Archaeometry Laboratory

NEUTRON ACTIVATION ANALYSIS OF MULTIPLE CERAMIC TYPES FROM NORTHWEST ARGENTINA AND CHILE

ANIDS-LAZ019-LAZ753 (non-consecutive)

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INTRODUCTION

This report describes the preparation, analysis, and interpretation of 584 samples of pottery, clay, and experimental ceramics (LAZ019-753, non-consecutive) from Formative period sites throughout northwest Argentina with a minority from Chile (Table 1). The largest portion of the sample comes from five valleys: Aconquija, Cajón, El Bolsón, Campo del Pucará, and Santa María. Minor samples come from other locations. The sample consists of a variety of ceramic types assigned by the principal investigators. The majority of the sample comes from four wares: Fine Wares with different colors (black, gray, red, and buff), Ordinary Ware, Vaquerías Ware, and Condorhuasi Ware. A minority of other wares have been identified and sampled as well. A number of clays and experimentally-fired pottery were also submitted for analysis.

Table 1. NAA pottery sample and its distribution across valleys and sites.

Type	*Aconquija*	*Amaicha*	*Cafayate area*	*Cajón*	*El Bolsón*	*Lerma*	*North Calchaquí*	*North Chile*	*Santa María*	*Guachipas*	*Hualfín*	*Campo del Pucará*	*Quebrada del Toro*	*Total*
Condorhuasi	12			1								7		20
Cienaga	4													4
Allpatauca	5											1		6
Ordinary	55			34	26				46			24	6	191
Clay	2		1	2			1		2	3				11
Río Diablo	1			3								2		6
Baño Blanco	3			3					3					9
Famabalasto	1			1										2
Aguada	2				3				6		5			16
Vaquerías				19	1	1			4				6	31
San Pedro								4					3	7
Experimental	6	1	6	6					6					25
Candelaria III									1				1	2
Intermediate	1			6	1				3			2		13
Tosco				1										1
Modern			1							1				2
Fine Wares	76			38	12		1		55		25	19	12	238
Total	168	1	8	114	43	1	2	4	126	4	30	55	28	584

This sample is part of a larger database of ceramics previously analyzed at MURR for Veronica Williams, Martín Giesso, and Guillermo de la Fuente. After examined in isolation, the Lazarri sample will be compared to these other databases.

SAMPLE PREPARATION

Pottery and clay samples were prepared for INAA using procedures standard at MURR. Fragments of about 1 cm^2 were removed from each sample and abraded using a silicon carbide burr in order to remove glaze, slip, paint, and adhering soil, 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.

Two analytical samples were prepared from each source 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).

NAA: 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 8×10^{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 5×10^{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.

LA-ICP-MS: INSTRUMENTATION AND METHODS

Laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) was conducted with a PerkinElmer SCIEX NexION 300 Quadrupole ICP-MS coupled with a Photon-Machines Inc. laser. Methods generally follow Speakman and Neff (2005), but adjustments were made for the newer instrumentation. Samples were cut into chips less than 4 x 4 x 1 mm size and fitted on a standard thin section slide with the use of poster tack. A camera displays the sample area on the computer screen at high magnification.

The analysts can then target the laser to ablate specific components of the sample. The laser was set to ablate at least 6-12 lines measuring 100 µm each with a circular spot size of 40 µm. After each line ablation, the laser was paused for 20 seconds while the ICP-MS continues to collect data. The laser moves at a rate of 5 µm/s firing laser bursts at a rate of 30/s. Laser power was to 40 percent of the maximum. The ablated sample vapor travels through tubing in a helium transport agent. It is mixed with argon gas at the ICP-MS torch, where the sample is ionized and passes through two detectors that measure the intensity of the signal in terms of counts per second. The pulse detector is generally more accurate and precise for non-major elements, but the detector saturates at a relatively low intensity. The analog detector takes over for elements of greater intensities. The ICP-MS was run in dual detector mode and transitions between detectors are corrected using a conversion factor.

The method developed by Barry Higgins and Wesley D. Stoner for analysis of archaeological pottery collects data for 39 elements: the same list as above for NAA plus silicon (Si), copper (Cu), magnesium (Mg), tin (Sn), ytterbium (Yb), and lead (Pb). The detector is set for a dwell time of 10 ms/isotope with only a single sweep and a single reading per replicate. The number of replicates changes depending of the number of lines ablated and the material targeted.

Switching the laser on and off for a pause of 20 seconds between scans forms a series of curves for each isotope. Each peak represents a single ablated line, whereas the baseline between peaks serves as the sample blank. In Microsoft Excel, Higgins and Stoner have developed a macro script that automatically subtracts the sample blank (the average of 10 baseline replicates both before and after the sample peak) from each replicate (represented by individual rows in the Excel spreadsheet). The blank-subtracted replicates within each peak are summed and averaged over however many lines were ablated within the specimen. At this stage, anomalous peaks can be identified and eliminated to avoid a single peak from skewing the data.

Average data of element isotopes in counts per second is then corrected to total elemental signal using isotopic abundance ratios. At this point, we employ a modified standardization method developed by Gratuze and associates (2001). Elemental data is expressed as a ratio to an internal standard appropriate for the sample matrix. For pottery, Si is used as the internal standard because it is a stable and immobile major element that it very abundant in all pottery. Aluminum could also be used. The ratio expression is referred to as the standard signal. The standard signal is then referenced to published values for standard reference materials to arrive at the *Ky:*

$$Ky = \frac{Standardized\ signal\ for\ Y}{[Y] in\ the\ reference\ material} * [internal\ standard] in\ the\ reference\ material$$

Where *K* is the conversion factor for element *y.* The standard signal is then divided by the *Ky* and the sum of all elements is normalized to 100 percent oxide. Finally, we apply standard geochemical coefficients to remove oxygen from all elemental concentrations, leaving the all data in parts-per-million.

INTERPRETING CHEMICAL DATA

Nickel (Ni) was removed from all NAA statistical techniques due to the high number of missing values within the dataset. No elements were eliminated from the LA-ICP-MS dataset.

Statistical analysis was carried out on base-10 logarithms of concentrations for all 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. 1976; 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 and relatively 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. With pottery, however, chemical composition additionally varies according to the paste recipes that potters employ. A paste recipe reflect the cumulative pottery production steps from the selection of raw materials, preparation of those materials, the mixing of temper and clay, and even the firing of the pottery can affect the final recipe as changes in color and mineral structure can take place. 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*. 1982) 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 techniques 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 its 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, and analyses tend to be dominated by those elements or isotopes for which the concentrations are relatively large. This is yet another reason for the log transformation of the data.

One frequently exploited strength of PCA, discussed by Baxter (1992), Baxter and Buck (2000), 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.

Summary of Interpretive Techniques Used in the Current Study

Northwest Argentina and northern Chile are difficult regions to employ compositional analyses of pottery because most of the sediments suitable for pottery production form through weathering and run off of similar parent materials in the mountains. Most of the study region forms an interior drainage basin, like the Basin of Mexico. While chemical differences among the raw materials used to manufacture pottery appear across space within interior drainage basins, they tend to be very subtle due to the mixing of sediments.

Because of the difficulties of chemical sourcing in this region, we performed the analysis in two distinct ways, separated into Parts I and II of this report.

Part I: The Bottom-Up Approach

Part I of the analysis features what we call the "bottom-up" perspective, in which we begin with the raw chemical data and blindly formulate chemical groups without knowledge of previous group assignments (Speakman and Glascock 2004; Cecil and Glascock 2006; and Boulanger and Glascock 2010), archaeological provenience, or ceramic descriptive data. We then explore the chemical groups in relation to the descriptive data to make interpretations regarding exchange and the technology of pottery production.

Within the bottom-up approach, we employed a staged analysis. The first stage was to create core reference groups. Core reference groups consist of closely related specimens that form a coherent chemical cluster that consistently differs from other groups regardless of the statistical techniques employed. We formed core reference groups based on hierarchical cluster analysis (HCA), principal components analysis (PCA), and inspection of elemental plots. The core reference groups were then validated by jack-knifed Mahalanobis Distance-based probabilities, which led to minor adjustments. In total, only 236 specimens were assigned to core groups, 43 percent of all ancient pottery submitted for analysis.

Second, we conducted a canonical discriminant analysis (CDA) on the core reference groups and used these discriminant functions to assign the remaining specimens to the best group. One must exercise caution when using and interpreting CDAs (see Kovarovic et al. 2011). Unlike PCA, which does not change the relation among specimens in multidimensional elemental space, CDA rescales the data by "building linear combinations of the original variables that maximize between to within group variance (Kovarovic et al. 2011)". CDA only uses the variables of significance to rescale the data, so a large portion of the data is ignored. Additionally, the reference groups that CDA uses to rescale the variance are previously established by the analyst.

If the reference groups entered into the analysis do not accurately represent chemically distinct clusters, the analysis will lead to false assignment of unknowns to unrelated groups. This is the reason for the narrowly defined core reference groups, discussed above. With all of these problems in mind, when properly applied, CDA provides a measure of group membership in difficult sourcing regions where other techniques may fail to confidently assign specimens to groups.

Based on the CDA, we create macrogroups for each core group. Whereas core groups represent a very conservative group structure, macrogroups represent a more liberal assignment of unknown samples into reference groups. We only assign a specimen to a macrogroup if it has more than 1 percent probability of belonging to a core group *and* more than three times the probability of belonging to any other group. Membership probabilities are included in Appendix A.

We regard the bottom-up approach as a more robust way to formulate chemical groupings. However, among the principal valleys of interest, Aconquija, Cajón, Santa María, and El Bolsón displayed very similar ceramic chemistries for the Fine Wares, which comprises the majority of the sample. To discern the potential for exchange among these valleys, we employed a top-down analysis.

Part II: The Top-Down Approach

Part II of the current analysis is termed the "top-down" approach. We begin by establishing core reference groups around the median chemical values for all specimens of each ceramic type within each valley. The chemical median provides a better approximation of local paste recipes than the mean because the former excludes chemical outliers that may derive from abberant paste recipes and imports from other valleys. These "core valley groups" represent our best approximation of local paste recipes against which all other specimens are compared. If a sample displays a difference between the valley of archaeological recovery and valley of source determination, exchange may be inferred.

We added the top-down analysis after preliminary results were shared with the project PI. The PI wanted to know whether specific trade vessels moved across the landscape either by trade or migration of people. The bottom-up approach, while providing more robust chemical groupings, did not provide the resolution necessary to separate certain paste recipes among valleys. Group 2, for example, consists mainly of Fine Wares from several valleys. Ceramics from the different valleys do subtly differentiate among several elemental axes within Group 2, but a more aggressive analytical technique was needed to evaluate exchange. We conducted CDA on the core valley groups and placed non-core specimens into the appropriate groups, or left them unassigned, based on Mahalanobis distance-based probabilities. This approach worked well, but two major caveats must be noted.

Assuming the core valley group to be the only paste recipe used to manufacture pottery in a valley neglects any potential for potters to choose alternate paste recipes among the resources availble locally. Given a variety of local clays, temper, and mixing strategies, would all potters

make the same decisions? Furthermore, this top-down approace assumes that all of the ceramics within a given type category (i.e., Fine, Ordinary, Intermediate) were properly classified. We noticed, for example, that Fine ceramics from the Aconquija Valley mainly fell into Group 2, but a distinct cluster more resembled the Ordinary ceramics from the same valley. We suggest that this may represent inconsistencies in typing the ceramics. Alternatively, reliance on decorative stlye to define types rather than paste characteristics could result in similarly typed pottery made from very different raw material sources. It was necessary to examine interaction according to each type separately because chemical differences between ceramic types are obviousy not necessarily due to exchange but rather differing paste recipes. The PIs simplified the type descriptions at the request of the primary author of this report for these reasons. This simplification may have forced homogeneity where there was none. The project PI's should consider these issues while interpreting the results and consult their detailed ceramic descriptions and petrographic results where appropriate.

BENEFITS OF MULTI-TECHNIQUE ANALYSES

The bulk composition data produced by NAA presents a holistic view of pottery composition. It is the sum of all materials mixed together by the potter (temper, clay, natural inclusions) plus chemical alterations caused by use of the pottery and post-depositional diagenesis. While NAA is the most accurate, precise, and standardized technique to determine the concentration of many elements (Glascock 1992, Neff 2000), the bulk nature of the data provides some limitations. Several studies have shown that significant variation in one component of a ceramic paste (temper, clay, natural inclusions) may be reduced or masked by another (e.g., Cochrane and Neff 2005; Larson et al. 2005; Neff et al. 1988,1989; Stoner and Glascock 2012). In many cases, chemical information on a specific component of the ceramic paste may provide information on potting behavior or provenance that NAA cannot. Using laser ablation as the sample introduction mechanism for ICP-MS allows the analyst to obtain data for specific components of the paste. It is *the most direct method* of characterizing the clay used to produce pottery. Multi-technique analyses almost always produce complementary results and permit more robust arguments.

PART I: BOTTOM-UP INTERPRETATION OF CHEMICAL RESULTS

NAA RESULTS

Figures 1 and 2 show the general structure of the sample of ancient pottery on principal component axes. The figures depict only ancient pottery (n=546), and not any of the experimental pottery or clays submitted for analysis (discussed below).

Formation of Core Reference Groups

A total of seven reference groups appear in the current dataset. Below I summarize each group individually according to the variables that distinguishes it (see Figures 3-10).

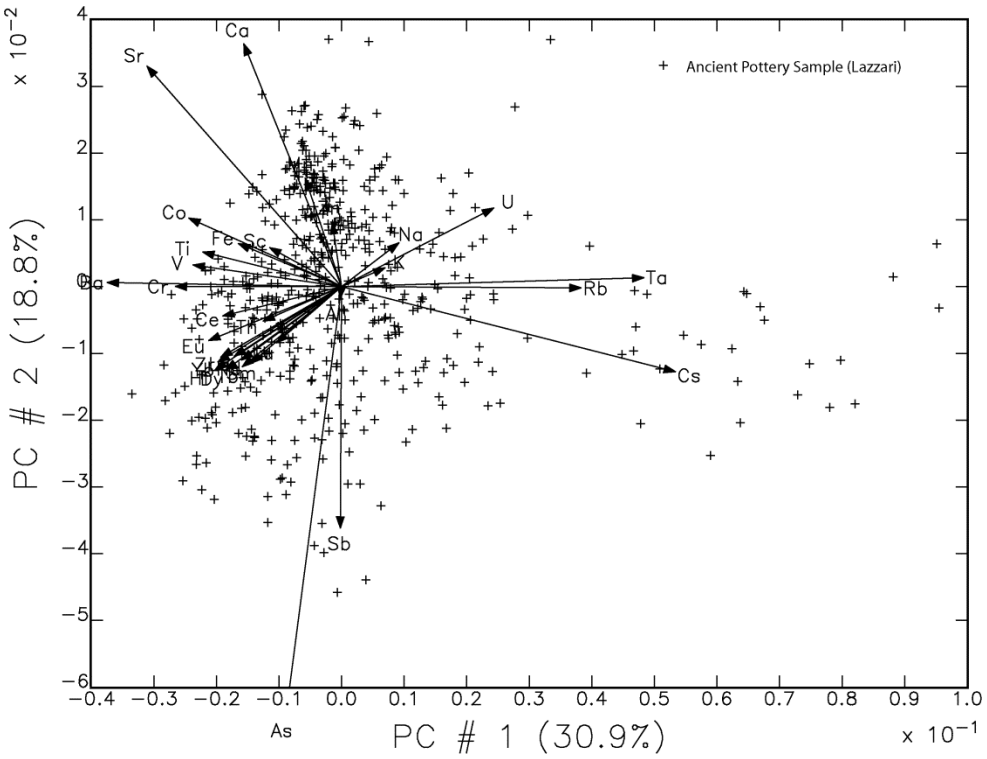

Figure 1. RQ-mode principal component scatterplot of ancient pottery displayed on Components 1 and 2. Element loadings appear as arrows.

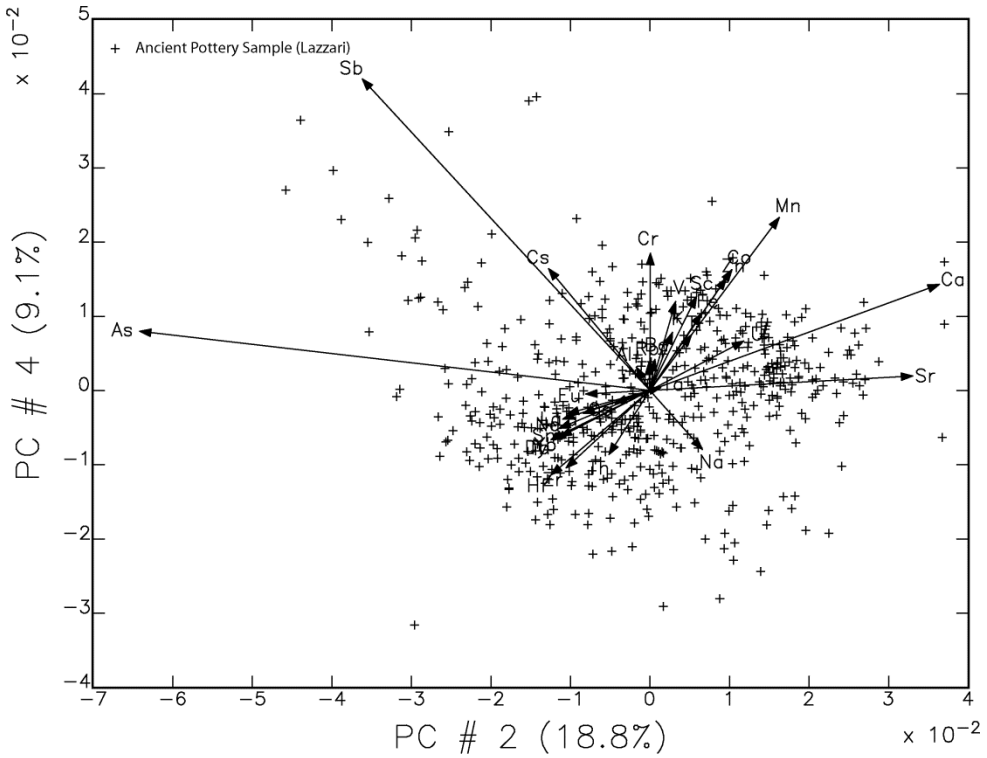

Figure 2. RQ-mode principal component scatterplot of ancient pottery displayed on Components 2 and 4. Element loadings appear as arrows.

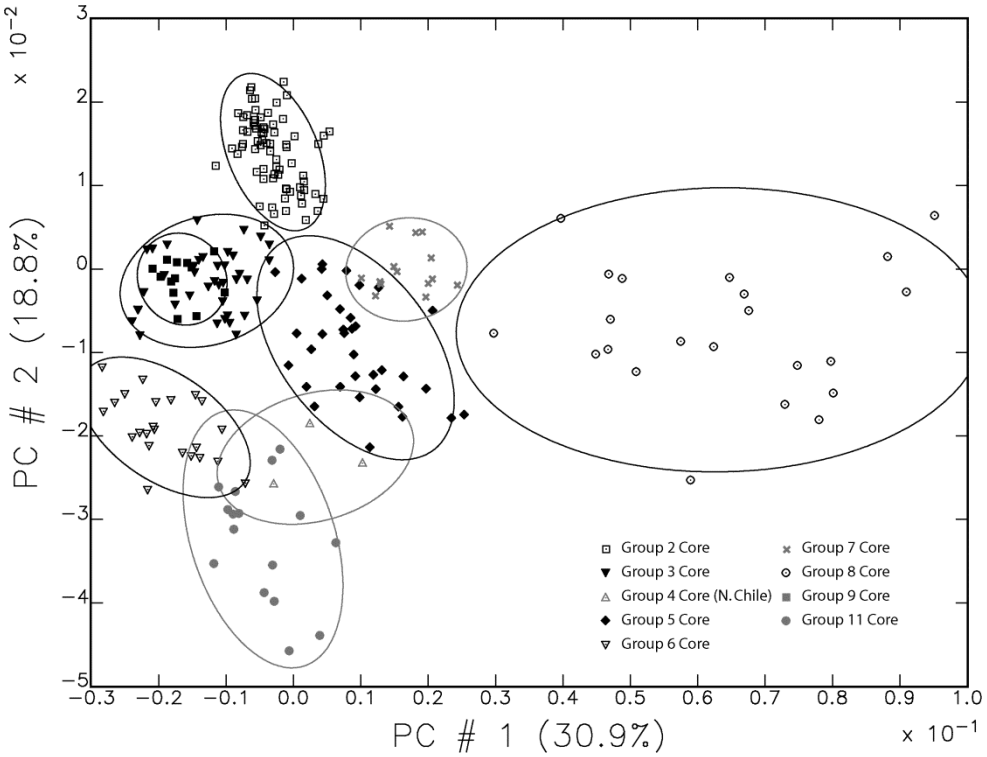

Figure 3. Scatterplot of core chemical groups displayed on Principal Components 1 and 2. Ellipses represent 90-percent confidence intervals of group membership.

Core Group 1 (Ambato) (n=0)

The Ambato reference group was defined by Martin Giesso through a sample of ceramics from the Valley of the same name. Speakman and Glascock (2004) placed two of the Lazzari specimens into the Ambato Group, but upon further inspection, those two specimens may not be good matches with Ambato. The Ambato reference group is chemically similar to Core Group 3 (see below), but tends to be higher in Hf, As, Sb, Sr, Zr, and most rare earth elements. Ambato ceramics are typically low in Rb, Cs, Ta, and Ca. Figure 3 demonstrates the exclusion of samples previously assigned to Ambato (LAZ035 and LAZ079). This result is confirmed by a PCA and Mahalanobis distance-based probabilities. These two groups are very difficult to distinguish, but on average the two specimens previously assigned to Ambato appear to be more chemically similar to Core Group 3. Furthermore, while some specimens within the current sample fall into the chemical range of the Ambato reference group on a few elemental axes, no single specimen consistently plots within the Ambato reference group. Given that the Ambato reference group is very chemically homogeneous and well defined, we are confident that none of the ceramics in the current study were produced in the Ambato Valley. It is clear that there is a chemical difference between Core Group 3 and Ambato that must be further evaluated through future analyses.

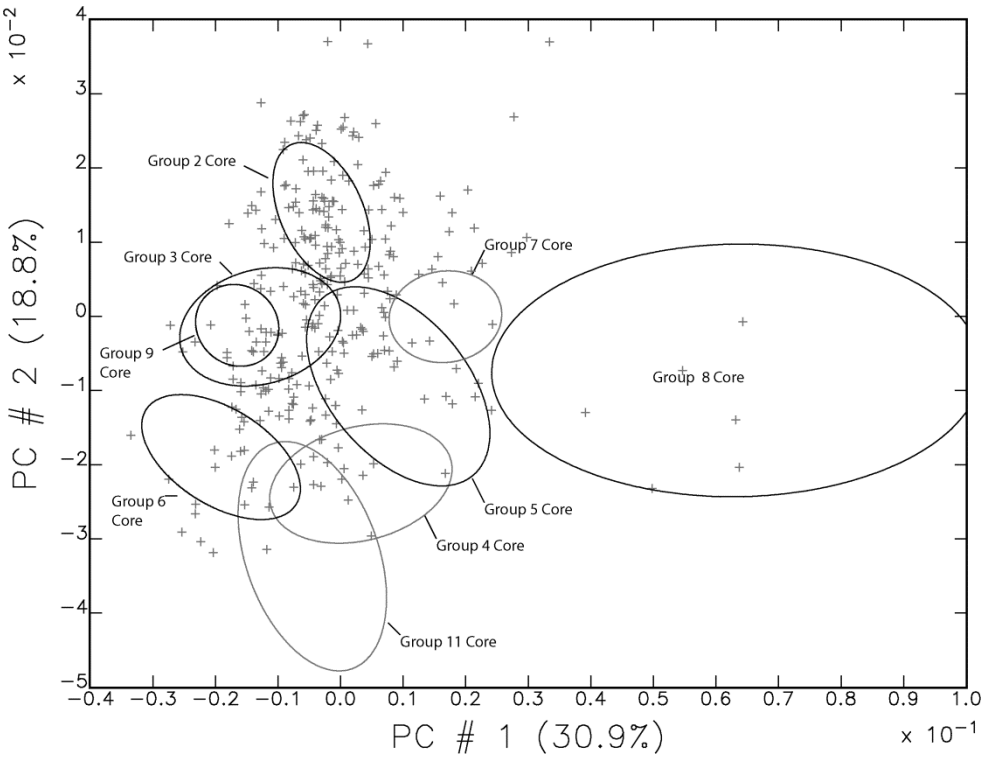

Figure 4. Scatterplot of initially unassigned specimens displayed on Principal Components 1 and 2. Ellipses represent 90-percent confidence intervals of group membership.

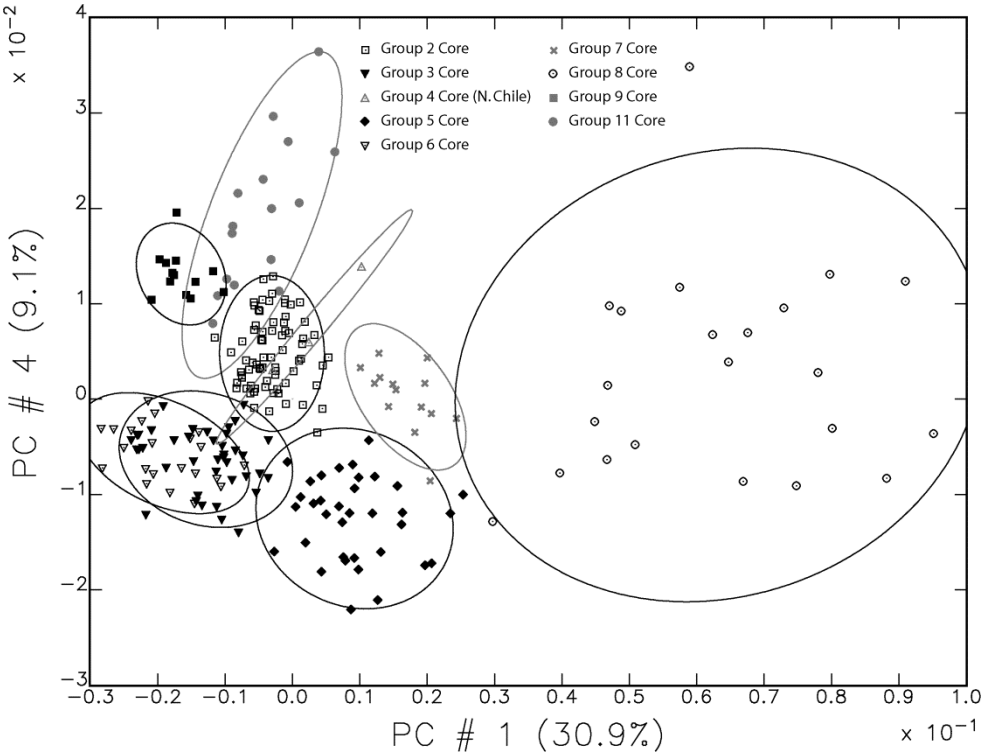

Figure 5. Scatterplot of core chemical groups displayed on Principal Components 1 and 4. Ellipses represent 90-percent confidence intervals of group membership.

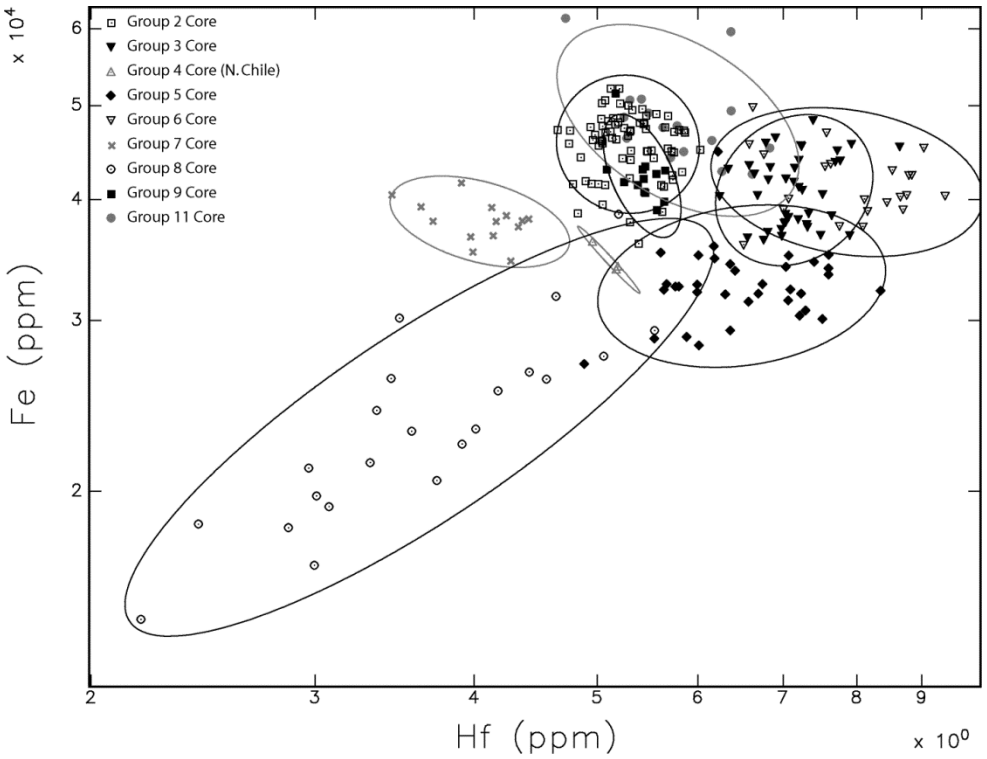

Figure 6. Scatterplot of core chemical groups displayed on logged axes of Hf and Fe. Ellipses represent 90-percent confidence intervals of group membership.

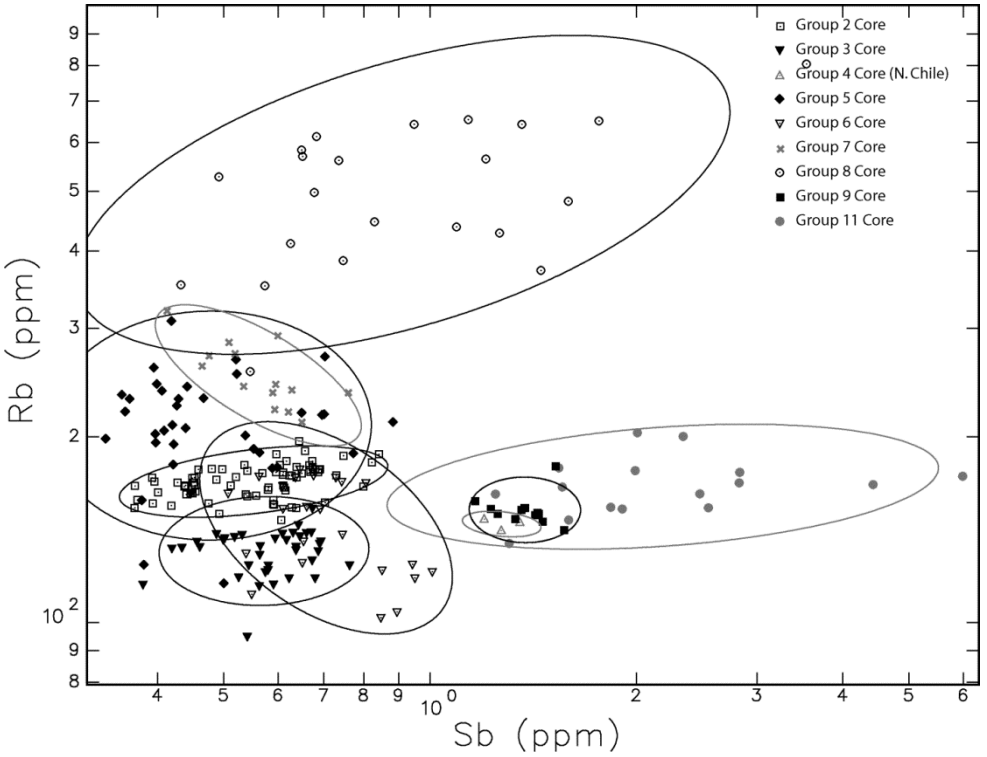

Figure 7. Scatterplot of core chemical groups displayed on logged axes of Sb and Rb. Ellipses represent 90-percent confidence intervals of group membership.

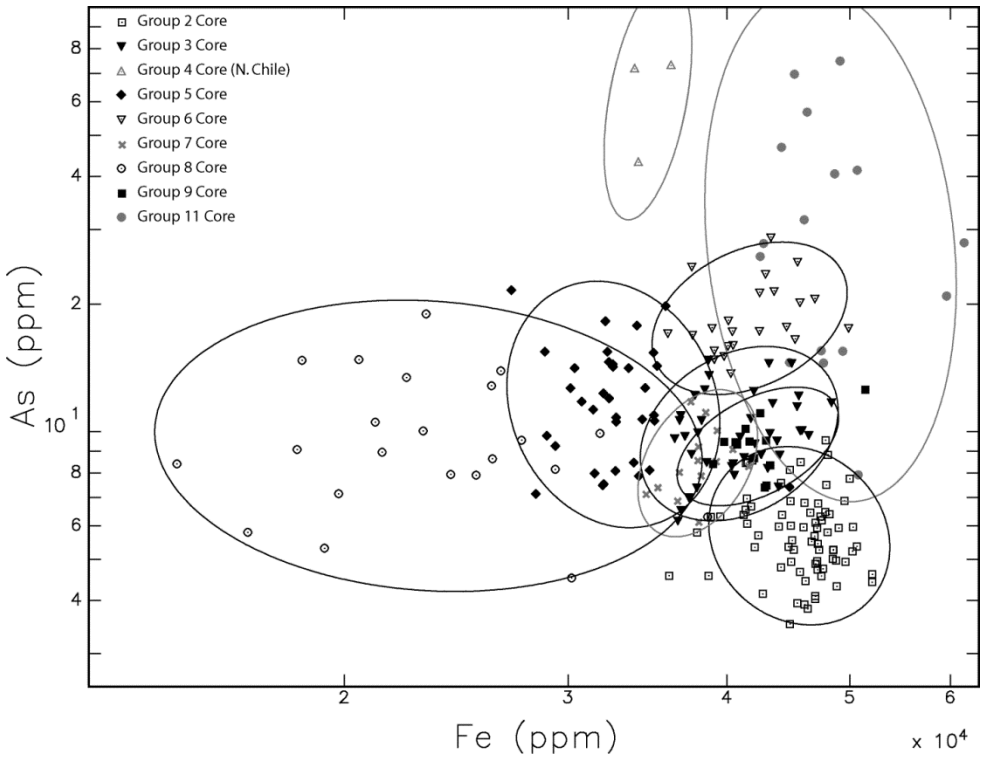

Figure 8. Scatterplot of core chemical groups displayed on logged axes of Fe and As. Ellipses represent 90-percent confidence intervals of group membership.

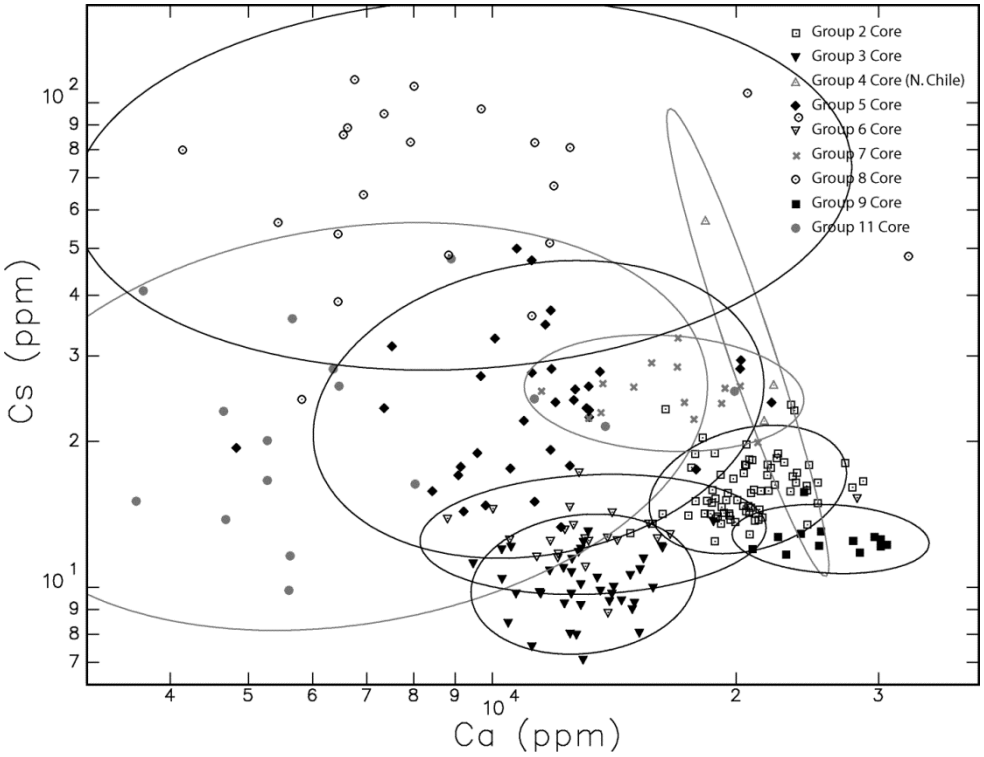

Figure 9. Scatterplot of core chemical groups displayed on logged axes of Ca and Cs. Ellipses represent 90-percent confidence intervals of group membership.

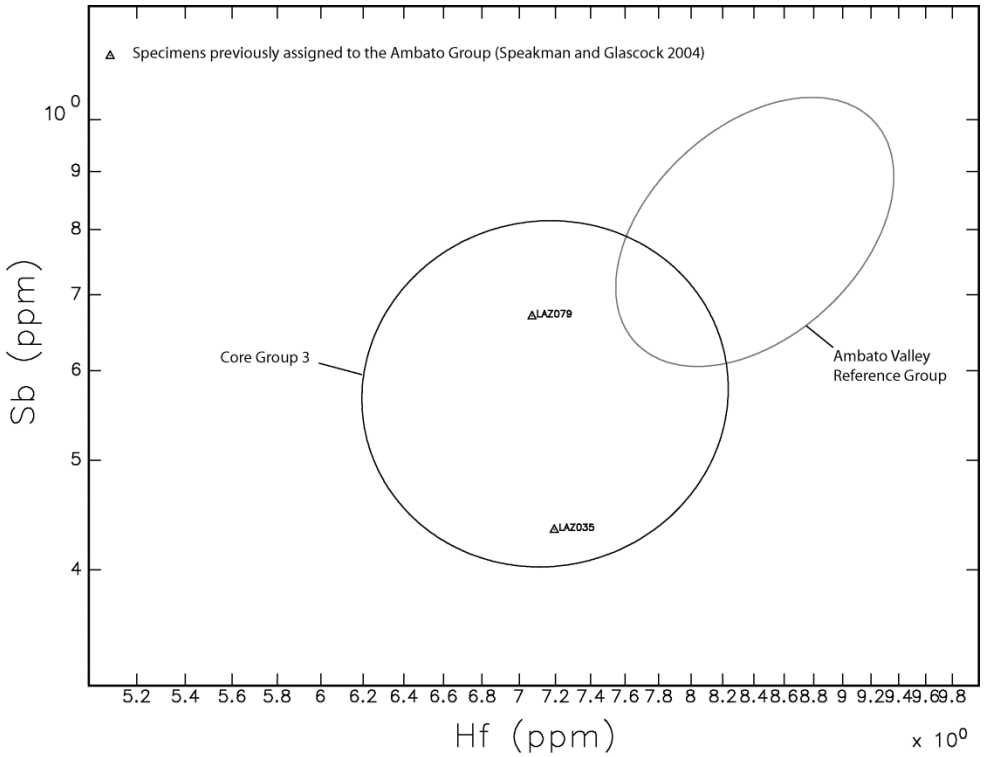

Figure 10. Scatterplot of two samples previously assigned to the Ambato Valley Reference group displayed on logged axes of Hf and Sb. Ellipses represent 90-percent confidence intervals of group membership. This figure shows the separation of these specimens from the Ambato reference group.

Core Group 2^{NAA} (n=73)

Core Group 2 contains the highest number of specimens. In fact, this group formulates the modal chemical composition for the entire sample, with the other groups representing derivations from the norm. Group 2 presents high concentrations among the transition metals (e.g., Fe, Cr, Co, Mn, Zn) and the Alkaline earth metals Ca and Sr. It displays low concentrations of Cs, Rb, As, and Sb and REEs.

Core Group 3^{NAA} (n=39)

Core Group 3 contains among the lowest concentrations of the same elements enriched in Group 8 (Cs, Rb, and Ta), but possesses high values for Hf and Zr. The abundance of these two elements are usually correlated and they are both associated with zircon crystals often found in granites, felsic igneous rocks, and quartz sands. Group 3 is not alone in possessing relatively high Hf and Zr concentrations, but it differs from Groups 5 and 6 based on its relatively low REE concentrations.

Core Group 4^{NAA} (North Chile) (n=3)

A total of four specimens from north Chile were submitted for analysis. Three of these clearly differentiate based on high values for As, Sb, Ba, Ca and Sr, but low values for most REEs and transition metals. These three specimens are clearly different from the samples from northwest Argentina. The fourth specimen is not a good chemical match to any of the groups discussed here, including Group 4.

Core Group 5^{NAA} (n=35)

Core Group 5 discussed in this report replaces the Group 5 defined by Speakman and Glascock (2012). Originally, specimens LAZ074, LAZ100, LAZ102, and LAZ115 made up Group 5, but these four specimens together do not form a chemically coherent group. Furthermore, they are better characterized as chemical outliers of Core Group 2. Currently Group 5 is replaced with specimens that display relatively low values for transition metals (Co, Cr, Fe, Mn, Sc, V, Zn) and Ca, but high concentrations of As, Hf, Ta, and Zr. Core Group 5 is also slightly above average in REE concentrations.

Core Group 6^{NAA} (n=23)

Core Group 6 contains the highest values of Hf, Zr, and most REEs. It also has higher than average levels of transition elements and As. However, Group 6 contains among the lowest values of Cs, Rb, Ta, and U. Defined as such, Group 6 is the chemical opposite to Group 8 in this dataset.

Core Groups 7^{NAA} (n=14) and 8^{NAA} (n=22)

Core Groups 7 and 8 share the same chemical characteristics but differ in the degree of their elemental valuation. Both display elevated levels of Cs, Rb, Ta, and U, but depleted Hf and Zr. They both also contain below average concentrations of the transition metals, with Group 8 representing the extreme low of transition metal concentrations in the sample. Group 8 is characterized by a very large amount of internal chemical variability. Group 8 may therefore be better thought of as chemical outliers to the main sample rather than a cohesive grouping. This pattern may form through post-depositional chemical alteration, but there is currently no way to evaluate this hypothesis. Ions of Cs and Rb readily substitute for one another in the structure of many sheet silicates, which includes clays and micas. In particular, the phyllosilicate lepidolite (of the mica group) is often enriched in both of these elements. If these specimens contain high percentages of mica, this might explain their enrichment in Cs and Rb. During laser ablation, the lead author generally noted a very high percentage of large mica inclusions in many samples. Support for the presence of lepidolite may come in terms of a high percentage of mica in the Group 8 specimens through the petrographic analysis. Such a finding would legitimate Group 8 as a chemically and technologically significant group.

Core Group 9^{NAA} (n=13)

Core Group 9 is small, but chemically coherent and distinct due to its high levels of Ca and Sb. Forshadowing the LA-ICP-MS results, the clays used to produce Core Group 9 ceramics are high in Ca while the temper is high in Sb. All of the specimens in Core Group 9 are of the Vaquerías ware.

Core Group 10^{NAA} (n=0)

Boulanger and Glascock (2010) defined a Group 10 in an earlier analysis (n=12). Only seven of these samples form a coherent chemical group while the remainder is considered for the moment as chemical outliers. The seven that form a coherent cluster are chemically indistinguishable from Core Group 3 and were merged into said group. This change results from the addition of new samples which permitted the better definition of Core Group 3. We currently do not assign any specimens to Core Group 10, but leave the position open in the event that future analyses validate its status as a chemical group.

Core Group 11^{NAA} (n=16)

Core Group 11 is the only group newly created in the current analysis. It consists almost entirely of samples from Quebrada del Toro. Core Group 11 is high in As, Sb, and transition metals, but low in Ca and Sr. As a whole, Group 11 is rather chemically distinct, but it has a lot of internal variation. Sampling more ceramics from Quebrada del Toro in the future may lead to better definition of this group. Not all ceramics from this region fall into Group 11, but most do share its chemical characteristics to some degree.

Unassigned (n=310)

At this stage of analysis, a high proportion of specimens remain purposefully unassigned. While most of these are assigned to macro groups below, it should be noted here that the overwhelming majority of these cluster around Groups 2, 4, and 5. In total 56 percent of all ancient ceramics remain unassigned at this point.

Placement of Unassigned Specimens into Macrogroups

The core reference groups were entered into a canonical discriminant analysis to associate the unassigned samples with the best core group (Figures 11 and 12). Probability of group membership is calculated from Mahalanobis distance-based probabilities of the first 5 discriminant functions, explaining over 95 percent of the variability in the sample. The resultant group formations are called “macrogroups” (expressed as MG#) because they project the best group assignment even if the probability of membership is relatively low. Because the

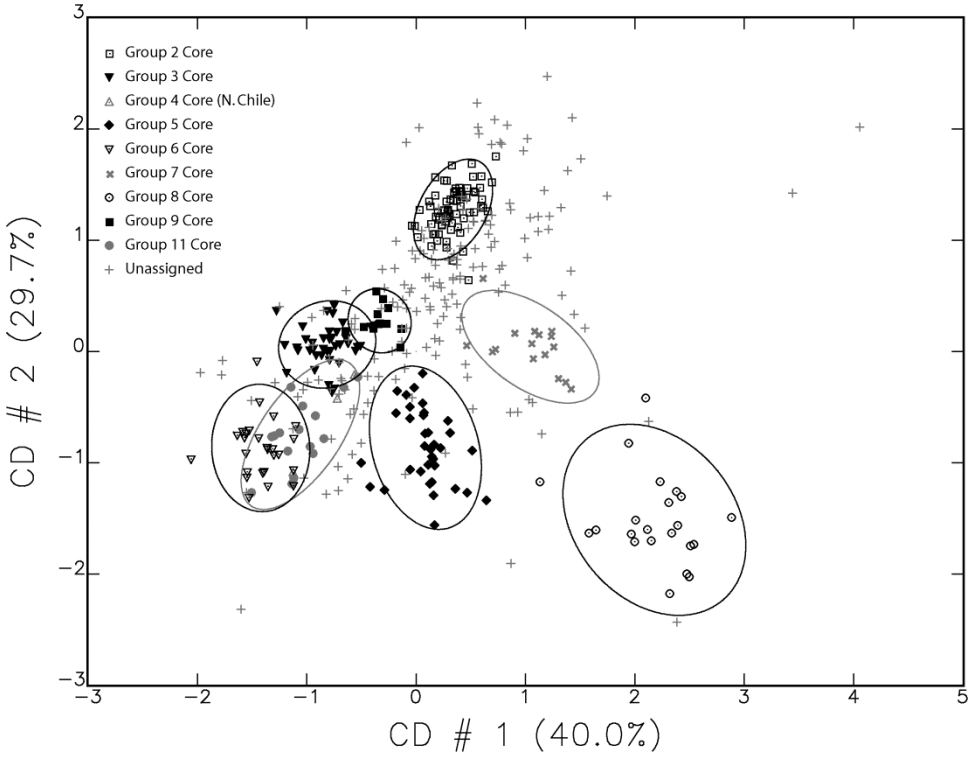

Figure 11. Scatterplot of core reference groups on Canonical Discriminant Functions 1 and 2. Ellipses represent 90-percent confidence intervals of group membership. Unassigned specimens cluster around Groups 2, 3 and 7.

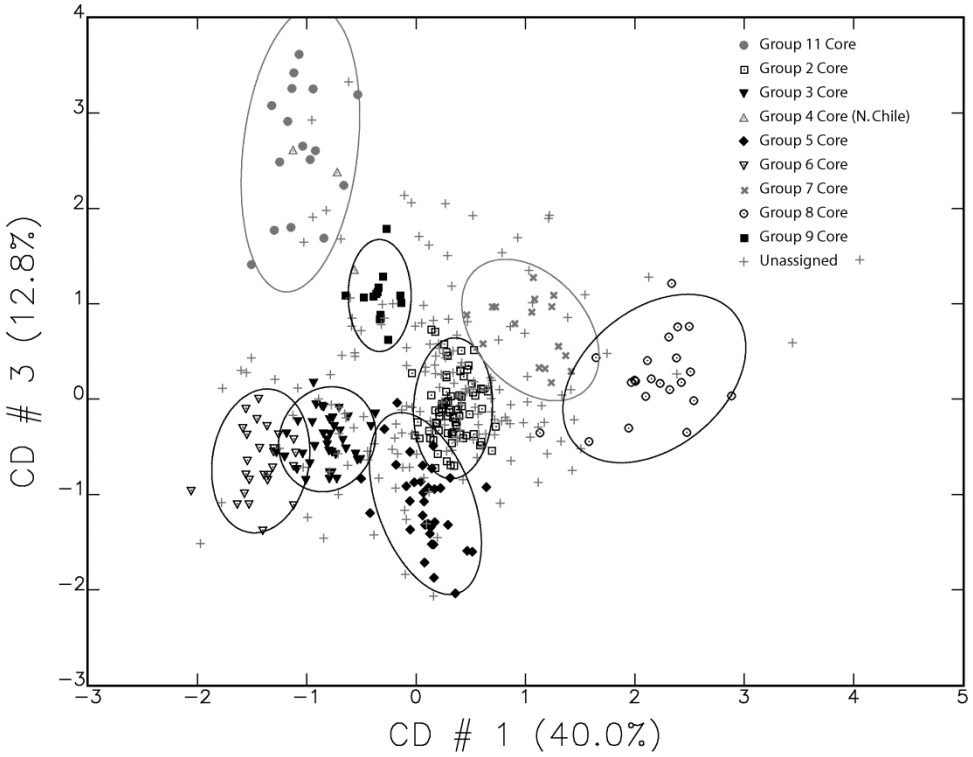

Figure 12. Scatterplot of core reference groups on Canonical Discriminant Functions 1 and 3. Ellipses represent 90-percent confidence intervals of group membership.

Table 2. Cross-tabulation of group assignments within the Lazzari pottery sample over time.

Current Assignments	Old Assignments from Speakman and Glascock (2004) and Boulanger and Glascock (2010)											
	Ambato	*G2*	*G3*	*G4*	*G5*	*G6*	*G7*	*G8*	*G9*	*G10*	*UNAS*	*Total*
MG2		57			1		12		5		92	167
MG3	2	1	6						1		42	52
MG4				3								3
MG5			17				1				42	60
MG6						17					22	39
MG7			1				5			9	20	35
MG8								3		1	20	24
MG9		3							6		7	16
MG11									1		23	24
UNAS		3	19	1	3	3	1		5	2	89	126
Total	2	64	43	4	4	20	19	3	18	12	358	546

chemical separation of groups will likely continue to blur with the addition of more samples from the region, future analyses must maintain the *core* reference groups as those whose members possess a very high probability of group membership. After forming macrogroups, we make final adjustments to the resultant group structure using PCA, HCA, and inspection of elemental concentrations. Table 2 compares the current group assignments to those constructed by Speakman and Glascock (2004) and Boulanger and Glascock (2010), and Table 3 shows the final macrogroup structure. Probabilities of group membership are included in Appendix A.

The current assignments accord fairly well with the group structure identified through previous analyses (see Table 2). MG2, 4, 6, and 8 agree strongly across the different analyses. As mentioned above, the two specimens previously included into the Ambato Reference group actually fall in to MG3. Old Group 3 defined by Speakman and Glascock (2004) was divided and most specimens were moved to MG5. Old Group 5, which previously consisted only of four outlier specimens, was completely redefined in the current study. Old Group 7 specimens were split up primarily into MG2 and MG7. Old Group 9 was also split up. Most of the Vaquerías wares remained in MG9 because this ware consistently demonstrates rather distinct chemistries in the sample. Those that did not fit with the major cluster of Vaquerías ceramics resembled the MG2 Fine Wares. This issue is clarified with the LA-ICP-MS discussion below. Old Group 10 really did not hold together as a robust chemical group with the addition of the new samples, so we reassigned those specimens. However, we left the "Group 10" category open.

BREAKDOWN OF GROUP ASSIGNMENTS ACCORDING TO VALLEY AND CERAMIC TYPE

Perhaps the most important part of the current analysis involves the examination of the composition of chemical groups in terms of their archaeological provenience and typological style (see Table 3). Archaeological provenience refers to the regions and sites where the ceramics were collected. In economic terms, this is the context of consumption, but not necessarily the context of production. Ceramics produced elsewhere may have been traded into the context of consumption or perhaps they traveled with migrating human groups. Contrasting chemical composition with archaeological provenience is, of course, one method used to

Table 3. Cross-tabulation of group assignments versus ceramic type and major region of collection.

TYPE	VALLEY	MG2	MG3	MG4	MG5	MG6	MG7	MG8	MG9	MG11	UNAS	Total
Condorhuasi	Aconquija	2	4		1						5	12
	Cajón Valley		1									1
	Campo del Pucará		2		2			1			2	7
Cienaga	Aconquija	1			1		2					4
Allpatauca	Aconquija				2						3	5
	Campo del Pucará										1	1
Ordinary	Aconquija	2	4		32	3		8			6	55
	Cajón Valley	1	5		1	15		1		1	10	34
	El Bolsón Valley		3		2	1	7	4			9	26
	Santa María Valley	7	14		1	11				1	12	46
	Campo del Pucará		9		3		1	5			6	24
	Quebrada del Toro									6		6
Río Diablo	Aconquija	1										1
	Cajón Valley				1						2	3
	Campo del Pucará									1	1	2
Baño Blanco	Aconquija	3										3
	Cajón Valley	2									1	3
	Santa María Valley	2									1	3
Famabalasto	Aconquija	1										1
	Cajón Valley	1										1
Aguada	Aconquija	2										2
	El Bolsón Valley	3										3
	Santa María Valley	4					1				1	6
	Hualfín Valley	3					1				1	5
Vaquerias	Cajón Valley	2							12		5	19
	El Bolsón Valley	1										1
	Lerma Valley								1			1
	Santa María Valley	1							2	1		4
	Quebrada del Toro								1	2	3	6
San Pedro	North Chile			3							1	4
	Quebrada del Toro									1	2	3
Candelaria III	Santa María Valley		1									1
	Quebrada del Toro									1		1
Intermediate	Aconquija										1	1
	Cajón Valley	1				4					1	6
	El Bolsón Valley		1									1
	Santa María Valley	1				1					1	3
	Campo del Pucará							1			1	2
Tosco	Cajón Valley					1						1
Fine Wares	Aconquija	42	2		6		10	3			13	76
	Cajón Valley	16	2		1	2	1			1	15	38
	El Bolsón Valley	5	1		1		1	1			3	12
	North Calchaquí Valley									1		1
	Santa María Valley	48	1			1					5	55
	Hualfín Valley	15			1		7				2	25
	Campo del Pucará		2		5		4				8	19
	Quebrada del Toro									8	4	12
Total		167	52	3	60	39	35	24	16	24	126	546

reconstruct exchange. Typological style is a somewhat subjective assessment that depends on inspection of technological and stylistic characteristics of the pottery in question. We use type categories provided by Marisa Lazzari. It is not expected that types will exhibit a perfect correlation with the chemical groups defined above. Lack of correlation may derive from variability in the paste recipes used to make a particular ceramic type or miscategorization of types, which happens even with the most formalized typologies. At issue is the traits used to type ceramics. If decorative style takes precedence, variation in paste recipe among ceramics decorated in the same way will yield chemical variation within types. If technological attributes

(temper, paste texture, porosity, natural inclusions, aplastic grain size) are the primary variables of type definition, type categories should correlate well with chemical groups.

Fine Wares (n=238)

All fine paste wares of different colors were grouped together because color (black, buff, red, and grey) made no detectable difference in their chemical compositions. Adjusting the firing atmosphere can produce a wide range of colors in chemically identical clays.

The overwhelming majority of fine paste ceramics fall within MG2 (76 percent of all assigned fine wares) (Figure 13; see also Table 3). Many of the unassigned specimens are also chemically similar to MG2. In general, the fine paste ceramics exhibit much less chemical variability than most of the other ceramic types. Higher chemical variability among coarser ceramics results from the addition of temper. LA-ICP-MS of temper grains and other aplastics for a sub-sample of ceramics displays greatly variable compositions in all ceramic types except the Vaquerías ware (discussed below). The remaining 24 percent of assigned fine paste ceramics fell into MG3, 5, 6, 7, 8, and 11. This variability of assignments likely reflects variation in the amount and type of aplastic inclusions naturally occurring in the clays or added as temper. The petrographic analysis should illuminate this phenomenon.

Fine paste ceramics from most valleys fit within MG2, though there are some exceptions. None of the fine paste ceramics sampled from Campo del Pucará or Quebrada del Toro were assigned to this group. Campo del Pucará fine wares are chemically similar to MG3, 5, and 7. Groups 3 and 5 are typically dominated by ordinary ceramics. This may suggest that the "fine paste" ceramics from Campo del Pucará have more aplastic inclusions than any of the other valleys. The same might be said of fine paste ceramics from other valleys that resemble the chemistry of MG3 and 5. MG7, though, appears to be an alternative chemical assignment primarily for fine paste ceramics. MG7 comprises mostly Fine Wares from Aconquija, Hualfín, and Campo del Pucará. Many of the Fine Wares from Quebrada del Toro formed their own distinctive MG11.

Witihn MG2, there is a subtle gradation among the chemistries of ceramics from different valleys. Unfortunately these chemical differences are not distinct enough to aid sourcing, but it may become significant with the addition of future analyses. Fine paste ceramics from the Hualfín Valley tend to be slightly lower in transition metal concentrations, particularly Cr, but slightly higher in U, Rb, Cs, Na, Ca, Th, and As. Those from Campo del Pucará and Quebrada del Toro are higher in Hf concentrations. Note that many of the ceramics from the aforementioned regions were not assigned to MG2 for these reasons. Nevertheless, these patterns may help to isolate production regions in the future (see Part II of the analysis below).

Fine Ware-Like Ceramics (n=33)

Here I group several categories of ceramics together that are *chemically* similar to the fine wares discussed above (Figure 14). These include Aguada, Baño Blanco, Famabalasto, and Río Diablo. Eighty-five percent of these ceramic types that have been assigned belong to MG2. A minority (n=4) was assigned to other groups, and several remain unassigned (n=7).

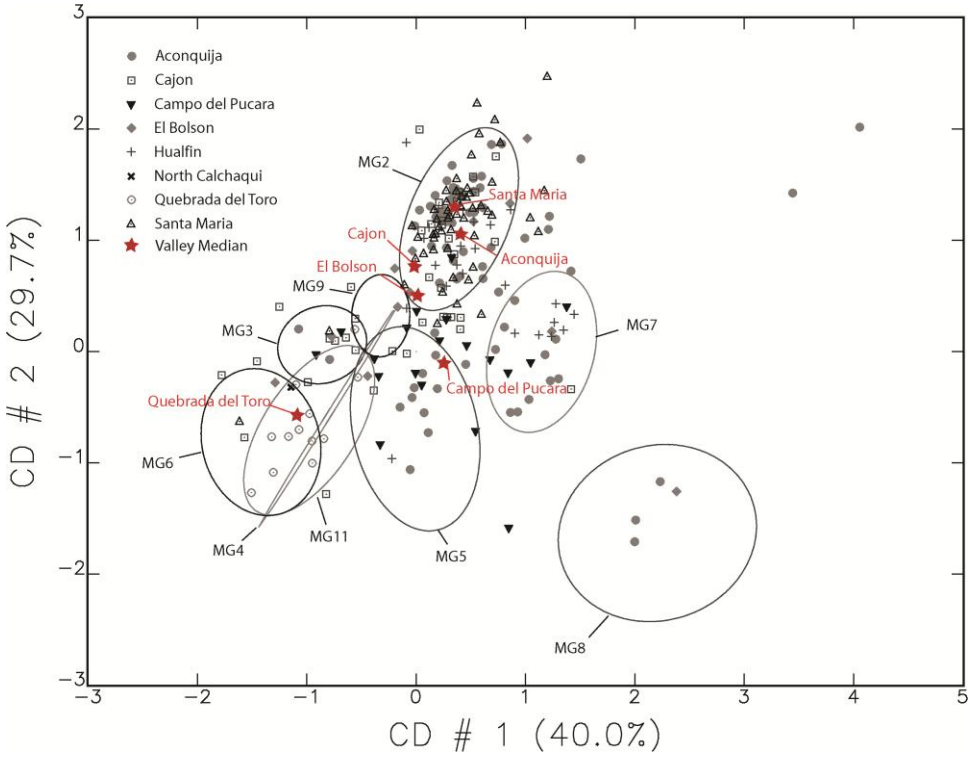

Figure 13. Scatterplot of fine wares projected according to valley on Canonical Discriminant Functions 1 and 2. Ellipses represent 90-percent confidence intervals of group membership. Red stars indicate the valley median for fine wares.

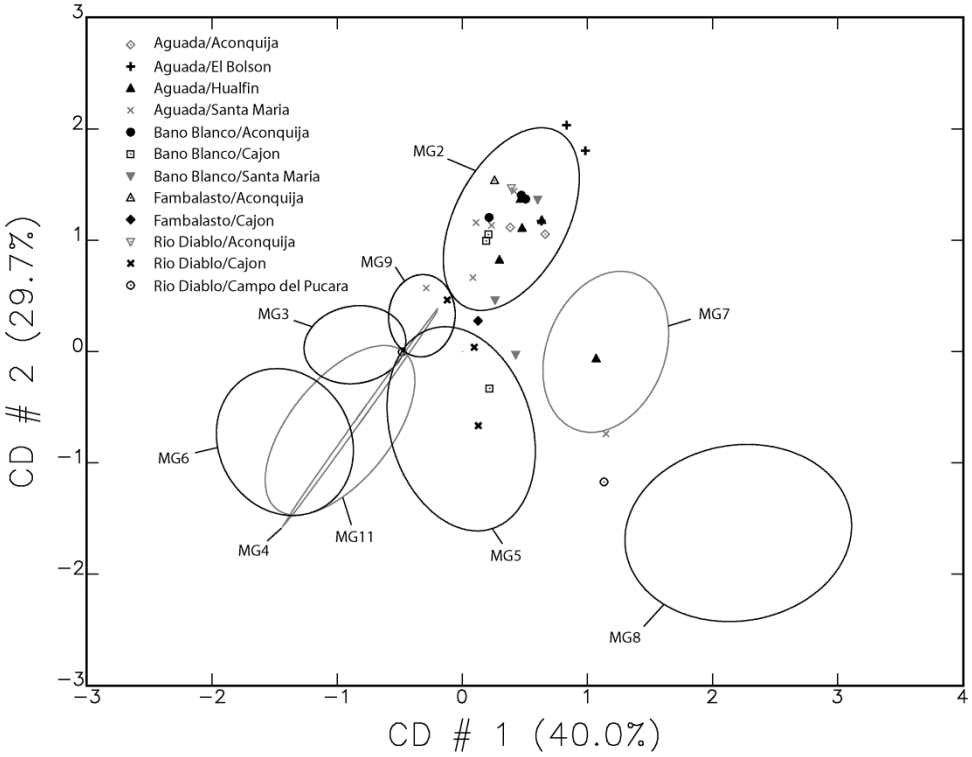

Figure 14. Scatterplot of fine ware-like ceramics projected according to valley on Canonical Discriminant Functions 1 and 2. Ellipses represent 90-percent confidence intervals of group membership.

Ordinary Wares (n=191)

Ordinary Wares, because of their more heterogeneous paste recipes, fall into a number of chemical groups, including MG3, 5, 6, 8, and a minority of specimens in others (Figures 15 and 16; see also Table 3). MG3 contains specimens from all regions except Quebrada del Toro. Group 5 is dominated by ordinary ware ceramics from the Aconquija Valley and a minority of others. It is possible that the Aconquija ordinary ceramics were more lightly tempered than those from other valleys. Notice that a number of fine paste ceramics from the same region were placed into MG5. Perhaps the typological division between fine paste and ordinary ceramics from Aconquija is more of a gradient with no hard line division. MG6 is dominated by ordinary ceramics from the Cajón and Santa María valleys. MG8 is the most distinctive group in the sample. It comprises ceramics mostly from Campo del Pucará, El Bolsón, and Aconquija. Given the relatively high levels of Cs and Rb in this group, elements typically found in some micas, we suggest that either they may contain a large percentage of mica in the paste recipe.

Most ordinary wares from Aconquija clearly differ from those of other regions. Cajón and Santa María ordinary wares share similar chemistries and cluster in MG3 and 6, suggesting that these chemical groups are likely subvariants of the same paste recipe. Fifty-six percent of the ceramics, in general, of MG6 come from the Cajón Valley. While this could suggest that the Cajón Valley was the source of this chemical group, it is more likely that multiple valleys employed a similar paste recipe with similar materials. Campo del Pucará contains no ordinary ceramics of MG6, but a significant number of specimens were assigned to MG8. Seventy-five percent of all MG8 ceramics are ordinary ceramics from three valleys: Aconquija, El Bolsón, and Campo del Pucará. The remaining 25 percent is made up of different ceramic types from the same valleys (with one exception from the Cajón Valley). Ordinary ceramics from El Bolsón are distributed among several compositional groups, which probably reflects the fact that sediment from most of the valleys in the region drain into this basin. The principal assignment of the El Bolsón ordinary ceramics is MG7. MG7 contains primarily fine paste ceramics, so those ordinary ceramics from El Bolsón may be relatively lightly tempered. Finally, the ordinary ceramics from Quebrada del Toro *all* fall into MG11.

Condorhuasi, Vaquerías, and Intermediate Wares (n=64)

Vaquerías ware is one of the most chemically-distinct ceramics in the sample. The temper, which is unique to the Vaquerías ware, is high in Sb (Figure 17; see also Table 3). The clays, as we demonstrate among the LA-ICP-MS data, are high in Ca. The majority of the Vaquerías ceramics form a tight cluster within MG9. These are all thought to pertain to a single geographic and/or production source in the Lerma Valley (Lazzari personal communication 2012). The only Vaquerías specimen from the Lerma Valley in the current sample falls into MG9, but more from the Lerma Vally should be sampled in the future to confirm this pattern. Most of the Vaquerías ceramics from the Cajón and Santa María valleys, and one (possibly two) from Quebrada del Toro, fall into MG9. Also interesting are the Vaquerías *style* ceramics that do not resemble the MG9 chemistry. A minority of this ceramic type sampled from all valleys except Lerma displays ceramic compositions that fit within the chemical range that appears *local* for the area where

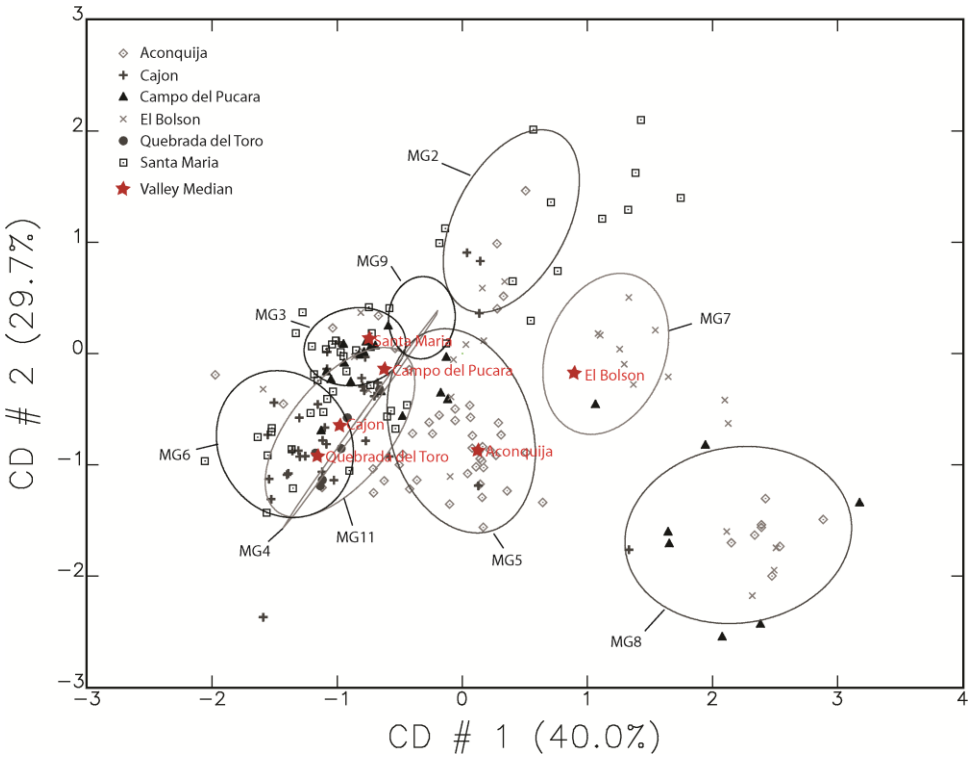

Figure 15. Scatterplot of ordinary ceramics projected according to valley on Canonical Discriminant Functions 1 and 2. Ellipses represent 90-percent confidence intervals of group membership. Red stars indicate the valley median for ordinary wares.

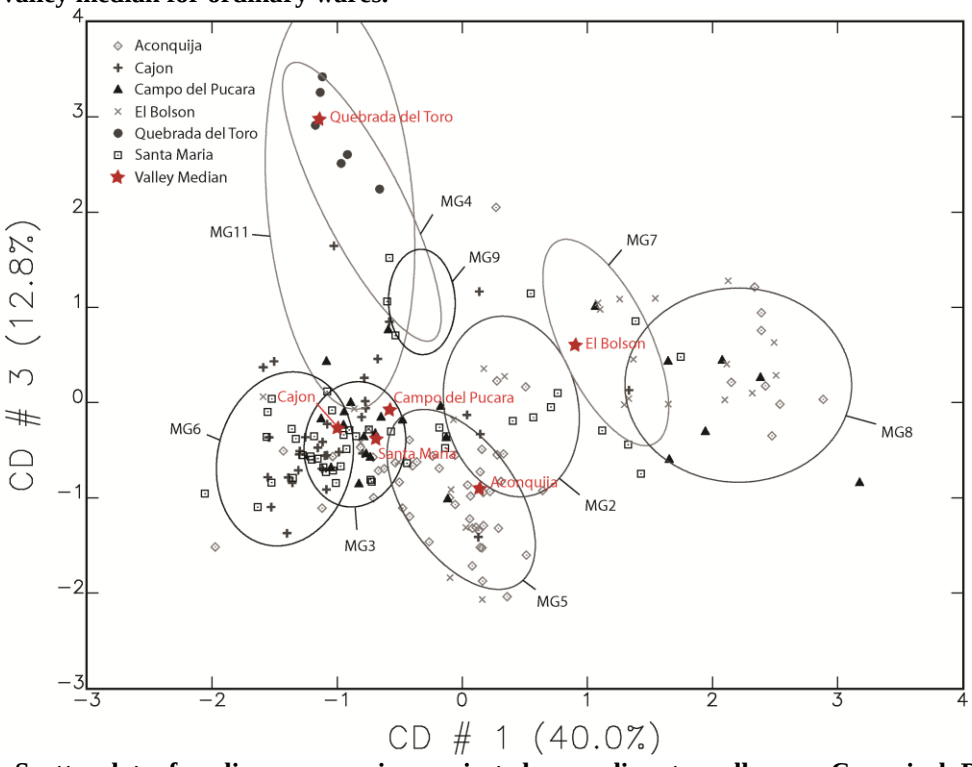

Figure 16. Scatterplot of ordinary ceramics projected according to valley on Canonical Discriminant Functions 1 and 3. Ellipses represent 90-percent confidence intervals of group membership. Red stars indicate the valley median for ordinary wares.

they were collected. These patterns represent two distinct production and exchange networks: one involves direct procurement from the Lerma Valley, the other is local production of imitation Vaquerías pottery.

Condorhuasi ceramics are not as chemically homogeneous (Figure 17; see also Table 3). The temper and natural aplastic inclusions of the Condorhuasi ware displays much more chemical variability than that used for the Vaquerías ware (see below). This ware was assigned to primarily to two groups, MG3 and MG5, the same two groups that contain most of the ordinary ware. This would imply that the paste recipes of Condorhuasi and ordinary wares are similar while the decoration and surface treatments permits the visual difference to assign them to distinct ceramic types. Two Condorhuasi ceramics from Aconquija are assigned to MG2, which consists primarily of fine paste wares. These two specimens are probably more lightly tempered than the average for Condorhuasi ceramics.

The intermediate ceramics are too few to identify any significant patterns (Figure 17; see also Table 3). They generally appear to be very diverse chemically, which suggests a lot of variability in production recipe.

Minor Ceramic Types

Several minor types were submitted for analysis (Figures 18 and 19; see also Table 3). Allpatuaca ceramics from Aconquija and Campo del Pucará tend to cluster around Group 5. Cienaga samples from Aconquija are rather chemically diverse, but 3 out of 4 fall into groups typically populated by fine paste wares. Candelaria III ceramics appear chemically similar to other ceramics from the same valleys, which suggest that they are locally produced. Most San Pedro ceramics are very distinct from the remainder of the sample. Three of the San Pedro ceramics from North Chile form MG4, but the fourth actually appears more like ceramics from Argentina. Two of the San Pedro ceramics from Quebrada del Toro (unassigned in the final group assessment) are very similar to those from North Chile. They might not come from the same production source, but it is likely that these two were imported from Chile. The third San Pedro ceramic from Quebrada del Toro appears to be a local imitation. The only Tosco ceramics is assigned to MG6.

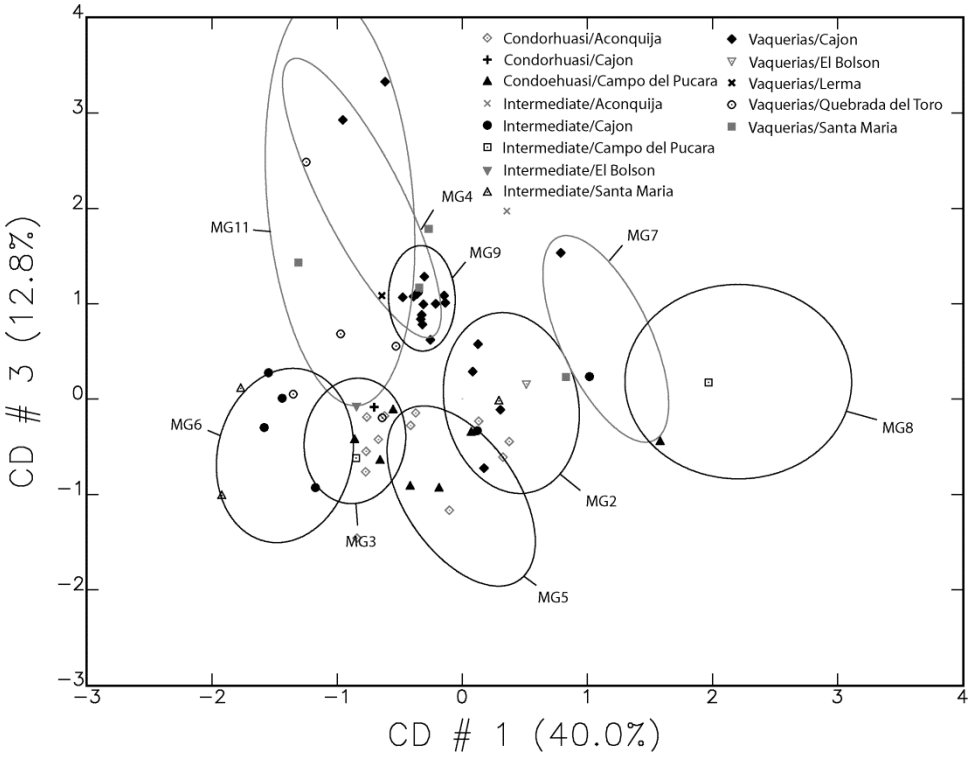

Figure 17. Scatterplot of Condorhuasi, Vaquerías, and intermediate ceramics projected according to valley on Canonical Discriminant Functions 1 and 3. Ellipses represent 90-percent confidence intervals of group membership.

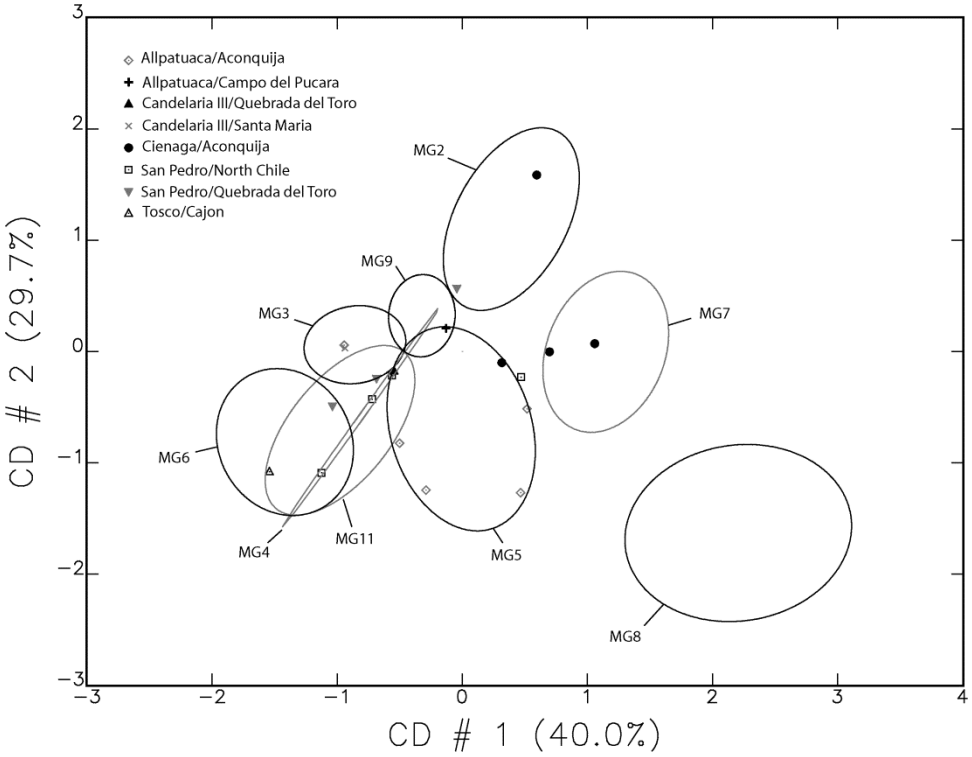

Figure 18. Scatterplot of minor ceramic types ceramics projected according to valley on Canonical Discriminant Functions 1 and 2. Ellipses represent 90-percent confidence intervals of group membership.

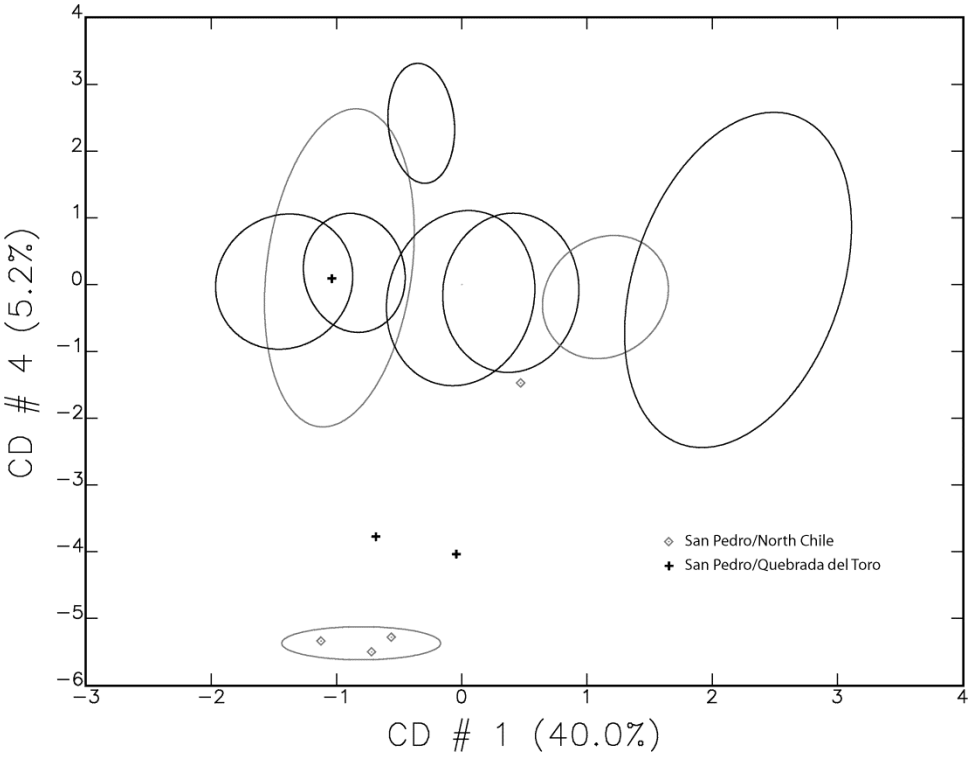

Figure 19. Scatterplot of minor ceramic types projected according to valley on Canonical Discriminant Functions 1 and 4. Ellipses represent 90-percent confidence intervals of group membership.

LA-ICP-MS RESULTS

The LA-ICP-MS results largely confirm the NAA results, but provide additional interpretive advantages. Most importantly, it provides chemical data on the clay, temper, and pigment fractions separately.

The LA-ICP-MS data measure something different than the bulk NAA data. While the bulk data consider the clay, temper, and inclusions all mixed together, the LA-ICP-MS targets specific components individuals. Therefore, we cannot use the same group designations as the NAA data. Instead, we opt to use letters for groups here.

Clay Fraction

The clay fraction of the subsample (n=74) displays three distinct chemistries (Table 4 and Figures 20-25). Groups formed through ICP carry the superscript ^{ICP}.

Group A^{ICP}

Group A^{ICP} separates based on relatively high levels of Ca and Sr, but low concentrations of Cs, Ta, Rb. Rare earth and transition metal levels are intermediate. Group A^{ICP} clays contain about 2 percent more Ca than the other clays, suggesting that it may be composed of a different type of

clay mineral. All of the ceramics in Group A^{ICP} are of the Vaquerías ware. Moreover, the majority of all Vaquerías ware in the sample was assigned to Group A^{ICP}. Those Vaquerías ceramics from Quebrada del Toro and the Cajón Valley assigned to other groups are likely imitations of the Vaquerías *style* using local paste recipes.

Group B^{ICP}

Group B^{ICP} is lower in almost all of the elements measured relative to the other three groups. The only two elements that display higher than average concentrations in Group B^{ICP} are Si and Ti. Silicon within this group, in particular, is between 1-4 percent higher than all other groups. This might indicate a higher proportion of quartz (SiO_2) finely divided into the clay matrix, suggesting use of a quartz-laden clay. The higher Si could account for the lower concentrations of other elements through dilution. Ninety-three percent of the Condorhuasi ceramics in the LA-ICP-MS sample resemble Group B^{ICP}. The remaining one Condorhuasi specimen is unassigned. Group B^{ICP} contains a minority of other ceramic types as well. The second most frequent type is Vaquerías. As mentioned above, the Vaquerías ceramics from Quebrada del Toro and the Cajón Valley represents stylistic emulation of the ware but local production.

Table 4. Clay fraction data (LA-ICP-MS) cross-tabulated according to valley and ceramic type designations within chemical group assignments.

ICP Group	*Valley*	*Baño Blanco*	*Condorhuasi*	*Fine Ware*	*Intermediate*	*Ordinary*	*Vaquerías*	*Total*
Group A	Cajón Valley						11	**11**
n=15	Lerma Valley						1	**1**
	Quebrada del Toro						1	**1**
	Santa María Valley						2	**2**
Group B	Aconquija		9			1		**10**
n=22	Cajón Valley	1				1	3	**5**
	Campo del Pucará		4					**4**
	El Bolsón Valley					1		**1**
	Quebrada del Toro						2	**2**
Group C	Aconquija					10		**10**
n=24	Cajón Valley					2		**2**
	Santa María Valley				2	10		**12**
Group D n=5	Quebrada del Toro			1		4		**5**
Unassigned	Cajón Valley			1				**1**
n=8	Campo del Pucará		1					**1**
	Quebrada del Toro					1	3	**4**
	Santa María Valley					2		**2**
Total		**1**	**14**	**2**	**2**	**32**	**23**	**74**

Group C^{ICP}

Group C^{ICP} exhibits high REE concentrations, particularly Eu and Sm. It also displays above average transition metal (particularly Ni) and As concentrations. As for the major composition of the clays, Group C^{ICP} contains the lowest Si concentrations and the highest Al concentrations. It is possible that the clays used to produce these ceramics contained either gibbsite or kaolinite minerals, which both carry Al^{+3} cations (as opposed to Fe or Mg, for example) in their octahedral layers. Group C^{ICP} contained 69 percent of all the ordinary wares and all of the intermediate wares (see Table 4). No other ceramic types fit chemically within this group.

Group D^{ICP}

Group D^{ICP} contains only 5 sherds, all of which are from Quebrada del Toro. This group is similar to the ceramics from North Chile in that they are high in As.

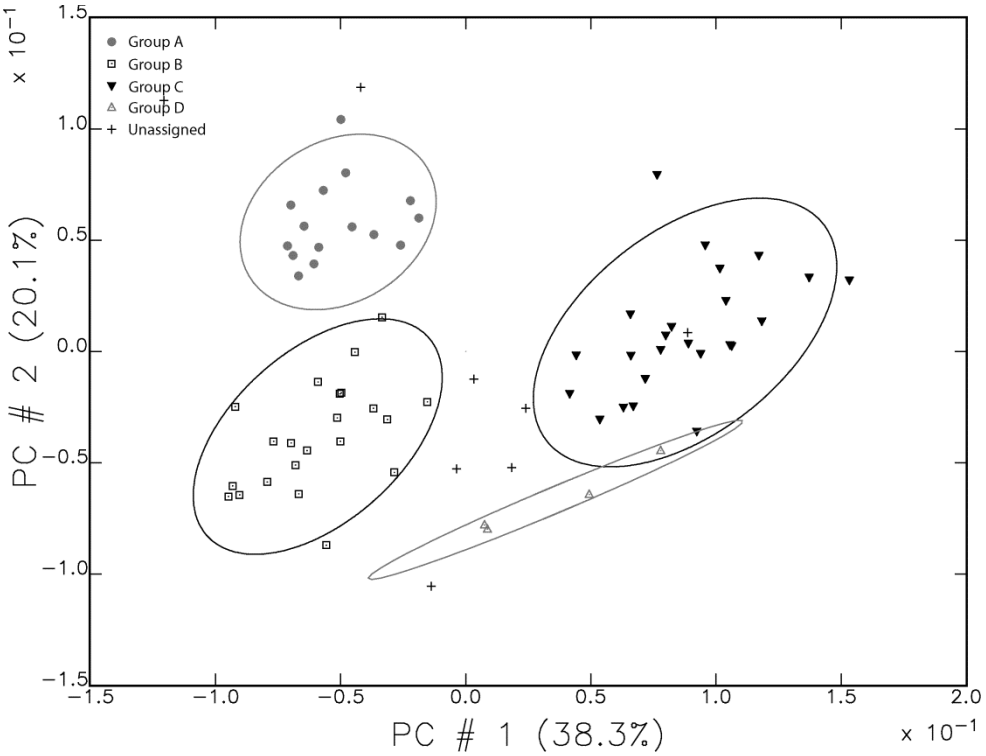

Figure 20. Scatterplot of clay fraction groups determined through LA-ICP-MS projected on Principal Components 1 and 2. Ellipses represent 90-percent confidence intervals of group membership.

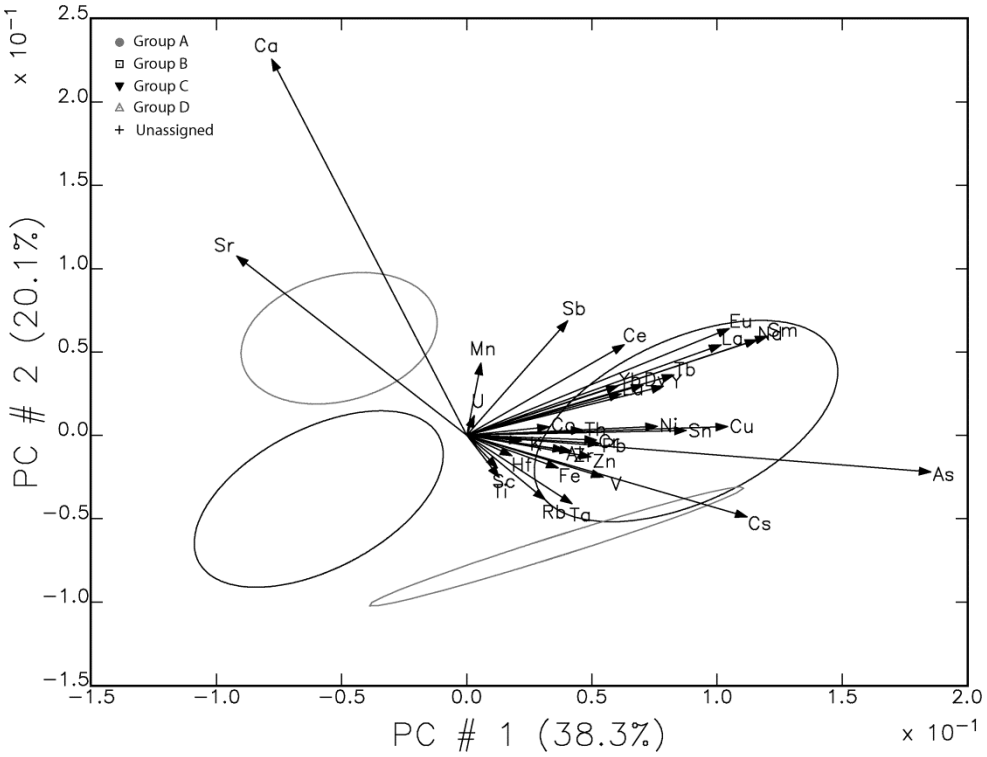

Figure 21. RQ-mode scatterplot of minor ceramic types ceramics projected according to valley on Principal Components 1 and 2. Ellipses represent 90-percent confidence intervals of group membership. Arrows represent elemental loadings on principal components.

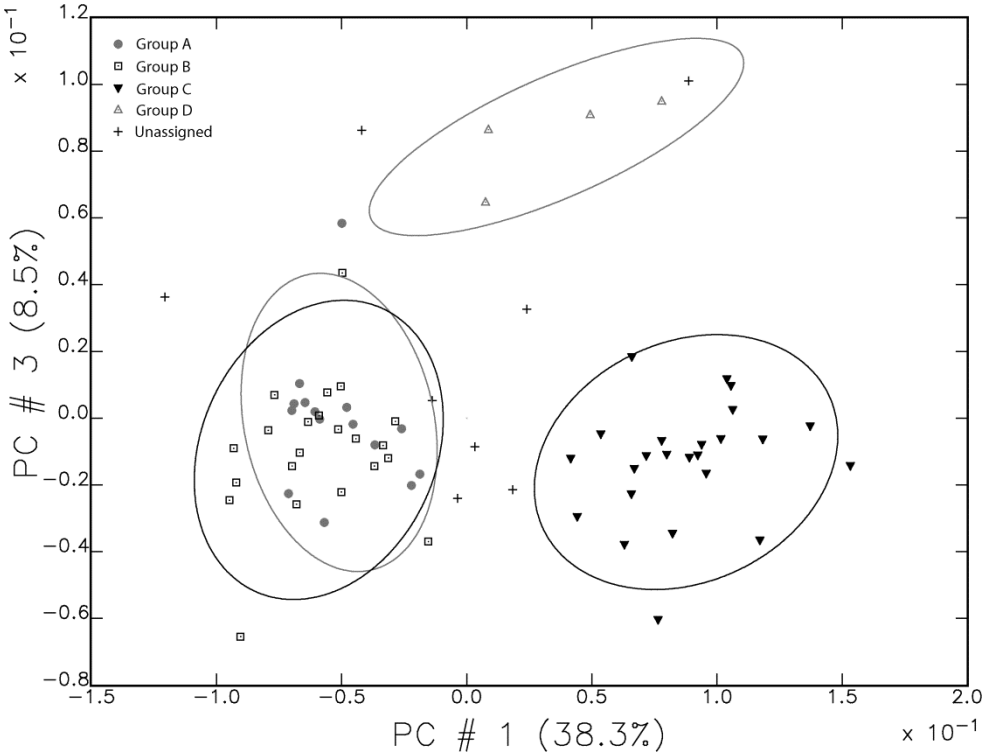

Figure 22. Scatterplot of clay fraction groups determined through LA-ICP-MS projected on Principal Components 1 and 2. Ellipses represent 90-percent confidence intervals of group membership.

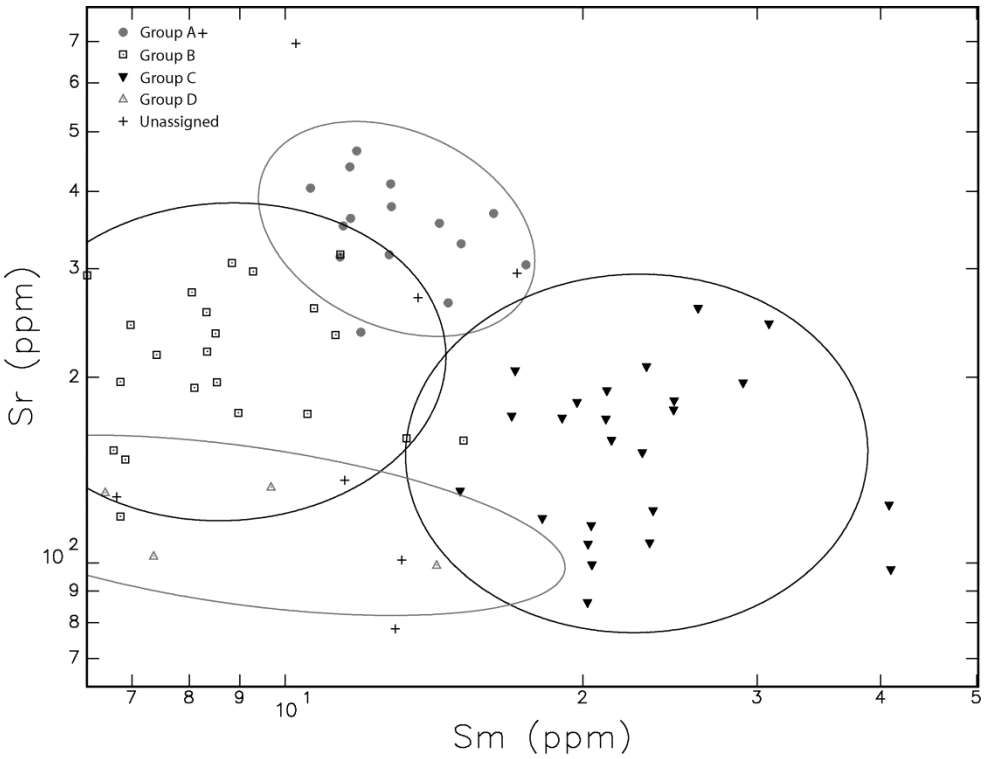

Figure 23. Scatterplot of clay fraction groups determined through LA-ICP-MS projected on logged axes of Sm and Sr. Ellipses represent 90-percent confidence intervals of group membership.

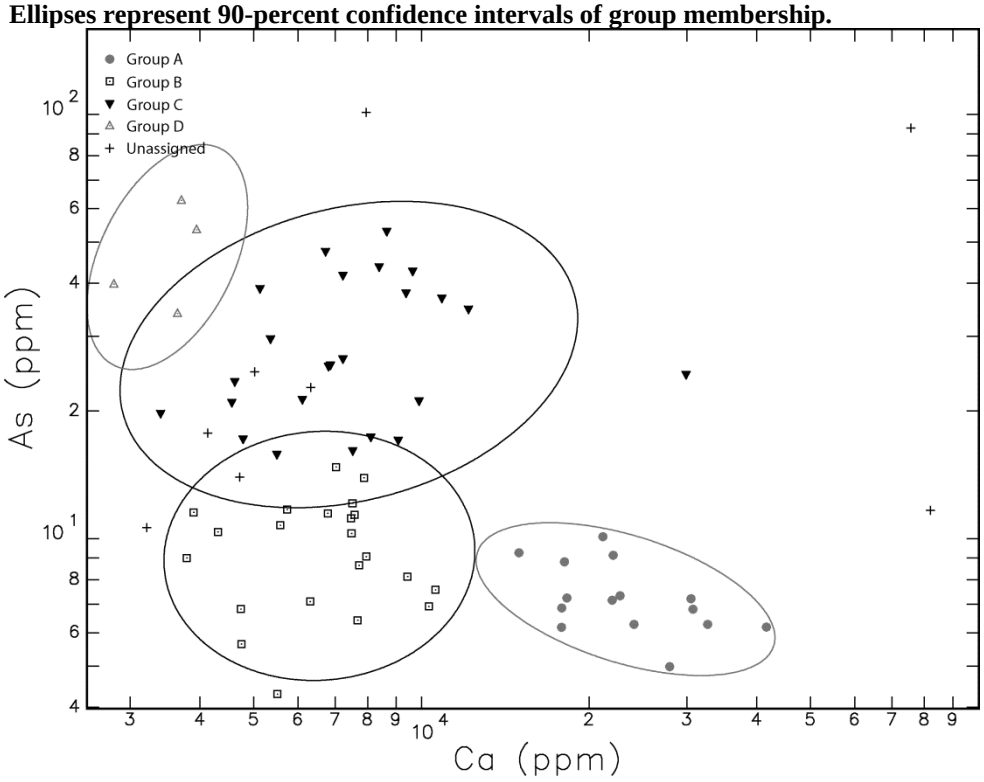

Figure 24. Scatterplot of clay fraction groups determined through LA-ICP-MS projected on logged axes of Ca and As. Ellipses represent 90-percent confidence intervals of group membership.

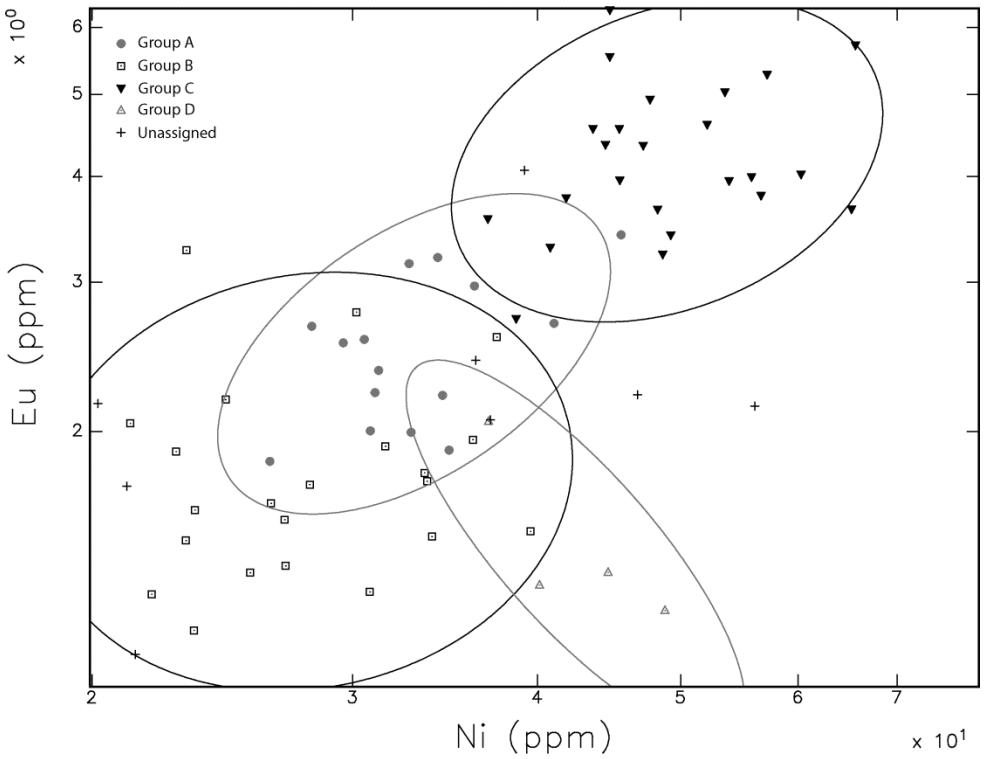

Figure 25. Scatterplot of clay fraction groups determined through LA-ICP-MS projected on logged axes of Ni and Eu. Ellipses represent 90-percent confidence intervals of group membership.

Temper Fraction

Only one clear difference exists among the entire temper sample. Vaquerías temper is distinct from all other temper types (Figures 26 and 27). The remaining temper types encompass a wide range of chemical variability with no predictable difference among them. Of course, a difference in the bulk chemistry could be formed by the *amount* of temper added to the paste, which likely explains the differences observed between fine wares and ordinary wares among the bulk NAA data. In general, the variability of temper blurs, but does not erase, the difference among chemically distinctive clay sources in the NAA sample.

Vaquerías temper is high in Sb and low in Na compared to the other tempers. Temper is clearly the source of elevated Sb levels observed in the NAA data.

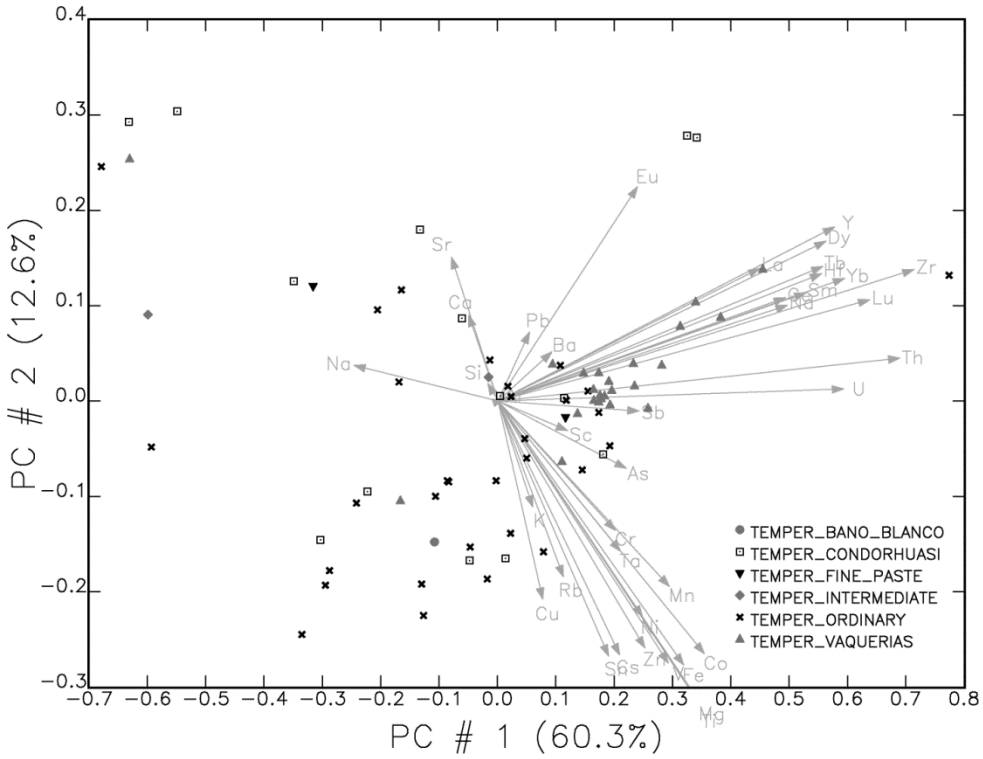

Figure 26. Scatterplot of the temper fraction determined through LA-ICP-MS projected on Principal Components 1 and 2. Ellipses represent 90-percent confidence intervals of group membership.

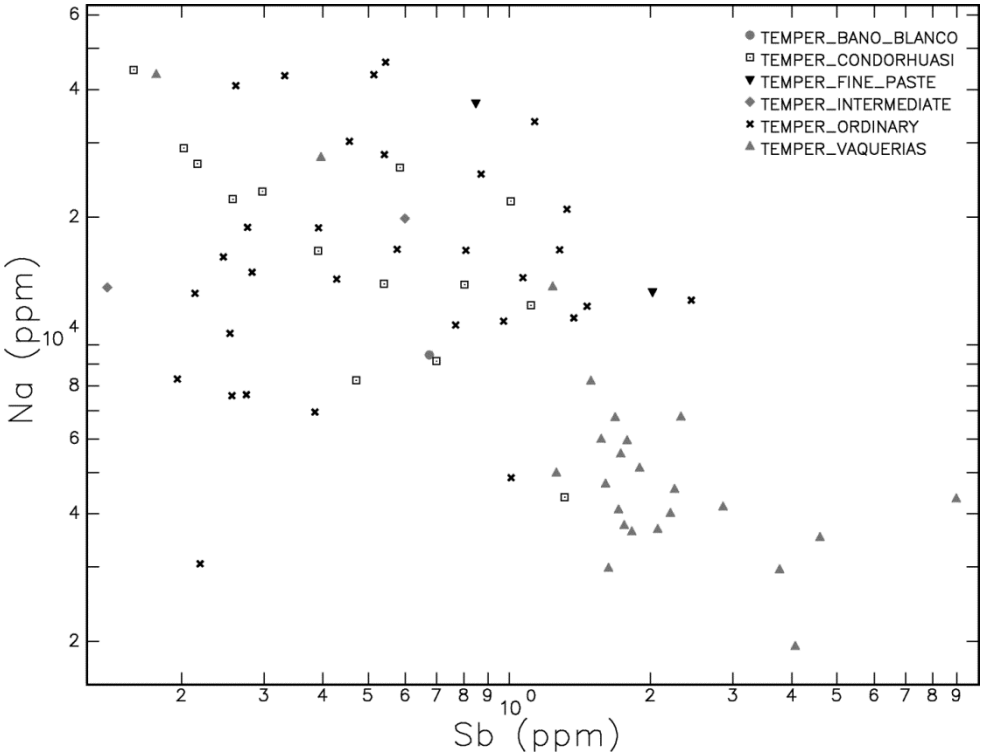

Figure 27. Scatterplot of the temper fraction determined through LA-ICP-MS projected on logged axes of Sb and Na. Ellipses represent 90-percent confidence intervals of group membership.

Pigment Fraction

Two types of pigment were analyzed on the Condorhuasi ceramics. Potters applied red pigments very thinly to the ceramics. In a few cases, white pigment was painted over the red. LA-ICP-MS clearly differentiates between the two colors (Figures 28 and 29). The white pigment is high in Ca, Sr, and Mg, but very low in all transition metals. This chemical profile indicates possible use of a pigment base made from calcium carbonate. The red pigment is relatively high in transition metals and generally appears similar to the clays used to make Condorhuasi ceramics. We suggest that the red pigment may actually be an oxidized slip of the same clays used to produce the ceramics. The slight difference in chemistry between the clay and 'slip' would be expected because the clay minerals are levigated away from silt and sand inclusions.

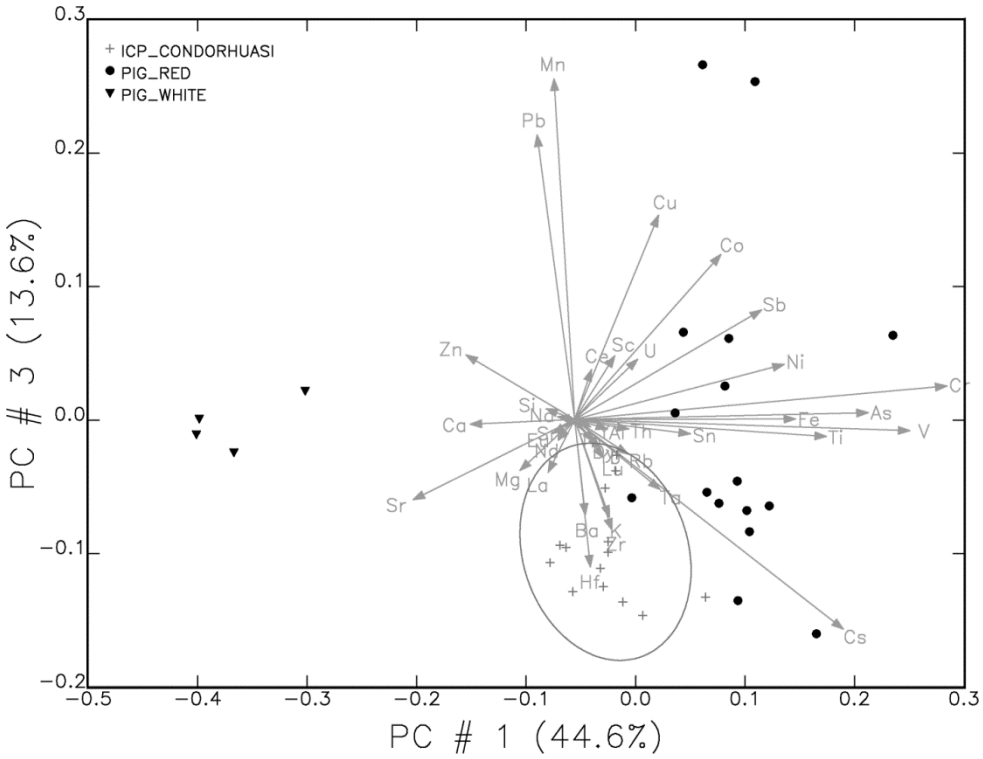

Figure 28. Scatterplot of the pigment fraction determined through LA-ICP-MS projected on Principal Components 1 and 3. Ellipses represent 90-percent confidence intervals of group membership. Some data points are replicates.

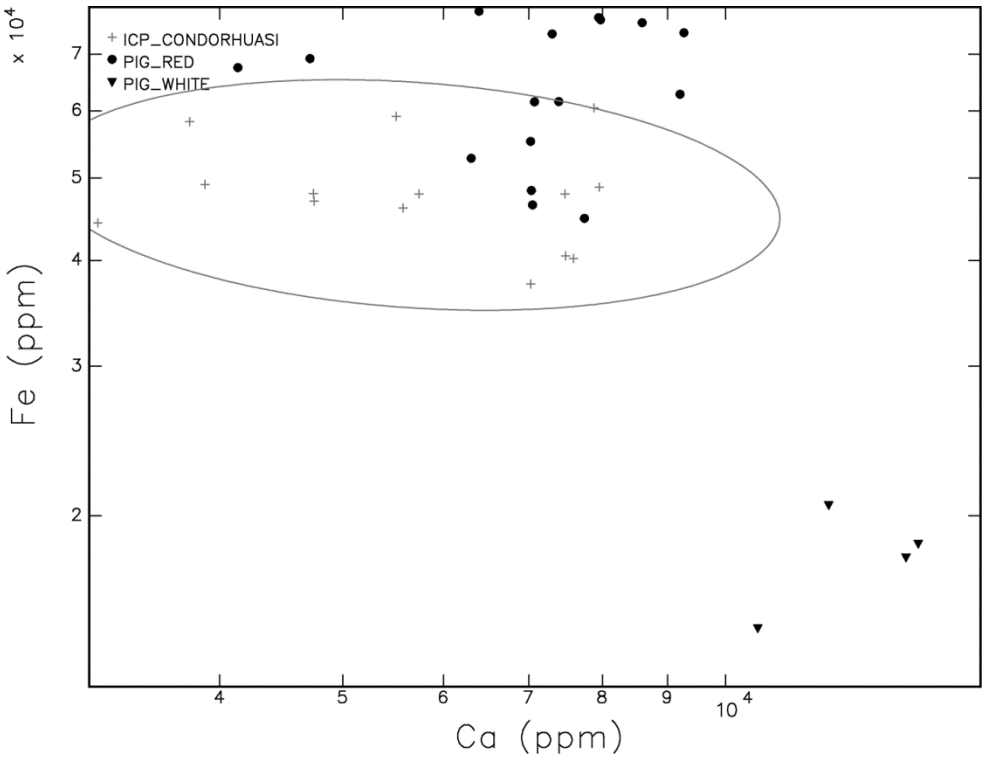

Figure 29. Scatterplot of the pigment fraction determined through LA-ICP-MS projected on logged axes of Ca and Fe. Ellipses represent 90-percent confidence intervals of group membership. Some data points are replicates.

COMPARISON TO OTHER DATASETS THROUGHOUT THE REGION

Here we compare the current sample to previous assays throughout the larger region. The reference data sets include analyses by Williams and de la Fuente. The sample from the Ambato Valley analyzed by Giesso has already been discussed above and will not be repeated here.

Data collected by de la Fuente is only briefly compared here because we currently lack descriptive data for the sample. This sample was collected from sites in the Abaucán Valley, in the province of Catamarca, in northwest Argentina. The majority of these specimens date to the Late Horizon and carry Inka stylistic themes. At the site of Batungasta, evidence for more than 50 ceramic kilns led to the identification of relatively intensive pottery production. Chemical analysis of ceramics there is therefore considered to be local. The chemistry of de la Fuente's sample is similar to MG2 and MG3 of the current study, but not identical (Figures 30 and 31). The sample from the Abucán Valley possesses higher levels of Ca, Sr, Na, and As but lower concentrations of Cs, Rb, Ta, and Zn. There are certainly a number of specimens that could be attributed to production in a different valley than the context of recovery, but the samples date to very different time periods with very different political contexts.

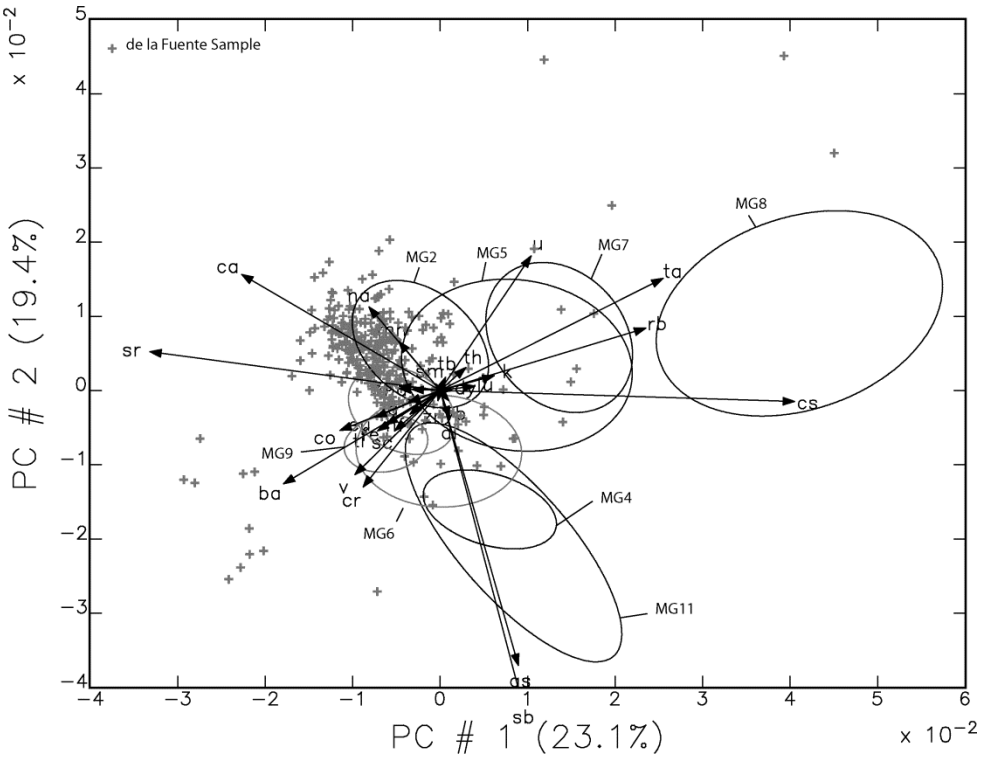

Figure 30. De la Fuente's sample from the Abucán Valley projected on Principal components 1 and 2 over 90 percent confidence intervals of membership in the current group structure.

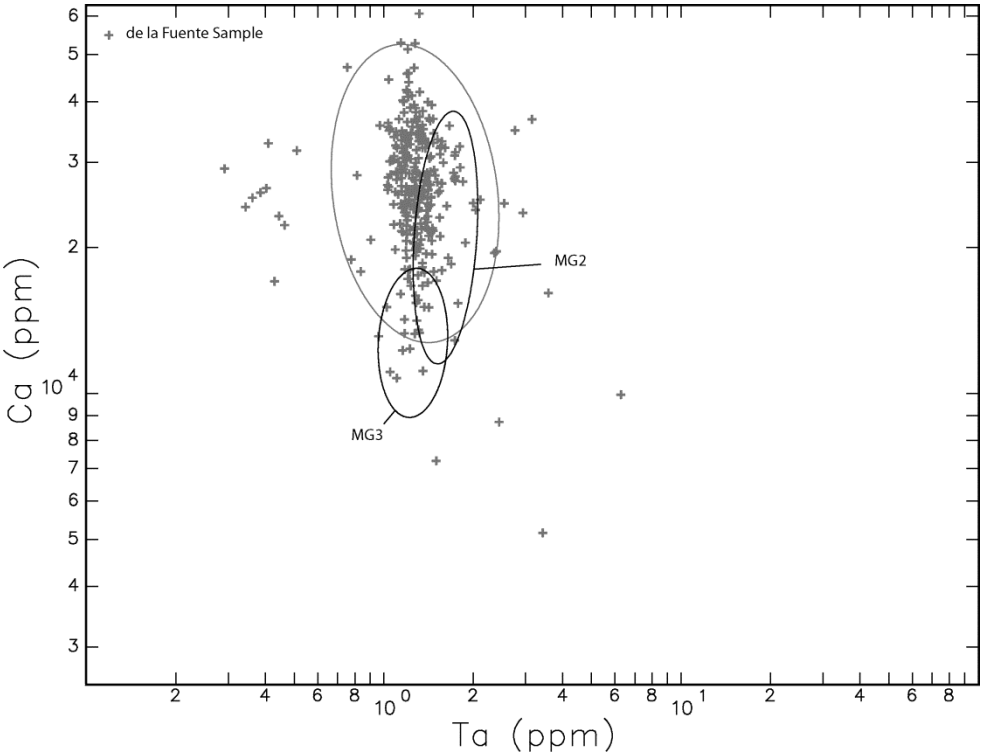

Figure 31. De la Fuente's sample from the Abucán Valley projected on Principal components 1 and 2 over 90 percent confidence intervals of membership in MG2 and MG3.

Williams also examined Late Horizon ceramics with Inka associations. She collected a sample from northwest Argentina, specifically the provinces of Salta and Catamarca. Williams's Group 1 and Group 2 were assumed to be produced in the Titicaca Basin and north Chile respectively. Group 1 is very dissimilar to any of the ceramics in the Lazzari sample, but LAZ399, LAZ621, LAZ624, and LAZ625 are similar to VWG2. The assignment of these samples to north Chile, however, is called into question by the strong chemical difference between Lazzari's MG4 (ceramics from north Chile) and VWG2.

The remainder of Williams's sample was assigned to northwest Argentina groups. VWG3 comprises mostly Yocavil Polychrome and Fambalasto Black-on-Red ceramics from the site of Potrero-Chaquiago in the Catamarca province. While the two Fambalasto ceramics in the current sample do not resemble VWG3, a number of Lazzari's specimens do. Specimens LAZ051, LAZ052, LAZ403, LAZ633, LAZ729, LAZ740, and LAZ748 all weakly resemble VWG3. These ceramics were all assigned to MG2 in the current analysis, but tended to be marginal examples of the chemical group. Interpretation of exchange is limited here because VWG3 displays an intermediate ceramic chemistry between MG2 and MG3. Any chemical similarities could simply be local variation among paste recipes.

VWG4, which includes Inka provincial pottery from Potrero de Payogasta in the Salta province, is very chemically similar to MG11. This is not surprising because Quebrada del Toro, the area that produced all ceramics in MG11, is in the Salta province as well. The similarities between these two samples reinforces the 'local' production recipe for sites in the Salta province.

VWG5, Inka and Santamariano style pottery collected at Potrero-Chaquiago in the Catamarca province, is similar to MG2. Both are relatively homogeneous chemical groups of similar composition despite the difference in time frame and stlye of ceramics. The commonality may have to do with their fine textured paste recipe and use of similar clays.

VWG6, provincial Inka pottery from Potrero de Payogasta, is rather chemically distinct from the Lazzari sample, but one sample from the Aconquija area (LAZ383) may have been imported from Salta. This sample was formerly unassigned due to its aberrant chemistry. It seems likely that it can be attributed to production in the Salta province.

VWG7, provincial Inka pottery mostly from the Yavi Chico site in Jujuy, is also similar to MG11, but diverges based on higher Hf and lower transition metal concentrations. Specimens LAZ605, LAZ610, and LAZ622 might be imports from the Jujuy province. All three of these specimens were collected in the Quebrada del Toro area, which is the closest region to Jujuy in the Lazzari sample.

VWG8, a small group of pottery from Potrero-Chaquiago in Catamarca, is chemically similar to MG2 in the current study. Due to the similar paste recipes and proximity of these groups, no exchange can be inferred.

VWG9, primarily Inka provincial ceramics from the Salta province, is chemically similar to MG9 in the current sample, but they differ subtly in the elements Cs, Rb, Ta, Ca, and Sr. Again

these two groups were likely produced in the same province. Even though most of the MG9 ceramics in the Lazzari sample were *found* in the Catamarca province, we argue above that they were likely *produced* in the Lerma Valley in Salta or nearby.

VWGX is a unique group that Speakman and Glascock (2005) suggest was imported to the site of Potrero-Chaquiago in Catamarca. Interestingly, two specimens within the Lazzari sample (LAZ258 and LAZ261) resemble VWGX, suggesting that these could be imports as well. These two specimens were left unassigned in the analysis above.

SUMMARY OF PART I

It is clear from all lines of examination that a major determinant of ceramic chemistry is the choice of raw materials to make different ceramic types. Ordinary wares, fine paste wares, Condorhuasi, and Vaquerías ceramics are all chemically different with some overlap among types. On one hand, one can see with the unaided eye that these ceramic types differ. They contain different percentages and types of temper and each exhibits different surface treatments and decorations. On the other hand, the chemical differences go beyond what can be seen. Alternate clays were used to produce each ceramic type, as best shown by the LA-ICP-MS of the clay fraction. The correlation between clay chemistry and visually identified type holds up even across valley designations, with a few exceptions. That potters within different valleys employed similar paste recipes to make similar-looking ceramics could indicate several things. First, the materials used to produce ceramics of a certain type were relatively chemically homogeneous over a very broad area. This homogeneity of clay chemistry partially results from the interior drainage pattern in the region, causing sediments weathered from similar parent rocks to mix in the locations where human settlements sit. The chemical variability observed among ordinary, fine, and intermediate wares likely occurs on a gradient determined by the amount and type of temper added to the clay. Other ceramic types, like Vaquerías and Condorhuasi, employed clays with unique chemistries that may be restricted in their geographic availability.

We delay a detailed discussion of exchange until after the presentation of Part II of the analysis.

PART II: TOP-DOWN ASSESSMENT OF INTERACTION AMONG VALLEYS

Reconstructing trade relationships in this region is difficult because ceramics sampled from most of the major river valleys overlap considerably. This overlap could result from relatively homogeneous materials used by potters across the study region, similarities in production recipe, or trade among valleys. To evaluate among these different explanations, we approach the data in a very different way compared to the analysis above. In this section we establish core groups according to valley. We then treat these as reference groups for the assignation of non-core specimens.

The methods of analysis presented in this section are much the same as those presented above, but we start with the assumption that the local paste recipe for any given type within each valley

is the densest cluster of ceramic specimens around the chemical *median* for all ceramics of a given type within each valley. The median provides an advantage over the mean by excluding chemical outliers, which could have been imported from other valleys. Ceramics that display chemistries that do not fit within the core valley group of the valley where it was collected may represent import of ceramic vessels from another valley. Canonical discriminant analysis was used to place unassigned specimens into core valley groups.

We keep this analysis discreet from that described in Part I because there are many assumptions that go into the current top-down method. First, we are assuming that potters within a region used a relatively homogeneous paste recipe to produce each of the different ceramic types defined for analysis. This may not be true. All potters may choose from a range of availble raw materials to manufacture fine paste ceramics, for example. Second, we assume that all ceramics were correctly assigned within the regional typology. As Lazzari notes, the Formative ceramics found in this region do not precisely match existing types in the region. At the lead author's request, the project PIs simplified their type descriptions, which might add perceived variability among the chemical results. Third, it is assumed that ceramics that do not match the core valley reference groups could be imported from another location. Because of assumption 1, this might not be true. Given the overlap among ceramics from different valleys, however, this approach is the best way availble to address trade and exchange among the sampled settlements.

The chemical overlap among valleys is most apparent with the fine wares. This would indicate that potters in the major valleys used chemically similar clays to produce fine wares. Fine ware ceramics from the Hualfín, Campo del Pucará, and Quebrada del Toro, however, are fairly distinctive (Figures 30 and 31). El Bolsón and the Cajón Valley display heterogeneous and widely ranging fine paste recipes that overlap only in part with that from the Aconquija and Santa María Valleys. The variability of El Bolsón and Cajón fine wares could be explained by at least three scenarios. First, ceramic classification variability could have identified as "fine ware" coarser ceramics that are closer to the ordinary ware. The petrographic analysis should be able to verify or deny this claim. Second, sites in these areas were more connected through exchanged relationships with other valleys. Third, El Bolsón is a catchment basin that receives sediment from all of the surrounding valleys. One would expect clays availble for pottery to be mixed in this area. The Aconquija and Santa María fine wares display a similar wide range of chemistries, but they are much more heavily skewed toward MG2.

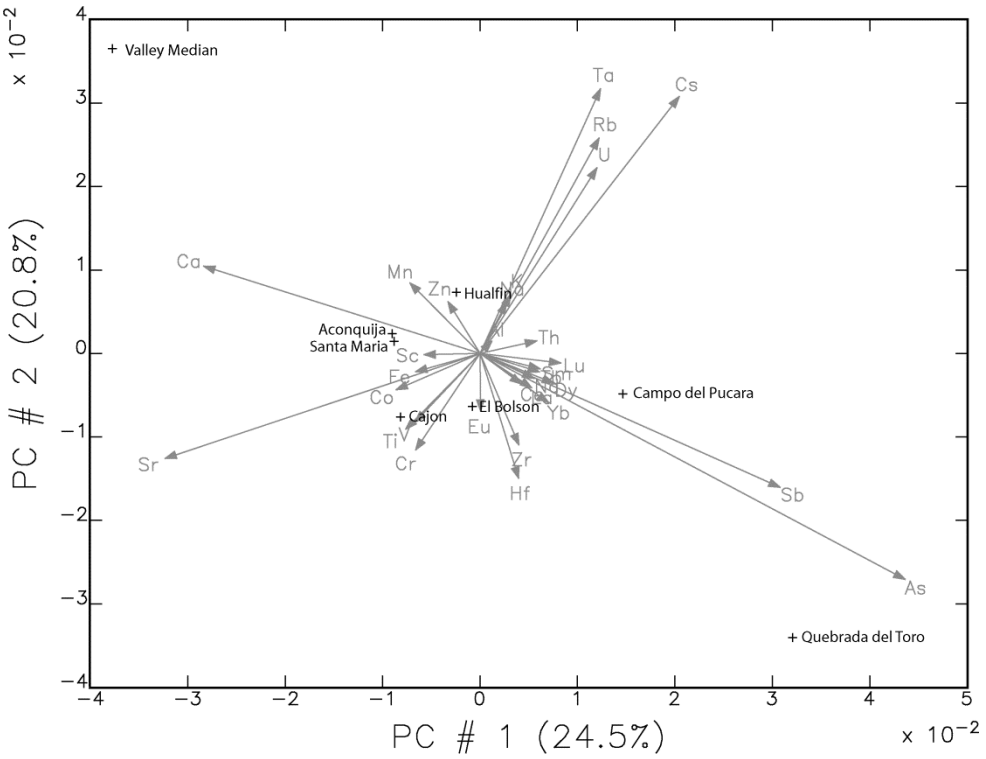

Figure 30. RQ-mode scatterplot depicting the median chemical concentrations for fine wares sampled from each valley displayed on Principal Components 1 and 2 calculated only from the Fine Wares in the sample.

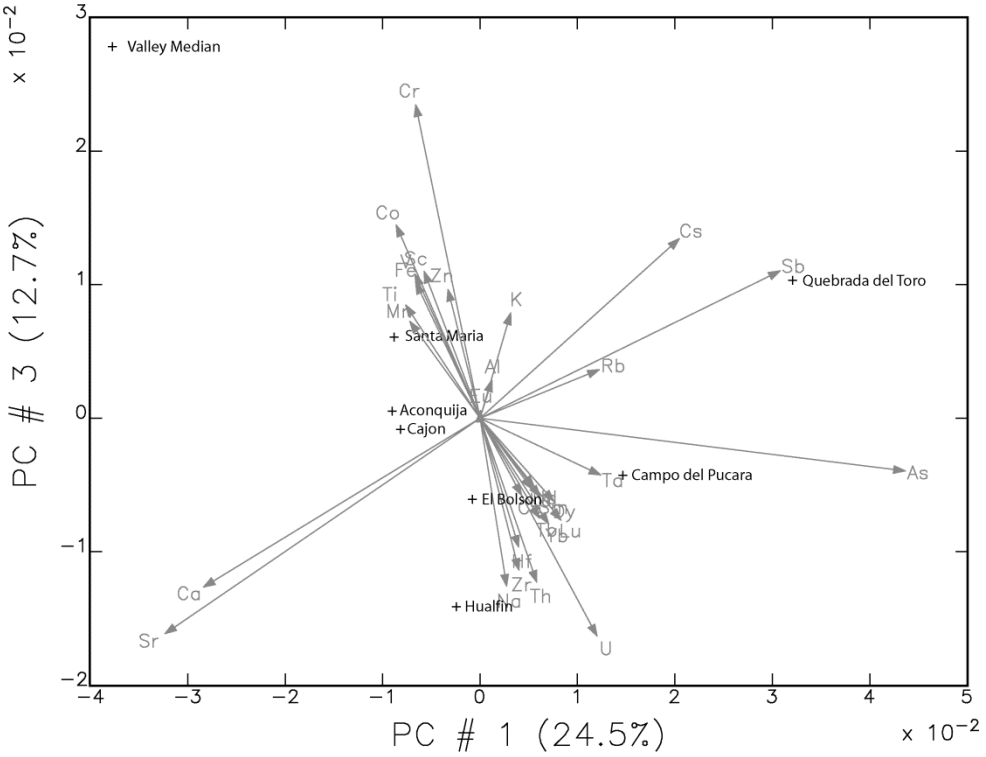

Figure 31. RQ-mode scatterplot depicting the median chemical concentrations for fine wares sampled from each valley displayed on Principal Components 1 and 3 calculated only from the Fine Wares in the sample.

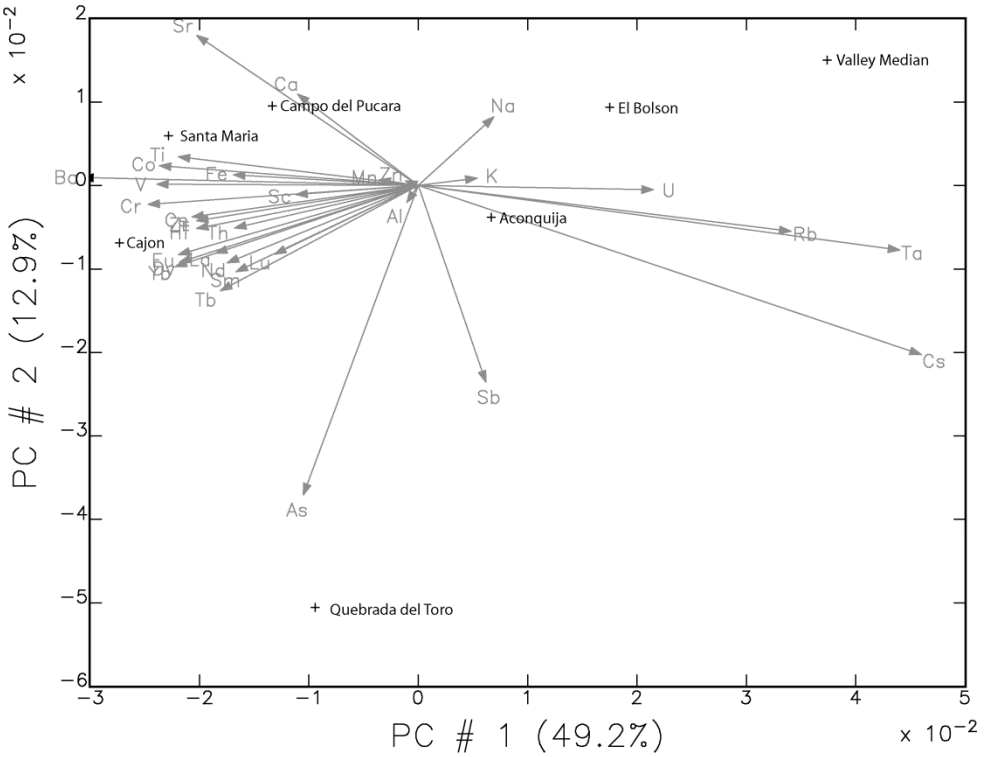

Figure 32. RQ-mode scatterplot depicting the median chemical concentrations for Ordinary Wares sampled from each valley displayed on Principal Components 1 and 2 calculated only from the Ordinary Wares in the sample.

Fine Wares

Table 5 shows the potential Fine Ware imports identified within each valley. The first three rows list what are likely locally-produced pottery vessels. Notice that the highest percentage of Fine Ware pottery within each valley was locally produced. This is no surprise since the technology and materials to produce pottery are widespread and the final product is bulky. However a number of imports can be identified (see Appendix B for membership probabilities for each specimen). The Aconquija, Santa María, and Cajón valleys display the highest percentage of potential imports. This may be due to exchange, but the reader should note that Fine Wares among these three valleys are only subtly different in chemistry. Therefore, some specimens identified as representing exchange among these three valleys may actually be local production with variant paste recipes.

Among the Fine Ware imports to Aconquija, the primary suppliers are the El Bolsón, Campo del Pucará and Hualfín valleys. Campo del Pucará, in particular, was a major supplier. In fact, settlements in the Aconquija Valley were the *only* consumers of Fine Wares from Campo del Pucará. Conversely, only 17 percent of Fine Ware ceramics sampled from Campo del Pucará were imported from elsewhere. This suggests an economic relationship between Campo del Pucará and the Aconquija Valley, but Aconquija settlements must have exported something other than pottery. Santa María Valley settlements show interactions primarily with the Cajón and

Aconquija valleys. Note, however, that the relative chemical similarity of Fine Ware pottery from these three valleys makes the assertion of interaction tenuous. Settlements in both the El Bolsón and Quebrada del Toro valleys produced almost all of their own ceramics, but both may have exported pottery to other locations. Eighty percent of the exports from Quebrada del Toro went to the Cajón Valley. Fine ceramics made in the El Bolsón Valley potentially were consumed in the Aconquija, Cajón, and Hualfín valleys. This is also a tenuous assessment because the El Bolsón core valley group displays a lot of internal chemical variation that overlaps with several other groups.

Table 5. Potential Fine Ware imports sorted by valley (unassigned specimens not depicted).

Production Source	***Archaeological Provenience***							
	Aconquija	Bolsón	Cajón	Campo del Pucará	Hualfín	Quebrada del Toro	Santa Maria	Total
Local	34	10	19	15	18	12	27	135
Local/Cajón		1					6	7
Local/Santa Maria			1					1
Aconquija							1	1
Aconquija/Cajón							4	4
Bolsón	7		6		3		1	17
Bolsón/Cajón	1			1				2
Bolsón/Hualfín							1	1
Cajón	2				3		7	12
Cajón/Aconquija							1	1
Cajón/Bolsón	1						1	2
Campo del Pucará	12							12
Campo/Bolsón	1							1
Hualfín	2			1				3
Hualfín/Bolsón	3							3
Hualfín/Quebrada			1					1
Santa Maria			3					3
Quebrada			4	1				5
Total	**63**	**11**	**34**	**18**	**24**	**12**	**49**	**211**
Percent Imported	**46%**	**0%**	**44%**	**17%**	**25%**	**0%**	**45%**	

Fine-Like Ceramics

We used the same Fine Ware core valley groups to determine provenance for other categories of fine ceramics. Table 6 cross-tabulates archaeological provenience and production source for several fine-like ceramics.

Aguada ware was sampled from four valleys. Those from El Bolsón and Hualfín Valleys are almost entirely locally produced. Conversely, the two Aguada samples from the Aconquija Valley were likely produced in another valley, either El Bolsón or Cajón. Finally, the five

Aguada ceramics sampled from the Santa María Valley were produced at a mix of places with most being local products.

All of the Allpatuaca ware ceramics appear to have been locally produced. While the five samples collected in the Aconquija Valley do not match the Fine Ware core valley group for that region, they do match the chemistry of Ordinary ceramics from Aconquija. This is good evidence that they were locally made and that the paste recipe was more similar to Ordinary ceramics than the Fine Wares (verify or deny using petrography).

Baño Blanco was mostly a local product, with only three potential trade wares being found in the Cajón and Santa María valleys.

The four Cienaga ceramics sampled from the Aconquija Valley were likely imported primarily from Campo del Pucará. Given the large chemical difference between Aconquija and Campo del Pucará ceramics, the likelihood of economic interaction between these two regions is high.

Two potential imports exist among the Rio Diablo ceramics. One sampled from the Cajón Valley appears imported from near the El Bolsón or Hualfin valley. It must be cautioned, however, that the chemical difference between El Bolsón and Cajón ceramics is not great. The other potential import was sampled from Campo del Pucará. Its chemistry most closely matches Fine ceramics from Quebrada del Toro. The chemical composition of ceramics from these two valleys is qualitatively similar, but differs in a matter of degree (see Figure 30). Both are elevated in As and Sb, but to different extents. This similarity in reference groups raises doubt as to the validity of import.

Of the four San Pedro ceramics sampled from north Chile, three appear to be locally made. The fourth was unassigned, but in general it appears non-local to north Chile. Three San Pedro ceramics sampled from Quebrada del Toro were produced locally.

Because the Vaquerías ware displays such a different clay and temper chemistry, we can deduce that most of these specimens were made elsewhere and imported, likely from the Lerma Valley. At the same time, a minority of Vaquerías *style* ceramics appear to be produced with pastes that appear local to the valley of archaeological recovery. This demonstrates that there are both material interactions among groups in the region *and* an exchange of ideas and ceramic styles that travel through different networks, supporting an assertion made previously be Lazzari and associates (2009). We do not have a sufficient sample from the Lerma Valley (n=1) to serve as a valid reference group, but it should be noted that the closest valley is Quebrada del Toro. Chemically, most of the Vaquerías ceramics fall into the Quebrada del Toro group. Due to the lack of a true reference group for the Lerma Valley, this calculation is not very useful. Returning to both the NAA and LA-ICP-MS elemental plots, we can see that the majority of Vaquerías ware ceramics fit into a tightly defined chemical group that is quite distinct from the remainder of samples (see Figures 17 [Group 9] and 20 [Group A]). As mentioned above, Vaquerías ware from the Lerma Valley contains high Ca within the clay fraction and high Sb within its unique temper. The clearest differentiation among the Vaquerías ware was achieved through LA-ICP-MS of the clay fraction. Based on this analysis, a total of 14 Vaquerías ware pots was

determined to be imported into the sample valleys of Cajón (n=11), Quebrada del Toro (n=1), and Santa María (n=2) (see Table 4). Two specimens from the Cajón Valley were unusually high in Sb, which may correspond to a higher than average percentage of temper. Note that the one sample from Lerma also falls into chemical Group A^{ICP}, but it is assumed that this was locally made. Three Vaquerías pots sampled from the Cajón Valley and two sampled from Quebrada del Toro appear to have been local imitations (see Group B^{ICP}). The desire to imitate these ceramics locally represents a cheaper method of cultural emulation than import direct from the source. Three of the Vaquerías specimens from Quebrada del Toro were unassigned in the LA-ICP-MS dataset, which may indicate local production or import from an unknown source. Vaquerías ware provides the clearest example of exchange in the dataset.

Table 6. Potential Fine Ware-Like imports sorted by type and valley (unassigned specimens not depicted).

Production Source	***Archaeological Provenience***									
	Aconquija	*Bolson*	*Cajon*	*Campo del Pucara*	*Hualfin*	*Lerma*	*North Chile*	*Quebrada del Toro*	*Santa Maria*	*Total*
Aguada										
Local		3			4				3	10
Aconquija/Cajon									1	1
Bolson/Campo					1					1
Bolson/Hualfin	1									1
Cajon	1								1	2
Allpatuaca										
Local				1						1
Local (Ordinary Paste Recipe)	5									5
Bano Blanco										
Local	3		2						1	6
Bolson			1							1
Cajon									1	1
Quebrada del Toro									1	1
Cienaga										
Cajon	1									1
Campo del Pucara	3									3
Rio Diablo										
Local	1		1	1						3
Bolson/Hualfin			1							1
Quebrada del Toro				1						1
San Pedro										
Local							3	3		6
Vaquerias										
Local			7							7
Aconquija/Cajon		1								1

Production Source	*Archaeological Provenience*									
	Aconquija	*Bolson*	*Cajon*	*Campo del Pucara*	*Hualfin*	*Lerma*	*North Chile*	*Quebrada del Toro*	*Santa Maria*	*Total*
Cajon									1	1
Quebrada del Toro			10			1		6	3	20
Total	**15**	**4**	**22**	**3**	**5**	**1**	**3**	**9**	**12**	**74**

Condorhuasi

Both the NAA and LA-ICP-MS (clay fraction) data tell us that the Condorhuasi paste recipe is quite different from the Ordinary and Vaquerías wares. Despite their coarse texture, Condorhuasi most closely resembles the chemistry of the Fine Wares, but different enough that a direct comparison would be impossible among the NAA data. The Fine Wares are underrepresented among the LA-ICP-MS data, so a comparison with them will not work. Among the Condorhuasi ceramic sample, those from Aconquija and Campo del Pucará are distinguishable on elemental axes of Rb, Cs, Ta, and Ba (Figure 33 and 34). This suggests that there was no interaction between these two regions, though the chemical separation is not large. The one Condorhuasi sample from the Cajón Valley resembles the chemistry of those from the Aconquija Valley. This is likely due to either exchange or the use of similar clay resources. Two Aconquija samples (LAZ025 and LAZ190) resemble the chemistry of Condorhuasi ceramics from Campo del Pucará. Among the LA-ICP-MS clay fraction data, however, LAZ190 does not strongly resemble those from Campo del Pucará (LAZ025 was not sampled for ICP). The data support local production for both Aconquija and Campo del Pucará.

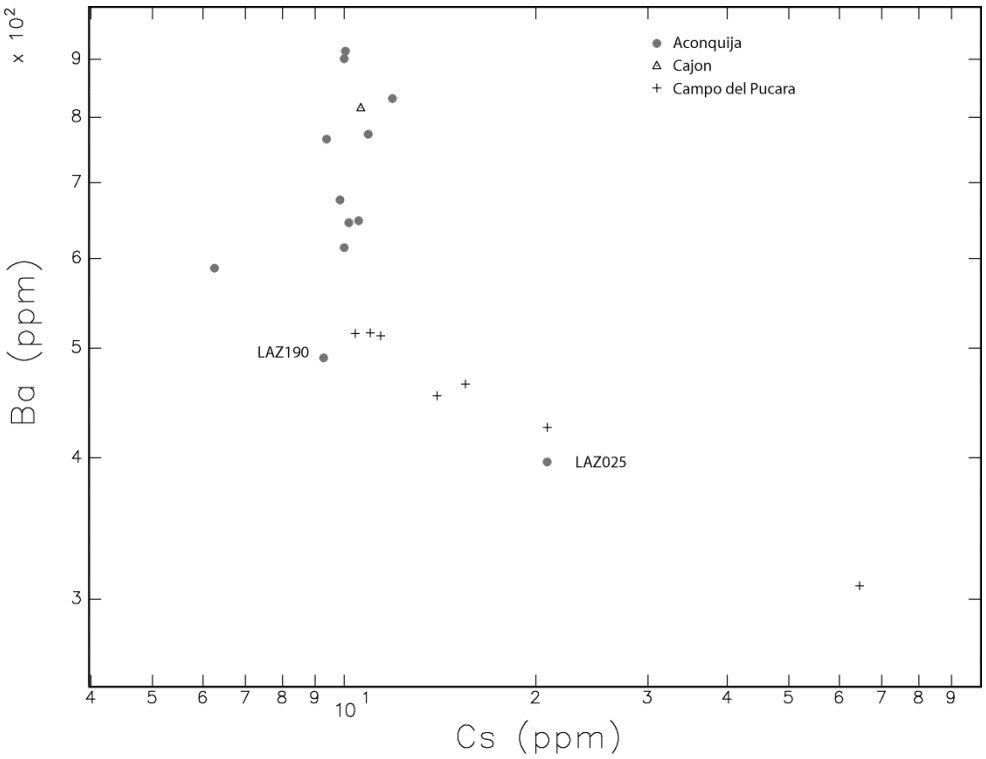

Figure 33. Scatterplot of Condorhuasi ceramic chemistry on logged axes of Cs and Ba. Based on the NAA data.

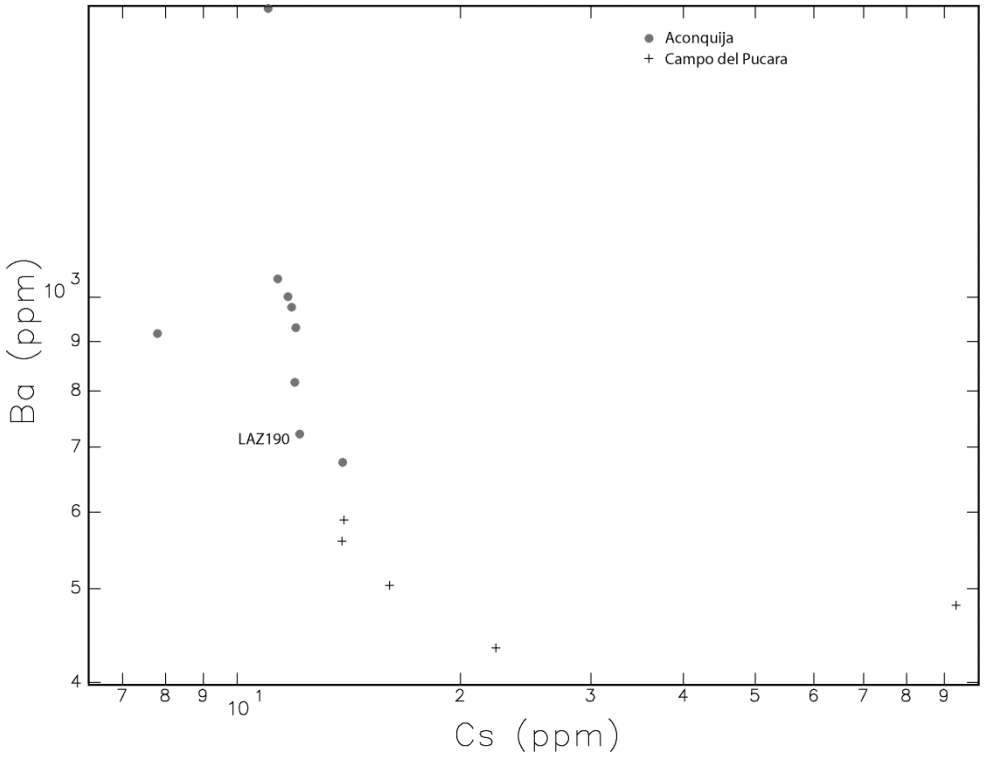

Figure 34. Scatterplot of Condorhuasi ceramic chemistry on logged axes of Cs and Ba. Based on the LA-ICP-MS data of the clay fraction.

Ordinary Wares

The ordinary wares display a greater tendency to cluster according to valley (see below and Figure 15-16). In general, all of the ordinary wares are chemically distinct from the fine wares. Ordinary wares were also traded less frequently as the highest number of imports was identified among the Aconquija ware at 20 percent. Among the Ordinary wares sampled from the Aconquija Valley, most potential imports are from neighboring valleys (Bolsón and Santa María) that share a similar chemical profile to Aconquija. This raises doubts about their possible import. In fact, the same could be said about all of the potential imports identified among the Ordinary wares, except for two. One Ordinary pot sampled from each of the Cajón and Santa María valleys resembled the Quebrada del Toro core valley group, which is rather chemically distinct. Imports from El Bolsón to Cajón, Santa María, and Campo del Pucará are also fairly reliable.

Table 7. Potential Ordinary Ware imports sorted by type and valley (unassigned specimens not depicted).

Production Source	***Archaeological Provenience***						
	Aconquija	Bolson	Cajon	Campo del Pucara	Quebrada del Toro	Santa Maria	**Total**
Local	36	17	26	13	6	26	**124**
Bolson	4		1	2		2	**9**
Cajon						2	**2**
Campo del Pucara/ Santa Maria	2						**2**
Quebrada del Toro			1			1	**2**
Santa Maria	3	2	1				**6**
Total	**45**	**19**	**29**	**15**	**6**	**31**	**145**
Percent Imported	**20.0**	**10.5**	**10.3**	**13.3**	**0.0**	**16.1**	**14.5**

CONCLUSIONS

The analysis above permits us to answer a number of questions regarding pottery production and exchange in the region.

First, differences between the paste recipes of Fine ceramics and Ordinary ceramics explain the most chemical variability in the dataset. This is to be expected because the type and amount of temper between these ceramic wares is very different. The Fine Wares were generally much more homogeneous across the study region than the Ordinary Ware. The coarser texture of the latter therefore contributed to its increased variability and typically permitted better differentiation among the source valleys. The similarity among the Fine Wares from different valleys posed a problem when determining exchange among them. To remedy this problem, we constructed core valley reference groups for each valley, which are the densest cluster of ceramics around the valley median. Doing this led to the identification of several trade wares

(see below), but caution must be used and trade wares should be confirmed using an alternate technique (i.e., petrography).

Second, the overwhelming majority of all ceramics sampled were locally produced and consumed. The only exception to this is the Vaquerías ware. The majority of Vaquerías ceramics were imported into the study region. The likely source of these exchanges was the Lerma Valley, but more pottery must be sourced from that region prior to concluding a Vaquerías ware source. A minority of Vaquerías *style* ceramics display chemical signatures local to the Cajón and Quebrada del Toro valleys, representing local emulation of a 'foreign' style.

The Condorhuasi ceramics sampled from Campo del Pucará and Aconquija separate on elemental axes of Ba, Cs, Rb, and Ta in both the NAA and LA-ICP-MS datasets. The LA-ICP-MS dataset demonstrates a cleaner separation between these groups, but also suggests that the Condorhuasi pottery possesses a clay fraction that matches neither the Ordinary ware nor the Vaquerías ware (Fine Ware pottery was not well represented among the ICP-MS data [n=1]). We believe that Condorhuasi pottery was likely produced and consumed locally within each sample region, though we cannot rule out the possiblity of import from an unknown source.

Besides the clear example of Vaquerías exchange, a number of other exchange relationships took place among the sampled regions. Among the Fine Ware and Fine Ware-Like ceramics (Aguada, Allpatuaca, Baño Blanco, Cienaga, Río Diablo, and San Pedro) Aconquija and Santa María settlements were among the most active importers of ceramics. One must bear in mind that the median chemistries of El Bolsón, Cajón, Aconquija, and Santa María valley Fine Wares are similar, so interaction among these valleys is extremely hard to determine. These four valleys, however, differ sufficiently from the median chemistry of Campo del Pucará, Hualfín, and Quebrada del Toro valley ceramics. Aconquija settlements imported a significant number of pots from Campo del Pucará and Hualfín, but none from Quebrada del Toro. Cajón Valley settlements conversely imported several Fine Ware vessels from Quebrada del Toro, but nothing from the other two. Moving the other direction, Hualfín settlements consumed ceramics produced in the El Bolsón and Cajón valleys. Campo del Pucará potentially imported only two Fine Ware vessels while Quebrada del Toro imported nothing. This discussion of Fine wares demonstrates exchange among the sample regions, but different valleys made different decisions about who they would establish economic networks with.

A higher proportion of Ordinary Ware pottery was locally-produced compared to Fine Ware pottery. This likely derives from the relatively low value of utilitarian vessels and the large cost of transporting such bulky vessels across the landscape. There are very few specimens that can be confidently attributed to exchange, but those that can support the same relationships between Aconquija/Campo del Pucará settlements and Cajón/Quebrada del Toro settlements as the Fine Wares.

Future studies should attempt to establish a source database for the Lerma Vaquerías ceramics. Also, it may prove important to increase the representation of Fine Ware ceramics among the LA-ICP-MS data. In general, additional sourcing from all valleys and groups discussed here will

help create more robust groups. In particular, it should be a long term goal to boost the sample numbers in valleys that are underrepresented in the current sample.

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APPENDIX A: DESCRIPTIVE INFORMATION AND COMPOSITIONAL ASSIGNMENTS.

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ019	Group B	Group 3	CG3	UNASSIGNED	20.41	MG3	Aconquija	Ingenio Arenal-Faldas	Condorhuasi
LAZ028	Group C	Group 3	CG5	MG5	66.77	na	Aconquija	Loma Alta	Ordinary
LAZ033	Group B	Group 3	UNASSIGNED	MG5	44.31	na	Aconquija	Antigal de Tesoro	Condorhuasi
LAZ036	Group B	Group 3	UNASSIGNED	UNASSIGNED	7.97	MG2	Aconquija	Tesoro 1	Ordinary
LAZ078	Group B	Group 3	UNASSIGNED	UNASSIGNED	3.04	MG5	Cajón Valley	Yutopián	Baño Blanco
LAZ083	Group A	Group 2	CG9	MG9	88.21	na	Cajón Valley	Cardonal	Vaquerías
LAZ106	Group B	Group 3	UNASSIGNED	UNASSIGNED	7.40	MG3	Aconquija	Ingenio Arenal-Faldas	Condorhuasi
LAZ128	Group A	Group 2	CG9	MG9	10.92	na	Lerma Valley	Las Garzas	Vaquerías
LAZ130	Group A	Group 2	CG9	MG9	82.10	na	Santa María Valley	Tolombón 56-26	Vaquerías
LAZ146	Group C	Group 3	CG5	MG5	76.95	na	Aconquija	Antigal de Tesoro	Ordinary
LAZ147	Group C	Group 3	CG5	MG5	96.27	na	Aconquija	Antigal de Tesoro	Ordinary
LAZ149	Group C	Group 3	CG5	MG5	86.21	na	Aconquija	Antigal de Tesoro	Ordinary
LAZ150	Group C	Group 3	CG5	MG5	98.88	na	Aconquija	Antigal de Tesoro	Ordinary
LAZ151	Group C	Group 3	CG5	MG5	88.22	na	Aconquija	Antigal de Tesoro	Ordinary
LAZ153	Group C	Group 3	CG3	MG3	65.57	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ154	Group C	Group 3	CG3	MG3	77.80	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ155	Group C	Group 3	UNASSIGNED	UNASSIGNED	23.51	MG3	Santa María Valley	Bañado Viejo	Ordinary
LAZ156	Group C	Group 3	UNASSIGNED	MG3	14.13	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ157	Group C	Group 3	UNASSIGNED	MG3	49.17	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ158	Group C	Group 3	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Santa María Valley	Bañado Viejo	Ordinary
LAZ161	Group C	Group 3	UNASSIGNED	UNASSIGNED	19.15	MG6	Santa María Valley	Bañado Viejo	Ordinary
LAZ162	Group C	Group 3	CG5	MG5	39.30	na	Aconquija	Loma Alta	Ordinary
LAZ163	Group C	Group 3	CG5	MG5	18.92	na	Aconquija	Loma Alta	Ordinary
LAZ164	Group C	Group 3	CG5	MG5	70.98	na	Aconquija	Loma Alta	Ordinary
LAZ165	Group C	Group 3	UNASSIGNED	MG3	74.64	na	Cajón Valley	Cardonal	Ordinary
LAZ166	Group B	Group 3	CG3	MG3	63.83	na	Cajón Valley	Cardonal	Ordinary
LAZ168	Group C	Group 3	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Cajón Valley	Cardonal	Ordinary
LAZ169	Group C	Group 3	UNASSIGNED	MG5	12.17	na	Aconquija	Tesoro 1	Ordinary
LAZ181	Group A	Group 9	CG9	MG9	1.72	na	Santa María Valley	Tolombón	Vaquerías
LAZ187	Group B	Group 3	CG3	UNASSIGNED	20.41	MG5	Aconquija	Ingenio del Arenal	Condorhuasi
LAZ188	Group B	Group 3	CG3	UNASSIGNED	36.91	MG3	Aconquija	Ingenio del Arenal	Condorhuasi
LAZ190	Group B	Group 9	CG3	MG3	49.67	na	Aconquija	Antigal de Tesoro	Condorhuasi
LAZ204	Group A	Group 9	CG9	MG9	67.42	na	Cajón Valley	Cardonal	Vaquerías
LAZ205	Group A	Group 9	CG9	MG9	23.21	na	Cajón Valley	Cardonal	Vaquerías
LAZ206	Group A	Group 9	UNASSIGNED	MG9	76.62	na	Cajón Valley	Cardonal	Vaquerías
LAZ207	Group A	Group 9	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Cajón Valley	Bordo Marcial	Vaquerías

[1] Based on Speakman and Glascock (2004), Cecil and Glascock (2006), and Boulanger and Glascock (2010)

[2] In the case of specimens successfully assigned to macrogroups, these probabilities represent the probability of belonging to the assigned group. In the cases of specimens that were not successfully assigned to a macrogroup, these probabilities reflect the chance of belonging to the group denoted in the "Best Group" column.

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ208	Group A	Group 9	CG9	MG9	58.65	na	Cajón Valley	Bordo Marcial	Vaquerías
LAZ209	Group A	Group 9	CG9	MG9	46.83	na	Cajón Valley	Bordo Marcial	Vaquerías
LAZ237	Unassigned	Group 3	UNASSIGNED	UNASSIGNED	5.47	MG6	Cajón Valley	Cardonal	Grey Fine Ware
LAZ260	Group B	Group 3	UNASSIGNED	UNASSIGNED	20.38	MG5	El Bolsón Valley	El Alto El Bolsón	Ordinary
LAZ376	Group B	UNASSIGNED	CG3	MG3	70.02	na	Aconquija	Ingenio Arenal-Faldas	Condorhuasi
LAZ392	Group B	UNASSIGNED	UNASSIGNED	MG2	55.25	na	Aconquija	Ingenio Arenal-Faldas	Condorhuasi
LAZ393	Group B	UNASSIGNED	CG3	MG3	68.32	na	Aconquija	Ingenio Arenal-Faldas	Condorhuasi
LAZ446	Group B	UNASSIGNED	CG9	MG9	25.62	na	Cajón Valley	Bordo Marcial	Vaquerías
LAZ447	Group A	UNASSIGNED	CG9	MG9	41.22	na	Cajón Valley	Cardonal	Vaquerías
LAZ448	Group B	UNASSIGNED	UNASSIGNED	UNASSIGNED	3.21	MG2	Cajón Valley	Cardonal	Vaquerías
LAZ451	Group B	UNASSIGNED	UNASSIGNED	UNASSIGNED	9.42	MG2	Cajón Valley	Cardonal	Vaquerías
LAZ452	Group A	UNASSIGNED	CG9	MG9	98.25	na	Cajón Valley	Cardonal	Vaquerías
LAZ455	Group A	UNASSIGNED	UNASSIGNED	MG9	18.93	na	Cajón Valley	Cardonal	Vaquerías
LAZ457	Group A	UNASSIGNED	CG9	MG9	71.23	na	Cajón Valley	Cardonal	Vaquerías
LAZ465	Group C	UNASSIGNED	UNASSIGNED	MG6	18.41	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ466	Group C	UNASSIGNED	UNASSIGNED	MG6	35.90	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ467	Unassigned	UNASSIGNED	UNASSIGNED	MG11	8.65	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ468	Unassigned	UNASSIGNED	UNASSIGNED	MG6	8.37	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ469	Group C	UNASSIGNED	CG6	MG6	78.15	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ488	Group C	UNASSIGNED	UNASSIGNED	UNASSIGNED	7.91	MG6	Santa María Valley	Bañado Viejo	Intermediate
LAZ489	Group C	UNASSIGNED	UNASSIGNED	MG6	9.24	na	Santa María Valley	Bañado Viejo	Intermediate
LAZ607	Group D	UNASSIGNED	CG11	MG11	58.35	na	Quebrada del Toro	Tres Cruces I	Ordinary
LAZ608	Unassigned	UNASSIGNED	CG11	MG11	10.13	na	Quebrada del Toro	Tres Cruces I	Ordinary
LAZ609	Group D	UNASSIGNED	CG11	MG11	48.18	na	Quebrada del Toro	Tres Cruces I	Ordinary
LAZ615	Group D	UNASSIGNED	CG11	MG11	69.85	na	Quebrada del Toro	Las Cuevas V	Grey Fine Ware
LAZ619	Group D	UNASSIGNED	CG11	MG11	95.76	na	Quebrada del Toro	Alero Tres Cruces I	Ordinary
LAZ623	Group B	UNASSIGNED	UNASSIGNED	UNASSIGNED	13.08	MG11	Quebrada del Toro	Las Cuevas I	Vaquerías
LAZ624	Unassigned	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Quebrada del Toro	Las Cuevas I	Vaquerías
LAZ625	Unassigned	UNASSIGNED	UNASSIGNED	UNASSIGNED	20.71	MG6	Quebrada del Toro	Las Cuevas I	Vaquerías
LAZ626	Group B	UNASSIGNED	UNASSIGNED	MG11	59.69	na	Quebrada del Toro	Potrero Grande	Vaquerías
LAZ627	Group A	UNASSIGNED	CG9	MG9	90.73	na	Quebrada del Toro	La Encrucijada II	Vaquerías
LAZ628	Unassigned	UNASSIGNED	CG11	MG11	81.73	na	Quebrada del Toro	Tres Cruces I	Vaquerías
LAZ669	Group B	UNASSIGNED	UNASSIGNED	MG3	61.42	na	Campo del Pucará	Alamito	Condorhuasi
LAZ673	Group B	UNASSIGNED	UNASSIGNED	UNASSIGNED	2.09	MG5	Campo del Pucará	Alamito	Condorhuasi
LAZ683	Group B	UNASSIGNED	UNASSIGNED	MG5	20.11	na	Campo del Pucará	Alamito	Condorhuasi
LAZ688	Unassigned	UNASSIGNED	CG8	MG8	47.51	na	Campo del Pucará	Alamito	Condorhuasi
LAZ690	Group B	UNASSIGNED	UNASSIGNED	UNASSIGNED	34.17	MG6	Campo del Pucará	Alamito	Condorhuasi
LAZ020	na	Group 2	CG2	MG2	68.17	na	Aconquija	Ingenio Arenal-Faldas	Grey Fine Ware
LAZ021	na	Unassigned	UNASSIGNED	MG2	45.98	na	Aconquija	Ingenio Arenal-Faldas	Cienaga
LAZ022	na	Group 2	CG2	MG2	98.48	na	Aconquija	Ingenio Arenal-Faldas	Grey Fine Ware

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ023	na	Group 3	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Aconquija	Ingenio Arenal-Faldas	Allpatauca
LAZ024	na	Unassigned	CG3	MG3	52.71	na	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ025	na	Group 7	UNASSIGNED	MG2	54.80	na	Aconquija	Ingenio Arenal-Faldas	Condorhuasi
LAZ026	na	Group 7	CG7	MG7	41.39	na	Aconquija	Loma Alta	Cienaga
LAZ027	na	Group 2	CG2	MG2	98.87	na	Aconquija	Loma Alta	Grey Fine Ware
LAZ029	na	Group 3	UNASSIGNED	MG5	37.01	na	Aconquija	Loma Alta	Cienaga
LAZ030	na	Group 2	CG2	MG2	88.96	na	Aconquija	Antigal de Tesoro	Grey Fine Ware
LAZ031	na	Group 6	UNASSIGNED	UNASSIGNED	1.34	MG5	Aconquija	Antigal de Tesoro	Grey Fine Ware
LAZ032	na	Group 7	CG5	MG5	4.08	na	Aconquija	Antigal de Tesoro	Ordinary
LAZ034	na	Group 7	CG7	MG7	98.93	na	Aconquija	Antigal de Tesoro	Buff Fine Ware
LAZ035	na	Ambato	CG3	MG3	77.05	na	Aconquija	Tesoro 1	Grey Fine Ware
LAZ037	na	Group 2	UNASSIGNED	MG2	53.37	na	Aconquija	Tesoro 1	Grey Fine Ware
LAZ038	na	Group 2	UNASSIGNED	MG2	64.62	na	Aconquija	Tesoro 1	Grey Fine Ware
LAZ039	na	Group 2	CG2	MG2	96.38	na	Aconquija	Tesoro 1	Grey Fine Ware
LAZ040	na	CLAY	CLAY	CLAY			Aconquija	La Apereza	Clay
LAZ045	na	Group 3	CG5	MG5	88.11	na	Aconquija	Loma Alta	Buff Fine Ware
LAZ046	na	Group 7	CG7	MG7	43.69	na	Aconquija	Loma Alta	Buff Fine Ware
LAZ047	na	Group 2	CG2	MG2	94.61	na	Aconquija	Loma Alta	Black Fine Ware
LAZ048	na	Group 2	CG2	MG2	94.96	na	Aconquija	Loma Alta	Grey Fine Ware
LAZ049	na	Group 3	CG5	MG5	97.40	na	Aconquija	Loma Alta	Grey Fine Ware
LAZ050	na	Group 2	CG2	MG2	76.86	na	Aconquija	Loma Alta	Red Fine Ware
LAZ051	na	Group 7	CG2	MG2	37.74	na	Aconquija	Loma Alta	Buff Fine Ware
LAZ052	na	Group 7	CG2	MG2	53.34	na	Aconquija	Loma Alta	Buff Fine Ware
LAZ053	na	Group 2	CG2	MG2	81.10	na	Aconquija	Loma Alta	Grey Fine Ware
LAZ054	na	Group 3	UNASSIGNED	UNASSIGNED	9.78	MG2	Aconquija	Loma Alta	Condorhuasi
LAZ055	na	Unassigned	CG7	MG7	99.23	na	Aconquija	Loma Alta	Cienaga
LAZ056	na	Group 7	UNASSIGNED	MG7	42.48	na	Aconquija	Loma Alta	Red Fine Ware
LAZ057	na	Group 7	UNASSIGNED	MG2	10.71	na	Aconquija	Loma Alta	Buff Fine Ware
LAZ058	na	Group 2	CG2	MG2	65.30	na	Aconquija	Loma Alta	Buff Fine Ware
LAZ059	na	Unassigned	CG8	MG8	98.72	na	Aconquija	Loma Alta	Red Fine Ware
LAZ060	na	Group 7	UNASSIGNED	MG2	31.19	na	Aconquija	Loma Alta	Grey Fine Ware
LAZ061	na	Group 2	UNASSIGNED	MG2	98.68	na	Aconquija	Loma Alta	Grey Fine Ware
LAZ062	na	Group 3	CG5	MG5	80.99	na	Aconquija	Loma Alta	Grey Fine Ware
LAZ063	na	Group 3	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Aconquija	Loma Alta	Grey Fine Ware
LAZ064	na	Group 7	CG2	MG2	23.64	na	Aconquija	Loma Alta	Grey Fine Ware
LAZ065	na	Group 3	CG5	MG5	91.20	na	Aconquija	Loma Alta	Grey Fine Ware
LAZ066	na	Group 2	CG2	MG2	94.59	na	Aconquija	Loma Alta	Río Diablo
LAZ067	na	Group 2	CG2	MG2	64.75	na	Aconquija	Loma Alta	Buff Fine Ware
LAZ068	na	Unassigned	UNASSIGNED	MG7	50.27	na	Aconquija	Loma Alta	Grey Fine Ware
LAZ069	na	Group 2	CG2	MG2	97.64	na	Aconquija	Loma Alta	Buff Fine Ware
LAZ070	na	Group 7	UNASSIGNED	MG7	50.93	na	Aconquija	Loma Alta	Buff Fine Ware
LAZ071	na	Group 3	CG5	MG5	99.34	na	Aconquija	Loma Alta	Grey Fine Ware
LAZ072	na	Group 3	UNASSIGNED	UNASSIGNED	12.99	MG5	Aconquija	Loma Alta	Red Fine Ware
LAZ073	na	Group 2	CG2	MG2	96.66	na	Aconquija	Loma Alta	Baño Blanco
LAZ074	na	Group 5	UNASSIGNED	UNASSIGNED	3.89	MG2	Aconquija	Loma Alta	Grey Fine Ware
LAZ075	na	Group 2	CG2	MG2	36.46	na	Aconquija	Loma Alta	Famabalasto
LAZ076	na	Group 2	CG2	MG2	98.84	na	Aconquija	Loma Alta	Aguada

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ077	na	Group 7	UNASSIGNED	MG2	16.20	na	Aconquija	Loma Alta	Aguada
LAZ079	na	Ambato	CG3	MG3	66.55	na	Cajón Valley	Yutopián	Condorhuasi
LAZ080	na	Group 2	CG2	MG2	90.28	na	Cajón Valley	Yutopián	Baño Blanco
LAZ081	na	Unassigned	UNASSIGNED	UNASSIGNED	2.41	MG7	Cajón Valley	Yutopián	Buff Fine Ware
LAZ082	na	Unassigned	UNASSIGNED	MG2	31.41	na	Cajón Valley	Yutopián	Famabalasto
LAZ084	na	Unassigned	UNASSIGNED	MG11	4.01	na	Cajón Valley	Cardonal	Buff Fine Ware
LAZ085	na	Group 2	CG2	MG2	85.94	na	Cajón Valley	Cardonal	Grey Fine Ware
LAZ086	na	Group 2	CG2	MG2	94.38	na	Cajón Valley	Cardonal	Red Fine Ware
LAZ087	na	Group 6	CG6	MG6	69.84	na	Cajón Valley	Cardonal	Ordinary
LAZ088	na	Unassigned	CG2	MG2	52.54	na	Santa María Valley	Lampacito	Red Fine Ware
LAZ089	na	Unassigned	UNASSIGNED	MG2	12.53	na	Santa María Valley	Lampacito	Grey Fine Ware
LAZ090	na	Group 2	CG2	MG2	70.30	na	Santa María Valley	Lampacito	Grey Fine Ware
LAZ091	na	Unassigned	UNASSIGNED	MG2	7.92	na	Santa María Valley	Bañado 472	Grey Fine Ware
LAZ092	na	Group 2	CG2	MG2	98.07	na	Santa María Valley	Bañado 470	Baño Blanco
LAZ093	na	Group 2	UNASSIGNED	MG2	88.54	na	Santa María Valley	Bañado 402	Buff Fine Ware
LAZ094	na	Group 2	CG2	MG2	80.11	na	Santa María Valley	Bañado 470	Grey Fine Ware
LAZ095	na	Unassigned	UNASSIGNED	MG2	15.90	na	Santa María Valley	Bañado 410	Grey Fine Ware
LAZ096	na	Unassigned	CG6	MG6	5.09	na	Santa María Valley	Bañado 480	Ordinary
LAZ097	na	Unassigned	UNASSIGNED	MG3	3.38	na	Santa María Valley	Bañado 480	Ordinary
LAZ098	na	Group 2	CG2	MG2	85.59	na	Santa María Valley	Bañado 473	Grey Fine Ware
LAZ099	na	Group 2	UNASSIGNED	MG2	79.94	na	Santa María Valley	Bañado 463	Buff Fine Ware
LAZ100	na	Group 5	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Aconquija	Ingenio Arenal-Faldas	Grey Fine Ware
LAZ101	na	Unassigned	UNASSIGNED	UNASSIGNED	9.63	MG6	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ102	na	Group 5	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Aconquija	Ingenio Arenal-Faldas	Grey Fine Ware
LAZ103	na	Group 6	CG6	MG6	34.29	na	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ104	na	Unassigned	UNASSIGNED	MG3	3.38	na	Aconquija	Ingenio Arenal-Faldas	Buff Fine Ware
LAZ105	na	Group 2	UNASSIGNED	UNASSIGNED	2.61	MG2	Aconquija	Ingenio Arenal-Faldas	Grey Fine Ware
LAZ107	na	Unassigned	UNASSIGNED	MG5	53.23	na	Aconquija	Tesoro 1	Ordinary
LAZ108	na	Group 2	CG2	MG2	72.81	na	Aconquija	Tesoro 1	Grey Fine Ware
LAZ109	na	Group 2	CG2	MG2	90.66	na	Aconquija	Tesoro 1	Grey Fine Ware
LAZ110	na	Group 2	CG2	MG2	66.60	na	Aconquija	Tesoro 1	Grey Fine Ware
LAZ111	na	Group 2	CG2	MG2	69.26	na	Aconquija	Tesoro 1	Grey Fine Ware
LAZ112	na	Group 3	UNASSIGNED	MG7	2.81	na	Santa María Valley	Ampajango	Aguada
LAZ113	na	Group 2	UNASSIGNED	MG2	39.43	na	Santa María Valley	Ampajango	Aguada
LAZ114	na	Unassigned	UNASSIGNED	UNASSIGNED	1.57	MG2	Santa María Valley	Morro de las Espinillas 443	Baño Blanco
LAZ115	na	Group 5	UNASSIGNED	MG2	13.17	na	Santa María Valley	Morro de las Espinillas	Grey Fine Ware
LAZ116	na	Unassigned	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Santa María Valley	Morro de las Espinillas 443	Ordinary
LAZ117	na	Group 2	CG2	MG2	81.18	na	Santa María Valley	Morro de las Espinillas 443	Grey Fine Ware
LAZ118	na	Group 2	CG2	MG2	60.12	na	Santa María Valley	Morro de las Espinillas 443	Buff Fine Ware
LAZ119	na	Group 2	UNASSIGNED	UNASSIGNED	8.02	MG2	Santa María Valley	Morro de las Espinillas 443	Aguada
LAZ120	na	Group 2	UNASSIGNED	MG2	75.24	na	Santa María Valley	Morro de las Espinillas 443	Aguada
LAZ121	na	Group 7	UNASSIGNED	MG2	43.33	na	Santa María Valley	Morro de las Espinillas	Grey Fine Ware

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ122	na	Group 2	CG2	MG2	98.24	na	Aconquija	Antigal de Tesoro	Grey Fine Ware
LAZ123	na	Unassigned	UNASSIGNED	MG7	22.33	na	Aconquija	Antigal de Tesoro	Grey Fine Ware
LAZ124	na	Unassigned	UNASSIGNED	MG2	87.60	na	Aconquija	Antigal de Tesoro	Baño Blanco
LAZ125	na	Group 2	CG2	MG2	97.97	na	Aconquija	Antigal de Tesoro	Buff Fine Ware
LAZ126	na	Unassigned	UNASSIGNED	MG7	51.99	na	Aconquija	Antigal de Tesoro	Buff Fine Ware
LAZ127	na	Group 2	CG2	MG2	94.27	na	Aconquija	Antigal de Tesoro	Grey Fine Ware
LAZ129	na	Unassigned	UNASSIGNED	MG11	1.39	na	North Calchaquí Valley	Campo Colorado	Grey Fine Ware
LAZ131	na	Group 3	UNASSIGNED	UNASSIGNED	3.19	MG5	Santa María Valley	Tolombón 56-2	Red Fine Ware
LAZ132	na	Group 4 (Chile)	CG4	MG4	na		North Chile	San Pedro de Atacama	San Pedro
LAZ133	na	Group 4 (Chile)	CG4	MG4	na		North Chile	San Pedro de Atacama XIII	San Pedro
LAZ134	na	Group 4 (Chile)	CG4	MG4	na		North Chile	Tulor	San Pedro
LAZ135	na	Unassigned	UNASSIGNED	UNASSIGNED	1.65	MG7	North Chile	Socaire	San Pedro
LAZ148	na	UNASSIGNED	CG8	MG8	95.19	na	Aconquija	Antigal de Tesoro	Ordinary
LAZ152	na	Group 6	CG6	MG6	38.58	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ159	na	Group 6	CG6	MG6	99.48	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ160	na	Group 6	UNASSIGNED	MG6	62.78	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ167	na	Group 2	UNASSIGNED	UNASSIGNED	11.75	MG2	Cajón Valley	Cardonal	Ordinary
LAZ170	na	Group 6	UNASSIGNED	MG6	1.25	na	Aconquija	Tesoro 1	Ordinary
LAZ171	na	Group 2	UNASSIGNED	MG3	46.86	na	Aconquija	Tesoro 1	Ordinary
LAZ172	na	Group 6	UNASSIGNED	UNASSIGNED	16.81	MG5	Aconquija	Tesoro 1	Ordinary
LAZ173	na	UNASSIGNED	CLAY	CLAY			Aconquija	Las Conchas	Clay
LAZ174	na	UNASSIGNED	CLAY	CLAY			Amaicha	Los Colorados	Experimental
LAZ175	na	UNASSIGNED	CLAY	CLAY			Cajón Valley	Cardonal	Clay
LAZ176	na	Group 9	UNASSIGNED	MG2	2.49	na	Santa María Valley	Tolombón	Buff Fine Ware
LAZ177	na	Group 2	CG2	MG2	41.24	na	Santa María Valley	Masao	Buff Fine Ware
LAZ178	na	Group 2	UNASSIGNED	MG2	59.38	na	Santa María Valley	Molino del Puesto	Buff Fine Ware
LAZ179	na	Group 2	UNASSIGNED	MG2	75.24	na	Santa María Valley	Bañado	Red Fine Ware
LAZ180	na	Group 9	UNASSIGNED	MG11	42.87	na	Santa María Valley	Chimpa	Vaquerías
LAZ182	na	Group 7	UNASSIGNED	MG2	52.49	na	Santa María Valley	Ampajango	Buff Fine Ware
LAZ183	na	Group 2	CG2	MG2	99.38	na	Santa María Valley	Caspinchango	Aguada
LAZ184	na	Group 2	CG2	MG2	55.09	na	Santa María Valley	Tolombón	Aguada
LAZ185	na	UNASSIGNED	CG3	MG3	22.84	na	Santa María Valley	Tolombón	Candelaria III
LAZ186	na	UNASSIGNED	CG3	MG3	98.97	na	Aconquija	Ingenio del Arenal	Ordinary
LAZ189	na	Group 2	CG2	MG2	91.21	na	Aconquija	Antigal de Tesoro	Grey Fine Ware
LAZ191	na	Group 2	CG2	MG2	94.63	na	Aconquija	Antigal de Tesoro	Grey Fine Ware
LAZ192	na	Group 2	CG2	MG2	80.82	na	Cajón Valley	Cardonal	Intermediate
LAZ193	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	4.79	MG2	Cajón Valley	Cardonal	Ordinary
LAZ194	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	13.86	MG3	Cajón Valley	Cardonal	Buff Fine Ware
LAZ195	na	Group 2	UNASSIGNED	MG2	31.13	na	Cajón Valley	Cardonal	Ordinary
LAZ196	na	Group 9	UNASSIGNED	UNASSIGNED	1.67	MG9	Cajón Valley	Cardonal	Grey Fine Ware
LAZ197	na	Group 2	CG2	MG2	97.40	na	Cajón Valley	Cardonal	Buff Fine Ware
LAZ198	na	Group 9	UNASSIGNED	MG2	5.93	na	Cajón Valley	Cardonal	Grey Fine Ware
LAZ199	na	UNASSIGNED	UNASSIGNED	MG3	45.27	na	Cajón Valley	Cardonal	Ordinary
LAZ200	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	4.42	MG2	Cajón Valley	Cardonal	Intermediate

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ201	na	Group 9	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Cajón Valley	Cardonal	Ordinary
LAZ202	na	Group 7	UNASSIGNED	UNASSIGNED	2.03	MG2	Cajón Valley	Cardonal	Buff Fine Ware
LAZ203	na	Group 10	CG7	MG7	22.07	na	Cajón Valley	Cardonal	Grey Fine Ware
LAZ210	na	Group 10	UNASSIGNED	MG8	28.77	na	Cajón Valley	Cardonal	Ordinary
LAZ211	na	Group 6	CG6	MG6	95.62	na	Cajón Valley	Cardonal	Ordinary
LAZ212	na	Group 6	CG6	MG6	72.05	na	Cajón Valley	Cardonal	Ordinary
LAZ213	na	UNASSIGNED	UNASSIGNED	MG6	28.83	na	Cajón Valley	Cardonal	Ordinary
LAZ214	na	Group 6	CG6	MG6	80.93	na	Cajón Valley	Cardonal	Ordinary
LAZ215	na	Group 3	CG3	UNASSIGNED	na	UNASSIGNED	Cajón Valley	Cardonal	Grey Fine Ware
LAZ216	na	Group 6	CG6	MG6	93.35	na	Cajón Valley	Cardonal	Ordinary
LAZ217	na	Group 3	UNASSIGNED	UNASSIGNED	2.78	MG6	Cajón Valley	Cardonal	Grey Fine Ware
LAZ218	na	Group 6	CG6	MG6	71.23	na	Cajón Valley	Cardonal	Ordinary
LAZ219	na	UNASSIGNED	UNASSIGNED	MG5	8.62	na	Cajón Valley	Cardonal	Grey Fine Ware
LAZ220	na	UNASSIGNED	UNASSIGNED	MG11	21.55	na	Cajón Valley	Cardonal	Ordinary
LAZ221	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Cajón Valley	Cardonal	Buff Fine Ware
LAZ222	na	Group 2	CG2	MG2	97.70	na	Cajón Valley	Cardonal	Buff Fine Ware
LAZ223	na	Group 6	CG6	MG6	72.71	na	Cajón Valley	Cardonal	Red Fine Ware
LAZ224	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	18.66	MG6	Cajón Valley	Cardonal	Ordinary
LAZ225	na	Group 6	UNASSIGNED	MG6	49.87	na	Cajón Valley	Cardonal	Ordinary
LAZ226	na	Group 2	UNASSIGNED	MG2	69.09	na	Cajón Valley	Cardonal	Grey Fine Ware
LAZ227	na	Group 9	CG2	MG2	84.95	na	Cajón Valley	Cardonal	Grey Fine Ware
LAZ228	na	UNASSIGNED	CG3	UNASSIGNED	42.36	MG3	Cajón Valley	Cardonal	Ordinary
LAZ229	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	2.49	MG3	Cajón Valley	Cardonal	Buff Fine Ware
LAZ230	na	Group 9	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Cajón Valley	Cardonal	Buff Fine Ware
LAZ231	na	Group 6	CG6	MG6	91.41	na	Cajón Valley	Cardonal	Ordinary
LAZ232	na	Group 6	CG6	MG6	91.94	na	Cajón Valley	Cardonal	Ordinary
LAZ233	na	Group 6	CG6	MG6	83.28	na	Cajón Valley	Cardonal	Ordinary
LAZ234	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Cajón Valley	Cardonal	Ordinary
LAZ235	na	Group 6	UNASSIGNED	UNASSIGNED	19.31	MG5	Cajón Valley	Cardonal	Ordinary
LAZ236	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Cajón Valley	Cardonal	Grey Fine Ware
LAZ238	na	UNASSIGNED	CG6	MG6	97.72	na	Cajón Valley	Cardonal	Ordinary
LAZ239	na	Group 9	UNASSIGNED	MG2	13.71	na	Cajón Valley	Cardonal	Buff Fine Ware
LAZ240	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Cajón Valley	Cardonal	Black Fine Ware
LAZ241	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	1.94	MG6	Cajón Valley	Cardonal	Ordinary
LAZ242	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	11.56	MG5	Cajón Valley	Cardonal	Río Diablo
LAZ243	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	1.35	MG2	Cajón Valley	Cardonal	Río Diablo
LAZ244	na	UNASSIGNED	CG3	MG3	67.96	na	Cajón Valley	Cardonal	Red Fine Ware
LAZ245	na	Group 6	CG6	MG6	56.81	na	Cajón Valley	Cardonal	Tosco
LAZ246	na	UNASSIGNED	UNASSIGNED	MG5	3.40	na	Cajón Valley	Bordo Marcial	Río Diablo
LAZ247	na	Group 9	UNASSIGNED	MG2	21.49	na	Cajón Valley	Bordo Marcial	Buff Fine Ware
LAZ248	na	Group 9	UNASSIGNED	UNASSIGNED	13.43	MG2	Cajón Valley	Bordo Marcial	Buff Fine Ware
LAZ249	na	UNASSIGNED	CG5	MG5	25.15	na	Cajón Valley	Bordo Marcial	Ordinary
LAZ250	na	UNASSIGNED	CG3	MG3	59.34	na	Cajón Valley	Bordo Marcial	Red Fine Ware
LAZ251	na	Group 2	CG2	MG2	71.08	na	Aconquija	Antigal de Tesoro	Buff Fine Ware
LAZ252	na	Group 10	UNASSIGNED	MG7	21.23	na	Aconquija	Antigal de Tesoro	Buff Fine Ware
LAZ253	na	Group 10	UNASSIGNED	MG7	52.75	na	El Bolsón Valley	La Mesada	Ordinary
LAZ254	na	Group 10	UNASSIGNED	MG7	17.95	na	El Bolsón Valley	La Mesada	Ordinary

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ255	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	8.59	MG2	El Bolsón Valley	La Mesada	Grey Fine Ware
LAZ256	na	Group 2	CG2	MG2	74.90	na	El Bolsón Valley	La Mesada	Vaquerías
LAZ257	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	El Bolsón Valley	La Mesada	Buff Fine Ware
LAZ258	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	2.23	MG5	El Bolsón Valley	La Mesada	Ordinary
LAZ259	na	Group 10	CG7	MG7	67.59	na	El Bolsón Valley	El Alto El Bolsón	Ordinary
LAZ261	na	Group 10	CG8	UNASSIGNED	2.43	MG8	El Bolsón Valley	El Alto El Bolsón	Ordinary
LAZ262	na	Group 8	CG8	MG8	73.36	na	El Bolsón Valley	El Alto El Bolsón	Ordinary
LAZ263	na	Group 10	CG7	MG7	77.52	na	El Bolsón Valley	El Alto El Bolsón	Ordinary
LAZ264	na	UNASSIGNED	CG3	UNASSIGNED	na	UNASSIGNED	El Bolsón Valley	El Alto El Bolsón	Ordinary
LAZ265	na	Group 8	CG8	MG8	87.51	na	El Bolsón Valley	El Alto El Bolsón	Ordinary
LAZ266	na	UNASSIGNED	CG3	MG3	21.79	na	El Bolsón Valley	El Alto El Bolsón	Ordinary
LAZ267	na	Group 8	CG8	MG8	25.27	na	El Bolsón Valley	Cueva Pintada	Ordinary
LAZ268	na	UNASSIGNED	CG5	MG5	17.65	na	El Bolsón Valley	Morro Relincho	Ordinary
LAZ269	na	Group 10	UNASSIGNED	MG7	39.73	na	El Bolsón Valley	Morro Relincho	Ordinary
LAZ270	na	UNASSIGNED	UNASSIGNED	MG5	21.64	na	El Bolsón Valley	Morro Relincho	Ordinary
LAZ271	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	5.76	MG6	El Bolsón Valley	Morro Relincho	Buff Fine Ware
LAZ272	na	Group 10	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	El Bolsón Valley	Morro Relincho	Ordinary
LAZ273	na	Group 10	CG7	MG7	4.74	na	El Bolsón Valley	Morro Relincho	Red Fine Ware
LAZ274	na	Group 7	UNASSIGNED	MG2	30.94	na	El Bolsón Valley	Los Viscos	Aguada
LAZ275	na	Group 7	UNASSIGNED	MG2	20.47	na	El Bolsón Valley	Los Viscos	Aguada
LAZ276	na	Group 7	UNASSIGNED	MG2	24.48	na	El Bolsón Valley	Los Viscos	Aguada
LAZ277	na	Group 10	CG7	MG7	60.60	na	El Bolsón Valley	Los Viscos	Ordinary
LAZ278	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	El Bolsón Valley	Los Viscos	Ordinary
LAZ279	na	Group 2	UNASSIGNED	MG2	55.45	na	Santa María Valley	Morro de las Espinillas	Grey Fine Ware
LAZ280	na	Group 2	UNASSIGNED	MG2	33.66	na	Santa María Valley	Morro de las Espinillas	Buff Fine Ware
LAZ281	na	Group 2	CG2	MG2	76.24	na	Santa María Valley	Morro de las Espinillas	Grey Fine Ware
LAZ282	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	7.32	MG7	Santa María Valley	Morro de las Espinillas	Ordinary
LAZ283	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Santa María Valley	Morro de las Espinillas	Ordinary
LAZ284	na	Group 2	UNASSIGNED	MG2	52.12	na	Santa María Valley	Morro de las Espinillas	Buff Fine Ware
LAZ359	na	UNASSIGNED	CG5	MG5	97.69	na	Aconquija	Antigal de Tesoro	Ordinary
LAZ360	na	UNASSIGNED	CG8	MG8	99.68	na	Aconquija	Antigal de Tesoro	Ordinary
LAZ361	na	UNASSIGNED	CG3	MG3	67.29	na	Aconquija	Antigal de Tesoro	Ordinary
LAZ362	na	UNASSIGNED	CG7	MG7	65.65	na	Aconquija	Antigal de Tesoro	Grey Fine Ware
LAZ363	na	UNASSIGNED	CG2	MG2	96.04	na	Aconquija	Antigal de Tesoro	Buff Fine Ware
LAZ364	na	UNASSIGNED	CG2	MG2	82.40	na	Aconquija	Antigal de Tesoro	Grey Fine Ware
LAZ365	na	UNASSIGNED	CG5	MG5	24.09	na	Aconquija	Antigal de Tesoro	Ordinary
LAZ366	na	UNASSIGNED	UNASSIGNED	MG2	64.94	na	Aconquija	Antigal de Tesoro	Baño Blanco
LAZ367	na	UNASSIGNED	UNASSIGNED	MG2	1.02	na	Aconquija	Antigal de Tesoro	Black Fine Ware
LAZ368	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	5.80	MG7	Aconquija	Tesoro 1	Intermediate
LAZ369	na	UNASSIGNED	CG6	MG6	12.77	na	Aconquija	Tesoro 1	Ordinary
LAZ370	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Aconquija	Tesoro 1	Ordinary
LAZ371	na	UNASSIGNED	UNASSIGNED	MG2	27.77	na	Aconquija	Tesoro 1	Grey Fine Ware
LAZ372	na	UNASSIGNED	UNASSIGNED	MG7	29.27	na	Aconquija	Tesoro 1	Grey Fine Ware
LAZ373	na	UNASSIGNED	CG2	MG2	89.38	na	Aconquija	Tesoro 1	Grey Fine Ware
LAZ374	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Aconquija	Ingenio Arenal-Faldas	Grey Fine Ware
LAZ375	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Aconquija	Ingenio Arenal-Faldas	Grey Fine Ware
LAZ377	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	26.13	MG2	Aconquija	Ingenio Arenal-Faldas	Red Fine Ware

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ378	na	UNASSIGNED	UNASSIGNED	MG2	4.81	na	Aconquija	Ingenio Arenal-Faldas	Grey Fine Ware
LAZ379	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Aconquija	Ingenio Arenal-Faldas	Buff Fine Ware
LAZ380	na	UNASSIGNED	CG5	MG5	13.75	na	Aconquija	Ingenio Arenal-Faldas	Allpatauca
LAZ381	na	UNASSIGNED	CG8	MG8	10.18	na	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ382	na	UNASSIGNED	CG5	MG5	74.18	na	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ383	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ384	na	UNASSIGNED	CG5	MG5	67.52	na	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ385	na	UNASSIGNED	UNASSIGNED	MG2	94.91	na	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ386	na	UNASSIGNED	CG2	MG2	98.16	na	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ387	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	15.82	MG5	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ388	na	UNASSIGNED	UNASSIGNED	MG5	36.47	na	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ389	na	UNASSIGNED	CG5	MG5	51.80	na	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ390	na	UNASSIGNED	CG5	MG5	8.01	na	Aconquija	Ingenio Arenal-Faldas	Allpatauca
LAZ391	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	7.93	MG2	Aconquija	Ingenio Arenal-Faldas	Buff Fine Ware
LAZ394	na	UNASSIGNED	CG3	MG3	61.26	na	Aconquija	Ingenio Arenal-Faldas	Condorhuasi
LAZ395	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Aconquija	Ingenio Arenal-Faldas	Allpatauca
LAZ396	na	UNASSIGNED	CG8	MG8	39.27	na	Aconquija	Ingenio Arenal-Faldas	Buff Fine Ware
LAZ397	na	UNASSIGNED	UNASSIGNED	MG2	41.46	na	Aconquija	Ingenio Arenal-Faldas	Buff Fine Ware
LAZ398	na	UNASSIGNED	UNASSIGNED	MG5	61.13	na	Aconquija	Ingenio Arenal-Faldas	Buff Fine Ware
LAZ399	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Aconquija	Ingenio Arenal-Faldas	Allpatauca
LAZ400	na	UNASSIGNED	UNASSIGNED	MG2	52.67	na	Aconquija	Ingenio Arenal-Faldas	Grey Fine Ware
LAZ401	na	UNASSIGNED	CG2	MG2	92.57	na	Aconquija	Ingenio Arenal-Faldas	Grey Fine Ware
LAZ402	na	UNASSIGNED	CG8	MG8	39.56	na	Aconquija	Ingenio Arenal-Faldas	Buff Fine Ware
LAZ403	na	UNASSIGNED	UNASSIGNED	MG2	65.09	na	Aconquija	Ingenio Arenal-Faldas	Grey Fine Ware
LAZ404	na	UNASSIGNED	CG8	MG8	83.68	na	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ405	na	UNASSIGNED	CG5	MG5	62.86	na	Aconquija	Ingenio Arenal-Faldas	Ordinary
LAZ406	na	UNASSIGNED	CG5	MG5	16.46	na	Aconquija	Loma Alta	Ordinary
LAZ407	na	UNASSIGNED	CG5	MG5	71.31	na	Aconquija	Loma Alta	Ordinary
LAZ408	na	UNASSIGNED	CG5	MG5	15.85	na	Aconquija	Loma Alta	Ordinary
LAZ409	na	UNASSIGNED	UNASSIGNED	MG5	22.18	na	Aconquija	Loma Alta	Ordinary
LAZ410	na	UNASSIGNED	CG8	MG8	25.16	na	Aconquija	Loma Alta	Ordinary
LAZ411	na	UNASSIGNED	CG8	MG8	63.69	na	Aconquija	Loma Alta	Ordinary
LAZ412	na	UNASSIGNED	CG5	MG5	39.26	na	Aconquija	Loma Alta	Ordinary
LAZ413	na	UNASSIGNED	CG5	MG5	67.29	na	Aconquija	Loma Alta	Ordinary
LAZ414	na	UNASSIGNED	CG5	MG5	32.95	na	Aconquija	Loma Alta	Ordinary
LAZ415	na	UNASSIGNED	UNASSIGNED	MG5	52.28	na	Aconquija	Loma Alta	Ordinary
LAZ416	na	UNASSIGNED	CG5	MG5	1.91	na	Aconquija	Loma Alta	Ordinary
LAZ417	na	UNASSIGNED	UNASSIGNED	MG5	36.70	na	Aconquija	Loma Alta	Ordinary
LAZ418	na	UNASSIGNED	CG5	MG5	90.26	na	Aconquija	Loma Alta	Ordinary
LAZ419	na	UNASSIGNED	CG8	MG8	64.46	na	Aconquija	Loma Alta	Ordinary
LAZ420	na	UNASSIGNED	CG5	MG5	55.60	na	Aconquija	Loma Alta	Ordinary
LAZ421	na	UNASSIGNED	CG8	MG8	21.63	na	Aconquija	Loma Alta	Ordinary
LAZ422	na	UNASSIGNED	CG2	MG2	82.41	na	Aconquija	Loma Alta	Grey Fine Ware
LAZ423	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Aconquija	Loma Alta	Buff Fine Ware
LAZ424	na	UNASSIGNED	CG2	MG2	67.80	na	Aconquija	Loma Alta	Grey Fine Ware
LAZ425	na	UNASSIGNED	UNASSIGNED	MG5	62.07	na	Aconquija	Loma Alta	Ordinary
LAZ426	na	UNASSIGNED	UNASSIGNED	MG3	72.07	na	Cajón Valley	Bordo Marcial	Ordinary
LAZ427	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Cajón Valley	Bordo Marcial	Ordinary

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ428	na	UNASSIGNED	UNASSIGNED	MG2	53.34	na	Cajón Valley	Bordo Marcial	Buff Fine Ware
LAZ429	na	UNASSIGNED	CG6	MG6	6.59	na	Cajón Valley	Bordo Marcial	Grey Fine Ware
LAZ430	na	UNASSIGNED	UNASSIGNED	MG2	30.15	na	Cajón Valley	Bordo Marcial	Grey Fine Ware
LAZ431	na	UNASSIGNED	UNASSIGNED	MG2	24.70	na	Cajón Valley	Bordo Marcial	Grey Fine Ware
LAZ432	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Cajón Valley	Bordo Marcial	Grey Fine Ware
LAZ433	na	UNASSIGNED	UNASSIGNED	MG6	37.24	na	Cajón Valley	Bordo Marcial	Ordinary
LAZ434	na	UNASSIGNED	UNASSIGNED	MG6	33.18	na	Cajón Valley	Bordo Marcial	Intermediate
LAZ435	na	UNASSIGNED	UNASSIGNED	MG2	14.64	na	Cajón Valley	Bordo Marcial	Grey Fine Ware
LAZ436	na	UNASSIGNED	CG6	MG6	79.08	na	Cajón Valley	Bordo Marcial	Intermediate
LAZ437	na	UNASSIGNED	CG2	MG2	72.00	na	Cajón Valley	Bordo Marcial	Black Fine Ware
LAZ438	na	UNASSIGNED	CG2	MG2	97.13	na	Cajón Valley	Bordo Marcial	Buff Fine Ware
LAZ439	na	UNASSIGNED	UNASSIGNED	MG3	94.98	na	Cajón Valley	Bordo Marcial	Ordinary
LAZ440	na	UNASSIGNED	UNASSIGNED	MG6	24.50	na	Cajón Valley	Bordo Marcial	Intermediate
LAZ441	na	UNASSIGNED	CG6	MG6	95.37	na	Cajón Valley	Bordo Marcial	Ordinary
LAZ442	na	UNASSIGNED	UNASSIGNED	MG6	45.17	na	Cajón Valley	Bordo Marcial	Ordinary
LAZ443	na	UNASSIGNED	CG6	MG6	48.81	na	Cajón Valley	Bordo Marcial	Intermediate
LAZ444	na	UNASSIGNED	CG2	MG2	46.86	na	Cajón Valley	Bordo Marcial	Vaquerías
LAZ445	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Cajón Valley	Bordo Marcial	Vaquerías
LAZ449	na	UNASSIGNED	UNASSIGNED	MG9	9.63	na	Cajón Valley	Cardonal	Vaquerías
LAZ450	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	6.48	MG7	Cajón Valley	Cardonal	Vaquerías
LAZ453	na	UNASSIGNED	UNASSIGNED	MG2	37.24	na	Cajón Valley	Cardonal	Buff Fine Ware
LAZ454	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	2.02	MG2	Cajón Valley	Cardonal	Buff Fine Ware
LAZ456	na	UNASSIGNED	CG2	MG2	54.75	na	Cajón Valley	Cardonal	Vaquerías
LAZ458	na	UNASSIGNED	CG2	MG2	93.09	na	Cajón Valley	Yutopián	Baño Blanco
LAZ459	na	UNASSIGNED	UNASSIGNED	MG6	29.11	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ460	na	UNASSIGNED	UNASSIGNED	MG2	12.51	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ461	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Santa María Valley	Bañado Viejo	Ordinary
LAZ462	na	UNASSIGNED	UNASSIGNED	MG5	32.16	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ463	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	27.37	MG5	Santa María Valley	Bañado Viejo	Ordinary
LAZ464	na	UNASSIGNED	UNASSIGNED	MG6	46.70	na	Santa María Valley	Bañado Viejo	Ordinary
LAZ470	na	UNASSIGNED	UNASSIGNED	MG2	8.38	na	Santa María Valley	Bañado Viejo	Baño Blanco
LAZ471	na	UNASSIGNED	CG2	MG2	99.48	na	Santa María Valley	Bañado Viejo	Grey Fine Ware
LAZ472	na	UNASSIGNED	CG2	MG2	19.31	na	Santa María Valley	Bañado Viejo	Grey Fine Ware
LAZ473	na	UNASSIGNED	UNASSIGNED	MG2	11.17	na	Santa María Valley	Bañado Viejo	Buff Fine Ware
LAZ474	na	UNASSIGNED	CG2	MG2	84.75	na	Santa María Valley	Bañado Viejo	Buff Fine Ware
LAZ475	na	UNASSIGNED	CG2	MG2	50.68	na	Santa María Valley	Bañado Viejo	Grey Fine Ware
LAZ476	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	7.31	MG5	Santa María Valley	Bañado Viejo	Ordinary
LAZ477	na	UNASSIGNED	CG2	MG2	67.25	na	Santa María Valley	Bañado Viejo	Buff Fine Ware
LAZ478	na	UNASSIGNED	UNASSIGNED	MG2	79.44	na	Santa María Valley	Bañado Viejo	Grey Fine Ware
LAZ479	na	UNASSIGNED	CG2	MG2	95.00	na	Santa María Valley	Bañado Viejo	Red Fine Ware
LAZ480	na	UNASSIGNED	UNASSIGNED	MG2	54.35	na	Santa María Valley	Bañado Viejo	Grey Fine Ware
LAZ481	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Santa María Valley	Bañado Viejo	Buff Fine Ware
LAZ482	na	UNASSIGNED	UNASSIGNED	MG2	92.68	na	Santa María Valley	Bañado Viejo	Grey Fine Ware
LAZ483	na	UNASSIGNED	CG2	MG2	99.47	na	Santa María Valley	Bañado Viejo	Intermediate
LAZ484	na	UNASSIGNED	CG2	MG2	92.34	na	Santa María Valley	Bañado Viejo	Grey Fine Ware
LAZ485	na	UNASSIGNED	UNASSIGNED	MG2	40.88	na	Santa María Valley	Bañado Viejo	Black Fine Ware

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ486	na	UNASSIGNED	UNASSIGNED	MG2	8.51	na	Santa María Valley	Bañado Viejo	Buff Fine Ware
LAZ487	na	UNASSIGNED	CG2	MG2	37.51	na	Santa María Valley	Bañado Viejo	Buff Fine Ware
LAZ490	na	UNASSIGNED	CG3	MG3	48.01	na	El Bolsón Valley	Barranco Don Silvestre	Ordinary
LAZ491	na	UNASSIGNED	UNASSIGNED	MG3	55.03	na	El Bolsón Valley	Barranco Don Silvestre	Grey Fine Ware
LAZ492	na	UNASSIGNED	UNASSIGNED	MG2	60.06	na	El Bolsón Valley	Barranco Don Silvestre	Buff Fine Ware
LAZ493	na	UNASSIGNED	CG8	MG8	49.25	na	El Bolsón Valley	Barranco Don Silvestre	Ordinary
LAZ494	na	UNASSIGNED	CG3	MG3	83.81	na	El Bolsón Valley	El Médano	Ordinary
LAZ495	na	UNASSIGNED	CG3	MG3	85.98	na	El Bolsón Valley	El Médano	Intermediate
LAZ496	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	El Bolsón Valley	Cueva Pintada	Ordinary
LAZ497	na	UNASSIGNED	UNASSIGNED	MG2	12.73	na	El Bolsón Valley	Los Viscos	Grey Fine Ware
LAZ498	na	UNASSIGNED	UNASSIGNED	MG2	28.38	na	El Bolsón Valley	Los Viscos	Buff Fine Ware
LAZ499	na	UNASSIGNED	CG8	MG8	61.71	na	El Bolsón Valley	Los Viscos	Buff Fine Ware
LAZ500	na	UNASSIGNED	UNASSIGNED	MG2	21.29	na	El Bolsón Valley	Los Viscos	Buff Fine Ware
LAZ501	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	10.08	MG2	El Bolsón Valley	Los Viscos	Ordinary
LAZ502	na	UNASSIGNED	UNASSIGNED	MG7	93.51	na	El Bolsón Valley	Los Viscos	Ordinary
LAZ503	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	10.81	MG2	El Bolsón Valley	Los Viscos	Ordinary
LAZ504	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Cajón Valley	Yutopián	Experimental
LAZ505	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Cajón Valley	Arcillas Verdes	Experimental
LAZ506	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Aconquija	La Aspereza, Cerrillos	Experimental
LAZ507	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Aconquija	La Aspereza, Cerrillos	Experimental
LAZ508	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Santa María Valley	Quebrada de Jujuil	Experimental
LAZ509	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Santa María Valley	Quebrada de Jujuil	Experimental
LAZ510	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Cafayate area	Las Conchas	Experimental
LAZ511	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Cafayate area	Las Conchas	Experimental
LAZ512	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Cajón Valley	Yutopián	Experimental
LAZ513	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Cajón Valley	Arcillas Verdes	Experimental
LAZ514	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Aconquija	La Aspereza, Cerrillos	Experimental
LAZ515	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Aconquija	La Aspereza, Cerrillos	Experimental
LAZ516	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Santa María Valley	Quebrada de Jujuil	Experimental
LAZ517	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Santa María Valley	Quebrada de Jujuil	Experimental
LAZ518	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Cafayate area	Las Conchas	Experimental
LAZ519	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Cafayate area	Las Conchas	Experimental
LAZ520	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Cajón Valley	Yutopián	Experimental
LAZ521	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Cajón Valley	Arcillas Verdes	Experimental
LAZ522	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Aconquija	La Aspereza, Cerrillos	Experimental
LAZ523	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Aconquija	La Aspereza, Cerrillos	Experimental
LAZ524	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Santa María Valley	Quebrada de Jujuil	Experimental
LAZ525	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Santa María Valley	Quebrada de Jujuil	Experimental
LAZ526	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Cafayate area	Las Conchas	Experimental
LAZ527	na	UNASSIGNED	EXPERIMENTAL	EXPERIMENTAL			Cafayate area	Las Conchas	Experimental
LAZ528	na	UNASSIGNED	CLAY	CLAY			Guachipas Valley	La Viña	Clay
LAZ529	na	UNASSIGNED	CLAY	CLAY			Guachipas Valley	La Viña	Clay
LAZ530	na	UNASSIGNED	CLAY	CLAY			Guachipas Valley	La Viña	Clay
LAZ531	na	UNASSIGNED	CLAY	CLAY			Cafayate area	Las Conchas	Clay
LAZ532	na	UNASSIGNED	CLAY	CLAY			North Calchaquí Valley	Palo Pintado	Clay
LAZ533	na	UNASSIGNED	Modern	Modern	na	Modern	Guachipas Valley	La Viña	Modern
LAZ534	na	UNASSIGNED	Modern	Modern	na	Modern	Cafayate area	Las Conchas	Modern

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ598	na	UNASSIGNED	UNASSIGNED	MG2	17.73	na	El Bolsón Valley	Alto Juan Pablo	Grey Fine Ware
LAZ599	na	UNASSIGNED	UNASSIGNED	MG6	23.85	na	El Bolsón Valley	Alto Juan Pablo	Ordinary
LAZ600	na	UNASSIGNED	UNASSIGNED	MG5	61.47	na	El Bolsón Valley	Alto Juan Pablo	Buff Fine Ware
LAZ601	na	UNASSIGNED	CG11	MG11	49.51	na	Quebrada del Toro	Las Cuevas I	Red Fine Ware
LAZ602	na	UNASSIGNED	CG11	MG11	70.40	na	Quebrada del Toro	Las Cuevas V	Ordinary
LAZ603	na	UNASSIGNED	CG11	MG11	70.24	na	Quebrada del Toro	Las Cuevas V	Red Fine Ware
LAZ604	na	UNASSIGNED	UNASSIGNED	MG11	58.40	na	Quebrada del Toro	Tres Cruces I	Red Fine Ware
LAZ605	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	30.70	MG11	Quebrada del Toro	Tres Cruces I	Red Fine Ware
LAZ606	na	UNASSIGNED	CG11	MG11	24.57	na	Quebrada del Toro	Tres Cruces I	Grey Fine Ware
LAZ610	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Quebrada del Toro	Tres Cruces I	San Pedro
LAZ611	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	35.61	MG11	Quebrada del Toro	Tres Cruces I	Buff Fine Ware
LAZ612	na	UNASSIGNED	UNASSIGNED	MG11	66.44	na	Quebrada del Toro	Tres Cruces I	Candelaria III
LAZ613	na	UNASSIGNED	CG11	MG11	34.25	na	Quebrada del Toro	Las Cuevas V	Red Fine Ware
LAZ614	na	UNASSIGNED	CG11	MG11	97.50	na	Quebrada del Toro	Las Cuevas V	Ordinary
LAZ616	na	UNASSIGNED	CG11	MG11	90.47	na	Quebrada del Toro	Las Cuevas V	Buff Fine Ware
LAZ617	na	UNASSIGNED	CG11	MG11	82.67	na	Quebrada del Toro	Las Cuevas V	San Pedro
LAZ618	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	12.33	MG3	Quebrada del Toro	Alero Tres Cruces I	Grey Fine Ware
LAZ620	na	UNASSIGNED	UNASSIGNED	MG11	29.64	na	Quebrada del Toro	Alero Tres Cruces I	Buff Fine Ware
LAZ621	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Quebrada del Toro	Tres Cruces I	San Pedro
LAZ622	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	15.27	MG11	Quebrada del Toro	Tres Cruces I	Buff Fine Ware
LAZ629	na	UNASSIGNED	CG2	MG2	97.04	na	Santa María Valley	Soria 2	Grey Fine Ware
LAZ630	na	UNASSIGNED	CG2	MG2	54.51	na	Santa María Valley	Soria 2	Buff Fine Ware
LAZ631	na	UNASSIGNED	UNASSIGNED	MG6	52.55	na	Santa María Valley	Soria 2	Grey Fine Ware
LAZ632	na	UNASSIGNED	UNASSIGNED	MG2	0.07	na	Santa María Valley	Soria 2	Grey Fine Ware
LAZ633	na	UNASSIGNED	UNASSIGNED	MG2	32.03	na	Santa María Valley	Soria 2	Grey Fine Ware
LAZ634	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	1.67	MG2	Santa María Valley	Soria 2	Ordinary
LAZ635	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	12.23	MG3	Santa María Valley	Soria 2	Ordinary
LAZ636	na	UNASSIGNED	UNASSIGNED	MG2	27.15	na	Santa María Valley	Soria 2	Ordinary
LAZ637	na	UNASSIGNED	UNASSIGNED	MG2	7.78	na	Santa María Valley	Soria 2	Ordinary
LAZ638	na	UNASSIGNED	CG3	MG3	4.04	na	Santa María Valley	Soria 2	Ordinary
LAZ639	na	UNASSIGNED	CG3	MG3	16.41	na	Santa María Valley	Soria 2	Ordinary
LAZ640	na	UNASSIGNED	CG3	MG3	44.89	na	Santa María Valley	Soria 2	Buff Fine Ware
LAZ641	na	UNASSIGNED	UNASSIGNED	MG2	88.78	na	Santa María Valley	Soria 2	Ordinary
LAZ642	na	UNASSIGNED	UNASSIGNED	MG2	17.24	na	Santa María Valley	Soria 2	Ordinary
LAZ643	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Santa María Valley	Soria 2	Ordinary
LAZ644	na	UNASSIGNED	UNASSIGNED	MG2	0.01	na	Santa María Valley	Soria 2	Ordinary
LAZ645	na	UNASSIGNED	CG3	MG3	60.30	na	Santa María Valley	Soria 2	Ordinary
LAZ646	na	UNASSIGNED	CG6	MG6	49.25	na	Santa María Valley	Soria 2	Ordinary
LAZ647	na	UNASSIGNED	CG3	MG3	6.98	na	Santa María Valley	Soria 2	Ordinary
LAZ648	na	UNASSIGNED	CG3	MG3	36.08	na	Santa María Valley	Soria 2	Ordinary
LAZ649	na	UNASSIGNED	CG3	MG3	81.28	na	Santa María Valley	Soria 2	Ordinary
LAZ650	na	UNASSIGNED	CG3	MG3	60.27	na	Santa María Valley	Soria 2	Ordinary
LAZ651	na	UNASSIGNED	UNASSIGNED	MG2	36.80	na	Santa María Valley	Soria 2	Ordinary
LAZ652	na	UNASSIGNED	UNASSIGNED	MG3	72.90	na	Santa María Valley	Soria 2	Ordinary
LAZ653	na	UNASSIGNED	CG3	MG3	37.66	na	Santa María Valley	Soria 2	Ordinary
LAZ654	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	5.73	MG2	Santa María Valley	Soria 2	Grey Fine Ware
LAZ655	na	UNASSIGNED	CG2	MG2	51.60	na	Santa María Valley	Soria 2	Buff Fine Ware
LAZ656	na	UNASSIGNED	UNASSIGNED	MG2	31.47	na	Santa María Valley	Soria 2	Buff Fine Ware

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ657	na	UNASSIGNED	UNASSIGNED	MG2	54.28	na	Santa María Valley	Soria 2	Vaquerías
LAZ658	na	UNASSIGNED	UNASSIGNED	MG2	39.75	na	Santa María Valley	Soria 2	Grey Fine Ware
LAZ659	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Santa María Valley	Soria 2	Grey Fine Ware
LAZ660	na	UNASSIGNED	UNASSIGNED	MG2	27.36	na	Santa María Valley	Soria 2	Grey Fine Ware
LAZ661	na	UNASSIGNED	UNASSIGNED	MG2	47.37	na	Santa María Valley	Soria 2	Grey Fine Ware
LAZ662	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Santa María Valley	Soria 2	Grey Fine Ware
LAZ663	na	UNASSIGNED	UNASSIGNED	MG2	81.86	na	Santa María Valley	Soria 2	Grey Fine Ware
LAZ664	na	UNASSIGNED	UNASSIGNED	MG2	3.57	na	Santa María Valley	Soria 2	Grey Fine Ware
LAZ665	na	UNASSIGNED	CG2	MG2	70.66	na	Santa María Valley	Soria 2	Grey Fine Ware
LAZ666	na	UNASSIGNED	CLAY	CLAY			Santa María Valley	Soria 2	Clay
LAZ667	na	UNASSIGNED	CLAY	CLAY			Santa María Valley	Soria 2	Clay
LAZ668	na	UNASSIGNED	CG8	UNASSIGNED	22.11	MG8	Campo del Pucará	Alamito	Río Diablo
LAZ670	na	UNASSIGNED	CG3	MG3	73.89	na	Campo del Pucará	Alamito	Ordinary
LAZ671	na	UNASSIGNED	UNASSIGNED	MG7	35.82	na	Campo del Pucará	Alamito	Grey Fine Ware
LAZ672	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	12.54	MG3	Campo del Pucará	Alamito	Ordinary
LAZ674	na	UNASSIGNED	UNASSIGNED	MG7	53.48	na	Campo del Pucará	Alamito	Ordinary
LAZ675	na	UNASSIGNED	CG3	MG3	69.16	na	Campo del Pucará	Alamito	Ordinary
LAZ676	na	UNASSIGNED	UNASSIGNED	MG7	43.05	na	Campo del Pucará	Alamito	Grey Fine Ware
LAZ677	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	6.97	MG2	Campo del Pucará	Alamito	Buff Fine Ware
LAZ678	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	6.15	MG2	Campo del Pucará	Alamito	Grey Fine Ware
LAZ679	na	UNASSIGNED	CG8	MG8	82.71	na	Campo del Pucará	Alamito	Intermediate
LAZ680	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	7.44	MG8	Campo del Pucará	Alamito	Ordinary
LAZ681	na	UNASSIGNED	UNASSIGNED	MG5	51.59	na	Campo del Pucará	Alamito	Ordinary
LAZ682	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	7.42	MG11	Campo del Pucará	Alamito	Allpatauca
LAZ684	na	UNASSIGNED	UNASSIGNED	MG3	56.26	na	Campo del Pucará	Alamito	Grey Fine Ware
LAZ685	na	UNASSIGNED	UNASSIGNED	MG5	30.18	na	Campo del Pucará	Alamito	Ordinary
LAZ686	na	UNASSIGNED	UNASSIGNED	MG11	39.29	na	Campo del Pucará	Alamito	Río Diablo
LAZ687	na	UNASSIGNED	UNASSIGNED	MG3	33.74	na	Campo del Pucará	Alamito	Ordinary
LAZ689	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	7.69	MG11	Campo del Pucará	Alamito	Grey Fine Ware
LAZ691	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Campo del Pucará	Alamito	Grey Fine Ware
LAZ692	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	19.49	MG11	Campo del Pucará	Alamito	Ordinary
LAZ693	na	UNASSIGNED	CG3	MG3	45.16	na	Campo del Pucará	Alamito	Ordinary
LAZ694	na	UNASSIGNED	UNASSIGNED	MG3	53.20	na	Campo del Pucará	Alamito	Ordinary
LAZ695	na	UNASSIGNED	UNASSIGNED	MG3	44.31	na	Campo del Pucará	Alamito	Ordinary
LAZ696	na	UNASSIGNED	CG3	MG3	46.50	na	Campo del Pucará	Alamito	Ordinary
LAZ697	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	29.33	MG11	Campo del Pucará	Alamito	Ordinary
LAZ698	na	UNASSIGNED	UNASSIGNED	MG3	5.88	na	Campo del Pucará	Alamito	Ordinary
LAZ699	na	UNASSIGNED	UNASSIGNED	MG3	63.67	na	Campo del Pucará	Alamito	Ordinary
LAZ700	na	UNASSIGNED	UNASSIGNED	MG5	42.35	na	Campo del Pucará	Alamito	Buff Fine Ware
LAZ701	na	UNASSIGNED	CG8	MG8	9.60	na	Campo del Pucará	Alamito	Ordinary
LAZ702	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	64.29	MG3	Campo del Pucará	Alamito	Intermediate
LAZ703	na	UNASSIGNED	UNASSIGNED	MG5	33.58	na	Campo del Pucará	Alamito	Black Fine Ware
LAZ704	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	25.50	MG5	Campo del Pucará	Alamito	Buff Fine Ware
LAZ705	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	2.69	MG2	Campo del Pucará	Alamito	Buff Fine Ware
LAZ706	na	UNASSIGNED	UNASSIGNED	MG5	42.26	na	Campo del Pucará	Alamito	Grey Fine Ware
LAZ707	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	3.67	MG11	Campo del Pucará	Alamito	Ordinary
LAZ708	na	UNASSIGNED	UNASSIGNED	MG3	43.61	na	Campo del Pucará	Alamito	Condorhuasi

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ709	na	UNASSIGNED	UNASSIGNED	MG8	4.14	na	Campo del Pucará	Alamito	Ordinary
LAZ710	na	UNASSIGNED	CG5	MG5	27.43	na	Campo del Pucará	Alamito	Ordinary
LAZ711	na	UNASSIGNED	UNASSIGNED	MG8	13.33	na	Campo del Pucará	Alamito	Ordinary
LAZ712	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	27.15	MG11	Campo del Pucará	Alamito	Ordinary
LAZ713	na	UNASSIGNED	CG3	MG3	57.87	na	Campo del Pucará	Alamito	Buff Fine Ware
LAZ714	na	UNASSIGNED	UNASSIGNED	MG5	44.49	na	Campo del Pucará	Alamito	Condorhuasi
LAZ715	na	UNASSIGNED	UNASSIGNED	MG7	17.36	na	Campo del Pucará	Alamito	Grey Fine Ware
LAZ716	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	11.94	MG2	Campo del Pucará	Alamito	Black Fine Ware
LAZ717	na	UNASSIGNED	UNASSIGNED	MG5	94.57	na	Campo del Pucará	Alamito	Grey Fine Ware
LAZ718	na	UNASSIGNED	UNASSIGNED	MG5	80.83	na	Campo del Pucará	Alamito	Buff Fine Ware
LAZ719	na	UNASSIGNED	UNASSIGNED	MG7	1.42	na	Campo del Pucará	Alamito	Black Fine Ware
LAZ720	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	9.39	MG2	Campo del Pucará	Alamito	Grey Fine Ware
LAZ721	na	UNASSIGNED	UNASSIGNED	MG8	2.10	na	Campo del Pucará	Alamito	Ordinary
LAZ722	na	UNASSIGNED	CG8	MG8	82.55	na	Campo del Pucará	Alamito	Ordinary
LAZ723	na	UNASSIGNED	UNASSIGNED	MG2	31.23	na	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware
LAZ724	na	UNASSIGNED	UNASSIGNED	MG2	1.21	na	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware
LAZ725	na	UNASSIGNED	CG7	MG7	81.97	na	Hualfín Valley	La Ciénaga - Catamarca	Buff Fine Ware
LAZ726	na	UNASSIGNED	UNASSIGNED	MG5	5.05	na	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware
LAZ727	na	UNASSIGNED	UNASSIGNED	MG2	5.02	na	Hualfín Valley	La Ciénaga - Catamarca	Buff Fine Ware
LAZ728	na	UNASSIGNED	CG7	MG7	59.63	na	Hualfín Valley	La Ciénaga - Catamarca	Buff Fine Ware
LAZ729	na	UNASSIGNED	UNASSIGNED	MG2	18.02	na	Hualfín Valley	La Ciénaga - Catamarca	Buff Fine Ware
LAZ730	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	2.19	MG2	Hualfín Valley	La Ciénaga - Catamarca	Aguada
LAZ731	na	UNASSIGNED	UNASSIGNED	MG2	31.77	na	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware
LAZ732	na	UNASSIGNED	UNASSIGNED	MG7	43.44	na	Hualfín Valley	La Ciénaga - Catamarca	Buff Fine Ware
LAZ733	na	UNASSIGNED	UNASSIGNED	MG2	27.50	na	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware
LAZ734	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	3.31	MG2	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware
LAZ735	na	UNASSIGNED	CG7	MG7	41.86	na	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware
LAZ736	na	UNASSIGNED	UNASSIGNED	MG2	35.85	na	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware
LAZ737	na	UNASSIGNED	UNASSIGNED	MG2	25.37	na	Hualfín Valley	La Ciénaga - Catamarca	Aguada
LAZ738	na	UNASSIGNED	UNASSIGNED	MG2	19.43	na	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware

ANID	ICP GROUP	OLD GROUP[1]	CORE GROUP	MACROGROUP	MG PROBABILITY[2]	BEST GROUP	VALLEY	SITE	CERAMIC TYPE
LAZ739	na	UNASSIGNED	UNASSIGNED	MG7	83.41	na	Hualfín Valley	La Ciénaga - Catamarca	Buff Fine Ware
LAZ740	na	UNASSIGNED	UNASSIGNED	MG2	43.71	na	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware
LAZ741	na	UNASSIGNED	UNASSIGNED	UNASSIGNED	na	UNASSIGNED	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware
LAZ742	na	UNASSIGNED	UNASSIGNED	MG2	20.64	na	Hualfín Valley	La Ciénaga - Catamarca	Buff Fine Ware
LAZ743	na	UNASSIGNED	UNASSIGNED	MG2	69.74	na	Hualfín Valley	La Ciénaga - Catamarca	Aguada
LAZ744	na	UNASSIGNED	UNASSIGNED	MG2	34.26	na	Hualfín Valley	La Ciénaga - Catamarca	Buff Fine Ware
LAZ745	na	UNASSIGNED	UNASSIGNED	MG7	73.87	na	Hualfín Valley	La Ciénaga - Catamarca	Buff Fine Ware
LAZ746	na	UNASSIGNED	UNASSIGNED	MG2	18.25	na	Hualfín Valley	La Ciénaga - Catamarca	Buff Fine Ware
LAZ747	na	UNASSIGNED	UNASSIGNED	MG2	15.19	na	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware
LAZ748	na	UNASSIGNED	UNASSIGNED	MG2	39.75	na	Hualfín Valley	La Ciénaga - Catamarca	Buff Fine Ware
LAZ749	na	UNASSIGNED	UNASSIGNED	MG2	22.82	na	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware
LAZ750	na	UNASSIGNED	CG7	MG7	82.90	na	Hualfín Valley	La Ciénaga - Catamarca	Aguada
LAZ751	na	UNASSIGNED	UNASSIGNED	MG2	35.36	na	Hualfín Valley	La Ciénaga - Catamarca	Aguada
LAZ752	na	UNASSIGNED	UNASSIGNED	MG7	43.24	na	Hualfín Valley	La Ciénaga - Catamarca	Grey Fine Ware
LAZ753	na	UNASSIGNED	CLAY	CLAY			Cajón Valley	Cardonal	Clay

APPENDIX B: PROBABILITIES OF CORE VALLEY GROUP MEMBERSHIP FOR *FINE WARES*. BASED ON MAHALANOBIS DISTANCE CALCULATIONS OF THE FIRST FOUR CANONICAL DISCRIMINANT FACTORS.

ANID	*Aconquija*	*Bolsón*	*Cajón*	*Campo del Pucará*	*Hualfín*	*Quebrada del Toro*	*Santa María*	*Archaeological Provienence*	*Imported From*
LAZ020	61.4	0.6	15.7	0.0	0.0	0.3	7.6	Aconquija	Local
LAZ022	82.3	0.3	6.9	0.0	0.0	0.2	0.4	Aconquija	Local
LAZ027	88.4	0.2	6.9	0.0	0.0	0.1	0.1	Aconquija	Local
LAZ030	96.6	0.7	12.0	0.0	0.1	0.1	0.2	Aconquija	Local
LAZ031	0.0	0.5	0.2	0.4	2.2	0.5	0.0	Aconquija	Unassigned
LAZ034	0.0	1.2	0.5	0.1	3.1	0.1	0.0	Aconquija	Hualfín or Bolsón
LAZ035	0.2	2.9	31.9	0.6	0.3	0.2	0.2	Aconquija	Cajón
LAZ037	67.3	0.2	3.5	0.0	0.0	0.1	0.0	Aconquija	Local
LAZ038	31.3	0.4	1.9	0.0	0.0	0.1	0.0	Aconquija	Local
LAZ039	7.2	0.1	3.2	0.0	0.1	0.1	0.1	Aconquija	Local
LAZ045	0.0	0.0	0.0	2.1	0.0	0.0	0.0	Aconquija	Campo del Pucará
LAZ046	0.0	3.7	0.5	55.3	2.0	1.2	0.0	Aconquija	Campo del Pucará
LAZ047	43.9	1.2	12.9	0.0	0.1	0.1	0.2	Aconquija	Local
LAZ048	14.1	0.0	0.8	0.0	0.0	0.0	0.0	Aconquija	Local
LAZ049	0.0	0.1	0.0	22.1	0.1	0.1	0.0	Aconquija	Campo del Pucará
LAZ050	7.0	0.0	0.8	0.0	0.0	0.1	0.0	Aconquija	Local
LAZ051	0.0	91.3	26.7	0.1	15.1	0.3	0.0	Aconquija	Bolsón
LAZ052	0.0	51.1	7.5	0.0	58.9	0.3	0.0	Aconquija	Hualfín or Bolsón
LAZ053	68.0	0.1	3.5	0.0	0.0	0.1	0.0	Aconquija	Local
LAZ056	0.0	7.1	3.2	0.1	10.6	0.1	0.0	Aconquija	Hualfín or Bolsón
LAZ057	0.0	3.6	0.5	0.0	33.1	0.2	0.0	Aconquija	Hualfín
LAZ058	87.6	0.4	5.8	0.0	0.0	0.1	0.0	Aconquija	Local
LAZ059	0.0	0.0	0.0	0.3	0.0	0.0	0.0	Aconquija	Unassigned
LAZ060	0.0	0.7	12.3	0.0	0.2	0.1	0.0	Aconquija	Cajón
LAZ061	57.2	0.9	15.2	0.1	0.0	0.4	9.7	Aconquija	Local
LAZ062	0.0	0.7	0.3	15.5	0.4	0.2	0.0	Aconquija	Campo del Pucará
LAZ063	0.0	0.0	0.7	0.0	0.0	0.0	0.0	Aconquija	Unassigned
LAZ064	0.0	48.2	6.7	0.0	1.8	0.2	0.0	Aconquija	Bolsón
LAZ065	0.0	0.1	0.1	13.9	0.1	0.1	0.0	Aconquija	Campo del Pucará
LAZ067	73.4	0.2	4.5	0.0	0.0	0.1	0.0	Aconquija	Local
LAZ068	0.0	0.9	0.3	5.3	1.4	0.1	0.0	Aconquija	Campo del Pucará
LAZ069	78.2	0.6	11.2	0.0	0.0	0.1	0.2	Aconquija	Local
LAZ070	0.0	2.9	0.6	26.4	2.6	1.1	0.0	Aconquija	Campo del Pucará
LAZ071	0.0	0.1	0.0	1.9	0.1	0.2	0.0	Aconquija	Unassigned
LAZ072	0.0	0.1	1.2	0.0	0.0	0.2	0.0	Aconquija	Unassigned
LAZ074	0.5	0.0	0.2	0.0	0.0	0.1	0.0	Aconquija	Local
LAZ081	0.0	0.8	0.6	1.7	4.6	3.1	0.0	Cajón	Hualfín or Quebrada
LAZ084	0.0	0.3	0.2	0.0	0.0	2.5	0.0	Cajón	Quebrada
LAZ085	6.9	1.0	60.0	0.0	0.0	0.5	11.1	Cajón	Local
LAZ086	37.1	3.0	60.3	0.1	0.2	0.4	36.1	Cajón	Local
LAZ088	1.1	1.8	21.2	0.1	0.3	0.2	13.9	Santa Maria	Local or Cajón
LAZ089	0.1	0.2	3.2	0.0	0.0	4.4	16.6	Santa Maria	Local
LAZ090	6.6	1.2	16.6	0.1	0.1	1.3	92.8	Santa Maria	Local
LAZ091	2.5	0.6	8.3	0.1	0.0	2.2	79.5	Santa Maria	Local
LAZ093	9.8	0.8	3.4	0.1	0.1	1.7	93.6	Santa Maria	Local
LAZ094	11.2	3.5	84.5	0.1	0.2	0.6	55.3	Santa Maria	Local or Cajón

ANID	*Aconquija*	*Bolsón*	*Cajón*	*Campo del Pucará*	*Hualfín*	*Quebrada del Toro*	*Santa María*	*Archaeological Provienence*	*Imported From*
LAZ095	0.1	4.1	15.3	1.2	0.2	4.7	3.6	Santa Maria	Cajón
LAZ098	59.2	1.8	33.2	0.1	0.1	0.5	22.4	Santa Maria	Aconquija or Cajón
LAZ099	4.6	0.9	3.1	0.3	0.1	1.2	79.3	Santa Maria	Local
LAZ100	0.0	0.0	0.3	0.0	0.0	0.0	0.0	Aconquija	Unassigned
LAZ102	0.0	0.0	0.1	0.0	0.0	0.0	0.0	Aconquija	Unassigned
LAZ104	0.0	1.3	0.2	0.0	0.0	0.6	0.0	Aconquija	Unassigned
LAZ105	0.0	0.9	0.4	17.6	1.9	0.3	0.0	Aconquija	Campo del Pucará
LAZ108	92.9	0.6	6.8	0.0	0.0	0.1	0.1	Aconquija	Local
LAZ109	64.0	1.1	15.1	0.1	0.1	0.4	19.1	Aconquija	Local
LAZ110	65.4	0.6	12.3	0.0	0.0	0.2	0.2	Aconquija	Local
LAZ111	4.6	1.1	1.5	0.0	0.0	0.1	0.0	Aconquija	Local
LAZ115	0.0	0.0	0.4	0.0	0.0	0.0	0.0	Santa Maria	Unassigned
LAZ117	2.4	1.9	14.9	0.1	0.0	2.0	39.3	Santa Maria	Local
LAZ118	11.8	1.5	10.7	0.1	0.0	1.2	53.2	Santa Maria	Local
LAZ121	0.0	54.2	3.4	0.0	1.6	0.4	0.0	Santa Maria	Bolsón
LAZ122	84.6	0.2	4.8	0.0	0.0	0.1	0.0	Aconquija	Local
LAZ123	0.0	1.0	1.5	0.4	4.6	2.6	0.0	Aconquija	Hualfín
LAZ125	39.4	0.1	2.4	0.0	0.0	0.1	0.0	Aconquija	Local
LAZ126	0.0	7.6	0.9	12.3	9.0	1.2	0.0	Aconquija	Campo del Pucará
LAZ127	15.6	1.5	22.1	0.1	0.0	0.6	6.4	Aconquija	Local
LAZ129	0.0	0.4	0.3	0.0	0.0	23.4	0.0	Calachaqui	No reference group for this valley
LAZ131	25.6	1.6	10.7	0.3	0.1	0.6	49.0	Santa Maria	Local
LAZ176	2.4	0.5	19.4	0.0	0.0	0.9	9.0	Santa Maria	Cajón
LAZ177	1.2	4.6	22.3	0.4	0.1	1.2	14.2	Santa Maria	Local or Cajón
LAZ178	24.5	2.9	21.3	0.1	0.1	0.3	0.9	Santa Maria	Aconquija or Cajón
LAZ179	5.8	1.9	24.3	0.1	0.0	0.9	9.1	Santa Maria	Local or Cajón
LAZ182	0.0	28.4	14.1	0.1	21.7	0.3	0.0	Santa Maria	Bolsón or Hualfín
LAZ189	29.8	0.4	4.9	0.2	0.1	0.2	5.2	Aconquija	Local
LAZ191	74.2	1.3	21.4	0.0	0.1	0.2	0.7	Aconquija	Local
LAZ194	0.0	0.4	7.2	0.8	0.1	0.1	0.0	Cajón	Local
LAZ196	3.0	2.3	54.9	0.1	0.1	2.0	62.8	Cajón	Local or Santa Maria
LAZ197	0.8	6.3	60.0	0.0	0.3	0.5	5.9	Cajón	Local
LAZ198	2.4	0.7	1.2	0.3	0.1	1.0	12.8	Cajón	Santa Maria
LAZ202	0.0	7.9	16.6	0.0	2.3	0.1	0.0	Cajón	Local
LAZ203	0.0	0.0	0.0	0.8	0.0	0.0	0.0	Cajón	Unassigned
LAZ215	0.0	73.3	20.6	0.9	0.9	1.3	0.0	Cajón	Bolsón
LAZ217	0.0	16.5	5.4	6.2	0.4	1.3	0.0	Cajón	Bolsón
LAZ219	0.0	3.2	9.6	0.0	3.2	1.0	0.0	Cajón	Local
LAZ221	0.0	65.3	5.8	0.0	51.3	0.2	0.0	Cajón	Bolsón
LAZ222	11.5	8.6	90.8	0.1	0.1	0.6	22.7	Cajón	Local
LAZ223	0.0	4.4	2.0	5.9	0.4	15.9	0.0	Cajón	Quebrada
LAZ226	17.0	3.6	87.3	0.0	0.1	0.3	13.9	Cajón	Local
LAZ227	7.6	2.4	97.0	0.0	0.1	0.6	34.8	Cajón	Local
LAZ229	3.4	2.7	32.3	0.0	0.4	0.1	0.4	Cajón	Local
LAZ230	0.0	11.5	17.4	2.8	0.3	0.7	0.2	Cajón	Local
LAZ236	0.0	10.2	1.9	0.1	0.3	1.4	0.0	Cajón	Bolsón
LAZ237	0.0	0.0	0.0	0.0	0.0	0.3	0.0	Cajón	Unassigned
LAZ239	27.4	5.1	70.4	0.1	0.1	0.5	13.7	Cajón	Local
LAZ240	0.0	0.0	0.1	0.0	0.0	0.0	0.0	Cajón	Local
LAZ244	0.0	0.8	0.4	1.5	0.1	36.0	0.0	Cajón	Quebrada
LAZ247	1.1	0.6	3.2	0.2	0.0	5.1	67.9	Cajón	Santa Maria
LAZ248	0.1	0.7	0.4	0.3	0.1	10.7	3.4	Cajón	Quebrada
LAZ250	0.0	39.0	5.5	5.2	0.4	1.5	0.0	Cajón	Bolsón
LAZ251	70.4	1.6	42.5	0.1	0.1	0.3	13.0	Aconquija	Local

ANID	*Aconquija*	*Bolsón*	*Cajón*	*Campo del Pucará*	*Hualfín*	*Quebrada del Toro*	*Santa María*	*Archaeological Provienence*	*Imported From*
LAZ252	0.0	2.4	0.5	23.0	3.7	0.5	0.0	Aconquija	Campo del Pucará
LAZ255	0.0	93.5	22.1	0.1	13.7	0.5	0.0	Bolsón	Local
LAZ257	0.0	54.4	62.8	0.4	1.0	0.6	0.3	Bolsón	Local or Cajón
LAZ271	0.0	67.1	7.4	0.5	0.6	0.9	0.0	Bolsón	Local
LAZ273	0.0	61.3	6.6	0.0	44.6	0.2	0.0	Bolsón	Local
LAZ279	3.6	1.0	1.5	0.5	0.1	1.5	45.2	Santa Maria	Local
LAZ280	1.0	0.3	0.6	0.1	0.0	4.5	33.6	Santa Maria	Local
LAZ281	32.6	0.5	10.7	0.0	0.1	0.1	0.1	Santa Maria	Aconquija
LAZ284	1.3	1.1	1.4	1.1	0.3	1.0	26.3	Santa Maria	Local
LAZ362	0.0	13.2	7.9	4.0	2.2	0.8	0.6	Aconquija	Bolsón
LAZ363	0.0	0.2	0.3	0.0	0.0	0.1	0.0	Aconquija	Unassigned
LAZ364	69.4	0.7	12.7	0.1	0.0	0.4	11.9	Aconquija	Local
LAZ367	9.7	0.0	1.1	0.0	0.0	0.1	0.0	Aconquija	Local
LAZ371	0.0	0.6	0.3	0.1	0.2	0.1	0.0	Aconquija	Unassigned
LAZ372	0.0	41.3	29.5	0.0	14.4	0.1	0.0	Aconquija	Bolsón
LAZ373	3.4	0.3	1.2	0.0	0.0	0.1	0.0	Aconquija	Local
LAZ374	0.0	0.0	0.1	0.0	0.0	0.0	0.0	Aconquija	Unassigned
LAZ375	0.1	0.1	1.7	0.0	0.0	0.2	0.0	Aconquija	Unassigned
LAZ377	0.0	32.4	43.9	0.8	1.9	0.3	0.0	Aconquija	Cajón or Bolsón
LAZ378	0.0	46.4	18.7	0.1	18.8	0.2	0.0	Aconquija	Bolsón
LAZ379	0.0	0.1	0.0	90.0	0.4	0.2	0.0	Aconquija	Campo del Pucará
LAZ391	0.1	3.3	2.1	7.9	1.0	0.7	1.1	Aconquija	Campo or Bolsón
LAZ396	0.0	0.0	0.0	1.8	0.0	0.0	0.0	Aconquija	Unassigned
LAZ397	33.6	1.0	8.9	0.0	0.0	0.1	0.1	Aconquija	Local
LAZ398	0.0	0.1	0.0	42.6	0.1	0.1	0.0	Aconquija	Campo del Pucará
LAZ400	35.5	4.9	63.1	0.0	0.1	0.3	8.7	Aconquija	Local
LAZ401	79.2	0.8	26.3	0.0	0.0	0.2	2.8	Aconquija	Local
LAZ402	0.0	2.4	0.5	0.0	1.3	0.1	0.0	Aconquija	Bolsón
LAZ403	0.0	17.9	16.1	1.8	0.4	0.4	0.0	Aconquija	Bolsón or Cajón
LAZ422	61.0	0.5	9.1	0.0	0.1	0.1	0.1	Aconquija	Local
LAZ423	0.0	18.8	1.8	0.0	8.0	0.1	0.0	Aconquija	Bolsón
LAZ424	2.4	0.2	4.0	0.0	0.1	0.1	0.2	Aconquija	Local
LAZ428	0.0	0.1	0.0	0.0	0.0	0.1	0.0	Cajón	Unassigned
LAZ429	0.0	0.2	1.0	0.0	0.0	0.4	0.0	Cajón	Local
LAZ430	0.0	0.8	4.3	0.0	0.1	0.0	0.0	Cajón	Local
LAZ431	12.5	0.5	6.6	0.3	0.2	0.2	2.7	Cajón	Local
LAZ432	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Cajón	Unassigned
LAZ435	2.8	0.6	1.5	0.2	0.1	3.0	76.1	Cajón	Santa Maria
LAZ437	3.2	1.7	76.1	0.0	0.1	0.4	19.4	Cajón	Local
LAZ438	1.3	3.6	90.3	0.0	0.2	0.4	13.6	Cajón	Local
LAZ453	0.0	19.9	48.8	0.2	2.4	0.2	0.0	Cajón	Local
LAZ454	0.0	12.7	4.1	0.3	0.0	1.0	0.0	Cajón	Bolsón
LAZ471	24.2	1.3	15.5	0.1	0.0	1.0	63.2	Santa Maria	Local
LAZ472	2.3	0.5	5.6	0.1	0.0	1.4	66.3	Santa Maria	Local
LAZ473	1.7	0.5	2.1	0.2	0.1	2.1	59.4	Santa Maria	Local
LAZ474	7.1	1.3	9.1	0.2	0.1	2.1	100.0	Santa Maria	Local
LAZ475	3.0	1.1	20.4	0.1	0.0	2.5	88.0	Santa Maria	Local
LAZ477	4.6	0.7	4.9	0.1	0.1	2.1	95.3	Santa Maria	Local
LAZ478	10.9	1.2	65.4	0.0	0.0	0.7	26.7	Santa Maria	Local or Cajón
LAZ479	4.4	1.4	30.3	0.1	0.1	1.8	87.3	Santa Maria	Local
LAZ480	5.8	0.7	2.0	0.2	0.1	1.1	69.8	Santa Maria	Local
LAZ481	0.5	0.2	0.4	0.0	0.0	1.3	0.9	Santa Maria	Unassigned
LAZ482	8.5	3.0	58.9	0.1	0.2	0.7	69.4	Santa Maria	Local
LAZ484	2.1	2.5	5.0	1.0	0.4	1.0	39.0	Santa Maria	Local
LAZ485	5.0	0.9	2.7	0.1	0.0	2.5	82.8	Santa Maria	Local
LAZ486	1.8	0.9	4.7	0.1	0.0	3.7	78.6	Santa Maria	Local
LAZ487	35.5	1.5	41.4	0.1	0.0	0.7	38.8	Santa Maria	Local or

ANID	*Aconquija*	*Bolsón*	*Cajón*	*Campo del Pucará*	*Hualfín*	*Quebrada del Toro*	*Santa María*	*Archaeological Provienence*	*Imported From*
LAZ491	0.0	64.0	9.4	0.1	1.0	0.4	0.0	Bolsón	Cajón Local
LAZ492	0.0	62.9	11.8	0.1	1.5	0.7	0.0	Bolsón	Local
LAZ497	0.0	36.3	2.0	0.0	5.1	0.1	0.0	Bolsón	Local
LAZ498	0.0	89.3	15.8	0.2	10.7	0.4	0.0	Bolsón	Local
LAZ499	0.0	0.0	0.0	0.1	0.0	0.0	0.0	Bolsón	Unassigned
LAZ500	0.0	53.9	4.7	0.0	26.7	0.4	0.0	Bolsón	Local
LAZ598	0.0	100.0	18.6	0.1	10.1	0.4	0.0	Bolsón	Local
LAZ600	0.0	83.9	9.2	1.0	2.5	0.7	0.0	Bolsón	Local
LAZ601	0.0	0.4	0.0	0.0	0.0	87.8	0.0	Quebrada del Toro	Local
LAZ603	0.0	0.0	0.0	0.0	0.0	0.1	0.0	Quebrada del Toro	Local
LAZ604	0.0	1.0	0.1	0.0	0.0	96.7	0.0	Quebrada del Toro	Local
LAZ605	0.0	2.0	0.1	0.0	0.0	76.7	0.0	Quebrada del Toro	Local
LAZ606	0.0	1.3	0.1	0.0	0.0	56.6	0.0	Quebrada del Toro	Local
LAZ611	0.0	0.7	0.1	0.0	0.0	84.4	0.0	Quebrada del Toro	Local
LAZ613	0.0	0.0	0.0	0.0	0.0	1.5	0.0	Quebrada del Toro	Local
LAZ615	0.0	0.0	0.0	0.0	0.0	0.7	0.0	Quebrada del Toro	Local
LAZ616	0.0	0.3	0.0	0.0	0.0	79.2	0.0	Quebrada del Toro	Local
LAZ618	0.0	0.8	0.4	0.0	0.0	55.4	0.0	Quebrada del Toro	Local
LAZ620	0.0	0.8	0.1	0.0	0.0	85.9	0.0	Quebrada del Toro	Local
LAZ622	0.0	2.5	0.2	0.0	0.0	52.0	0.0	Quebrada del Toro	Local
LAZ629	17.9	1.1	6.6	0.2	0.1	0.7	81.8	Santa Maria	Local
LAZ630	2.8	4.8	27.7	0.6	0.6	0.4	12.3	Santa Maria	Cajón
LAZ631	0.0	2.7	1.5	0.2	0.0	2.1	0.0	Santa Maria	Unassigned
LAZ632	0.0	0.0	0.1	0.0	0.0	0.0	0.0	Santa Maria	Unassigned
LAZ633	2.2	0.9	2.2	0.1	0.0	3.4	64.1	Santa Maria	Local
LAZ640	0.9	0.6	7.1	0.1	0.0	0.3	0.1	Santa Maria	Cajón
LAZ654	0.0	0.0	0.1	0.0	0.0	0.1	0.0	Santa Maria	Unassigned
LAZ655	0.9	1.5	45.1	0.1	0.1	1.8	18.3	Santa Maria	Cajón
LAZ656	0.9	0.5	3.6	0.1	0.0	5.2	61.1	Santa Maria	Local
LAZ658	36.7	1.7	43.3	0.0	0.0	0.4	4.5	Santa Maria	Cajón or Aconquija
LAZ659	0.2	0.9	21.4	0.0	0.0	0.7	0.9	Santa Maria	Cajón
LAZ660	0.1	1.3	7.9	0.0	0.1	0.7	0.4	Santa Maria	Cajón
LAZ661	7.2	5.0	5.6	0.0	0.0	0.3	0.3	Santa Maria	Aconquija or Cajón
LAZ662	0.0	0.0	0.1	0.0	0.0	0.0	0.0	Santa Maria	Unassigned
LAZ663	4.4	1.8	38.8	0.1	0.1	2.0	85.3	Santa Maria	Local
LAZ664	44.7	1.6	31.0	0.1	0.2	0.2	11.8	Santa Maria	Aconquija or Cajón
LAZ665	7.5	9.3	25.4	0.0	0.1	0.5	4.2	Santa Maria	Cajón or Bolsón
LAZ671	0.0	1.4	0.4	0.6	4.3	0.1	0.0	Campo del Pucará	Hualfín
LAZ676	0.0	1.2	0.2	68.7	1.9	0.5	0.0	Campo del Pucará	Local
LAZ677	0.0	0.1	0.0	55.4	0.4	0.3	0.0	Campo del Pucará	Local
LAZ678	0.0	2.0	0.2	80.9	3.3	1.1	0.0	Campo del Pucará	Local
LAZ684	0.0	6.5	1.0	21.4	1.0	5.9	0.0	Campo del Pucará	Local
LAZ689	0.0	2.1	0.4	1.1	0.2	37.2	0.0	Campo del	Quebrada

ANID	*Aconquija*	*Bolsón*	*Cajón*	*Campo del Pucará*	*Hualfín*	*Quebrada del Toro*	*Santa María*	*Archaeological Provienence*	*Imported From*
LAZ691	0.0	0.0	0.0	0.1	0.0	0.0	0.0	Pucará Campo del Pucará	Local
LAZ700	0.0	0.0	0.0	0.0	0.0	0.1	0.0	Campo del Pucará	Unassigned
LAZ703	0.0	0.1	0.0	56.3	0.3	0.3	0.0	Campo del Pucará	Local
LAZ704	0.0	1.1	0.1	85.6	2.7	0.7	0.0	Campo del Pucará	Local
LAZ705	0.0	0.2	0.1	94.1	0.6	0.2	0.0	Campo del Pucará	Local
LAZ706	0.0	1.7	0.2	31.7	0.9	0.4	0.0	Campo del Pucará	Local
LAZ713	0.0	23.0	18.7	2.9	0.3	2.7	0.5	Campo del Pucará	Bolsón or Cajón
LAZ715	0.0	0.3	0.1	66.8	0.6	0.3	0.0	Campo del Pucará	Local
LAZ716	0.0	1.1	0.1	89.1	1.7	1.0	0.0	Campo del Pucará	Local
LAZ717	0.0	0.3	0.1	98.7	0.7	0.2	0.0	Campo del Pucará	Local
LAZ718	0.0	0.1	0.0	42.4	0.2	0.1	0.0	Campo del Pucará	Local
LAZ719	0.0	0.0	0.0	36.4	0.1	0.1	0.0	Campo del Pucará	Local
LAZ720	0.0	0.3	0.0	45.2	1.2	1.1	0.0	Campo del Pucará	Local
LAZ723	0.0	16.9	2.2	0.1	73.0	0.6	0.0	Hualfín	Local
LAZ724	0.0	4.4	1.6	0.0	91.4	0.5	0.0	Hualfín	Local
LAZ725	0.0	19.2	4.7	0.1	56.1	0.5	0.0	Hualfín	Local
LAZ726	0.0	0.1	0.1	0.0	0.1	0.2	0.0	Hualfín	Unassigned
LAZ727	0.0	23.9	1.7	0.0	4.6	0.2	0.0	Hualfín	Bolsón
LAZ728	0.0	11.7	1.5	0.0	22.9	0.1	0.0	Hualfín	Local
LAZ729	0.0	3.5	15.8	0.5	1.6	0.1	0.0	Hualfín	Cajón
LAZ731	0.0	6.6	1.3	0.0	65.5	0.3	0.0	Hualfín	Local
LAZ732	0.0	92.9	12.4	0.1	8.2	0.3	0.0	Hualfín	Bolsón
LAZ733	0.0	81.5	13.8	0.0	31.4	0.2	0.0	Hualfín	Bolsón
LAZ734	0.0	4.2	0.8	0.0	55.2	0.4	0.0	Hualfín	Local
LAZ735	0.0	1.1	0.3	0.2	1.8	0.1	0.0	Hualfín	Local
LAZ736	0.0	1.1	0.9	0.0	59.9	0.8	0.0	Hualfín	Local
LAZ738	0.0	1.6	1.0	0.0	59.5	0.5	0.0	Hualfín	Local
LAZ739	0.0	2.3	0.2	0.0	3.8	0.2	0.0	Hualfín	Local
LAZ740	0.0	11.9	1.5	0.0	56.4	0.3	0.0	Hualfín	Local
LAZ741	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Hualfín	Cajón
LAZ742	0.0	4.2	0.8	0.0	59.3	0.2	0.0	Hualfín	Local
LAZ744	0.0	1.5	0.7	0.0	77.6	0.5	0.0	Hualfín	Local
LAZ745	0.0	2.5	8.3	0.0	2.6	0.0	0.0	Hualfín	Cajón
LAZ746	0.0	11.6	2.2	0.0	70.4	0.2	0.0	Hualfín	Local
LAZ747	0.0	7.1	3.0	0.1	55.9	1.0	0.0	Hualfín	Local
LAZ748	0.0	6.8	1.5	0.0	59.0	0.5	0.0	Hualfín	Local
LAZ749	0.0	14.8	2.4	0.0	98.0	0.3	0.0	Hualfín	Local
LAZ752	0.0	3.6	0.6	0.0	12.1	0.1	0.0	Hualfín	Local

APPENDIX C: PROBABILITIES OF CORE VALLEY GROUP MEMBERSHIP FOR *FINE-LIKE WARES*. BASED ON MAHALANOBIS DISTANCE CALCULATIONS OF THE FIRST FOUR CANONICAL DISCRIMINANT FACTORS.

Aguada

ANID	*Aconquija*	*Bolson*	*Cajon*	*Campo del Pucara*	*Hualfin*	*Quebrada del Toro*	*Santa Maria*	*Archaeological Provenience*	*Production Source*
LAZ076	0.2	31.7	72.5	0.5	0.5	0.8	1.7	Aconquija	Cajon
LAZ077	0.0	20.4	7.1	0.0	30.8	0.3	0.0	Aconquija	Hualfin/Bolson
LAZ274	0.0	75.8	9.5	0.0	30.0	0.2	0.0	Bolson	Local
LAZ275	0.0	23.6	2.8	0.0	4.4	0.3	0.0	Bolson	Local
LAZ276	0.0	14.3	11.0	0.0	5.3	0.1	0.0	Bolson	Local
LAZ730	0.0	0.1	0.1	0.0	7.5	0.6	0.0	Hualfin	Local
LAZ737	0.0	0.2	0.8	0.0	2.9	1.1	0.0	Hualfin	Local
LAZ743	0.0	47.0	46.5	0.0	3.8	0.2	0.0	Hualfin	Bolson/Campo
LAZ750	0.0	10.0	1.2	0.2	41.2	0.5	0.0	Hualfin	Local
LAZ751	0.0	37.6	17.0	0.0	16.5	0.2	0.0	Hualfin	Local/Bolson
LAZ112	0.0	0.2	0.4	0.2	0.8	1.5	0.0	Santa Maria	Unassigned
LAZ113	0.4	3.5	29.1	0.2	0.0	2.4	17.8	Santa Maria	Local/Cajon
LAZ119	0.1	1.8	3.8	0.1	0.0	7.4	12.7	Santa Maria	Local
LAZ120	0.6	1.4	1.6	0.4	0.1	5.1	31.8	Santa Maria	Local
LAZ183	40.1	3.4	64.9	0.1	0.1	0.5	16.2	Santa Maria	Cajon/Aconquija
LAZ184	2.1	5.8	46.1	0.3	0.1	0.6	4.1	Santa Maria	Cajon

Allpatuaca

ANID	*Aconquija*	*Bolson*	*Cajon*	*Campo del Pucara*	*Hualfin*	*Quebrada del Toro*	*Santa Maria*	*Archaeological Provenience*	*Production Source*
LAZ023	0.0	0.1	0.0	0.1	0.1	1.6	0.0	Aconquija	Local (Ordinary)
LAZ380	0.0	0.6	0.2	0.0	0.0	0.1	0.0	Aconquija	Local (Ordinary)
LAZ390	0.0	3.6	0.4	0.2	0.1	0.2	0.0	Aconquija	Local (Ordinary)
LAZ395	0.0	0.0	0.0	0.0	0.0	0.4	0.0	Aconquija	Local (Ordinary)
LAZ399	0.0	0.0	0.0	0.0	0.0	0.1	0.0	Aconquija	Local (Ordinary)
LAZ682	0.1	0.6	0.3	1.2	0.2	2.0	1.7	Campo del Pucara	Local

Bano Blanco

ANID	*Aconquija*	*Bolson*	*Cajon*	*Campo del Pucara*	*Hualfin*	*Quebrada del Toro*	*Santa Maria*	*Archaeological Provenience*	*Production Source*
LAZ073	29.6	3.2	47.0	0.2	0.1	0.6	32.6	Aconquija	Local
LAZ124	1.1	0.7	13.0	0.0	0.0	1.5	6.5	Aconquija	Local/Cajon
LAZ366	8.8	0.1	1.2	0.0	0.0	0.1	0.0	Aconquija	Local
LAZ078	0.0	24.8	3.4	1.3	1.2	0.4	0.0	Cajon	El Bolson
LAZ080	1.7	6.0	12.8	0.1	0.1	0.2	0.2	Cajon	Local
LAZ458	4.3	4.3	27.2	0.5	0.1	0.8	21.0	Cajon	Local
LAZ092	26.6	6.3	50.5	0.1	0.2	0.3	3.7	Santa Maria	Cajon
LAZ114	0.0	0.2	1.3	0.9	0.0	7.0	0.0	Santa Maria	Quebrada del Toro
LAZ470	9.0	1.0	3.3	0.3	0.1	1.4	90.2	Santa Maria	Local

Candelaria

ANID	*Aconquija*	*Bolson*	*Cajon*	*Campo del Pucara*	*Hualfin*	*Quebrada del Toro*	*Santa Maria*	*Archaeological Provenience*	*Production Source*
LAZ612	0.0	0.0	0.0	0.0	0.0	1.5	0.0	Quebrada del Toro	Unassigned
LAZ185	0.0	6.0	2.5	0.1	0.0	8.4	0.0	Santa Maria	Unassigned

Cienaga

ANID	*Aconquija*	*Bolson*	*Cajon*	*Campo del Pucara*	*Hualfin*	*Quebrada del Toro*	*Santa Maria*	*Archaeological Provenience*	*Production Source*
LAZ021	0.0	0.8	6.6	0.0	0.5	0.0	0.0	Aconquija	Cajon
LAZ026	0.0	0.9	0.2	10.2	0.5	0.8	0.0	Aconquija	Campo del Pucara
LAZ029	0.0	0.0	0.1	5.5	0.1	0.0	0.0	Aconquija	Campo del Pucara
LAZ055	0.0	8.8	1.5	12.2	6.1	0.9	0.0	Aconquija	Campo del Pucara

Fambalasto

ANID	Aconquija	Bolson	Cajon	Campo del Pucara	Hualfin	Quebrada del Toro	Santa Maria	Archaeological Provenience	Production Source
LAZ075	0.2	5.7	8.8	0.1	0.0	1.0	1.0	Aconquija	Unassigned
LAZ082	0.0	3.8	4.6	0.1	8.6	1.1	0.0	Cajon	Unassigned

Rio Diablo

ANID	Aconquija	Bolson	Cajon	Campo del Pucara	Hualfin	Quebrada del Toro	Santa Maria	Archaeological Provenience	Production Source
LAZ066	59.7	1.4	10.2	0.0	0.1	0.1	0.2	Aconquija	Local
LAZ242	0.0	0.6	5.2	0.0	0.4	0.0	0.0	Cajon	Local
LAZ243	0.0	59.7	5.3	0.0	28.0	0.2	0.0	Cajon	Bolson/Hualfin
LAZ246	0.0	2.0	0.5	0.0	3.9	0.1	0.0	Cajon	Unassigned
LAZ668	0.0	0.0	0.0	0.4	0.0	0.0	0.0	Campo del Pucara	Local
LAZ686	0.0	1.1	0.1	0.1	0.1	28.1	0.0	Campo del Pucara	Quebrada del Toro

San Pedro

ANID	Aconquija	Bolson	Cajon	Campo del Pucara	Hualfin	Quebrada del Toro	Santa Maria	Archaeological Provenience	Production Source
LAZ132	0.0	0.0	0.0	0.0	0.0	0.1	0.0	North Chile	NA
LAZ133	0.0	0.0	0.0	0.0	0.0	0.0	0.0	North Chile	NA
LAZ134	0.0	0.0	0.0	0.0	0.0	0.4	0.0	North Chile	NA
LAZ135	0.0	0.4	1.0	3.2	0.1	15.5	0.0	North Chile	NA
LAZ610	0.0	0.0	0.1	0.1	0.0	2.8	0.0	Quebrada del Toro	Quebrada del Toro
LAZ617	0.0	0.2	0.2	0.0	0.0	21.4	0.4	Quebrada del Toro	Quebrada del Toro
LAZ621	0.0	0.0	0.1	0.0	0.1	2.9	0.0	Quebrada del Toro	Quebrada del Toro

Tosco

ANID	Aconquija	Bolson	Cajon	Campo del Pucara	Hualfin	Quebrada del Toro	Santa Maria	Archaeological Provenience	Production Source
LAZ245	0.0	1.0	0.1	0.8	0.2	3.8	0.0	Cajon	Unassigned

Vaquerias

ANID	Aconquija	Bolson	Cajon	Campo del Pucara	Hualfin	Quebrada del Toro	Santa Maria	Archaeological Provenience	Production Source
LAZ083	0.0	0.7	2.5	0.0	0.0	6.2	0.3	Cajon	Unassigned
LAZ204	0.9	0.8	3.1	0.0	0.0	1.9	8.6	Cajon	?
LAZ205	0.0	3.4	5.4	0.1	0.0	3.9	0.1	Cajon	?
LAZ206	0.0	1.2	3.2	0.0	0.0	2.8	0.1	Cajon	?
LAZ207	0.0	0.1	0.1	0.0	0.0	21.6	0.0	Cajon	Quebrada del Toro
LAZ208	0.0	1.1	0.9	0.1	0.0	12.3	5.8	Cajon	Quebrada del Toro
LAZ209	0.0	2.5	1.8	0.1	0.0	12.9	0.5	Cajon	Quebrada del Toro
LAZ444	2.8	10.3	26.7	0.0	0.2	0.3	2.2	Cajon	Local
LAZ445	0.0	0.1	0.1	0.0	0.0	13.3	0.0	Cajon	Quebrada del Toro
LAZ446	0.0	0.3	0.9	0.0	0.0	3.2	0.1	Cajon	Quebrada del Toro
LAZ447	0.0	2.1	4.8	0.0	0.0	6.0	0.3	Cajon	Local/Quebrada del Toro
LAZ448	0.0	0.7	0.9	0.0	0.0	21.1	0.5	Cajon	Quebrada del Toro
LAZ449	0.1	1.7	7.8	0.2	0.0	7.3	19.9	Cajon	Local/Santa Maria
LAZ450	0.0	0.1	0.8	0.3	0.0	1.9	0.0	Cajon	Unassigned
LAZ451	0.0	1.1	0.6	0.1	0.0	13.5	1.9	Cajon	Quebrada del Toro
LAZ452	0.0	0.3	0.3	0.0	0.0	17.6	0.1	Cajon	Quebrada del Toro
LAZ455	0.0	0.9	2.9	0.0	0.0	6.8	0.3	Cajon	Quebrada del Toro
LAZ456	0.5	24.5	48.5	0.0	1.0	0.5	2.0	Cajon	Local
LAZ457	0.0	0.6	1.0	0.0	0.0	10.8	0.3	Cajon	Quebrada del

									Toro
LAZ256	39.2	3.8	27.6	0.0	0.1	0.3	2.1	Bolson	Aconquija/Cajon
LAZ128	0.0	1.3	1.9	0.0	0.0	9.6	0.0	Lerma	Quebrada del Toro
LAZ623	0.0	0.3	0.1	0.0	0.0	45.6	0.0	Quebrada del Toro	Quebrada del Toro
LAZ624	0.0	0.3	0.1	0.0	0.0	31.3	0.0	Quebrada del Toro	Quebrada del Toro
LAZ625	0.0	0.1	0.0	0.0	0.0	3.9	0.0	Quebrada del Toro	Quebrada del Toro
LAZ626	0.0	0.3	0.0	0.0	0.0	47.5	0.0	Quebrada del Toro	Quebrada del Toro
LAZ627	0.0	0.7	1.7	0.0	0.0	11.9	6.0	Quebrada del Toro	Quebrada del Toro
LAZ628	0.0	0.1	0.0	0.0	0.0	19.5	0.0	Quebrada del Toro	Quebrada del Toro
LAZ130	0.0	0.6	1.3	0.0	0.0	11.0	0.1	Santa Maria	Quebrada del Toro
LAZ180	0.0	0.1	0.1	0.0	0.0	3.3	0.0	Santa Maria	Quebrada del Toro
LAZ181	0.0	0.4	0.6	0.0	0.0	6.2	2.1	Santa Maria	Quebrada del Toro
LAZ657	0.2	1.4	38.7	0.0	0.1	0.4	6.9	Santa Maria	Cajon

APPENDIX D: PROBABILITIES OF CORE VALLEY GROUP MEMBERSHIP FOR *ORDINARY WARES*. BASED ON MAHALANOBIS DISTANCE CALCULATIONS OF THE FIRST FOUR CANONICAL DISCRIMINANT FACTORS.

ANID	*Aconquija*	*Bolson*	*Cajon*	*Campo del Pucara*	*Quebrada del Toro*	*Santa Maria*	*Archaeological Provenience*	*Imported From*
LAZ028	93.5	0.1	0.0	0.0	0.3	0.0	Aconquija	Local
LAZ032	65.0	0.4	0.0	0.0	0.4	0.0	Aconquija	Local
LAZ101	74.2	0.1	0.0	0.0	0.4	0.0	Aconquija	Local
LAZ103	24.6	1.0	0.0	0.0	0.9	0.1	Aconquija	Local
LAZ107	37.5	0.9	0.0	0.0	0.6	0.1	Aconquija	Local
LAZ146	77.9	0.1	0.0	0.0	0.4	0.1	Aconquija	Local
LAZ147	94.2	0.1	0.0	0.0	0.3	0.0	Aconquija	Local
LAZ149	78.1	0.0	0.0	0.0	0.2	0.0	Aconquija	Local
LAZ150	93.8	0.1	0.0	0.0	0.4	0.1	Aconquija	Local
LAZ151	60.4	0.1	0.0	0.0	0.4	0.0	Aconquija	Local
LAZ162	47.4	1.0	0.0	0.0	0.8	0.4	Aconquija	Local
LAZ163	85.5	0.2	0.0	0.0	0.4	0.1	Aconquija	Local
LAZ164	66.5	0.0	0.0	0.0	0.3	0.0	Aconquija	Local
LAZ169	18.9	0.1	0.0	0.0	0.4	0.0	Aconquija	Local
LAZ172	15.4	0.1	0.0	0.0	0.5	0.0	Aconquija	Local
LAZ359	5.1	0.5	0.0	0.0	0.4	0.1	Aconquija	Local
LAZ365	74.3	0.1	0.0	0.0	0.3	0.0	Aconquija	Local
LAZ382	24.1	0.7	0.0	0.0	0.5	0.0	Aconquija	Local
LAZ383	26.3	0.9	0.0	0.0	0.7	0.0	Aconquija	Local
LAZ384	41.5	0.2	0.0	0.0	0.3	0.0	Aconquija	Local
LAZ387	54.6	0.2	0.0	0.0	0.4	0.1	Aconquija	Local
LAZ389	29.6	1.5	0.0	0.0	0.5	0.0	Aconquija	Local
LAZ405	44.9	0.3	0.0	0.0	0.4	0.0	Aconquija	Local
LAZ406	39.1	0.1	0.0	0.0	0.3	0.0	Aconquija	Local
LAZ407	38.4	0.1	0.0	0.0	0.3	0.0	Aconquija	Local
LAZ408	25.0	0.0	0.0	0.0	0.2	0.0	Aconquija	Local
LAZ409	68.2	0.1	0.0	0.0	0.4	0.0	Aconquija	Local
LAZ412	34.5	0.0	0.0	0.0	0.3	0.0	Aconquija	Local
LAZ413	63.9	0.1	0.0	0.0	0.3	0.0	Aconquija	Local
LAZ414	36.5	0.0	0.0	0.0	0.2	0.0	Aconquija	Local
LAZ415	49.4	0.1	0.0	0.0	0.4	0.0	Aconquija	Local
LAZ416	65.5	0.1	0.0	0.0	0.3	0.0	Aconquija	Local
LAZ417	61.9	0.1	0.0	0.0	0.4	0.0	Aconquija	Local
LAZ418	70.9	0.1	0.0	0.0	0.2	0.0	Aconquija	Local
LAZ420	37.5	2.1	0.0	0.0	0.6	0.1	Aconquija	Local
LAZ425	63.9	0.1	0.0	0.0	0.4	0.0	Aconquija	Local
LAZ036	0.0	5.2	0.0	0.0	1.0	0.0	Aconquija	Bolson
LAZ370	0.0	4.9	0.0	0.0	0.7	0.0	Aconquija	Bolson
LAZ385	0.0	3.8	0.0	0.0	0.5	0.0	Aconquija	Bolson
LAZ386	0.0	10.9	0.0	0.0	0.6	0.0	Aconquija	Bolson
LAZ024	0.0	4.1	0.5	30.7	2.9	24.7	Aconquija	Campo del Pucara/ Santa Maria
LAZ361	0.0	1.6	0.0	22.0	1.6	10.8	Aconquija	Campo del Pucara/ Santa Maria
LAZ171	0.0	3.0	6.2	2.0	1.5	20.4	Aconquija	Santa Maria
LAZ186	0.0	4.6	1.0	6.6	1.2	41.7	Aconquija	Santa Maria
LAZ369	0.3	8.4	2.2	0.0	1.3	52.8	Aconquija	Santa Maria
LAZ148	0.0	0.0	0.0	0.0	0.1	0.0	Aconquija	Unassigned
LAZ170	0.8	0.4	0.3	0.0	0.8	0.3	Aconquija	Unassigned
LAZ360	0.0	0.0	0.0	0.0	0.1	0.0	Aconquija	Unassigned
LAZ381	0.0	0.0	0.0	0.0	0.2	0.0	Aconquija	Unassigned
LAZ388	4.6	9.1	0.9	0.0	1.0	2.3	Aconquija	Unassigned
LAZ404	0.0	0.0	0.0	0.0	0.1	0.0	Aconquija	Unassigned
LAZ410	0.0	0.0	0.0	0.0	0.1	0.0	Aconquija	Unassigned
LAZ411	0.0	0.0	0.0	0.0	0.1	0.0	Aconquija	Unassigned
LAZ419	0.0	0.0	0.0	0.0	0.1	0.0	Aconquija	Unassigned
LAZ421	0.0	0.0	0.0	0.0	0.1	0.0	Aconquija	Unassigned
LAZ253	0.0	54.6	0.0	0.0	0.5	0.0	Bolson	Local

LAZ254	0.0	73.0	0.0	0.0	0.6	0.0	Bolson	Local
LAZ258	0.0	96.4	0.0	0.0	1.0	0.0	Bolson	Local
LAZ259	0.0	86.5	0.0	0.0	1.0	0.0	Bolson	Local
LAZ260	0.1	39.6	0.2	0.0	1.1	0.0	Bolson	Local
LAZ261	0.0	0.8	0.0	0.0	0.2	0.0	Bolson	Local
LAZ263	0.0	57.0	0.0	0.0	0.7	0.0	Bolson	Local
LAZ268	0.0	80.2	0.0	0.0	1.0	0.0	Bolson	Local
LAZ269	0.0	94.2	0.0	0.0	0.9	0.0	Bolson	Local
LAZ270	0.0	4.2	0.0	0.1	1.7	0.0	Bolson	Local
LAZ277	0.0	53.1	0.0	0.0	0.8	0.0	Bolson	Local
LAZ278	0.0	64.5	0.0	0.0	0.9	0.0	Bolson	Local
LAZ490	0.2	15.7	8.6	0.1	1.8	1.7	Bolson	Local
LAZ496	0.0	25.5	0.0	0.0	2.1	0.0	Bolson	Local
LAZ501	0.1	24.7	2.2	0.0	1.7	0.1	Bolson	Local
LAZ502	0.0	69.1	0.0	0.0	1.3	0.0	Bolson	Local
LAZ503	0.0	28.6	0.0	0.0	1.3	0.0	Bolson	Local
LAZ494	0.0	7.4	1.9	1.4	2.2	71.0	Bolson	Santa Maria
LAZ599	0.0	6.1	6.8	0.8	3.3	84.4	Bolson	Santa Maria
LAZ262	0.0	0.0	0.0	0.0	0.1	0.0	Bolson	Unassigned
LAZ264	0.0	1.5	0.0	0.7	1.7	0.8	Bolson	Unassigned
LAZ265	0.0	0.0	0.0	0.0	0.2	0.0	Bolson	Unassigned
LAZ266	0.0	2.1	0.0	4.6	1.3	4.5	Bolson	Unassigned
LAZ267	0.0	0.0	0.0	0.0	0.1	0.0	Bolson	Unassigned
LAZ272	0.0	0.3	0.0	0.0	3.3	0.0	Bolson	Unassigned
LAZ493	0.0	0.0	0.0	0.0	0.1	0.0	Bolson	Unassigned
LAZ193	0.0	29.6	0.2	0.0	1.6	0.0	Cajon	Bolson
LAZ087	2.5	2.6	26.0	0.0	2.6	0.5	Cajon	Local
LAZ165	0.4	3.9	81.1	0.0	2.5	16.3	Cajon	Local
LAZ167	0.4	13.4	17.6	0.0	3.1	0.3	Cajon	Local
LAZ168	0.2	3.0	43.7	0.0	5.9	1.4	Cajon	Local
LAZ199	0.9	8.4	48.9	0.0	1.9	22.3	Cajon	Local
LAZ201	0.1	1.3	8.9	0.0	5.0	0.1	Cajon	Local
LAZ211	0.1	0.7	56.5	0.0	3.2	0.2	Cajon	Local
LAZ212	0.3	3.4	87.5	0.0	3.2	9.3	Cajon	Local
LAZ213	0.4	3.7	63.0	0.0	5.0	0.8	Cajon	Local
LAZ214	0.5	4.0	66.5	0.0	3.6	0.6	Cajon	Local
LAZ216	0.5	1.4	77.9	0.0	3.6	0.1	Cajon	Local
LAZ218	3.5	1.1	28.9	0.0	1.7	0.4	Cajon	Local
LAZ224	1.0	1.9	98.2	0.0	2.6	1.1	Cajon	Local
LAZ225	0.3	0.5	41.1	0.0	2.3	0.1	Cajon	Local
LAZ228	0.2	1.3	79.6	0.0	2.7	1.2	Cajon	Local
LAZ231	0.7	0.6	51.7	0.0	2.6	0.0	Cajon	Local
LAZ232	0.2	1.0	72.6	0.0	3.1	0.4	Cajon	Local
LAZ233	0.1	0.8	24.5	0.0	8.0	0.0	Cajon	Local
LAZ234	1.9	5.5	66.5	0.0	2.6	3.4	Cajon	Local
LAZ235	0.8	3.1	73.6	0.0	2.1	2.6	Cajon	Local
LAZ238	0.8	1.6	99.0	0.0	2.5	1.2	Cajon	Local
LAZ241	0.6	0.7	73.1	0.0	2.6	0.1	Cajon	Local
LAZ426	0.1	5.0	52.0	0.2	2.4	43.6	Cajon	Local
LAZ433	0.5	2.0	52.3	0.0	1.7	8.8	Cajon	Local
LAZ441	0.0	2.5	30.5	0.1	2.3	14.3	Cajon	Local
LAZ442	0.2	1.6	83.1	0.0	3.9	0.9	Cajon	Local
LAZ220	0.0	0.4	0.2	0.0	6.3	0.0	Cajon	Quebrada del Toro
LAZ166	0.0	3.1	0.6	1.6	1.9	25.6	Cajon	Santa Maria
LAZ195	0.1	2.0	0.0	0.0	0.4	0.0	Cajon	Unassigned
LAZ210	0.0	0.0	0.0	0.0	0.2	0.0	Cajon	Unassigned
LAZ249	0.9	0.0	0.0	0.0	0.5	0.0	Cajon	Unassigned
LAZ427	0.0	0.1	0.0	0.0	0.6	0.0	Cajon	Unassigned
LAZ439	0.0	2.3	0.2	15.2	1.6	7.5	Cajon	Unassigned
LAZ674	0.0	17.5	0.0	0.0	0.5	0.0	Campo del Pucara	Bolson
LAZ681	0.0	15.9	1.2	0.3	1.8	1.5	Campo del Pucara	Bolson
LAZ670	0.0	3.4	0.2	88.0	2.1	73.6	Campo del Pucara	Local
LAZ672	0.0	3.2	0.6	60.2	6.3	57.5	Campo del Pucara	Local
LAZ675	0.0	5.0	3.1	48.7	2.6	37.5	Campo del Pucara	Local
LAZ685	1.1	7.3	0.1	0.0	0.9	8.7	Campo del Pucara	Local
LAZ687	0.0	1.9	0.0	58.6	2.9	41.5	Campo del Pucara	Local
LAZ693	0.0	2.9	0.1	45.8	2.9	61.6	Campo del Pucara	Local

LAZ694	0.0	2.2	0.0	68.0	1.6	23.2	Campo del Pucara	Local
LAZ695	0.0	3.1	0.3	71.7	2.7	61.5	Campo del Pucara	Local
LAZ696	0.0	3.9	0.2	43.5	1.3	22.4	Campo del Pucara	Local
LAZ697	0.0	3.7	0.4	99.3	2.5	81.6	Campo del Pucara	Local
LAZ698	0.0	3.8	0.5	97.6	2.4	79.8	Campo del Pucara	Local
LAZ699	0.0	2.7	0.1	75.2	3.1	60.9	Campo del Pucara	Local
LAZ707	0.0	2.2	0.1	52.9	4.2	42.4	Campo del Pucara	Local
LAZ680	0.0	0.0	0.0	0.0	0.1	0.0	Campo del Pucara	Unassigned
LAZ692	0.0	4.0	4.4	0.3	7.6	18.2	Campo del Pucara	Unassigned
LAZ701	0.0	0.0	0.0	0.0	0.1	0.0	Campo del Pucara	Unassigned
LAZ709	0.0	0.0	0.0	0.0	0.2	0.0	Campo del Pucara	Unassigned
LAZ710	0.0	1.3	0.0	0.1	0.8	2.0	Campo del Pucara	Unassigned
LAZ711	0.0	0.0	0.0	0.0	0.2	0.0	Campo del Pucara	Unassigned
LAZ712	0.0	1.9	0.0	0.0	3.1	0.5	Campo del Pucara	Unassigned
LAZ721	0.0	0.0	0.0	0.0	0.1	0.0	Campo del Pucara	Unassigned
LAZ722	0.0	0.7	0.0	0.0	0.3	0.0	Campo del Pucara	Unassigned
LAZ602	0.0	0.1	0.0	0.0	83.4	0.0	Quebrada del Toro	Local
LAZ607	0.0	0.2	0.0	0.0	82.9	0.0	Quebrada del Toro	Local
LAZ608	0.0	0.0	0.0	0.0	93.1	0.0	Quebrada del Toro	Local
LAZ609	0.0	0.1	0.0	0.0	87.6	0.0	Quebrada del Toro	Local
LAZ614	0.0	0.1	0.0	0.0	82.9	0.0	Quebrada del Toro	Local
LAZ619	0.0	0.1	0.0	0.0	91.0	0.0	Quebrada del Toro	Local
LAZ282	0.6	22.9	0.0	0.0	0.8	0.0	Santa Maria	Bolson
LAZ641	0.0	4.7	0.0	0.0	0.6	0.0	Santa Maria	Bolson
LAZ159	0.3	2.5	40.8	0.0	2.5	2.7	Santa Maria	Cajon
LAZ160	0.4	5.2	69.0	0.0	3.0	16.2	Santa Maria	Cajon
LAZ467	6.4	3.3	19.9	0.0	1.6	1.2	Santa Maria	Unassigned
LAZ646	0.0	0.9	0.3	0.2	10.9	0.3	Santa Maria	Quebrada del Toro
LAZ096	0.0	5.2	7.8	0.2	1.6	86.6	Santa Maria	Local
LAZ097	0.0	4.1	0.6	96.5	3.2	91.4	Santa Maria	Local
LAZ153	0.0	4.3	1.9	38.8	2.2	82.8	Santa Maria	Local
LAZ154	0.0	4.9	0.8	0.8	1.3	81.7	Santa Maria	Local
LAZ155	0.0	2.7	0.1	0.1	1.0	26.5	Santa Maria	Local
LAZ156	0.1	6.1	7.6	0.3	1.4	76.0	Santa Maria	Local
LAZ157	0.0	4.9	0.5	0.1	2.0	66.0	Santa Maria	Local
LAZ158	0.1	8.3	0.7	0.0	1.8	11.1	Santa Maria	Local
LAZ161	0.0	4.4	8.4	3.7	3.4	74.5	Santa Maria	Local
LAZ461	0.0	3.5	0.1	25.6	1.9	31.8	Santa Maria	Local
LAZ462	0.1	5.4	0.5	0.0	1.0	44.1	Santa Maria	Local
LAZ463	1.1	3.9	48.0	0.0	1.6	20.2	Santa Maria	Local
LAZ465	0.0	3.1	0.0	0.0	1.0	11.3	Santa Maria	Local
LAZ466	0.0	2.9	0.3	46.7	4.8	68.3	Santa Maria	Local
LAZ468	0.0	2.4	0.1	78.8	3.9	71.9	Santa Maria	Local
LAZ469	0.0	2.5	6.0	2.3	5.2	15.9	Santa Maria	Local
LAZ635	0.0	4.7	2.8	0.1	3.9	38.0	Santa Maria	Local
LAZ638	0.0	5.2	1.5	40.4	3.8	66.0	Santa Maria	Local
LAZ639	0.0	5.7	1.0	3.4	1.9	96.7	Santa Maria	Local
LAZ645	0.0	3.1	0.1	10.0	2.2	63.6	Santa Maria	Local
LAZ647	0.0	5.3	2.6	0.7	2.9	90.9	Santa Maria	Local
LAZ648	0.0	4.8	2.5	2.4	1.3	48.9	Santa Maria	Local
LAZ649	0.0	3.8	1.1	12.1	2.9	80.8	Santa Maria	Local
LAZ650	0.0	2.8	0.3	17.6	3.9	61.2	Santa Maria	Local
LAZ652	0.0	2.2	0.0	3.8	5.5	21.9	Santa Maria	Local
LAZ653	0.0	4.5	7.4	9.3	4.2	56.9	Santa Maria	Local
LAZ116	0.0	0.1	0.0	0.0	0.2	0.0	Santa Maria	Unassigned
LAZ152	1.4	0.5	2.7	0.0	1.0	1.1	Santa Maria	Unassigned
LAZ283	0.0	3.9	0.0	0.0	0.5	0.0	Santa Maria	Unassigned
LAZ459	4.5	2.2	18.6	0.0	1.9	0.8	Santa Maria	Unassigned
LAZ460	0.0	1.5	0.0	0.0	0.8	0.0	Santa Maria	Unassigned
LAZ464	0.6	0.3	0.0	0.0	0.5	0.2	Santa Maria	Unassigned
LAZ476	0.0	8.7	1.0	0.2	3.6	0.5	Santa Maria	Unassigned
LAZ634	0.0	0.2	0.0	0.0	0.2	0.0	Santa Maria	Unassigned
LAZ636	0.0	1.6	0.0	0.0	3.1	0.1	Santa Maria	Unassigned
LAZ637	0.0	5.0	0.0	0.0	0.5	0.0	Santa Maria	Unassigned
LAZ642	0.8	3.3	0.0	0.0	0.6	0.7	Santa Maria	Unassigned
LAZ643	0.0	0.5	0.0	0.0	0.3	0.0	Santa Maria	Unassigned
LAZ644	0.0	0.8	0.0	0.0	0.3	0.0	Santa Maria	Unassigned

LAZ651	0.0	4.8	0.0	0.0	0.8	0.0	Santa Maria	Unassigned

APPENDIX E: ADDENDUM TO REPORT INCORPORATING RECENT LA-ICP-MS ANALYSES OF ORDINARY CERAMICS FROM CAMPO DEL PUCARÁ

10/7/2013

In the previous LA-ICP-MS analysis of the sample clay fraction it became apparent that all of the Condorhuasi ceramics sampled from the Aconquija Valley chemically resembled those from Campo del Pucará. Given the fact that the clay fraction of Ordinary ceramics from Aconquija were chemically distinct from the Condorhuasi ceramics sampled in the same region, we wanted to further test the possibility that the latter were imported, possibly from Campo del Pucará or another source. To test this, we focused on the clay fraction of Ordinary wares from Campo del Pucará to construct a reference dataset of ceramic clay fractions that were probably locally produced. We construct the following hypotheses prior to analysis:

> *H_1 Condorhuasi ceramics recovered in the Aconquija Valley were imported from Campo del Pucará.* If the clay fraction of Condorhuasi ceramics recovered from the Aconquija Valley chemically match the clay fraction of Ordinary wares from Campo del Pucará, it would strengthen the argument of import. Ordinary wares are most likely produced locally. Because of the coarse texture of these ceramics, and the aplastic fraction of the paste does not add significant source-specific variability in this case, the bulk NAA chemical data has been proven to be less useful for sourcing in this case. The clay fraction, however, does significantly vary among valleys in the study area, so the targeted LA-ICP-MS analysis is seen to be the definitive assessment of source in this case.
>
> *H_2 Condorhuasi ceramics from both Campo del Pucará and Aconquija were produced at a third location.* We know that Condorhuasi ceramics from both regions are chemically similar. If their comparison to Campo del Pucará Ordinary ware clay fraction were to yield dissimilar chemical results, we might make two deductions. First (H_2), the Condorhuasi ceramics from *both* Aconquija and Campo del Pucará were produced in a third location. The second deduction follows in the form of an alternate hypothesis.
>
> *H_3 Different clays were used to produce Condorhuasi and Ordinary ceramics*. It is possible that a different type of clay was used to produce Ordinary and Condorhuasi ceramics. Decisions may have been made due to the performance characteristics of the clay. However, we do not see this scenario as likely because the pastes are visually and petrographically similar. Both contain abundant mica flakes. In an evaluation of H_2 and H_3, we believe that the latter is the weaker possibility.

Before proceding to the results, we must recognize a possible source of instrumental error that has been corrected. Since the previous analyses, the laser has been set up on a different ICP-MS, but of identical model NexION 300x. As a caution against instrumental variability (due either to

sensitivity of the detectors or set-up) causing drift in the data, we restandardized all of the data together. Based on replicate analyses of standard reference materials (SRM610, SRM612, and Ohio Red Clay). We noticed a systematic chemical shift in the values for Na and K, so we reran five Condorhuasi ceramics from Campo del Pucará (LAZ669, LAX673, LAZ683, LAZ688, and LAZ690) on the new instrument. Using data for these 5 ceramics that were run on both instruments, we calculated a conversion factor and calibrated the new runs to the old instrument. We then discarded the elements K and Na in the following analysis, which both demonstrated a lot of variability in detection even in homogenous standards. The data are now directly comparable, and there should be no worry of coampatibility. The following is not important for interpreting the data, but I detail the probable problem here to assist in future setup involving the same region. I suspect that the problem stemmed from a different dual-detector calibration that was set up on each machine. The ICP-MS has two detectors: a pulse detector used to count ions present in the very low ppm to ppb range. The pulse detector cannot handle large counts of major elements, which is where the analog detector takes over. We run the MS in dual-dector mode, which automatically switches to the analog detector when the pulse detector is saturated beyond capacity. A smooth transition is guaranteed by a "dual-detector calibration" that had been run before hand. Small variances in the DDC can lead to wide fluctuations in the resultant data. I suspect that the DDC for the two machines do not match precisely. Since each DDC is calculated relative to its machine, neither is necessarily wrong, they just don't match. My procedure to calibrate the two machines using 5 common runs essentially corrected the offset between the two DDCs of the two mass spectrometers.

Principal component analysis was recalculated using the entire new dataset (Figure E.1 and E.2). As mentioned above, we eliminated Na and K in the principal component calculation. Group membership of the older samples changed slightly (see attached master spreadsheet). The new assays of Ordinary Campo del Pucará ceramics almost all fall within Group B: the group that contains almost the entire Condorhuasi sample from both Aconquija and Campo del Pucará. The new assays therefore rather strongly support H_1: *Condorhuasi ceramics recovered in the Aconquija Valley were imported from Campo del Pucará.*

An additional result of the new analyses was the establishment of a new group. Group E consists of ceramics that are unusually high in Rb and Cs. Four of the five specimens in this group were assigned to MG8 while one was left unassigned in the bulk chemical dataset. MG8 was also defined based on its extreme values of Cs and Rb, suggesting that the bulk chemistry of this group is greatly affected by the clay fraction. As mentioned in the main text. The mica flakes in these ceramics are very high in these elements, as well as Ta and As. The clays are very micaceaus and there are mica flakes very finly divided among the clays so they are unavoidable by the laser.

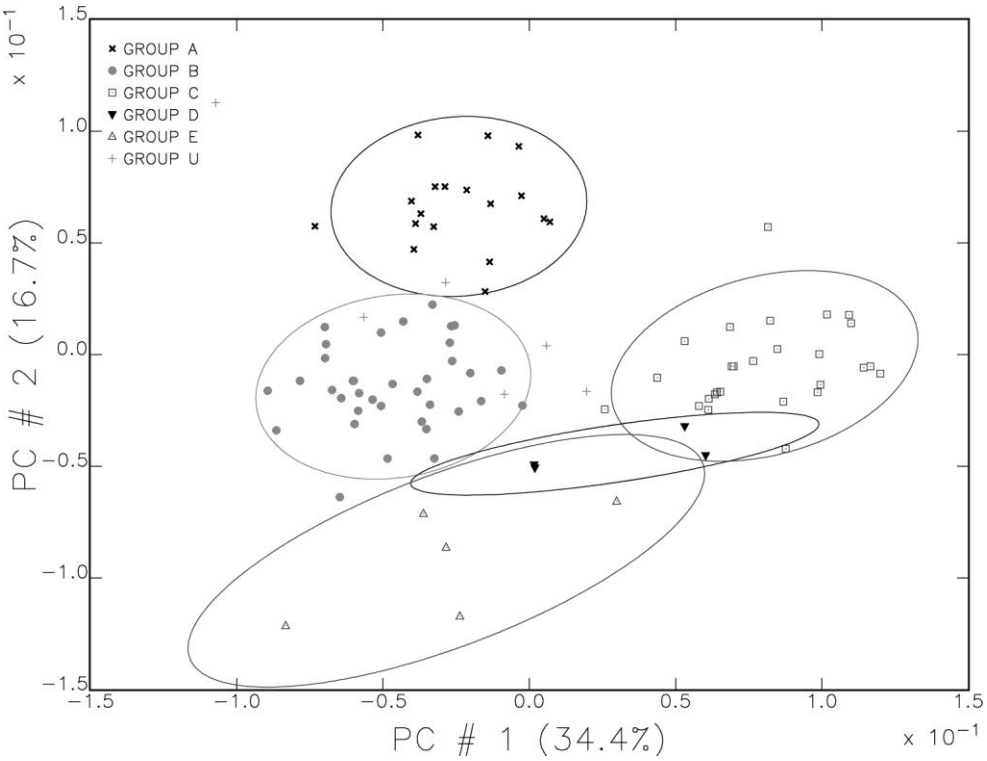

Figure E.1. New principal component analysis showing 90 percent confidence ellipses of group membership and data points that represent the individual chemistry of clay fractions of sherds in the sample. Data displayed on Principal Components 1 and 2, together explaining 51 percent of chemical variability in the sample.

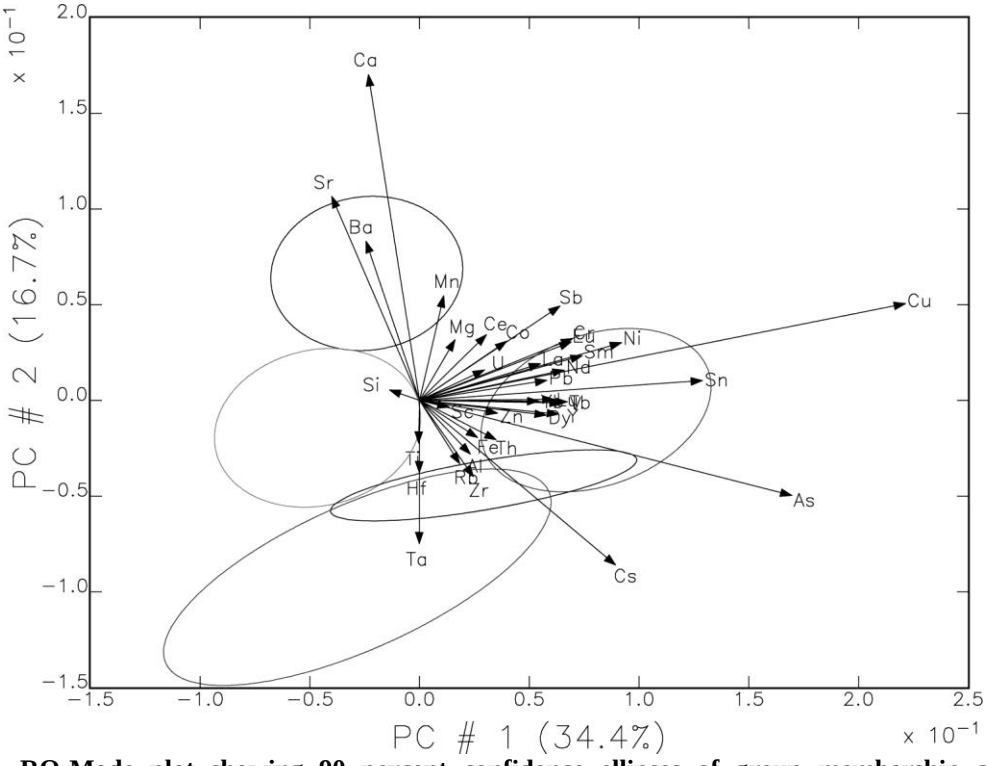

Figure E.2. RQ-Mode plot showing 90 percent confidence ellipses of group membership and vectors displaying the magnitude and direction with which individual elements affect Principal Components 1 and 2.

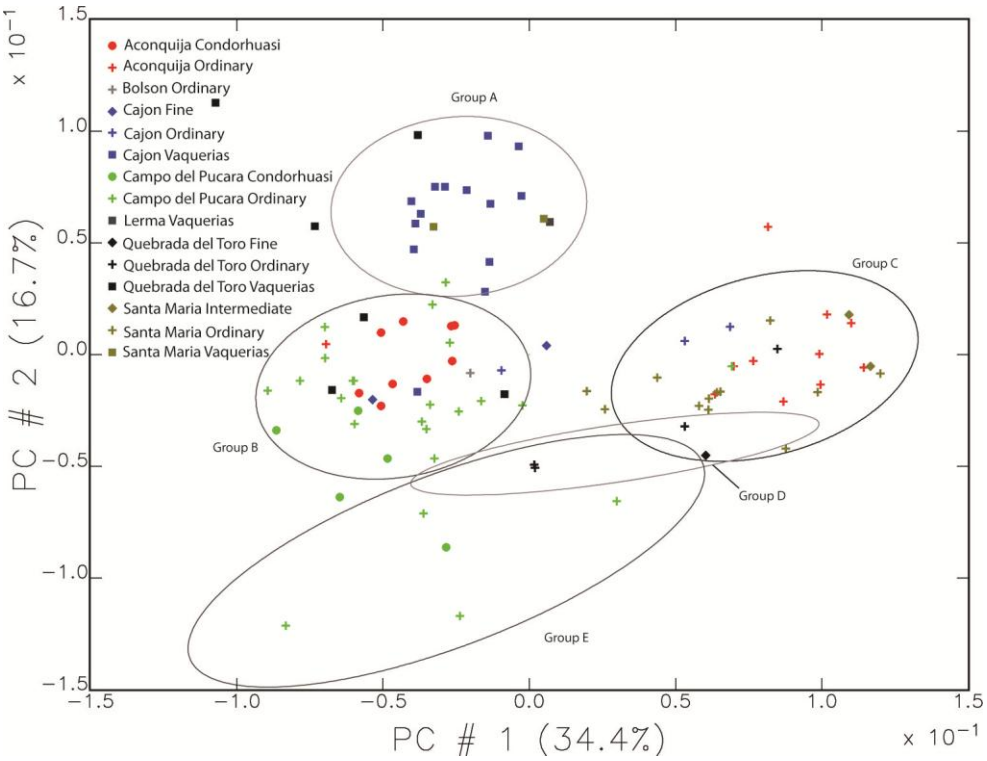

Figure E. 3. Same as Figure E.1 but coding individual data points according to the Valley where they were recovered (color coded) and the type of pottery sampled (symbol coded).