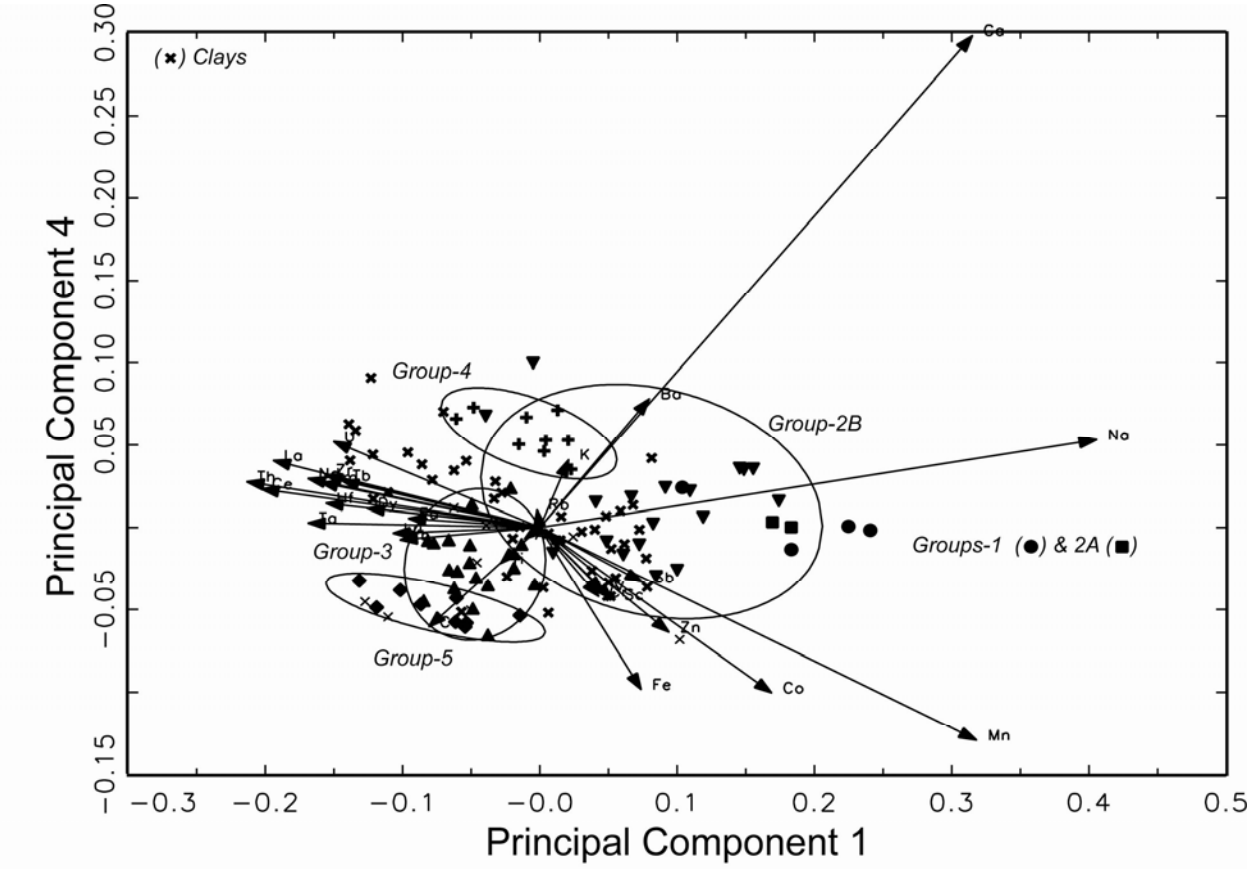

Figure 2. Variance-covariance matrix plot of principal component 1 and 4 derived from PCA of the Fort Bragg pottery and clay samples. Ellipses are drawn at the 90% confidence interval.

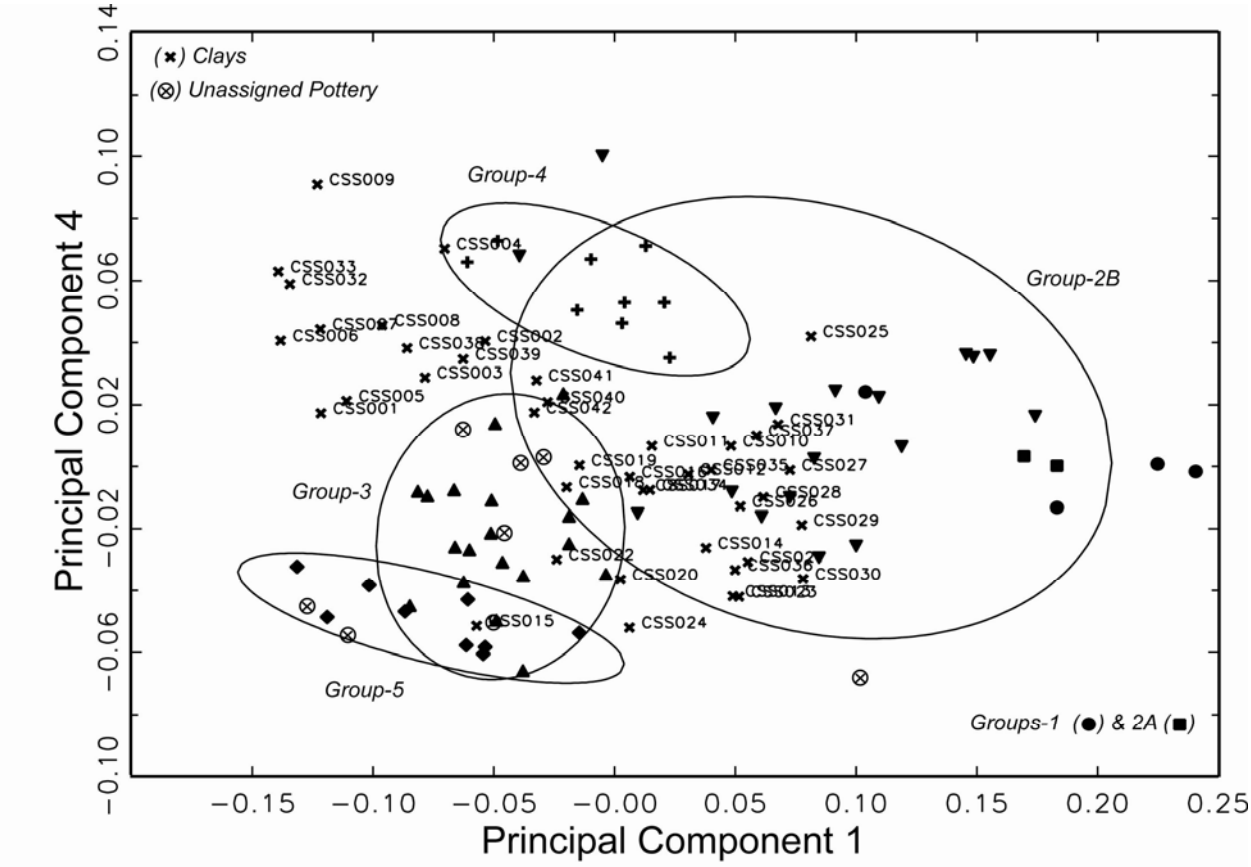

Figure 3. Plot of principal component 1 and 4 derived from PCA of the Fort Bragg pottery and clay samples. Ellipses are drawn at the 90% confidence interval. (Same as Figure 2, but without and vectors and with clays labeled.)

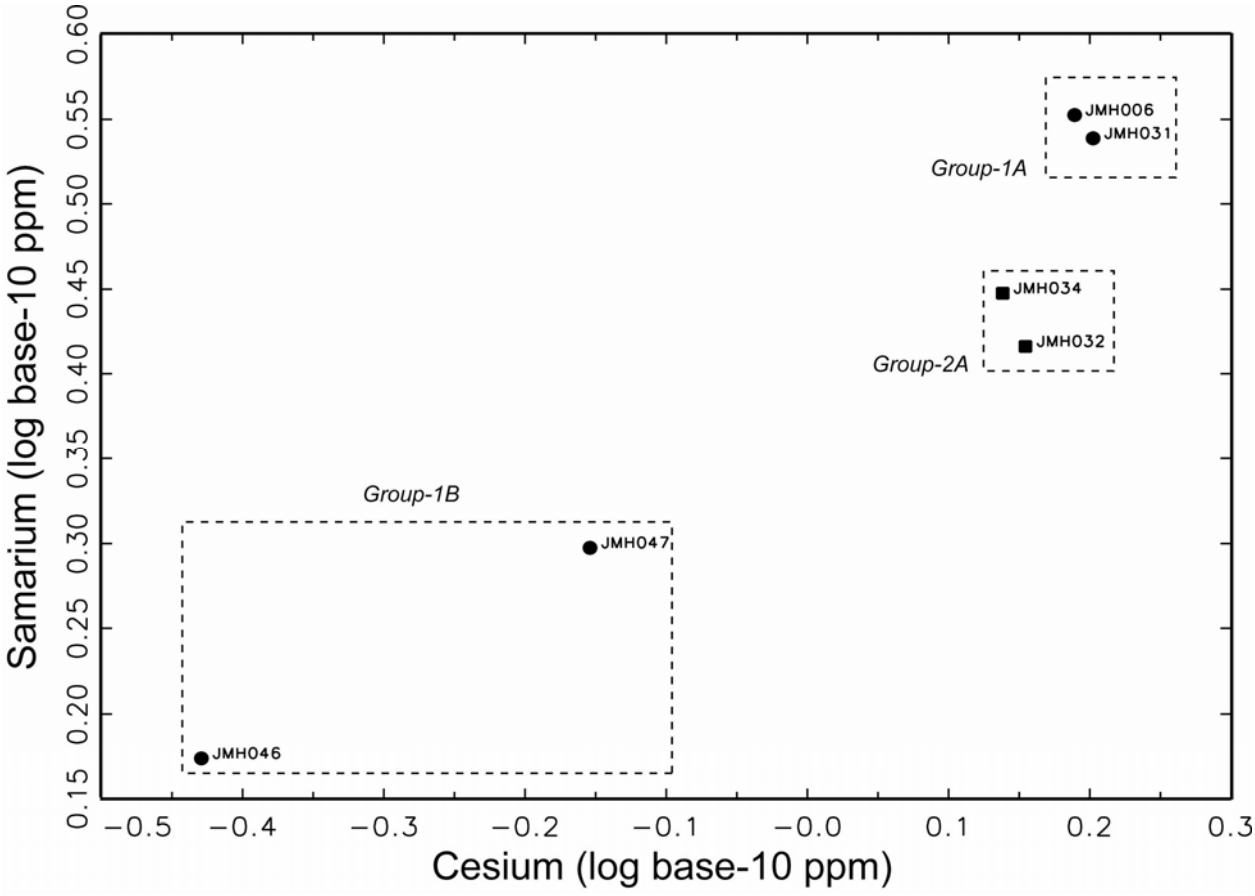

Figure 4. Plot of cesium and samarium base-10 logged concentrations illustrating the differences that exist between Groups 1 and 2. Based on these differences, we suggest that Group-1 be split into two groups.

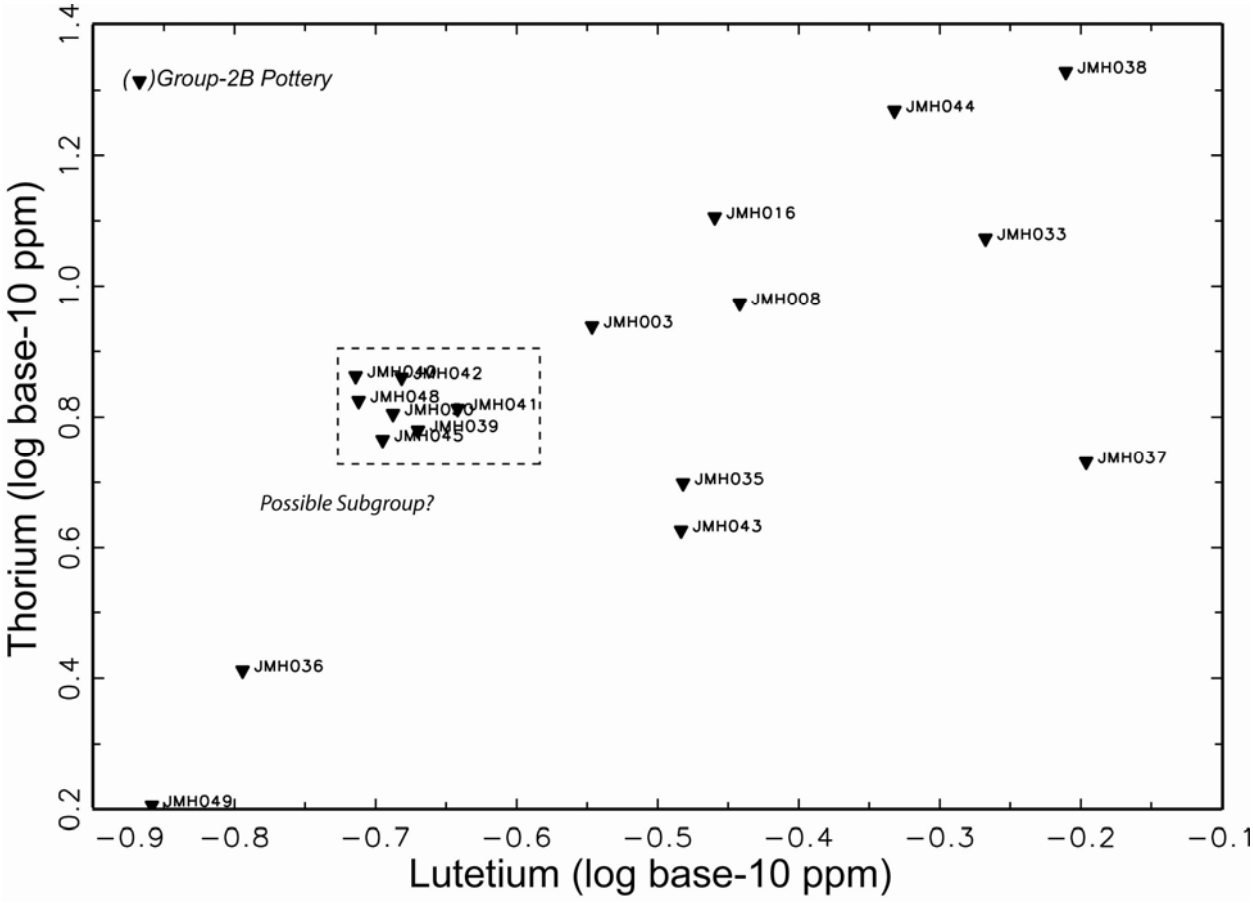

Figure 5. Plot of lutetium and thorium base-10 logged concentrations illustrating the differences that exist within Group 2B. Based on this variation, additional sampling of ottery is recommended to determine if and how many subgroups exist.

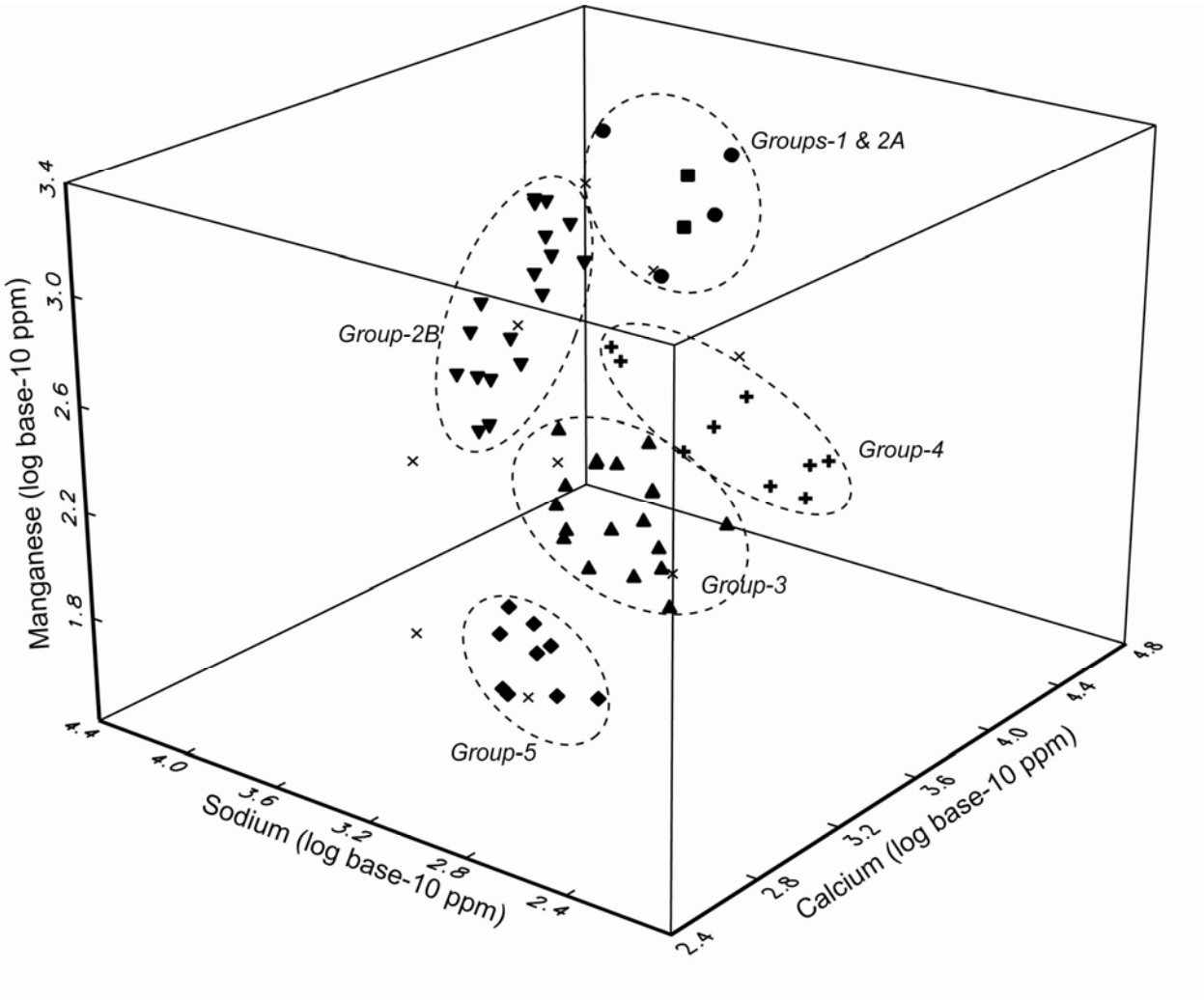

Figure 6. Plot of calcium, sodium, and manganese base-10 logged concentrations illustrating the differences among the various compositional groups.

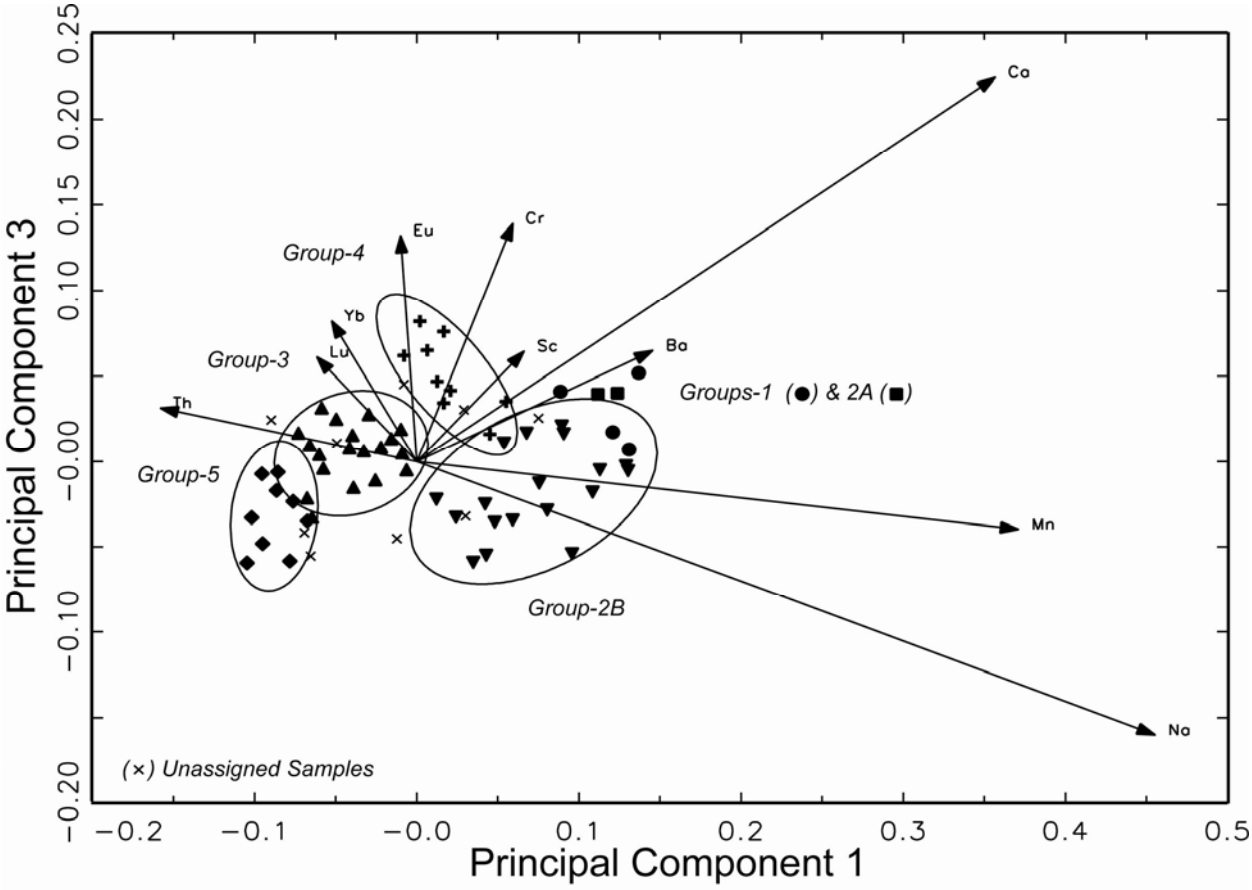

Figure 7. Variance-covariance matrix plot of principal component 1 and 3 derived from PCA of the Fort Bragg pottery and clay samples using a reduced set of elements. Ellipses are drawn at the 90% confidence interval.

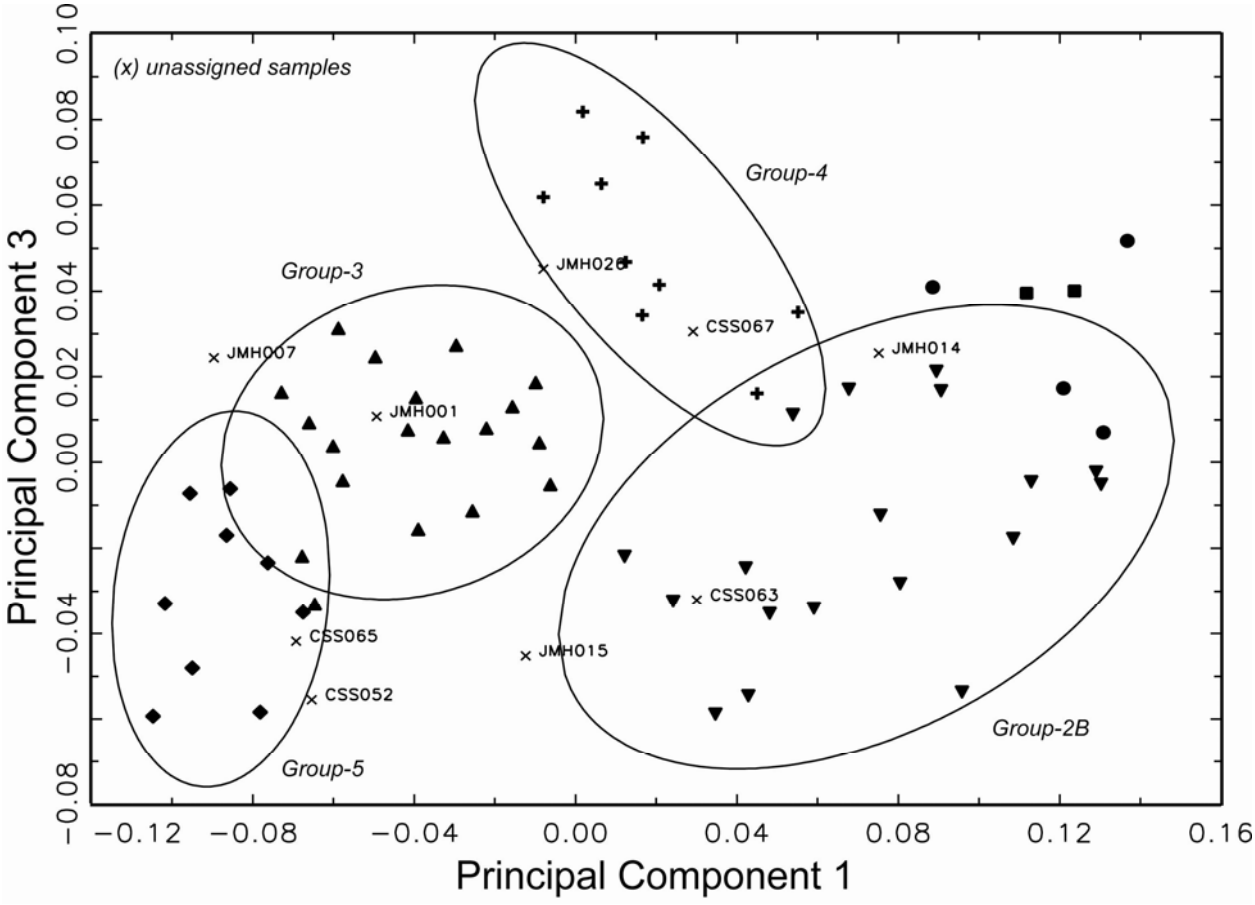

Figure 8. Plot of principal component 1 and 3 derived from PCA of the Fort Bragg pottery and clay samples using a reduced set of elements. Ellipses are drawn at the 90% confidence interval. (Same as Figure 7, but without and vectors and with unassigned pottery labeled.)

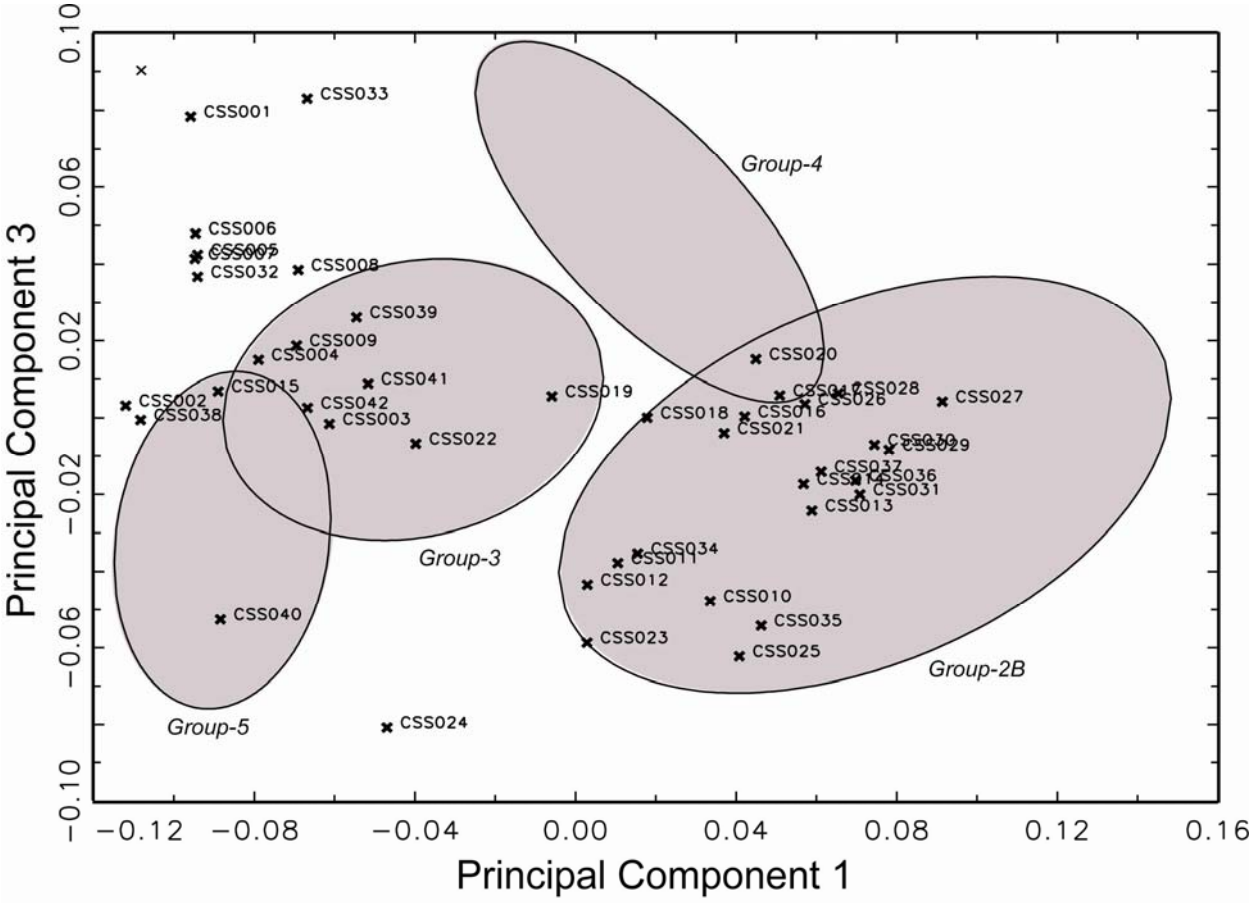

Figure 9. Plot of principal component 1 and 3 derived from PCA of the Fort Bragg pottery and clay samples using a reduced set of elements. Clay samples are projected against 90% confidence ellipses calculated for the four largest groups.

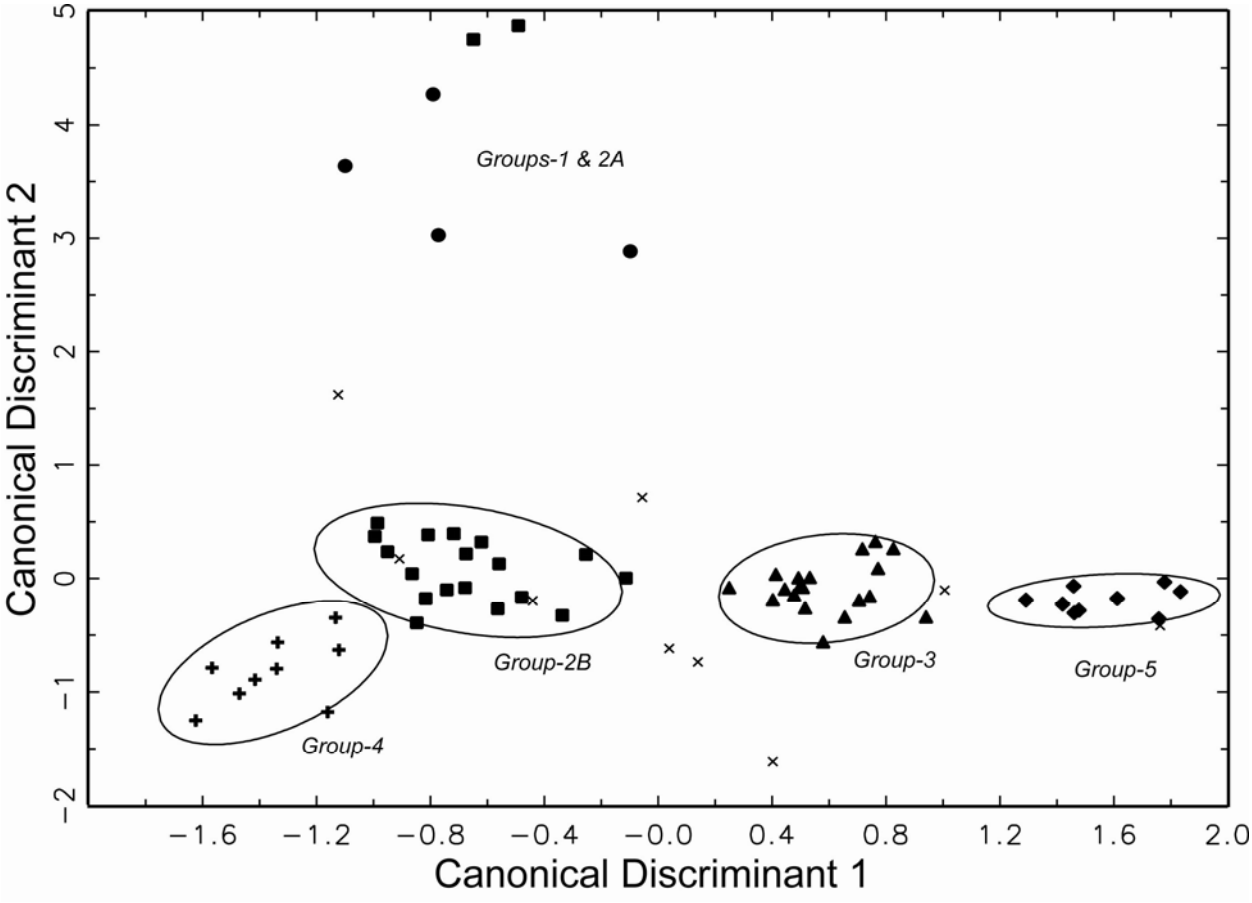

Figure 10. Plot of Canonical Discriminant 1 and 2 illustrating the separation of the various Fort Bragg pottery groups.

Table 1.

Principal Components Analysis Based on All Fort Bragg Pottery and Clays using all Elements

Simultaneous R-Q Factor Analysis Based on Variance-Covariance Matrix

Eigenvalues and Percentage of Variance Explained:

	Eigenvalue	%Variance	Cum. % Var.
1	0.7820	35.1033	35.1033
2	0.5296	23.7744	58.8777
3	0.2410	10.8193	69.6969
4	0.1604	7.1981	76.8951
5	0.1089	4.8866	81.7817
6	0.0932	4.1817	85.9633
7	0.0640	2.8723	88.8357
8	0.0541	2.4302	91.2659
9	0.0311	1.3951	92.6609
10	0.0253	1.1364	93.7974
11	0.0221	0.9935	94.7909
12	0.0213	0.9565	95.7474
13	0.0202	0.9060	96.6534
14	0.0162	0.7286	97.3820
15	0.0119	0.5331	97.9152
16	0.0110	0.4958	98.4110
17	0.0088	0.3957	98.8067
18	0.0056	0.2515	99.0582
19	0.0041	0.1851	99.2433
20	0.0035	0.1571	99.4004
21	0.0027	0.1207	99.5211
22	0.0024	0.1094	99.6305
23	0.0018	0.0809	99.7113
24	0.0017	0.0780	99.7894
25	0.0012	0.0559	99.8453
26	0.0011	0.0512	99.8965
27	0.0009	0.0389	99.9355
28	0.0007	0.0323	99.9678
29	0.0005	0.0217	99.9895
30	0.0002	0.0105	100.0000

Eigenvectors (largest to smallest):

La	-0.2197	0.2135	-0.0815	0.1014	-0.0213	-0.0526	0.0431	-0.0081	0.0807	0.0954	-0.0119	-0.1183	-0.0589	-0.1767	-0.1581	0.1121	0.1047	0.0599	-0.0636	-0.0685	-0.2625	-0.4642	-0.2572	-0.2119	0.0842	-0.0553	0.1332	-0.5659	0.0124	0.1230
Lu	-0.1213	0.1172	-0.0499	-0.0087	0.0243	-0.1085	-0.1119	0.0680	-0.0280	-0.1622	0.0157	0.0419	0.2183	0.2299	0.0973	0.1492	-0.0698	0.2574	0.1767	-0.2072	-0.1462	0.0434	0.2561	-0.0837	-0.0425	0.2969	0.1660	-0.0929	-0.6381	-0.0611
Nd	-0.1914	0.2480	-0.1394	0.0738	-0.0058	-0.0777	0.1513	0.0002	-0.0477	0.0673	-0.0198	-0.0544	-0.2159	-0.1967	-0.0496	-0.1284	0.0185	0.1722	-0.3039	-0.3419	0.1886	0.2755	-0.3531	0.2445	0.2960	0.1414	0.0296	0.1543	-0.1778	-0.1857
Sm	-0.1809	0.2348	-0.1410	0.0679	-0.0019	-0.1106	0.0963	-0.0056	-0.0074	0.0477	-0.0210	-0.0090	-0.1420	-0.0496	-0.0046	-0.0038	-0.0423	-0.0667	-0.0611	0.0012	-0.0012	0.1213	0.1861	0.0640	-0.1843	-0.0564	-0.0487	0.1796	-0.0897	0.8351
U	-0.1702	0.0833	0.0386	0.1304	0.0736	0.0652	0.0199	-0.2746	0.1942	-0.4023	-0.6618	0.1218	0.0132	0.1529	0.1300	-0.2306	0.0118	-0.1312	-0.0928	-0.1779	-0.1112	-0.0770	0.0073	-0.0632	-0.0547	-0.0587	-0.1331	0.0377	0.0647	-0.0665
Yb	-0.1154	0.1405	-0.1062	-0.0187	0.0283	-0.1061	-0.0840	0.1052	-0.0527	-0.1829	0.1259	0.0163	0.2378	0.2286	0.1212	0.1099	-0.0185	0.3378	0.1687	-0.1762	0.0796	-0.0898	-0.0720	0.3253	0.0478	0.1905	-0.3320	-0.1139	0.5136	0.1106
Ce	-0.2295	0.2298	-0.0963	0.0581	-0.0193	-0.0983	0.0519	-0.0168	0.0819	0.1123	0.0455	-0.0961	-0.1318	-0.0625	-0.2079	0.1717	0.0369	0.0765	0.0629	0.0953	-0.1420	-0.3577	0.1546	-0.1282	-0.2330	0.1595	-0.1241	0.5785	0.1042	-0.3081
Co	0.1911	0.2455	-0.2284	-0.2506	-0.1556	0.0018	0.0048	-0.0831	0.1135	-0.2014	0.1034	-0.2001	0.4128	0.1106	-0.5528	-0.0921	0.0940	-0.3186	0.0189	-0.1483	-0.0079	0.1028	-0.0567	0.0232	-0.0015	-0.0777	0.0308	0.0448	-0.0121	0.0013
Cr	0.0487	0.1112	-0.2600	-0.1052	0.0070	0.4054	-0.2000	-0.5642	0.1459	-0.1185	0.3640	0.2338	-0.2373	-0.0614	0.0439	0.0255	-0.0117	0.1266	-0.1007	0.0124	0.0644	-0.0610	0.1901	0.0229	0.0606	-0.0182	-0.1064	-0.0958	-0.0530	-0.0192
Cs	-0.0916	0.1926	0.2512	-0.1517	0.3567	0.2141	-0.0777	0.2445	0.3726	0.2520	0.1440	0.1081	-0.1616	0.2805	-0.0587	-0.3785	0.2466	0.0122	0.2323	-0.0811	-0.0817	0.0167	-0.0787	0.0534	-0.0131	-0.0475	-0.0014	0.0206	-0.0467	0.0272
Eu	-0.1085	0.2668	-0.2035	0.0137	-0.0196	-0.1288	0.2188	0.0059	-0.0472	0.1825	0.0060	0.0835	-0.0852	-0.0712	0.1190	-0.0570	-0.0230	-0.2485	0.0943	0.1041	-0.2776	0.4144	0.2951	0.1336	-0.2059	0.0441	-0.0638	-0.3647	0.1674	-0.3050
Fe	0.0834	0.1343	-0.0975	-0.2458	-0.0465	0.2335	-0.0047	-0.0160	0.0918	0.0306	-0.1061	-0.7255	-0.0350	0.0082	0.5004	0.1055	0.1295	-0.0185	0.0438	0.0474	-0.0397	-0.0165	-0.0157	0.0790	0.0169	-0.0516	-0.0097	0.0459	-0.0598	-0.0071
Hf	-0.1765	0.0165	0.1518	0.0367	-0.1183	-0.1738	-0.3460	-0.1817	-0.1269	0.0863	0.1645	-0.2316	0.0087	0.0770	0.0175	-0.2132	-0.1753	0.1880	-0.0033	-0.1661	-0.2173	0.3198	0.0045	-0.4835	0.1033	-0.2423	-0.0881	0.0725	0.1786	-0.0037
Rb	-0.0023	0.2673	0.3731	0.0271	0.0305	0.2392	0.0491	0.2173	0.2089	-0.0622	0.1388	-0.0321	0.1093	0.0314	0.0183	0.1884	-0.5894	-0.1521	-0.4180	0.0142	-0.0483	-0.0076	0.0393	-0.0006	0.0096	0.0624	-0.0918	-0.0362	0.0201	-0.0268
Sb	0.0847	0.0970	-0.0236	-0.0831	0.7487	0.1007	-0.0856	-0.0245	-0.5359	-0.1342	-0.0510	-0.0922	-0.0334	-0.0953	-0.1386	0.1190	-0.0162	-0.0722	-0.0328	-0.0136	-0.1601	0.0140	-0.0031	-0.0161	0.0354	-0.0314	-0.0351	0.0301	0.0160	-0.0027
Sc	0.0601	0.1083	-0.1295	-0.1100	-0.0331	0.1835	-0.0142	-0.1085	-0.0564	0.1724	-0.0813	0.2420	0.2351	-0.0686	0.1381	0.0523	-0.2334	0.2025	0.1120	0.0132	-0.1683	0.0763	-0.5210	0.0490	-0.4793	-0.1812	0.1831	0.1286	-0.0210	-0.0018
Ta	-0.1912	0.0903	0.1666	0.0069	-0.0211	0.0076	-0.3838	-0.1359	0.0787	0.0958	-0.1060	0.1267	0.1316	0.0871	0.0080	0.4056	0.3903	-0.1466	-0.2054	0.2598	-0.0859	0.2714	-0.1268	0.0401	0.1217	0.2515	0.2101	0.0663	0.1278	0.0624
Tb	-0.1634	0.2253	-0.1962	0.0709	0.1159	-0.1057	0.0504	0.1009	-0.0103	-0.1650	0.1327	0.0744	0.0714	0.1201	0.1844	-0.0103	0.0271	-0.1671	0.0787	0.4012	0.4300	0.0475	-0.2880	-0.4034	0.0114	-0.0611	-0.2657	-0.0481	-0.1668	-0.0655
Th	-0.2418	0.1010	0.1963	0.0690	0.0315	0.0697	-0.1406	-0.1531	0.0111	0.1216	-0.2321	-0.1780	-0.0819	-0.0020	-0.2871	0.2377	-0.1767	0.0744	0.3155	-0.0178	0.5164	0.0794	0.1326	0.1675	-0.1269	-0.2659	0.1077	-0.1736	-0.0119	-0.0947
Zn	0.1065	0.2037	-0.0248	-0.1594	-0.0409	0.1056	0.0776	0.0307	-0.1656	0.1595	-0.2550	-0.0333	0.1544	0.1203	-0.1453	-0.3306	0.0597	0.4719	-0.3475	0.3748	0.1540	-0.0288	0.2252	-0.1040	-0.0300	0.1156	0.1000	-0.1008	0.0748	0.0072
Zr	-0.1774	0.0208	0.1173	0.0796	-0.0902	-0.1040	-0.2917	-0.1936	-0.2273	-0.0449	0.1298	-0.1541	-0.0058	0.0070	0.0304	-0.4615	-0.2185	-0.2534	0.0796	0.2684	-0.0335	-0.2403	-0.1361	0.3510	-0.0643	0.2814	0.1152	-0.0210	-0.1012	0.0048
Al	-0.0128	0.0726	-0.0038	-0.0177	-0.0743	0.1140	0.1469	-0.1243	-0.0143	0.2473	-0.2010	0.1149	0.1803	-0.0482	-0.0708	0.0460	-0.1971	0.0297	0.3403	0.2535	-0.2435	-0.0095	-0.0093	0.0962	0.6145	-0.0697	-0.2686	0.1143	-0.1428	0.0723
Ba	0.0904	0.2472	0.2206	0.1959	-0.4050	0.3640	0.1598	0.0656	-0.4961	-0.1036	0.0461	0.0698	-0.2489	0.3239	-0.0326	0.0763	0.1965	-0.0769	0.1133	-0.1004	-0.0510	-0.0187	-0.0716	-0.0546	-0.0217	-0.0198	-0.0144	0.0152	-0.0059	0.0054
Ca	0.3563	0.1049	-0.2906	0.7444	0.0755	0.1501	-0.3185	0.1679	0.1369	0.1095	-0.0555	-0.1086	0.0761	-0.0122	-0.0269	-0.0658	-0.0097	0.0305	0.0288	0.0164	-0.0183	0.0479	0.0402	0.0343	0.0144	-0.0035	0.0178	0.0234	0.0101	-0.0144
Dy	-0.1426	0.1828	-0.1429	0.0289	0.0430	-0.0944	0.0555	0.0872	-0.0562	-0.0990	0.1330	0.1481	0.1077	0.1373	0.2399	-0.0274	-0.0429	-0.0628	-0.0382	0.0106	0.0346	-0.1772	0.1942	0.1021	0.2887	-0.4361	0.5800	0.1756	0.1662	-0.0763
K	0.0237	0.2499	0.3864	0.1025	-0.0301	0.0688	0.0508	-0.0044	0.0041	-0.2362	0.1171	0.0515	0.3062	-0.6544	0.1263	-0.1402	0.2694	0.1041	0.1775	-0.0121	0.0562	0.0372	0.1233	-0.0304	-0.0376	-0.0111	-0.0020	0.0423	0.0074	0.0122
Mn	0.3600	0.3206	-0.0122	-0.3228	-0.1672	-0.2726	-0.4209	0.2512	0.0237	-0.1475	-0.2267	0.1824	-0.3808	-0.1659	0.0154	0.0399	-0.1243	0.0014	0.1123	0.0305	0.0003	-0.0509	-0.0200	-0.0189	0.0801	-0.0189	-0.0050	-0.0092	0.0139	-0.0089
Na	0.4590	0.2403	0.2912	0.1330	0.1578	-0.4535	0.2450	-0.4624	0.0870	0.1464	0.0843	-0.0360	-0.0167	0.2244	0.1035	0.0851	0.0303	0.0396	-0.0071	-0.0174	0.0501	-0.0699	-0.0737	0.0306	-0.0167	0.0136	0.0284	-0.0081	-0.0259	0.0111
Ti	-0.0326	0.0506	0.0267	-0.0547	-0.0725	-0.0933	-0.2600	0.0400	-0.1988	0.3764	-0.0296	0.1391	0.2462	0.0003	0.1368	0.0042	0.1943	-0.1680	-0.2985	-0.2218	0.0831	-0.2441	0.1304	0.1565	-0.0880	-0.3104	-0.3907	-0.0236	-0.2271	-0.0875
V	0.0526	0.0734	-0.0924	-0.0982	0.0308	0.1455	-0.0001	-0.0771	-0.0898	0.3543	-0.1055	0.0944	0.1170	-0.0770	0.1593	-0.0655	-0.1363	-0.2835	0.1575	-0.3566	0.2870	-0.1085	0.0745	-0.3415	0.0902	0.4337	0.1692	0.0259	0.2090	0.0794

Table 1.

Scaled Factor Loading Matrix (largest to smallest component):

La	-0.1943	0.1554	-0.0400	0.0406	-0.0070	-0.0161	0.0109	-0.0019	0.0142	0.0152	-0.0018	-0.0173	-0.0084	-0.0225	-0.0172	0.0118	0.0098	0.0045	-0.0041	-0.0040	-0.0136	-0.0229	-0.0109	-0.0088	0.0030	-0.0019	0.0039	-0.0152	0.0003	0.0019
Lu	-0.1072	0.0853	-0.0245	-0.0035	0.0080	-0.0331	-0.0283	0.0158	-0.0049	-0.0258	0.0023	0.0061	0.0310	0.0293	0.0106	0.0157	-0.0066	0.0193	0.0113	-0.0123	-0.0076	0.0021	0.0109	-0.0035	-0.0015	0.0100	0.0049	-0.0025	-0.0140	-0.0009
Nd	-0.1692	0.1805	-0.0684	0.0296	-0.0019	-0.0237	0.0383	0.0000	-0.0084	0.0107	-0.0030	-0.0079	-0.0307	-0.0251	-0.0054	-0.0135	0.0017	0.0129	-0.0195	-0.0202	0.0098	0.0136	-0.0150	0.0102	0.0104	0.0048	0.0009	0.0041	-0.0039	-0.0028
Sm	-0.1599	0.1709	-0.0692	0.0272	-0.0006	-0.0338	0.0244	-0.0013	-0.0013	0.0076	-0.0031	-0.0013	-0.0202	-0.0063	-0.0005	-0.0004	-0.0040	-0.0050	-0.0039	0.0001	-0.0001	0.0060	0.0079	0.0027	-0.0065	-0.0019	-0.0014	0.0048	-0.0020	0.0128
U	-0.1505	0.0606	0.0190	0.0522	0.0243	0.0199	0.0050	-0.0639	0.0342	-0.0640	-0.0985	0.0178	0.0019	0.0195	0.0142	-0.0242	0.0011	-0.0098	-0.0060	-0.0105	-0.0058	-0.0038	0.0003	-0.0026	-0.0019	-0.0020	-0.0039	0.0010	0.0014	-0.0010
Yb	-0.1021	0.1023	-0.0521	-0.0075	0.0093	-0.0324	-0.0212	0.0245	-0.0093	-0.0291	0.0187	0.0024	0.0338	0.0291	0.0132	0.0115	-0.0017	0.0253	0.0108	-0.0104	0.0041	-0.0044	-0.0031	0.0136	0.0017	0.0064	-0.0098	-0.0031	0.0113	0.0017
Ce	-0.2030	0.1673	-0.0473	0.0233	-0.0064	-0.0300	0.0131	-0.0039	0.0144	0.0179	0.0068	-0.0140	-0.0187	-0.0080	-0.0227	0.0180	0.0035	0.0057	0.0040	0.0056	-0.0074	-0.0177	0.0066	-0.0053	-0.0082	0.0054	-0.0037	0.0155	0.0023	-0.0047
Co	0.1690	0.1786	-0.1121	-0.1003	-0.0513	0.0006	0.0012	-0.0193	0.0200	-0.0320	0.0154	-0.0292	0.0587	0.0141	-0.0602	-0.0097	0.0088	-0.0238	0.0012	-0.0088	-0.0004	0.0051	-0.0024	0.0010	-0.0001	-0.0026	0.0009	0.0012	-0.0003	0.0000
Cr	0.0430	0.0809	-0.1276	-0.0421	0.0023	0.1237	-0.0506	-0.1313	0.0257	-0.0189	0.0542	0.0341	-0.0337	-0.0078	0.0048	0.0027	-0.0011	0.0095	-0.0065	0.0007	0.0033	-0.0030	0.0081	0.0010	0.0021	-0.0006	-0.0031	-0.0026	-0.0012	-0.0003
Cs	-0.0810	0.1401	0.1233	-0.0608	0.1177	0.0653	-0.0196	0.0569	0.0657	0.0401	0.0214	0.0158	-0.0230	0.0357	-0.0064	-0.0398	0.0231	0.0009	0.0149	-0.0048	-0.0042	0.0008	-0.0033	0.0022	-0.0005	-0.0016	0.0000	0.0006	-0.0010	0.0004
Eu	-0.0960	0.1942	-0.0999	0.0055	-0.0065	-0.0393	0.0554	0.0014	-0.0083	0.0290	0.0009	0.0122	-0.0121	-0.0091	0.0130	-0.0060	-0.0022	-0.0186	0.0061	0.0062	-0.0144	0.0205	0.0125	0.0056	-0.0073	0.0015	-0.0019	-0.0098	0.0037	-0.0047
Fe	0.0738	0.0978	-0.0479	-0.0984	-0.0153	0.0713	-0.0012	-0.0037	0.0162	0.0049	-0.0158	-0.1059	-0.0050	0.0010	0.0545	0.0111	0.0122	-0.0014	0.0028	0.0028	-0.0021	-0.0008	-0.0007	0.0033	0.0006	-0.0017	-0.0003	0.0012	-0.0013	-0.0001
Hf	-0.1560	0.0120	0.0745	0.0147	-0.0390	-0.0530	-0.0875	-0.0423	-0.0224	0.0137	0.0245	-0.0338	0.0012	0.0098	0.0019	-0.0224	-0.0165	0.0141	-0.0002	-0.0098	-0.0113	0.0158	0.0002	-0.0202	0.0036	-0.0082	-0.0026	0.0019	0.0039	-0.0001
Rb	-0.0020	0.1946	0.1832	0.0109	0.0101	0.0730	0.0124	0.0506	0.0368	-0.0099	0.0207	-0.0047	0.0155	0.0040	0.0020	0.0198	-0.0553	-0.0114	-0.0268	0.0008	-0.0025	-0.0004	0.0017	0.0000	0.0003	0.0021	-0.0027	-0.0010	0.0004	-0.0004
Sb	0.0749	0.0706	-0.0116	-0.0333	0.2470	0.0307	-0.0217	-0.0057	-0.0945	-0.0213	-0.0076	-0.0135	-0.0048	-0.0121	-0.0151	0.0125	-0.0015	-0.0054	-0.0021	-0.0008	-0.0083	0.0007	-0.0001	-0.0007	0.0012	-0.0011	-0.0010	0.0008	0.0004	0.0000
Sc	0.0531	0.0788	-0.0636	-0.0440	-0.0109	0.0560	-0.0036	-0.0253	-0.0099	0.0274	-0.0121	0.0353	0.0334	-0.0087	0.0151	0.0055	-0.0219	0.0152	0.0072	0.0008	-0.0087	0.0038	-0.0221	0.0020	-0.0169	-0.0061	0.0054	0.0034	-0.0005	0.0000
Ta	-0.1691	0.0657	0.0818	0.0028	-0.0070	0.0023	-0.0971	-0.0316	0.0139	0.0152	-0.0158	0.0185	0.0187	0.0111	0.0009	0.0426	0.0366	-0.0110	-0.0132	0.0154	-0.0045	0.0134	-0.0054	0.0017	0.0043	0.0085	0.0062	0.0018	0.0028	0.0010
Tb	-0.1445	0.1640	-0.0963	0.0284	0.0382	-0.0323	0.0128	0.0235	-0.0018	-0.0262	0.0197	0.0109	0.0101	0.0153	0.0201	-0.0011	0.0025	-0.0125	0.0051	0.0237	0.0223	0.0023	-0.0122	-0.0168	0.0004	-0.0021	-0.0078	-0.0013	-0.0037	-0.0010
Th	-0.2138	0.0735	0.0964	0.0276	0.0104	0.0213	-0.0356	-0.0356	0.0020	0.0193	-0.0345	-0.0260	-0.0116	-0.0003	-0.0313	0.0250	-0.0166	0.0056	0.0203	-0.0011	0.0268	0.0039	0.0056	0.0070	-0.0045	-0.0090	0.0032	-0.0047	-0.0003	-0.0014
Zn	0.0942	0.1482	-0.0122	-0.0638	-0.0135	0.0322	0.0196	0.0071	-0.0292	0.0254	-0.0379	-0.0049	0.0219	0.0153	-0.0158	-0.0347	0.0056	0.0353	-0.0223	0.0222	0.0080	-0.0014	0.0096	-0.0043	-0.0011	0.0039	0.0029	-0.0027	0.0016	0.0001
Zr	-0.1568	0.0151	0.0576	0.0319	-0.0298	-0.0317	-0.0738	-0.0450	-0.0401	-0.0071	0.0193	-0.0225	-0.0008	0.0009	0.0033	-0.0485	-0.0205	-0.0190	0.0051	0.0159	-0.0017	-0.0119	-0.0058	0.0146	-0.0023	0.0095	0.0034	-0.0006	-0.0022	0.0001
Al	-0.0114	0.0529	-0.0019	-0.0071	-0.0245	0.0348	0.0372	-0.0289	-0.0025	0.0393	-0.0299	0.0168	0.0256	-0.0061	-0.0077	0.0048	-0.0185	0.0022	0.0219	0.0150	-0.0126	-0.0005	-0.0004	0.0040	0.0217	-0.0024	-0.0079	0.0031	-0.0031	0.0011
Ba	0.0800	0.1799	0.1083	0.0784	-0.1336	0.1111	0.0404	0.0153	-0.0875	-0.0165	0.0069	0.0102	-0.0354	0.0413	-0.0036	0.0080	0.0184	-0.0058	0.0073	-0.0059	-0.0026	-0.0009	-0.0030	-0.0023	-0.0008	-0.0007	-0.0004	0.0004	-0.0001	0.0001
Ca	0.3151	0.0764	-0.1427	0.2981	0.0249	0.0458	-0.0806	0.0391	0.0241	0.0174	-0.0083	-0.0159	0.0108	-0.0016	-0.0029	-0.0069	-0.0009	0.0023	0.0019	0.0010	-0.0010	0.0024	0.0017	0.0014	0.0005	-0.0001	0.0005	0.0006	0.0002	-0.0002
Dy	-0.1261	0.1330	-0.0702	0.0116	0.0142	-0.0288	0.0140	0.0203	-0.0099	-0.0158	0.0198	0.0216	0.0153	0.0175	0.0261	-0.0029	-0.0040	-0.0047	-0.0025	0.0006	0.0018	-0.0087	0.0082	0.0043	0.0102	-0.0147	0.0171	0.0047	0.0037	-0.0012
K	0.0210	0.1818	0.1897	0.0410	-0.0099	0.0210	0.0129	-0.0010	0.0007	-0.0376	0.0174	0.0075	0.0435	-0.0834	0.0138	-0.0147	0.0253	0.0078	0.0114	-0.0007	0.0029	0.0018	0.0052	-0.0013	-0.0013	-0.0004	-0.0001	0.0011	0.0002	0.0002
Mn	0.3183	0.2333	-0.0060	-0.1293	-0.0552	-0.0832	-0.1065	0.0585	0.0042	-0.0235	-0.0337	0.0266	-0.0541	-0.0211	0.0017	0.0042	-0.0117	0.0001	0.0072	0.0018	0.0000	-0.0025	-0.0008	-0.0008	0.0028	-0.0006	-0.0001	-0.0002	0.0003	-0.0001
Na	0.4059	0.1749	0.1430	0.0533	0.0521	-0.1384	0.0620	-0.1076	0.0153	0.0233	0.0125	-0.0053	-0.0024	0.0286	0.0113	0.0089	0.0028	0.0030	-0.0005	-0.0010	0.0026	-0.0034	-0.0031	0.0013	-0.0006	0.0005	0.0008	-0.0002	-0.0006	0.0002
Ti	-0.0288	0.0368	0.0131	-0.0219	-0.0239	-0.0285	-0.0658	0.0093	-0.0350	0.0599	-0.0044	0.0203	0.0350	0.0000	0.0149	0.0004	0.0182	-0.0126	-0.0192	-0.0131	0.0043	-0.0121	0.0055	0.0065	-0.0031	-0.0105	-0.0115	-0.0006	-0.0050	-0.0013
V	0.0465	0.0534	-0.0453	-0.0393	0.0102	0.0444	0.0000	-0.0179	-0.0158	0.0564	-0.0157	0.0138	0.0166	-0.0098	0.0174	-0.0069	-0.0128	-0.0212	0.0101	-0.0211	0.0149	-0.0054	0.0032	-0.0142	0.0032	0.0147	0.0050	0.0007	0.0046	0.0012

Table 2. Principal Components Analysis Based on All Fort Bragg Pottery and Clays using Abbreviated Element List.

Simultaneous R-Q Factor Analysis Based on Variance-Covariance Matrix

Eigenvalues and Percentage of Variance Explained:

	Eigenvalue	%Variance	Cum. % Var.
1	0.5334	49.7844	49.7844
2	0.1570	14.6534	64.4378
3	0.1344	12.5406	76.9784
4	0.0951	8.8784	85.8568
5	0.0601	5.6096	91.4663
6	0.0487	4.5497	96.0160
7	0.0240	2.2393	98.2553
8	0.0106	0.9871	99.2424
9	0.0071	0.6660	99.9084
10	0.0010	0.0916	100.0000

Eigenvectors (largest to smallest):

Lu	-0.0845	0.2447	0.1673	0.0298	0.2916	0.0509	0.1130	0.4912	-0.0587	-0.7476
Yb	-0.0719	0.2664	0.2240	-0.0171	0.3160	0.0458	0.0004	0.5841	-0.0110	0.6559
Cr	0.0811	0.1149	0.3800	-0.3620	-0.4169	-0.6122	0.2243	0.1079	0.3059	-0.0245
Eu	-0.0138	0.4210	0.3604	0.0280	0.3968	-0.1522	-0.4885	-0.4836	0.1926	-0.0412
Sc	0.0907	0.1433	0.1761	-0.1909	-0.1580	-0.1507	-0.1454	-0.0570	-0.9120	0.0088
Th	-0.2166	0.2857	0.0857	0.4054	0.1123	-0.1039	0.7314	-0.3360	-0.1420	0.0911
Ba	0.1994	0.3135	0.1772	0.6112	-0.5816	0.2083	-0.2227	0.1450	0.0680	-0.0123
Ca	0.4886	-0.5199	0.6126	0.1432	0.2039	0.1582	0.1576	-0.0544	-0.0279	-0.0021
Mn	0.5082	0.4494	-0.1089	-0.4445	-0.0348	0.4842	0.2599	-0.1398	0.0866	0.0075
Na	0.6237	0.0775	-0.4366	0.2730	0.2556	-0.5108	-0.0136	0.1110	-0.0318	0.0063

Scaled Factor Loading Matrix (largest to smallest component):

Lu	-0.0617	0.0970	0.0613	0.0092	0.0715	0.0112	0.0175	0.0505	-0.0050	-0.0234
Yb	-0.0525	0.1056	0.0821	-0.0053	0.0775	0.0101	0.0001	0.0601	-0.0009	0.0205
Cr	0.0592	0.0455	0.1393	-0.1117	-0.1022	-0.1352	0.0347	0.0111	0.0258	-0.0008
Eu	-0.0101	0.1668	0.1321	0.0086	0.0973	-0.0336	-0.0757	-0.0497	0.0163	-0.0013
Sc	0.0663	0.0568	0.0646	-0.0589	-0.0387	-0.0333	-0.0225	-0.0059	-0.0770	0.0003
Th	-0.1582	0.1132	0.0314	0.1250	0.0275	-0.0229	0.1133	-0.0346	-0.0120	0.0029
Ba	0.1456	0.1242	0.0650	0.1885	-0.1426	0.0460	-0.0345	0.0149	0.0057	-0.0004
Ca	0.3568	-0.2060	0.2246	0.0442	0.0500	0.0349	0.0244	-0.0056	-0.0024	-0.0001
Mn	0.3712	0.1780	-0.0399	-0.1371	-0.0085	0.1069	0.0403	-0.0144	0.0073	0.0002
Na	0.4555	0.0307	-0.1600	0.0842	0.0627	-0.1128	-0.0021	0.0114	-0.0027	0.0002

Table 3. Mahalanobis Distance and Posterior Classification based on PC01-PC07. Principal component scores were derived from PCA of the 30 retained elements. Probabilities are jackknifed for specimens included in each group.

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Assigned Group	Best Group Based on M.D.
JMH003	44.2	14.0	20.1	4.3	Group-2B	Group-2B
JMH008	96.7	8.4	25.4	1.3	Group-2B	Group-2B
JMH016	22.5	15.6	13.6	6.3	Group-2B	Group-2B
JMH033	65.2	0.0	5.1	2.3	Group-2B	Group-2B
JMH035	33.9	0.0	2.6	2.9	Group-2B	Group-2B
JMH036	35.8	0.0	3.3	0.7	Group-2B	Group-2B
JMH037	81.7	0.0	6.8	6.7	Group-2B	Group-2B
JMH038	6.4	0.0	11.4	0.6	Group-2B	Group-4
JMH039	49.2	0.0	5.1	7.6	Group-2B	Group-2B
JMH040	96.4	0.0	3.7	2.6	Group-2B	Group-2B
JMH041	37.4	1.6	56.7	1.7	Group-2B	Group-4
JMH042	77.5	1.2	38.0	22.8	Group-2B	Group-2B
JMH043	43.6	0.0	3.3	2.1	Group-2B	Group-2B
JMH044	5.5	0.0	1.7	0.1	Group-2B	Group-2B
JMH045	74.7	0.0	5.1	0.9	Group-2B	Group-2B
JMH048	68.9	0.0	4.9	0.9	Group-2B	Group-2B
JMH049	1.7	0.0	6.1	1.1	Group-2B	Group-4
JMH050	70.3	2.1	24.5	4.4	Group-2B	Group-2B

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Assigned Group	Best Group Based on M.D.
CSS053	20.9	51.1	30.1	5.0	Group-3	Group-3
CSS064	1.5	19.2	20.6	3.3	Group-3	Group-4
CSS066	4.0	2.4	8.3	2.0	Group-3	Group-4
JMH002	6.4	79.2	11.0	33.2	Group-3	Group-3
JMH004	25.3	94.5	15.4	23.9	Group-3	Group-3
JMH005	44.2	7.2	17.2	25.1	Group-3	Group-2B
JMH010	9.0	20.8	11.4	12.8	Group-3	Group-3
JMH017	2.5	7.2	11.3	3.5	Group-3	Group-4
JMH018	9.4	36.1	15.4	1.3	Group-3	Group-3
JMH020	3.6	65.6	9.5	9.9	Group-3	Group-3
JMH021	0.9	64.0	9.3	30.0	Group-3	Group-3
JMH022	3.4	14.1	23.1	0.7	Group-3	Group-4
JMH023	0.8	83.4	8.2	11.2	Group-3	Group-3
JMH024	0.7	40.6	18.6	10.0	Group-3	Group-3
JMH025	2.0	83.4	6.8	21.6	Group-3	Group-3
JMH027	12.2	84.1	11.2	19.8	Group-3	Group-3
JMH028	6.3	53.6	21.1	21.9	Group-3	Group-3
JMH029	0.3	76.5	8.6	13.8	Group-3	Group-3
JMH030	1.0	87.9	10.2	20.1	Group-3	Group-3

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Assigned Group	Best Group Based on M.D.
CSS054	0.0	0.4	73.2	0.3	Group-4	Group-4
CSS055	0.0	0.2	32.1	0.2	Group-4	Group-4
CSS056	0.0	0.3	98.0	0.2	Group-4	Group-4
CSS057	0.2	2.0	49.8	0.4	Group-4	Group-4
CSS058	0.5	6.7	12.5	0.4	Group-4	Group-4
CSS059	0.1	1.2	63.8	0.4	Group-4	Group-4
CSS060	20.1	6.6	52.2	0.7	Group-4	Group-4
CSS061	7.0	1.9	53.4	0.5	Group-4	Group-4
CSS062	0.0	0.8	28.7	0.2	Group-4	Group-4

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Assigned Group	Best Group Based on M.D.
CSS050	11.6	0.9	5.1	80.1	Group-5	Group-5
CSS051	4.7	0.1	3.2	42.1	Group-5	Group-5
CSS068	5.2	6.0	5.8	53.5	Group-5	Group-5
CSS069	0.8	0.7	4.1	42.6	Group-5	Group-5
JMH009	1.1	0.1	1.7	28.4	Group-5	Group-5
JMH011	0.6	7.2	4.8	37.8	Group-5	Group-5
JMH012	0.9	0.0	2.0	63.8	Group-5	Group-5
JMH013	1.2	0.0	2.0	28.7	Group-5	Group-5
JMH019	3.7	0.3	3.4	97.4	Group-5	Group-5

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Assigned Group
JMH006	3.9	0.0	0.7	1.8	Group-1
JMH031	4.0	0.0	1.4	1.9	Group-1
JMH046	0.8	0.0	0.8	1.4	Group-1
JMH047	0.0	0.0	0.7	1.8	Group-1

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Assigned Group
JMH032	1.9	0.0	0.7	2.1	Group-2A
JMH034	8.3	0.0	0.7	2.3	Group-2A

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Assigned Group
CSS052	8.5	0.1	3.2	62.1	Unassigned
CSS063	84.7	7.3	26.1	8.2	Unassigned
CSS065	4.9	0.1	2.4	0.6	Unassigned
CSS067	25.3	2.5	7.3	9.7	Unassigned
JMH001	2.3	0.2	4.3	1.7	Unassigned
JMH007	0.2	2.9	6.4	3.3	Unassigned
JMH014	28.6	0.0	0.8	0.3	Unassigned
JMH015	17.3	0.0	2.2	1.9	Unassigned
JMH026	0.4	3.5	12.4	14.2	Unassigned

ID. NO.	Group-2B	Group-3	Group-4	Group-5
CSS001	0.0	0.1	16.2	0.4
CSS002	0.0	0.0	3.6	0.2
CSS003	6.2	0.1	3.7	0.6

CSS004	0.0	0.0	2.8	0.1
CSS005	0.0	2.8	8.1	0.5
CSS006	0.0	0.4	5.5	0.4
CSS007	0.0	0.5	7.1	0.4
CSS008	0.1	2.2	8.1	0.3
CSS009	0.1	0.0	1.9	0.2
CSS010	34.1	2.5	15.1	2.4
CSS011	60.2	5.8	10.7	1.6
CSS012	76.0	6.8	12.1	1.9
CSS013	2.5	0.1	4.9	0.8
CSS014	3.2	0.2	4.5	1.6
CSS015	0.4	0.1	5.8	2.7
CSS016	88.7	1.9	42.8	14.2
CSS017	72.1	1.4	26.3	10.2
CSS018	63.9	8.4	30.0	13.0
CSS019	16.8	22.4	20.3	2.9
CSS020	31.0	0.1	7.3	1.1
CSS021	1.0	0.0	1.5	1.5
CSS022	3.8	0.3	6.1	3.9
CSS023	37.4	1.3	10.9	23.1
CSS024	26.4	0.0	2.4	14.5
CSS025	24.6	0.0	3.8	0.3
CSS026	61.1	0.1	3.9	5.6
CSS027	3.0	0.0	1.6	3.2
CSS028	68.6	0.0	3.7	5.8
CSS029	2.8	0.0	1.9	1.7
CSS030	5.9	0.0	1.9	0.8
CSS031	1.6	0.3	3.6	3.9
CSS032	0.1	0.0	3.3	0.2
CSS033	0.0	0.6	8.6	0.2
CSS034	18.0	4.2	12.1	6.0
CSS035	1.7	0.7	9.2	6.7
CSS036	11.4	0.1	12.7	1.9
CSS037	17.4	0.9	7.2	4.5
CSS038	0.0	0.1	2.2	0.3
CSS039	0.1	3.8	7.2	0.3
CSS040	0.8	0.0	2.0	0.3
CSS041	0.1	9.7	8.5	0.3
CSS042	0.1	9.0	7.2	0.5

Table 4. Mahalanobis Distance and Posterior Classification based on PC01-PC04. Principal component scores were derived from PCA of the abbreviated element list. Probabilities are jackknifed for specimens included in each group.

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Assigned Group	Best Group Based on M.D.
JMH003	29.3	4.0	2.8	0.3	Group-2B	Group-2B
JMH008	91.9	1.3	13.5	0.2	Group-2B	Group-2B
JMH016	52.1	6.5	1.9	0.8	Group-2B	Group-2B
JMH033	55.6	0.2	9.2	0.0	Group-2B	Group-2B
JMH035	34.3	0.0	0.3	0.0	Group-2B	Group-2B
JMH036	9.4	0.0	0.1	0.0	Group-2B	Group-2B
JMH037	26.4	0.1	1.4	0.0	Group-2B	Group-2B
JMH038	21.3	0.4	6.8	0.1	Group-2B	Group-2B
JMH039	96.5	0.1	2.1	0.0	Group-2B	Group-2B
JMH040	83.2	0.0	0.4	0.0	Group-2B	Group-2B
JMH041	93.6	0.3	11.7	0.2	Group-2B	Group-2B
JMH042	18.8	0.2	2.5	0.4	Group-2B	Group-2B
JMH043	55.5	0.2	1.7	0.0	Group-2B	Group-2B
JMH044	5.5	0.0	1.0	0.1	Group-2B	Group-2B
JMH045	49.6	0.0	0.6	0.0	Group-2B	Group-2B
JMH048	54.2	0.0	0.6	0.0	Group-2B	Group-2B
JMH049	37.3	0.0	0.7	0.0	Group-2B	Group-2B
JMH050	56.0	0.2	2.2	0.4	Group-2B	Group-2B

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Assigned Group	Best Group Based on M.D.
CSS053	2.1	52.6	1.9	0.3	Group-3	Group-3
CSS064	0.0	29.0	0.7	0.3	Group-3	Group-3
CSS066	0.2	11.2	0.1	2.1	Group-3	Group-3
JMH002	0.7	100.0	0.4	1.4	Group-3	Group-3
JMH004	3.8	81.8	0.6	1.4	Group-3	Group-3
JMH005	12.4	45.9	1.2	0.5	Group-3	Group-3
JMH010	0.1	1.5	0.1	4.4	Group-3	*Group-5*
JMH017	0.6	21.4	0.1	1.8	Group-3	Group-3
JMH018	0.9	55.6	1.5	0.5	Group-3	Group-3
JMH020	3.7	80.3	1.4	0.6	Group-3	Group-3
JMH021	0.9	96.0	0.4	1.2	Group-3	Group-3
JMH022	0.2	24.3	7.1	0.1	Group-3	Group-3
JMH023	0.9	78.9	0.1	9.6	Group-3	Group-3
JMH024	0.0	34.3	0.4	0.4	Group-3	Group-3
JMH025	3.5	81.5	0.4	2.3	Group-3	Group-3
JMH027	6.2	36.9	0.2	8.3	Group-3	Group-3
JMH028	0.9	41.8	0.7	0.5	Group-3	Group-3
JMH029	0.0	10.1	0.1	2.3	Group-3	Group-3
JMH030	0.3	62.1	0.1	7.0	Group-3	Group-3

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Assigned Group	Best Group Based on M.D.
CSS054	0.0	0.6	56.3	0.0	Group-4	Group-4
CSS055	0.0	0.4	54.2	0.0	Group-4	Group-4
CSS056	0.0	0.3	46.2	0.0	Group-4	Group-4
CSS057	0.1	3.3	31.5	0.0	Group-4	Group-4
CSS058	0.0	1.0	37.1	0.0	Group-4	Group-4
CSS059	0.2	4.8	98.1	0.0	Group-4	Group-4
CSS060	23.6	4.7	32.0	0.1	Group-4	Group-4
CSS061	4.3	1.4	21.1	0.0	Group-4	Group-4
CSS062	0.0	0.3	61.5	0.0	Group-4	Group-4

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Assigned Group	Best Group Based on M.D.
CSS050	1.2	12.6	0.1	44.1	Group-5	Group-5
CSS051	0.2	1.3	0.0	64.6	Group-5	Group-5
CSS068	0.1	1.6	0.1	53.4	Group-5	Group-5
CSS069	0.0	0.9	0.0	30.6	Group-5	Group-5
JMH009	1.5	1.8	0.0	23.5	Group-5	Group-5
JMH011	0.0	3.0	0.0	15.7	Group-5	Group-5
JMH012	0.5	7.9	0.0	81.0	Group-5	Group-5
JMH013	0.2	9.2	0.0	46.4	Group-5	Group-5
JMH019	0.3	8.7	0.0	88.4	Group-5	Group-5

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Assigned Group
JMH006	4.5	0.0	0.0	0.0	Group-1
JMH031	1.2	0.0	0.0	0.0	Group-1
JMH046	0.6	0.0	0.0	0.0	Group-1
JMH047	1.7	0.0	0.0	0.0	Group-1

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Assigned Group
JMH032	0.3	0.0	0.0	0.0	Group-2A
JMH034	0.7	0.0	0.0	0.0	Group-2A

ID. NO.	**Group-2B**	**Group-3**	**Group-4**	**Group-5**	**Assigned Group**
CSS052	4.0	0.3	0.0	17.7	Unassigned
CSS063	67.4	2.4	2.3	0.4	Unassigned
CSS065	0.1	0.2	0.1	2.6	Unassigned
CSS067	9.5	0.2	1.0	0.0	Unassigned
JMH001	1.7	8.4	0.1	4.2	Unassigned
JMH007	0.0	9.7	0.1	2.2	Unassigned
JMH014	2.7	0.0	0.0	0.0	Unassigned
JMH015	12.3	0.0	0.1	1.1	Unassigned
JMH026	1.0	6.5	2.4	0.1	Unassigned

ID. NO.	**Group-2B**	**Group-3**	**Group-4**	**Group-5**	**Origin of Clay**
CSS001	0.0	0.0	0.5	0.0	Lower Little/ Sandhills
CSS002	0.0	0.0	0.1	0.1	Lower Little/ Sandhills
CSS003	0.0	2.2	0.2	0.7	Lower Little/ Sandhills

CSS004	0.0	0.1	0.7	0.0	Lower Little/ Sandhills
CSS005	0.0	0.7	0.3	0.1	Lower Little/ Sandhills
CSS006	0.0	1.1	0.3	0.1	Lower Little/ Sandhills
CSS007	0.0	0.5	0.3	0.1	Lower Little/ Sandhills
CSS008	0.0	2.0	0.7	0.1	Lower Little/ Sandhills
CSS009	0.0	1.4	0.6	0.1	Lower Little/ Sandhills
CSS010	82.3	0.4	3.4	0.4	Cape Fear/ Coastal Plain
CSS011	43.7	0.8	1.8	0.7	Cape Fear/ Coastal Plain
CSS012	21.9	0.8	1.3	0.8	Cape Fear/ Coastal Plain
CSS013	5.2	0.1	1.4	0.1	Cape Fear/ Coastal Plain
CSS014	17.1	0.3	2.0	0.1	Cape Fear/ Coastal Plain
CSS015	0.0	10.5	0.1	0.9	Lower Little/ Cape Fear
CSS016	65.0	3.3	11.3	0.2	Pee Dee/ Coastal Plain
CSS017	52.2	1.6	13.6	0.1	Pee Dee/ Coastal Plain
CSS018	49.0	13.5	3.4	0.4	Pee Dee/ Coastal Plain
CSS019	1.5	58.7	3.2	0.2	Pee Dee/ Coastal Plain
CSS020	9.5	0.3	3.1	0.1	Pee Dee/ Coastal Plain
CSS021	8.9	0.0	0.1	0.0	Haw River/ Piedmont
CSS022	1.9	22.1	0.3	3.4	Haw River/ Piedmont
CSS023	47.9	0.2	0.5	1.7	Haw River/ Piedmont
CSS024	7.2	0.0	0.1	3.4	Haw River/ Piedmont
CSS025	24.6	0.0	2.5	0.1	Haw River/ Piedmont
CSS026	47.7	0.1	0.6	0.0	Yadkin/ Piedmont
CSS027	31.9	0.0	0.1	0.0	Yadkin/ Piedmont
CSS028	58.9	0.1	0.7	0.0	Yadkin/ Piedmont
CSS029	18.3	0.0	0.1	0.0	Yadkin/ Piedmont
CSS030	12.5	0.0	0.2	0.0	Yadkin/ Piedmont
CSS031	92.3	0.2	1.2	0.0	Deep/ Piedmont
CSS032	0.0	1.5	0.2	0.1	Lower Little/ Sandhills
CSS033	0.0	0.2	1.9	0.0	Lower Little/ Sandhills
CSS034	72.0	1.8	1.8	0.8	Deep/ Piedmont
CSS035	36.7	0.2	2.8	0.3	Deep/ Piedmont
CSS036	3.2	0.1	7.2	0.1	Deep/ Piedmont
CSS037	99.3	0.9	8.9	0.1	Deep/ Piedmont
CSS038	0.0	0.0	0.1	0.1	Lumber/ Coastal Plain
CSS039	0.0	4.1	1.2	0.1	Lumber/ Coastal Plain
CSS040	0.0	0.0	0.1	0.3	Lumber/ Coastal Plain
CSS041	0.0	1.9	1.2	0.1	Lumber/ Coastal Plain
CSS042	0.0	0.5	0.3	0.1	Lumber/ Coastal Plain

Table 5. Mahalanobis Distance and Posterior Classification based on PC01-PC04 for untempered clays. Principal component scores were derived from PCA of the abbreviated element list. Probabilities are jackknifed for specimens included in each group.

ID. NO.	Group-2B	Group-3	Group-4	Group-5	Origin of Clay	Best Group
CSS001	0.0	0.0	0.5	0.0	Lower Little/ Sandhills	?
CSS002	0.0	0.0	0.1	0.1	Lower Little/ Sandhills	?
CSS003	0.0	2.2	0.2	0.7	Lower Little/ Sandhills	Group-3 (Lower Little/Sandhills)
CSS004	0.0	0.1	0.7	0.0	Lower Little/ Sandhills	?
CSS005	0.0	0.7	0.3	0.1	Lower Little/ Sandhills	?
CSS006	0.0	1.1	0.3	0.1	Lower Little/ Sandhills	Group-3 (Lower Little/Sandhills)
CSS007	0.0	0.5	0.3	0.1	Lower Little/ Sandhills	?
CSS008	0.0	2.0	0.7	0.1	Lower Little/ Sandhills	Group-3 (Lower Little/Sandhills)
CSS009	0.0	1.4	0.6	0.1	Lower Little/ Sandhills	Group-3 (Lower Little/Sandhills)
CSS010	82.3	0.4	3.4	0.4	Cape Fear/ Coastal Plain	Group-2B(Yadkin/Haw?)
CSS011	43.7	0.8	1.8	0.7	Cape Fear/ Coastal Plain	Group-2B(Yadkin/Haw?)
CSS012	21.9	0.8	1.3	0.8	Cape Fear/ Coastal Plain	Group-2B(Yadkin/Haw?)
CSS013	5.2	0.1	1.4	0.1	Cape Fear/ Coastal Plain	Group-2B(Yadkin/Haw?)
CSS014	17.1	0.3	2.0	0.1	Cape Fear/ Coastal Plain	Group-2B(Yadkin/Haw?)
CSS015	0.0	10.5	0.1	0.9	Lower Little/ Cape Fear	Group-3 (Lower Little/Sandhills)
CSS016	65.0	3.3	11.3	0.2	Pee Dee/ Coastal Plain	Group-2B(Yadkin/Haw?)
CSS017	52.2	1.6	13.6	0.1	Pee Dee/ Coastal Plain	Group-2B(Yadkin/Haw?)
CSS018	49.0	13.5	3.4	0.4	Pee Dee/ Coastal Plain	Group-2B(Yadkin/Haw?)
CSS019	1.5	58.7	3.2	0.2	Pee Dee/ Coastal Plain	Group-3 (Lower Little/Sandhills)
CSS020	9.5	0.3	3.1	0.1	Pee Dee/ Coastal Plain	Group-2B(Yadkin/Haw?)
CSS021	8.9	0.0	0.1	0.0	Haw River/ Piedmont	Group-2B(Yadkin/Haw?)
CSS022	1.9	22.1	0.3	3.4	Haw River/ Piedmont	Group-3 (Lower Little/Sandhills)
CSS023	47.9	0.2	0.5	1.7	Haw River/ Piedmont	Group-2B(Yadkin/Haw?)
CSS024	7.2	0.0	0.1	3.4	Haw River/ Piedmont	Group-2B(Yadkin/Haw?)
CSS025	24.6	0.0	2.5	0.1	Haw River/ Piedmont	Group-2B(Yadkin/Haw?)
CSS026	47.7	0.1	0.6	0.0	Yadkin/ Piedmont	Group-2B(Yadkin/Haw?)
CSS027	31.9	0.0	0.1	0.0	Yadkin/ Piedmont	Group-2B(Yadkin/Haw?)
CSS028	58.9	0.1	0.7	0.0	Yadkin/ Piedmont	Group-2B(Yadkin/Haw?)
CSS029	18.3	0.0	0.1	0.0	Yadkin/ Piedmont	Group-2B(Yadkin/Haw?)
CSS030	12.5	0.0	0.2	0.0	Yadkin/ Piedmont	Group-2B(Yadkin/Haw?)
CSS031	92.3	0.2	1.2	0.0	Deep/ Piedmont	Group-2B(Yadkin/Haw?)
CSS032	0.0	1.5	0.2	0.1	Lower Little/ Sandhills	Group-3 (Lower Little/Sandhills)
CSS033	0.0	0.2	1.9	0.0	Lower Little/ Sandhills	Group-4 (Pee Dee/Lumber?
CSS034	72.0	1.8	1.8	0.8	Deep/ Piedmont	Group-2B(Yadkin/Haw?)
CSS035	36.7	0.2	2.8	0.3	Deep/ Piedmont	Group-2B(Yadkin/Haw?)
CSS036	3.2	0.1	7.2	0.1	Deep/ Piedmont	Group-4 (Pee Dee/Lumber?
CSS037	99.3	0.9	8.9	0.1	Deep/ Piedmont	Group-2B(Yadkin/Haw?)
CSS038	0.0	0.0	0.1	0.1	Lumber/ Coastal Plain	?
CSS039	0.0	4.1	1.2	0.1	Lumber/ Coastal Plain	Group-3 (Lower Little/Sandhills)
CSS040	0.0	0.0	0.1	0.3	Lumber/ Coastal Plain	?
CSS041	0.0	1.9	1.2	0.1	Lumber/ Coastal Plain	Group-3 (Lower Little/Sandhills)
CSS042	0.0	0.5	0.3	0.1	Lumber/ Coastal Plain	?

Table 6.

anid	Chem_grp	pet_grp	long_rdf	long_date	short_rdf	short_date	sourceper	region	material	site_no	easting	northing
JMH001	Unas.	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Hk868	661397	3888463
JMH002	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Ht392	677587	3899773
JMH003	Group-2B	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Ht273	682707	3902173
JMH004	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Hk127	669987	3890963
JMH005	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Hk59	653907	3887003
JMH006	Group-1	Group-1	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Hk123	668827	3891083
JMH007	Unas.	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Cd750	686287	3889423
JMH008	Group-2B	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Ht269	682437	3903333
JMH009	Group-5	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Cd486	673997	3894863
JMH010	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Hk715	662047	3880102
JMH011	Group-5	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mr241	640217	3879333
JMH012	Group-5	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mr259	640647	3880813
JMH013	Group-5	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mr241	640217	3879333
JMH014	Unas.	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mr253	640907	3880693
JMH015	Unas.	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mr241	640217	3879333
JMH016	Group-2B	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Sc71	641112	3875213
JMH017	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mr93	671697	3894218
JMH018	Group-3	Group-3	HRB5	5/19/2002	CLS1-S	5/30/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Sc87	641582	3875489
JMH019	Group-5	Group-3	HRB5	5/19/2002	CLS1-S	5/30/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mr93	671697	3894218
JMH020	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mr241	640217	3879333
JMH021	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Cd8	695587	3885023
JMH022	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Cd8	695587	3885023
JMH023	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Cd8	695587	3885023
JMH024	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Cd8	695587	3885023
JMH025	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Cd8	695587	3885023
JMH026	Unas.	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Cd8	695587	3885023
JMH027	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Cd8	695587	3885023
JMH028	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Cd8	695587	3885023
JMH029	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Cd8	695587	3885023
JMH030	Group-3	Group-3	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Cd8	695587	3885023
JMH031	Group-1	Group-1	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Ch29	673867	3951383
JMH032	Group-2A	Group-2A	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Ch29	673867	3951383
JMH033	Group-2B	Group-2A	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Ch29	673867	3951383
JMH034	Group-2A	Group-2A	HRB5	5/19/2002	HER1-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Ch29	673867	3951383
JMH035	Group-2B	Group-2B	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Ch29	673867	3951383
JMH036	Group-2B	Group-2B	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Ch29	673867	3951383
JMH037	Group-2B	Group-2B	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Ch29	673867	3951383
JMH038	Group-2B	Group-2B	HRB5	5/19/2002	CLS1-S	5/30/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Ch29	673867	3951383
JMH039	Group-2B	Group-2B	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Ch29	673867	3951383
JMH040	Group-2B	Group-2B	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Ch29	673867	3951383
JMH041	Group-2B	Group-2B	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mg22	584467	3917363
JMH042	Group-2B	Group-2B	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mg22	584467	3917363
JMH043	Group-2B	Group-2B	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mg22	584467	3917363
JMH044	Group-2B	Group-2B	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mg22	584467	3917363
JMH045	Group-2B	Group-2B	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mg22	584467	3917363

Table 6.

anid	Chem_grp	pet_grp	long_rdf	long_date	short_rdf	short_date	sourceper	region	material	site_no	easting	northing
JMH046	Group-1	Group-1	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mg22	584467	3917363
JMH047	Group-1	Group-1	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mg22	584467	3917363
JMH048	Group-2B	Group-2B	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mg22	584467	3917363
JMH049	Group-2B	Group-2B	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mg22	584467	3917363
JMH050	Group-2B	Group-2B	HRB5	5/19/2002	HER2-S	5/18/2002	J.M. Herbert	Southeast U.S., North Carolina	Pottery	31Mg22	584467	3917363
CSS001	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0677832	3887458
CSS002	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0674316	3892165
CSS003	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0674308	3894404
CSS004	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0669883	3896330
CSS005	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0648897	3879046
CSS006	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0655285	3880183
CSS007	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0662959	3888792
CSS008	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0665640	3892747
CSS009	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0669869	3896332
CSS010	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0695950	3884406
CSS011	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0695785	3884925
CSS012	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0695881	3885783
CSS013	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0694988	3883886
CSS014	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0694580	3885187
CSS015	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0681641	3903843
CSS016	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0618115	3805454
CSS017	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0617891	3805299
CSS018	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0617277	3804557
CSS019	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0609741	3814785
CSS020	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0617564	3804425
CSS021	N/A		TYO1	9/25/2005	TET1-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0672279	3950470
CSS022	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0673360	3946847
CSS023	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0676289	3953225
CSS024	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0679059	3963491
CSS025	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0679577	3955654
CSS026	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0588424	3918363
CSS027	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0589049	3919007
CSS028	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0588793	3918787
CSS029	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0587073	3916353
CSS030	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0586491	3916289
CSS031	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0649907	3931674
CSS032	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0655185	3879989
CSS033	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0652542	3880990
CSS034	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0656984	3936306
CSS035	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0656546	3935781
CSS036	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0654570	3936918
CSS037	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0649907	3931674
CSS038	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0738743	3805824
CSS039	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0735133	3805737
CSS040	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0735128	3805762

Table 6.

anid	Chem_grp	pet_grp	long_rdf	long_date	short_rdf	short_date	sourceper	region	material	site_no	easting	northing
CSS041	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0739824	3805587
CSS042	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Clay		0739824	3805587
CSS043	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Temper		0649907	3931674
CSS044	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Temper		0609899	3882633
CSS045	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Temper		0661980	3966520
CSS046	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Temper		0672611	3964710
CSS047	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Temper		0649907	3931674
CSS048	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Temper		0649925	3931884
CSS049	N/A		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Temper		0681033	3892130
CSS050	Group-5		TYO1	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Kolb	617824	3804859
CSS051	Group-5		TYO2	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Kolb	617824	3804859
CSS052	Unas.		TYO2	9/25/2005	TET2-S	9/22/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Kolb	617824	3804859
CSS053	Group-4		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Kolb	617824	3804859
CSS054	Group-4		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Kolb	617824	3804859
CSS055	Group-4		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Kolb	617824	3804859
CSS056	Group-4		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	not known	617824	3804859
CSS057	Group-4		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Kolb	617824	3804859
CSS058	Group-4		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Kolb	617824	3804859
CSS059	Group-4		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Kolb	617824	3804859
CSS060	Group-4		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Waccamaw	733147	3796473
CSS061	Group-4		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Waccamaw	733147	3796473
CSS062	Group-4		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Waccamaw	733147	3796473
CSS063	Unas.		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Waccamaw	733147	3796473
CSS064	Group-4		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Waccamaw	733147	3796473
CSS065	Unas.		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Waccamaw	733147	3796473
CSS066	Group-4		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Waccamaw	733147	3796473
CSS067	Unas.		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Waccamaw	733147	3796473
CSS068	Group-5		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Waccamaw	733147	3796473
CSS069	Group-5		TYO2	9/25/2005	CBS1-S	9/23/2005	J.M. Herbert	Southeast U.S., North Carolina	Pottery	Waccamaw	733147	3796473

Table 6.

anid	drainage	alt_id	prov	vess_form	vess_part	cer_type	time	period	as	la	lu
JMH001	Lower Little/ Sandhills	FS 59	522n778e	jar	body	Hanover II Fabric	4	Middle-Late Woodland	0.0000	99.5728	0.5972
JMH002	Lower Little/ Sandhills	990498p72	TU 2	jar	body	Hanover II Fabric	4	Middle-Late Woodland	2.9049	49.7283	0.4660
JMH003	Lower Little/ Sandhills	990484p263	TU 2	jar	body	Cape Fear III?	4	Middle-Late Woodland	3.4591	19.2709	0.2840
JMH004	Lower Little/ Sandhills	19p782	surface	jar	body	Hanover II Fabric	4	Middle-Late Woodland	0.0000	30.4076	0.4150
JMH005	Lower Little/ Sandhills	19p752.1	surface	jar	body	Hanover I Cord	3	Middle Woodland	5.2467	33.1167	0.4673
JMH006	Lower Little/ Sandhills	19p1038	surface	jar	body	Hanover I Fabric	3	Middle Woodland	6.4882	14.0729	0.3138
JMH007	Lower Little/ Sandhills	97968p98	TU 4	jar	body	New River?	1	Early Woodland	5.9881	96.5696	0.7400
JMH008	Lower Little/ Sandhills	990483p452	TU 2	jar	body	Mount Pleasant? Cord	3	Middle Woodland	0.0000	23.3452	0.3616
JMH009	Lower Little/ Sandhills	980102	A&C	jar	body	Cape Fear Cord	3	Middle Woodland	0.0000	56.9360	0.4244
JMH010	Lower Little/ Sandhills	990794	TU 2	jar	body	Hanover Fabric	3	Middle Woodland	0.0000	15.8282	0.2989
JMH011	Drowning Cr.	980239p35	TU 2b	jar	body	Hanover I Cord	3	Middle Woodland	8.3603	19.1634	0.3045
JMH012	Drowning Cr.	990790	shovel test	jar	body	Hanover II Fabric	4	Middle-Late Woodland	0.0000	94.4412	0.4796
JMH013	Drowning Cr.	980239	TU 6	jar	body	Deptford Linear Chec	3	Middle Woodland	0.0000	61.2737	0.5113
JMH014	Drowning Cr.	990789p9		jar	body	Yadkin Fabric v. Coo	2	Early-Middle Woodlan	4.7152	22.0366	0.4495
JMH015	Drowning Cr.	980239p77	TU 7	jar	body	Sand-tempered Plain	u		0.0000	55.7820	0.5380
JMH016	Drowning Cr.	19p598.1	surface	jar	rim	New River Net?	1	Early Woodland	2.0158	36.6145	0.3470
JMH017	Lower Little/ Ft. Br	980237p37	TU 2	jar	body	New River Cord Marke	1	Early Woodland	7.8108	52.7458	0.5758
JMH018	Drowning Cr.	96123p6	surface	jar	body	?	u		3.3765	40.0459	0.5222
JMH019	Lower Little/ Ft. Br	980237p36	TU 2	jar	body	?	u		12.3661	44.9688	0.4766
JMH020	Drowning Cr.	92604	surface	jar	body	New River Cord Marke	1	Early Woodland	10.0778	77.5146	0.4493
JMH021	Cape Fear R.	2103p4.1	surface	jar	rim	Hanover II Paddle-ed	3	Middle Woodland	9.8062	53.6860	0.4297
JMH022	Cape Fear R.	2103p4.2	surface	jar	rim	New River Fabric	1	Early Woodland	0.0000	38.5537	0.3652
JMH023	Cape Fear R.	2103p4.3	surface	jar	rim	Hanover II Fabric	4	Middle-Late Woodland	0.0000	28.3835	0.3943
JMH024	Cape Fear R.	2103p4.4	surface	jar	rim	Hanover II Fabric	4	Middle-Late Woodland	0.0000	42.2456	0.5472
JMH025	Cape Fear R.	2103p4.5	surface	jar	body	Cape Fear Cord	3	Middle Woodland	8.6297	48.6255	0.5182
JMH026	Cape Fear R.	2103p4.6	surface	jar	body	Hanover II Fabric	3	Middle Woodland	0.0000	55.7368	0.4691
JMH027	Cape Fear R.	2103p4.7	surface	jar	body	Hanover I Fabric	3	Middle Woodland	0.0000	32.7389	0.4030
JMH028	Cape Fear R.	2103p4.8	surface	jar	rim	Hanover I Fabric	3	Middle Woodland	2.1087	68.9769	0.5482
JMH029	Cape Fear R.	2103p4.9	surface	jar	body	Hanover I Fabric	3	Middle Woodland	0.0000	24.5929	0.5067
JMH030	Cape Fear R.	2103p4.10	surface	jar	body	Hanover II Fabric	4	Middle-Late Woodland	3.0762	23.7649	0.4780
JMH031	Haw R.	2309p67.1	Plowzone	jar	body	Yadkin Paddle-edge	2	Early-Middle Woodlan	3.5218	17.8664	0.2973
JMH032	Haw R.	2309p67.2	Plowzone	jar	body	Yadkin Cord	2	Early-Middle Woodlan	9.6477	11.8503	0.1715
JMH033	Haw R.	2309p299.1	Plowzone	jar	body	Yadkin Plain	2	Early-Middle Woodlan	71.2670	38.6547	0.5399
JMH034	Haw R.	2309p67.3	Plowzone	jar	rim	Cape Fear Fabric	u		11.3084	17.6916	0.2613
JMH035	Haw R.	2309p67.4	Plowzone	jar	body	Yadkin Plain	2	Early-Middle Woodlan	0.0000	22.7117	0.3295
JMH036	Haw R.	2309p67.5	Plowzone	jar	body	Yadkin Plain	2	Early-Middle Woodlan	3.6625	10.7125	0.1606
JMH037	Haw R.	2309p299.2	Plowzone	jar	body	Yadkin eroded	2	Early-Middle Woodlan	4.9247	24.1811	0.6366
JMH038	Haw R.	2309p299.3	Plowzone	jar	body	Yadkin Plain	2	Early-Middle Woodlan	0.0000	104.4568	0.6157
JMH039	Haw R.	2309p299.4	Plowzone	jar	body	Yadkin eroded	2	Early-Middle Woodlan	0.0000	13.4203	0.2138
JMH040	Haw R.	2309p299.5	Plowzone	jar	body	Yadkin eroded	2	Early-Middle Woodlan	8.2030	26.2447	0.1931
JMH041	Yadkin	488p14.1	wall slump	jar	rim	Yadkin Fabric	2	Early-Middle Woodlan	0.0000	15.1818	0.2281
JMH042	Yadkin	488p14.2	wall slump	jar	rim	New River Simp.?	1	Early Woodland	0.0000	13.2407	0.2082
JMH043	Yadkin	488p14.3	wall slump	jar	rim	Yadkin Fabric	2	Early-Middle Woodlan	0.0000	20.3279	0.3285
JMH044	Yadkin	488p14.4	wall slump	jar	body	?	u		0.0000	37.3791	0.4653
JMH045	Yadkin	488p14.5	wall slump	jar	body	New River Cord Marke	1	Early Woodland	3.5851	20.3977	0.2018

Table 6.

anid	drainage	alt_id	prov	vess_form	vess_part	cer_type	time	period	as	la	lu
JMH046	Yadkin	488p14.6	wall slump	jar	body	New River Net	1	Early Woodland	0.0000	5.5258	0.1389
JMH047	Yadkin	488p14.7	wall slump	jar	body	Yadkin Check Stamped	2	Early-Middle Woodlan	0.0000	6.9720	0.1729
JMH048	Yadkin	488p14.8	wall slump	jar	body	Yadkin Plain	1	Early Woodland	4.5961	19.5653	0.1941
JMH049	Yadkin	488p14.9	wall slump	jar	body	Yadkin eroded	u		0.0000	8.0192	0.1385
JMH050	Yadkin	488p14.10	wall slump	jar	body	Yadkin eroded	2	Early-Middle Woodlan	0.0000	14.4669	0.2052
CSS001	Lower Little/ Sandhills	FBR002	N/A	N/A	N/A	N/A	N/A	N/A	23.5941	71.7364	0.4197
CSS002	Lower Little/ Sandhills	FBR003	N/A	N/A	N/A	N/A	N/A	N/A	6.2493	22.8187	0.2940
CSS003	Lower Little/ Sandhills	FBR004	N/A	N/A	N/A	N/A	N/A	N/A	0.8514	52.5040	0.5105
CSS004	Lower Little/ Sandhills	FBR005	N/A	N/A	N/A	N/A	N/A	N/A	1.3623	31.5653	0.3013
CSS005	Lower Little/ Sandhills	FBR006	N/A	N/A	N/A	N/A	N/A	N/A	4.5252	96.2671	0.3996
CSS006	Lower Little/ Sandhills	FBR007	N/A	N/A	N/A	N/A	N/A	N/A	11.3955	74.9262	0.5333
CSS007	Lower Little/ Sandhills	FBR008	N/A	N/A	N/A	N/A	N/A	N/A	1.0021	44.7717	0.6134
CSS008	Lower Little/ Sandhills	FBR009	N/A	N/A	N/A	N/A	N/A	N/A	0.0000	54.6615	0.5064
CSS009	Lower Little/ Sandhills	FBR010	N/A	N/A	N/A	N/A	N/A	N/A	0.9117	50.5420	0.6588
CSS010	Cape Fear/ Coastal Plain	FBR011	N/A	N/A	N/A	N/A	N/A	N/A	1.2906	20.8581	0.2756
CSS011	Cape Fear/ Coastal Plain	FBR012	N/A	N/A	N/A	N/A	N/A	N/A	3.9131	24.0530	0.3549
CSS012	Cape Fear/ Coastal Plain	FBR013	N/A	N/A	N/A	N/A	N/A	N/A	2.8297	17.7224	0.3339
CSS013	Cape Fear/ Coastal Plain	FBR014	N/A	N/A	N/A	N/A	N/A	N/A	6.2131	27.1106	0.5092
CSS014	Cape Fear/ Coastal Plain	FBR016	N/A	N/A	N/A	N/A	N/A	N/A	4.4094	38.1837	0.4610
CSS015	Lower Little/ Cape Fear	FBR017	N/A	N/A	N/A	N/A	N/A	N/A	1.2159	35.0298	0.7347
CSS016	Pee Dee/ Coastal Plain	FBR019	N/A	N/A	N/A	N/A	N/A	N/A	3.6215	44.6760	0.4943
CSS017	Pee Dee/ Coastal Plain	FBR020	N/A	N/A	N/A	N/A	N/A	N/A	3.5147	52.3661	0.4966
CSS018	Pee Dee/ Coastal Plain	FBR021	N/A	N/A	N/A	N/A	N/A	N/A	2.7113	54.7189	0.4866
CSS019	Pee Dee/ Coastal Plain	FBR023	N/A	N/A	N/A	N/A	N/A	N/A	4.0419	29.2980	0.3997
CSS020	Pee Dee/ Coastal Plain	FBR027	N/A	N/A	N/A	N/A	N/A	N/A	6.8010	59.7890	0.5917
CSS021	Haw River/ Piedmont	FBR029	N/A	N/A	N/A	N/A	N/A	N/A	4.9701	18.6516	0.4034
CSS022	Haw River/ Piedmont	FBR030	N/A	N/A	N/A	N/A	N/A	N/A	8.0289	24.9764	0.5180
CSS023	Haw River/ Piedmont	FBR035	N/A	N/A	N/A	N/A	N/A	N/A	9.3821	13.9832	0.2629
CSS024	Haw River/ Piedmont	FBR040	N/A	N/A	N/A	N/A	N/A	N/A	3.2798	17.1765	0.2015
CSS025	Haw River/ Piedmont	FBR041	N/A	N/A	N/A	N/A	N/A	N/A	1.2193	10.9328	0.2232
CSS026	Yadkin/ Piedmont	FBR048	N/A	N/A	N/A	N/A	N/A	N/A	7.0821	22.5213	0.4410
CSS027	Yadkin/ Piedmont	FBR049	N/A	N/A	N/A	N/A	N/A	N/A	2.1457	27.3623	0.4216
CSS028	Yadkin/ Piedmont	FBR051	N/A	N/A	N/A	N/A	N/A	N/A	5.0830	25.3601	0.4435
CSS029	Yadkin/ Piedmont	FBR054	N/A	N/A	N/A	N/A	N/A	N/A	8.2078	20.9833	0.4159
CSS030	Yadkin/ Piedmont	FBR055	N/A	N/A	N/A	N/A	N/A	N/A	10.3737	21.8706	0.4255
CSS031	Deep/ Piedmont	FBR058	N/A	N/A	N/A	N/A	N/A	N/A	2.8932	25.8857	0.3720
CSS032	Lower Little/ Sandhills	FBR059	N/A	N/A	N/A	N/A	N/A	N/A	2.8059	55.2007	0.5706
CSS033	Lower Little/ Sandhills	FBR067	N/A	N/A	N/A	N/A	N/A	N/A	3.4293	92.2952	0.7043
CSS034	Deep/ Piedmont	FBR071	N/A	N/A	N/A	N/A	N/A	N/A	7.4921	25.9927	0.4681
CSS035	Deep/ Piedmont	FBR074	N/A	N/A	N/A	N/A	N/A	N/A	7.1065	27.2032	0.3822
CSS036	Deep/ Piedmont	FBR077	N/A	N/A	N/A	N/A	N/A	N/A	6.8366	38.0994	0.4917
CSS037	Deep/ Piedmont	FBR080	N/A	N/A	N/A	N/A	N/A	N/A	4.6230	24.2203	0.4523
CSS038	Lumber/ Coastal Plain	FBR081	N/A	N/A	N/A	N/A	N/A	N/A	3.3109	22.7639	0.3381
CSS039	Lumber/ Coastal Plain	FBR082	N/A	N/A	N/A	N/A	N/A	N/A	2.1741	34.5718	0.4058
CSS040	Lumber/ Coastal Plain	FBR083	N/A	N/A	N/A	N/A	N/A	N/A	3.6697	15.9745	0.3692

Table 6.

anid	drainage	alt_id	prov	vess_form	vess_part	cer_type	time	period	as	la	lu
CSS041	Lumber/ Coastal Plain	FBR084	N/A	N/A	N/A	N/A	N/A	N/A	4.6677	24.4433	0.2914
CSS042	Lumber/ Coastal Plain	FBR085	N/A	N/A	N/A	N/A	N/A	N/A	1.7123	22.3558	0.2562
CSS043	Deep/ Piedmont	FBR086	N/A	N/A	N/A	N/A	N/A	N/A	0.5599	0.0959	0.0000
CSS044	Pee Dee/ Piedmont	FBR087	N/A	N/A	N/A	N/A	N/A	N/A	0.0000	1.1010	0.0102
CSS045	Haw/ Piedmont	FBR088	N/A	N/A	N/A	N/A	N/A	N/A	2.6709	17.6182	0.2107
CSS046	Haw/ Piedmont	FBR089	N/A	N/A	N/A	N/A	N/A	N/A	0.0000	31.9604	0.4408
CSS047	Deep/ Piedmont	FBR090	N/A	N/A	N/A	N/A	N/A	N/A	5.0008	30.7855	0.3999
CSS048	Deep/ Piedmont	FBR091	N/A	N/A	N/A	N/A	N/A	N/A	0.0000	8.0345	0.4728
CSS049	Lower Little/ Sandhills	FBR092	N/A	N/A	N/A	N/A	N/A	N/A	0.5144	7.6491	0.0762
CSS050	Pee Dee / Kolb site	jmh051	Feat 99-32			Yadkin		early Middle Woodland	12.7992	23.6674	0.3676
CSS051	Pee Dee / Kolb site	jmh052	Feat 99-32			Yadkin		early Middle Woodland	12.1746	19.3304	0.3090
CSS052	Pee Dee / Kolb site	jmh053	Feat 99-32			Hanover I		Middle Woodland	5.6330	23.4511	0.3867
CSS053	Pee Dee / Kolb site	jmh054	Feat 99-32			New River		Early Woodland	11.9087	40.4153	0.3112
CSS054	Pee Dee / Kolb site	jmh055	Feat 99-32			New River		Early Woodland	6.1843	39.0222	0.3750
CSS055	Pee Dee / Kolb site	jmh056	Feat 96-106			New River		Early Woodland	1.9702	25.0961	0.2903
CSS056	Pee Dee / Non-site location	jmh057	top of bluff			New River		Early Woodland	4.6424	42.2566	0.3347
CSS057	Pee Dee / Kolb site	jmh058	Feat 02-22			Cape Fear		late Middle Woodland	1.6428	34.1704	0.3967
CSS058	Pee Dee / Kolb site	jmh059	Feat 99-32			Cape Fear		late Middle Woodland	3.8817	95.4992	0.6579
CSS059	Pee Dee / Kolb site	jmh060	Feat 02-22			Hanover I		Middle Woodland	2.4697	33.8020	0.3387
CSS060	Lumber / Waccamaw site	jmh061	960p7			Thoms Creek		Early Woodland	2.2234	36.8752	0.3554
CSS061	Lumber / Waccamaw site	jmh062	960p7			Cape Fear		late Middle Woodland	2.2734	46.0052	0.4474
CSS062	Lumber / Waccamaw site	jmh063	960p7			Hanover II		Late Woodland	4.8495	57.9593	0.5256
CSS063	Lumber / Waccamaw site	jmh064	960p7			Hanover II		Late Woodland	2.4879	26.1408	0.2649
CSS064	Lumber / Waccamaw site	jmh065	960p7			Hanover I		Middle Woodland	4.6826	41.1868	0.4849
CSS065	Lumber / Waccamaw site	jmh066	960p7			Hanover I		Middle Woodland	2.4706	21.4730	0.2793
CSS066	Lumber / Waccamaw site	jmh067	960p7			unknown			4.8068	27.4188	0.3032
CSS067	Lumber / Waccamaw site	jmh068	960p7			Hanover		Middle Woodland	7.4936	78.1803	0.5828
CSS068	Lumber / Waccamaw site	jmh069	960p7			Cape Fear		late Middle Woodland	1.9104	13.3118	0.2709
CSS069	Lumber / Waccamaw site	jmh070	960p7			Cape Fear		late Middle Woodland	2.7402	14.2728	0.2593

Table 6.

anid	nd	sm	u	yb	ce	co	cr	cs	eu	fe	hf	ni	rb	sb	sc
JMH001	88.4419	16.5247	4.7065	5.0562	201.8710	13.3317	96.0398	14.6516	3.7015	56657.6	10.4328	0.00	115.5500	0.1770	20.1383
JMH002	48.3913	9.1531	2.3935	3.4237	113.4748	18.5748	70.8174	2.0784	2.1042	34714.0	8.9650	0.00	36.2400	0.2485	16.8205
JMH003	17.7850	3.3666	1.9901	2.2074	40.8276	8.2472	79.9666	3.1007	0.7112	43108.0	7.3928	0.00	37.0500	0.5250	16.5926
JMH004	27.6813	5.0468	3.0057	2.7294	63.6444	12.7983	92.2701	3.4358	0.9598	39329.4	8.8116	0.00	58.0100	0.2341	19.7936
JMH005	32.0205	5.8467	2.3613	3.1511	74.6022	10.2585	111.2353	3.6080	1.1054	44259.1	12.8430	0.00	41.1300	0.3907	12.9434
JMH006	18.4588	3.5685	0.0000	2.3520	25.8398	34.2531	116.2129	1.5458	1.1289	78398.1	2.8549	71.69	20.2100	0.7483	27.8806
JMH007	115.8437	20.5606	2.9012	5.1798	242.7061	9.3138	66.0699	1.6059	4.7266	57486.7	8.1343	105.18	19.8600	0.2884	16.6929
JMH008	22.4133	4.1604	3.2442	2.2452	50.0332	6.7129	63.2395	3.8121	0.9220	27035.2	7.9758	0.00	58.8100	0.4276	15.1398
JMH009	47.5315	8.3975	3.4729	2.9211	118.2728	12.2877	69.3766	5.2316	1.9201	38941.6	6.6519	0.00	71.2200	0.1462	15.2446
JMH010	12.3327	2.3766	2.2439	2.0554	31.6243	8.1213	60.6414	2.0199	0.3329	26525.4	9.0991	0.00	68.2900	0.2957	16.0657
JMH011	12.6237	2.9624	3.4195	1.9980	37.8819	3.8023	86.4109	3.2458	0.4451	71261.3	10.5450	0.00	34.6700	0.3678	14.1355
JMH012	103.9165	16.9660	4.4654	4.1386	244.0060	9.2503	74.4425	3.3714	3.4959	32402.1	9.9383	0.00	51.9100	0.1846	14.3842
JMH013	67.9700	11.4088	2.6682	4.0384	133.1132	4.8190	126.9012	5.1711	2.5083	25383.7	8.1863	0.00	57.9600	0.4178	19.7502
JMH014	20.8290	5.0129	0.9215	3.0613	71.2758	67.6433	474.6001	2.8443	1.2007	87132.7	5.4466	168.91	47.1100	0.6260	30.0584
JMH015	39.5920	7.7828	3.9474	3.8681	114.6298	4.3721	34.0500	2.6949	1.2448	28877.2	16.8642	0.00	83.3100	0.2718	10.3217
JMH016	29.5945	6.0671	3.4758	2.3926	68.5216	10.2402	85.0393	5.5673	1.1481	38107.8	6.1681	0.00	90.6000	0.3943	18.8388
JMH017	53.8375	10.6469	4.7036	4.1106	112.0684	12.6529	143.8818	2.9040	2.2314	29814.9	12.2034	0.00	32.0900	0.5361	15.5323
JMH018	43.2346	7.8563	7.5144	3.5076	88.0141	6.9441	90.4197	2.7738	1.5428	21778.9	8.9063	0.00	22.6500	0.6004	16.5634
JMH019	44.0606	8.6028	4.7454	3.2819	109.2866	8.8861	79.0111	3.2728	1.5397	30943.3	12.5824	0.00	39.8400	0.2094	15.7002
JMH020	71.2814	13.0671	4.2689	3.2670	163.8490	16.2977	84.7473	3.9493	2.9018	87631.1	6.3922	0.00	54.9000	0.1967	19.5249
JMH021	40.4435	7.9519	4.9615	2.5717	119.0031	10.3581	90.6674	4.9027	1.5573	56558.9	8.6603	58.80	63.0900	0.2249	19.6804
JMH022	37.4224	7.0581	3.1906	2.4833	87.9552	7.9255	69.0647	4.3530	1.6375	18654.2	4.8821	0.00	32.2600	0.3257	15.2814
JMH023	18.1975	4.4341	4.2455	2.2258	59.5826	6.2592	88.2804	3.7843	0.7746	37904.8	9.0909	0.00	44.1600	0.1714	20.5670
JMH024	38.2890	7.6044	4.2498	3.7273	97.1368	10.4285	82.1548	2.2470	1.4009	47858.3	13.4285	0.00	31.0800	0.1385	17.3805
JMH025	41.7285	7.4523	5.0523	3.7542	92.9209	15.6144	69.8972	3.3067	1.4693	80846.2	7.6161	0.00	55.6700	0.1044	16.8218
JMH026	45.9205	10.2029	3.4716	3.0634	123.4860	14.1530	99.8424	15.9463	2.0425	62416.6	9.1201	0.00	110.1800	0.1634	21.3723
JMH027	28.6155	5.4709	3.6008	2.6403	70.1331	8.6939	69.0438	1.8978	0.8969	40833.8	8.5677	0.00	36.6200	0.1569	14.5622
JMH028	65.4503	12.6223	4.8547	4.6288	152.8797	19.6965	84.6129	3.1337	2.7458	37861.9	11.5096	0.00	40.9900	0.1681	15.7959
JMH029	21.2141	4.9658	3.3551	3.8815	61.5005	8.5161	86.2771	2.1272	0.9528	31953.6	12.1368	0.00	36.4200	0.1480	18.5509
JMH030	23.1000	4.9678	3.6186	3.7875	60.6502	8.8101	87.3513	1.9394	0.9714	32413.6	12.5469	0.00	29.5000	0.1505	18.6771
JMH031	16.2879	3.4587	2.4546	2.1794	39.5871	22.5063	376.7160	1.5936	0.8004	45417.8	7.1405	81.26	20.1100	0.2436	17.4289
JMH032	10.7520	2.6060	0.0000	1.8173	23.8269	30.0983	425.7328	1.4273	0.6823	60026.1	1.7080	93.15	18.8100	1.1494	30.3193
JMH033	35.0617	8.2940	5.0909	4.0551	83.7576	21.9518	93.8509	5.2009	1.7565	46638.9	3.4851	51.53	67.3700	3.0424	19.0148
JMH034	13.4455	2.8035	0.0000	2.0345	29.6844	34.8198	296.4895	1.3748	0.8577	61965.1	1.4916	159.49	12.0400	0.5528	28.0524
JMH035	13.3781	4.2486	1.1484	1.9786	57.4525	13.2746	159.2353	1.1592	1.1180	36362.2	9.4112	0.00	30.2900	0.1622	21.2901
JMH036	9.7140	2.6801	1.3329	1.2268	24.6518	12.6511	71.2022	0.7732	0.8165	42734.1	4.1814	0.00	17.8600	0.0884	19.3091
JMH037	28.8465	5.8188	0.0000	4.5888	61.9787	17.5280	173.6509	7.5223	1.4095	37654.0	5.4720	0.00	87.5500	0.4900	21.8188
JMH038	77.8484	12.6227	5.8701	4.7986	184.1680	11.9744	57.8024	2.8178	2.2142	44114.6	21.6139	0.00	106.8100	0.1562	12.4558
JMH039	11.3939	1.9605	1.4967	1.2615	17.1221	14.5074	60.6399	0.7070	0.5362	37293.5	12.0702	0.00	33.7700	0.1141	17.7798
JMH040	38.8946	5.7309	2.3546	1.3686	55.8228	14.5439	84.1404	2.3707	1.3149	59591.2	8.7070	0.00	36.8600	0.5443	19.6654
JMH041	11.4366	2.5307	1.9934	1.1821	28.1451	6.2091	51.2869	2.4673	0.5646	21430.8	7.3453	0.00	39.0600	0.3447	17.1159
JMH042	14.5608	2.1203	1.1717	1.2038	23.7735	6.1105	54.5585	2.7016	0.5002	22842.3	8.8394	0.00	45.5500	0.3962	17.8197
JMH043	11.9308	3.5059	0.0000	1.9820	36.6517	21.6916	64.1310	1.3724	0.9057	72439.6	7.6451	0.00	67.6600	0.1820	19.8214
JMH044	29.6640	6.6103	22.4125	1.9499	73.4717	3.5266	30.3896	4.0132	0.9822	15407.4	10.9639	0.00	158.2500	0.1206	7.0680
JMH045	27.3892	4.4323	0.0000	1.4265	40.0469	15.0497	57.9360	2.4315	1.3841	50409.6	4.6809	0.00	45.6400	0.9085	17.1235

Table 6.

anid	nd	sm	u	yb	ce	co	cr	cs	eu	fe	hf	ni	rb	sb	sc
JMH046	0.0000	1.4915	0.0000	1.1076	8.3946	30.5661	138.6965	0.3722	0.5099	47952.9	0.7973	0.00	0.0000	0.5456	33.1299
JMH047	10.3928	1.9838	0.0000	1.4293	12.0524	33.1867	298.0702	0.7015	0.7133	72005.4	1.1456	0.00	24.8100	0.3477	40.8904
JMH048	22.9086	4.4272	1.7897	1.5895	43.7017	15.0371	62.3546	2.7310	1.3911	52688.6	3.7275	48.82	45.9700	0.9746	17.9097
JMH049	7.2423	1.9047	0.6004	0.9619	16.9144	15.6908	52.2413	0.4899	0.6998	22481.7	3.6615	0.00	18.4300	0.0611	8.1353
JMH050	14.3773	2.2329	1.3478	1.1114	26.1061	5.5487	46.0357	2.5121	0.5030	19133.9	9.1366	0.00	38.7600	0.3080	14.3699
CSS001	67.2688	13.9924	6.9518	2.2811	140.2215	4.5605	215.0754	4.4456	2.7003	82236.8	7.4814	0.00	35.1600	1.6033	18.7038
CSS002	10.8539	2.2697	2.0785	1.8266	41.7852	1.6319	37.2504	1.0687	0.3044	16592.8	7.2905	0.00	9.0500	0.2916	7.0404
CSS003	39.2767	8.0164	4.0056	3.4502	104.9169	10.8863	38.7249	1.7668	1.1204	23043.1	13.4291	19.83	54.9300	0.1777	8.1767
CSS004	19.8914	4.4228	2.6976	1.9669	62.9062	2.5520	40.9550	2.5916	0.7777	8148.1	7.2188	31.49	27.9100	0.1610	7.9818
CSS005	48.2059	8.1628	3.7126	2.6628	166.9417	7.7943	122.7603	2.6509	1.5136	22807.1	6.2549	0.00	26.9800	0.3229	21.1121
CSS006	68.0764	14.1617	5.9876	3.5037	158.7126	4.8317	82.2239	1.3859	2.9478	25343.9	10.9718	0.00	22.7700	0.3952	15.1326
CSS007	33.5809	7.3904	6.6804	3.7689	87.7636	5.3374	81.4899	1.3148	1.1789	15062.8	19.1240	0.00	13.7300	0.1143	15.3987
CSS008	33.1139	7.0677	5.5973	3.0470	87.8431	3.8176	91.0995	1.6645	1.3539	16063.6	12.0527	0.00	31.0600	0.1517	23.7039
CSS009	37.4321	7.8999	5.8793	4.0877	100.7593	1.7762	43.1650	1.3752	0.5954	6375.2	27.6046	26.24	28.0400	0.2351	6.5735
CSS010	17.0735	3.5884	2.2052	1.8417	42.6722	10.7196	41.8988	3.2060	0.6947	14794.9	7.0257	0.00	50.5900	0.3917	9.6918
CSS011	21.4547	4.5412	3.0635	2.3420	50.3140	8.3755	51.7598	3.2141	0.9159	32838.8	9.1564	0.00	44.9100	0.4937	13.0934
CSS012	12.7897	2.7041	2.6483	2.0587	32.3951	7.1068	52.2941	3.5113	0.5302	29444.7	8.6622	0.00	51.5500	0.4687	10.4156
CSS013	25.8323	5.5521	3.0874	3.3599	66.9242	22.7027	58.1198	3.8805	1.3306	45434.7	8.8190	0.00	60.5600	0.8159	17.4784
CSS014	31.7679	6.7819	2.6229	3.1352	84.4591	20.2557	64.4757	3.2863	1.3780	39500.8	8.9725	0.00	53.9900	0.7914	15.8158
CSS015	26.1075	5.9967	2.2044	5.8311	65.0635	27.7132	42.6267	0.9410	1.5299	53318.3	9.0309	0.00	6.9400	0.2370	18.0081
CSS016	33.8246	6.8386	4.4776	3.3245	76.8906	14.6942	98.6890	6.0089	1.4956	38797.3	10.2235	60.77	110.6500	0.3739	19.8383
CSS017	44.6213	8.9381	3.1240	3.5803	99.6572	19.5325	94.1048	6.1983	1.9666	45473.0	8.6222	0.00	99.4400	0.4553	20.7690
CSS018	41.3860	8.3214	4.7394	3.2968	102.5898	17.2108	94.8046	7.0844	1.7946	25718.7	8.7668	67.76	91.0600	0.3811	21.6942
CSS019	24.4013	4.9014	3.8576	2.5141	58.0679	7.6799	100.5620	5.9279	0.9574	39377.4	13.0984	0.00	60.0100	0.5098	19.7052
CSS020	50.4257	10.5179	3.5550	4.2387	131.0582	29.5949	96.9093	7.1400	2.3864	61514.3	7.5268	82.72	122.2200	0.6007	23.7389
CSS021	17.7146	3.9083	1.8859	2.8397	31.8697	12.6891	75.5092	2.7143	1.0020	31593.9	6.9403	0.00	16.3500	0.6133	14.1596
CSS022	18.9207	3.7939	2.8247	3.5957	44.6196	5.0068	84.0330	9.6176	0.8562	55224.3	7.6150	0.00	151.3600	1.9713	22.4244
CSS023	9.4003	2.2069	3.4227	1.4806	26.7012	10.5607	58.1034	7.0476	0.4057	61965.9	6.4400	36.29	138.2400	0.6218	14.6003
CSS024	10.7368	2.1567	3.1539	1.2017	30.6289	5.3767	40.8244	6.2760	0.4103	35678.0	6.3883	0.00	104.4300	0.4758	10.7168
CSS025	6.5884	1.8500	3.9343	0.9247	20.7565	3.2930	30.8381	3.4828	0.3651	20710.0	5.2675	0.00	114.0800	0.2922	8.7379
CSS026	23.5781	4.9043	2.1932	3.0786	54.3743	12.6518	79.4682	5.4889	1.1351	35703.5	6.8711	0.00	68.5600	0.5481	21.6925
CSS027	24.1355	5.7294	1.9641	3.1301	54.0624	11.8948	65.4764	4.3711	1.4063	34194.2	5.8162	34.85	51.2000	0.4071	20.5079
CSS028	23.6304	5.2821	1.7712	3.0578	57.1272	15.5381	72.2954	4.9281	1.2778	35968.8	6.3622	0.00	62.6100	0.6368	24.2526
CSS029	19.6131	4.3671	1.7732	2.8363	48.0479	16.8408	80.6620	3.8596	1.0333	33488.3	6.8077	0.00	53.1800	0.4869	16.1344
CSS030	20.0150	4.5631	1.5640	2.9376	52.2166	22.0631	68.5107	4.4511	1.1003	45839.1	6.4625	0.00	59.4000	0.4958	19.0474
CSS031	22.4834	5.0758	1.8606	2.8200	48.9736	7.5507	47.6103	3.0362	1.2364	27666.6	6.7320	0.00	37.8900	1.1844	14.5795
CSS032	53.0419	11.4554	6.2682	3.8178	115.1057	2.8021	58.8438	1.0738	2.0578	9241.5	12.4707	34.00	19.2700	0.3141	13.0263
CSS033	93.4781	21.2876	7.8779	5.0395	201.2023	6.4751	119.7364	3.6852	4.8362	10472.2	8.7353	72.33	37.4100	0.6950	25.0709
CSS034	25.5086	5.5441	4.0485	3.1822	59.6517	14.4176	55.0056	4.4149	1.1848	38110.5	7.6989	0.00	74.7700	1.0734	12.3935
CSS035	22.9283	4.8712	4.0257	2.5490	55.3956	9.6169	46.9356	3.7956	0.9534	28953.9	7.5802	0.00	64.3700	0.8339	10.6365
CSS036	34.1242	7.4068	2.3079	3.7103	78.2681	22.7301	82.1305	7.9454	1.6603	56235.3	6.7635	0.00	125.6000	1.8358	23.6396
CSS037	21.0942	4.9698	1.6611	3.2631	55.3744	13.6023	46.3085	4.2164	1.2320	24842.5	6.9995	35.10	59.5200	0.9334	14.4581
CSS038	17.5165	3.6141	2.6819	2.2544	45.1173	1.4556	42.2095	1.4139	0.4543	18143.3	15.1344	0.00	4.2700	0.4417	4.8061
CSS039	26.1190	5.1371	4.7953	2.5299	64.0417	3.2843	89.5845	6.1000	0.9554	20431.4	11.2525	0.00	58.2300	0.3534	13.0184
CSS040	13.5310	2.9288	1.2719	2.6133	32.4320	2.0822	2.0956	3.3626	0.5808	13408.5	4.2581	0.00	35.7200	0.2369	5.8311

Table 6.

anid	nd	sm	u	yb	ce	co	cr	cs	eu	fe	hf	ni	rb	sb	sc
CSS041	16.6191	3.1344	2.8755	1.9389	42.3704	3.4511	81.0472	5.1338	0.5373	23204.9	9.7531	0.00	39.9400	0.3944	12.9678
CSS042	14.5810	2.8606	1.9591	2.0260	37.6199	3.4615	65.0967	5.5610	0.4849	25990.9	9.3137	0.00	25.7700	0.2827	10.5591
CSS043	0.0000	0.0166	0.0000	0.0077	0.1378	0.1512	0.3433	0.1079	0.0058	393.4	0.0000	0.00	0.6100	0.1799	0.0449
CSS044	0.6319	0.1179	0.0000	0.0828	1.8798	0.0558	0.3909	0.0597	0.0294	101.5	0.0926	0.00	0.4600	0.0437	0.0788
CSS045	22.0427	4.8299	0.6811	1.4475	40.8138	27.8425	55.4169	1.7414	1.2699	64908.5	3.0910	34.26	53.2700	0.2065	20.8314
CSS046	24.8936	5.0636	2.7748	3.2776	85.7347	3.2085	2.7061	1.4961	1.2503	15275.6	7.9911	0.00	79.7700	0.0474	3.9302
CSS047	23.8213	4.9514	3.3870	2.7257	60.7559	2.4370	55.1900	3.7194	0.8110	18140.1	16.7424	34.33	14.8800	0.4529	8.1374
CSS048	8.7591	3.0174	0.0000	3.5808	18.2612	59.6768	87.6317	0.4792	1.0844	92692.0	2.7207	101.84	10.9200	0.0000	43.8290
CSS049	6.2153	1.2394	0.9185	0.4471	15.2878	0.2976	4.7984	0.1329	0.0922	1239.5	3.6621	0.00	3.3300	0.0800	0.7176
CSS050	24.8281	5.0975	3.2298	2.4130	52.2706	3.9772	89.4746	4.1523	0.9549	34277.1	13.3482	43.82	38.3900	0.4104	12.5973
CSS051	16.5759	3.1568	2.6862	2.2321	39.5590	3.0921	89.9866	4.7323	0.5741	38555.0	10.5367	0.00	43.9300	0.4177	11.8289
CSS052	27.9972	4.8097	2.8037	2.6734	52.9206	5.3746	66.6679	4.1110	0.9790	33289.4	7.9214	0.00	30.9800	0.3970	12.1437
CSS053	45.4395	7.6365	1.8065	2.4582	84.5012	9.6813	108.2723	5.3923	1.5163	45620.4	5.4871	27.83	50.4200	0.3435	14.3164
CSS054	32.2240	5.6583	3.5224	2.8803	67.7447	7.8371	97.3866	5.4867	0.9939	44300.9	6.0606	27.96	92.0900	0.4884	13.5427
CSS055	20.2727	3.6772	2.8388	2.0525	43.7370	5.2675	91.1020	2.2547	0.6021	28377.0	9.0446	0.00	52.2400	0.2777	12.4861
CSS056	32.7989	5.5407	3.4447	2.3642	71.5177	7.7348	86.8839	4.6522	0.9662	43877.6	7.6759	0.00	117.3900	0.3394	12.8979
CSS057	26.6317	5.1649	2.7625	2.7233	61.3527	10.4386	99.7718	3.3042	0.6947	33480.8	12.0965	0.00	64.2700	0.3019	15.4993
CSS058	108.3727	19.1650	4.0299	5.6883	198.2144	12.6296	109.9985	3.4799	3.7305	37887.6	9.2595	51.81	88.8400	0.3130	16.3087
CSS059	30.1395	5.0587	2.6283	2.4565	61.1739	7.2437	82.5337	2.5284	0.8214	30927.8	10.8449	0.00	124.1600	0.2605	14.3969
CSS060	36.9691	6.4717	2.9876	2.5443	72.4087	8.8960	72.3966	4.4222	1.2838	26360.6	5.9420	0.00	96.4500	0.3533	17.4723
CSS061	44.4274	7.8717	2.9748	3.2525	89.7460	14.9161	79.2661	4.8094	1.6242	26793.5	7.1130	0.00	118.3100	0.3420	18.5159
CSS062	53.8507	10.5779	3.9920	3.6443	115.1100	7.2377	101.1899	4.4613	1.8120	41413.2	8.1186	32.88	104.7500	0.4658	14.3337
CSS063	22.9390	4.6980	2.4786	2.0721	55.8893	5.4236	61.5192	3.5323	0.9179	23579.0	7.4779	0.00	57.9200	0.3425	13.2884
CSS064	39.4288	7.2123	5.0132	3.4283	84.8863	10.1946	121.4140	6.8794	1.3579	34830.5	10.9456	0.00	53.1600	0.4670	17.9266
CSS065	20.0902	3.9679	2.3107	1.8849	44.9441	4.2748	48.8122	2.9237	0.7796	15434.4	6.8379	0.00	25.5900	0.2506	9.6214
CSS066	18.5567	4.0808	3.6195	1.9648	51.5616	15.2579	172.3725	3.7107	0.6800	27304.3	12.3044	111.49	22.5300	0.6527	12.5356
CSS067	85.3556	13.7550	5.0180	4.3603	134.8264	15.0312	97.8033	5.0291	2.6732	48819.4	8.3503	60.78	56.1500	0.4209	14.1410
CSS068	13.4410	2.3660	1.6870	1.5325	28.4639	5.6059	56.5045	2.7119	0.4293	24172.1	6.9522	0.00	20.1200	0.3748	9.5500
CSS069	12.5582	2.9777	4.8637	1.3928	32.5990	3.8963	68.4386	2.6912	0.4428	19281.3	7.7730	0.00	11.8300	0.3089	10.1594

Table 6.

anid	sr	ta	tb	th	zn	zr	al	ba	ca	dy	k	mn	na	ti	v
JMH001	0.00	1.4177	1.6204	17.3638	71.93	295.52	107775.9	504.1	667.7	8.5613	13633.0	451.63	627.5	6283.0	133.62
JMH002	0.00	1.0031	0.9271	8.1813	79.67	211.19	100492.4	380.4	1530.6	6.3059	7381.1	175.38	786.4	5113.5	78.26
JMH003	0.00	0.8003	0.4657	8.6449	43.59	149.56	98163.2	239.6	3309.8	2.6070	7986.9	200.42	5098.3	5406.3	118.09
JMH004	0.00	0.9858	0.6977	9.8821	46.28	167.51	102272.9	316.6	1603.7	4.3865	10200.5	182.80	1380.1	5878.5	110.80
JMH005	0.00	1.1004	0.7947	11.9508	41.82	298.75	70116.9	308.2	2234.9	4.6193	8137.0	290.43	1799.2	6139.5	104.66
JMH006	242.92	0.3521	0.5169	2.1464	73.42	25.98	75884.7	85.2	30003.2	2.5364	2752.4	1160.84	10900.5	3886.7	207.15
JMH007	0.00	0.8249	1.7277	10.2292	45.79	196.71	93285.7	238.2	754.4	9.0321	2066.0	222.06	248.8	6133.8	139.64
JMH008	0.00	0.8573	0.4991	9.3843	58.09	151.90	94327.5	472.9	4178.7	3.3446	9436.2	263.18	6177.6	5499.9	94.95
JMH009	0.00	1.1510	0.9941	11.3492	55.64	180.97	100753.7	471.4	434.3	6.1309	15678.2	124.36	740.1	4582.3	109.55
JMH010	0.00	0.7410	0.2434	10.8864	40.88	184.87	77444.3	117.4	1439.8	2.3014	8762.2	129.42	603.8	5254.6	97.67
JMH011	0.00	1.1776	0.3233	12.3015	0.00	210.57	85121.5	216.7	554.2	2.6825	4108.2	79.40	373.8	5719.6	101.43
JMH012	0.00	1.0533	1.4950	14.0024	53.23	238.34	102703.1	320.5	464.6	7.8399	10601.2	141.60	573.6	5164.6	88.00
JMH013	0.00	1.1799	1.4403	11.8365	54.67	160.23	118903.6	303.6	346.9	9.3697	10529.5	91.89	592.7	6377.5	133.87
JMH014	0.00	0.7641	0.5314	5.5712	0.00	113.95	85389.5	199.1	6218.6	3.0944	3567.5	1460.52	3342.9	4140.8	137.31
JMH015	60.08	1.7167	0.9543	18.5588	29.34	408.78	72424.2	809.3	923.0	4.8880	26057.4	261.00	3341.3	5688.3	68.27
JMH016	0.00	0.9666	0.5642	12.7166	83.31	134.39	99991.6	475.1	2061.1	3.9015	14400.6	245.03	3672.9	5248.7	119.80
JMH017	0.00	0.9225	1.1779	11.9043	52.35	311.85	82920.3	196.0	826.4	7.7309	2659.9	213.42	719.6	4890.4	99.61
JMH018	0.00	1.4183	0.9043	12.4316	64.81	230.32	102517.5	370.4	2518.4	5.9689	4501.3	113.44	1865.7	6909.8	136.63
JMH019	0.00	1.4063	0.9000	13.9669	57.02	280.23	95614.8	259.1	547.0	5.5768	7029.2	99.67	647.5	7073.1	112.86
JMH020	0.00	1.0912	1.2458	12.2525	81.59	160.50	113968.8	400.6	2233.3	7.4146	9209.3	181.44	1687.6	5543.5	142.40
JMH021	0.00	1.4479	0.7889	13.0197	66.78	203.36	110402.2	628.4	1526.6	4.6511	10100.7	272.76	535.2	5984.6	131.96
JMH022	0.00	0.9184	0.9103	8.7522	45.37	110.72	95015.9	500.8	4265.9	5.3635	5695.1	144.36	1262.1	5002.1	117.82
JMH023	0.00	1.7757	0.5352	13.2956	82.75	193.48	114752.1	620.8	895.8	3.3031	4484.7	285.90	371.5	7037.2	106.03
JMH024	0.00	1.6778	1.0801	18.6422	49.38	331.75	101000.8	364.1	2235.1	5.3799	5170.9	194.70	370.0	6701.1	124.22
JMH025	0.00	1.0933	0.9193	12.1206	61.25	167.59	95631.0	591.3	1454.6	5.1983	10860.8	322.27	715.3	5137.6	128.69
JMH026	0.00	1.4575	0.9167	15.9463	76.78	203.99	106153.8	901.9	3401.3	5.2367	14042.6	648.37	470.2	5455.1	135.89
JMH027	0.00	1.4574	0.5082	13.8200	38.82	167.60	95475.6	488.9	1065.6	3.8817	5331.5	370.42	666.1	5261.6	96.47
JMH028	0.00	1.5751	1.4645	16.1797	49.08	267.40	89498.1	366.9	2242.9	7.1009	5580.9	321.42	765.0	6590.1	124.53
JMH029	0.00	1.8077	0.5569	14.8601	73.11	296.74	112708.8	692.1	1175.1	3.9014	4040.5	126.06	366.7	7446.3	117.79
JMH030	0.00	1.7969	0.4953	14.4533	45.72	289.88	114508.5	636.9	976.1	4.0944	4200.4	225.18	347.3	7523.7	120.38
JMH031	0.00	0.6276	0.4484	3.8090	45.01	158.90	58933.3	451.4	19629.4	3.2435	3610.3	433.72	4172.7	4416.9	122.05
JMH032	0.00	0.4448	0.7010	2.0657	63.13	0.00	80937.6	222.3	31258.3	2.5845	4192.6	560.66	4868.4	3620.4	167.38
JMH033	415.58	0.9050	1.2131	11.7967	123.40	115.70	98574.9	829.4	11253.1	5.1541	16671.3	628.03	8460.3	5216.2	123.43
JMH034	0.00	0.2526	0.4118	1.6322	72.07	30.92	68782.3	229.5	35367.4	2.9986	3231.3	853.43	5206.6	3175.8	177.00
JMH035	215.77	0.6809	0.4704	4.9772	44.34	235.35	87530.9	566.0	12488.1	3.5059	4863.2	520.71	6225.5	7620.4	201.50
JMH036	346.63	0.2528	0.3058	2.5730	45.11	115.56	111179.4	366.5	18038.8	2.2914	2010.9	288.49	13339.4	4464.3	150.70
JMH037	0.00	0.5747	0.9256	5.3699	79.53	101.03	83730.7	648.3	5309.0	6.6819	7653.4	652.36	4867.8	4307.4	115.86
JMH038	100.93	2.2104	1.2708	21.2140	63.12	461.55	92941.6	881.5	6945.8	7.7949	26299.6	300.21	7972.2	6001.5	63.16
JMH039	216.07	1.1294	0.1556	6.0053	62.33	256.72	91433.0	635.3	7336.4	1.3528	11918.3	670.10	5458.8	11324.4	133.84
JMH040	294.47	0.4016	0.4378	7.2633	131.71	198.53	109640.0	494.9	15490.7	2.5808	8722.2	736.55	11113.6	5579.3	180.51
JMH041	74.88	0.7621	0.2028	6.4813	0.00	153.17	94047.5	1165.7	3568.7	1.7103	9461.2	357.56	3940.9	6440.6	117.41
JMH042	0.00	0.8546	0.1672	7.2276	72.21	181.86	99853.3	811.2	2029.5	1.5706	10618.6	569.97	3881.4	6485.8	136.26
JMH043	0.00	1.2315	0.3662	4.2158	68.18	145.29	77553.6	858.8	5408.6	3.2646	11608.4	1072.19	3463.8	15585.6	166.24
JMH044	196.80	1.9701	0.5615	18.5403	40.43	301.95	105961.6	861.6	6841.2	3.5703	32733.1	190.20	13873.4	3355.1	53.12
JMH045	392.32	0.2781	0.3539	5.8106	112.83	120.76	97900.4	926.9	20579.3	2.6884	13740.3	634.59	16191.8	4826.8	170.94

Table 6.

anid	sr	ta	tb	th	zn	zr	al	ba	ca	dy	k	mn	na	ti	v
JMH046	0.00	0.0954	0.0000	0.6359	85.93	0.00	78527.5	448.2	29425.0	1.8903	0.0	691.88	3399.9	2087.8	162.80
JMH047	103.54	0.1244	0.2934	1.3825	109.99	0.00	104690.1	1145.5	35208.6	2.3093	6353.3	1130.73	3343.1	3284.0	213.25
JMH048	493.69	0.3969	0.4087	6.6596	114.55	115.25	100257.0	855.7	21406.7	2.2655	16008.3	601.47	16712.1	5449.1	169.13
JMH049	187.78	0.1694	0.2385	1.5980	37.16	82.34	102177.4	601.1	7081.1	1.6933	4349.8	379.82	10951.9	2833.6	80.96
JMH050	0.00	0.7710	0.2191	6.3679	43.71	180.45	83408.9	507.7	2372.7	1.5348	11130.9	360.69	4203.8	6325.2	118.15
CSS001	94.25	1.0691	1.9219	19.6346	41.14	219.93	100288.8	174.1	0.0	7.4020	2456.4	38.15	207.0	3404.2	189.02
CSS002	0.00	0.6464	0.3473	11.0387	14.64	160.28	52783.6	53.5	0.0	1.5617	840.4	27.99	192.1	2768.9	62.55
CSS003	60.52	1.0690	0.9796	13.6378	35.62	319.48	69284.7	385.4	0.0	4.3460	16304.7	87.44	720.6	4555.1	69.08
CSS004	33.84	0.9952	0.6786	8.8775	15.47	182.22	67776.5	160.9	0.0	3.6822	6111.6	32.01	396.0	3732.7	55.59
CSS005	66.61	2.0145	0.7467	22.4766	36.10	205.40	191590.7	186.8	0.0	4.6092	5026.7	31.81	391.2	8681.9	199.77
CSS006	85.51	1.2902	1.7101	17.7069	24.66	330.81	107983.0	233.0	0.0	9.1426	4379.1	41.24	343.0	5793.6	121.68
CSS007	0.00	1.5787	1.0622	16.4466	26.36	470.53	86690.7	129.1	0.0	5.8671	3527.3	42.84	305.3	7094.0	97.34
CSS008	0.00	1.7351	0.8040	13.3736	28.06	311.72	130531.6	162.3	0.0	5.3657	7029.9	54.44	489.9	6741.2	102.95
CSS009	28.56	1.8675	0.8656	22.1714	13.03	670.17	44090.3	195.1	0.0	5.8376	8499.3	76.17	470.6	6647.0	53.20
CSS010	121.74	0.7864	0.4735	7.4982	34.31	165.18	61603.9	392.9	3095.9	2.9201	9013.2	340.15	4672.4	4876.8	74.08
CSS011	88.71	0.9049	0.5597	9.1820	35.68	230.42	75691.2	343.7	2486.0	3.1280	8099.0	141.53	5153.5	5262.3	102.09
CSS012	65.94	1.0849	0.3871	8.4346	39.16	187.21	78578.6	352.0	2400.4	3.0604	11578.5	156.49	3488.5	5703.3	122.47
CSS013	0.00	1.0847	1.0106	7.0678	131.92	218.07	88048.4	412.0	2929.1	4.8528	14449.5	1430.97	4084.7	7798.3	148.89
CSS014	101.24	1.0301	0.8511	10.4699	90.24	213.03	82081.0	352.3	0.0	5.0607	8976.1	1271.74	4070.5	6832.5	124.56
CSS015	0.00	0.4711	1.1886	3.7401	60.31	245.21	78631.2	134.6	1176.0	7.6193	2363.6	108.14	282.8	4683.2	81.48
CSS016	119.29	1.5615	1.1539	12.7144	105.45	239.11	103365.6	667.9	3482.5	5.4863	18410.3	492.69	4251.6	7330.0	151.80
CSS017	93.20	1.3938	1.1652	12.2801	119.72	194.58	107782.2	662.6	4005.3	6.7510	16677.9	599.42	4586.5	7126.4	145.94
CSS018	95.02	1.3716	1.1324	13.0131	106.08	240.68	121681.1	608.6	2446.0	6.7922	15869.0	304.07	3318.4	7480.8	154.84
CSS019	0.00	1.4258	0.5611	13.5127	51.94	308.60	107249.8	316.3	0.0	3.6398	11455.0	179.98	1756.1	7732.3	161.74
CSS020	58.91	1.6492	1.2402	14.3342	128.64	183.12	123849.9	660.2	3206.1	7.3836	16921.1	1299.90	2494.1	8576.6	178.87
CSS021	58.11	0.7750	0.6319	4.6292	34.75	177.89	45887.6	156.9	5209.5	4.3512	0.0	1111.57	1504.5	8992.4	129.42
CSS022	71.27	1.1268	0.7587	12.8436	56.92	197.48	111678.0	563.3	1289.8	4.7883	23913.9	119.02	1278.7	5310.0	143.54
CSS023	0.00	1.1164	0.2563	14.0018	51.77	161.18	112171.0	405.5	1510.7	1.7743	15308.1	240.98	3479.6	3793.3	131.53
CSS024	0.00	1.0502	0.2138	10.8699	38.36	169.52	86818.4	327.7	567.3	1.7472	12854.3	153.15	1567.4	3813.3	87.97
CSS025	93.81	0.9069	0.1997	12.6091	29.26	130.64	75822.0	492.1	4774.4	1.4444	21524.1	181.55	7687.2	2762.6	68.95
CSS026	70.04	1.0968	0.7804	6.5682	84.58	180.65	79331.0	305.5	6546.8	4.8709	10805.2	835.39	3040.5	8317.1	152.56
CSS027	73.64	1.5577	0.7948	5.3587	67.37	132.09	65541.7	231.3	11583.4	4.6447	5597.7	1568.16	4682.4	12838.7	113.19
CSS028	48.95	0.8981	1.0252	6.2603	83.07	138.31	86266.2	363.3	7465.0	4.9516	9724.0	841.77	3512.0	7358.9	160.78
CSS029	56.39	1.0041	0.8000	5.2159	57.42	189.25	57081.3	212.1	7308.5	3.9513	9700.5	1736.52	3693.0	6452.9	108.68
CSS030	0.00	1.1190	0.6825	5.7526	63.87	145.37	67817.0	280.0	6144.3	4.0749	9683.9	2175.06	2911.9	8291.1	130.37
CSS031	72.36	0.7084	0.7702	5.2339	62.61	167.35	72123.3	233.4	7759.2	4.4719	5406.8	535.56	7227.6	5262.8	91.87
CSS032	0.00	1.1829	1.5067	16.3124	19.14	337.91	69191.8	196.5	0.0	7.4115	4547.0	47.07	337.3	4708.9	78.76
CSS033	100.31	1.6993	2.7166	20.2270	39.19	290.80	176702.3	306.2	0.0	13.8589	7008.7	44.71	505.8	7104.6	186.56
CSS034	41.47	0.8935	0.7677	8.9667	48.97	204.11	64720.8	285.9	2343.7	5.0881	9461.6	188.56	5904.7	5010.2	88.09
CSS035	63.07	0.8527	0.6661	8.6078	41.44	193.86	66633.2	253.2	2745.9	4.0258	10190.5	411.72	9250.0	3669.1	88.80
CSS036	99.58	0.9725	1.0710	10.9034	99.97	174.27	94165.1	720.2	2955.0	5.7319	22553.5	972.46	7663.0	5435.7	154.36
CSS037	79.67	0.8742	0.7941	6.1037	55.57	175.91	72965.8	411.8	6439.5	4.4934	8884.9	449.83	6107.7	6056.1	108.83
CSS038	0.00	1.4425	0.4885	8.2284	14.71	364.83	36485.4	51.2	0.0	3.0319	0.0	41.14	205.5	6432.6	50.50
CSS039	66.17	1.1031	0.5814	9.3689	31.84	294.44	74334.7	240.0	4073.9	3.9517	9776.9	65.44	558.6	5424.6	108.36
CSS040	126.82	0.3052	0.4909	4.7159	32.29	104.13	56857.7	109.5	3069.0	3.7796	1731.0	63.17	347.4	6821.9	80.58

Table 6.

anid	sr	ta	tb	th	zn	zr	al	ba	ca	dy	k	mn	na	ti	v
CSS041	42.44	1.1990	0.3862	9.8933	24.47	251.80	80228.8	213.8	4290.2	2.8583	5749.7	52.85	700.9	5242.5	105.69
CSS042	70.90	1.0324	0.4395	8.2669	22.43	221.24	65213.6	97.8	4366.9	2.4119	4235.7	52.18	488.5	4722.7	83.99
CSS043	0.00	0.0000	0.0028	0.0135	1.05	0.00	1424.3	0.0	0.0	0.0000	0.0	17.93	136.0	0.0	0.00
CSS044	0.00	0.0098	0.0151	0.0446	0.86	1.80	1870.1	0.0	0.0	0.0986	0.0	3.78	127.9	0.0	0.00
CSS045	652.86	0.2444	0.4881	4.6550	115.42	82.98	83898.9	370.4	45658.0	2.4825	14776.5	1498.38	22877.7	6771.1	215.52
CSS046	219.56	0.9477	0.6861	10.9542	61.21	204.88	79362.4	625.1	7654.3	3.7691	30643.1	754.31	31082.8	1705.7	19.27
CSS047	0.00	1.4489	0.6615	9.5406	15.18	383.30	64835.9	767.0	7947.0	3.1165	15027.8	320.12	32426.2	1215.5	15.27
CSS048	147.78	0.2059	0.7057	0.8031	105.78	0.00	78527.4	171.3	70385.9	4.4050	5357.0	1885.57	19979.6	3892.2	282.68
CSS049	0.00	0.2261	0.1459	2.8290	8.63	91.26	3857.9	22.3	0.0	0.5883	626.2	23.16	398.7	662.5	5.20
CSS050	20.10	1.1653	0.6317	10.6382	35.43	312.54	62884.8	231.3	601.6	3.8285	5413.3	127.77	913.1	5911.8	125.04
CSS051	0.00	1.1846	0.4012	10.8458	32.02	276.50	59342.6	183.6	406.7	3.3888	5453.0	79.45	652.3	5676.7	115.97
CSS052	0.00	1.1252	0.7816	10.3390	44.66	199.40	71317.7	231.7	442.1	4.0736	5385.7	97.58	1659.1	5467.1	115.11
CSS053	0.00	0.7919	0.9218	11.3550	65.32	150.92	76059.6	282.7	2962.9	4.9098	7653.2	205.69	1590.5	4607.4	117.66
CSS054	102.19	1.1380	0.7209	11.5148	49.36	158.74	80261.4	1028.9	11805.1	4.4100	8655.0	110.21	654.9	4921.1	114.16
CSS055	294.43	1.1562	0.5053	9.0508	40.09	224.33	69392.5	2041.0	12633.8	2.9394	7297.0	108.07	968.1	5646.3	80.04
CSS056	208.49	1.0280	0.7553	11.3237	46.54	206.78	77642.7	1322.3	16292.2	4.4163	10988.9	136.05	677.2	4578.4	101.47
CSS057	127.87	1.0406	0.6416	14.2425	52.99	292.97	79901.1	1386.2	8408.9	3.6077	7935.6	150.26	1640.5	5333.6	104.39
CSS058	171.07	1.0429	2.2754	12.4688	62.78	315.57	96704.2	1028.2	10770.1	12.7106	10763.4	175.56	1492.2	5853.6	117.23
CSS059	254.01	0.9367	0.7239	11.8108	47.70	273.31	69257.8	1707.9	9360.4	3.6759	13988.8	268.21	977.0	4988.9	88.50
CSS060	172.57	0.9997	0.7223	11.2847	65.83	162.95	102850.1	925.9	7329.5	4.6194	14768.1	345.07	3005.4	5140.1	110.88
CSS061	260.14	1.1125	1.0270	11.9071	84.62	154.45	97892.7	1160.8	11776.5	5.1781	13210.0	239.54	4106.8	5424.6	120.31
CSS062	200.06	1.7872	1.4584	15.0191	55.48	249.90	80984.4	1502.1	14321.8	7.4361	11709.0	134.51	731.6	4988.3	111.85
CSS063	81.55	0.8867	0.5021	9.7543	44.59	232.47	80367.6	457.8	2489.2	3.7359	10798.8	605.48	2916.8	4658.1	99.81
CSS064	0.00	1.3038	1.0098	12.8389	72.46	353.89	94010.6	258.4	2453.7	5.2345	7966.4	106.33	726.2	6462.8	155.02
CSS065	0.00	0.8224	0.4855	7.3319	27.65	191.62	58089.9	220.0	1070.1	2.8859	5184.7	40.96	1285.8	4031.2	82.48
CSS066	0.00	0.9348	0.4732	11.1028	46.64	326.86	74437.2	133.2	821.4	2.7709	3030.9	177.29	569.6	5624.5	117.61
CSS067	0.00	0.9768	1.7051	10.8473	61.11	256.72	88450.6	289.7	5562.1	8.1007	9334.6	852.81	1573.9	5475.3	122.54
CSS068	0.00	0.8891	0.3118	6.4742	27.66	170.50	57996.1	141.7	668.2	2.4265	3315.3	95.95	680.0	5093.5	103.13
CSS069	0.00	1.0283	0.3044	9.6660	28.55	227.31	65253.9	89.3	460.6	2.2980	1334.7	82.39	462.9	5149.7	85.32