1994

The Spatial Distribution of Ground Stone Tools as a Marker of Status Differentials in a Chinookan Plank House on the Lower Columbia River

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10.15760/etd.2893

THESIS APPROVAL

The abstract and thesis of John William Wolf for the Master of Arts in Anthropology were presented July 7, 1994, and accepted by the thesis committee and the department.

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ABSTRACT

An abstract of the thesis of John William Wolf for the Master of Arts in Anthropology presented July 7, 1994.

Title: The Spatial Distribution of Ground Stone Tools as a Marker of Status Differentials in a Chinookan Plank House on the Lower Columbia River.

Social status was an integral part of the social structure of Northwest Coast societies. The presence of ranked social structures and household space based on rank is reported in the ethnographic literature. Archaeologists have long searched for independent and verifiable means to infer social structure from archaeological deposits. Burial goods have been used to identify status differences. Do other items of material culture also reflect such differences?

The purpose of this study was to ascertain whether or not the distribution of certain tools recovered from a Chinookan plank house on the lower Columbia River paralleled the household residence location that was keyed to social status. Among Northwest Coast societies the household was the basic social and economic unit. Ground stone tools were selected for study because they include tools which were instrumental parts of a technology that depended upon highly organized and scheduled activities, i.e. fishing and house construction. If these tools were controlled by particular individuals or families within the household, their archaeological deposition

might reflect social status differences.

Two questions were asked in this study. (1) What is the correlation between the volume of sediment excavated and the number of ground stone artifacts recovered from the house? (2) What is the relationship between residence location and the density of ground stone artifacts recovered from the house?

The ground stone artifacts were identified, classified and counted. Correlation coefficients between the volumes of sediment excavated and the number of ground stone artifacts recovered showed that the correlation was suspiciously weak, in general, and not correlated for fishing net weights. Some factor other than solely excavation volumes was affecting ground stone artifact counts. To answer the second question linear regressions were performed. They revealed that although location was to some degree a function of the density of ground stone artifacts, that relationship was weak at the .05 significance level. However, the relationship was stronger for fishing net weights. It is likely that there are multiple reasons for ground stone tool distributions and sites must be excavated with broad exposures in order to understand the relationship between residence location and artifact densities.

THE SPATIAL DISTRIBUTION OF GROUND STONE TOOLS AS A MARKER OF STATUS DIFFERENTIALS IN A CHINOOKAN PLANK HOUSE ON THE LOWER COLUMBIA RIVER

by

JOHN WILLIAM WOLF

A thesis submitted in partial fulfillment of the
requirements for the degree of

MASTER OF ARTS
in
ANTHROPOLOGY

Portland State University
1994

ACKNOWLEDGEMENTS

There are many people who have advised, assisted and encouraged me in the production of this thesis. I thank my adviser, Dr. Kenneth M. Ames, who directed the excavations at the Meier Site (35CO5) and my thesis committee members for their time, patience, and counsel.

My entire experience as an anthropology student at Portland State University has been enriched by a faculty with a wide variety of theoretical approaches and research interests. I have learned a great deal from each and every one of them. No less important have been my fellow students. They, too, have opened new windows through which I observe human conditions and culture. In this regard, I owe a special debt to Geoffrey Kleckner who has been my shepherd through the wilderness of statistical methodology.

However, none of us, faculty or students, would be as successful in our endeavors if it were not for the support, efficiency, and friendship of the departmental secretary, Connie Cash. She more than ably guides us through the morass of the university bureaucracy and paper chase. No matter how difficult the day (ours or hers), Connie is one certain source of a smile and a word of encouragement (and an occasional cookie).

The discipline of anthropology has given me much, but nothing so precious as a new appreciation of family. My father and I did not always agree on the issues of the day, but we shared a love of baseball and a commitment to a job done well. My mother's inspiration has been slightly different. She has always kept faith in me, even in the most troubled times. Similarly, I owe a special note of appreciation to my aunt and uncle, Irene and Jesse Newman, who have provided not only occasional financial assistance, but also a refuge from the city.

It is an unfortunate reality that our successes and achievements cannot be shared with all who contributed to them. I have lost some precious friends and they deserve mention here. No one is more responsible for my return to college, after a career in politics and government, than Ken Alward. No one I know has ever had as many true friends, and deservedly so. He persuaded and cajoled until I took a chance and returned to school. I am in his eternal debt.

Bob Foohey and I were friends from the second grade until his death. He provided me with unending intellectual challenge. Our lifestyles and views were often very different. Bob could be the most exasperating of friends, but he was never boring and he was ever loyal.

Emeline Mathews was one of those free spirits we all envy but are too terrified to emulate. Her view was truly planetary. She was a natural anthropologist. She thought holistically and, seemingly, instinctively eschewed ethnocentrism.

Bill Hedlund and John "Stormy" Ernst were among the first people I met when I came to Portland in 1970. They were among my many friends who were/are veterans of the Vietnam War. From these men I learned teamwork, tenacity and loyalty. They "walked the walk" <u>and</u> "the talk." We all owe them more than we can ever give.

It is to my family and friends that I dedicate this work.

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CHAPTER I

INTRODUCTION

Social status was fundamental to the structure and social relationships of Northwest Coast societies. The presence of ranked social structures and household space based on rank is reported in the ethnographic literature, beginning with initial Native American contacts with Euro-American explorers and traders. The question this thesis addresses is whether such ranking and spatial organization is revealed in the archaeological record. Looking for evidence of social structure and organization in the material remains of prehistoric cultures has a long tradition in archaeology, with V. Gordon Childe, if not the earliest, certainly the most vocal proponent. By the end of his career and life Childe was determined to search for "independent and verifiable means" to infer social structure from archaeological deposits (Trigger 1989).

Commonly, status differences are argued to be present when exotic trade items or other symbols of wealth are found in association with burial remains. But what other items of the material culture, besides burial goods, might reflect status differences in the prehistoric past? It is that question that prompted me to conduct my research on the distribution of ground stone tools as a possible marker of such status differentials within the household.

The Chinookan and other Northwest Coast groups were engaged in a social process which produced the means for their own social reproduction. Societal activities included subsistence strategies (production), distribution, transmission of property, rights and privileges, socializing successive generations of children, and ritual practices. These activities all acted to reinforce and maintain the way society was organized.

I view technology and environment as parameters within which specific social and economic relations may occur and social reproduction takes place. The fundamental theory which underlies this study is that the technology, the tasks to utilize that technology, and the power and authority that controls production activities all operate to reproduce (maintain and reinforce) society. This social reproduction is supported and augmented by juridico-political institutions, ideological beliefs and ritual practices. What I attempt in this thesis is the bridging of the physical remains of the application of technology and task organization (i.e. artifacts and features) with evidence of how Northwest Coast (i.e. Chinookan) society was organized, as manifested by residence location within the household.

The large plank house was the residence for the basic economic unit of the Northwest Coast. A group of families, both related and unrelated, comprised the household and engaged in production activities. Although individuals would participate in many different tasks, experts in particular tasks were highly valued and they would spend most of their time engaged in the activity of their expertise. As ethnographic evidence will show, residence location within the house was based on rank or social status. Thus, the archaeological remains of a Northwest Coast house is a logical place to look for evidence of social ranking. The household I investigated is one that was excavated by the Portland State University Summer Archaeological Field School from 1987-1991. The site (35CO5) is called the Meier Site and is composed of the archaeological remains of a plank house, midden and yard area.

Ground stone tools are the focus of this investigation because within the general category of ground stone tools are net weights and mauls. These are tools that, ethnographically, were used in highly organized activities (fishing and housebuilding/maintenance, respectively). If these tools were controlled by particular individuals or families within the household, then their archaeological deposition might reflect status differences. The specific research questions are: Do ground stone tools appear in greater concentration in the higher status area of the house than other areas and do the tools representing highly organized activities appear in greater concentration in the higher status area of the house than other areas?

To answer that question several lines of evidence must be advanced. Chapter II reviews the theoretical and ethnographic literature upon which my argument is based and presents an overview of Northwest Coast and Chinookan social organization. When the Europeans first arrived in the region, the Chinookan peoples lived along the banks of the Columbia River from just above what is now The Dalles, Oregon, to the mouth of the Columbia , as well as along the Willamette River from its falls to the Columbia and along the Clackamas River. Chapter II also discusses the physical and social structures of Northwest Coast and Chinookan houses in that region.

Chapter III, Materials and Research Methods, begins with an explanation of how I classified the ground stone tools from the Meier Site, the problems that developed, and how I resolved them. Discussions of the excavation units and my method for dividing the house and determining artifact densities are also found in Chapter III. Included in that chapter is an explanation of time and space budgeting, task organization and labor allocation and how these relate to production control. Both time and space are viewed as resources and are considered integral elements of production. It is the linking of the ground stone tools with time-space budgeting considerations which allows ground stone tools to be potential markers of status differentials within the house. The chapter ends with a brief explanation of the statistical tests that I employed.

Chapter IV addresses the results of my investigation, while Chapter V discusses my conclusions and suggestions for further research. However, I must emphasize that this investigation is very preliminary in nature. It is designed less to definitively answer questions regarding the relationship of artifact distributions to spatial locations in the house than it is to identify problems associated with such an investigation and to help formulate multiple working hypotheses about household activities and relationships in the plank house excavated at the Meier Site.

CHAPTER II

REVIEW OF THE LITERATURE AND THEORETICAL FOUNDATIONS

NORTHWEST COAST SOCIETIES

It generally has been agreed that Native American populations of the Northwest Coast had social structures that are best described as "ranked" (Curtis 1911; Drucker 1963; Suttles 1968, 1990). The societies were composed of a wealthy elite ("chiefs" or "titleholders"), commoners and slaves (Suttles, 1990). The term "ranked" is from the classification scheme devised by Fried (1967), who also identified the Northwest Coast Native American societies as such. Subsequent researchers argued that Fried's classification was too simplistic and that "ranked" does not fully describe the complexity of social organization among the Northwest Coast peoples. Specifically, the presence of extensive slavery and slave trading is argued to be evidence of class stratification (Donald 1985).

I subscribe to this latter view and find Fried's arguments to the contrary wanting. "Stratified" societies are viewed by Fried as being more evolved and complex than ranked societies. In The Evolution of Political Society (1967), Fried argues that Northwest Coast groups did not really practice authenic slavery. Fried prefers the term "captive" to "slave" in describing the Northwest Coast. These "captives" were not "slaves" (according to Fried) because they engaged in tasks that were also performed by non-captives. For Fried the "captives" were not of economic importance in the manner of the black slaves of the South. The captives were valued as sacrificial victims not economic laborers. Fried further argues that any ethnographic reference to "slavery" is a misnomer employed by the ethnographer and any appearance of conventional slavery must have occurred after contact with Europeans. He admits, however, that there is an absence of "reliable first hand accounts of the progress of slavery" (1967, p. 221).

In my view the most unusual argument made by Fried is that slavery was not significant because (after Drucker, 1965) "slaves" were few in number and slave mortality was high. What he seems to be saying is that for slavery to exist as an economic component in a society, slaves must be treated well enough to have a high survival rate and there must be a lot of them. It is unlikely that this is much of a distinction for the "captive" who labors <u>and</u> may be a subject of ritual sacrifice or for the "slave" who simply labors for the economic benefit of the master. Also, if "captives" or "slaves" are readily replaced, then, their survival rate may be of no importance to their owners.

My point is that Fried's classification scheme may be useful as a pedagogical tool to initially guide students in their attempts to understand the variation in political and social organization practiced by human populations. But it is too simple and general for blind application to Northwest Coast societies. This is particularly true in the light of subsequent studies of slavery in these societies.

Mitchell (1985) found that based on the earliest census taken by the Hudson

Bay Company (1824-25), the slave population averaged 22.5% for the entire Northwest Coast region, with a range from 16% to 31%. The highest slave population percentages were at the northern and southern extremes of the region, the Tlingit and Chinook respectively. The group which had the highest number of slaves was the Chinook. Unfortunately there is no way to assess the accuracy of these census figures or to extrapolate into pre-contact periods.

Among the Northwest Coast populations a slave's status would never change. Slaves could be and certainly were traded, but they were forever bound. Escape was difficult, if not impossible, and failed escapes could be terminal. There was no upward mobility. Nonslaves and slaves did not often intermarry, for this would be of direct disadvantage to the nonslave and no advantage to the slave and their off-spring would be slaves (Donald 1985; Hajda 1984; Ray 1938; Suttles 1990). Their use as potential sacrificial victims does not belie their utility as labor. They could also be killed at the whim of the slaveholder. Though all slaves were not killed, all worked, and being gender-free were used for any task regardless of sex (Lockley 1928; Merk 1931; Mitchell and Donald 1988; Ray 1938). The fact that they may have performed work of a similar nature as the nonslave inhabitants of the household does not deny that their presence was unwilling and their labor *a priori* coerced. In addition, Ray (1938) explains that although slaves often worked side-by-side with their masters, their particular tasks were the most difficult. They were not a leisure class, they were a laboring class whose production activities were controlled and directed by titleholders and commoners.

Chinookan social organization followed the general regional model of social divisions (titleholders, commoners and slaves). The titleholders were surely ranked *in sensu* Fried (1967). Each member of this group had a specific status position relative to everyone else in the group (Drucker 1963, 1965; Silverstein 1990). Donald (1985) argues that the presence of this ranking within the group has tended to mask the presence of class divisions within the society as a whole. He divides stratified societies into three types: "developing or incipient classes;" "class-divided societies;" and "class societies" (p. 242). He views most Northwest Coast societies as class-divided societies, in which there were three classes (titleholders, commoners, slaves), but for titleholders and commoners kinship was the source of social identity rather than class. Kent (1990) offers a similar interpretation. She sees all human societies falling into one of four categories, and places Northwest Coast societies into "Category IV" with "hereditary chiefs with formal power and inherited sociopolitical stratification in the form of classes" (p. 139). Hierarchical individual ranking is often present (as in the case of the Northwest Coast groups). Whichever classification scheme is preferred, it is clear that Northwest Coast societies were stratified.

THE CHINOOKAN HOUSE

Although authorities may disagree as to the importance of slavery in Northwest Coast societies and whether to term these societies "ranked" or "stratified," no one disagrees that social status was fundamental to their structure and organization (Drucker 1963; Suttles 1968, 1990). One's status was not simply reflected in one's material possessions or ability to influence or direct community activities. Status was also manifested in the organization of space within the household (Marshall 1989, Vastokas 1966). House designs and specific spatial positions of rank within the house varied among the various Northwest Coast groups, but all had some system of spatial differentiation based on rank, which was clearly reflected in the layout of living space within the house (Drucker 1951, 1953, 1965; Arima and Dewhirst 1990; Goddard 1972; Marshall 1989; Suttles 1990).

Most Northwest Coast groups had permanent winter villages. During the other seasons, house planks were stored in water (swamps or ponds) in order to protect and preserve them (Ames et al. 1992; Hajda 1984). However, not all groups had seasonal house locales. For instance, the Meier Site house appears to have been occupied year around and represents a rare example of sedentism among people who hunted, fished and gathered for subsistence (Ames et al. 1992).

House form varied throughout the region, with most houses constructed on a post and beam framework near a body of water (river, lake, ocean). They were rectangular in general form, but some had doors along the side on the short axis, while others had doors at the end of the long axis. The Chinookan houses favored this latter arrangement (Silverstein 1990). The long axis of the house was aligned with the prevailing winds (Ray 1938). The doors invariably faced the water (Waterman 1923) and in the case of the Meier Site house the body of water was a lake to the south (Ames et al. 1992). Lashed to the framework were cedar planks (Curtis 1911; Kane 1968; Lockley 1928; Ray 1938; Silverstein 1990). Among the Chinook the planks were usually oriented vertically (Silverstein 1990; Suttles 1990). Plank molds at the Meier Site confirm this arrangement there. Planks comprising the gabled roof could be adjusted to permit the escape of smoke from the hearth fires within. Generally, the houses were 4.5 to 9 meters wide and 6 to 15 meters long. There are reports of much larger houses, ranging from 60 to 137 meters in length. The Meier Site house is larger than usual, with dimensions of approximately 14 meters by 35 meters. Ames et al. (1992) estimate that 8-11 families, totalling 60 people, could have resided in the house.

The interior of the Chinookan house consisted of a central hearth area which ran along the length of the house (Ames et al. 1992; Hajda 1984; Lockley 1928; Ray 1938). The hearths at the Meier Site are shallow bowls composed of clay. They are about 50 centimeters in diameter and 10 centimeters wide and are contained within hearth boxes about 2 meters square. These boxes are marked by abrupt, clear and square-cornered boundaries of ash deposits. Along the two side walls and back wall of the house a bench was constructed of packed earth. The builders constructed wooden platforms above the bench area. This would be an area where one could accomplish a variety of household chores. It was also the sleeping area. Between the bench and the hearth boxes there was a corridor which also contained storage pits. It is from within the pits that most ground stone artifacts were recovered, while most projectile points came from the floor zone (Ames et al. 1992). The Meier Site house shows evidence that at one time this corridor was covered by planks and below the planks was a crawlspace which gave access to the storage pits. Over time, for reasons unknown, the planking was removed and the corridor packed with fill while the house was still occupied (Ames et al. 1992).

SOCIAL AND SPATIAL POSITION WITHIN THE HOUSE

Among all Northwest Coast groups physical position of one's space within the house was a reflection of one's rank/position within the society (Ames et al.1992; Arima and Dewhirst 1990; Drucker 1951, 1963, 1965; Goddard 1972; Marshall 1989; Suttles 1990; Vastokas 1966). The household or domestic group was composed of families, slaves, and any visitors that might be present. A family consisted of husband, wife, dependent children and any related elderly individuals not otherwise connected. Along the Northwest Coast the northern groups tended to be matrilineal, while in the south, including the Chinookan, they were patrilineal (Jorgensen 1980). Invariably the highest ranking individual and his family resided in the rear of the house. Among the Nootkan groups the right rear seems to have been the position of highest rank, with the left rear second in status (Arima and Dewhirst 1990). These rear areas usually were separated from the rest of the house by a wooden screen, and in Chinookan houses sometimes with carved and/or painted wooden figures (Ames et al. 1992). Slaves might reside with the family which owned them or be grouped in the less desirable areas of the house. As one moved away from the back wall the social position shifted downward. In some Northwest Coast groups, the corners of the house were assigned to those of close kin association to the highest ranking individual, while the areas along the walls in the center region of the house were assigned to those of more lowly rank. Among Chinookan groups it appears that this was not the arrangement. Instead, there was a diminution of rank as one moved away from the back of the house. In these groups the areas nearest the door were occupied by slaves (Ames et al. 1992; Arima and Dewhirst 1990; Drucker 1951, 1963, 1965; Goddard 1972; Ray 1938; Ruby and Brown 1976)

Chatters has argued that economic differentiation should be visible, archaeologically, in Northwest Coast houses because "the longhouse" is "the domicile of the economic unit" (1989, p. 169). Because "status is expressed in area segregation" (Kent 1990, p. 141) archaeological deposits should in some way reflect this segregation. Architect/historian Amos Rapoport (1969, 1990a, 1990b) sees built environments as both elements and reflections of cultural forms and social organizations. To me this view is a theoretical imperative for any type of household archaeology, such as that advocated by Wilk and Rathje (1982). The house is more than a physical structure. It is a cultural phenomenon. Humans can live in many kinds of structures; therefore the form of the house is influenced by climate, availability of raw materials, and socio-cultural preferences (Rapoport 1969). To Rapoport the built environment is a product of environmental design, i.e. "any purposeful modification or change in the physical environment...by humans" (1990a). Furthermore, any building is part of an "activity system" which is "organized in time and space" (Rapoport 1990b, p. 12). Thus, activities and settings are inexorably linked, but this linkage goes beyond the temporal and spatial connections. They are linked "through meaning" so that when one enters a building/house (a setting) there are particular cues which define rules of behavior (Rapoport 1990b, p. 12). The household setting includes "fixed-feature elements" such as the building itself, floors, hearths, etc.; "semi-fixed-feature elements" such as furnishings; and "non-fixed-feature elements" which include people, activities and behaviors (Rapoport 1990b, p.13). Societies with marked status differences should reflect these differences in all three elements. In other words, in the houses of all class-based or class-divided societies there will be cues and clues to the extent and nature of social stratification. Archaeologically, these elements leave evidence in the form of features, artifacts and ecofacts.

TIME/SPACE PACKING AND PRODUCTION CONTROL

As I stated in my introduction, it is within the Chinookan plank house that we find the tools that are used to fish and to build houses. These are activities which require planning and organization. Planning minimally involves determining when an activity will take place. Organization minimally involves who will engage in the activity. Hagerstrand has argued (Carlstein et al. 1978; Thrift, 1977) that both planning and organization are constrained by basic conditions which affect all human life and society. These limitations are worth noting here and have been summarized by Carlstein et al. (1978, p. 118):

> 1. the indivisibility of the human being (and of many other entities, living and non-living);
> 2. the limited length of each human life (and many other entities, living and non-living);
> 3. the limited ability of the human being (and many other indivisible entities) to take part in more than one task at a time;
> 4. the fact that every task (or activity) has a duration;
> 5. the fact that movement between points in space consumes time;

6. the limited packing capacity of space;
7. the limited outer size of terrestrial space (whether we look at a farm, a city, a county or the Earth as a whole); and
8. the fact that every situation is inevitably rooted in past situations.

Any activity, no matter how simple or complex, consumes time. Activities occur within particular spatial boundaries and the volume of activities (any and all of which demand time) that can be packed into a particular space are limited. So there are two fundamental limits on activities -- space and time -- and both are occupied simultaneously. Thus, activities in a particular space occur over a particular quanta of time (Carlstein et al. 1978).

Considerations of time/space limitations are important in this discussion, because the activities of primary interest here are fishing and housebuilding. Both activities are limited by both time and space considerations. For instance, fishing is obviously limited to the space where fish are present and those doing the fishing can get to them. The temporal limitation, particularly for the salmon which were so important to subsistence in the Northwest, is that established by the varying seasonal abundance of species. In addition, not only must the actual activity of fishing be scheduled, but tools necessary for fishing (nets, net weights, weirs, etc.) must be readied in advance and available when needed. In like manner, the labor necessary to prepare the tools and, then, use the tools for fishing, must be selected and readied.

On the other hand, housebuilding is spatially constrained by site location preferences (near water and other resources), topography, and territorial (social/political) restrictions. The temporal limitation on housebuilding is that it must occur so as not to interfere with primary subsistence activities (e.g. peak fishing or hunting seasons).

The point here is that both time and space are resources that are used as surely as any other resource (Thrift 1977). Consequently, they require allocation as surely as any other resource. It is because of this need for space and time allocations that human groups establish space-time budgets. Even the most basic of human social organizations, the mobile hunting-gathering band, budgets time and space, simply by moving through space to a resource to capture it at a particular time. Tasks (jobs) and tools are means by which humans address the constraints of time and space (Zipf 1965). There is great variation in the production time of different kinds of tools. Chipped stone tools require less production time than ground stone tools. However, ground stone tools are more durable. Thus, ground stone tools have a higher time cost, but also offer a high benefit in their durability (Boydston 1989). This distinction is often phrased as the difference between "expedient" and "curated" tools (Boydston 1989; Nelson 1991). As societies become more complex (and sedentary), budgeting of space and time becomes more involved and an activity which is initially time demanding, such as the production of ground stone tools as net weights and mauls, can actually relieve time stress elsewhere in the production phase by displacing or repacking time (Boydston 1989; Carlstein 1978; Thrift 1977). This is a particularly useful strategy for sedentary people trying to cope with seasonal variability (Boydston 1989; Suttles 1968).

In the case of the Northwest Coast, the basic economic unit is the household (Chatters 1989; Jorgensen 1980; Mitchell and Donald 1988) and it was within the household that space-time budgeting decisions were made (Coupland 1985). This responsibility rested with the head of the household, who would oversee production by scheduling activities and allocating tasks (Coupland 1985; Drucker 1983). The extent to which the household chief was directly involved in scheduling and allocating is unclear (Curtis 1911; Ray 1938; Silverstein 1990), but it is reasonable to assume that those making such decisions were kinsmen of the chief or task specialists of the household (Ames 1993). Gilman (1981), although discussing the development of social stratification in Bronze Age Europe, argues that elites control production and the instruments of production as a means to maintain and perpetuate their status. Sahlins (1957) found that in Fiji, where household space was also distinguished by rank, production activities were directed by the family head and the regulation and co-ordination of the men's daily activities were the most important function of the family head. Chatters (1989) points out that the household leader selected housemates with expertise that covered the gamut of potential household activities.

Three Northwest Coast sites are of particular relevance for this investigation. Samuels (1989) reports on spatial patterns found in the floor middens of the Ozette longhouses. In this case artifact densities were more uniform among the house floor than faunal debris densities. The house with a central hearth feature (House 1), suggestive of ceremonial use, was also the house that showed evidence of removal of faunal debris from the house and redeposit to an exterior midden. What is significant for my study is that the Ozette research offers a precedent for examining spatial distributions as a means to draw inferences about social structure. Huelsbeck (1989) also found evidence of status items (decorative ceremonial shells) located in corner areas in House 1 at Ozette, which was where higher status Makah individuals and their families resided.

Chatters (1989) investigated and reported on two sites: the Sbabadid Longhouse on the floodplain of the Black River of the southern Puget Sound area and the Tualdad Altu village, also on the Black River. By comparing tool inventories and densities he found possible specialist areas in the Sbabadid house, based on the differential distribution of artifacts. At Tualdad Altu he also found significant differences in tool densities in different areas of the longhouse.

The question that follows logically from the abovementioned studies is if specialist activities can be read in the archaeological record by examining the differential distribution of tools and status can be read from the distribution of ceremonial items, can status also be read from tool distributions? It should be possible to find physical evidence of tools used for production, examine their relative densities and determine whether their locations are consistent with ethnographically known high status areas of the plank house. The first step must be to understand how tasks are organized.

Task allocation includes not only the terminal tasks (fishing, house construction), but also the preparatory tasks (e.g., making net weights and mauls). In the course of these preparatory tasks, the tools of production are created and/or repaired. Among Northwest Coast groups these tools belonged to the household, not to those who labored with them (Jorgensen1980).

By virtue of the social organization of the household the utilization of the tools for fishing and house construction are the ultimate responsibility of the household head. Thus the head of the household, holding that position because of his rank and membership in the noble class, controls the forces of production. In any society these include both the organization of production (planning/scheduling of labor) and the means of production, which include the tools of production (Atkinson 1982; Cohen 1982; Friedman 1974; Keenan 1981; Little 1986). By viewing space and time as resources, these too become elements of the means of production (Adams 1975; Godelier 1975; Thrift 1977). In addition to the forces of production, the economic base (or infrastructure) of a society includes the "relations of production" which are the relations of power and authority which control or determine the utilization of the forces of production (Atkinson 1982; Cohen 1982; Little 1986).

This study, therefore, examines the archaeological record of a Chinookan plank house on the lower Columbia River. It focuses on particular tools of production (ground stone). These are tools which require a significant investment of time in their own production. They are also tools that are utilized for activities that require the organization and scheduling of labor activities (fishing and house construction and maintenance). In the succeeding chapters I seek to answer the following question: Does the spatial distribution of ground stone tools reflect the differences in residence location in Northwest Coast houses that, ethnographically, varied according to social status?

CHAPTER III

MATERIALS AND RESEARCH METHODS

TOOL CLASSIFICATION

To investigate the questions relating to the distribution of ground stone tools recovered in the Meier Site long house, I had to begin by defining the artifacts that would be included in the study. The Meier Site is an artifact-rich site. More than 10,000 artifacts were identified in the field and close to 4,000 more have been identified during the course of laboratory processing of level boxes. The latter have, for the most part, included lithic debitage, which under closer laboratory examination revealed edge modification or usage, and pumice fragments.

The task of identifying ground stone artifacts seems simple enough at first. Stone tools that show evidence of having been ground are by definition "ground stone." However, there are tools that are ground to shape prior to use, such as net weights or nipple-tipped mauls, and tools that are ground as a result of usage, such as abraders. In addition, in the case of shaped abraders, pestles, and mortars, grinding occurs as both an element of production and an element of use. I included intentionally shaped ground stone and material ground through use in this investigation. The tool types initially selected were: mauls, pestles, bowls, mortars, net weights, shaped sandstone abraders, pumice artifacts, and any other item that showed evidence of having been ground or pecked. Pecked items were included because pecking is often a precursor step to grinding (Bordaz 1970, Kozak 1972, Semenov 1970, Stewart 1973). Unlike flaked tools, which can be quickly crafted (Hamilton 1994), ground stone tools require time consuming preparation. Pecking is often used to rough-out a shape. This, in itself, can take several hours, even days. The actual grinding to final shape is also time consuming. Therefore, much time is invested in the production of ground stone tools, such as net weights, bowls, mauls, and pestles (Bordaz 1970, Kozak 1972, Semenov 1970, Stewart 1973, 1977, 1984, Strong 1959).

Summary statistics for the tool types and sub-types are found in Table I at the end of this chapter. The ground stone tool types used in this study are described as follows (See Figures 1-8 below):

Abraders may be tabular or blocky, but all show evidence of grinding on one or more faces. Raw materials for abraders are generally pumice, sandstone and basalt. They come in a variety of shapes, sizes, and degrees of coarseness (ranging from fine-grained siltstone to coarse vesicular basalt). They are used to shape other items, such as bone or wood tools, or for grinding and polishing other stone tools. They may be used as is or, as is often the case of sandstone, ground to a preferred shape (Bordaz 1970; Kozak 1972; Semenov 1970; Stewart 1973).

Bowls and mortars (Figure 2) may have shallow or deep concave surfaces and may range from palm-sized to a size too heavy or cumbersome to easily move. They are most often made from basalt or pumice and are generally used for processing vegetable material (Stewart 1973). Mortars hold material to be processed with pestles.

The occasional presence of ochre stains suggest that some of the small bowls at the Meier Site which fit in the palm of the hand may have been used as pigment holders.

Mauls and pestles are funtionally distinct types of tools. Mauls are woodworking tools that are used to drive wedges or chisels. They can be massive and either hand-held or hafted. All the mauls in this study have been subjected to pecking and/or grinding to shape. Most are made of basalt. Some shapes are more elaborate than others, such as the nipple-tipped maul, in which the proximal end is formed by a long and gradual taper which expands near the the end and, then, narrows to form the nipple. Stewart (1984) states that hand-held mauls were favored in the southern groups of the Northwest Coast, while heavy, hafted mauls were preferred by the northern groups. Hafted mauls are often girdled, in which a groove is pecked and/or ground around the short axis of a round or slightly oblong stone (Figure 3). The Meier Site shows both types (Figures 3 and 4).

Pestles are used in conjunction with mortars in the processing of vegetable material (Stewart 1973). In terms of their forms they tend to be smaller and more uniformly cylindrical than mauls (Figure 5). They may be made of less dense material than mauls (e.g. rhyolite). While functionally distinct, mauls and pestles cannot be consistently distinguished in archaeological assemblages. Thus, for this research, they are treated in the same class .

Net Weights are used to hold fishing nets in place (Figure 6). Large seine nets were popular fishing apparatus for the Chinook (Ray 1938) and were weighted with stones to hold them in place. Net weights come in a variety of sizes and shapes. Most are made of basalt (Stewart 1973, 1977).

The three most common shapes are the "drilled" net weight, which is discoid in shape and has a hole usually offset from the center. "Notched" net weights are also discoid, but instead of a hole for the attachment of the net, the sides of the weight have material removed by flaking or battering. This permits the net to be secured to the weight. The third kind of net weight is the "girdled" net weight. This is a generally spherical or ellipsoidal stone in which a groove has been pecked around the stone. All three types, as well as discoid "blanks" not yet drilled or notched, are found at the Meier Site.

There were also ground stone artifacts that did not fit into any of the above categories. They include:

1. Adze/celt blades (n=3) are trapezoidal in outline form with straight sides converging to an edge (Figure 7). They are used for woodworking.

2. Decorated/marked/segmented pumice (n=3) includes pieces of pumice that have been incised, but bear no resemblance to other pumice classified as abraders.

3. Pigment stone (n=1), the surface of which is ground and also stained with ochre.

4. Pipe fragment (n=1), (Figure 8), which is hollow and round in cross-section and flares proximally forming the mouthpiece of a pipe.

5. Flaked/ground club (n=1) which is trapazoidal in the long-axis profile, with one edge that has been both flaked and ground.

6. Sculpted pumice (n=1) which is disc-shaped and bearing effigy figures on

the front and obverse faces.

Tools were initially selected for the database by extracting them from the artifact catalogue, based upon the field identifications made by the excavators. I found that items designated "maul" or "pestle" overlapped morphologically. In other words, one excavators "maul" was another excavators "pestle." Pestles are used for grinding (usually) plant or vegetable material in a mortar or bowl. Mauls are used for driving wedges and in other aspects of woodworking. It is unlikely that a pestle would be used as a maul, but mauls could certainly be used as a pestle to crush or grind. Therefore, I decided to include mauls and pestles together. However, this did not end the problem of overlapping designations, for the "girdled maul" posed another problem. Stewart (1973) identifies a grooved/girdled maul (p. 56) and a grooved anchor stone (p.79) which are indistinguishable from each other. This conflict also surfaced in the artifact designations of the Meier Site. The only way to resolve this was to look for evidence of battering in these girdled items. If present, they are designated "mauls" and if absent they are designated "net weights."

"Abraders" were also problematical. The excavators produced a great many abraders and not all of them were defined. Because my study is of "ground stone," I wanted to include all stone artifacts that resulted from grinding or shaping (i.e. pecking) by means other than flaking. By definition an abrader is used to abrade and in the process is abraded itself. However, many of the abraders found at the Meier Site tend to be what I call "abraders of convenience" or "*ad hoc* abraders." These are simply stones or pebbles that have been picked-up and used once or only few times and discarded or dropped (intentionally or otherwise). These are expedient tools as distinguished from curated tools (Hamilton 1994, Nelson 1991). All items designated "abrader" were examined and the "expedient" abraders, which were not ground stone, were excluded from the database.

Figures 1-8 on the following pages are examples of some of the ground stone items recovered from the Meier Site. The drawings were prepared by Joy Stickney, a graduate student in the Anthropology Department at Portland State University. Unless otherwise indicated, all drawings are actual size.

Figure 1. Abrader fragment. Item is actual size.

Figure 2. Bowl. Item is not actual size. Length = 14.4 cm.

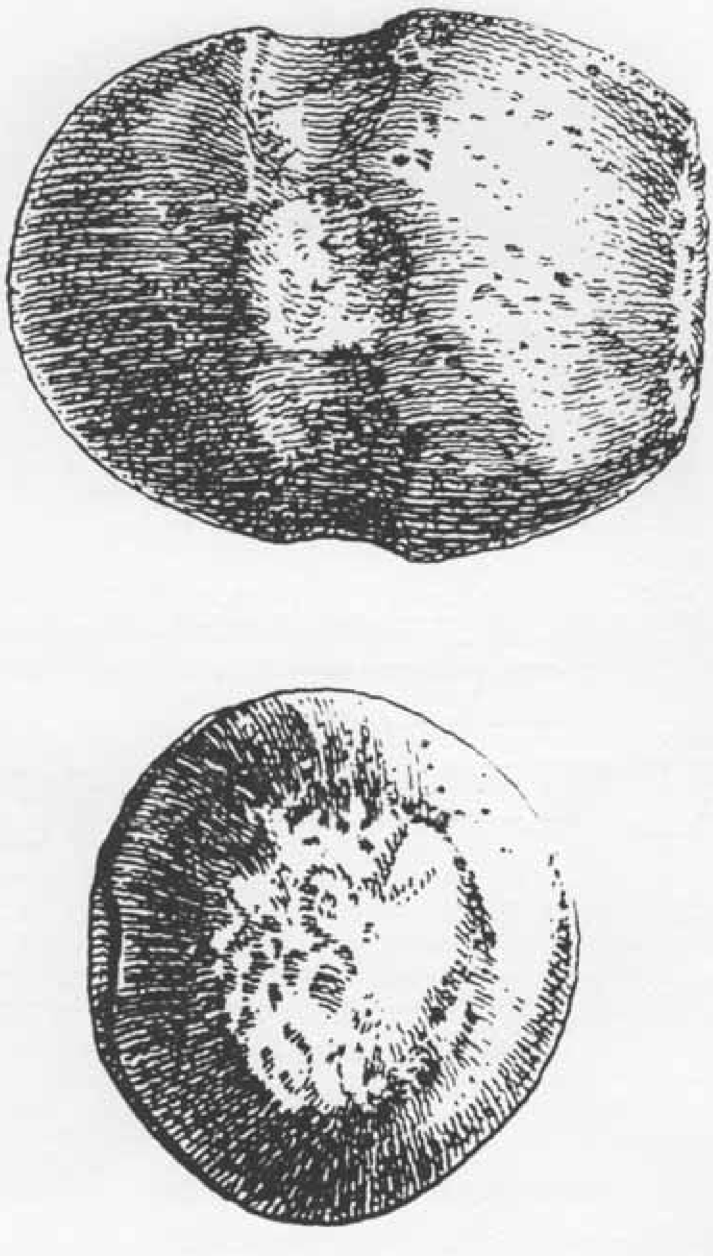

Figure 3. Girdled Maul. Item is actual size.

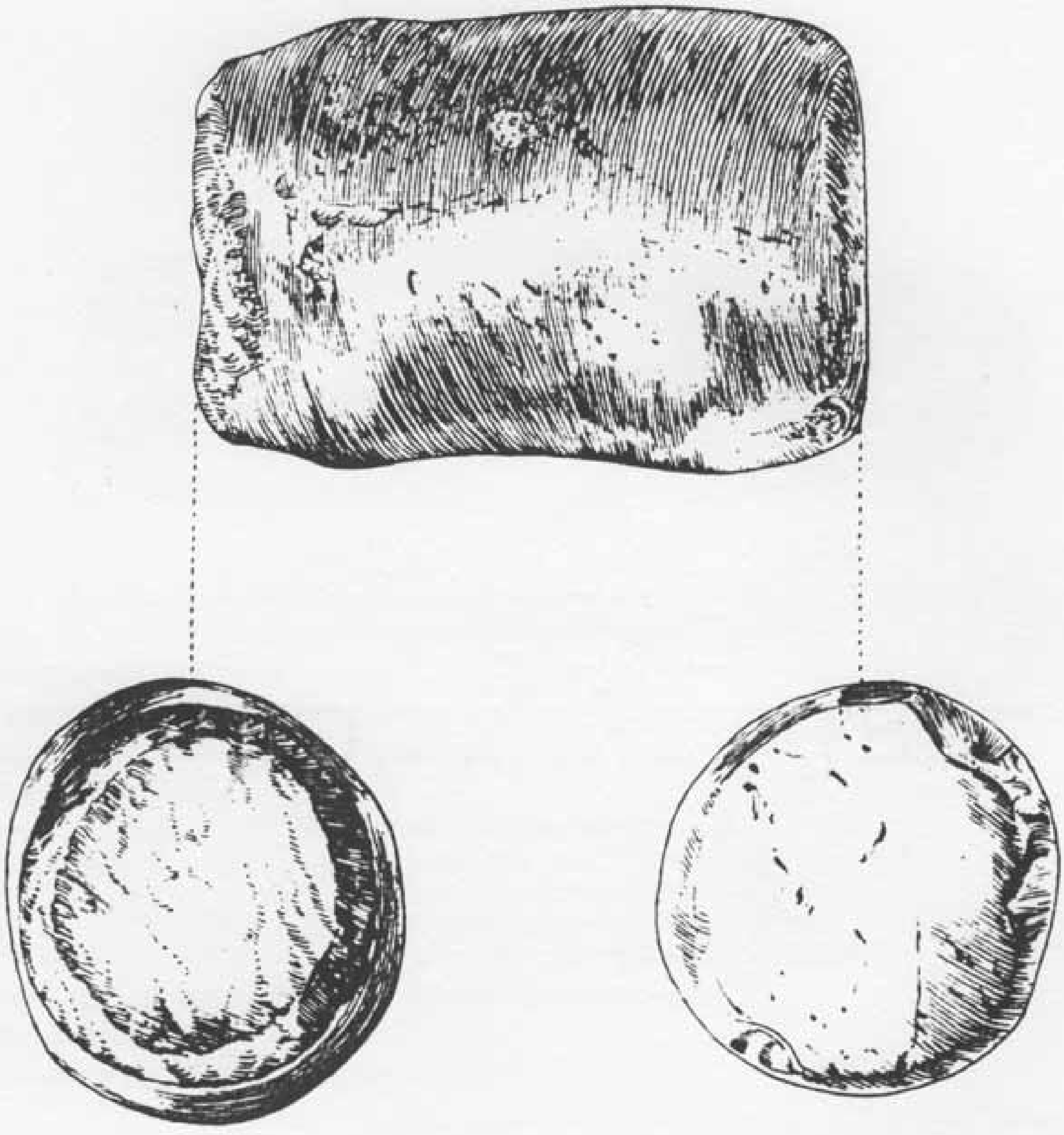

Figure 4. Maul. Item is not actual size. Length = 11 cm; max.diameter = 7.80 cm.

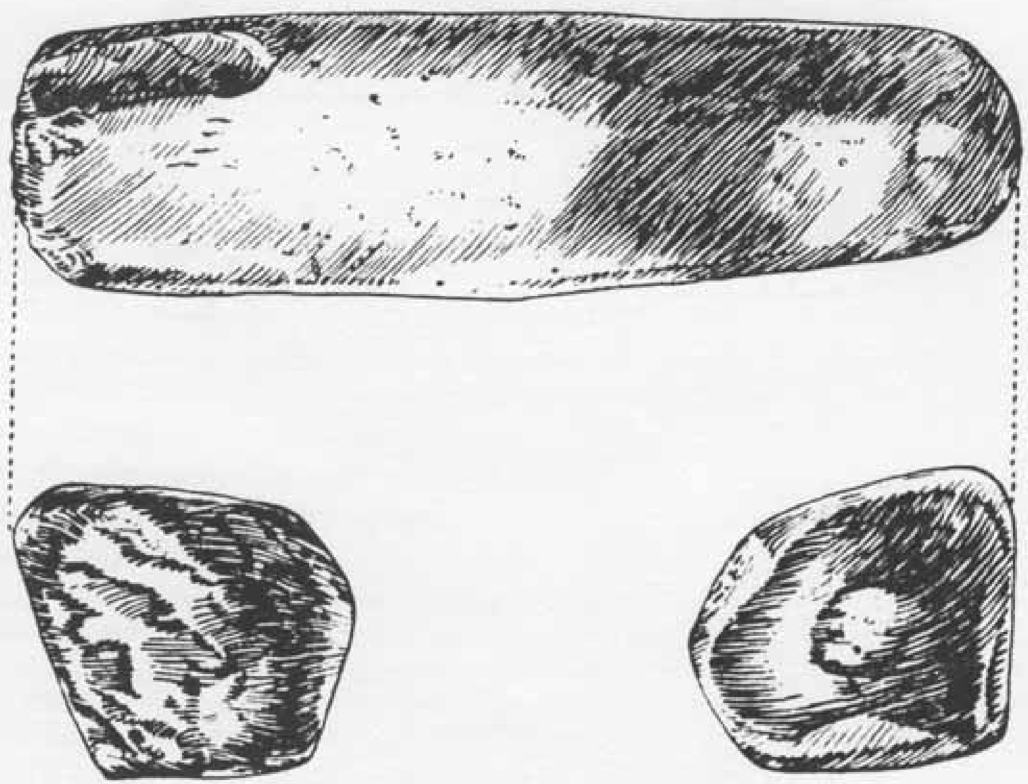

Figure 5. Pestle. Item is not actual size. Length = 15.70 cm; max. width = 4.60 cm.

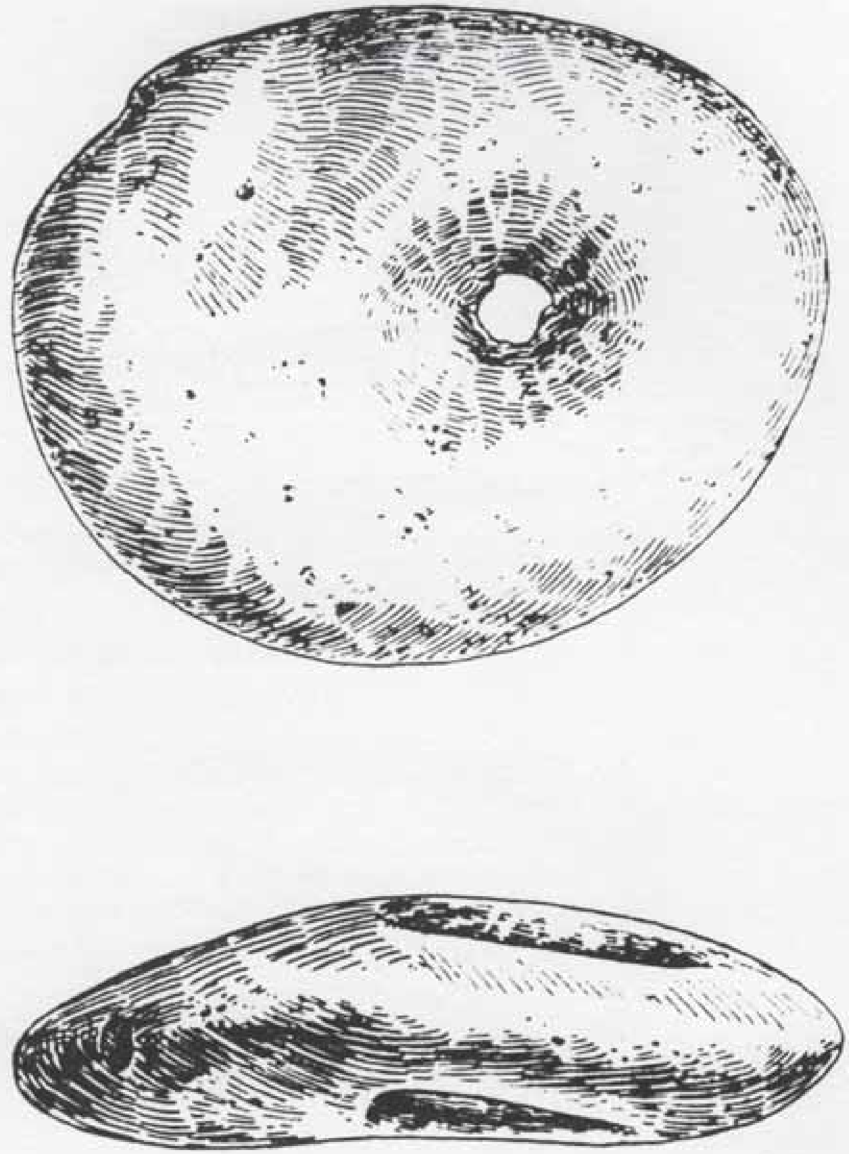

Figure 6. Net Weight (Drilled). Item is actual size.

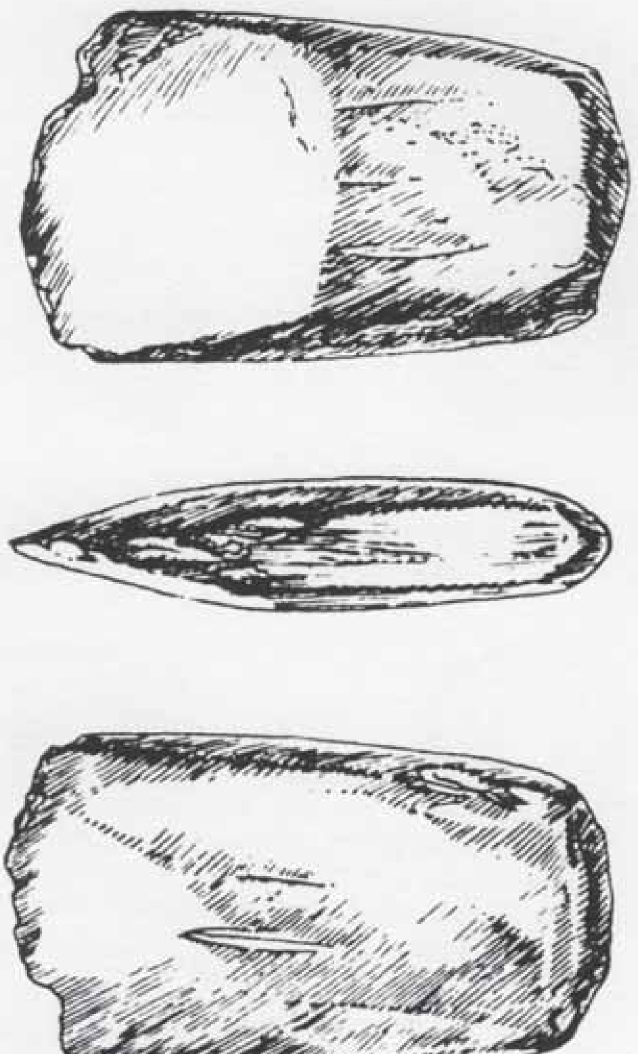

Figure 7. Celt. Item is actual size.

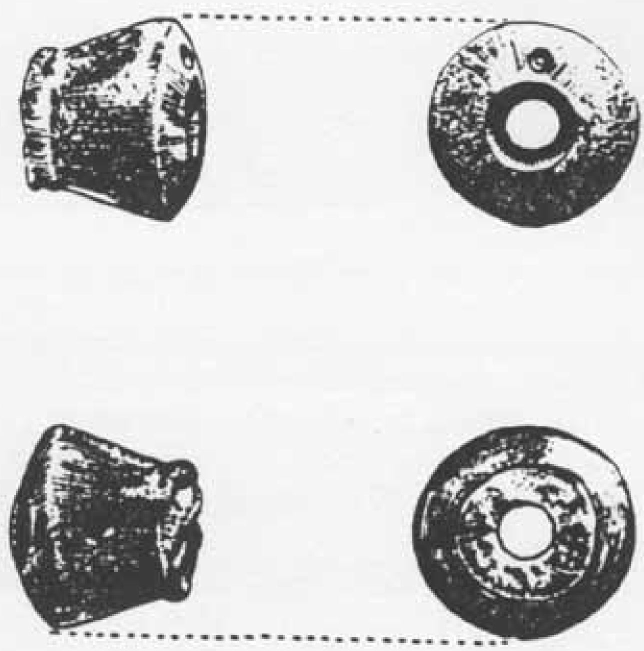

Figure 8. Pipe Fragment. Item is actual size.

I examined all non-flaked stone artifacts in the Meier Site collection. In the course of this review, each ground stone artifact was measured (maximum length, maximum width, maximum thickness in centimeters), its mass determined (grams) and its stone material type identified. Linear measurements were made using osteometric spreading calipers and an osteometric board. Mass measurements were made on a triple beam balance. Material designations were made by using rock and mineral identification techniques acquired in my geology courses and referring to field guides (Pough 1976; Mottana et al. 1978). In a few cases I consulted with Dr. Ames or fellow students in order to make a final designation.

Based upon my effort to classify the ground stone tools I felt compelled to amend my original categorizations. I found that the abraders which remained in my database could be further distinguished by raw material. Therefore, I have three abrader categories (pumice, sandstone, and basalt). Bowls and mortars are combined. With only 13 such items recovered I did not distinguish between the two for the purposes of this study. As discussed earlier, mauls and pestles are also combined. Net weights have their own separate category, but where possible, I have differentiated among girdled, drilled, and notched varieties. There are a few items which are distinctly pecked and they are categorized separately. There were some items which were clearly ground but were only fragments and could not be more specifically identified. These items are categorized as "general ground stone." The category "other" applies to tools for which there were less than five representatives of a particular type (e.g. adzes, sculpted pumice, segmented pumice).

The sample was restricted to items recovered below the plowzone (20cm). Tools found in the plowzone often actually show plow marks and clearly have been subject to post-depositional movement at the site. Because my research seeks to identify spatial patterning reflecting prehistoric curation areas, items found above 20 centimeters are not included in this analysis.

TABLE I

STATISTICAL SUMMARY OF TOOL CLASSIFICATION

Tool Type/Sub-Type	Number	Mean Length in cm.	Mean Width in cm.	Mean Thickness in cm.	Mean Mass in grams
Pumice Abraders	108	67.17 (23.77)	49.07 (16.90)	31.33 (11.37)	65.89 (73.96)
Sandstone Abraders	90	74.11 (40.79)	50.73 (25.82)	13.74 (8.31)	118.84 (223.34)
Basalt Abraders	16	93.13 (63.72)	60.19 (27.89)	33.88 (19.58)	230.22 (316.80)
Bowls/Mortars	13	113.00 (67.56)	91.00 (63.77)	52.69 (35.40)	1732.31 (3669.5)
Mauls/Pestles	32	140.91 (68.94)	62.41 (18.15)	51.03 (14.67)	832.16 (854.13)
Net Weights	33	115.09 (36.60)	95.30 (31.99)	39.30 (13.68)	573 21 (402.30)

Standard Deviation = ( )

THE MEIER SITE HOUSE

The particular focus of this report is on the Meier Site (35CO5) located on the Oregon shore near the confluence of the Columbia River and the Multnomah Channel of the Willamette River, across from Sauvie Island. The site is part of a dairy farm, specifically, a cow pasture. The site was the focus of excavation by the Portland State University Summer Archaeological Field School from 1987 to 1991. The native population which resided there prior to Euro-American contact were speakers of a Chinookan language dialect and are classed with the Lower Columbia Chinookan cultures which extend from near The Dalles to the mouth of the Columbia River. The site is considered an example of Multnomah II and III cultural phases of the Portland Basin chronology. The Multnomah II phase began about 700 years ago (Ames et al. 1992, Pettigrew 1990).

The excavations at Meier have focused on a dwelling (plank house), its yard area and its midden. The site has been extensively vandalized and it is estimated that no more than 50% of the original site remained untouched by artifact marauders. The house itself is estimated at about 35 meters in length and 13-14 meters wide. This places it among larger, although not the largest, of multi-family dwellings in the Pacific Northwest (Ames et al. 1992).

Figure 9 is a map of the excavation units within the house. The rectangular dotted line shows the hypothesized walls of the plank house. These boundaries were ascertained based upon the location of corner post molds and wall plank molds (Ames et al. 1992). Only the house units are included. The other units excavated at the Meier Site are not included in this study because they occur entirely or primarily outside the established boundaries of the house. However, when I made my initial survey of ground stone artifacts I identified 79 ground stone items from outside the house (i.e. recovered from the middens and the yard). The assignment of a unit that had a portion in the house was determined by whether or not the majority (50%+) of the unit was inside or outside the house. Those units mostly in the house were included, those which were not were excluded.

The map of the Meier Site (Figure 9) appears on page 37. It is followed by a discussion of how I divided the house into sections and assigned excavation units to their respective sections.

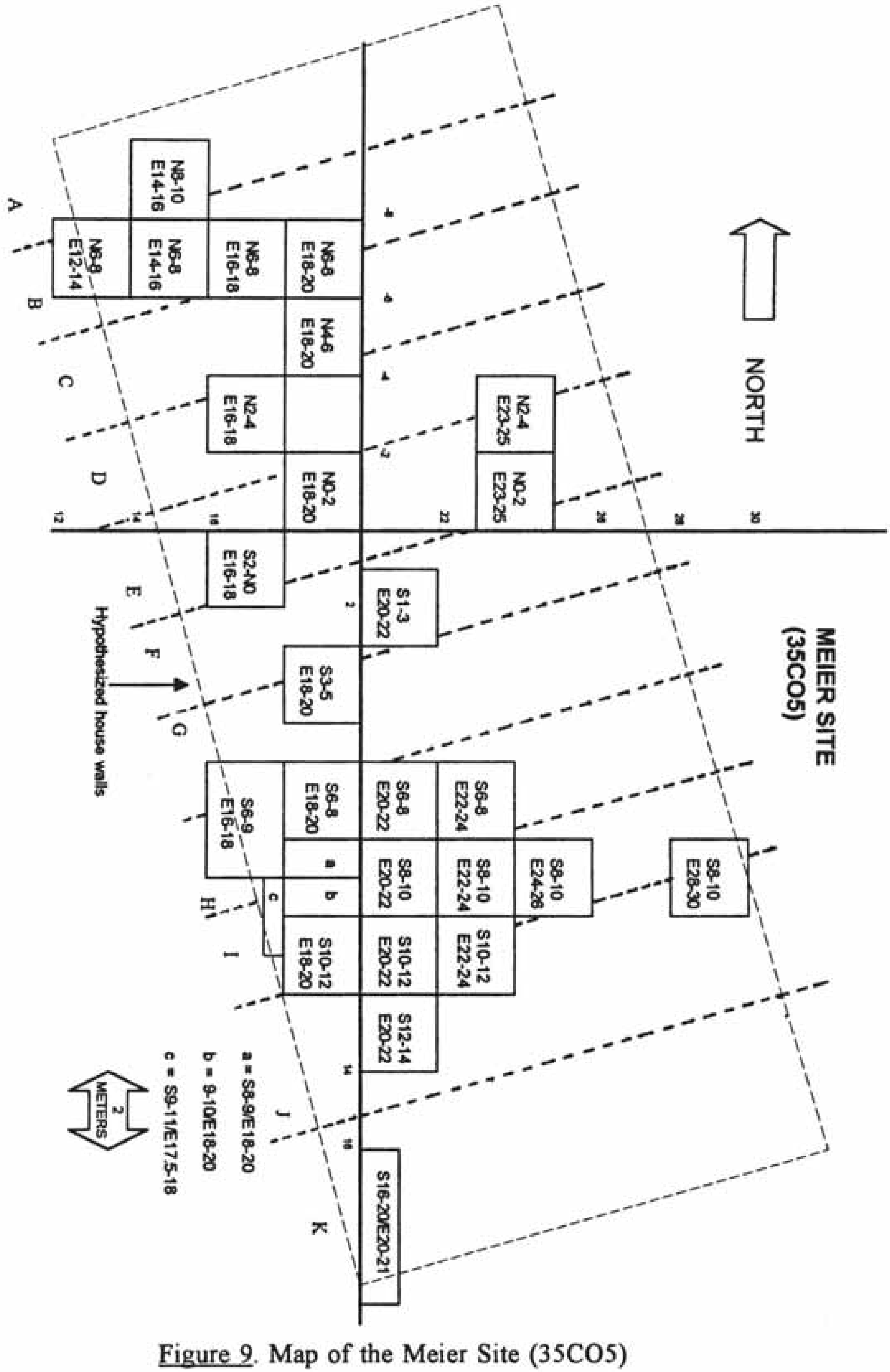

Figure 9. Map of the Meier Site (35CO5)

In order to compare densities of ground stone totals along the long axis of the house I divided the house into 11 sections (Figure 9, bold-dashed line). At the Meier Site the back of the house is on the north end and the door, which would have faced the water of the lake, is at the south (Ames et al. 1992). The house itself is offset from the north-south axis, as can be seen in Figure 9. The placement of excavation units means that the lines dividing the sections of the house often cut through excavation units. Most of the artifacts under study are not point provenienced, therefore, I could not split an excavation unit. Doing so would prevent me from knowing which side of the line an artifact belonged in the case of the marginal units. Therefore, movement of the line left or right of a section boundary was determined in such a way that any potentially divided unit would be assigned to the section in which most of the unit appeared (Table II).

In order to examine the density of artifacts it is necessary to know the volume of sediment excavated from each unit. I performed calculations for each excavation unit at the Meier Site by reviewing the level sheets and the excavators' logbooks for the excavation units. Average depths were calculated using beginning and ending depths for the corners and center of each unit. The average depths were multiplied by the length and width of each unit to estimate volume of sediment removed from each unit. The estimated volumes of excavated sediment were summed for the units in each house section (Table III). There was a total of 105.36 cubic meters of sediment excavated from within the house.

TABLE II

EXCAVATION UNITS BY HOUSE SECTION

SECTION	UNITS	SECTION	UNITS
A	N8-10/E14-16	H	S6-8/E22-24
B	N6-8/E12-14	H	S6-9/E16-18
B	N6-8/E14-16	H	S8-9/E18-20
B	N6-8/E16-18	I	S9-10/E18-20
B	N6-8/E18-20	I	S9-11/E17.5-18
C	N4-6/E18-20	I	S8-10/E20-22
D	N2-4/E16-18	I	S8-10/E22-24
E	N2-4/E23-25	I	S8-10/E24-26
E	N0-2/E18-20	I	S10-12/E18-20
E	N0-2/E23-25	I	S10-12E20-22
E	S2-N0/E16-18	J	S8-10/E28-30
F	S1-3/S20-22	J	S10-12/E22-24
G	S3-5/E18-20	J	S12-14/E20-22
H	S6-8/E18-20	K	S16-20/E20-22
H	S6-8/E20-22		

The unit volumes were used to calculate the artifact densities (number of artifacts per cubic meter) for each unit (Appendix C) and the section volumes were used to calculate the densities for each section (Table III).

TABLE III

HOUSE SECTION VOLUME AND DENSITY

HOUSE SECTION	SECTION VOLUME	SECTION DENSITY
A	4.20 cubic meters	1.905 artifacts/cu. m.
B	13.64 cubic meters	4.326 artifacts/cu. m.
C	2.96 cubic meters	7.096 artifacts/cu. m.
D	3.72 cubic meters	5.376 artifacts/cu. m.
E	15.92 cubic meters	3.455 artifacts/cu. m.
F	2.28 cubic meters	9.649 artifacts/cu. m.
G	3.92 cubic meters	3.061 artifacts/cu. m.
H	18.57 cubic meters	2.208 artifacts/cu. m.
I	24.68 cubic meters	3.039 artifacts/cu. m.
J	13.32 cubic meters	1.877 artifacts/cu. m.
K	2.04 cubic meters	1.961 artifacts/cu. m.
TOTAL VOLUME = HOUSE DENSITY =	105.36 cubic meters	3.246 artifacts/cu. m.

STATISTICAL TESTS

I applied two statistical tests to the data. I first wanted to know whether or not the densities of ground stone tools were affected by sample size. In this regard I was concerned that the amount of sediment excavated from each unit might affect the number of ground stone tools recovered from each unit. In other words, was the number of ground stone tools correlated with the amount of sediment excavated? To assess this I calculated Pearson's correlation coefficient as a measure of the relationship between the two variables -- the number of ground stone tools and the volume of excavated sediment from each unit (Snedecor and Cochran 1967).

The second test was to determine whether or not the ground stone tools were evenly distributed within the house. Here I employed a linear regression of the house sections' ground stone densities. Densities were calculated by dividing the ground stone counts by the volume of excavated sediment for each of the house sections (A through K). The affect of location on ground stone density was assessed by treating location as the independent variable and density as the dependent. The results of these tests are discussed in the following chapter.

CHAPTER IV

RESULTS

The analysis of the Meier Site ground stone artifacts revealed that there was a total of 342 such artifacts recovered from units within the house (Appendix A). Table IV lists the artifact counts by tool category for the house as a whole. Unit summaries for artifact counts by tool category are found at Appendix B. Twenty-two artifacts were designated "other." This last category of items included two adze fragments, a celt, a pigment stone, a pipe bowl, one each of decorated pumice, marked pumice and sculpted pumice, one segmented pumice stone, and one flaked and ground club.

TABLE IV

ARTIFACT COUNTS BY TOOL CATEGORY

TOOL CATEGORY	#
Pumice Abraders	108
Sandstone Abraders	90
Basalt Abraders	16
Bowls/Mortars	13
Mauls /Pestles	32
Net Weights	33
Pecked Stone	10
General Ground Stone	19
Other	21
TOTAL	342

When the artifact counts are divided by the excavated volumes (in cubic meters), the resulting values are the densities (artifacts per cubic meter). This results in the highest density value of 9.649 artifacts/cu. meter in Section F of the house and the lowest value in Section J (1.877 artifacts/ cu. meter) (Table III). The density of ground stone tools for the house as an entirety is 3.246 artifacts/cu. meter (Table III). If one divides the house in half (north = Sections A through F; south = Sections G through K), the densities between the two halves can be compared. This reveals a density of 4.330 artifacts/cu. meter in the north half and 2.506 artifacts/cu. meter in the south half.

The first statistical test I applied to the data was Pearson's Correlation.. In this case there are 29 excavation units and ground stone counts and excavation volumes are paired for comparison. For this test there are 27 degrees of freedom. The null hypothesis is that excavation volumes and artifact counts are not correlated. The resulting correlation coefficients are presented in Table V below.

TABLE V

PEARSON CORRELATION MATRIX

	Volume	Total # Grnd St.	Maul/Pest.	Net Wts
Volume	1.000	0.374	-0.007	0.166

The correlation coefficient for the unit volumes and ground stone counts is 0.374. With 27 degrees of freedom a correlation coefficient above 0.367 is significant at the 5% level (Snedecor and Cochran 1967). The correlation coefficient for unit volumes and ground stone counts falls slightly above this value. However, this result is so close to the critical value for the 5% significance level that one suspects that the correlation between excavated volume and unit ground stone count is weak and other factors may be influencing the distribution of ground stone artifacts.

I, then, looked at the two tool categories most closely related to fishing and house construction/maintenance -- net weights and mauls/pestles, respectively. The correlation coefficient for net weights and excavated volumes is 0.166, which is well below the 0.367 margin (5% level of significance). The correlation coefficient for the maul/pestle class was even lower (-0.007). Thus, in the case of both net weights and mauls their numbers in the collection of recovered artifacts from the Meier Site house likely result from some factor other than excavation volumes.

A linear regression was applied in order to ascertain the relationship between ground stone density and location within the house. My intention was to see to what extent ground stone artifact density was a function of location in the house and, by inference, social status as reflected in residence location within the house. I initially performed three separate regressions. In each case density was the dependent variable and location was the independent variable. The first regression was for the eleven house sections. The second regression excluded the outlier of the first regression (unit S1-3/E20-22). This unit is the sole unit comprising House Section F. The third regression was performed in order to eliminate the sections composed of only one excavation unit (A, C, D, F, G and K) by combining Sections A & B, C & D, F & G, and J & K, respectively. Sections H and I already had several units each and were not combined. The results of the three regressions are presented in the following table (Table VI).

TABLE VI

RESULTS OF LINEAR REGRESSIONS

	Degrees of Freedom	Multiple R	P-value
Regression #1	09	0.377	0.253
Regression #2	08	0.558	0.093
Regression #3	05	0.652	0.113

What the regressions demonstrate is that density of ground stone artifacts and location are not highly correlated at the Meier Site. At best about two-thirds (Regression #3, Multiple R = 0.652) of the distribution of ground stone artifacts can be attributed as a function of location within the house. P-values range from 0.093 to 0.253, suggesting that chance alone could account for the ground stone artifact distributions anywhere from almost 10% to 25% of the time. In terms of statistical significance these values to do not approach the .05 significance level. Thus, for the purposes of this study, the null hypothesis that ground stone artifact density is not a linear function of location cannot be rejected.

When I began my study I hypothesized that tools related to fishing and house construction would be found in greater concentration in the higher status areas of the house. However, mauls are polythetic tools used for quarrying, woodworking, processing bark into cloth, butchering and/or marrow extraction (Carr 1984). Abraders are also polythetic tools (roughening platforms for knapping, working wood, working bone, defleshing and thinning hides, grinding and polishing other stone) (Carr 1984). Therefore, I performed a final regression (#4) using only net weights to determine to what extent their density was a function of location. The results of that regression are found in Table VII.

TABLE VII

RESULTS OF NET WEIGHT REGRESSION

	Degrees of Freedom	Multiple R	P-Value
Regression #4	05	0.691	0.085

In this case the correlation coefficient (Multiple R) is considerably higher than the first three regressions. Although 0.754 is the threshold at the .05 level of significance to reject the null hypothesis that density and location are not linearly related, the value for Regression #4 is sufficiently close to question, if not reject, the null hypothesis. The P-value for this regression is also lower than for the regressions for all ground stone artifacts. It indicates that chance alone would account for net weight densities less than 9% of the time. Again, although this is not sufficent to reject the null hypothesis it is sufficient to suspect that ground stone density may to some extent be a function of location.

I also examined the results of other researchers' work on the Meier Site material, in order to see whether or not there were differences in densities of other artifacts (Ames 1994). I examined projectile points, projectile point fragments, and fire-cracked rock (FCR). Table VIII shows the projectile point/fragment densities, and

Table IX, the FCR distributions. The projectile point densities are number of artifacts per cubic meter of sediment excavated. The FCR table shows mean kilos and the mean number (count) for each section of the house, as well as the areas outside the house (middens and yard). For these studies the researchers divided the house into three sections: north, central and south. In order to compare these densities with the ground stone I also calculated the ground stone densities for each of these three areas of the house and the area outside the house (Table X).

TABLE VIII

PROJECTILE POINT AND FRAGMENT DENSITIES

	NORTH	CENTRAL	SOUTH	OUTSIDE
Proj. Points	4.59	7.69	7.97	5.02
PP Fragments	1.72	4.64	4.85	4.35
All PP items	6.32	12.32	12.82	9.37

TABLE IX

FCR DISTRIBUTION BY MASS AND COUNT

	NORTH	CENTRAL	SOUTH	OUTSIDE
Mean Kilos	68.66	62.37	76.45	56.36
Mean Count	1135.81	1057.13	1565.47	967.57

TABLE X

GROUND STONE DENSITIES

	NORTH	CENTRAL	SOUTH	OUTSIDE
Ground Stone	4.196	3.235	2.590	1.953

The densities of the projectile points are in marked contrast with the ground stone tools. The projectile points appear to be in higher concentration in the central and south end of the house. These are expedient tools which can be fashioned quickly and easily retouched (in comparison to curated ground stone tools) (Hamilton 1994; Nelson 1991). As for FCR, it is greatest in the south third of the house. As for the ground stone tools they have a greater density in the north section of the house than elsewhere in the house or outside the house. What this seems to suggest is that there is evidence of economic differentiation in the house. Production (and curation) activities occur in the house, but not equally in all parts of the house. Nor do production activities occur equally between the interior of the house and the outside activity area(s). Faunal analysis has not been done for the Meier Site, but it will be interesting to see whether or not such a difference also occurs among bone and shell remains.

CHAPTER V

CONCLUSIONS

Why would the ground stone tools be more densely distributed in the north end of the house than elsewhere? The north end of the house had the least amount of sediment excavated yet has the highest density of ground stone artifacts. The division of the house into north, central and south thirds is no more arbitray than any other division. However, a finer division allows a clearer view of the possible gradation of the distribution of ground stone artifacts along the long axis of the house. This is how I ultimately approached the question of the relationship between artifact density and location.

My first task was to determine whether or not there was a correlation between arrtifact count and the volume of sediment excavated from the units. The correlation coefficient for ground stone count and excavated volume is 0.374. This is close enough to the 0.367 boundary, below which correlation between count and volume would be questioned, to raise suspicions that other factors may be operating to influence the distribution in the archaeological record and the recovery of ground stone tools in the Meier Site plank house units. Volume of excavated sediment may be having some impact on the ground stone artifact counts, but the correlation is weak. Net weights and mauls are particularly distributed in a way uncorrelated with excavation volumes.

On the other hand, any direct linear relationship between ground stone artifact density and location also appears to be weak. The null hypothesis that location is not a function of density cannot be rejected, although it may be suspect. However, in the case of monothetic tools (net weights) the null hypothesis is weakened.

My contention has been that the distribution of ground stone artifacts is a result of *in situ* deposition which reflects the area of the house in which the tools were curated. This cannot be confirmed by this study for ground stone as a general category. However, confirmation of this hypothesis for net weights is nearer. They are found in greatest concentration in the north third of the house (48.5%), with 72.7% occuring in the north half of the house. The largest cache of net weights (artifact #s 10309, 10375 - 10379) was found in a unit in the north section of the house (N6-8/E16-18). They were all drilled net weights and were clustered together (Appendix A and B).

The north end of the house is hypothesized to be the rear area of the house (Ames et al. 1992). It is, therefore, the high status area of the house. The household leader and his highly ranked kin would reside there. The household leader was the person who planned and organized activities, such as fishing and house construction and maintenance. He would decide when and where such activities would take place (Jorgensen 1980). Fishing, in particular, required scheduling and preparation (Ames 1981; Ray 1938; Stewart 1977). Tools had to be readied and individuals needed to be assigned tasks for both the preparation of tools and the implementation of the primary task (catch fish, cut planks). Tools belonged to the household, but the ultimate responsibility for those tools (in preparedness and use) rested with the household leader. That person may not directly produce the tools, but should tools not be ready when needed and tasks fail to be completed or are only marginally successful, it is the household leader who may be held accountable. Slaves may not have had a choice in where they lived, but titleholders and commoners did and they could "vote with their feet" should a household leader "fail to deliver" (Curtis 1911; Jorgensen 1980). It is unlikely that tools which required many days to manufacture and were vital to subsistence, such as net weights, would be carelessly maintained or stored. Investment of time to prepare and maintain tools will ultimately save time later, because the tools have been prepared and stored for future use (Boydston 1989).

Therefore, I have hypothesized that ground stone tools, particularly net weights, are found at a greater density in the north end of the house because that is where they belonged when not in use. That is where they were stored. This storage in the higher status sections of the house (grading upward from south to north) reflects elite control of the tools of production. The location of these tools, which Rapoport would call non-fixed-feature elements of the household setting (1990b), reflects the ethnographic evidence that status differences in Chinookan society had a physical manifestation in the residence location within the longhouse. However, the statistical test (linear regression) that I applied to the Meier Site ground stone data to identify the relationship between location and artifact density cannot confirm that hypothesis.

It became apparent to me early in my research that to really address the issue of status differences in the archaeological record would require continuing and expanding household and settlement archaeology. Excavations must be designed to open wide, connected exposures, in order to extract the kind of data necessary to see status differences across a household or settlement. The Meier Site excavations did this to some degree and made my current research effort possible. But to truly understand the nature of status differences, and to obtain the archaeological evidence to do so, will require research strategies (Chatters 1989; Hayden et al. 1985; Smith 1976a, 1976b) that tie households and settlements together in a connected tapestry which lends itself to a regional analysis of prehistoric social and economic relationships and structures.

This study has been a very preliminary attempt to understand the nature of the relationship between artifact density and social status location in the house. The Meier Site project itself could never hope to answer such questions alone. It was but one household, half of which had been pot-hunted. Its ground stone segment is less than 3% of the total artifact collection. But despite such limitations the ground stone artifacts from the Meier Site remain instructive and informative.

This study, I believe, also confirms that ethnohistorical information can help formulate hypotheses that can be tested against the archaeological record. Wolf (1982) is correct in cautioning that the societies described by Euro-American ethnographers were "secondary...tertiary, quarternary, or centenary." However, these ethnographic reports can serve as a starting point in trying to assess the mode(s) of production of these socieites. It is at this point that prehistoric archaeology and historic archaeology/ethnohistory must be conjoined. In this case, ethnographic information concerning the physical and social structure of Northwest Coast and Chinookan houses was coupled with theoretical approaches derived from economic anthropology, human geography and architectural theory to formulate the hypothesis that artifact distributions (ground stone tool densities), which are non-fixed elements of the built environment (a plankhouse) should reflect status differences that are in part related to the organization and scheduling of productive activities. That hypothesis was not statistically confirmed, but the effort to test the hypothesis has given me encouragement that attempts to find social status differences reflected in the archaeological remains of production activities are worth pursuing.

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APPENDIX A: GROUND STONE ARTIFACTS

Artifact	Identification	Material	Level	Unit Address	Length	Width	Thick.	Mass
#9861	Abrader	Pumice	65-80cm	N0-2/E18-20	43.00	31.00	20.00	10.50
#10125	Abrader	Sandstone	95-110cm	N0-2/E18-20	41.00	36.00	6.00	13.90
#10129	Abrader	Pumice	95-110cm	N0-2/E18-20	94.00	73.00	55.00	130.90
#2134	Abrader	Pumice	65-75cm	N0-2/E23-25	75.00	62.00	22.00	62.90
#2135	Abrader	Pumice	65-75cm	N0-2/E23-25	77.00	44.00	34.00	50.60
#2175	Abrader	Pumice	65-75cm	N0-2/E23-25	62.00	53.00	53.00	92.00
#2406	Abrader	Pumice	95-105cm	N0-2/E23-25	119.00	65.00	31.00	110.60
#9144	Abrader	Pumice	40-50cm	N2-4/E16-18	65.00	39.00	20.00	34.10
#9187	Abrader	Pumice	40-50cm	N2-4/E16-18	56.00	55.00	42.00	49.10
#9190	Abrader	Pumice	40-50cm	N2-4/E16-18	64.00	54.00	35.00	90.70
#9366	Abrader	Pumice	40-65cm	N2-4/E16-18	50.00	41.00	23.00	41.80
#9381	Abrader	Pumice	40-65cm	N2-4/E16-18	69.00	46.00	30.00	60.90
#9566	Abrader	Vesicular Basalt	65-80cm	N2-4/E16-18	66.00	64.00	51.00	115.20
#9753	Abrader	Basalt	80-95cm	N2-4/E16-18	78.00	43.00	26.00	56.70
#9791	Abrader	Sandstone	82cm	N2-4/E16-18	78.00	38.00	11.00	44.50
#9859	Abrader	Pumice	80-95cm	N2-4/E16-18	105.00	65.00	39.00	174.70
#9860	Abrader	Pumice	91cm	N2-4/E16-18	85.00	62.00	41.00	143.20
#10808	Abrader	Pumice	40-50cm	N2-4/E16-18	23.00	16.00	15.00	8.00
#10820	Abrader	Pumice	75-110cm	N2-4/E16-18	62.00	59.00	35.00	45.90
#4812	Abrader	Pumice	68-78cm	N2-4/E23-25	38.00	15.00	9.00	2.80
#8409	Abrader	Pumice	48-68cm	N2-4/E23-25	91.00	62.00	44.00	105.60
#13832	Abrader	Pumice	28-48cm	N2-4/E23-25	42.00	35.00	35.00	32.30
#10509	Abrader	Vesicular Basalt	110-135cm	N4-6/E18-20	80.00	30.00	25.00	43.20
#10518	Abrader	Vesicular Basalt	110-135cm	N4-6/E18-20	89.00	76.00	58.00	297.90
#10532	Abrader	Sandstone	90-135cm	N4-6/E18-20	204.00	120.00	16.00	672.40
#9236	Abrader	Pumice	38-45cm	N6-8/E12-14	55.00	55.00	30.00	44.60
#9489	Abrader	Pumice	50-65cm	N6-8/E14-16	60.00	37.00	27.00	27.00
#9731	Abrader	Pumice	79cm	N6-8/E14-16	65.00	61.00	34.00	56.20
#9739	Abrader	Pumice	50-65cm	N6-8/E14-16	62.00	42.00	27.00	68.70
#10262	Abrader	Pumice	80-95cm	N6-8/E14-16	77.00	43.00	42.00	56.50
#10265	Abrader	Pumice	80-95cm	N6-8/E14-16	59.00	43.00	43.00	91.00
#9065	Abrader	Pumice	40-50cm	N6-8/E16-18	74.00	56.00	40.00	96.90
#9091	Abrader	Pumice	40-50cm	N6-8/E16-18	39.00	26.00	17.00	5.90
#9261	Abrader	Pumice	40-50cm	N6-8/E16-18	77.00	73.00	56.00	133.10
#9424	Abrader	Pumice	50-65cm	N6-8/E16-18	94.00	60.00	50.00	126.40
#9494	Abrader	Pumice	40-50cm	N6-8/E16-18	82.00	52.00	34.00	81.50
#9901	Abrader	Pumice	65-80	N6-8/E16-18	51.00	32.00	22.00	24.80
#10353	Abrader	Pumice	95-115cm	N6-8/E16-18	83.00	60.00	27.00	59.20
#10428	Abrader	Pumice	95-115cm	N6-8/E16-18	65.00	46.00	25.00	35.70
#10492	Abrader	Pumice	115-?cm	N6-8/E16-18	66.00	66.00	45.00	87.50
#10807	Abrader	Pumice	65-80cm	N6-8/E16-18	63.00	40.00	35.00	39.90
#10812	Abrader	Pumice	50-65cm	N6-8/E16-18	34.00	30.00	30.00	22.50
#10816	Abrader	Pumice	40-50cm	N6-8/E16-18	42.00	35.00	17.00	10.50
#9464	Abrader	Pumice	58cm	N8-10/E14-16	131.00	63.00	38.00	223.00
#9947	Abrader	Pumice	75cm	N8-10/E14-16	55.00	55.00	28.00	46.30
#10238	Abrader	Pumice	80-95cm	N8-10/E14-16	72.00	42.00	23.00	43.00
#6090	Abrader	Pumice	70-85cm	S1-3/E20-22	60.00	40.00	40.00	25.30
#6338	Abrader	Pumice	85cm	S1-3/E20-22	71.00	54.00	30.00	50.50
#6365	Abrader	Pumice	85-105cm	S1-3/E20-22	45.00	28.00	27.00	20.20
#6459	Abrader	Pumice	105-155cm	S1-3/E20-22	62.00	42.00	20.00	26.20
#6581	Abrader	Welded Tuff	64cm	S1-3/E20-22	99.00	62.00	25.00	136.80
#3829	Abrader	Sandstone	20-30cm	S10-12/E18-20	38.00	21.00	11.00	8.20
#4460	Abrader	Pumice	50cm	S10-12/E18-20	80.00	60.00	41.00	111.80

APPENDIX A: GROUND STONE ARTIFACTS (continued)

#1490	Abrader	Pumice	36-48cm	S10-12/E20-22	66.00	45.00	19.00	20.20
#1629	Abrader	Pumice	36-48cm	S10-12/E20-22	76.00	59.00	29.00	53.40
#1972	Abrader	Sandstone	63cm	S10-12/E20-22	38.00	33.00	6.00	9.10
#2229	Abrader	Pumice	75-90cm	S10-12/E20-22	59.00	57.00	50.00	104.10
#2327	Abrader	Pumice	75-90cm	S10-12/E20-22	64.00	59.00	31.00	40.20
#2553	Abrader	Pumice	100-110cm	S10-12/E20-22	47.00	33.00	24.00	10.70
#2753	Abrader	Pumice	124cm	S10-12/E20-22	63.00	62.00	28.00	47.70
#2995	Abrader	Pumice	100-110cm	S10-12/E20-22	80.00	49.00	34.00	53.40
#11484	Abrader	Pumice	120-130cm	S10-12/E20-22	51.00	31.00	26.00	10.30
#3990	Abrader	Pumice	40-50cm	S10-12/E22-24	42.00	33.00	14.00	11.80
#4342	Abrader	Pumice	60-70cm	S10-12/E22-24	50.00	36.00	29.00	44.60
#3962	Abrader	Pumice	30-40cm	S12-14/E20-22	72.00	45.00	27.00	33.10
#4007	Abrader	Pumice	46cm	S12-14/E20-22	85.00	74.00	44.00	168.90
#5092	Abrader	Pumice	147cm	S12-14/E20-22	96.00	66.00	45.00	112.30
#10395	Abrader	Pumice	95-115cm	S2-N0/E16-18	84.00	58.00	27.00	63.00
#10600	Abrader	Pumice	78-85cm	S2-N0/E16-18	70.00	65.00	47.00	100.10
#10822	Abrader	Pumice	80-95cm	S2-N0/E16-18	48.00	29.00	27.00	15.30
#10824	Abrader	Pumice	80-95cm	S2-N0/E16-18	49.00	35.00	20.00	14.20
#5748	Abrader	Pumice	50-60cm	S3-5/E18-20	45.00	44.00	30.00	22.30
#6036	Abrader	Pumice	79cm	S3-5/E18-20	46.00	35.00	26.00	21.60
#6085	Abrader	Pumice	77cm	S3-5/E18-20	113.00	72.00	37.00	151.90
#6113	Abrader	Pumice	73cm	S3-5/E18-20	39.00	28.00	21.00	6.90
#6287	Abrader	Pumice	85-105cm	S3-5/E18-20	62.00	54.00	40.00	58.90
#6445	Abrader	Pumice	124cm	S3-5/E18-20	81.00	66.00	29.00	39.50
#6556	Abrader	Pumice	125-145cm	S3-5/E18-20	44.00	42.00	31.00	20.20
#1724B	Abrader	Pumice	58cm	S6-8/E20-22	69.00	46.00	19.00	21.60
#1729	Abrader	Pumice	54cm	S6-8/E20-22	99.00	61.00	41.00	104.30
#2051	Abrader	Pumice	60-70cm	S6-8/E20-22	116.00	79.00	42.00	208.30
#2091	Abrader	Pumice	60-70cm	S6-8/E20-22	62.00	50.00	24.00	34.30
#3058	Abrader	Pumice	83cm	S6-8/E20-22	76.00	43.00	23.00	42.80
#4559	Abrader	Sandstone	55cm	S6-8/E22-24	150.00	75.00	48.00	770.00
#8209	Abrader	Sandstone	40-70cm	S6-8/E22-24	27.00	20.00	6.00	2.90
#5626	Abrader	Welded Tuff	25cm	S6-9/E16-18	62.00	45.00	39.00	110.60
#6044	Abrader	Pumice	49cm	S6-9/E16-18	110.00	62.00	39.00	100.80
#1774	Abrader	Sandstone	63-73	S8-10/E20-22	122.00	79.00	11.00	144.40
#1958	Abrader	Pumice	78cm	S8-10/E20-22	77.00	70.00	51.00	99.40
#2355	Abrader	Sandstone	84cm	S8-10/E20-22	92.00	70.00	17.00	81.90
#2472	Abrader	Pumice	110-120cm	S8-10/E20-22	88.00	59.00	57.00	69.90
#2600	Abrader	Pumice	134cm	S8-10/E20-22	66.00	60.00	58.00	76.80
#4161	Abrader	Pumice	35-45cm	S8-10/E22-24	26.00	20.00	11.00	2.20
#4162	Abrader	Pumice	35-45cm	S8-10/E22-24	46.00	42.00	25.00	26.40
#4615	Abrader	Pumice	68cm	S8-10/E22-24	46.00	33.00	30.00	15.30
#2407	Abrader	Pumice	82cm	S8-10/E24-26	113.00	90.00	34.00	175.90
#3680	Abrader	Sandstone	32cm	S8-10/E28-30	82.00	60.00	8.00	54.70
#1321	Abrader	Pumice	110-130cm	S8-9/E18-20	65.00	48.00	28.00	29.70
#6059	Abrader	Pumice	70-85cm	S1-3/E20-22	38.00	35.00	20.00	15.20
#6469	Abrader	Vesicular Basalt	105-155cm	S1-3/E20-22	73.00	63.00	51.00	143.60
#9141	Abrader (2pcs.)	Pumice	40-50cm	N4-6/E18-20	125.00	46.00	25.00	77.20
#9972	Abrader (Shaped)	Sandstone	65-80cm	N0-2/E18-20	64.00	62.00	12.00	73.70
#10299	Abrader (Shaped)	Sandstone	80-95cm	N0-2/E18-20	108.00	78.00	12.00	132.50
#10564	Abrader (Shaped)	Sandstone	147-159cm	N0-2/E18-20	184.00	145.00	43.00	1499.60
#2292	Abrader (Shaped)	Sandstone	75-85cm	N0-2/E23-25	73.00	56.00	20.00	114.10
#2293	Abrader (Shaped)	Sandstone	75-85cm	N0-2/E23-25	46.00	40.00	8.00	20.70
#2939	Abrader (Shaped)	Vesicular Basalt	95-105cm	N0-2/E23-25	223.00	98.00	73.00	1292.20

APPENDIX A: GROUND STONE ARTIFACTS (continued)

#9408	Abrader (Shaped)	Sandstone	58-65cm	N2-4/E16-18	94.00	83.00	16.00	140.00
#9653	Abrader (Shaped)	Sandstone	65-80cm	N2-4/E16-18	74.00	51.00	9.00	50.50
#9827	Abrader (Shaped)	Sandstone	85cm	N2-4/E16-18	105.00	57.00	12.00	101.10
#10150	Abrader (Shaped)	Basalt	110-125cm	N2-4/E16-18	42.00	40.00	32.00	69.00
#1946	Abrader (Shaped)	Sandstone	48-68cm	N2-4/E23-25	61.00	49.00	13.00	64.80
#2210	Abrader (Shaped)	Basalt	68-78cm	N2-4/E23-25	262.00	123.00	29.00	553.50
#2362	Abrader (Shaped)	Sandstone	74.5cm	N2-4/E23-25	162.00	77.00	31.00	570.20
#8393	Abrader (Shaped)	Sandstone	48-68cm	N2-4/E23-25	54.00	40.00	16.00	41.70
#9825	Abrader (Shaped)	Sandstone	70cm	N4-6/E18-20	78.00	75.00	12.00	88.40
#10537	Abrader (Shaped)	Sandstone	112cm	N4-6/E18-20	156.00	90.00	27.00	630.80
#9111	Abrader (Shaped)	Sandstone	40-50cm	N6-8/E16-18	41.00	33.00	15.00	25.00
#9486	Abrader (Shaped)	Sandstone	50-65cm	N6-8/E16-18	54.00	50.00	7.00	22.80
#9487	Abrader (Shaped)	Sandstone	50-65cm	N6-8/E16-18	141.00	55.00	26.00	211.60
#9519	Abrader (Shaped)	Basalt	50-65cm	N6-8/E16-18	24.00	18.00	5.00	2.40
#9822	Abrader (Shaped)	Basalt	65-80	N6-8/E16-18	103.00	75.00	54.00	301.50
#9902	Abrader (Shaped)	Sandstone	65-80cm	N6-8/E16-18	65.00	52.00	11.00	39.20
#10358	Abrader (Shaped)	Sandstone	95-115cm	N6-8/E16-18	89.00	41.00	14.00	51.10
#10463	Abrader (Shaped)	Sandstone	95-115cm	N6-8/E16-18	82.00	59.00	10.00	75.30
#10706	Abrader (Shaped)	Sandstone	80-105cm	N6-8/E18-20	58.00	30.00	23.00	62.80
#13883	Abrader (Shaped)	Pumice	32-40cm	N8-10/E14-16	40.00	29.00	15.00	7.20
#5790	Abrader (Shaped)	Sandstone	50-60cm	S1-3/E20-22	65.00	49.00	17.00	67.40
#1711	Abrader (Shaped)	Sandstone	61cm	S10-12/E20-22	159.00	125.00	21.00	539.00
#2382	Abrader (Shaped)	Sandstone	79cm	S10-12/E20-22	223.00	113.00	14.00	451.60
#2414	Abrader (Shaped)	Sandstone	90-100cm	S10-12/E20-22	44.00	30.00	6.00	10.40
#2415	Abrader (Shaped)	Sandstone	90-100cm	S10-12/E20-22	63.00	33.00	6.00	12.00
#2510	Abrader (Shaped)	Pumice	93cm	S10-12/E20-22	114.00	98.00	25.00	211.80
#2561	Abrader (Shaped)	Sandstone	107cm	S10-12/E20-22	131.00	98.00	18.00	317.30
#4649	Abrader (Shaped)	Basalt	80-95cm	S12-14/E20-22	72.00	58.00	34.00	253.10
#4813	Abrader (Shaped)	Sandstone	95-110cm	S12-14/E20-22	60.00	33.00	10.00	27.20
#5830	Abrader (Shaped)	Basalt	31cm	S16-20/E20-21	70.00	65.00	15.00	144.00
#9134	Abrader (Shaped)	Sandstone	37cm	S2-N0/E16-18	105.00	72.00	9.00	95.80
#5731	Abrader (Shaped)	Sandstone	50cm	S3-5/E18-20	117.00	83.00	40.00	631.70
#5926	Abrader (Shaped)	Sandstone	60-70cm	S3-5/E18-20	49.00	41.00	20.00	75.30
#6288	Abrader (Shaped)	Sandstone	90cm	S3-5/E18-20	112.00	93.00	19.00	306.40
#4591	Abrader (Shaped)	Sandstone	80-90cm	S6-8/E18-20	55.00	34.00	6.00	15.00
#1912	Abrader (Shaped)	Basalt	58-63cm	S6-8/E20-22	127.00	92.00	13.00	228.50
#1949	Abrader (Shaped)	Sandstone	59cm	S6-8/E20-22	81.00	57.00	10.00	56.90
#2267	Abrader (Shaped)	Sandstone	78cm	S6-8/E20-22	75.00	36.00	10.00	32.20
#2504	Abrader (Shaped)	Vesicular Basalt	93cm	S6-8/E20-22	87.00	43.00	38.00	118.30
#2540	Abrader (Shaped)	Sandstone	90-100cm	S6-8/E20-22	51.00	36.00	16.00	45.40
#2549	Abrader (Shaped)	Sandstone	90-100cm	S6-8/E20-22	38.00	33.00	7.00	10.20
#2650	Abrader (Shaped)	Sandstone	105cm	S6-8/E20-22	50.00	43.00	6.00	13.80
#3011	Abrader (Shaped)	Pumice	120cm	S6-8/E20-22	65.00	39.00	12.00	20.20
#3728	Abrader (Shaped)	Sandstone	40cm	S6-8/E22-24	79.00	62.00	12.00	81.00
#4494	Abrader (Shaped)	Sandstone	40-70cm	S6-8/E22-24	35.00	16.00	6.00	4.70
#5701	Abrader (Shaped)	Sandstone	31cm	S6-9/E16-18	81.00	47.00	10.00	50.20
#1724A	Abrader (Shaped)	Sandstone	62cm	S8-10/E20-22	170.00	112.00	29.00	542.00
#1734	Abrader (Shaped)	Sandstone	60-63cm	S8-10/E20-22	62.00	26.00	10.00	21.60
#2480	Abrader (Shaped)	Welded Tuff	119cm	S8-10/E20-22	145.00	112.00	35.00	626.70
#4698	Abrader (Shaped)	Sandstone	70-75cm	S8-10/E22-24	63.00	37.00	17.00	58.90
#1759	Abrader Frag. (Shaped)	Sandstone	48-68	N2-4/E23-25	81.00	62.00	10.00	21.60
#9313	Abrader Fragment	Sandstone	53cm	N0-2/E18-20	41.00	39.00	19.00	18.40
#10423	Abrader Fragment	Sandstone	110-130cm	N0-2/E18-20	42.00	19.00	5.00	7.80
#10452	Abrader Fragment	Sandstone	110-130cm	N0-2/E18-20	55.00	41.00	8.00	18.70

APPENDIX A: GROUND STONE ARTIFACTS (continued)

#10546	Abrader Fragment	Sandstone	130-166cm	N0-2/E18-20	42.00	36.00	14.00	25.70
#9858	Abrader Fragment	Sandstone	83cm	N2-4/E16-18	83.00	63.00	10.00	65.90
#9833	Abrader Fragment	Sandstone	71cm	N4-6/E18-20	61.00	46.00	19.00	66.90
#10556	Abrader Fragment	Pumice	143cm	N4-6/E18-20	90.00	68.00	56.00	152.40
#10570	Abrader Fragment	Sandstone	110-135cm	N4-6/E18-20	57.00	40.00	13.00	24.50
#9393	Abrader Fragment	Pumice	45-55cm	N6-8/E12-14	32.00	26.00	17.00	9.10
#10026	Abrader Fragment	Sandstone	80-95cm	N6-8/E16-18	52.00	43.00	26.00	83.10
#10360	Abrader Fragment	Sandstone	95-115cm	N6-8/E16-18	30.00	25.00	6.00	6.50
#10361	Abrader Fragment	Sandstone	95-115cm	N6-8/E16-18	46.00	33.00	10.00	17.30
#10707	Abrader Fragment	Sandstone	80-115cm	N6-8/E18-20	58.00	39.00	25.00	68.10
#10710	Abrader Fragment	Pumice	80-105cm	N6-8/E18-20	60.00	57.00	41.00	44.40
#9326	Abrader Fragment	Sandstone	40-50cm	N8-10/E14-16	60.00	47.00	13.00	40.90
#10110	Abrader Fragment	Sandstone	74cm	N8-10/E14-16	52.00	33.00	20.00	46.20
#5676	Abrader Fragment	Sandstone	53cm	S1-3/E20-22	60.00	47.00	8.00	22.00
#5815	Abrader Fragment	Sandstone	66cm	S1-3/E20-22	65.00	42.00	15.00	47.40
#12399	Abrader Fragment	Pumice	85-105cm	S1-3/E20-22	53.00	45.00	22.00	24.60
#4574	Abrader Fragment	Pumice	100cm	S10-12/E18-20	41.00	40.00	24.00	26.30
#2063	Abrader Fragment	Pumice	65-75cm	S10-12/E20-22	65.00	55.00	24.00	52.10
#2383	Abrader Fragment	Pumice	79cm	S10-12/E20-22	76.00	72.00	55.00	117.70
#2419	Abrader Fragment	Pumice	99cm	S10-12/E20-22	48.00	30.00	24.00	25.70
#2498	Abrader Fragment	Pumice	90-100cm	S10-12/E20-22	65.00	58.00	28.00	80.20
#2508	Abrader Fragment	Pumice	90cm	S10-12/E20-22	64.00	44.00	30.00	46.30
#2623	Abrader Fragment	Sandstone	117cm	S10-12/E20-22	103.00	83.00	14.00	149.00
#2654	Abrader Fragment	Sandstone	119cm	S10-12/E20-22	101.00	55.00	11.00	85.50
#2728	Abrader Fragment	Sandstone	110-120cm	S10-12/E20-22	57.00	40.00	6.00	23.70
#2805	Abrader Fragment	Pumice	145cm	S10-12/E20-22	73.00	45.00	35.00	42.80
#4066	Abrader Fragment	Basalt	40-50cm	S12-14/E20-22	42.00	33.00	5.00	11.80
#4080	Abrader Fragment	Pumice	40-50cm	S12-14/E20-22	80.00	36.00	22.00	29.50
#4899	Abrader Fragment	Pumice	110-125cm	S12-14/E20-22	73.00	59.00	47.00	73.00
#7608	Abrader Fragment	Pumice	80-95cm	S12-14/E20-22	32.00	23.00	10.00	2.80
#9838	Abrader Fragment	Sandstone	65-80	S2-N0/E16-18	15.00	12.00	7.00	1.30
#4742	Abrader Fragment	Sandstone	100-110cm	S6-8/E18-20	29.00	20.00	7.00	5.20
#5855	Abrader Fragment	Pumice	32-52cm	S6-9/E16-18	48.00	33.00	30.00	12.40
#2094	Abrader Fragment	Pumice	83-93cm	S8-10/E20-22	55.00	27.00	23.00	30.00
#2844	Abrader Fragment	Vesicular Basalt	98cm	S8-10/E20-22	52.00	42.00	33.00	52.60
#4022	Abrader Fragment	Sandstone	30.5-50.5cm	S8-10/E28-30	62.00	34.00	13.00	40.30
#11676	Abrader Fragment	Pumice	110-130cm	S8-9/E18-20	28.00	17.00	14.00	2.10
#9702	Abrader Fragment	Pumice	65-80cm	N6-8/E16-18	48.00	41.00	38.00	46.30
#9023	Abrader Fragment (Shaped)	Sandstone	34-40cm	N0-2/E18-20	25.00	18.00	8.00	4.90
#10439	Abrader Fragment (Shaped)	Sandstone	110-130cm	N0-2/E18-20	61.00	52.00	23.00	77.00
#10441	Abrader Fragment (Shaped)	Sandstone	110-130cm	N0-2/E18-20	43.00	33.00	4.00	9.80
#10493	Abrader Fragment (Shaped)	Sandstone	54-56cm	N2-4/E16-18	67.00	43.00	21.00	99.10
#10508	Abrader Fragment (Shaped)	Sandstone	110-135cm	N4-6/E18-20	60.00	46.00	7.00	24.70
#10273	Abrader Fragment (Shaped)	Sandstone	80-95cm	N6-8/E14-16	85.00	69.00	19.00	100.80
#5638	Abrader Fragment (Shaped)	Sandstone	50-60cm	S1-3/E20-22	33.00	20.00	11.00	7.50
#5643	Abrader Fragment (Shaped)	Sandstone	50-60cm	S1-3/E20-22	43.00	35.00	12.00	25.70
#6302	Abrader Fragment (Shaped)	Sandstone	85-105cm	S1-3/E20-22	44.00	39.00	6.00	16.40
#6303	Abrader Fragment (Shaped)	Sandstone	85-105cm	S1-3/E20-22	34.00	25.00	5.00	4.50
#4241	Abrader Fragment (Shaped)	Sandstone	50-64cm	S12-14/E20-22	58.00	57.00	7.00	30.50
#4785	Abrader Fragment (Shaped)	Sandstone	95-110cm	S12-14/E20-22	72.00	41.00	7.00	28.20
#9913	Abrader Fragment (Shaped)	Sandstone	65-80cm	S2-N0/E16-18	71.00	46.00	15.00	72.10
#6441	Abrader Fragment (Shaped)	Sandstone	58cm	S6-9/E16-18	51.00	32.00	12.00	18.00
#3688	Abrader Fragment (Shaped)	Sandstone	35cm	S8-10/E22-24	42.00	27.00	5.00	6.70
#6356	Adze	Meta-sed.	93cm	S3-5/E18-20	45.00	41.00	17.00	42.50

APPENDIX A: GROUND STONE ARTIFACTS (continued)

#2982	Adze Fragment	Meta-sed.	100-110cm	S10-12/E20-22	LENGTH			Weight
#6378	Bowl	Pumice	99cm	S1-3/E20-22	70.00	58.00	35.00	77.50
#6412	Bowl	Pumice	91-97cm	S1-3/E20-22	74.00	60.00	43.00	110.40
#2326	Bowl	Basalt	78cm	S10-12/E20-22	96.00	85.00	29.00	257.00
#2611	Bowl	Pumice	110cm	S6-8/E20-22	140.00	112.00	59.00	518.80
#10011	Bowl Frag.	Sandstone	80-95cm	N0-2/E18-20	64.00	51.00	17.00	54.40
#2009	Bowl Fragment	Pumice	63-73cm	S10-12/E20-22	82.00	47.00	31.00	79.90
#4053	Bowl Fragment	Pumice	40-50cm	S12-14/E20-22	58.00	40.00	37.00	34.20
#4679	Bowl Fragment	Pumice	80-95cm	S12-14/E20-22	72.00	62.00	37.00	81.90
#4926	Bowl Fragment	Pumice	117cm	S6-8/E18-20	82.00	69.00	45.00	122.00
#4944	Bowl Fragment	Pumice	123cm	S6-8/E18-20	71.00	60.00	28.00	53.90
#6391	Celt	Meta-sed.	42cm	S6-9/E16-18	56.00	25.00	7.00	12.40
#10709	Decorated Pumice	Pumice	80-115cm	N6-8/E18-20	60.00	50.00	18.00	16.00
#10631	Edge-ground Cobble	Basalt	55-80cm	N6-8/E18-20	93.00	85.00	37.00	422.90
#2478	Edge-ground Cobble	Basalt	115cm	S8-10/E20-22	103.00	100.00	34.00	551.70
#3719	Edge-ground Cobble	Quartzite	30-40cm	S9-10/E18-20	55.00	46.00	27.00	97.00
#2948	Edge-pecked Cobble	Basalt	101cm	S8-10/E24-26	63.00	50.00	41.00	187.40
#9764	"Exotic Rock"	Chert	55-60cm	S2-N0/E16-18	83.00	43.00	40.00	197.10
#9876	Flaked & Ground Club	Basalt	72cm	N6-8/E12-14	190.00	85.00	44.00	840.80
#3386	Grinding Stone	Sandstone	70cm	S8-10/E22-24	88.00	43.00	17.00	88.30
#2300	Ground Pebble	Basalt	78cm	S6-8/E20-22	20.00	20.00	18.00	6.70
#10115	Ground Stone	Vesicular Basalt	95-110cm	N0-2/E18-20	100.00	55.00	53.00	344.40
#1660	Ground Stone	Welded Tuff	36-36cm	S10-12/E20-22	91.00	74.00	36.00	212.40
#2083	Ground Stone	Quartzite	63-73cm	S10-12/E20-22	63.00	50.00	41.00	107.90
#2772	Ground Stone	Vesicular Basalt	124cm	S10-12/E20-22	65.00	60.00	50.00	118.20
#4809	Ground Stone	Basalt	110cm	S12-14/E20-22	92.00	47.00	19.00	82.80
#5727	Ground Stone	Basalt	25cm	S16-20/E20-21	45.00	42.00	28.00	49.00
#2046	Ground Stone	Basalt	60-70cm	S6-8/E20-22	59.00	49.00	35.00	102.10
#4728	Ground Stone (Girdled)	Vesicular Basalt	96cm	S12-14/E20-22	188.00	163.00	102.00	3220.00
#2659	Ground Stone (Ochre stain)	Sandstone	110-120cm	S10-12/E20-22	28.00	22.00	4.00	3.20
#4747	Ground Stone (Perforated)	Basalt	100-110cm	S6-8/E18-20	36.00	27.00	7.00	8.70
#10403	Ground Stone Fragment	Basalt	90-110cm	N4-6/E18-20	93.00	83.00	38.00	425.20
#2521	Ground Stone Fragment	Pumice	90-100cm	S10-12/E20-22	65.00	51.00	37.00	55.80
#2596	Ground Stone Fragment	Basalt	109cm	S10-12/E20-22	59.00	53.00	35.00	142.40
#12865	Ground Stone Fragment	Basalt	110-120cm	S10-12/E20-22	72.00	69.00	20.00	114.20
#3919	Ground Stone Fragment	Basalt	32cm	S12-14/E20-22	75.00	35.00	14.00	34.80
#4468	Ground Stone Fragment	Vesicular Basalt	65-80cm	S12-14/E20-22	107.00	62.00	25.00	118.50
#5913	Ground Stone Frament	Vesicular Basalt	37-43cm	S16-20/E20-21	58.00	32.00	45.00	68.80
#9844	Maul	Basalt	76cm	N0-2/E18-20	132.00	83.00	55.00	886.90
#10328	Maul	Basalt	113cm	N0-2/E18-20	282.00	108.00	69.00	2700.00
#1988	Maul	Basalt	60-65cm	N0-2/E23-25	152.00	61.00	52.00	627.90
#2199	Maul	Basalt	65cm	N0-2/E23-25	148.00	72.00	68.00	1149.10
#2398	Maul	Basalt	92cm	N2-4/E23-25	110.00	56.00	51.00	438.60
#10507	Maul	Basalt	109-114cm	N4-6/E18-20	169.00	69.00	62.00	1025.40
#10536	Maul	Basalt	112cm	N4-6/E18-20	368.00	92.00	69.00	4000.00
#9468	Maul	Basalt	50-65cm	N6-8/E16-18	158.00	83.00	73.00	1446.50
#10409	Maul	Basalt	115cm	N8-10/E14-16	135.00	69.00	58.00	610.00
#5508	Maul	Sandstone	40-51cm	S1-3/E20-22	162.00	86.00	70.00	1438.50
#5859	Maul	Basalt	60-76cm	S1-3/E20-22	156.00	50.00	50.00	711.60
#6465	Maul	Basalt	100cm	S1-3/E20-22	110.00	78.00	70.00	1100.00
#9106	Maul	Basalt	28cm	S2-N0/E16-18	136.00	52.00	35.00	428.50
#10290	Maul	Basalt	89cm	N6-8/E14-16	205.00	42.00	34.00	452.00
#5631	Maul Fragment	Basalt	25.5cm	S16-20/E20-21	44.00	42.00	42.00	105.00
#10421	Maul Fragment	Basalt	95-115cm	N6-8/E16-18	51.00	41.00	36.00	100.00

APPENDIX A: GROUND STONE ARTIFACTS (continued)

					L	W	T	Wt
#10639	Maul Fragment	Basalt	55-80cm	N6-8/E18-20	103.00	47.00	34.00	340.70
#10647	Maul Fragment	Basalt	55-80cm	N6-8/E18-20	101.00	62.00	34.00	447.90
#2746	Maul Fragment	Basalt	124cm	S10-12/E20-22	64.00	56.00	43.00	227.20
#9132	Maul Fragment	Granite	33-39cm	S2-N0/E16-18	106.00	80.00	49.00	604.10
#6571	Maul Fragment	Basalt	52-101cm	S6-9/E16-18	72.00	46.00	20.00	72.90
#4876	Maul Fragment	Basalt	76cm	S8-10/E22-24	72.00	62.00	60.00	444.70
#1731	Maul Fragment	Basalt	48cm	S8-10/E24-26	74.00	56.00	39.00	252.90
#3937	Maul Tip	Basalt	43.5cm	S8-10/E28-30	61.00	28.00	26.00	33.60
#12178	Maul/Pestle	Basalt	90-100cm	S6-8/E20-22	181.00	42.00	37.00	421.70
#2768	Mortar	Basalt	123-139cm	S10-12/E20-22	259.00	250.00	133.00	11000.00
#10296	Mortar Base	Basalt	90-105cm	N4-6/E18-20	239.00	203.00	118.00	8800.00
#3876	Mortar Fragment	Basalt	40-50cm	S10-12/E22-24	162.00	86.00	73.00	1330.00
#2911	Net Weight	Welded Tuff	84cm	N0-2/E23-25	121.00	113.00	35.00	404.30
#2769	Net Weight	Vesicular Basalt	122-128cm	S10-12/E20-22	193.00	166.00	52.00	1315.30
#2840	Net Weight	Vesicular Basalt	141cm	S10-12/S20-22	76.00	57.00	38.00	181.30
#4727	Net Weight	Basalt	97-107cm	S12-14/E20-22	178.00	165.00	30.00	1380.50
#9932	Net Weight	Basalt	65-80cm	S2-N0/E16-18	109.00	90.00	34.00	418.20
#4056	Net Weight	Basalt	48cm	S6-8/E18-20	106.00	72.00	46.00	409.20
#2186	Net Weight	Basalt	98cm	S8-10/E20-22	106.00	89.00	30.00	400.00
#10375	Net Weight 'A' (Drilled)	Basalt	109-117cm	N6-8/E16-18	131.00	109.00	31.00	593.00
#10376	Net Weight 'B' (Drilled)	Basalt	109-117cm	N6-8/E16-18	142.00	112.00	41.00	699.90
#10377	Net Weight 'C' (Drilled)	Basalt	109-117cm	N6-8/E16-18	131.00	115.00	45.00	758.60
#10378	Net Weight 'D' (Drilled)	Basalt	109-117cm	N6-8/E16-18	125.00	112.00	25.00	465.10
#10379	Net Weight 'E' (Drilled)	Basalt	109-117cm	N6-8/E16-18	120.00	117.00	31.00	592.60
#10309	Net Weight (Drilled)	Basalt	112-118cm	N6-8/E16-18	140.00	119.00	32.00	662.80
#9960	Net Weight (Drilled)	Igneous	70-77cm	S2-N0/E16-18	140.00	110.00	37.00	422.60
#9757	Net Weight (Girdled)	Basalt	60-75cm	N4-6/E18-20	94.00	80.00	57.00	556.20
#10167	Net Weight (Girdled)	Basalt	92cm	N4-6/E18-20	92.00	77.00	64.00	589.90
#10515	Net Weight (Girdled)	Basalt	116-125cm	N4-6/E18-20	92.00	82.00	58.00	594.90
#10527	Net Weight (Girdled)	Basalt	90-135cm	N4-6/E18-20	101.00	88.00	69.00	727.50
#10598	Net Weight (Girdled)	Basalt	135cm	N4-6/E18-20	89.00	80.00	47.00	421.00
#2511	Net Weight (Girdled)	Basalt	93cm	S10-12/E20-22	95.00	92.00	58.00	703.70
#2298	Net Weight (Girdled)	Basalt	75-82cm	S6-8/E20-22	98.00	95.00	65.00	884.50
#5783	Net Weight (Notched)	Quartzite	50-60cm	S1-3/E20-22	74.00	55.00	22.00	112.50
#9600	Net Weight (Notched)	Basalt	61-67cm	S2-N0/E16-18	116.00	116.00	22.00	470.10
#10655	Net Weight (Possible)	Basalt	55-80cm	N6-8/E18-20	83.00	63.00	22.00	190.50
#10611	Net Weight Blank	Basalt	67-77cm	N4-6/E18-20	203.00	143.00	30.00	1419.30
#10612	Net Weight Blank	Basalt	64-70cm	N4-6/E18-20	194.00	165.00	38.00	1807.10
#9211	Net Weight Fragment	Basalt	44cm	N6-8/E14-16	93.00	62.00	37.00	226.80
#1786	Net Weight Fragment	Basalt	50cm	S10-12/E20-22	105.00	59.00	49.00	301.40
#10077	Net Weight Fragment	Basalt	80cm	S2-N0/E16-18	92.00	91.00	27.00	299.90
#10325	Net Weight Fragment	Basalt	95-115cm	S2-N0/E16-18	70.00	62.00	25.00	124.80
#3894	Net Weight Fragment	Basalt	33.5cm	S6-8/E18-20	83.00	63.00	40.00	214.60
#11013	Net Weight Preform	Basalt	65-80cm	N2-4/E16-18	57.00	54.00	18.00	78.00
#10274	Net Wt. Fragment (Drilled)	Basalt	110cm	S2-N0/E16-18	149.00	72.00	42.00	489.90
#10717	Pecked & Ground Stone	Basalt	105-130cm	N6-8/E18-20	135.00	114.00	97.00	1847.90
#2150	Pecked & Ground Stone	Basalt	75-92cm	S10-12/E20-22	66.00	59.00	31.00	155.60
#2080	Pecked Stone	Basalt	68-78cm	N2-4/E23-25	63.00	38.00	45.00	99.20
#9277	Pecked Stone	Basalt	26-37cm	N6-8/E16-18	235.00	190.00	102.00	5000.00
#1670	Pecked Stone	Basalt	36-48cm	S10-12/E20-22	106.00	63.00	45.00	428.90
#2226	Pecked Stone	Basalt	77cm	S10-12/E20-22	74.00	66.00	30.00	145.60
#2880	Pecked Stone	Diorite	90-100cm	S10-12/E20-22	65.00	61.00	36.00	106.70
#4599	Pecked Stone	Basalt	80-95cm	S12-14/E20-22	106.00	40.00	29.00	163.40
#1285	Pecked Stone	Basalt	90-110cm.	S8-9/E18-20	81.00	54.00	47.00	244.80

APPENDIX A: GROUND STONE ARTIFACTS (continued)

#5982	Pestle	Rhyolite	60-70cm	S1-3/E20-22	120.00	46.00	42.00	301.50
#2807	Pestle	Basalt	146cm	S10-12/E20-22	227.00	81.00	69.00	1966.70
#1862	Pestle	Basalt	69cm	S8-10/E20-22	189.00	60.00	52.00	500.90
#1975	Pestle	Basalt	54cm	S8-10/E24-26	174.00	50.00	54.00	588.50
#774	Pestle	Basalt	132-166cm.	S8-9/E18-20	215.00	84.00	70.00	2200.00
#775	Pestle	Basalt	145cm	S8-9/E18-20	125.00	53.00	51.00	493.50
#1974	Pestle Fragment	Basalt	57-64cm	S8-10/E24-26	107.00	60.00	59.00	512.40
#9520	Pigment Stone	Unknown	50-65cm	N6-8/E16-18	38.00	35.00	8.00	11.40
#6062	Pipe Bowl	Unknown	74cm	S3-5/E18-20	29.00	28.00	24.00	15.30
#10145	Pumice (Marked)	Pumice	80cm	N6-8/E14-16	105.00	63.00	52.00	165.00
#10108	Pumice (Sculpted)	Pumice	85-92cm	N6-8/E16-18	72.00	66.00	35.00	91.90
#10392	Pumice (Segmented)	Pumice	95-115cm	S2-N0/E16-18	51.00	32.00	27.00	18.80
#10097	Pumice Ball	Pumice	80-95cm	N6-8/E16-18	24.00	22.00	18.00	8.20
#10800	Rounded Pumice	Pumice	65-80cm	N2-4/E16-18	37.00	27.00	20.00	9.00
#10781	Rounded Pumice	Pumice	115cm	N6-8/E16-18	75.00	54.00	34.00	66.60
#10809	Rounded Pumice	Pumice	40-50cm	N6-8/E16-18				
#10799	Rounded Pumice	Pumice	80-95cm	S2-N0/E16-18	43.00	33.00	25.00	13.30
#9155	Rounded Pumice	Pumice	61-64cm	S8-10/E22-24	46.00	36.00	18.00	16.90
#10030	Stone Club	Basalt	85-90cm.	N6-8/E16-18	142.00	81.00	50.00	619.90

APPENDIX B: HOUSE UNIT TOTALS

	PA	SSA	BA	B/M	M/P	NW	PS	GGS	OTH	TOT
N8-10/E14-16	4	2	0	0	1	0	0	0	1	**8**
N6-8/E12-14	2	0	0	0	0	0	0	0	1	**3**
N6-8/E14-16	5	1	0	0	1	1	0	0	1	**9**
N6-8/E16-18	13	9	2	0	2	6	1	0	5	**38**
N6-8/E18-20	1	2	0	0	2	1	1	0	2	**9**
N4-6/E18-20	2	6	2	1	2	7	0	1	0	**21**
N2-4/E16-18	9	6	3	0	0	1	0	0	1	**20**
N2-4/E23-25	3	4	1	0	1	0	1	0	0	**10**
N0-2/E18-20	2	11	0	1	2	0	0	1	0	**17**
N0-2/E23-25	4	2	1	0	2	1	0	0	0	**10**
S2-N0/E16-18	4	3	0	0	2	6	0	0	3	**18**
S1-3/E20-22	7	7	1	2	4	1	0	0	0	**22**
S3-5/E18-20	7	3	0	0	0	0	0	0	2	**12**
S6-8/E18-20	0	2	0	2	0	2	0	1	0	**7**
S6-8/E20-22	6	5	2	1	1	1	0	2	0	**18**
S6-8/E22-24	0	4	0	0	0	0	0	0	0	**4**
S6-9/E16-18	3	2	0	0	1	0	0	0	1	**7**
S8-9/E18-20	2	0	0	0	2	0	1	0	0	**5**
S8-10/E20-22	5	4	1	0	1	1	0	0	1	**13**
S8-10/E22-24	3	2	0	0	1	0	0	0	2	**8**
S8-10/E24-26	1	0	0	0	3	0	1	0	0	**5**
S8-10/E28-30	0	2	0	0	1	0	0	0	0	**3**
S9-10/E18-20	0	0	0	0	0	0	0	1	0	**1**
S10-12/E18-20	2	1	0	0	0	0	0	0	0	**3**
S10-12/E20-22	15	9	0	3	2	4	4	7	1	**45**
S10-12/E22-24	2	0	0	1	0	0	0	0	0	**3**
S12-14/E20-22	6	3	2	2	0	1	1	4	0	**19**
S16-20/E20-21	0	0	1	0	1	0	0	2	0	**4**
TOTALS	**108**	**90**	**16**	**13**	**32**	**33**	**10**	**19**	**21**	**342**

PA = Pumice Abraders; SSA = Sandstone Abraders; BA = Basalt Abraders;

B/M = Bowls and Mortars; M/P = Mauls and Pestles; NW = Net Weights;

PS = Pecked Stone; GGS = General Ground Stone; OTH = Other

APPENDIX C: HOUSE UNIT VOLUME AND DENSITY

UNIT	VOLUME	DENSITY
N8-10/E14-16	4.20 cu. m.	1.905
N6-8/E12-14	1.84 cu. m.	1.630
N6-8/E14-16	4.76 cu. m.	1.891
N6-8/E16-18	3.48 cu. m.	10.920
N6-8/E18-20	3.56 cu. m.	2.528
N4-6/E18-20	2.96 cu. m.	7.096
N2-4/E16-18	3.72 cu. m.	5.376
N2-4/E23-25	3.60 cu. m.	2.778
N0-2/E18-20	4.96 cu. m.	3.427
N0-2/E23-25	3.20 cu. m.	3.125
S2-N0/E16-18	4.16 cu. m.	4.327
S1-3/E20-22	2.28 cu. m.	9.649
S3-5/E18-20	3.92 cu. m.	3.061
S6-8/E18-20	5.52 cu. m.	1.268
S6-8/E20-22	4.56 cu. m.	3.947
S6-8/E22-24	3.28 cu. m.	1.220
S6-9/E16-18	2.95 cu. m.	2.373
S8-9/E18-20	2.26 cu. m.	2.212
S8-10/E20-22	4.92 cu. m.	2.642
S8-10/E22-24	4.04 cu. m.	1.980
S8-10/E24-26	4.16 cu. m.	1.202
S8-10/E28-30	3.80 cu. m.	0.789
S9-10/E18-20	2.28 cu. m.	0.439
S9-11/E17.5-18	0.32 cu. m.	0.000
S10-12/E18-20	3.76 cu. m.	0.798
S10-12/E20-22	5.20 cu. m.	8.654
S10-12/E22-24	4.12 cu. m.	0.728
S12-14/E20-22	5.40 cu. m.	3.518
S16-20/E20-21	2.04 cu. m.	1.961