THE FUNCTION(S) OF A SHELLMIDDEN SITE FROM THE SOUTHERN STRAIT OF GEORGIA

by

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ABSTRACT

Shellmiddens have long been regarded as a single site type that is individually heterogeneous but collectively homogeneous. Recent research regarding the role a site played in the spatial and economic organization of prehistoric coastal peoples has begun to illustrate the diversity of function within this class of site.

At Long Harbour, each depositional unit is independently analyzed and compared against a functional model derived from ethnographic and archaeological sources. The results indicate that the site did not maintain a single function over the course of its use. If this is true of other shell middens in the region, then the concept of a shell midden as a single site type warrants reexamination.

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Chapter 1
SITE FUNCTION AND SHELL MIDDENS

Shell middens have been the subject of archaeological research on the Northwest Coast for over a century, yet are still a relatively poorly understood class of cultural deposits. There is as yet no commonly accepted definition of what constitutes a shell midden, with each investigator having to define their terms anew (eg. Ham 1982, Muckle 1985, Waselkov 1987, Wessen 1982). In general, shell middens contain a certain visible percentage of humanly deposited shell within the site matrix. As complex deposits, the proportion of shell is variable within and among sites. The general nature of the term has "tended to foster the unfortunate and erroneous impression that all shell middens represent the same type of site and, by inference, the same cultural and depositional behaviors." (Wessen 1982:37). Shell midden sites still tend to be classified on the supposition that thick, or large deposits, represent village sites while thin deposits are associated with short term special purpose sites (Thompson 1978, Lightfoot 1985, Croes and Hackenberger 1988). This study will test these assumptions through the determination of site function over different periods in the occupational history of a stratified shell midden.

Much of the research involving shell middens in the Georgia Strait region of the Northwest Coast has been devoted to the formulation of a regional culture history (Borden 1950, 1968, 1970; Carlson 1960; Mitchell 1971b), or to the placement of individual sites within a culture historical framework (eg. Carlson 1970, Haggarty and Sendy 1976, Kidd 1969). Shell middens are well suited for this type of investigation due to the stratified nature of many of these deposits. Where midden accumulation is rapid, the bulk of the deposits tends to maintain the vertical separation of stratigraphic units, lessening the possibility of the mixing of deposits (Waselkov 1987). At many sites then, cultural units are incorporated in and separated by stratigraphic units. As Gruber (1978) points out however, the equation of a cultural-stratigraphic series with historical change distorts process by emphasizing discontinuity at the expense of gradualism.

Many researchers have had difficulty in assigning sites within a culture-historical framework because of inconsistencies in their site data when compared to regional reconstructions. These problems arise from the fact that although a given site may represent a wide time range, it is not likely to represent the full cultural inventory of the group who occupied it. As Abbott (1971:103) points out;

> "Since different activities were carried out at each site, within a period of weeks the same individuals could be expected to leave quite distinct archaeological traces at sites miles removed from each other. The corollary to this is that no one site may be expected to reflect the total culture of any group.".

As a consequence of this, a complete cultural reconstruction is not possible until the whole range of site types is sampled. Since it is extremely unlikely that shell middens as a class represent a single functional site type, the determination of the functional nature of the site is an important consideration beyond the interpretation of a specific site. "Site function is the role played by the site in the larger drama of the cultural system of which the site is an integral element." (South 1979:213). The functional determination of sites has important implications regarding settlement patterning and economic behavior of the culture which used and produced a range of sites.

The functional nature of shell midden sites on the Atlantic coast of North America has been a recent topic of archaeological investigation. Brennan (1981) in a regional study of Lower Hudson shell middens came to the conclusion that they represented a single type of site. Using evidence such as the lack of strata, burials, features, tool production by-products, and the narrow range of tool types and faunal remains, he concluded that the sites were short term shellfish gathering sites whose function remained constant for over 5000 years. This apparent continuity over time is unusual as "other places are defined by functional changes over the course of their use." (Lightfoot 1985:318).

Such a shell midden site has also been noted by Kerber (1985), though the range of Atlantic shell midden sites also includes habitation sites (Bishop and Black 1988, Sanger 1981, Speiss 1988). Indeed, other regional studies (Lightfoot 1985, Sigler-Eisenberg and Russo 1986) show much diversity in the functions of shell middens; even within a limited area (Barber 1983).

On the Northwest Coast, the possibility that changes in assemblage content (Abbott 1971:106, Mitchell 1971b:50) and differences in deposits within shell middens (Stein 1984:29) may result from changes in site function have been put forward. Those who have specifically investigated site function have done so through a variety of means including artifacts, artifacts and fauna, ethnographic reconstruction and local resources, artifacts and local resources, and surface features.

Attempts to determine site function from statistical analysis of the artifacts found therein are based on the presumed functional attributes of artifact classes. These studies are derived from attempts to determine the effects of tool kits on Paleolithic assemblages (Binford and Binford 1968). The simplest of these was used by Kennady (1971) at Garrison Bay. Here the relative frequency of four classes, selected as indicators of functional change, were compared both vertically and horizontally. Four functional components were identified, showing some spatial patterning and though these "components" correlate with stratigraphic breaks, this relationship is not explored.

Multidimensional scaling has been employed to define clusters of artifact classes. Whitlam (1977) concluded that a non-shell midden site near Hope was a distinct functional locus, but neither the nature of the assemblage nor the nature of the function are discussed. Matson (1974) in an overview of several shell midden sites from the Southern Georgia Strait succeeded in delimiting several assemblage clusters. That these clusters correspond best with temporal units is not surprising, as the typology employed was stylistic rather than functional. Also, the deletion from consideration of components with fewer than twelve classes effectively precluded the inclusion of special purpose sites.

The widest functional study for the area was conducted by Thompson (1978) on 29 shell midden sites. A cluster analysis was run on the most frequent artifact classes, yielding seven assemblage types that are equated with settlement types. The appearance of new °settlement' types correspond to phase boundaries, and seemingly fall into locational/environmental categories. The locational classes are somewhat artificial groupings however, as the regional perspective of the study makes the °macro locations' too insensitive to show the potential resources available at each location.

An attempt to isolate a postulated sealing and fishing assemblage using a Pearson's r test failed to demonstrate the expected association from a number of sites in the region (Monks 1972). Though several possible explanations for the results are offered, the result could be interpreted as independence for these two activities. In general, results of functional studies using artifacts alone have been fairly inconclusive; a finding somewhat predictable given the failure to consider whole assemblages or the factors governing their formation.

To supplement functional conclusions based on artifacts, investigators have turned to faunal remains. Where there is a functional relationship between a site's dominant food class and artifact class or classes, then interpretations regarding food procurement activities at the site become more secure (Croes and Hackenburger 1988, Monks 1977). Any systematic change in the relationship between the artifactual and faunal data sets may have implications regarding the economic focus of the system. Coupland (1990) improved on these approaches by investigating the composition and distribution of artifact and faunal assemblages. In addition, seasonality estimates enabled a comparison with ethnographic patterning in order to substantiate his conclusions. This study represents the most intensive functional analysis of a shell midden site in the region to date.

The combined use of ethnographic and local resource data form the most commonly used functional analytical technique in the region (eg. Ham 1982, Patenaude 1985, Peacock 1982). Function is determined by reconstructing the seasons of maximum resource abundance in the local environment. This is then compared to the local ethnographic seasonal pattern. Where recorded activities correspond with local resource availability, the ethnographic site types generate a list of predicted activities and their material correlates. The archaeological data are then compared against this short list of site types and their expected archaeological remains.

While seemingly working well in these instances, the technique has a number of drawbacks. First, the model assumes that the ethnographic pattern is valid for all of prehistory. Second, it assumes a consistency of resource availability over time. Lastly, it assumes that the function of the site relates to prime resource availability, when other subsistence considerations elsewhere may have precluded the occupation of the site during this time. The pairing of resources to the ethnographies produces a restricted list such that the total range of site types are not considered. While these data sets are useful, their exclusive use could lead to oversights or possibly incorrect functional interpretations.

The use of surface features to assign a functional status to a site has some applications in a shell midden context. The recovery of perishable structural remains allowed for a winter village classification at Ozette (Samuels 1988, Wessen 1982) and at Garrison Bay (Kennady 1971). This instance is extremely rare, as shell middens generally lack surficial features. Examples where they do occur are village sites distinguished by rectangular depressions from the accumulation of shell around the perimeter of a structure (Abbott 1962, Matson et al 1980, Mitchell 1971a), or defensive sites characterized by banks and ditches (Mitchell 1968b). As Schlanger and Orcutt (1986) point out however, functional interpretations should not be made on surface features alone, as errors of classification may arise due to changes in the function of the site over the course of its life history.

The determination of site function has become a subject of interest in the Southern Georgia Strait region over the last decade. The methods of analysis have varied greatly, from artifact analysis to determinations based on surface characteristics of the site, and have had mixed results. The present analysis will be the determination of the function of a stratified shell midden site from the southern Strait of Georgia. The study will examine a broad range of data from several occupational periods, according independent cross checks of functional interpretations over the course of the life history of the site. It will be the first study to consider the physical nature of a midden in functional terms.

Chapter 2
FUNCTIONAL ANALOGS

A survey of the ethnographic record of Coast Salish cultures living in the southern Georgia Strait region provides a knowledge of the range of functional site types which may correspond with shell midden deposits, and a functional determination of artifact classes.

Functional analogs: sites

The use of analogy to interpret the functional nature of a site requires two assumptions: that the ethnographies accurately describe the culture, and that the archaeological data reflect the ethnographically described cultural behavior (Monks 1972:5). These assumptions force us to consider that an ethnographically derived list of functional sites may be incomplete, or lacking parallel in prehistory. Such cases should be recognisable through their varience from expectations, and would require that the models be revised or discarded in favor of others that more adequately explain the archaeological material. Despite these limitations, the abundant ethnographic record of the area can be used as a starting point to formulate models of possible site types and their material correlates which can be tested against the archaeological record.

The Gulf Islands were utilized by at least two groups, for various reasons, and for varying time periods during historic times. A summary of movements of people to such places and the associated activities at those sites will serve as an indicator of the range of site types which may be encountered. Data for the Saanich is taken from Barnett (1955), Jenness (n.d.) and Suttles (1950). Cowichan data come from Barnett (1955), Curtis (1913), Duff (1952) and Jenness (n.d.).

Cowichan seasonal movements:

March — After four months in the winter village, most band members travel to a bay on the east side of Saltspring for herring and roe. Steelhead were available in the Cowichan River.

April — Processed herring and roe were brought back to the winter village. Steelhead were taken in the Cowichan River. Herring was available in Cowichan Bay and off Saltspring Island.

May — The band divided into task groups; some of which took spring salmon in the river. Others lived in mat lodges or lean tos on Mayne and Saltspring Island while they gathered camus, salmonberry shoots, wild parsnip and wild carrots, and fished for cod and Halibut. Herring, seal, porpoise and halibut were taken off Mayne, Prevost and Pender Island.

June — Most of the band went to three Fraser River summer villages on Lulu Island, halfway between the mouth and New Westminister, for the sockeye run. Those who stayed behind took steelhead and spring salmon at weirs in the Cowichan River, or fished for cod and halibut from small camps in the Gulf Islands.

July-August Summer sites on Fraser River were occupied for the sockeye run. Spring salmon continued to be taken in the Cowichan River, while families trolled for sockeye off Pender Island from temporary camps.

September This time was spent cleaning and drying salmon, hunting, gathering and drying berries at both summer sites and winter villages. Spring and Coho salmon were still available in the Cowichan River.

October The band returned to the winter village, storing the dried food stocks and collecting firewood. Humpback salmon was taken from the Cowichan River.

November-December Residence was in the winter village or in small fishing camps along the Cowichan River, where Humpback salmon were taken from weirs.

January-February The coldest winter months were spent in the winter villages on Cowichan bay and along the Cowichan River. People subsisted on stored resources supplemented by fresh deer, elk, birds, clams, and steelhead salmon.

Saanich seasonal movements:

March Following a winter of mainly dried food, seal, Spring salmon, cod, grilse and ducks were taken in the waters nearby the winter villages.

April Deer, elk, cod, Spring salmon, halibut and herring were taken from the land and sea areas surrounding the winter village.

May The band dispersed into task groups which camped in mat lodges on the Gulf Islands. Camus, wild carrots and rushes were collected. People trolled for Spring salmon while cod and herring were also caught. Seal and duck were hunted.

June Much of the band returned to the winter village. Cod, herring, and Spring salmon continued to be taken in the Gulf Islands. Halibut was taken off the east side of East Point on Saturna Island. Deer bucks were hunted on Mayne, Pender and Saturna Islands for winter food supplies. Bull elk were hunted on Vancouver Island.

July Many band members moved to summer reef net sites on the east coast of Point Roberts for the Sockeye and Humpback runs. Deer and elk were hunted. Some band members had reef net stations off Pender and Mayne Island and would fish there rather than go to Point Roberts. Seals and porpoises were taken off D'arcy, Chatam and Discouvery Islands. Halibut continued to be taken off East Point.

August — At reef net stations, salmon were cleaned and dried, while berries and seeds were collected. Mountain goats were hunted on the mainland.

September — The bands returned to their winter villages to store the processed food, and to maintain the houses and graveyards. Small fishing camps were set up at Goldriver where Humpback were taken with a liester or harpooned during their spawning run. Temporary mat lodge camps were established in the Gulf Islands for the hunting of seals and (sea lions) and for the collecting of clams.

November-February — The cold winter months were spent in the winter villages along the coast of the Saanich Peninsula. Stored food was supplemented by fresh clams, seaweed, cod, Spring salmon, ducks, and deer. All of these were usually obtained near the village.

With the exception of the riverine/reef-net focus of the major salmon fishery, the seasonal economic movements of the Saanich and Cowichan were essentially the same. Three basic site types emerge: villages, seasonal camps, and temporary camps. Suttles (1950:163) mentions these three site types, implying that all three types could be in use at the same time during certain parts of the year. Though shellfish gathering is only mentioned directly in association with winter villages and fall temporary camps, shell midden deposits may be expected to be encountered at all coastal and some inland site types.

The 'winter village' is somewhat of a misnomer, as it was likely occupied to some extent year round. It consisted of a house or row of houses whose long axes were parallel to the beach. The houses had shed roofs, supported independently from the walls, with the highest side facing the water. Walls consisted of boards lashed horizontally to irregularly spaced small posts. The floors were never excavated, but sometimes were leveled with crushed mussel shell spread over them. Fires were located along the central axis of the building. Outside, the beach was sometimes banked up to form a level area, and canoe runs were cleared. Cemeteries were associated with each village, at one end of the site or on a nearby island. Most people were buried in boxes weighted with stones, placed on the ground or in trees; wealthy people received canoe burials, while the poor were wrapped in mats or blankets and children were placed in baskets before being placed on the ground. Seldom was any property placed with the deceased, though sometimes food was burned. Infrequently, villages would be enclosed by a palisade, or have a fortified site nearby.

Seasonal sites were less organized, having no permanent dwellings to structure the space. Structures typically consisted of single family mat lodges constructed on pole frameworks. This type of framework is likely to be difficult to distinguish archaeologically from drying racks which are also likely to be found at seasonal sites. Wealthier families sometimes brought boards from the village to more permanent frameworks at seasonal camps occupied for several weeks; especially those associated with the fall salmon runs. Due to the variety of resources used and or processed at these sites, artifacts and faunal remains should reflect a variety of classes. So too should there be a variety of features encountered though the majority of these are likely to relate to resource preparation. As occupation lasted several weeks, burials might be encountered.

Temporary camps lacked permanent structural features due to the short length of use. Structures, if present, consisted of mat lodges or lean to's on pole frameworks. As a class, they were quite diverse, being the locus of a specific abundant resource, but lacking sufficient others to justify a protracted occupation. Examples include camus gathering camps, trolling camps, clam gathering locales, and halibut fishing camps. Inland camps, having associated small shell middens such as spirit quest sites and canoe and board producing locals, generally fall into this class though they may be indistinguishable from each other except by their associated tool kits. Steaming pits may be associated with camus camps, though, as Suttles (1950:61) points out, such features would be absent if the distance to the winter village was short, since processing would take place there. Temporary camps contained few burials, as attempts were made to bring the body back to the village cemetery (Barnett 1955:218).

Functional analogs: artifacts

Many of the artifact classification systems employed in the region are descriptive, based on a mixture of form, wear, production technique, raw material, and function. Attempts have been made to define functional categories based solely on form and wear (Kennady 1971, Thompson 1978, Whitlam 1977). This technique has been able to isolate groups of artifacts, most of which correspond to ethnographically described functional categories, but some problems of classification arise with objects that lack wear.

The assignment of functional labels to artifact classes involves three premises: 1) that morphology and function are coterminous (Schott 1986:15, Thompson 1978:69), 2) that each formal class possesses only a single function (Schott 1986:15), and 3) that these relationships are constant over time (Dunnell 1978:45).

Functional classifications of artifacts derived from analogy are limited, where not supported by ethnographic collections, as a result of the third person nature of artifact descriptions (Abbott 1971:77). The resultant functional artifact classification employed herein satisfies these restrictions; it is drawn from local ethnographies, while most of the classes show formal continuity over a long time span. Some artifacts are recycled into newer tools of different function. In these cases, it is classified on the basis of its most recent modification.

The following classification system assigns artifacts to general functional categories using ethnographically documented morphologic types, while recognizing that some classes (Eg. 'Whatzits') cannot be given a functional classification due to non use ethnographically or due to the generalized nature of the artifact. Only those classes that commonly preserve under archaeological conditions are presented.

Manufacturing Tools

The bark shredder is described as a flat handboard with as sharp edge and a hole for the fingers (Barnett 1955:70, Suttles 1950:221). Hard rocks that were round and flat were used as hammerstones (Suttles 1950:224). Awls made of sharpened bone were described by Curtis (1913:65) as being used for woodworking , but omitted by Suttles (1950:226) in his description of a woodworking tool kit. It is likely that the awl was used for a variety of manufacturing tasks including woodworking, sewing and basketry.

Woodworking

Nephrite, and sometimes mussel shell, bits were used for chisels and adzes depending on their size and type of handle (Barnett 1955:108, Jenness, N.d.:38). Curtis (1913:59) records that the thigh bone of a bear mounted in a yew handle was used as a chisel. Pecked stone mauls were used to pound antler wedges during the splitting of boards (Barnett 1955:108, Curtis 1913:59, Suttles 1950:226). Gouges were made of bone, mussel shell or beaver teeth set in a "horn" handle (Barnett 1955:109). Drilling was accomplished by a pointed stone (Barnett 1955:109, Curtis 1913:59) or bone drills (Suttles 1974:226) mounted on a shaft and rotated between the palms.

<u>Hideworking</u>

After soaking, the hair was removed from a hide by scraping with a deer or elk rib or a piece of wood as with a drawknife (Barnett 1955:125, Curtis 1913:63, Duff 1952:53).

<u>Fishing</u>

The salmon harpoon consisted of a shaft, two foreshafts, and two detachable composite heads composed of a simple bone arming tip between two valves of bone or "horn" (Barnett 1955:83). The arming tip for the salmon harpoon was a round bone point (Suttles 1952:10). Trolling hooks were of two pieces: a straight wood or bone shank, with a duck or other bone barb (Barnett 1955:85, Suttles 1950:135). The set line hook for flounder was a simple bone pin with the line attached to the center (Barnett 1955:86). Halibut hooks were of bent wood with bone barbs and weighted with sinkers the size of a man's fist (Barnett 1955:85-86, Curtis 1913:51, Suttles 115). Herring were impaled by a row of wood or bone barbs closely set in a flattened wooden pole (Barnett 1955:86, Curtis 1913:51, Suttles 1950:126). Liesters consisted of a shaft with two barbed prongs

(Suttles 1950:143). Anchors for nets are distinguished from line sinkers on the basis of size, being much larger and heavier (Suttles 1950:167).

<u>Hunting</u>

Arrow points were made of hardwood, bone or slate up to six inches long (Barnett 1955:101). Bone arrows were either round and smooth, or flat and barbed (Curtis 1913:66). A coarse black stone (basalt) was also used for arrow points (Suttles 1950:224).

The sea mammal harpoon was similar to that used for fish except that it was larger and often had only one foreshaft (Barnett 1955:98). The arming blade was of antler, bone or mussel shell (Curtis 1913:54, Suttles 1950:106), or slate (Suttles 1950:224). Regardless of material, the arming blade was flat (Suttles 1952:10). Curtis (1913:54) notes that the harpoon was sometimes a barbed bone.

Bird spears had up to 5 barbed points made of bone, wood or whalebone(?) (Barnett 1955:96, Suttles 1950:75) fixed to the shaft. The bases of the points were beveled to facilitate "splicing into" the foreshaft (Suttles 1950:76). Bird arrows were similar to bird spears in that barbed bone points were used, with only two points per shaft (Barnett 1955:102, Suttles 1950:79).

Collection

Digging sticks for roots, bulbs and clams were wooden with occasional crosspieces for handles (Barnett 1955:63, Suttles 1950:57) that may be made of antler.

Food Preparation

Clam shells were used as dippers, bowls (Barnett 1955:60,68), spoons (Curtis 1913:64), or cups (Suttles 1950:225). Spoons were occasionally made of mountain goat horn (Barnett 1955:67). The fish knife is described as "of thin slate shaped like a half disk or a rectangle with two rounded corners. Sometimes the blade was of bone...or of the shell of a large mussel." (Barnett 1955:62). For stone boiling, Jenness (n.d.:31) notes that an average of 6 boiling stones per box were required.

Personal Adornment

Ocher was rubbed on the skin (Barnett 1955:74, Curtis 1913:42, Jenness, n.d.:50) and on other artifacts. Combs were usually wooden with several teeth (Barnett 1955:75). Shell pendents (Barnett 1955:76, Curtis 1913:42) were hung from the ear lobe. "Dentalia and abalone shells were used as ornaments." (Suttles 1950:225). Beads were made of stone and worn as necklaces (Jenness, n.d.:50), or of clam shell worn "pendent on the breast" (Curtis 1913:43).

Ceremonial

During coming of age rites, young men and women were required to use a bird bone drinking tube (Barnett 1955:177, 281). Scallop shells were perforated to act as rattles (Suttles 1950:225).

Table 1
FUNCTIONAL ARTIFACT CLASSIFICATION

MANUFACTURING TOOLS	PERSONAL ADORNMENT	UNKNOWN
Hammerstone	Bead	Microblade
Anvil	Browband	Cobble Tool
Billet	Gorget	Rod
Flaker	Pendent	Whatzit
Abrader	Spool	Handstone
File	Labret	Chipped Disc
Saw	Pin	Fragment
Drill	Pigment	Unique
Paint pallet	Ring	
Net Gauge	Comb	
Bark Shredder		
Awl		
MANUFACTURING RESIDUE	FISHING	FOOD PROCESSING
Core	Barb	Knife
Flake	Gorge	Spoon
Sawn Mat'l	Sinker	Bowl
Chopped Mat'l	Anchor	Boiling Stones
Ground Mat'l	Harpoon	
Preform	Foreshaft	
HUNTING	WOODWORKING	CEREMONIAL
Point	Chisel	Inlay
Atlatl Hook	Maul	Effigy
Atlatl Weight	Wedge	Rattle
Foreshaft	Adze	Gaming Piece
Harpoon		Drinking Tube
HIDEWORKING	WAR	MULTIPURPOSE
Hide Scraper	Club	Retouched Flakes
Needle	Dagger	
COLLECTING		
Digging Tool		

The use of ethnographic analogs in the present functional study has two important applications. First, it allows for a determination of the range of possible Late Prehistoric site types that might be encountered and their material correlates. Secondly, it allows for the production of a classification system that should aid in the determination of functional variability within given site types.

Chapter 3
ASSEMBLAGE COMPOSITION

The functional interpretation of a site based on its archaeological assemblages rests on two premises: 1) that the material recovered from the site resulted from activities that took place on or near the site, and; 2) that the kinds and frequencies of classes reflect the range of archaeologically visible activities that commonly occurred on or near the site (Lightfoot 1985:298). In practice however, these premises are complicated by various cultural and natural factors (Schiffer 1976). Knowledge of the factors governing assemblage composition enables the prediction of assemblages that may be expected at different site types.

Ammerman and Feldman (1974) devised a model of assemblage formation with five variables: 1) activities of the group, 2) the frequency with which activities occurred, 3) the tool types, 4) the relations between tools and activities, and 5) the dropping rate of tools. While the assumption that a single group contributed to the assemblage for a whole year with all activities being performed at the site makes this model impractical in the present context, the proposed variables deserve consideration.

Ethnographic accounts do not furnish us with details concerning how often or how long any given activity was likely to take place at any given site.

Many functionally specific tool classes, such as fish knives, were continually used for several thousand years, enabling a functional association with activities listed in the ethnographic records.

Defining the "drop rate" of tools is a major problem. Without direct observation or replicative experimentation, this variable cannot be estimated. The drop rate is a product of two interrelated factors: the curation value and the use-life of the individual tool class. Curated items have a low probability of entering the archaeological record, while expedient tools are more likely to be deposited in a manner proportional to their use (Binford 1978a:372). Likewise, long use-life items have low drop rates, while short use-life items are dropped more frequently. These factors may contribute to the high proportions of unshaped abraders found in many regional assemblages, as these items have both a low curation value and a short use-life (Johnstone 1986). With longer occupations, the probability of loss or discard of curated items and long use-life artifacts increases, such that the archaeological assemblage more closely approximates the systemic assemblage (Schiffer 1975:266). Because of these problems, we are limited to knowing the types of activities represented, not their relative importance.

To many (eg. Abbott 1971:106, Ham 1982, Monks 1972:3), local resources are the primary determinants for site function and assemblage composition in area shell middens.

While this is certainly true for many sites, others, such as defensive locations, are situated with different considerations in mind. Some sites may experience changes in resource or other characteristics over the course of their use histories, or even within the span of a year, that make them suitable for different functions at different times. Such places may produce complex assemblages resulting from functionally differing activity sets (Binford 1982:16).

Faunal assemblages are influenced by other cultural factors. The division of an animal into waste and useable portions for consumption or preservation may result in disproportionate representation of certain elements at a site (Ham 1982, Croes and Hackenburger 1987). Preservation for storage results in delays between procurement and consumption, making seasonality estimates difficult (Ford 1989). In addition, species harvested from the breadth of the band's range increases the variety of taxa found at winter village sites (Lightfoot 1985).

In the archaeological context, questions arise as to the contemporaneity of deposits and the assemblages which they contain. "To understand the patterns of site use, we must first investigate processes of artifact accumulation and dispersal in the soil" (Villa and Courtin 1983:271). Binford (1982:16) notes,

> "Only in high energy cultural contexts where the actions of man actually bury artifacts can we relate provenience units which represent unit burial events

> to unit human actions. The composition of assemblages and their grain does not generally derive from the operation and hence organization of a cultural system but instead from the interaction between the cultural system and the processes which are conditioning burial of cultural debris.".

Brennan (1977) was the first to question whether the artifacts found in shell middens were actually deposited at the same time as the shells. Sanger (1981) addressed this problem through a series of radiocarbon tests. He concluded that visually recognizable deposits and the archaeological assemblages contained within them were in fact contemporaneous. Human actions such as the periodic cleaning of houses (Speiss 1988, Wessen 1982) result in the redeposition of portions of contemporaneous assemblages in different, widely spaced deposits whose characteristics may be quite dissimilar. These deposits would otherwise have been difficult to associate except through their cultural content. Some shell middens are characterized by the rapid accumulation of shell which acts to physically separate deposits, reducing mixing between strata and isolating assemblages from different occupations (Waselkov 1987).

Post depositional alterations to assemblage content can arise from a number of processes such as bioturbation, scavenging, and weathering.

Mixing through trampling has been a problem at sites with sandy matrices (Villa and Courtin 1983), but does not seem to be a problem in shell middens (Madson 1988, Muckle 1985) possibly due to interlocking of the platy shell fraction. In the absence of large or common burrowing animals, bioturbation is not likely to be a major factor in the mixing of assemblages. Worm action, however, can have an impact on small objects in certain shell midden contexts (Stein 1983), but this source is recognizable through its castings. Mixing can arise through the reincorporation of eroded material into younger deposits, with some translocated objects being recognized by their surface weathering.

Chatters (1987:345) notes that in sites lacking a good supply of cooking stones, old features might be scavenged for their rock. Such a case may also apply to scavenging of old artifacts for their raw material. Dogs, and possibly other carnivores, may scavenge the bone assemblage, though this effect should be recognizable through teeth marks on the bone. Such is definitely the case with the Long Harbour assemblage. Concentrations of scales may represent fecal remains (Van Oosten 1957:243) attributable to dogs or humans. Scavenging by dogs should have the effect of skewing the distribution of certain elements, but their effect on the representation of species is not known.

Various authors (Eg. Wiggen and Stucki 1987), have proposed that differential preservation of bone due to acidic conditions in the site matrix may influence the composition of faunal assemblages. However, local shell middens are characterized by neutral to slightly alkaline soils (Stein 1984b) and as such should have little effect on bone assemblages.

Assemblage structure is best described through its diversity; unfortunately, that term has been equated with the number of types in the assemblage (Eg. Kintigh 1984, Schlanger and Orcutt 1986, Schott 1986). Diversity has two components: "richness", which describes the number of classes in an assemblage, and "evenness", which describes the distribution of elements across classes (Jones and Leonard 1989). The relationship between diversity and sample size is well known, with diversity varying as a function of the size of the sample. Kintigh (1984) attempted to control for assemblage size by comparison to a simulated assemblage derived from a normal population with items evenly distributed among classes. Such a normal population is not a practical reality however. As Schlanger and Orcutt (1986:301) point out, the slope of the relationship between the numbers of types and sample size is different for differing site types, requiring several models. The formulae for richness indices (Bobrowsky and Ball 1989) have a common drawback in that they require the items in the assemblage to be sampled independently; a requirement that is unrealistic given excavation strategies which generate cluster samples. A more practical way of dealing with the problem of sample size dependence is to compare collections containing equal numbers of individuals, or unequal samples of completely inventoried populations

(Bobrowsky and Ball 1989:5). In the latter case, evenness of different assemblages is simply estimated through a test of variance of proportional abundance using a contingency table (Bobrowsky and Ball 1989:7, Nance personal communication).

Hypothetical assemblages for various site types have been devised by many authors. The length of stay and the number of activities carried out at the various site types result in a continuum of increasing assemblage diversity from special purpose sites through to long term village sites.

Since long term residential sites are the focus around which special purpose and seasonal sites revolve, they contain the most complex mix of archaeological remains (Binford 1982, Chatters 1987) including portions of assemblages from all other site types within the group's range (Kennady 1971, Lightfoot 1985). In addition, these locales were the focus of activities not practiced at other sites. Substantial structural features and large numbers of burials should be exclusive to village sites, while evidence of ceremonial activity may be encountered. Other activities such as the maintenance and manufacture of artifacts and the preparation and consumption of food should be more common than at other sites (Schlanger and Orcutt 1986). As activities at these sites are the most varied of all site types, assemblages should be the most diverse, with high class richness and even distribution across classes.

Artifacts should be recovered in various stages of manufacture and use (Kennady 1971).

Seasonal sites are quite individual and somewhat variable with several activities taking place. Such sites usually lacked permanent structures, while the features should reflect resource processing (Ham 1982, Thompson 1978). Artifact and faunal assemblages should be fairly diverse, with moderate richness, and variable evenness with a small number of possibly unrelated classes predominating (Chatters 1987). The density of artifacts should be lower than at residential sites with less evidence of tool manufacture (Ham 1982).

The short duration, limited resource nature of special purpose sites results in low assemblage diversity, with most of the assemblage comprising one or a few classes (Chatters 1987, Kerber 1985, Lightfoot 1985). The density of artifacts should be low, with those recovered being broken, exhausted, or expediently produced (Schlanger and Orcutt 1986). Permanent shelters and other features should be absent.

Models of expected assemblages resulting from differing site conditions open the possibility of misinterpretation of archaeological data if biasing factors that influence assemblage composition are not kept in mind. Some of these biases can be accounted for and avoided, while others may be recognized. The functional interpretation of sites based on the assemblages which they contain is not a straightforward process, best undertaken critically, with a realization that no functional classifications can be made with complete certainty.

Much of this uncertainty can be overcome through the independent analysis of many different data sets. Correspondence between data sets should reduce this uncertainty and allow for the acceptance of a functional model, while a lack of correspondence would necessitate the formulation of alternate models that resolve these discrepancies.

Chapter 4
SHELL MIDDEN STRUCTURE AND COMPOSITION

The functional differentiation of certain sites should be recognizable in the characteristics of the deposits which comprise the site. As the bulk of most shell middens are composed of sediments derived directly from human activity, different activities should result in deposits of differing character.

The terms used by archaeologists to describe the identifiable deposits within a shell midden are varied or ill defined, making comparisons between sites difficult. "Strata", "layers", "depositional periods" and "beds" have been used synonymously by different authors (Eg. Ham 1982; Stein 1987; Wiggen and Stucki 1987) to denote visually recognizable deposits within shell middens. Gashe and Tunca (1983) have attempted to standardize stratigraphic terms for archaeologists. An attempt is made herein to follow them in relation to local shell middens, with distinctions made in terms of the physical attributes of deposits regardless of their cultural content.

A stratum is a large internally consistent three dimensional body of cultural or natural origin characterized by the dominance of a certain sediment. As such, it serves to distinguish gross sediment types such as anthropogenic sediments, tills, littoral sediments and biotic sediments.

Layers are the basic units of strata (Brennan 1977:123; Gasche and Tunca 1983:328). Layers may result from one or many related depositional events. While it may be internally varied, a layer is deposited under similar physical conditions (Stein 1987:339). Layers are of large horizontal extent, isolated by surrounding deposits with different physical properties. A layer distinguishes between generally different midden deposits such as shell-poor and the shell-rich zones found in many shell middens.

Layers are composed of "sublayers" (Gasche and Tunca 1983:328) that have also been referred to as lenses (Wiggen and Stucki 1987); elemental sediment units (Fedele 1984:9); or facies (Stein and Rapp 1985). Sublayers are internally homogeneous deposits that are small in area, such that they may be easily mapped, and all or a large portion of them sampled. They are laid down during a single event such as the building of a fire, or the discard of a basket load of shell.

The history of shell midden research in the southern Strait of Georgia has seen the bulk of the site, the midden material itself, ignored as a subject of study. Only recently has the internal composition of the midden material been given serious consideration.

Excavation strategies focusing on the removal of individual sublayers demonstrate the internal complexity and diversity of shell midden layers. At Crescent Beach, Ham (1982) removed 31 sublayers from a deposit measuring 4 x 7 x 1.33 meters dating to the late prehistoric period. Hanson (1986) removed over 100 sublayers from a late period deposit from Pender Canal measuring 3 x 3 x 1 meters. Wiggen and Stucki (1987) report eight layers ranging from 0.1 to 0.7 meters in thickness, containing 698 sublayers from the Hoko River rockshelter, also dating to the late period.

An additional complication to the frequency and small size of sublayers is the accretional growth pattern of shell middens responding to shifting occupation areas (Barber 1983:114, Lightfoot 1985:291). In uncontained contexts, significant lateral deposition may occur such as on spits like Montague Harbour (Mitchell 1971) and Crescent Beach (Ham 1982).

The differential nature of certain deposits within shell middens have been the cause for comment and speculation as to their composition and origin (Sanger 1981:39). Hughes and Sullivan (1974) suggested some internal variation may result from the action of storm waves that might incorporate recognizable constituents into the midden. Unfortunately, minimum percentages of these water derived materials are not given, and since human activity may result in the incorporation of similar materials into the midden, recognition of such phenomena may prove difficult. Stein (1984) in a textural and chemical study of two shell middens in the San Juan Islands concluded that pedogenic processes such as leaching, dissolution of shell, or accumulation of oils are not responsible for the formation of shell-poor and shell-rich layers within the same sites.

Other studies give us a clearer understanding of how human activities influence the character of shell midden deposits. The catastrophic burial by landslide of the Ozette site provides an excellent example of a prehistoric context frozen in time, where the relations of shell middens to house structures may be examined. Wessen (1982:22) notes that house floors are generally well sorted and contain low amounts of large refuse items such as bones, shell, and fire cracked rock; while commonly containing hearths, and stake and post molds. Exterior deposits are more heterogeneous, composed of dense accumulations of shell with relatively large amounts of refuse items and few structural features. In a replicative experiment on a modern shell midden, Muckle (1985) indicated that the condition of certain deposits derive from their depositional environment and subsequent post depositional chemical and mechanical alteration. Typically, shell passes through a series of stages from dumping, to disarticulation and breakage. Complete valves are due to rapid burial without subsequent trampling. Discarded valves usually land concave side up, parallel to the surface of the midden pile. High fragmentation occurs from intense trampling, and is recognized by having 50% of the sample falling through a 4mm mesh screen.

These studies make it possible to predict the nature of the shell midden matrix for different functional site types. Village sites should be characterized by spatially discrete deposits of differing composition. Much of the shell fraction should be highly fragmented. Seasonal sites should have moderately to poorly spatially discrete deposits and variable fragmentation of the shell fraction. Special purpose sites should be characterized by spatially random deposits with low fragmentation values for the shell fraction.

Recent work addressing the problems of midden formation have gone a long way towards redressing the oversights of the past. Shell middens cannot continue to be regarded as homogeneous deposits. Though the deposits are complex, "it is fundamental to consider that real stratigraphic units reflect discrete cultural and behavioral units" (Wessen 1982:208). Most investigations of the character of local shell midden deposits have emphasized the importance of different deposits resulting from different cultural activity, while downplaying the contribution of natural factors. However, "by treating the accumulation in a structural sense, changes in patterns of deposition, both qualitative and quantitative, can be sought and defined in a formal way." (Ambrose 1967:163). Field and laboratory analysis of controlled matrix samples from individual sites have the potential of yielding cultural information relating to the nature of the human use of sites.

Chapter 5
SITE SETTING, HISTORY, AND METHODOLOGY.

Setting

The Long Harbour site (DfRu-44) is a coastal shell midden located near the head of Long Harbour, an inlet on the east coast of Saltspring Island. This island is the largest of the Gulf Islands group, situated in the Strait of Georgia between Vancouver Island and the mainland of British Columbia and Washington State (Fig. 1). Mitchell (1971b) has identified the Gulf Islands as a natural region characterized by a distinctive floral community adapted to a summer rainfall deficiency that corresponds to the distribution of Arbutus and Garry Oak.

Long Harbour is a geologic syncline, whose axis runs northwest to southeast dipping to the southeast. Bedrock consists of sandstones and shales which are mantled by a bed of yellow glacial till. The site, one of a number in the area, is located on the western shore of the harbour. It is flanked to the north and south by bluffs of poorly consolidated and highly fractured shale. Longshore drift has redistributed material eroded from these bluffs, creating a spit connecting them. The formation of the spit separated a low-lying marshy area, fed by groundwater and surface runoff to the west, from the ocean. This spit subsequently became the foundation for the Long Harbour Site. The midden extends for some 190 meters north to south, is 30 meters in width at its widest point, and ranges in depth from 0.1 to 2 meters (Fig. 2).

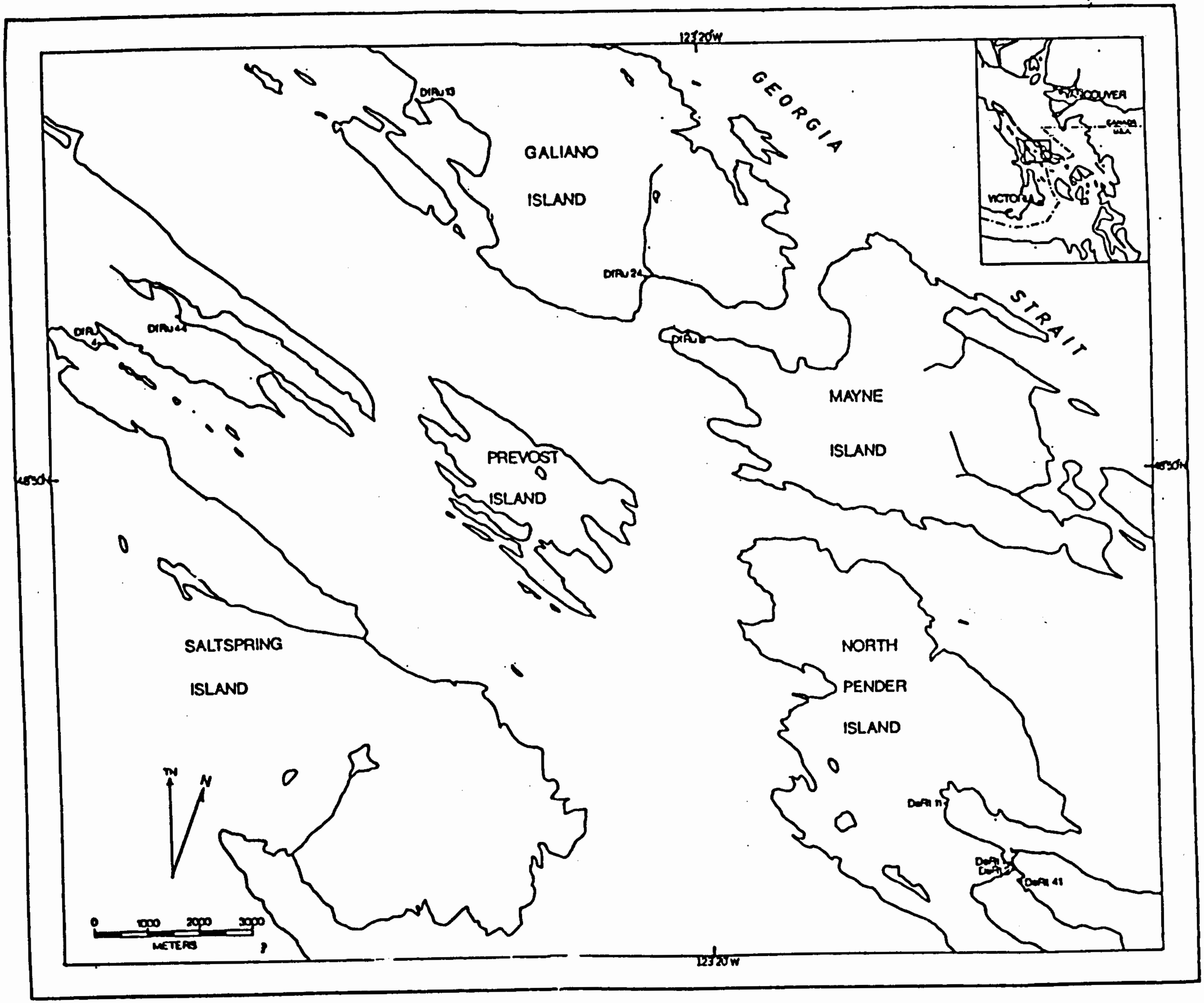


Figure 1- Site Location

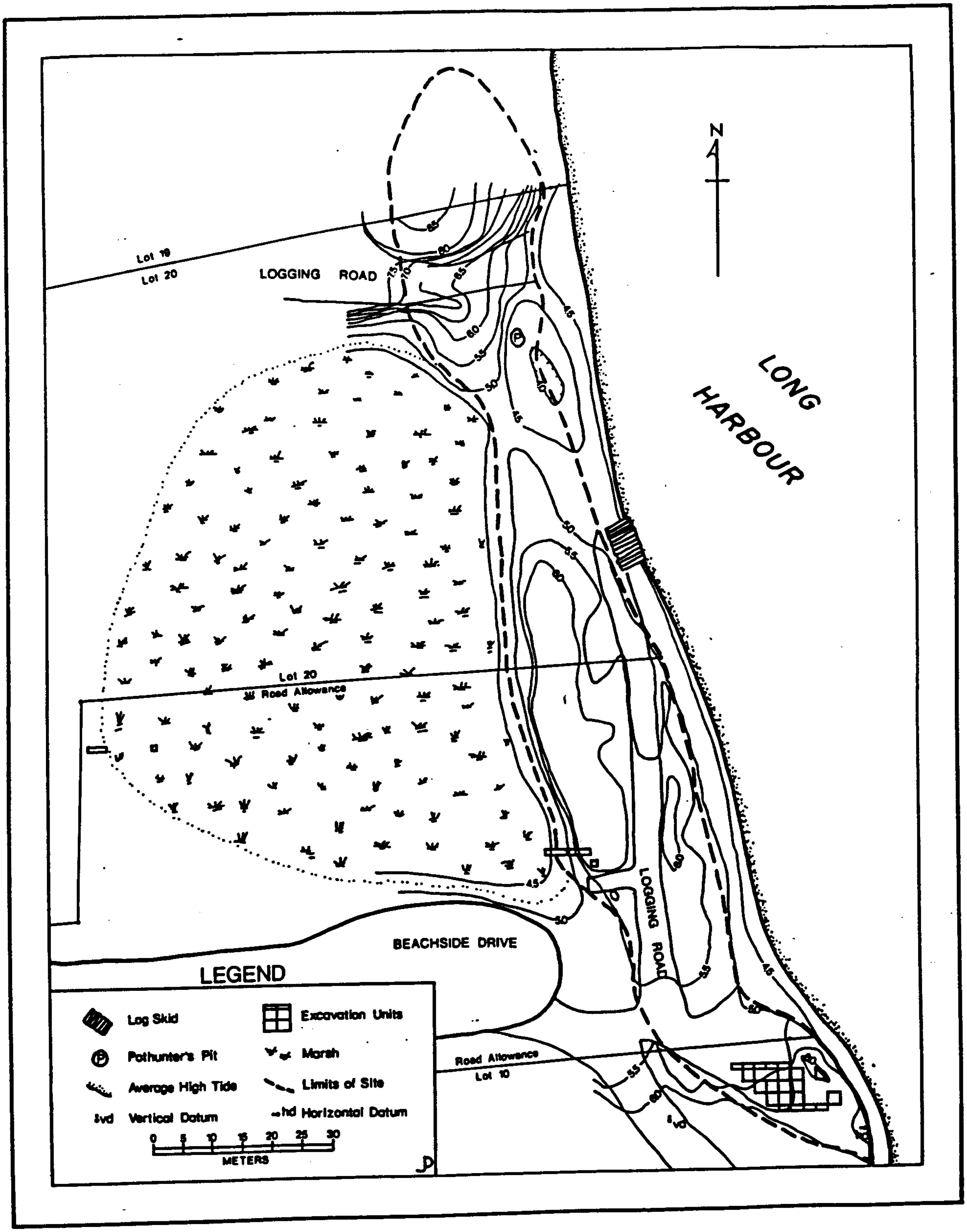


Figure 2- Site Map

The Long Harbour site is situated in an area of diverse resources. The site and adjacent areas support an abundant and varied flora composed of some 43 species (appendix 1), many of which are useful sources of food, fiber, fuel, and building materials. Fauna observed on the site include deer, river otter, raccoon, mink, squirrel, bald eagle, raven, crow, turkey vulture, and kingfisher. Harbour waters host seal, rock crab, pile perch, herring, ducks, and cormorants. The adjacent beach supports barnacle, a wide variety of clams (appendix 2a), seaweed, gull, and great blue heron. Closer to the harbour entrance, where the shore is rockier with deeper less calm water, additional food species are available including salmon, rockfish, dogfish, ratfish, mussels, oysters, whelks, urchins, chitons, and limpets. Until recently, elk and beaver could be obtained from interior prairies on the island.

As a stratified, multicomponent site, Long Harbour provided the opportunity to test a functional model over a time span of some 2000 years at a single locality. It was hoped that by dealing with a single site, it would be possible to control for differing resource availabilities that might influence the sorts of activities carried out at a site. Unfortunately, sea levels did not attain modern levels until the middle of the occupational sequence of the site. The effect of stabilization on the marine resources of the region is not known, but the potential impact to the microenvironments in the immediate vicinity of the site is great.

History

Direct references to the Long Harbour site are absent in the ethnographies, with the nearest site discussed being Ganges Harbour. Suttles (1950:127,137) records that a Saanich man owned a house there which he and his relatives used when they fished for herring and spring salmon. Curtis (1913:40) notes that except for a few old people, the Cowichan fished for herring and roe in March in a bay on the east side of Saltspring. Jenness (n.d.:18) states that the Cowichan fished for herring off Saltspring Island in April and that during May, many of them lived there in mat lodges, fishing for cod and halibut. Barnett (1955:22) notes that during May, the Cowichan collected camus on Saltspring.

Much of the present ground cover at the site is second growth resulting from the site being logged in the late 1940's. According to an informant, the site was used as a log sorting and dumping location until the early 1960's. These activities resulted in the disturbance of some 19% of the surface area of the site due to construction of roads and a log skid. There is also a large irregular excavation whose source is unknown, but may result from relic collectors. The site has since been subdivided; one lot of which remains in the public domain as a department of highways road allotment. Construction of a summer residence and an outhouse at the northern end of the site has further impacted the deposits (Fig. 2).

The Long Harbour site was recorded as part of a systematic survey of the Gulf Islands (Cassidy et al 1974), during which shovel tests were placed to determine the type and extent of midden deposits.

The present study arose out of local interest and a wish by one of the property holders to develop part of the site covered by a voluntary restrictive covenant. Archaeological excavations were carried out by S.F.U. during the summers of 1987 and 1988 under permits 87-10 and 88-42. Since this time, development of the property adjacent to the south end of the site has impacted the site surface in the area of the main excavations.

Field Methodology

A site horizontal datum was established at the southeast property marker on district lot Pl 33340 lot 10. The vertical datum was the top of an iron bar placed above the site at 1.25m north, 31.45m west of the horizontal datum at an elevation of 7.56m above mean sea level.

Following contour mapping, which revealed four areas of mounding, excavations were planned for two areas of the site. The first of these, a large areal excavation, was judgmentally located at the south end of the site in the area to be impacted by construction. The secondary excavation area was smaller in scope, located thirty-four meters to the north on the highways allotment adjacent to the marsh (Fig. 3). These units were judgmentally selected in order to see if perishable materials might be preserved in waterlogged deposits at the marsh edge, and to provide samples from another area of the site in order to control for horizontal variability in site use. The horizontal separation of the two excavation areas makes the latter proposition somewhat problematic as contemporaneity cannot be assured without stratigraphic correspondence or a secure sequence of radiocarbon dates. So, while contemporaneity between areas is guardedly assumed, they are treated as separate analytical units.

Given the depositional complexity of most shell middens, it is not surprizing that sampling strategies are seldom specifically tailored to deal with layer or sublayer deposits as data sets. Other sampling techniques, such as simple random sampling, require that the deposits be considered homogeneous; as the technique assumes a normal distribution of elements, each with an equal probability of being sampled (Peacock 1978, Spurling 1976). Unfortunately, even assuming non-patterned behavior, the depth of many shell middens precludes probabilistic sampling since the relative inaccessibility of deeper deposits makes it practically impossible to sample independently of previously excavated units (Brown 1979).

Ideally, the heterogeneity of shell middens will be recognized through the sampling of each layer (Waselkov 1987:150). The first step is the identification of the

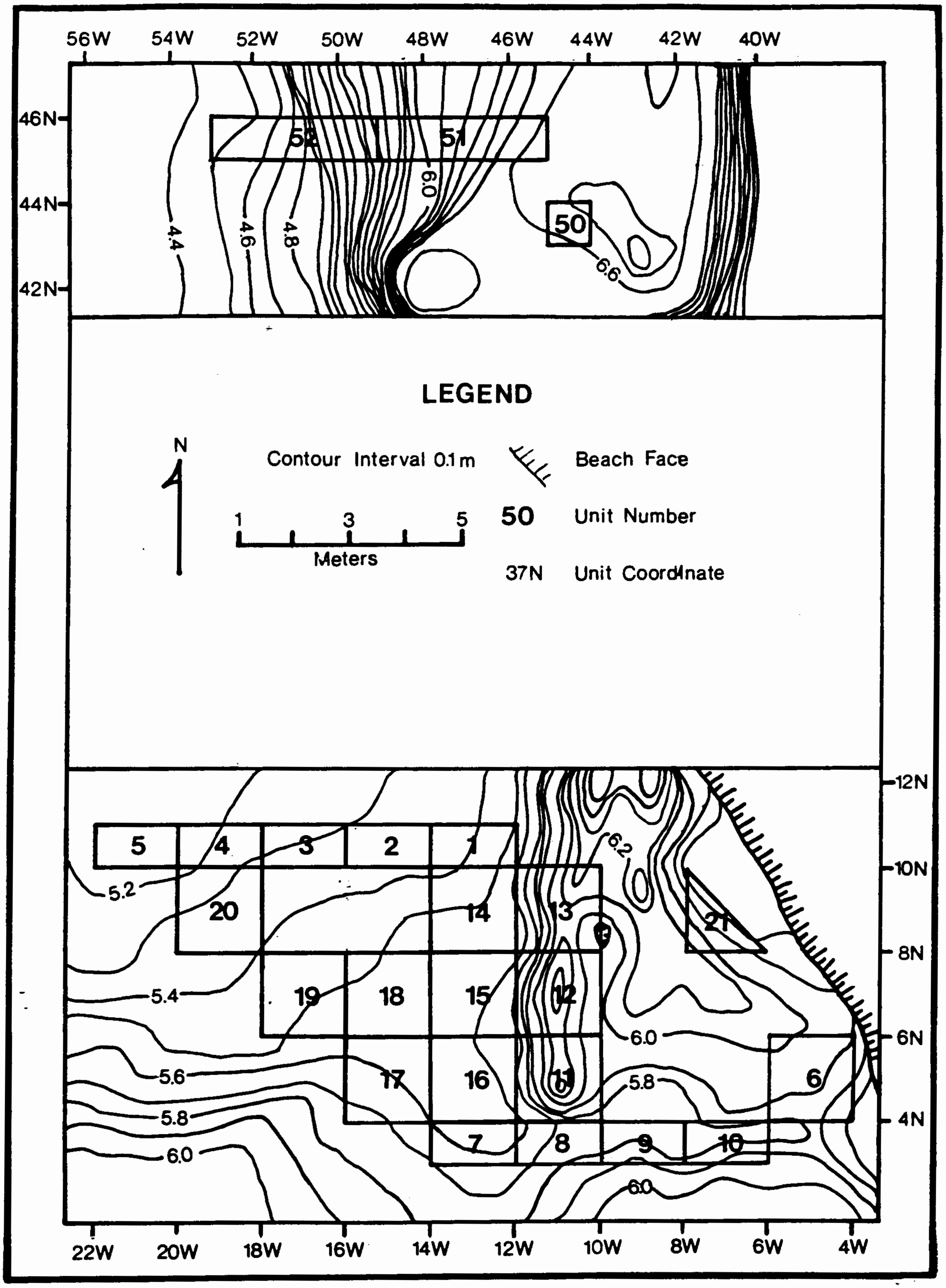


Figure 3- Excavation Areas

deposits that form the sampling population (Gasche and Tunca 1983:328, Villa and Courtin 1983:208). This can be difficult, though the use of erosional exposures, topographical and geomorphic information and coring can give a fair idea of the range of deposits prior to excavation (Brown 1979:165). In the case of the Long Harbour midden, road cuts and a possible looting pit allowed for viewing of deposits in areas of the site apart from those being excavated.

Excavation proceeded in two phases. The first was exploratory in nature, directed towards defining the stratigraphic layers within the site and determining the cultural components represented. A 1x1m test pit in the secondary excavation area, and two 1m wide trenches defining the boundaries of the main excavation area were undertaken in this first phase. Excavation was carried out with trowels in 10cm arbitrary levels as measured from the surface. All excavated material was passed through 6mm mesh screens. Bulk matrix samples for each level were taken from the baulk on the west wall of each unit in order to provide information on midden composition and for recovery of small materials which might have passed through the screens.

The second phase involved the excavation of two 1x4m units in the secondary excavation area, and 12 2x2m units in the main excavation area. Data were collected in "units of association", corresponding to stratigraphic layers. Trowels were employed to remove the matrix in 10cm levels within stratigraphic layers. All material was passed through 6mm mesh screens. An additional 14,000 cm^3 sample from each level was subjected to screening though 3mm mesh in order that small faunal specimens might be recovered as a back up to the bulk matrix samples. The 10x10x20cm bulk matrix samples were collected at random from each level of every unit. Excavation removed one layer at a time, with the newly exposed surface of each layer being contour mapped prior to its being excavated. Exposed profiles were mapped prior to backfilling.

Laboratory Methodology

Material recovered from the first phase of excavation was assigned a layer designation according to its provenience prior to analysis in order to make it compatible with the bulk of material recovered in phase two.

Artifacts from each layer were classified (Appendix 3) according to the functional typology developed in Chapter 2.

Faunal remains from each layer were identified to their lowest taxonomic level (NISP) using the zooarchaeology reference collection at S.F.U.. Cluster samples were chosen at random from available units of each layer. These constituted approximately twenty percent of the vertebrate sample recovered in situ and from the 6mm screens (Appendix 2c). Vertebrate remains recovered from the 3mm screens and from the bulk matrix samples have yet to be analyzed.

Human skeletal material was identified to element wherever possible. Sex was determined through non-metric physical differences (Bass 1971). Ages for infants were determined through dental crown formation (Deutsch et al. 1984) and by length of long bones (Fazekas and Kosa 1978). Due to the increasing variability between chronological age and skeletal age for adult humans, individuals were assigned to one of five age classes based on skeletal development. Children were grouped on the basis of the presence of deciduous teeth from eruption through loss. Juveniles were classed as those individuals having their second permanent molars, but not yet showing epiphyseal union of the long bones. Young adults were considered as those individuals who were experiencing epiphyseal closure of the long bones. The mid-adult class was characterized by epiphyseal union of the long bones, through endocranial suture closure. The old adult class consisted of individuals exhibiting partial to total ectocranial suture closure, and the presence of degenerative changes usually associated with aging such as arthritis and dental abscessing. Pathologies for each individual were noted and described (appendix 5).

Matrix samples were cluster sampled for each layer from units chosen at random. Though it was once suggested (Cook and Treganza 1947, Treganza and Cook 1948) that shell middens may be treated as homogeneous deposits and that the more common constituents may be accurately characterized by 25 matrix samples, at least 10 samples from each layer and from two areas of the site were processed for this study. Samples were dried and divided in two with a soil splitter.

After the larger rocks were removed to limit shell breakage, the subsamples were mechanically shaken for 1 minute through a series of 5 nested screens corresponding to phi units of 0 to -5, defined by the practical limits of sorting, ranging from 30-1mm mesh. The matrix constituents of shell, bone, other organics, and rock, were manually sorted down to -2 phi or 4mm. Below this size, the sample was further split before it was sorted. Unanalysed material consisted of sediments that did not fall into the other classes, and that sediment which passed through the 1mm mesh screen. Koloseike (1968) notes that this material, often overlooked, contains a significant amount of shell and other organic material which can be estimated through chemical tests. After sorting, the percentage of each constituent of the matrix samples were determined for volume, using water displacement in a graduated cylinder, and weight, using a scale, for each mesh size. This procedure permitted an estimate of the degree of trampling. The average and standard deviation of each constituent was determined in order to characterize the composition and variability of the midden for any given layer (Appendix 6).

Functional Model

The expected assemblage and matrix compositions for each site type developed in chapters 3 and 4 are summarized below (Tables 2 and 3). These can be diagrammatically represented such that each site type is associated with relative values of density, diversity and spatial discreteness (Figure 4). Density and diversity are used here as surrogate measures of intensity and duration of site occupation. As values for sites of known function are not available, relative values were used in this study.

TABLE 2
EXPECTED ASSEMBLAGE COMPOSITION

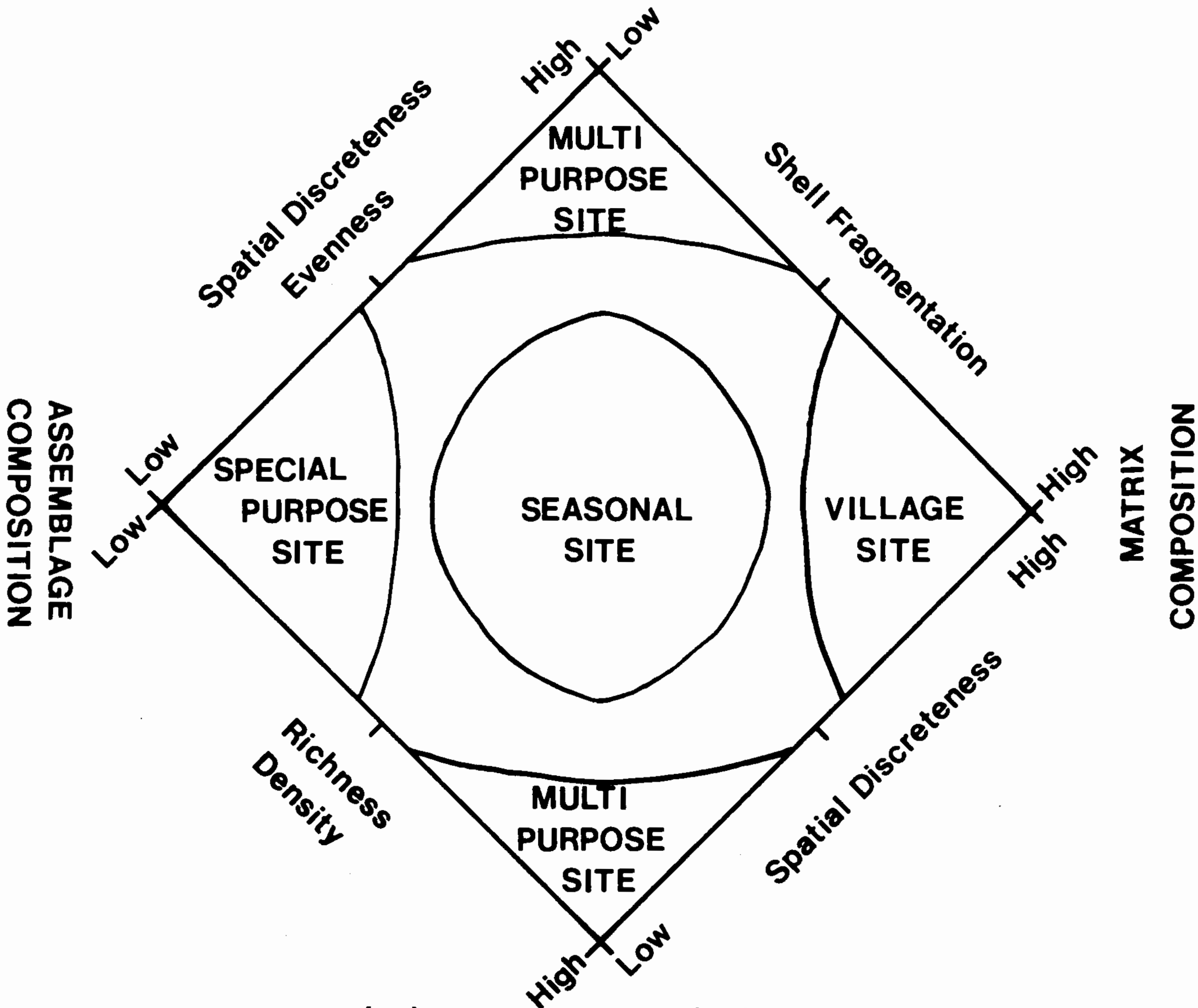
Variables	Site Type		
	Special Purpose	Seasonal	Village
Diversity			
Richness	Low	Moderate	High
Evenness	Low	Moderate	High
Distribution			
Density	Low	Moderate	High
Discreteness	Low	Moderate	High

Table 3
EXPECTED MATRIX COMPOSITION

Variables	Site Type		
	Special Purpose	Seasonal	Village
Structure			
Discreteness	Low	Moderate	High
Fragmentation	Low	Moderate	High

Density values for artifacts, vertebrate remains, and features were determined for each layer and excavation area by dividing the number by the corresponding volume of excavated material. High density labels were assigned when artifacts exceeded $10/m^3$, while a low density label was given to those assemblages with less than 3 artifacts/m^3. For vertebrate remains, high density assemblages are considered to be those exceeding 100 bones/m^3, while less than 40 bones/m^3 is considered to be a low density value.

Figure 4
Site Functional Model



Richness vs Evenness = (div)ersity
Density vs Discreteness = (dis)tribution
Discreteness vs Fragmentation = (str)ucture

(A)rtifacts
(V)ertibrate Remains
(M)atrix
(F)eatures

The functional site types are placed according to their expected assemblage and matrix compositions. The diversities and spatial distributions of artifacts and vertebrate remains along with the structure of the site matrix can plotted on a relative scale. A clustering of these values in one area of the diagram indicates functional correspondence.

Since the artifact sample was essentially the same for stratum 3, and stratum 4: layers 4 and 5, relative richness can be derived from the number of artifact classes represented (appendix 3a). A high relative evenness value was assigned to cases where the most frequently occurring class accounted for less than 30% of the assemblage. Low evenness values were recorded where greater than 50% of the assemblage was contained within a single class.

Though the samples from layers 4, 5 and 7 are unequal in size, it can be argued that they are sufficiently large to limit biassing effects due to sample size. Therefore, relative diversity measures for vertebrate remains can be assigned. The same criteria used for artifacts was applied to vertebrate remains.

For matrix characterization, high fragmentation values were given when greater than 60% of the samples yielded results that fell into the °high fragmentation' category, while low values were assigned when less than 40% of the samples fell into this class. Spatial discreteness was derived from the standard deviation of the samples, and from differences between excavation areas. High standard deviations within areas and large differences between areas indicate high spatial discreteness of deposits.

Each data set, from faunal remains to the midden matrix, was independently tested against the functional model for each "unit of association" corresponding to either a stratum or a layer within a stratum. This procedure allowed for multiple support of an assignment to a site type, and the identification of those data sets not in agreement with an assignment. In such cases, an attempt was made to explain these discrepancies. The testing in this manner of each stratum or layer allowed for the possibility of changing site function over time to be examined.

Chapter 6
RESULTS

General

A total of $93m^3$ of prehistoric site matrix was excavated, constituting approximately 2 percent of the total site volume. Six strata, numbered from basal till to the surface, were defined (Fig. 5,6). Stratum 6, containing a historic non-Indian component, is not considered in the present study.

Three hundred and ninety five artifacts were recovered; and 50 features were recorded from controlled excavation of prehistoric components (appendix 4).

To date, a total of 14,267 bones and 3,937 shells have been analyzed. Fifty seven species have been identified from the site including: 9 fish, 24 shellfish, 12 mammal, and 12 bird species (appendix 2b). A certain bias against mammalian axial skeletal elements due to scavenging by dogs is likely to exist. This is somewhat paralleled by human activities such as marrow extraction and artifact production which result in the fragmentation of long bones, making them unidentifiable to element and species. The net result of these biasing factors is that deer are probably somewhat under-represented. Except for salmon, all bony fishes are relatively evenly represented by cranial and body elements. Salmon are distinguished by a preponderance of body elements, suggesting that the majority of these fish did not arrive on the site in whole body condition, the result of being processed elsewhere.

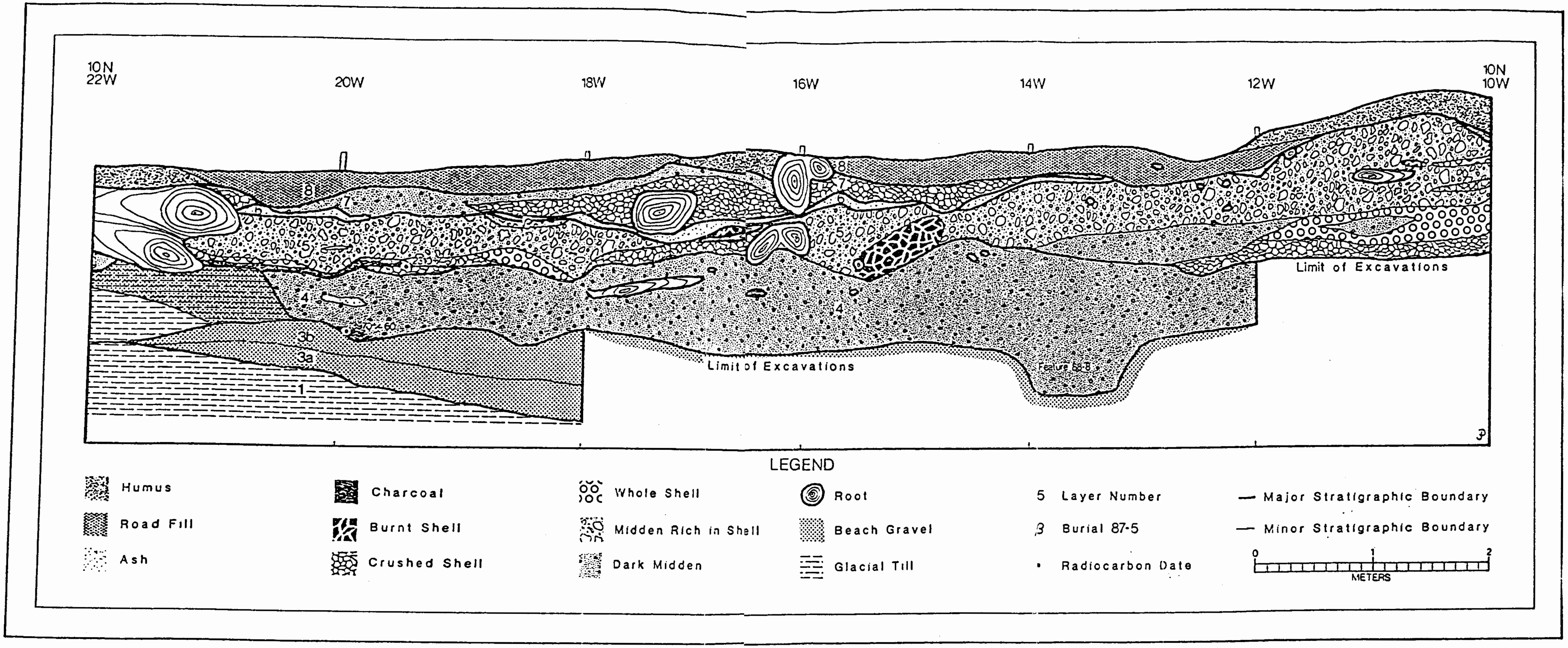


Figure 5- Profile, Main Excavation Area

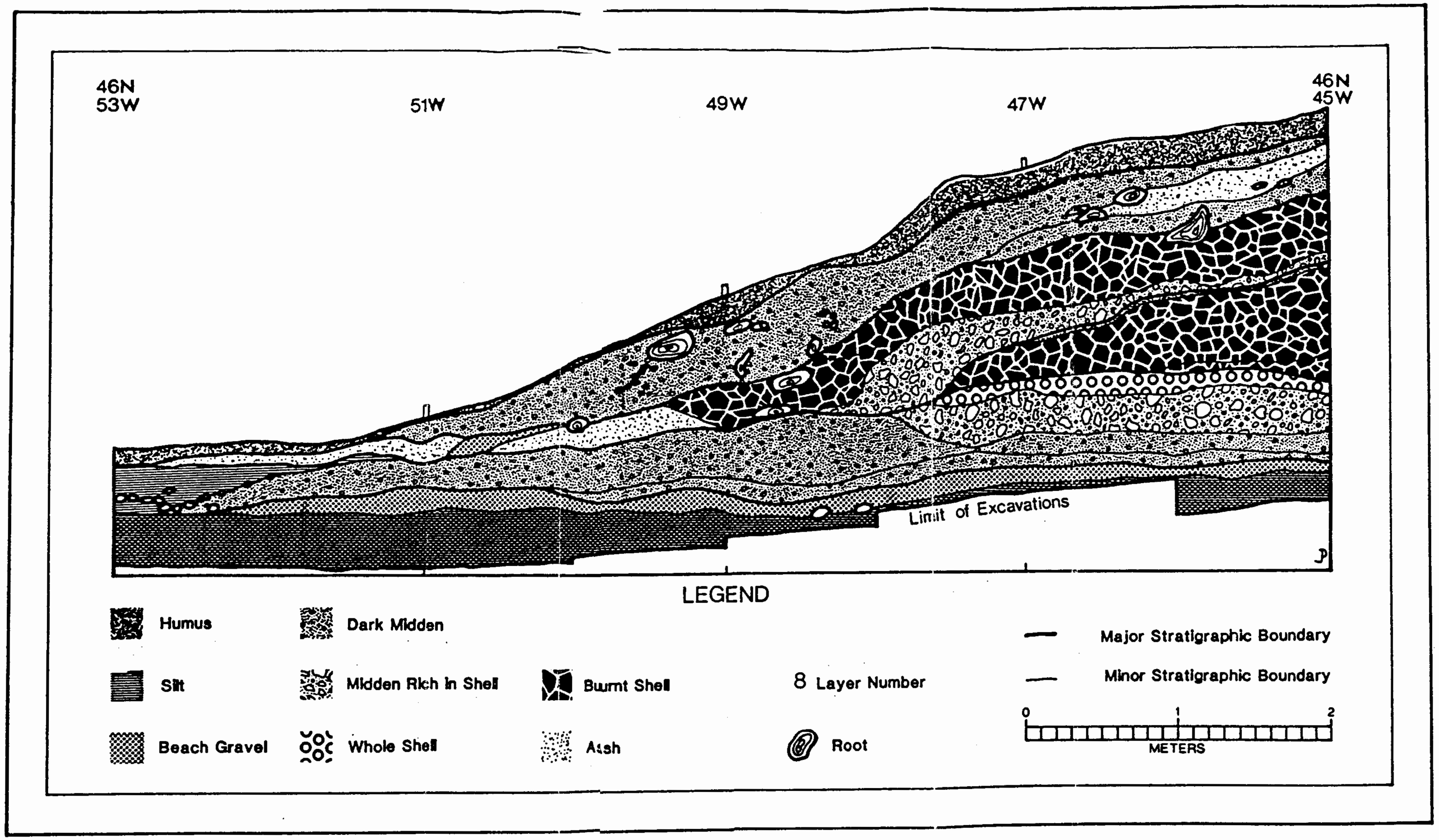


Figure 6- Profile, Secondary Excavation Area

As field techniques resulted in data being collected in units of association corresponding to site strata and layers, the present chapter will follow a similar organizational format, with various data sets being subdivided according to the layer in which they were contained.

STRATUM 1

Stratum 1 consists of glacial till, at the base of the site, is characterized by unsorted sand, gravel and pebbles, contained no cultural material.

STRATUM 2

Stratum 2 is a black silt to silt loam defined on the basis of granulometry. It was absent from the main excavation area, but present in the secondary excavation area. A similar sediment was encountered in test pits within the marsh, and it is probable that these sediments derive from a similar source, being water transported sediments accumulating in the marsh. This would explain its presence in the secondary excavation area bordering on the marsh, and its absence from the main excavation area located away from the marsh. While these sediments continue to accumulate today, they were primarily encountered in association with stratum 3 deposits.

STRATUM 3

Stratum 3 is mainly natural in origin, but contains cultural material. It consists primarily of water sorted beach gravels lying in parallel beds that dip towards the harbour. The beds range from 10 to 40 cm in thickness and are sorted vertically, with sand and fine gravels at the bottom grading to coarser gravels at the top of each bed. Thin carbon rich lenses, probably resulting from tidal drift, are interspersed between the beds. Shell content is generally quite low with the exception of the top surface of the stratum. The shell fraction is fragmentary, fragile and water worn. The lowermost half of this stratum in the main excavation area and all of this stratum in the secondary excavation area are water saturated during part of the year. At the edge of the marsh, stratum 3 gravels interfinger with stratum 2 silts and stratum 4 middens, while a lobe of till was redeposited over the stratum 3 gravels along the west edge of the main excavation area.

Ham (1990) records a similar gravel deposit containing cultural materials underlying shell midden deposits from a raised beach site at Cohoe Creek in the Queen Charlotte Islands. He interprets the alternation of fine and course sediments as resulting from seasonal variation of wave energy and water levels. Like Long Harbour, the cultural materials at Cohoe Creek are associated with the courser gravels.

Clague et al (1982:608) note that on the south coast the sea level had risen to within a few meters of its present level by 5000 BP, with a site on the Saanitch peninsula not achieving present levels until sometime after 2000 BP. This suggests that while the region as a whole may have achieved stability in sea levels after 4000 BP, local conditions continued to affect the relative emergence or submergence of individual sites. Williams and Roberts (1988), dealing with Fraser delta sediments, were able to be more precise, placing sea level stabilization at 2250 BP.

Chronology

Stratum 3 dates to the middle prehistoric Charles period (Borden 1975:96). One concentrated charcoal sample not associated with a feature was radiocarbon dated. It came from the upper surface of stratum 3 in unit 4 of the main excavation area and dated to 3970+/-60 BP (SFU 540). The few diagnostic artifact types such as chipped and ground adzes, chipped discs and whatzits fall into both the Charles and Locarno Beach periods. It is possible that this stratum was deposited during the transition between periods and that the old date is a reflection of the burning of driftwood.

Features

Eleven features were recorded from stratum 3, all from the main excavation area (Fig. 7). These included: 6 hearths, 3 pits, 4 postholes and a steaming oven.

All of the pit features were located at the upper surface of the layer, with the material removed during feature construction piled alongside the feature. The function of two of the pits is unknown, as they contained no preserved cultural material. The third pit feature was classed as a steaming pit as it was lined with cobble and

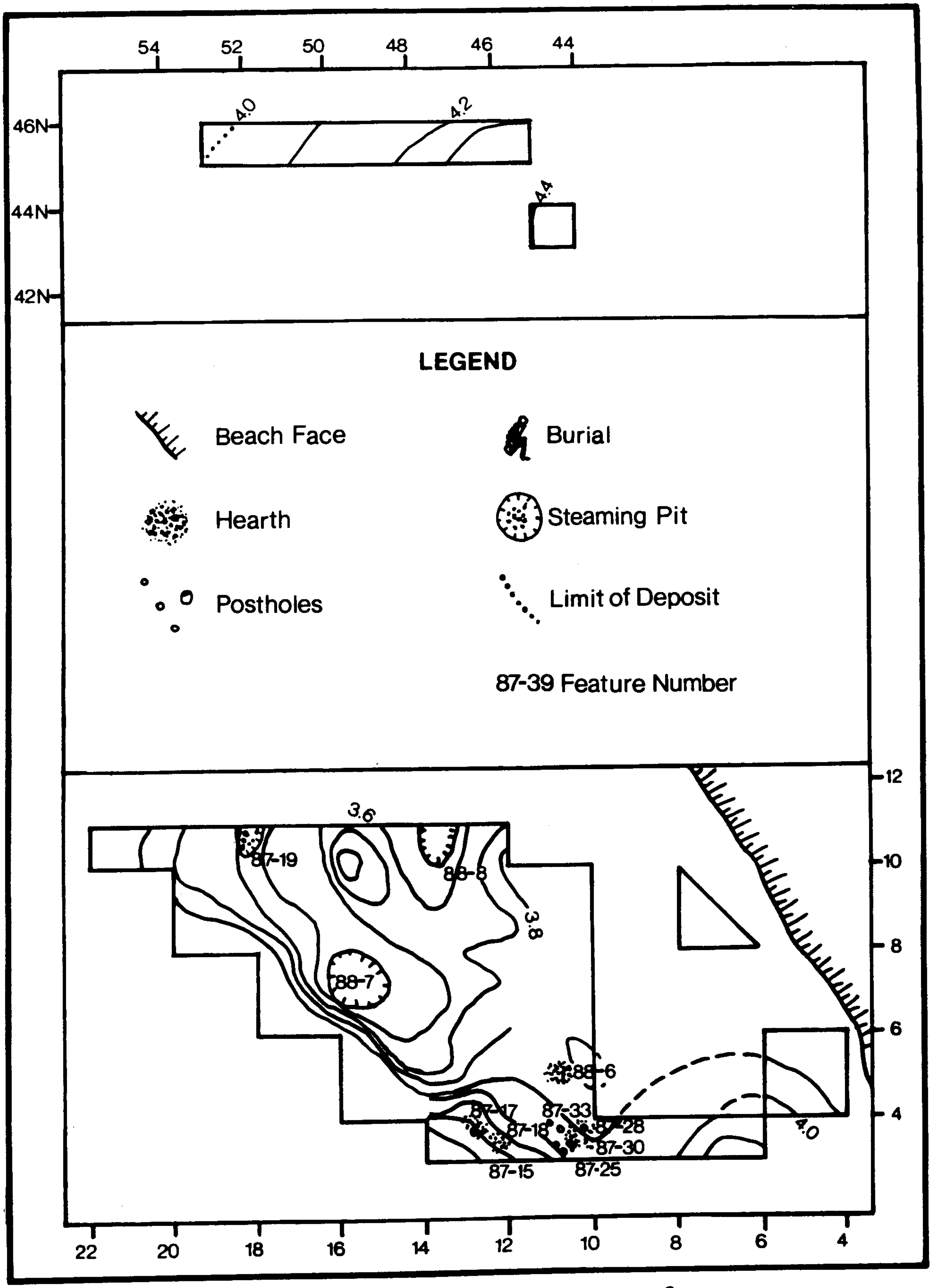


Figure 7- Features: Stratum 3

pebble sized thermally modified rock, and contained a piece of mammal bone.

Two of the hearths were associated with faunal remains. The first was simply a small depression, 50cm in diameter and 10cm deep, scooped out of the surface of the beach gravels and filled with charcoal and ash. Alongside was a small lens of native oyster shells. The other hearth was rock lined and contained ash along with elk, crow and grouse remains. The remaining hearths were composed of concentrations of rock and diffuse charcoal. All hearths were contained within the body of stratum 3, but on the surface of individual beds. This building of hearths atop beach beds indicates reoccupation of the site following sucessive storm events which buried past occupational surfaces with fresh beach gravels. The interfingering of strata in the secondary excavation area may be explained by such high energy events, as overwash gravels were deposited on top of silts at the marsh/spit boundary.

Four postholes were discovered in unit 8 measuring 10-12 cm across and 15-20 cm in depth. Unfortunately, time restrictions prohibited the further excavation of adjoining units to determine if some patterning was evident.

Artifacts

One hundred and three artifacts were recovered from stratum 3. The assemblage exhibits low diversity, with low class richness and uneven distribution within classes (appendix 3a). The bulk of the assemblage is composed of unmodified flakes. Though 5 of these display acute edge angles and faceted striking platforms characteristic of biface reduction flakes, the majority of the flakes probably did not result from the manufacture or maintenance of formed tools. Indeed, 16 of these can be ruled out as by-products of manufacturing, as they resulted from bipolar percussion, while many of the others are too large or blocky to result from tool production. Brennan (1981:44,47) has proposed that many of the flakes found in east coast shell middens are simple expedient tools, and such is probably the case here. The lack of apparent use retouch could be related to the durability of the raw material, being primarily coarse basalt, and to the short artifact uselife. That these artifacts were produced on the site is attested to by the presence of cores; most of which are bipolarly flaked.

The few formed tools recovered suggest few activities. Two points may have resulted from hunting, while wood working is suggested by an adze bit. Personal items are represented by a steatite ring. Other artifact classes serving unknown functions are more problematic, such as whatzits, microblades and "chipped discs", while others, such as retouched flakes, may have performed many different functions.

Artifact density values were not uniform over the site, with a high density of 33 artifacts/m^3 in the secondary excavation area, and a paradoxically low density of 2.6

artifacts/m^3 for the main excavation area and its associated features.

Faunal Remains

Few animal bones were recovered from stratum 3, due in part to periodic water saturation of much of the deposit. As a result, preserved bone comes from only the upper few levels of the layer. Bone density is quite low, averaging 14.6 bones/m^3 for the main excavation area, and 4.6 bones/m^3 in the secondary excavation area. This sample does not appear to be biased against any particular species, as a wide range of sizes and fragility were recovered. However, only generalizations may be made at this point, due to the small sample size.

This earliest occupation evidences use of a range of ecologic zones, variability in body size of prey species, and different techniques probably required to obtain them. Given the beach origin of the deposits, it is difficult to say to what extent shellfish were deliberately utilized except to note that native oysters were associated with hearth feature 88-6.

STRATUM 4

Stratum 4 comprises the shell midden deposits at the site; that is, those anthropogenic sediments containing a visible proportion of shell. This stratum has been subdivided into four layers, numbered 4-7 from bottom to top, corresponding to changes in the amount and condition of the shell fraction in the matrix. In all layers, the unanalysed portion of the matrix consists of sandy silt loam.

Stratum 4 Layer 4

Matrix

Layer 4 deposits are absent from the secondary excavation area, though temporally diagnostic artifacts dating to this period have been recovered by local collectors from the north end of the site suggesting that corresponding deposits may be found there. The matrix of layer 4 consists primarily of midden with low to moderate shell content (comprising 14% by volume and 24% by weight), and moderate gravel content. The shell fraction is generally quite fragmented, with 64% of the processed samples from the "dark midden" deposits falling into Muckle's (1985:78) "high fragmentation" class, suggestive of intensive trampling. There are localized deposits of midden rich in shell in units 7 and 20.

Chronology

Stratum 4 layer 4 is assigned to the middle prehistoric Locarno Beach period primarily on the basis of diagnostic artifact types such as chipped discs, whatzits, and metapodial awls, and on its stratigraphic position between more securely dated deposits.

Features

Eight features were identified in layer 4 (Fig. 8). The feature of most interest is a complex of postholes defining a probable house structure. The holes come in two

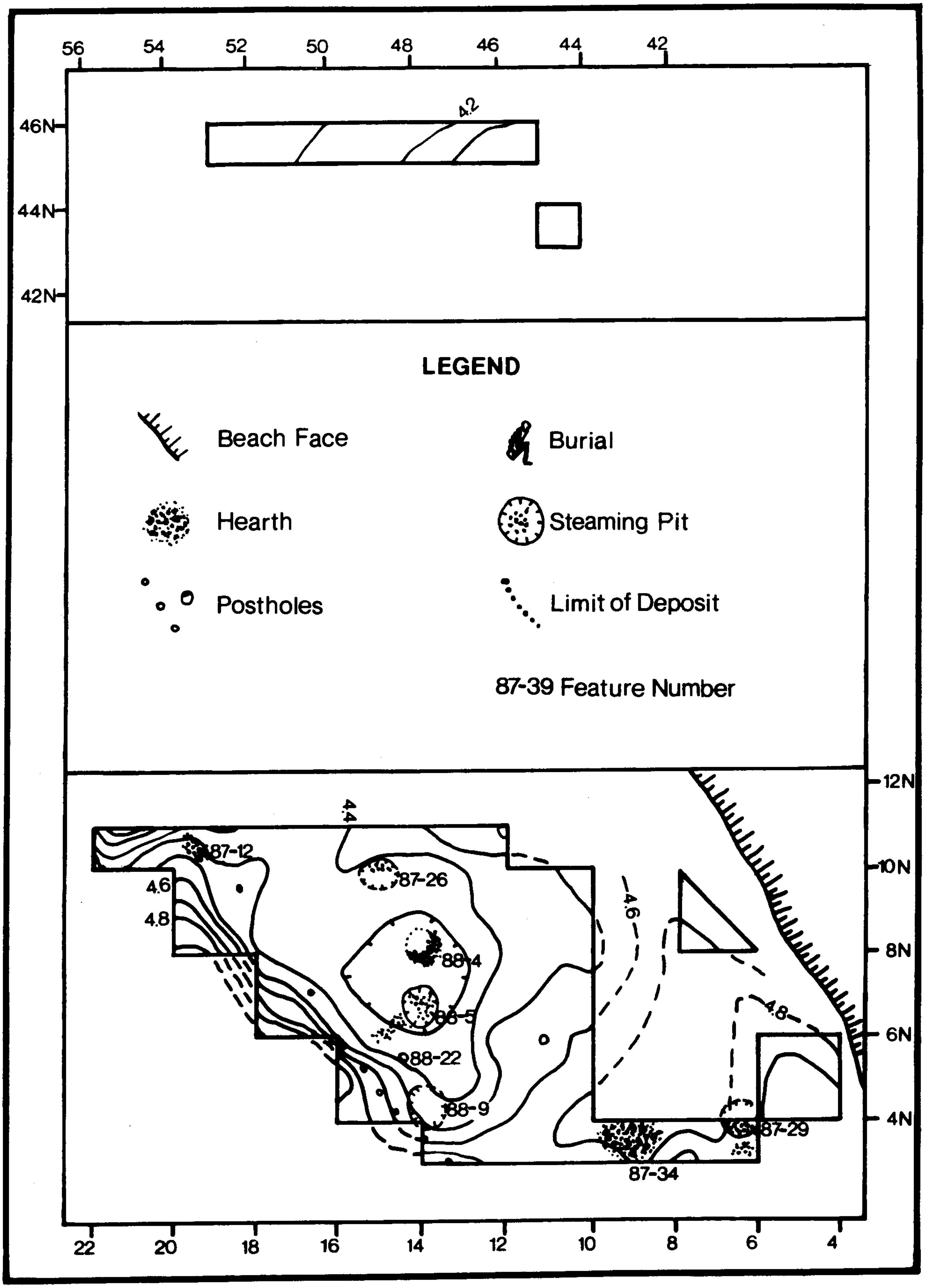


Figure 8- Features: Stratum 4, Layer 4

size ranges: small; measuring 10-12 cm in diameter, and large; measuring 25-30 cm across. Holes of both size classes contain large cobbles embedded in their walls, probably to act as shims. Similar postholes with cobbles were reported by Patenaude (1985:295) from the Pitt River site.

All eight of the smaller sized holes are arranged in a linear pattern stretching some 8m along the foot of a lobe of redeposited till at the west side of the main excavation area. The larger post holes were located in units 1, 11, and 17. If the Ozette architectural pattern (Samuels 1988) is applicable here, the small holes probably represent the back wall of a house, while the larger post-holes represent the locations of roof support posts. Unfortunately, the scope of excavations did not allow the discovery of side or beachward walls.

The remainder or the features, with the exception of a hearth in unit 4, lie within the bounds of the postulated house. Two hearths are located along the projected center line of the structure. They consist of concentrations of thermally altered cobbles, charcoal and ash ranging from 1-2m in diameter.

Three steaming pits were encountered in units 2, 10 and 15. Two of these contained faunal material: herring and sea lion bones. Waste rock piles were adjacent to two of these features, and one steaming pit had a stake mold near its rim.

A single refuse pit, located in unit 17, was classified as such based on its relative depth, the absence of evidence of thermal activity, and the presence of sea lion and shellfish remains.

Artifacts

Ninety eight artifacts were recovered from layer 4 deposits. The assemblage is quite diverse; being rich in classes, with numbers evenly distributed amongst classes. Artifact density is relatively high with an average of 5.43 artifacts/m^3. A variety of activities are represented.

Tool manufacture and maintenance is indicated by the presence of sawn and ground or chipped and ground preforms, abraders, saws, drills, billets and flakers. Bifacial debitage is curiously absent from the assemblage. More than half of the flakes were produced by bipolar production, and only one prepared core was recovered. A single concentration of debitage was noted; that being a cluster of 14 slate flakes from unit 8. At present the apparent absence of evidence for bifacial production might be simply a sampling bias given that the bulk of the excavated material came from the hypothesized interior of a house.

Wood working is indicated by adzes and chisels. Hidework is represented by the presence of a number of rib scrapers. Two concentrations of boiling stones from along the house wall supplement the food processing data suggested by the features.

Food procurement tools come in the form of points, sinkers and barbs, while personal items are represented by a blanket pin.

<u>Faunal Remains</u>

The faunal sample from layer 4 is sufficiently large to make some observations regarding the relative importance of species. The average bone density is high, with 100.1 bones/m^3.

Numerically, fish constitute the majority of vertebrate remains. Of these, herring, rockfish and salmon are the principal species, with herring accounting for 36% of all identified fish remains. Dogfish, perch and ratfish are represented to a lesser degree.

Birds form a relatively insignificant contribution to the faunal assemblage. While many species are represented, no single species stands out as being preferentially sought after.

Of the mammalian remains, deer and dog dominate, with sea lion and mink represented to a much lesser extent.

Invertebrates were used extensively during the time that this layer was deposited. Clams are the principal contributors to the invertebrate assemblage, led by littleneck and butter clam. Rocky shore species such as barnacles, mussels and whelks are less prevalent. While periwinkles are present in the deposit, they were probably not collected as a source of food in their own right, but rather came to the site attached to kelp, itself collected for food and as wrapping for food cooked by steaming.

Human Remains

Though no burials were encountered in layer 4, four isolated human remains were recovered (Appendix 5b). Collectively, these remains represent a minimum of two adult individuals, one of whom was probably female.

Stratum 4 Layer 5

Matrix

The deposits in layer 5 are the most heterogeneous of the site. In general, layer 5 shows a marked increase in shell content from layer 4. Midden deposits appear in the secondary excavation area, suggesting that this part of the spit became fully emergent at this time. These deposits are composed of thick sublayers of whole, crushed, and burned shell, averaging over 69% by weight, and showing a steady increase in shell content over time. The bottom of this layer shows a marked decrease in shell content, with those present being small, fragile, and displaying layer separation. As the water table seasonally saturates this part of the deposit, it is likely that much of the shell fraction has been leached out of the bottom of this deposit post-depositionally.

The main excavation area is more complex in terms of composition. Shell content is moderate, averaging 35% by weight and 30% by volume. Two areas of accumulation, or midden mounds, have been identified: the first between units 12 and 21, and the second between units 3 and 19. These areas have high shell contents with valves in whole or nearly whole condition, many of which are still paired. The westernmost mound is comprised of at least eight dumping episodes, with thin mussel lenses alternating with thick clam lenses. Deposits with lower shell content were found in units 17,18,19,5, and parts of units 1,4 and 20. The thermally altered rock fraction was generally quite high, while the gravel content was moderate.

Chronology

Layer 5 is assigned to the middle prehistoric Marpole period on the basis of two radiocarbon dates and associated temporally diagnostic artifact types. The first sample was of charcoal from the bottom of the layer in unit 5 of the main excavation area, and dated to 2310+/-60 BP (SFU 539). The second sample comes from charcoal located just above the stratum 3 gravels of the secondary excavation area in unit 51, and dates to 2230+/-50 BP (SFU 538). Artifacts such as shouldered non-toggling harpoons and perforated net weights are also consistent with other sites of Marpole age.

Features

Twenty seven features were recorded from layer 5 (Fig. 9). Nine of these were hearths; the most common type being a bed of cobbles with associated ash. Two of these have associated faunal remains including dog, deer, mink and clam. Two hearths lack cobbles. One consists of a

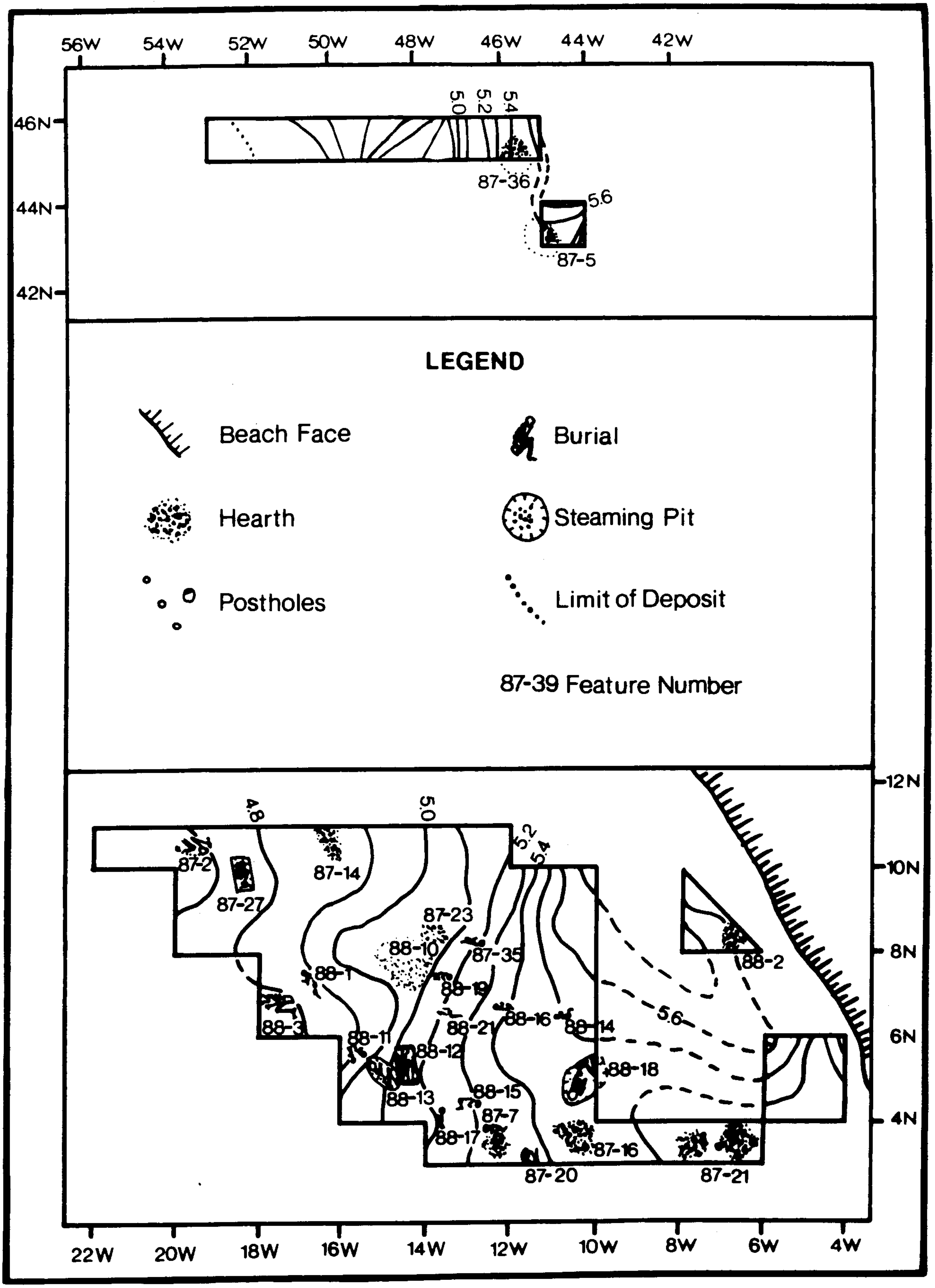


Figure 9- Features: Stratum 4, Layer 5

depression filled with gravel upon which a fire was lit, the second is simply a lens of ash. This was assigned a feature number partly because of its large size, measuring 20 cm thick and 1.5 m in diameter, and partly due to the cemented nature of the midden below the ash. Wasselkov (1987:149) notes that high temperature heating results in the cementing of shells in the presence of water. The fused nature of the midden below the ash implies that the ash resulted from an in situ fire. The two hearths from the secondary excavation area are associated with a low shell matrix at the base of the deposit. There is a marked concentration of heat fractured rock in unit 52 at the border of the marsh. Patenaude (1985:278) notes a similar occurrence at the swamp edge of the Pitt River site. These may be intentional deposits designed as shoring for the edge of the site, or simply cases of disposal of unwanted material away from activity areas.

The remaining features in layer 5 were all burials of three different forms: 1) box burials, distinguished by the tightly flexed nature of the skeleton and a rectangular outline in the soil; 2) pit burials which were simple shallow oval graves containing a loosely flexed skeleton; 3) surface burials which lacked pits, but sometimes included cedar staining on and around the bones, suggesting a blanket, matting or a basket.

In general, the burials were quite simple, unlike the nearby Hill site (Hall and Haggarty:1981, Roberts 1973) in

Ganges Harbour. Only one, a reburial, contained grave inclusions, consisting of deer, dog and mink remains. Some burials had one or more large rocks placed above them, presumably to act as markers or to discourage disturbance by animals. Burial pits were small and shallow, with the deepest reaching 50 cm, but most averaging 25 cm. Infant burials were all of the surface type, while there was apparently no pattern to the juvenile and adult burials. There was seemingly no preferred orientation for the remains.

Artifacts

One hundred fifty artifacts were recovered from layer 5. Like layer 4, the assemblage is quite diversified, representing many activities but, unlike the previous layer, the artifact density is low. Density values are a low 2.82 artifacts/m^3 in the main excavation area, and a moderate 4.94 artifacts/m^3 in the secondary excavation area.

Evidence for tool maintenance and manufacture is provided by preforms of ground slate and bone, and the presence of production tools such as abraders and saws. Flaked tool production and retouch seems to be nearly absent, as only two biface trimming flakes were identified. Nearly half of the flake sample, and all but one of the cores resulted from bipolar production. This suggests that the flakes themselves are the end product; expediently produced and discarded.

Woodworking is evidenced by the presence of wedges and chisels. Rib "scrapers" suggests that some hidework also took place at the site.

Food procurement tools are abundant. Hunting points of chipped basalt, ground slate, and ground bone are present. Fishing activities are evidenced by gorges, sinkers and barbs. Two of the latter, being small and found lying parallel, may represent a fragment of a herring rake, or perhaps are simply barbs from a pair of fish hooks. Large unilateral and bilaterally barbed and composite harpoons used in sea mammal hunting are present within the layer 5 assemblage, unlike that of layer 4.

Personal items in the assemblage were stone and shell beads.

Faunal Remains

Animal bones in layer 5 are quite abundant, but unevenly distributed. The majority come from the main excavation area, where the average bone density is exceptionally high, at 1146.2 bones/m^3. The secondary excavation area, on the other hand, had a low bone density of 21.8/m^3 for the shell rich matrices, and a moderate density of 87.2 bones/m^3 for the low shell matrix. The faunal assemblage is not diverse. Even though there is a richness of species, the assemblage is not evenly distributed, with a single species accounting for 78% of all bones.

Fish continue to constitute the bulk of the sample for this layer. There is no change in the number or type of species utilized, but there is a significant change in the manner of utilization. Herring becomes overwhelmingly dominant, constituting 94% of the identified fish remains. This shift suggests that while other species continued to be exploited, herring became the main target species for the site's occupants. Other than this change, the ranking of species remains much the same, with rockfish and salmon represented to a greater degree than cod, dogfish, perch or ratfish.

Birds continue to make up a small percentage of the vertebrate assemblage, with the bones continuing to be evenly distributed among species.

Within the class of mammals, deer and dog continue to dominate. The number of species represented increases, but this is probably a function of greater sample size. The number of sea mammal remains is small. This may result from processing of the animals at some other part of the site, or away from the site entirely.

Invertebrate remains show essentially the same distribution among species as was evident in the previous layer. The main difference in shellfish use in layer 5 involves a significant increase in the number of animals harvested. The shell fraction of the matrices shows an increase of 45% by weight and 113% by volume over that displayed in layer 4. This large increase suggests that shellfish became a target resource much as herring did at this time.

Human Remains

Nineteen individuals are represented in the 18 burials from layer 5 (Appendix 5a). These include 1 prenatal, 10 perinatal, 1 juvenile, and 7 adult individuals. The adult population consists of: 1 mid adult, and 2 old adult males; and 1 young adult, 1 mid adult, and 2 old adult females.

All individuals in the mid and old adult classes display dental abscessing. Other prevalent pathologies include healed fractures and osteoarthritis. Burial 87-1 had industrial tooth wear on the lingual surfaces of the lower left canine and incisors, and a deep, partially healed, set of grooves of unknown etiology on the ventral aspect of the left ulna. Burial 87-3 had a healed depressed fracture of the frontal above the left orbital margin. Burial 87-6 had osteoarthritis of the patellae and ribs. Burial 88-2 displayed occipital flattening, osteoarthritis of the patellae and thoracic vertebrae, and healed fractures of the second through fourth left metatarsals and the left talus. Burial 88-4 had a healed fracture of the left fifth metatarsal. Burial 88-12 shows occipital flattening and arthritis of the temporo-mandibular joint.

In addition to the primary and secondary internments, scattered remains comprising 87 bones and 36 teeth were also recovered (Appendix 5b). Fourteen of these, from unit 52, may come from a single individual as they display the same degree of calcination and may result from a cremation. These scattered elements minimally represent 18 individuals including: 2 infants, 2 children, 1 juvenile, 1 young adult, 7 mid adults, and 5 old adults.

Sixteen elements, or 21 percent of the non cremated scattered remains show evidence of carnivore chew marks. These are characterized by punctures to thin or spongy bone, and crenelated edges where denser bone has been truncated. Surficial furrowing is rare. The gnawed elements and the location of chewing closely parallel the results of Haglund et al (1988) for a modern forensic population subjected to scavenging by dogs. It is likely that the assemblage of scattered remains from Long Harbour derive from surface burials that were scavenged by dogs, with the more robust elements escaping consumption. Burial 88-15 is a secondary interment of a burial disturbed by dog scavenging. It is possible that the other secondary burial represents a similar situation.

Stratum 4 Layer 6

Matrix

Layer 6 is found only in the secondary excavation area (Fig 10), and is separated from layer 5 by an accumulation of humus and from layer 7 by stratum 5. The layer 6 deposit consists primarily of burnt shell whose content averages 70% by weight. As everything within it is also thermally altered, it is likely that this was heated in situ after deposition.

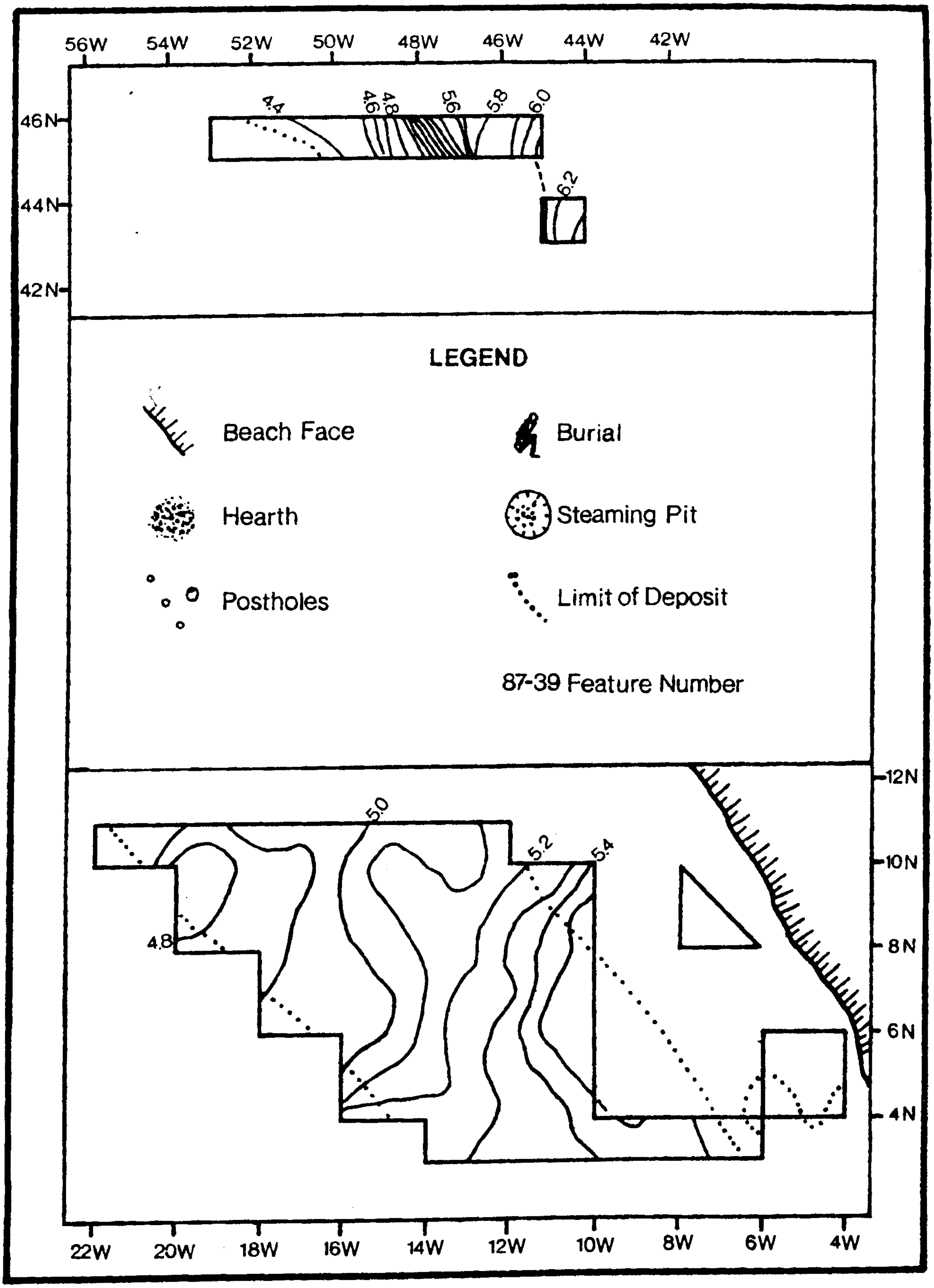


Figure 10- Features: Stratum 4, Layer 6; Stratum 5

Features

No features were discovered within layer 6.

Artifacts

Artifacts were rare in layer 6, only 6 were recovered for an average density of 2.67 artifacts/m^3. These include a barb, a bead, an incised pendent, a piece of ochre and two microblades.

Faunal Remains

The vertebrate assemblage is small, with a moderate density of 33.8 bones/m^3. The invertebrate assemblage also shows little difference in species selection from that displayed in previous layers.

Human Remains

No human remains were found in layer 6.

STRATUM 5

Matrix

The matrix of stratum 5 is composed of a 10-15 cm deposit of ash occurring primarily in the main excavation area, but also found to the west of the burnt shell deposits in unit 52 of the secondary excavation area. As this deposit is thin to non existent in raised areas, and thickest in depressed areas, it is likely that much of the ashy matrix is a wind blown deposit. The inclusion of fire fractured rock and other humanly derived material indicates some cultural activity on this ashy surface. The burned nature of the adjacent shell of stratum 4 layer 6 in the secondary excavation area may suggest that the fire from which the ash derived may have swept over this part of the site (Fig. 10). A lobe of redeposited till which lies immediately above the ash along the west side of the main excavation area may represent a slump event. A large fire event such as is represented by the stratum 5 ash could have denuded the slope, leading to increased slope wash, destabilization, and slumping.

Features

No features were encountered in stratum 5, due to the partial natural derivation of the layer and the probable short time span represented.

Artifacts

Only four artifacts, three microblades and a point, were recovered from stratum 5.

Faunal Remains

Like the artifact assemblage, the vertebrate assemblage is small, with a low average density of 6.5 bones/m^3 in the main excavation area. The small sample limits interpretation, but there are no apparent changes from the pattern found in layer 5.

Human Remains

Eleven scattered human remains representing a minimum of two adults were recovered from the main excavation area of stratum 5.

Stratum 4 Layer 7

Matrix

Layer 7 is a heterogeneous deposit, with lenses ranging from crushed shell to midden deposits with low shell content. Again, there is a difference in deposits between excavation areas, with the main area having an average of 12% less shell by weight than the secondary area. This difference is also reflected in the degree of crushing of the shell. Sixty two percent of the analyzed samples from the main excavation area fall into Muckle's (1985:78) "highly crushed" category, while only one third of the samples from the secondary excavation area fall into this category. Some of this difference may be attributed to crushing by logging equipment in the main excavation area, or it may be that different kinds of activities were being carried out prehistorically in the two areas.

Chronology

The artifact assemblage is composed of types found in layers 5 and 6 and, in addition, a grooved maul from this layer is consistent with those found in Marpole components of the middle prehistoric period. A radiocarbon sample derived from burial 87-4 in unit 13 yielded a date of 2220+/-60 BP (SFU 639). Calibrated dates (Stuiver and Becker 1986) of 2350 cal BP for the layer 5 sample and 2310-2170 cal BP for the layer 7 sample suggest that in the main excavation area layers 5 and 6 accumulated in 40 to 180 years.

Features

Four features were exposed during the excavation of layer 7 (Fig. 11). These included a cobble based hearth and a pit burial in the main excavation area, and a similar hearth and a box burial in the secondary excavation area.

Artifacts

The artifact sample is quite diverse; having many classes with the assemblage evenly distributed among them. However, this diversity may be a reflection of the small sample size as only thirty artifacts were recovered from this layer. Both excavation areas have low artifact densities, with the main area at 2.8 artifacts/m^3 and the secondary area at 1.66/m^3.

Many activities are possibly represented by the artifact classes. Abraders and a piece of partially ground slate suggest ground tool manufacture and maintenance, while evidence for bifacial tool making is absent. All of the cores and 60% of the flakes reflect bipolar production.

A grooved maul fragment suggests woodworking activities while a ground slate knife hints at food processing of fish. Food procurement tools include an atlatl weight and a barbed point for land mammal hunting, while sea mammal hunting is represented by composite harpoon parts. Bone barbs give evidence of fishing.

Personal items include a pendant and a bead.

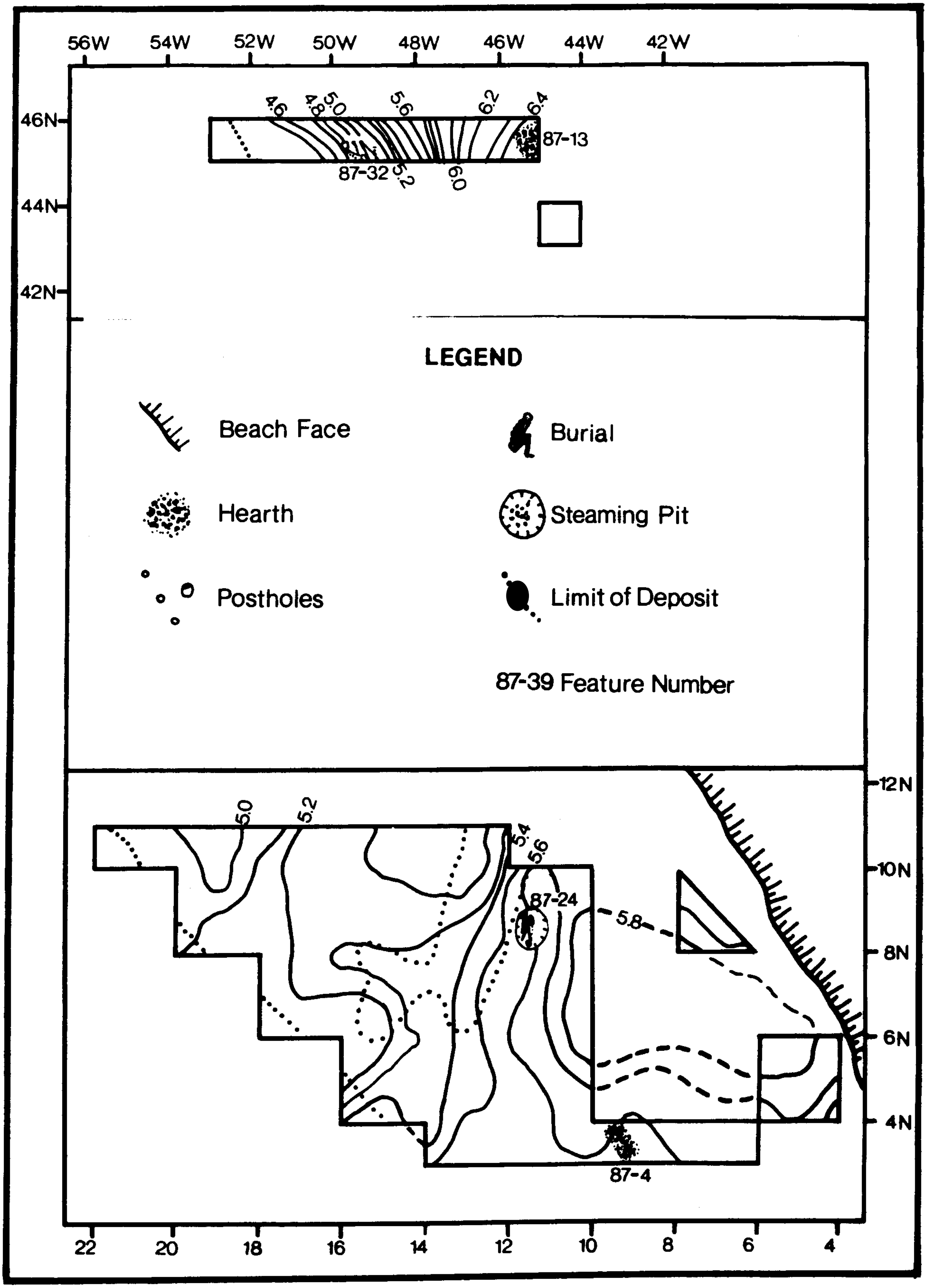


Figure 11- Features: Stratum 4, Layer 7

Faunal Remains

The vertebrate assemblage from layer 7 is small and lacking in diversity. Though the sample is fairly rich in classes, the elements are not evenly distributed, with one species constituting over 30% of the assemblage. Bone density varies over the site; having a moderate value of 101.1 bones/m^3 in the main excavation area, and a low average density value of 28.8 bones/m^3 in the secondary excavation area.

Fish again dominate the assemblage, with rockfish taking the place formerly held by herring. This shift is surprizing, in that, with the exception of a few bones recovered from a bulk matrix sample, herring practically disappear from the assemblage.

Deer and dog are still the principal mammalian species, with sea lion again represented. Birds continue to be a relatively insignificant contribution to the sample.

The invertebrate sample again shows much the same pattern of species selection as in previous layers, with littleneck and butter clam being best represented. The most notable change in layer 7 is in the amount of shellfish deposited at the site. While shellfish were still an important resource, there was a decrease in the average shell content both in terms of weight and volume from that contained within layer 5 and the midden deposits of layer 6.

Human Remains

Two burials were recovered from layer 7. Burial 87-4, a mid-adult female, displayed occipital flattening, and healed fractures on three left ribs and possibly the left clavicle. Burial 87-6, a mid-adult male, had dental abscessing that probably resulted in the severe infection displayed on the palate.

Four scattered human remains were recovered from unit 6. These likely came from a single child.

Chapter 7
CONCLUSIONS AND DISCUSSION

Determining how a shell midden functioned within an active cultural system through its span of occupation is an important step in better comprehending this widely distributed but poorly understood site type. Excavation of the Long Harbour site isolated six depositional strata containing a number of separate archaeological data sets. These units and their constituent layers were individually compared to predicted site types and their archaeological correlates to determine the function of the site at the time of occupation of each deposit. A functional overview of the site was undertaken, with a discussion of implications for other regional shell middens.

Strata 1 and 2

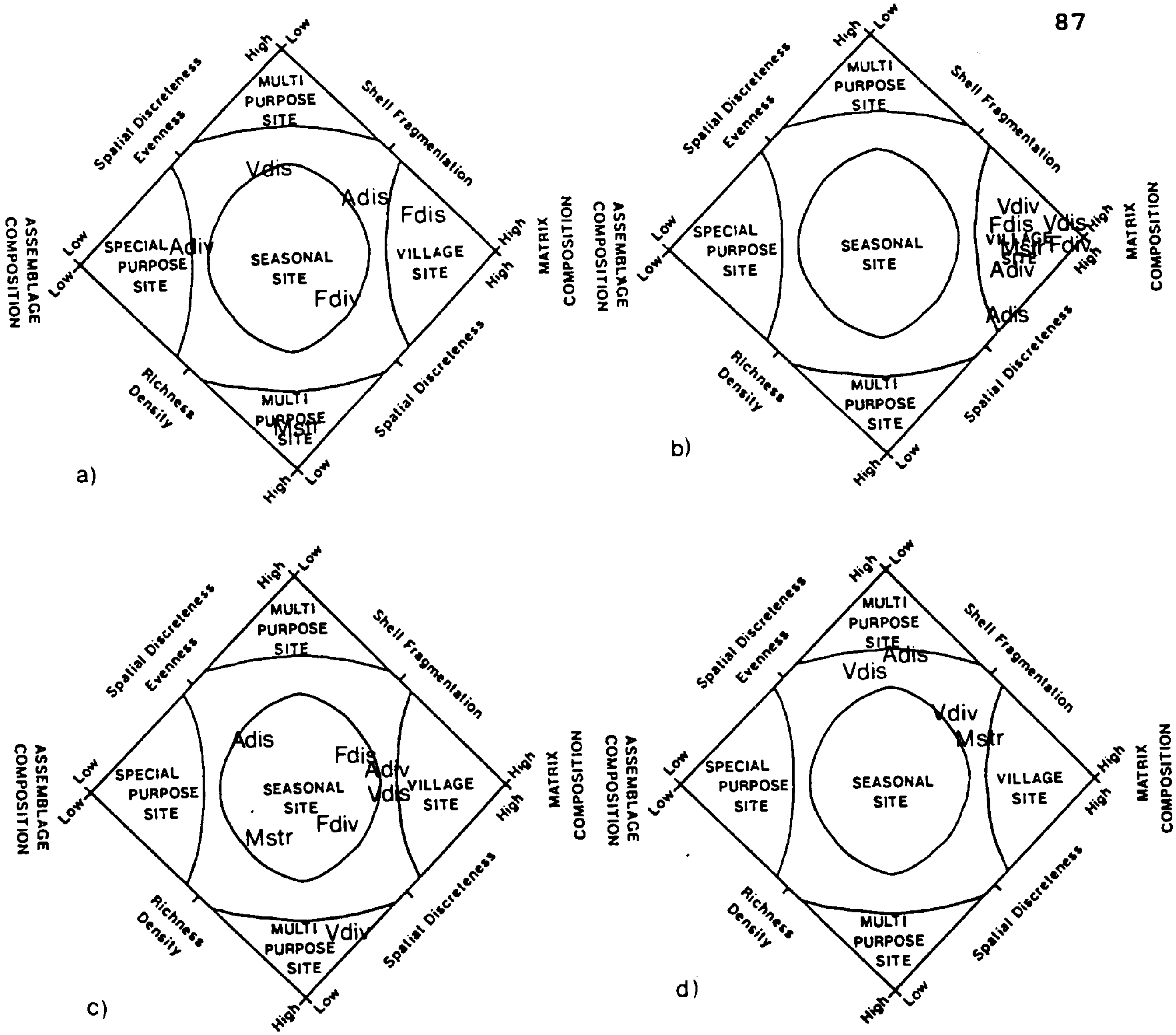
These strata are naturally derived and contain no cultural remains.

Stratum 3 Layer 3

Of all the layers encountered at Long Harbour, stratum 3 is the most difficult associational unit to classify as to its function. The periodic, probably seasonal, inundation of the spit precluded long term occupation. The low diversity of the artifact assemblage is a condition one would expect in short term, special purpose sites. However, the major artifact class is the unmodified flake, presumably suitable for a variety of tasks. The uneven horizontal distribution of artifacts, resulting in differing densities over different site areas, suggests some form of spatial control over multiple reoccupations. This is expected under conditions of repeated seasonal occupations, but not under conditions of a special purpose camp. Whether this apparent patterning is a result of human decision making or due to natural constraints such as sea levels has yet to be determined. Such a case could be made for the feature distribution and the matrix structure. Given that the main excavation area was the highest part of the site at this time period, the features could have been placed here in order to remove them as far as practical from the water table. The different locations on the spit of the two excavation areas could explain the variability in the matrix, since the larger gravels are less likely to carry across the width of the spit to be deposited on the inside edge.

Other data sets are less ambiguous. The features display a wide functional range consistent with a seasonal camp, while the faunal assemblage, though small, is not dominated by a single species as would be expected in a special purpose camp.

Thus, stratum 3 would best fall into the "seasonal camp" category (Fig. 12a). While the low diversity of the artifact assemblage could be taken to indicate a specialized site, the generalized nature of the artifacts, combined with their spatial distribution, suggest use as a seasonal site.



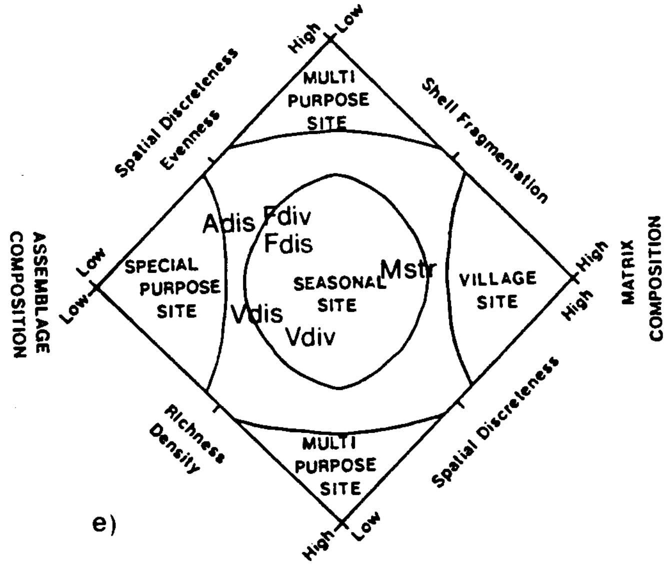


Figure 12-

Functional Classification
a) Stratum 3
b) Stratum 4, Layer 4
c) Stratum 4, Layer 5
d) Stratum 4, Layer 6
e) Stratum 4, Layer 7

The variety of features and the faunal assemblage support this interpretation. It may be concluded that occupation was seasonal, on the surface of an active spit.

Stratum 4 Layer 4

Layer 4 is much easier to categorize, and probably represents a village site. The best evidence for this interpretation comes from the structural remains. While admittedly the feature interpreted as a house does not necessarily imply a village, these structures are usually absent from other site types.

The matrix exhibits spatial separation of deposits, with midden accumulations of high shell content located in trash pits and outside the walls of the house. Low shell deposits are highly fractured indicating intensive trampling. Together, these indicate protracted use with control over refuse accumulations. Such characteristics should be absent under the conditions of short-term occupation associated with special purpose sites. In addition, both the faunal and artifact assemblages display high diversities and high densities consistent with a village site.

The scattered human remains suggest that while burials may have been present at the site during this time, they were not located near habitations, as consistent with ethnographic accounts of village sites.

The suggestion that the site functioned as a village at this time, where a number of spatially segregated activities were carried out, is supported by all archaeological data sets (Fig. 12b).

Stratum 4 Layer 5

The function of the Long Harbour site during the deposition of layer 5 is less obvious, suggesting seasonal or special purpose use.

At this time, the area of the site grew to include deposits in the secondary excavation area. The heterogeneity of the matrix suggests multiple reoccupation with little or no "site planning". The identification of at least three midden mounds, combined with the abundant, unbroken nature of the shell fraction, imply a rapid accumulation of midden deposits during periods of short occupation. These conditions are not those expected in a village site.

While the low artifact density might suggest a special purpose site, the diversity of the assemblage belies this, suggesting instead a seasonal site at which many activities were carried out.

The features identified from this layer indicate food processing and mortuary activity. The lack of permanent structural features argues against a village classification, but this may be a sampling phenomenon as any structures were likely to have been located on the narrow level area through which the logging road now passes. The lack of clustering of features suggests an unconstrained use of space inconsistent with a village site, while this distribution of features is expected with seasonal and special purpose sites, the number of individuals represented by the human remains is much larger than would be expected at special purpose sites. Such numbers would only be expected if the site had been reoccupied over a great many years. However, the radiocarbon dates suggest that the matrix accumulated rapidly over a short time. This implies that, barring unusual mortality patterns, fairly large groups of people were using the site; a pattern consistent with a seasonal site. The burials themselves represent the full spectrum of age and sex classes. These conditions are applicable to multifunction sites as there does not seem to be age or sexually defined task groups expected in many special purpose sites.

While the unevenness of the faunal assemblage might suggest a special purpose site occupied in order to harvest and process herring and clams, the richness of the assemblage suggests longer occupations sufficient to allow the exploitation of a wide range of resources. The varied nature of the assemblage does not conform with that expected from short term special purpose sites. Likewise, the dominance of a few species does not fit the even distribution of fauna expected in village sites. Therefore, the faunal data most closely parallel that expected for a seasonal site. The clustered distribution of vertebrate remains corresponds with that of the features, suggesting that the central part of the site near the secondary excavation area was devoted primarily to the discard of processed invertebrates. While village and seasonal sites may have had designated refuse areas, it is unlikely that these would have been refuse specific. Such concentrations of a single class of resource are more typical of special purpose sites.

The Long Harbour site of layer 5 could be interpreted as a seasonal site (Fig. 12c) occupied by a large mixed group, of all ages and both sexes, principally to harvest and process herring and shellfish, in the spring. The repeated reoccupation of the site resulted in the rapid build-up of separate shell mounds which gradually merged over time. Into and on top of this matrix were placed the unelaborate burials of those who died at or near the site.

Coupland (1990) has interpreted the materially similar and temporally equivalent Point Grey site as a "summer village". Given the lack of evidence for structural remains, it is possible that this too represents a seasonal camp.

Alternately, it is possible that the variable data sets in layer 5 result from a palimpsest derived from two or more functionally different occupations. Seasonally separated, specialized uses of the same site would have the effect of artificially increasing the richness of assemblages while not substantially altering their evenness. Thus, the stratum 4 layer 5 occupation might be interpreted as a special purpose site focused on two resources that were exploited at different times of the year. The first of these would have been primarily dedicated to the capture and processing of herring during the spring, while the second presumably focused on the collection and processing of marine invertebrates, primarily clams. If seasonally separated, these special purpose enterprises and auxiliary activities would give the impression of a seasonal site, with a palimpsest of short term occupations having the effect of longer occupations. While this may explain the simplicity of burials and the group composition, it does not justify the numbers represented. In order to account for these numbers, one would have to assume a nearby village which contributed to the burial assemblage at Long Harbour. If this were the case, a greater range of burial types, including more elaborate internments, would be expected.

Stratum 4 Layer 6

The small data sets recovered from layer 6 limit the certainty that can be given to a functional interpretation of the site. The matrix probably accumulated rather quickly as it is vertically consistent. The lack of features is not surprizing given that most of the culturally derived deposits comprise a midden mound. The artifact assemblage shows no change in types from the previous layer. The faunal assemblage also shows no differences in types from the previous layer.

The best that can be said for the functional nature of the site during the deposition of layer 6 is that it does not seem to differ significantly from the previous layer (Fig. 12d).

Stratum 5

The assemblage from stratum 5 is too small to permit a functional interpretation of the site for this depositional episode. This probably results from short duration or infrequent occupation at this time. Since we do not know the period of time represented by this deposit, we can only speculate about how the fire event may have affected the use of the site.

Stratum 4 Layer 7

The Long Harbour site probably functioned as a seasonal site during the time that layer 7 was being deposited.

The matrix shows much variability, suggesting many small volume deposition events consistent with reoccupation of seasonal or special purpose camps. Features again are fairly limited, ruling out a long term village occupation. A low artifact density also implies a short duration of occupation, inconsistent with a village situation. With the disappearance of herring and the reduction in shellfish collection, the faunal assemblage looks less like that of a special purpose site and more like that of a seasonal site.

Though rockfish are dominant, their relative proportion with respect to other fish does not change from that pattern exhibited in previous layers.

Overall, layer 7 best fits the expectations of a seasonal camp (Fig. 12e). A number of different activities seem to have taken place on the site, but the intensive focus on a few select food species seen in layer 5 is not evident.

General

The Long Harbour shell midden has been divided into gross analyitic units in order to examine the functional nature of the site during a number of periods in which it was occupied. It can be seen that the site did not maintain a single function over the course of its use, ranging from a seasonal to a village site during the Locarno Beach period, to seasonal sites of differing natures within the Marpole period. Indeed, the site was not even a shell midden for all of its life history, as it saw periodic occupation on an active spit prior to its conplete emergence. The assumption that large, deep shell middens are associated with villages does not hold true. In this case, the village occupation occured when the midden area was at its smallest, while subsequent seasonal occupations produced thicker midden deposits.

That at least one of these matrix/functional shifts corresponds to the cultural transition between Locarno and

Marpole phases opens the possibility that the changes seen at Long Harbour may be a reflection of larger cultural adaptations. These may include economic realignment, such as resource intensification, resulting in shifts in the positioning or timing of the seasonal round. It is probably not by chance that the growth in site area is coincident with the stabilization of sea levels in the southern Georgia Strait. This stabilization would have permitted the full development of intertidal resources, and perhaps this factor has much to do with the sudden surge in shellfish exploitation at this time.

If this site is indicative of other shell middens in the region, then the concept of the shell midden as a functionally specific site type needs to be reexamined. *A priori* visual classification of shell midden sites into types without the benefit of excavated data fosters misunderstanding of the role these sites played in the spatio-economic sphere of the people who used them. The definition of the function of a number of sites is a necessary first step in defining the range of activities practiced by a culture, and their placement in the landscape.

Functional studies of other sites in the region have begun to illustrate some of this patterning. Garrison Bay has been identified as a Marpole period "village" (Kennady 1973), the Point Grey site has been described as a Marpole component seasonally occupied "summer village" for the exploitation of herring (Coupland 1990), Crescent Beach has a Developed Coast Salish period component which has been identified as spring "fishing camp" for herring (Ham 1982), and Hoko River has been interpreted as a Locarno Beach period "fishing camp" for flatfish and roundfish (Croes and Hackenberger 1988). Other non-shell midden functional studies have identified a Locarno Beach period "hunting camp" at the Telep Site, while the multicomponent site of Pitt River has been interpreted as a Locarno Beach "fishing camp" and a Developed Coast Salish "fishing and berry gathering camp".

The model employed in this study has been useful in arranging archaeological variables in a relative and systematic manner. When more is known about the archaeological composition of known site types, then it may be possible to modify the model and evaluate the various data sets according to a quantitative scale. Due to uncertanties such as the drop rate of tools and the occupation span of sites, artifacts provide a rather poor indication of the functional nature of a site. Other data such as features, faunal remains, and matrix constituents are more reliable indicators of site function. Given the sometimes conflicting nature of various data sets, it is important to consider as many as possible in order to identify and explain anomalous data and correctly classify the site.

Studies of this sort will benefit from improved temporal control, both vertically and horizontally. Knowledge of the length of time represented by each depositional period will enable an estimation of the rate of sediment accumulation. Accurate indicators of season of occupation will help to resolve functional discrepancies regarding single or multi-seasonal occupation, especially where these cannot be stratigraphically separated.

BIBLIOGRAPHY

Abbott, D.N.
1971 *A Study of the Factors Relevant to the Interpretation of Archaeological Remains of Southeastern Vancouver Island.* M.A. Thesis, Department of Anthropology, Washington State University, Pullman.

Ambrose, W. R.
1967 Archaeology and Shell Middens. *Archaeology and Physical Anthropology in Oceania* 2:169-187.

Ammerman, A.J. and M.W. Feldman
1974 On the "Making" of an Assemblage of Stone Tools. *American Antiquity* 39(4):610-616.

Bailey, G.N.
1983 Problems of Site Formation and the Interpretation of Spacial and Temporal Discontinuities in the Distribution of Coastal Shell Middens. In *Quaternary Coastlines and Marine Archaeology*, ed. by P.M. Masters and N.C. Flemming. Academic Press, London.

Bamforth, D.B.
1986 Technological efficiency and tool curation. *American Antiquity* 51(1):38-50.

Barber, R.
1983 Diversity in Shell Middens: the view from Morril Point. *Man in the Northeast* 25:109-125.

Barnett, H.G.
1955 *The Coast Salish of British Columbia.* University of Oregon Press, Eugene.

Bass, W.M.
1971 *Human Osteology: a laboratory and field manual of the human skeleton.* Missouri Archaeological Society, University of Missouri, Columbia.

Bertelsen, R.
1985 Artifact pattern and stratificational units. *American Archaeology* 5(1):16-20.

Binford, L.R.
1978a Dimensional analysis of behavior and site structure: learning from an Eskimo hunting stand. *American Antiquity* 43:330-361.

1978b *Nunamiut Ethnoarchaeology*. Academic Press, New York.

1982 The Archaeology of Place. *Journal of Anthropological Archaeology* 1(1):5-31.

Binford, S.R. and L.R. Binford
1969 Stone Tools and Human Behavior. *Scientific American* 220:70-84.

Bishop, J.C. and D.W. Black
1988 The Lands Edge Also: culture history and seasonality at the Partridge Island shell midden. *Canadian Journal of Archaeology* 12:17-38.

Bobrowsky, P.T. and B.F. Ball
1989 The Theory and Mechanics of Ecological Diversity in Archaeology. In, *Quantifying Diversity in Archaeology*. Ed. by R.D. Leonard and G.T. Jones. Cambridge University Press, New York.

Borden, C.E.
1950 Preliminary Report on Archaeological Investigations in the Fraser Delta Region. *Anthropology in B.C.* 1:13-32.

1968a Prehistory of the Lower Mainland. *In, Lower Fraser Valley: Evolution of a Cultural Landscape*, ed. by Siemens. B.C. Geographical Series 9:9-26.

1975 *Origins and Development of Early Northwest Coast Culture to about 3000 B.C.*. National Museum of Man Mercury Series Archaeological Survey of Canada Paper no. 75, Ottawa.

Brennan, L.A.
1977 The Midden is the Message. *Archaeology of Eastern North America* 5:122-137.

1981 Pick-up Tools, Food, Bones and Inferences on Lifeway Function of Shell Heap Sites along the Lower Hudson. *Archaeology of Eastern North America* 9:42-51.

Brown, J.A.
1979 Deep-site Excavation Strategy as a Sampling Problem. In, *Sampling in Archaeology*. Ed. by J.W. Mueller. University of Arizona Press, Tucson.

Burley, D.V.
1979 *Marpole: Anthropological Reconstructions of a Prehistoric Northwest Coast Culture Type.* Ph.D. Dissertation. Simon Fraser University, Burnaby.

Cassidy, S., S. Acheson and C. Claxton
1975 *Archaeological Survey of the Southwest Gulf of Georgia.* Ms. Archaeological Sites Advisory Board, Vistoria.

Carlson, R.L.
1960 Chronology and Culture Change in the San Juan Islands, Washington. *American Antiquity* 25:562-586.

1970 Excavations at Helen Point on Mayne Island. In, Archaeology in British Columbia, New Discoveries. Ed by R.L. Carson. *B.C. Studies* 6-7: 113-125.

1986 *The 1985 excavations at the Canal site.* Ms. Heritage Conservation Branch, Victoria.

Chatters, J.C.
1987 Hunter-Gatherer Adaptations and Assemblage Structure. *Journal of Anthropological Archaeology* 6:336-375.

Clague, J.; J.R. Harper; R.J. Hebda and D.E. Howes
1982 Late Quaternary Sea Levels and Crustal Movements, Coastal British Columbia. *Canadian Journal of Earth Science* 19:597-618.

Cook, S.F. and A.E. Treganza
1947 The Quantitative Investigation of Aboriginal Sites: comparative physical and chemical analysis of two California Indian mounds. *American Antiquity* 2:135-141.

Coupland, G.
1990 *The Point Grey Site: a Marpole spring village component.* Paper presented at the 23rd annnual Canadian Archaeological Association Conference, Whitehorse.

Croes, D.R. and S. Hackenberger
1988 Hoko River Archaeological Complex: Modelling Prehistoric Northwest Coast Economic Evolution. In, *Research in Economic Anthropology Supplement 3.* Ed. by B.L. Isaac. Jai Press, Greenwich.

Curtis, E.S.
1913 Salishan Tribes of the Coast. *The North American Indian*, vol. 9. Johnson Reprint Corp, San Francisco.

Deutsch, D.; E. Pe'er and I. Gedalia
1984 Changes in Size, Morphology and Weight of Human Anterior Teeth During the Fetal Period. *Growth* 48(1):74-85.

Duff, W.
1952 *The Upper Stalo Indians of the Fraser Valley British Columbia.* Anthropology in B.C. Memoir 1 Provincial Museum, Victoria.

Dunnel, R.C.
1978 Anthropological and Scientific Models of Function in Archaeology. In, *Archaeological Essays in Honor of Irving B. Rouse.* Ed. by R.C. Dunnel and E.S. Hall. Mouton, The Hague.

Fazekas, I. and F. Kosa
1978 *Forensic Fetal Osteology.* Akademiai Kiado, Budapest.

Fedel, F.G.
1984 Towards an Analytical Stratigraphy: stratigraphy reasoning and excavation. *Stratigraphica Archaeologica* 1:7-15.

Flenniken, J.J.
1981 *Replicative Systems Analysis: A model applied to the Vein Quartz artifacts from the Hoko River Site.* Washington State University Laboratory of Anthropology Reports of Investigations No. 59. Washington State University, Pullman.

Ford, P.J.
1989 Archaeological and Ethnographic Correlates of Seasonality: Problems and Solutions on the Northwest Coast. *Canadian Journal of Archaeology* 13:133-150.

Gasche, H. and Tunca
1983 Guide to Archaeostratigraphic Classification and Terminology: Definitions and Principles. *Journal of Field Archaeology* 10:325-335.

Gruber, J.W.
1978 Archaeological Strata and Cultural Process. *Archaeology of Eastern North America*. 6:91-94.

Haggarty, J.C. and Sendey, J.H.W.
1976 *Test Excavation at Georgeson Bay, British Columbia*. British Columbia Provincial Museum Occasional Paper no. 19, Victoria.

Haglund, W.D.; D.T. Reay, and D.R. Swindler.
1988 Tooth Mark Artifacts and Survival of Bones in Animal Scavenged Human Skeletons. *Journal of Forensic Sciences* 33(4):985-997.

Hall, R.L. and Haggarty, J.C.
1981 Human skeletal remains and associated cultural material from the Hill Site, DfRu-4, Saltspring Island, British Columbia. In, *Contributions to physical anthropology, 1978-1980*. Ed. by J.S. Cybulski. National Museum of Man Mercury Series Archaeological Survey of Canada Paper no. 106, Ottawa.

Ham, L.C.
1982 *Seasonality, Shell Midden Layers, and Coast Salish Subsistence Activities at the Crescent Beach Site, DgRr-1*. PhD. dissertation. University of British Columbia, Vancouver.

1990 The Cohoe Creek Site: a Late Moresby Tradition shell midden. *Canadian Journal of Archaeology* 14:199-121.

Hanson, D.L.
1986 Faunal Remains from the Pender Canal Excavations of 1984 and 1984. In, *The 1985 Excavations at the Canal Site*. Ed. by R.L. Carlson. Ms. Heritage Conservation Branch, Victoria.

Hughes, P.J. and M.E. Sullivan
1974 The Redeposition of Midden Material by Storm Waves. *Royal Society of New South Wales, Journal and Proceedings* 107:6-10.

Jenness, D.
n.d. *The Saanich Indians of Vancouver Island*. Ms. Provincial Archives of British Columbia, Victoria.

Johnstone, D.P.
1986 Abraders and Ground Slate. *In, The 1985 Excavations at the Canal Site*. Ed. by R.L. Carlson. Ms. Heritage Conservation Branch, Victoria.

Jones, G.T. and R.D. Leonard
1989 The Concept and Measure of Archaeological Diversity. In, *Quantifying Diversity in Archaeology*. Ed. by R.D. Leonard and G.T. Jones. Cambridge University Press, New York.

Kenady, S.M.
1973 Environmental and Functional Change in Garrison Bay. In, *Miscellaneous San Juan Island Reports 1970-72*. pp. 39-83. University of Idaho Anthropology Manuscript Research Series, Pullman.

Kerber, J.E.
1985 Digging for Clams: shell midden analysis in New England. *North American Archaeologist* 6(2):97-113.

Kidd, R.S.
1969 The Archaeology of the Fossil Bay Site, Sucia Island, Northwestern Washington State, in Relation to the Fraser Delta Sequence. *National Museums of Canada Bulletin 232 Contributions to Anthropology VII: Archaeology*. Ottawa.

Kintigh, K.W.
1984 Measuring Archaeological Diversity by Comparison with Simulated Assemblages. *American Antiquity* 49(1):44-54.

Koloseike, A
1968 The Logic of Midden Analysis with Respect to Shell. *Archaeological Survey Annual Report #10*, University of California at Los Angeles. pp. 272-382.

Madson, M.
1988 *Lithic Manufacturing in a Northwest Coast Shell Midden: the grain size evidence*. Paper presented at the 41st annual Northwest Anthropology Conference, Tacoma.

Matson, R.G.
1974 Clustering and Scaling of Gulf of Georgia sites. *Syesis* 7:101-114.

Matson, R.G., D. Ludowicz and W. Boyd.
1980 *Excavations at Beach Grove in 1980*. Ms. Heritage Conservation Branch, Victoria.

Mitchell, D.H.
1968b Excavations at Two Trench Embankment Sites in the Gulf of Georgia Region. *Syesis* 3:29-46.

1971b Archaeology of the Gulf of Georgia Area, a Natural Region and its Culture Types. *Syesis* vol 4 (1). Victoria.

Monks, G.G.
1973 *Interrelationships of Artifact Classes From the Gulf of Georgia*. M.A. Thesis. Department of Anthropology and Sociology, University of Victoria, Victoria.

Muckle, R.J.
1985 *Archaeological Considerations of Bivalve Taphonomy*. M.A. Thesis. Department of Archaeology, Simon Fraser University, Burnaby.

Patenaude, V.C.
1985 *The Pitt River Archaeological Site DhRq 21: A Coast Salish Seasonal Camp on the Lower Fraser River*. Ms. Heritage Conservation Branch, Victoria.

Peacock, W.R.B.
1978 Probabilistic Sampling in Shell Middens: a case study from Oronsay, Inner Hebrides. In, *Sampling in Contemporary British Archaeology*. Ed. by J. Cherry, C. Gamble and S. Shennan. British Archaeological Reports, British series 50.

1982 *The Telep Site: a late autumn fish camp of the Locarno Beach culture type*. Ms. Heritage Conservation Branch, Victoria.

Roberts, G.W.
1973 *DfRu-4: The Hill Site*. Ms. Archaeological Sites Advisory Board. Victoria.

Samuels, S.R.
1988 *Spacial Patterns in Ozette Longhouse Floor Middens*. Paper given at the 21st Chacmool Conference, Calgary.

Sanger, D.
1981 Unscrambling Messages in the Midden. *Archaeology of Eastern North America* 9:37-42.

Schiffer, M.B.
1975 The Effects of Occupation Span on Site Content. In, *The Cache River Archaeological Project*. Ed. by M.B. Schiffer and J.H. House. Arkansas Archaeological Survey Research Series 8: 265-269.

Schlanger, S.H. and S.D. Orcutt
1986 Site Surface Characteristics and Functional Inferences. *American Antiquity* 51(2):296-312.

Schott, M.
1986 Technological Organization and Settlement Mobility. *Journal of Anthropological Research* 42:15-51.

South, S.
1979 Historic Site Content, Structure and Function. *American Antiquity* 44(2) 213-237.

Spiess, A.E.
1988 On New England Shell Middens: response to Sangers cautionary tale. *American Antiquity* 53(1):174-177.

Spurling, B.
1976 Random and Non-Random Sampling of the Same Site. In, *Current Research Reports*. Ed. by R.L. Carlson. Department of Archaeology, Simon Fraser University, Burnaby.

Stein, J.W.
1983 Earthworm Activity: A source of potential disturbance of archaeological sediments. *American Antiquity* 48:277-289.

1984b Interpreting the Stratigraphy of Northwest Shell Middens. *Tebiwa* 21:26-34.

1987 Deposits for Archaeologists. In *Archaeological Method and Theory vol 11*. Ed. by M.L. Schiffer. Academic Press, San Diego.

Stein, J.W. and G. Rapp Jr.
1985 Sediments Within Archaeological Sites: the untapped reservoir of prehistoric information. In, *Contributions of Aegean Archaeology*. Ed. by N.C. Wilke and W.D.E. Coulson. Center for Ancient Studies, University of Minnesota Press, Minneapolis.

Stuiver, M. and B. Becker
1986 High Precision Calibration of the Radiocarbon Time Scale, AD 1950-2500 BC. *Radiocarbon* 28(2):863-910.

Suttles, W.P.
1951 *The Economic Life of the Coast Salish of Haro and Rosario Straits*. Ph.D. Dissertation. University of Washington, Seattle.

1952 Notes on Coast Salish Sea-Mammal Hunting. *Anthropology in British Columbia* 3:10-20.

Thompson, G.
1978 *Prehistoric Settlement Changes in the Southern Northwest Coast: A functional report*. University of Washington, Reports in Archaeology #5. Seattle.

Treganza, A.E. and S.F. Cook
1948 The Quantitative Investigation of Aboriginal Sites: complete excavation with physical and archaeological analysis of a single mound. *American Antiquity* 4:287-297.

Villa, P. and Courtin, J.
1983 The Interpretation of Stratified Sites: a view from underground. *Journal of Archaeological Science* 10: 267-281.

Waselkov, G.A.
1987 Shellfish Gathering and Shell Midden Archaeology. *Advances in Archaeological Method and Theory* 10:93-210. Academic Press, Berkely.

Wessen, G.C.
1979 *Shell Middens as Cultural Deposits: a case study from Ozette*. Ph.D Dissertation, Washington State University. University Microfilms, Ann Arbor.

Whitlam, R.G.
1975 A Functional Analysis of Site DiRi 13 Located Near Hope, British Columbia. In, *Annual Report for the year 1975 Activities of the Archaeological Sites Advisory Board of British Columbia and Selected Research Reports*. Ed. by B.O. Simonsen. Government of the Province of British Columbia Ministry of Recreation and Conservation, Victoria.

Wigen, R.J. and B.R. Stucki
1988 Taphonomy and Stratigraphy in the Interpretation of Economic Patterns at Hoko River Rockshelter. *In Research in Economic Anthropology Supplement 3*. Ed. by B.L. Isaac. Jai Press, Greenwich.

Williams, W. and A. Roberts
1989 Holocene Sea Level Changes and Delta Growth: Fraser River delta, British Columbia. *Canadian Journal of Earth Sciences* 26:1657-1666.

Appendix 1

TABLE 4
SITE FLORA

	Second Growth Forest	
Trees	Arbutus	*Arbutus menziesii*
	Douglas Fir	*Pseudosuga menziesii*
	Grand Fir	*Abes grandis*
	Pacific Yew	*Taxus brevifolia*
	Red Cedar	*Thuja plicata*
	Western Hemlock	*Tsuga heterophylia*
Shrubs	Orange Honeysuckle	*Lonicera ciliosa*
	Oregon Grape	*Berberis nervosa*
	Salal	*Gaultheia shallon*
	Vanilla Leaf	*Achus triphylla*
Ferns & Grasses	Brachen Fern	*Pteridium aquilium pubescens*
	Sword Fern	**Polystichum** *munitum*
	Disturbed Areas	
Trees	Alder	*Alnus rubra*
	Broadleaf Maple	*Acer macrophylum*
Shrubs	Huckleberry	*Vaccinium ovatum*
	Salmonberry	*Rubrus spectabilis*
	Thimbleberry	*Rubrus parviflorus*
	Trailing Rubrus	*Rubrus pedatus*
Flowers	Canada Mint	*Mentha arvensis*
	Clover	*Trifolium spp.*
	Dandilion	*Traacum officinale*
	Horsetail Rush	*Equisetum arvensis*
	Plantain	*Alisma plantago aquatica*
	Self Heal	*Prunella vulgaris*
	Starflower	*Trientalis latifolia*
	Wild Lettus	*Latuca spp.*
	Wild Strawberry	*Fragaria spp.*
	Shoreline	
Shrubs	Ocean Spray	*Holodiscus discolor*
	Red Elderberry	*Sambucus racemosa arborescens*
	Wild Rose	*Rosa nutkana*
Flowers	Bedstraw	*Gallum spp.*
	Giant Vetch	*Vicia spp.*
	Purple Pea	*Lathyrus nevadensis*
	Wild Carrot	*Daucus carota*

Marsh

Trees	Willow	*Salix spp.*
Shrubs	Devils Club	*Oplopanax horridus*
	Hardhack	*Spyria horridus douglasii*
Flowers	Cattail Rush	*Typha latifolia*
	Scouring Rush	*Equistum hyemale*

Appendix 2a

TABLE 5
IDENTIFIED FAUNAL REMAINS

Fish	Cod	*Gadus spp.*
	Dogfish	*Squalus acanthias*
	Halibut	*Hippoglossus stenolepsis*
	Pacific Herring	*Culpea herengus*
	Pacific Cod	*Gadus macrocephalus*
	Pile Perch	*Rhacochilis vacca*
	Ratfish	*Hydrolagus colliei*
	Rockfish	*Sebastes spp.*
	Salmon	*Oncorhynchus spp.*
Shellfish	Barnacle	*Balanus glandula*
	Basket Cockle	*Clinocardium nuttallii*
	Bent Nose Clam	*Macoma nasuta*
	Bittium	*Bittium spp.*
	Butter Clam	*Saxidomus giganteus*
	Channeled Whelk	*Thais canaliculata*
	Edible Mussel	*Mytilus edulis*
	Green Sea Urchin	*Strongylocentrotus drobachiensis*
	Horse Clam	*Tresus capax*
	Jingle Shell	*Pododesmus macroschisma*
	Lean Dog Whelk	*Nassarius mendicus*
	Leafy Horn-mouth	*Ceratostoma foleata*
	Littleneck Clam	*Protothaca staminea*
	Mask Limpet	*Acmaea personna*
	Moon Snail	*Polinices lewisii*
	Native Oyster	*Ostrea lurida*
	Rock Crab	*Cancer productus*
	Rock Scallop	*Hinnites multirugosis*
	Sculptured Rock Shell	*Ocenebra interfossa*
	Sitka Periwinkle	*Littorina sitkana*
	Thatched Barnacle	*Balanus cariosus*
	Unstable Limpet	*Acmaea instablis*
	Wrinkled Whelk	*Thais lamellosa*
	Weathervane Scallop	*Pectin Caurinus*
Mammal	Coast Deer	*Odocoileus hemionus*
	Dog	*Canis familiaris*
	Dolphin	*Delphinidae spp.*
	Elk	*Cervus canadensis*
	Harbour Porpoise	*Phocaena vomerina*
	Marten	*Martes americana*
	Mink	*Mustela vison*
	Northern Sea Lion	*Eumatopias jubata*
	Raccoon	*Procyon lotor*
	River Otter	*Lutra canadensis*
	Wolf	*Canis lupus*

Bird	Bald Eagle	*Haliaeetus leucocephalus*
	Crow	*Corvus brachyrhynchos*
	Goose	*Anserini*
	Gull	*Larus spp.*
	Loon	*Gavia spp.*
	Mallard Duck	*Anas platyrhynchos*
	Pelagic Cormorant	*Phalacrocorax pelagicus*
	Pintail Duck	*Anas acuta*
	Raven	*Corvus corax*
	Ruffed Grouse	*Bonsa umbellus*
	Western Grebe	*Aechmophorus occidentalis*
	Wood Duck	*Aix sponsa*

Appendix 2b
INVERTEBRATE REMAINS

TABLE 6
Invertebrate Remains: Stratum 4 Layer 4

SANDY BEACH	Unit 7 level 10	Unit 8 level 14	Unit 9 level 12	Unit 10 level 10	Totals
Basket Cockle	12	5	4	2	23
Bent Nose Clam	2	0	0	1	3
Butter Clam	65	57	17	23	162
Horse Clam	0	1	0	0	1
Littleneck Clam	148	51	46	17	262
ROCKY BEACH					
Barnacle	9	6	15	0	30
Edible Mussel	6	3	25	0	34
Sitka Periwinkle	0	1	0	0	1
Wrinkled Whelk	0	17	2	2	21
Unidentifiable	0	31	11	3	45
					582

TABLE 7
Invertebrate Remains: Stratum 4 Layer 5

	Unit 4 level 4	Unit 8 level 5	Unit 8 level 7	Unit 9 level 4	Unit 51 level 3	Unit 51 level 4	Unit 51 level 6	Unit 51 level 10	Totals
SANDY BEACH									
Basket Cockle	0	10	6	8	9	15	32	6	48
Bent Nose Clam	1	1	5	3	1	0	3	0	11
Butter Clam	17	46	36	47	29	20	53	8	195
Horse Clam	0	0	1	1	0	0	1	0	2
Littleneck Clam	13	78	121	108	82	73	106	32	475
Rock Crab	0	1	0	0	0	0	0	0	1
ROCKY BEACH									
Barnacle	5	4	4	9	49	42	10	16	113
Channeled Whelk	0	1	1	0	0	0	0	0	2
Edible Mussel	2	7	22	15	27	56	36	20	129
Sitka Periwinkle	0	0	0	0	0	1	0	0	1
Wrinkled Whelk	14	16	14	18	10	7	17	1	79
Unidentifiable	18	16	6	9	6	2	2	2	57
									1113

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Table 8
Invertebrate Remains
Stratum 4 Layer 6

SANDY BEACH	Unit 51 level 1	Unit 51 level 2	Totals
Basket Cockle	11	8	19
Bent Nose Clam	1	1	2
Butter Clam	39	46	85
Horse Clam	1	3	4
Littleneck Clam	90	91	181
ROCKY BEACH			
Barnacle	16	28	44
Channeled Whelk	0	1	1
Edible Mussel	33	31	64
Native Oyster	0	0	0
Wrinkled Whelk	11	4	15
Unidentifiable	4	4	8
			423

TABLE 9
Invertebrate Remains: Stratum 5

SANDY BEACH	Unit 4 level 4	Unit 8 level 2	Unit level 3	Totals
Basket Cockle	1	17	9	27
Bent Nose Clam	0	1	0	1
Butter Clam	12	49	45	106
Horse Clam	0	0	0	0
Littleneck Clam	7	49	53	109
ROCKY BEACH				
Barnacle	1	5	13	19
Channeled Whelk	0	0	0	0
Edible Mussel	0	29	25	54
Native Oyster	0	1	0	1
Wrinkled Whelk	2	0	3	5
Unidentifiable	3	9	8	20
				342

TABLE 10
Invertebrate Remains: Stratum 4 Layer 7

SANDY BEACH	Unit level	Unit 4 level 3	Unit 7 level 3	Unit 8 level	Unit 51 level 1	Unit 5 level 3	Totals
Basket Cockle	12	4	7	26	15	12	76
Bent Nose Clam	2	0	0	0	3	1	6
Butter Clam	42	38	50	92	75	36	333
Horse Clam	0	1	0	0	1	0	2
Littleneck Clam	65	71	30	44	91	71	372
Rock Crab	2	0	2	0	0	0	4
ROCKY BEACH							
Barnacle	38	6	17	10	8	20	99
Bittium	1	0	0	0	0	0	1
Channeled Whelk	0	0	0	0	0	2	2
Edible Mussel	33	1	12	23	8	42	119
Sitka Periwinkle	0	0	0	0	1	2	3
Wrinkled Whelk	3	18	10	4	6	12	53
Unidentifiable	12	8	12	13	4	13	62

							1132

Appendix 2c
VERTEBRATE REMAINS

TABLE 11
Vertebrate Remains: Stratum 3 Layer 3

	Unit	Unit 5	Unit 7	Unit 8	Unit 50	Unit 5	Unit 5	Totals
Identified								
FISH								
Cod	0	0	0	0	0	1	0	1
Herring	0	0	0	10	0	0	0	10
Perch	0	0	0	2	0	0	0	2
Rockfish	0	0	0	4	0	0	0	4
Salmon	0	0	0	3	0	0	0	3
BIRD								
Grouse	0	0	0	2	0	0	0	2
Loon	0	0	0	1	0	0	0	1
Raven	0	0	0	5	0	0	0	5
L MAMMAL								
Deer	1	1	3	1	0	2	0	8
Elk	0	0	0	1	0	0	0	1
S MAMMAL								
Sea Lion	0	0	0	0	0	1	0	1
nidentified								
FISH	0	0	0	1	0	0	0	1
BIRD	0	0	0	4	0	0	1	5
L MAMMAL	0	0	1	26	1	0	6	34

								78

TABLE 12
Vertebrate Remains: Stratum 4 Layer 4

	Unit 4	Unit 5	Unit 6*	Unit 7	Unit 10	Unit 1	Unit 14	Unit 15	Unit 20*	Totals
Identified Remains										
FISH										
Cod	1	0	2	4	0	0	1	1	0	9
Dogfish	1	0	2	0	0	0	0	0	0	3
Halibut	0	0	0	0	1	0	0	0	0	1
Herring	0	0	2	8	0	0	63	0	26	99
Perch	0	0	0	0	0	0	0	1	0	1
Ratfish	4	0	0	1	0	0	2	0	0	7
Rockfish	2	0	21	16	61	2	8	2	5	117
Salmon	3	0	6	3	15	10	0	1	1	39
BIRD										
Cormoran	0	0	0	0	0	0	1	0	0	1
Duck	2	0	0	0	2	1	2	0	0	7
Goose	0	0	0	0	3	0	0	0	0	3
Grebe	0	0	0	0	0	0	0	0	1	1
Grouse	0	0	1	0	0	2	0	0	0	3
Gull	0	0	0	0	0	0	0	1	0	1
Herron	0	0	0	0	0	0	0	1	0	1
Swan	0	0	0	0	0	1	0	0	0	1
L MAMMAL										
Deer	4	6	0	2	4	4	1	0	8	29
Dog	16	0	7	6	12	2	2	0	18	63
Mink	0	0	0	0	1	0	0	0	0	1
S MAMMAL										
Sea Lion	1	1	0	0	1	1	0	1	3	8
Unidentified Remains										
FISH	28	0	32	7	54	8	98	6	10	243
BIRD	8	0	0	3	3	1	0	8	1	24
L MAMMAL	35	1	22	11	14	33	7	10	7	140
S MAMMAL	0	0	0	1	1	0	0	0	0	2
										804

* Note: Partial Layer Only

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TABLE 13

Vertebrate Remains: Stratum 4 Layer 5

	Unit 2*	Unit 4	Unit 5*	Unit 6	Unit 7	Unit 8*	Unit 10	Unit 15	Unit 17	Unit 50	Unit 51	Totals
Identified Remains												
FISH												
Cod	0	2	0	9	1	0	1	12	5	2	6	38
Dogfish	1	2	2	3	0	0	0	2	3	0	0	13
Herring	0	31	0	69	406	513	168	7911	576	0	34	9708
Perch	2	3	0	4	0	1	3	2	7	0	0	22
Ratfish	0	4	0	1	1	0	1	5	7	1	1	21
Rockfish	8	93	1	130	11	7	5	37	34	0	14	340
Salmon	1	107	0	17	0	1	17	5	8	1	25	182
BIRD												
Crow	0	0	0	0	0	0	0	20	0	0	0	20
Duck	0	0	0	0	3	1	1	6	2	1	0	14
Eagle	0	0	9	0	0	0	0	0	0	0	0	9
Goose	0	0	0	0	0	0	0	0	2	1	0	3
Grouse	0	0	0	0	0	0	0	3	4	0	0	7
Gull	0	0	0	1	0	0	0	1	0	0	1	3
Swan	0	0	0	0	0	0	0	0	1	0	0	1
L MAMMAL												
Deer	0	5	1	1	4	1	5	12	21	3	13	66
Dog	0	5	1	8	36	1	7	36	31	1	7	133
Marten	0	0	0	3	0	0	0	0	1	0	0	4
Mink	0	0	0	16	0	0	0	1	4	0	0	21
Raccoon	3	0	0	0	0	0	0	3	1	0	0	7
Rodent	0	0	0	0	0	0	0	0	4	0	0	4
Wolf	0	1	0	0	0	0	0	0	0	0	0	1
S MAMMAL												
Dolphin	0	0	0	0	0	0	0	1	0	0	0	1
Sea Lion	0	0	0	2	0	0	0	1	0	0	1	4
Unidentified Remains												
FISH	9	175	1	148	17	23	73	240	61	7	44	798
BIRD	0	3	0	2	1	1	4	31	19	4	9	74
L MAMMAL	0	5	2	86	143	14	68	402	332	21	68	1069
S MAMMAL	0	0	0	0	0	0	0	1	2	0	0	3

												12566

* Note: Partial Layer Only

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TABLE 14

Vertebrate Remains: Stratum 4 Layer 6

	Unit 50	Unit 51	Totals
Identified Remains			
FISH			
Cod	0	1	1
Herring	0	4	4
Rockfish	2	2	4
Salmon	3	9	12
BIRD			
Herron	0	1	1
L MAMMAL			
Deer	1	1	2
Dog	0	1	1
S MAMMAL			
Sea Lion	1	0	1
Unidentified Remains			
FISH	2	11	13
BIRD	0	2	2
L MAMMAL	4	20	24
			-
			65

TABLE 15

Vertebrate Remains: Stratum 5

	Unit 4	Unit 6	Unit 7	Unit 10	Unit 11	Unit 12	Unit 15	Unit 16	Unit 19	Totals
Identified Remains										
FISH										
Rockfish	0	0	0	0	0	0	0	1	0	1
Salmon	0	0	0	0	0	0	0	2	0	2
MAMMAL										
Deer	1	0	1	0	0	0	0	2	0	4
Dog	1	0	1	0	0	0	0	0	0	2
Unidentified Remains										
FISH	0	0	0	0	0	0	0	2	1	3
L MAMMAL	0	2	0	0	0	0	0	0	4	6
										18

TABLE 16
Vertebrate Remains: Stratum 4 Layer 7

	Unit 4	Unit 5	Unit 6	Unit 7	Unit 10	Unit 11	Unit 19	Unit 20	Unit 50	Unit 51	Totals
Identified Remains											
FISH											
Cod	1	0	1	1	0	0	5	0	0	0	8
Dogfish	1	0	0	1	0	0	0	0	0	0	2
Halibut	0	0	0	0	0	0	2	0	0	0	2
Perch	5	0	0	3	0	0	3	0	0	1	12
Rockfish	8	1	2	27	0	0	28	41	0	11	150
Salmon	5	0	0	3	0	0	29	0	0	7	44
L MAMMAL											
Deer	0	0	1	7	0	0	0	1	0	2	11
Dog	4	14	1	1	0	0	0	1	0	2	23
S MAMMAL											
Sea Lion	0	0	1	1	0	0	0	0	0	0	2
Unidentified Remains											
FISH	22	3	1	72	0	0	156	5	0	12	271
BIRD	0	0	1	6	0	1	0	1	0	0	10
L MAMMAL	2	6	46	28	0	0	3	13	0	8	106
S MAMMAL	0	0	0	0	0	0	0	2	0	0	2

											643

TABLE 17
ARTIFACT CATALOG

LAYER	MATRIX	TYPE	MATERIAL	PRIMMOD	CONDITION	N	LEN	NO	UNIT	LEV
3	GRAVEL	ABRADER	SANDSTONE	NONE	OTHER FRAG	1		121	8	14
3	GRAVEL	ABRADER	SILTSTONE	NONE	OTHER FRAG	1		312	52	5
3	GRAVEL	ABRADER	SILTSTONE	NONE	COMPLETE	1	127	74	7	7
3	GRAVEL	ADZE	ANDESITE	FLAKE-GRND	COMPLETE	1	93	342	51	3
3	GRAVEL	CHIPPED DISC	SLATE	FLAKING	COMPLETE	1		347	52	7
3	GRAVEL	CHIPPED DISC	SLATE	FLAKING	COMPLETE	1	72	193	4	16
3	SANDYGRAVEL	CORE	SLATE	FLAKING	COMPLETE	1	120	72	7	15
3	GRAVEL	CORE	BASALT	FLAKING	COMPLETE	1	31	47	50	28
3	GRAVEL	CORE	SLATE	FLAKING	COMPLETE	1		270	52	3
3	GRAVEL	CORE	BASALT	FLAKING	COMPLETE	1		311	52	3
3	GRAVEL	CORE	BASALT	FLAKING	COMPLETE	1		301	52	3
3	GRAVEL	CORE	SLATE	FLAKING	COMPLETE	1	106	76	7	19
3	GRAVEL	CORE	QUARTZ CR	FLAKING	OTHER FRAG	1		298	52	4
3	GRAVEL	FLAKE	SLATE	FLAKING	COMPLETE	2		320	52	3
3	GRAVEL	FLAKE	UNID ROCK	FLAKING	COMPLETE	1	72	73	7	15
3	GRAVEL	FLAKE	BASALT	FLAKING	BASE FRAG	1		57	50	29
3	GRAVEL	FLAKE	QUARTZ CR	FLAKING	COMPLETE	1		273	52	2
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1		36	50	27
3	GRAVEL	FLAKE	SLATE	FLAKING	COMPLETE	1		265	52	2
3	SANDYGRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1	7	370	52	2
3	GRAVEL	FLAKE	BASALT	FLAKING	BASE FRAG	1		260	52	3
3	GRAVEL	FLAKE	BASALT	FLAKING	OTHER FRAG	1		349	52	7
3	GRAVEL	FLAKE	QUARTZITE	FLAKING	COMPLETE	1		241	52	1
3	GRAVEL	FLAKE	SLATE	FLAKING	BASE FRAG	1		345	51	1
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1		217	50	27
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1		339	52	4
3	GRAVEL	FLAKE	ANDESITE	FLAKING	COMPLETE	1		185	5	11
3	GRAVEL	FLAKE	BASALT	FLAKING	OTHER FRAG	1		337	52	4
3	GRAVEL	FLAKE	CHERT	FLAKING	OTHER FRAG	1		164	4	14
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1		335	52	4
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	2		78	4	15
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1		332	52	5
3	GRAVEL	FLAKE	METAMORPH	FLAKING	COMPLETE	1	29	77	4	15
3	GRAVEL	FLAKE	BASALT	FLAKING	BASE FRAG	1		330	52	5
3	GRAVEL	FLAKE	BASALT	FLAKING	TIP FRAG	1	24	48	50	28
3	GRAVEL	FLAKE	BASALT	FLAKING	OTHER FRAG	1		317	52	5

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3	GRAVEL	FLAKE	BASALT	FLAKING	OTHER FRAG	2		45	50	28
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1		309	52	3
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	3		53	50	28
3	GRAVEL	FLAKE	BASALT	FLAKING	OTHER FRAG	1		304	52	6
3	GRAVEL	FLAKE	BASALT	FLAKING	BASE FRAG	1		52	50	28
3	GRAVEL	FLAKE	QUARTZ CR	FLAKING	BASE FRAG	1		296	52	4
3	GRAVEL	FLAKE	BASALT	FLAKING	TIP FRAG	5		44	50	28
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1		275	52	2
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	3		43	50	28
3	GRAVEL	FLAKE	SLATE	FLAKING	OTHER FRAG	1		354	52	5
3	GRAVEL	FLAKE	BASALT	FLAKING	BASE FRAG	1		42	50	28
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1		344	52	6
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1	37	20	50	22
3	GRAVEL	FLAKE	BASALT	FLAKING	OTHER FRAG	1		336	52	4
3	SANDYGRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1	32	25	50	24
3	GRAVEL	FLAKE	SLATE	FLAKING	OTHER FRAG	1		331	52	5
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1	30	27	50	25
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1		315	52	5
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	6		41	50	28
3	GRAVEL	FLAKE	BASALT	FLAKING	TIP FRAG	1		303	52	3
3	SANDYGRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	2		40	50	28
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1	48	399	51	3
3	GRAVEL	FLAKE	BASALT	FLAKING	OTHER FRAG	1		38	50	27
3	GRAVEL	FLAKE	SLATE	FLAKING	OTHER FRAG	1		338	52	4
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1	28	33	50	27
3	GRAVEL	FLAKE	BASALT	FLAKING	OTHER FRAG	6		49	50	28
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1	18	34	50	27
3	GRAVEL	FLAKE	QUARTZ CR	FLAKING	COMPLETE	1		292	52	2
3	GRAVEL	FLAKE	BASALT	FLAKING	TIP FRAG	1		37	50	27
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	1		333	52	5
3	GRAVEL	FLAKE	SLATE	FLAKING	OTHER FRAG	1		346	52	5
3	GRAVEL	FLAKE	BASALT	FLAKING	TIP FRAG	1		307	52	4
3	GRAVEL	FLAKE	BASALT	FLAKING	COMPLETE	3		35	50	27
3	GRAVEL	FLAKE,RETOUCH	BASALT	FLAKING	COMPLETE	1		316	52	5
3	GRAVEL	FLAKE,RETOUCH	BASALT	FLAKING	COMPLETE	1		350	52	5
3	GRAVEL	FLAKE,RETOUCH	BASALT	FLAKING	COMPLETE	1	60	199	51	
3	GRAVEL	FLAKE,RETOUCH	BASALT	FLAKING	COMPLETE	1		341	52	5
3	GRAVEL	FRAG,UNCLASS	CHALCEDONY	FLAKING	OTHER FRAG	1		246	52	1
3	GRAVEL	FRAG,UNCLASS	SANDSTONE	GRND-INC	OTHER FRAG	1		239	52	3
3	GRAVEL	MICROBLADE	QUARTZ CR	FLAKING	BASE FRAG	1		297	52	6

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3	GRAVEL	POINT	BASALT	FLAKING	TIP FRAG	1		46	50	28
3	SILTYGRAVEL	POINT	BASALT	FLAKING	BASE FRAG	1		51	50	28
3	GRAVEL	RING	STEATITE	DRILL-GRND	OTHER FRAG	1		235	52	3
3	GRAVEL	WHATZIT	STEATITE	DRILL-GRND	OTHER FRAG	1	32	69	7	14
4	MIDDEN	ABRADER	SILTSTONE	NONE	OTHER FRAG	1		166	2	13
4	MIDDEN	ABRADER	SILTSTONE	GRINDING	OTHER FRAG	1		300	17	2
4	MIDDEN	ABRADER	SILTSTONE	NONE	COMPLETE	1	98	120	10	14
4	MIDDEN	ABRADER	SILTSTONE	NONE	OTHER FRAG	1		375	15	
4	MIDDEN	ABRADER	SILTSTONE	NONE	COMPLETE	1		396	19	1
4	MIDDEN	ABRADER	SILTSTONE	GRINDING	OTHER FRAG	1		380	11	4
4	ASH	ABRADER	SANDSTONE	NONE	OTHER FRAG	1		153	8	
4	UNCERTAIN	ABRADER	SANDSTONE	NONE	OTHER FRAG	1		154	8	
4	MIDDEN	ABRADER	SILTSTONE	NONE	OTHER FRAG	1		60	4	9
4	MIDDEN	ABRADER	SILTSTONE	NONE	MID FRAG	1		385	20	1
4	MIDDEN	ADZE	SHELL	GRINDING	MID FRAG	1		384	18	3
4	MIDDEN	ADZE	SLATE	GRINDING	BASE FRAG	1		68	4	12
4	CLAY	ADZE	NEPHRITE	GRINDING	TIP FRAG	1		366	19	3
4	MIDDEN	ADZE	SHELL	GRINDING	BASE FRAG	1		106	2	10
4	MIDDEN	ANVIL	DIORITE	NONE	COMPLETE	1	133	63	7	12
4	MIDDEN	AWL	L MAMMAL	GRINDING	COMPLETE	1	81	62	4	10
4	MIDDEN	AWL	L MAMMAL	GRINDING	MID FRAG	1		99	10	11
4	MIDDEN	AWL	L MAMMAL	GRINDING	COMPLETE	1	80	393	14	3
4	MIDDEN	AWL	L MAMMAL	GRINDING	COMPLETE	1		61	7	11
4	MIDDEN	BARB	BIRD BONE	GRINDING	COMPLETE	1		367	11	2
4	MIDDEN	BILLET	S MAMMAL	SAWING	COMPLETE	1	268	182	1	11
4	MIDDEN	BOILING ST	UNID ROCK	NONE	COMPLETE	12		198	7	13
4	MIDDEN	BOILING ST	UNID ROCK	NONE	COMPLETE	45		388	20	3
4	CLAY	CHIPPED DISC	SLATE	FLAKING	COMPLETE	1		391	20	5
4	MIDDEN	CHIPPED DISC	SLATE	FLAKING	COMPLETE	1	93	59	7	11
4	MIDDEN	CHIPPED DISC	SLATE	FLAKING	COMPLETE	1	83	376	11	3
4	MIDDEN	CHIPPED DISC	SLATE	FLAKING	COMPLETE	1	68	377	11	2
4	MIDDEN	CHISEL-GOUGE	L MAMMAL	GRINDING	BASE FRAG	1		200	1	12
4	MIDDEN	CHISEL-GOUGE	ANTLER	GRINDING	COMPLETE	1	83	195	2	16
4	MIDDEN	CORE	SLATE	FLAKING	COMPLETE	1	104	66	4	11
4	UNCERTAIN	CORE	SLATE	FLAKING	COMPLETE	1	110	202		
4	MIDDEN	CORE	ANDESITE	FLAKING	COMPLETE	1	63	65	7	12
4	MIDDEN	DRILL	L MAMMAL	NONE	MID FRAG	1		102	10	12
4	MIDDEN	FILE	SLATE	NONE	BASE FRAG	1		383	18	3
4	MIDDEN	FLAKE	ANDESITE	FLAKING	COMPLETE	1		321	18	1
4	MIDDEN	FLAKE	ANDESITE	FLAKING	TIP FRAG	2		54	4	10

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4	MIDDEN	FLAKE	SLATE	FLAKING	COMPLETE	1		302	11	2
4	GRAVEL	FLAKE	BASALT	FLAKING	OTHER FRAG	1		83	4	18
4	MIDDEN	FLAKE	SLATE	FLAKING	COMPLETE			295	15	3
4	MIDDEN	FLAKE	CHERT	FLAKING	COMPLETE	1	51	96	8	10
4	MIDDEN	FLAKE	SLATE	FLAKING	COMPLETE	1		222	2	14
4	MIDDEN	FLAKE	SLATE	FLAKING	COMPLETE	1		308	11	2
4	MIDDEN	FLAKE	SLATE	FLAKING	COMPLETE	1		392	14	3
4	MIDDEN	FLAKE	QUARTZITE	FLAKING	COMPLETE	1	25	75	4	13
4	MIDDEN	FLAKE	METAMORPH	FLAKING	COMPLETE	1		379	11	4
4	MIDDEN	FLAKE	SLATE	FLAKING	COMPLETE	1		209	4	15
4	MIDDEN	FLAKE	SLATE	FLAKING	COMPLETE	1		363	11	2
4	ASH	FLAKE	SLATE	FLAKING	COMPLETE	14		220	8	12
4	MIDDEN	FLAKE	BASALT	FLAKING	OTHER FRAG	1		390	20	5
4	MIDDEN	FLAKE	BASALT	FLAKING	COMPLETE	1		395	20	
4	MIDDEN	FLAKE	BASALT	FLAKING	COMPLETE	1		368	15	3
4	MIDDEN	FLAKE	SLATE	FLAKING	COMPLETE			293	11	2
4	MIDDEN	FLAKE,RETOUCH	BASALT	FLAKING	COMPLETE	1		358	15	1
4	MIDDEN	FLAKER	L MAMMAL	SAWING	COMPLETE	1	93	394	14	3
4	MIDDEN	FRAG,UNCLASS	ANTLER	GRINDING	TIP FRAG	1		374	11	3
4	MIDDEN	FRAG,UNCLASS	SLATE	GRINDING	OTHER FRAG	1		360	19	1
4	MIDDEN	FRAG,UNCLASS	L MAMMAL	GRINDING	MID FRAG	2		323	15	3
4	MIDDEN	HAMMERSTONE	UNID ROCK	NONE	COMPLETE	1	93	128	2	12
4	MIDDEN	HAMMERSTONE	DIORITE	NONE	COMPLETE	1	135	189	10	16
4	MIDDEN	HAMMERSTONE	GRANITE	NONE	COMPLETE	1	84	180	5	10
4	MIDDEN	HAMMERSTONE	UNID ROCK	NONE	COMPLETE	1	85	194	5	12
4	MIDDEN	MICROBLADE	OBSIDIAN	FLAKING	BASE FRAG	1		389	1	17
4	MIDDEN	MICROBLADE	OBSIDIAN	FLAKING	MID FRAG	1		290	17	1
4	MIDDEN	MICROBLADE	OBSIDIAN	FLAKING	COMPLETE	1		319	18	1
4	MIDDEN	MICROBLADE	OBSIDIAN	FLAKING	TIP FRAG	1		107	8	12
4	MIDDEN	MICROBLADE	QUARTZ CR	FLAKING	BASE FRAG	1		371	15	3
4	MIDDEN	MICROBLADE	QUARTZ CR	FLAKING	BASE FRAG	1		362	11	1
4	MIDDEN	MICROBLADE	QUARTZ CR	FLAKING	COMPLETE	1		365	15	2
4	MIDDEN	MICROBLADE	OBSIDIAN	FLAKING	MID FRAG	1		327	18	2
4	MIDDEN	PIN	L MAMMAL	GRINDING	MID FRAG	1		381	11	4
4	MIDDEN	POINT	SLATE	GRINDING	OTHER FRAG	1		244	19	1
4	MIDDEN	POINT	SLATE	GRINDING	OTHER FRAG	1		187	9	1
4	MIDDEN	POINT	SLATE	GRINDING	MID FRAG	1		98	8	10
4	MIDDEN	POINT,BARBED	ANTLER	GRND-INC	COMPLETE	1	124	378	14	1
4	MIDDEN	PREFORM	SLATE	FLAKING	COMPLETE	1		397	19	2
4	MIDDEN	PREFORM	SLATE	FLAKE-GRND	COMPLETE	1	70	192	2	15

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4	MIDDEN	PREFORM	L MAMMAL	SAWING	COMPLETE	1	96	188	4	14
4	MIDDEN	SAW	SILTSTONE	FLAKE-GRND	OTHER FRAG	1		130	2	12
4	MIDDEN	SAW	SILTSTONE	FLAKING	OTHER FRAG	1	105	108	2	11
4	MIDDEN	SAWN MATL	L MAMMAL	SAWING	COMPLETE	1	163	387	20	3
4	MIDDEN	SCRAPER,HIDE	L MAMMAL	GRINDING	COMPLETE	1	109	386	14	3
4	MIDDEN	SCRAPER,HIDE	L MAMMAL	GRINDING	COMPLETE	1	101	190	3	14
4	MIDDEN	SCRAPER,HIDE	L MAMMAL	NONE	COMPLETE	1		373	11	2
4	MIDDEN	SCRAPER,HIDE	L MAMMAL	NONE	OTHER FRAG	1	99	113	10	13
4	MIDDEN	SINKER	SANDSTONE	PECKING	COMPLETE	1		398	21	1
5	MIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		274	17	9
5	MIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		250	19	9
5	MIDDEN	ADRADER	SILTSTONE	NONE	COMPLETE	1		249	17	4
5	SHELLMIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		261	14	6
5	SHELLMIDDEN	ADRADER	SANDSTONE	NONE	OTHER FRAG	1		356	11	8
5	MIDDEN	ADRADER	SILTSTONE	NONE	COMPLETE	1	165	262	14	6
5	MIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		223	19	5
5	MIDDEN	ADRADER	SILTSTONE	NONE	COMPLETE	1	50	279	16	4
5	MIDDEN	ADRADER	SANDSTONE	NONE	OTHER FRAG	1		310	21	7
5	SHELLMIDDEN	ADRADER	SILTSTONE	PECKING	OTHER FRAG	1		227	19	6
5	SHELLMIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		31	7	8
5	MIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		242	19	9
5	SHELLMIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		105	8	8
5	CR SHELL	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		253	16	1
5	MIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		285	18	10
5	MIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		268	18	9
5	MIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		281	16	4
5	MIDDEN	ADRADER	SANDSTONE	NONE	OTHER FRAG	1		205	19	3
5	SHELLMIDDEN	ADRADER	SANDSTONE	PECKING	OTHER FRAG	1		267	12	3
5	SHELLMIDDEN	ADRADER	SANDSTONE	NONE	OTHER FRAG	1		278	21	4
5	MIDDEN	ADRADER	SILTSTONE	PECKING	OTHER FRAG	1		64	7	12
5	MIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		263	17	7
5	MIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		271	17	8
5	SHELLMIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		168	5	7
5	SHELLMIDDEN	ADRADER	SILTSTONE	NONE	COMPLETE	1	121	291	16	4
5	SHELLMIDDEN	ADRADER	SILTSTONE	NONE	OTHER FRAG	1		264	21	2
5	BURNT SHELL	ANVIL	GRANITE	NONE	COMPLETE	1	68	364	13	7
5	MIDDEN	ARMING TIP	SLATE	GRINDING	BASE FRAG	1		211	19	3
5	SHELLMIDDEN	AWL	L MAMMAL	GRINDING	BASE FRAG	1		357	14	10
5	MIDDEN	AWL	L MAMMAL	GRINDING	TIP FRAG	1		19	50	21
5	WHOLE SHELL	AWL	L MAMMAL	GRINDING	COMPLETE	1	90	343	14	9

5	MIDDEN	AWL	L MAMMAL	GRINDING	COMPLETE	1		248	17	4
5	MIDDEN	AWL	L MAMMAL	GRINDING	TIP FRAG	1		236	19	6
5	SILT	BARB	L MAMMAL	GRINDING	COMPLETE	2		181	51	
5	MIDDEN	BARB	L MAMMAL	GRINDING	COMPLETE	1		277	19	10
5	SHELLMIDDEN	BEAD	SHELL	DRILL-GRND	COMPLETE	1	23	272	21	3
5	MIDDEN	BEAD	SHELL	DRILL-GRND	COMPLETE	1	2	152	51	2
5	SHELLMIDDEN	BEAD	SHELL	DRILL-GRND	COMPLETE	3		146	6	1
5	SHELLMIDDEN	BEAD	FOSSIL	NONE	OTHER FRAG	1		306	16	6
5	SHELLMIDDEN	BEAD	SHELL	GRINDING	COMPLETE	1	1	218	15	3
5	WHOLE SHELL	CHISEL-GOUGE	L MAMMAL	GRINDING	BASE FRAG	1		351	15	11
5	CR SHELL	CHISEL-GOUGE	TOOTH	GRINDING	OTHER FRAG	1		369	14	
5	MIDDEN	CHISEL-GOUGE	L MAMMAL	GRINDING	OTHER FRAG	1	10	251	18	5
5	SHELLMIDDEN	CHISEL-GOUGE	L MAMMAL	GRINDING	COMPLETE	1	68	183	4	10
5	SILT	CORE	SLATE	FLAKING	COMPLETE	1		232		
5	WHOLE SHELL	CORE	ANDESITE	FLAKING	OTHER FRAG	1		318	18	11
5	SILT	CORE	BASALT	FLAKING	COMPLETE	1	29	159	51	
5	SILT	CORE	SLATE	FLAKING	COMPLETE	1		214	52	2
5	SHELLMIDDEN	CORE	GREENSTONE	FLAKING	BASE FRAG	1		216	11	1
5	MIDDEN	CORE	UNID ROCK	FLAKING	COMPLETE	1	55	286	18	10
5	SHELLMIDDEN	CORE	QUARTZITE	FLAKING	COMP.ROLL	1	58	149	6	1
5	SHELLMIDDEN	FLAKE	SLATE	FLAKING	COMPLETE	1		258	11	8
5	MIDDEN	FLAKE	BASALT	FLAKING	COMPLETE	1		229	19	6
5	SHELLMIDDEN	FLAKE	ANDESITE	FLAKING	COMPLETE	1	77	322	12	7
5	SILT	FLAKE	BASALT	FLAKING	COMPLETE	1	38	175	51	
5	MIDDEN	FLAKE	ANDESITE	FLAKING	OTHER FRAG	2		284	18	10
5	MIDDEN	FLAKE	CHERT	FLAKING	BASE FRAG	1		22	7	7
5	MIDDEN	FLAKE	ANDESITE	FLAKING	OTHER FRAG	1	40	283	18	10
5	MIDDEN	FLAKE	BASALT	FLAKING	OTHER FRAG	1	17	56	1	3
5	MIDDEN	FLAKE	BASALT	FLAKING	COMPLETE	1	40	282	18	10
5	DARK HUMUS	FLAKE	UNID ROCK	FLAKING	COMPLETE	2		125	52	
5	SHELLMIDDEN	FLAKE	CHERT	FLAKING	COMPLETE	1		259	17	6
5	SILT	FLAKE	BASALT	FLAKING	COMPLETE	1	18	139	51	
5	SILT	FLAKE	BASALT	FLAKING	COMPLETE	1	25	171	51	
5	SHELLMIDDEN	FLAKE	BASALT	FLAKING	TIP FRAG	1	22	142	51	
5	ASH	FLAKE	BASALT	FLAKING	COMPLETE	1	30	256	18	7
5	SILT	FLAKE	BASALT	FLAKING	TIP FRAG	1	19	177	51	
5	MIDDEN	FLAKE	BASALT	FLAKING	TIP FRAG	2		156	50	27
5	SHELLMIDDEN	FLAKE	ANDESITE	FLAKING	COMPLETE	1	15	157	20	2
5	MIDDEN	FLAKE	BASALT	FLAKING	OTHER FRAG	1		240	19	8
5	SHELLMIDDEN	FLAKE	BASALT	FLAKING	COMPLETE	1	18	165	20	4

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5	SILT	FLAKE	GREENSTONE	FLAKING	COMPLETE	1		237	52	3
5	SHELLMIDDEN	FLAKE	BASALT	FLAKING	COMPLETE	1	26	355	11	8
5	SHELLMIDDEN	FLAKE	SLATE	FLAKING	COMPLETE	1		234	5	8
5	SHELLMIDDEN	FLAKE	SLATE	FLAKING	COMPLETE	1		21	7	11
5	MIDDEN	FLAKE	ANDESITE	FLAKING	COMPLETE	1		230	19	6
5	SHELLMIDDEN	FLAKE	QUARTZITE	FLAKING	COMPLETE	1	62	79	2	4
5	SHELLMIDDEN	FLAKE	ANDESITE	FLAKING	COMPLETE	1	36	173	6	5
5	MIDDEN	FLAKE	BASALT	FLAKING	COMPLETE	1		140	51	4
5	MIDDEN	FLAKE	SLATE	FLAKING	COMPLETE	1		228	20	4
5	SHELLMIDDEN	FLAKE	QUARTZITE	FLAKING	COMPLETE	1		382	14	10
5	SILT	FLAKE	BASALT	FLAKING	COMPLETE	1	22	197	51	
5	MIDDEN	FLAKE	BASALT	FLAKING	BASE FRAG	1		219	19	4
5	MIDDEN	FLAKE	BASALT	FLAKING	COMPLETE	1	43	55	7	10
5	MIDDEN	FLAKE	BASALT	FLAKING	COMPLETE	1		213	19	3
5	MIDDEN	FLAKE	SLATE	FLAKING	COMPLETE	1		191	51	5
5	SHELLMIDDEN	FLAKE	UNID ROCK	FLAKING	COMPLETE	1		131	9	6
5	SHELLMIDDEN	FLAKE	ANDESITE	FLAKING	COMPLETE	1		352	15	12
5	SILT	FLAKE	CHERT	FLAKING	COMPLETE	1		207	52	1
5	UNCERTAIN	FLAKE,RETOUCH	BASALT	FLAKING	COMPLETE	1		372	11	10
5	MIDDEN	FORESHAFT	ANTLER	SAW-GRND	COMPLETE	1	40	210	15	2
5	MIDDEN	FORESHAFT	ANTLER	SAW-GRND	MID FRAG	1		287	18	10
5	ASH	FRAG, UNCLASS	L MAMMAL	GRINDING	TIP FRAG	1		141	9	9
5	MIDDEN	FRAG, UNCLASS	L MAMMAL	GRINDING	OTHER FRAG	1		288	18	10
5	SHELLMIDDEN	FRAG, UNCLASS	L MAMMAL	GRINDING	OTHER FRAG	1		326	15	16
5	MIDDEN	FRAG, UNCLASS	L MAMMAL	GRINDING	MID FRAG	1		299	15	8
5	MIDDEN	FRAG, UNCLASS	SILTSTONE	GRINDING	OTHER FRAG	1		215	15	4
5	SHELLMIDDEN	GORGE	BIRD BONE	GRINDING	COMPLETE	1	62	144	20	
5	MIDDEN	GORGE	BIRD BONE	GRINDING	TIP FRAG	1		328	21	9
5	SHELLMIDDEN	GROUND MATL	DIORITE	GRINDING	COMPLETE	1		224	19	5
5	MIDDEN	HAMMERSTONE	DIORITE	NONE	OTHER FRAG	1		135	9	7
5	MIDDEN	HAMMERSTONE	QUARTZITE	NONE	OTHER FRAG	1		231	19	6
5	SHELLMIDDEN	HAMMERSTONE	UNID ROCK	NONE	COMPLETE	1	94	313	15	9
5	MIDDEN	HAMMERSTONE	QUARTZITE	NONE	COMPLETE	1	93	255	16	2
5	SHELLMIDDEN	HAMMERSTONE	UNID ROCK	NONE	COMPLETE	1	118	167	6	
5	WHOLE SHELL	HAMMERSTONE	UNID ROCK	NONE	COMPLETE	1	110	324	14	9
5	SILT	HAMMERSTONE	UNID ROCK	NONE	OTHER FRAG	1	86	147	51	2
5	MIDDEN	HARPOON	ANTLER	GRND-INC	BASE FRAG	1		269	14	6
5	MIDDEN	HARPOON	ANTLER	GRND-INC	BASE FRAG	1		243	19	9
5	DARK HUMUS	MICROBLADE	OBSIDIAN	FLAKING	MID FRAG	1		145	51	2
5	WHOLE SHELL	MICROBLADE	OBSIDIAN	FLAKING	COMPLETE	1		221	19	5

5	SHELLMIDDEN	MICROBLADE	OBSIDIAN	FLAKING	MID FRAG	1		178	6	6
5	SHELLMIDDEN	MICROBLADE	OBSIDIAN	FLAKING	MID FRAG	1		148	20	1
5	SHELLMIDDEN	MICROBLADE	OBSIDIAN	FLAKING	MID FRAG	1		158	6	1
5	MIDDEN	MICROBLADE	OBSIDIAN	FLAKING	MID FRAG	1		132	52	2
5	SHELLMIDDEN	POINT	L MAMMAL	GRINDING	COMPLETE	1	115	334	13	6
5	SHELLMIDDEN	POINT	SLATE	GRINDING	COMPLETE	1	75	109	13	3
5	WHOLE SHELL	POINT	BASALT	FLAKING	COMPLETE	1	57	176	20	
5	SHELLMIDDEN	POINT	SLATE	GRINDING	COMPLETE	1	65	90	3	9
5	SILT	POINT	SLATE	GRINDING	OTHER FRAG	1		170	51	
5	SHELLMIDDEN	POINT	BASALT	FLAKE-GRND	COMPLETE	1	57	353	14	10
5	WHOLE SHELL	POINT	L MAMMAL	GRINDING	MID FRAG	1		163	20	4
5	MIDDEN	POINT	SLATE	GRINDING	COMPLETE	1		245	19	9
5	CR SHELL	POINT	SLATE	GRINDING	COMPLETE	1	45	10	50	13
5	CR SHELL	POINT	SLATE	GRINDING	MID FRAG	1		93	51	6
5	MIDDEN	POINT	L MAMMAL	GRINDING	BASE FRAG	1		238	12	2
5	SHELLMIDDEN	POINT	L MAMMAL	GRINDING	TIP FRAG	1		294	11	7
5	SHELLMIDDEN	POINT,BARBED	L MAMMAL	GRINDING	TIP FRAG	1		184	6	9
5	SHELLMIDDEN	PREFORM	SLATE	FLAKE-GRND	COMPLETE	1	120	348	14	7
5	SHELLMIDDEN	PREFORM	L MAMMAL	SAWING	OTHER FRAG	1		196	14	2
5	MIDDEN	PREFORM	SLATE	FLAKE-GRND	TIP FRAG	1		22	17	3
5	MIDDEN	PREFORM	L MAMMAL	SAWING	COMPLETE	1		160	51	3
5	SHELLMIDDEN	PREFORM	SLATE	FLAKING	COMPLETE	1	72	151	20	1
5	DARK HUMUS	PREFORM	SLATE	FLAKING	BASE FRAG	1		162	51	
5	MIDDEN	PREFORM	SLATE	FLAKE-GRND	COMPLETE	1		325	15	9
5	SHELLMIDDEN	SAW	SANDSTONE	FLAKING	OTHER FRAG	1		252	14	5
5	MIDDEN	SAW	SANDSTONE	FLAKING	COMPLETE	1	55	226	18	5
5	MIDDEN	SAW	SILTSTONE	FLAKING	OTHER FRAG	1		329	12	7
5	UNCERTAIN	SAW	SILTSTONE	FLAKING	MID FRAG	1	120	143	9	
5	SHELLMIDDEN	SAW	SILTSTONE	GRINDING	COMPLETE	1	83	84	4	6
5	SHELLMIDDEN	SCRAPER, HIDE	L MAMMAL	NONE	COMPLETE	1		340	15	11
5	SILT	SCRAPER, HIDE	L MAMMAL	GRINDING	OTHER FRAG	1		174	51	
5	MIDDEN	SINKER	SANDSTONE	PECKING	COMPLETE	1		212	19	3
5	MIDDEN	SINKER	UNID ROCK	PECKING	COMPLETE	1		280	17	10
5	SHELLMIDDEN	WEDGE	L MAMMAL	GRINDING	COMPLETE	1	56	257	16	2
5	MIDDEN	WEDGE	ANTLER	GRINDING	OTHER FRAG	1	64	305	21	7
6	BURNT SHELL	BARB	BIRD BONE	GRINDING	MID FRAG	1		81	51	
6	BURNT SHELL	BEAD	SHELL	DRILL-GRND	COMPLETE	1	11	5	50	8
6	ASH	MICROBLADE	OBSIDIAN	FLAKING	BASE FRAG	1		123	52	
6	BURNT SHELL	MICROBLADE	OBSIDIAN	FLAKING	COMPLETE	1	24	2	50	5
6	ASH	MICROBLADE	OBSIDIAN	FLAKING	MID FRAG	1		124	52	

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6	BURNT SHELL	MICROBLADE	OBSIDIAN	FLAKING	TIP FRAG	1		179	51	5
6	ASH	MICROBLADE	OBSIDIAN	FLAKING	TIP FRAG	1		112	52	
6	SHELLMIDDEN	PENDENT	SHELL	INCISING	OTHER FRAG	1	62	88	51	
6	SHELLMIDDEN	PIGMENT	OCHRE	NONE	COMPLETE	1	10	87	51	
6	ASH	POINT	SLATE	GRINDING	TIP FRAG	1	56	133	13	3
7	CR SHELL	ABRADER	SILTSTONE	NONE	OTHER FRAG	1		126	17	
7	CR SHELL	ABRADER	SILTSTONE	NONE	OTHER FRAG	1		127	17	
7	MIDDEN	ARMING TIP	L MAMMAL	GRINDING	COMPLETE	1	50	15	5	2
7	BURNT SHELL	AWL	L MAMMAL	GRINDING	TIP FRAG	1		67	51	
7	MIDDEN	AWL	L MAMMAL	GRINDING	TIP FRAG	1		101	13	2
7	SUBLITTER	BARB	L MAMMAL	GRINDING	TIP FRAG	1		85	5	3
7	SUBLITTER	BARB	BIRD BONE	GRINDING	MID FRAG	1		80	51	
7	CR SHELL	BARB	L MAMMAL	GRINDING	COMPLETE	1	35	7	7	1
7	CR SHELL	BARB	L MAMMAL	GRINDING	TIP FRAG	1		6	7	1
7	MIDDEN	BEAD	SHELL	DRILL-GRND	COMPLETE	1	3	23	51	2
7	CR SHELL	CORE	UNID ROCK	FLAKING	COMPLETE	1	170	26	3	4
7	SUBLITTER	CORE	CHERT	FLAKING	OTHER FRAG	1		91	6	1
7	CR SHELL	CORE	BASALT	FLAKING	COMPLETE	1	25	95	6	
7	S SOIL+SHELL	EFFIGY	ANTLER	CARVING	OTHER FRAG	1		70	51	
7	SUBLITTER	FLAKE	QUARTZITE	FLAKING	COMPLETE	1	48	18	10	1
7	CR SHELL	FLAKE	CHERT	FLAKING	COMPLETE	1	13	94	6	1
7	SHELLMIDDEN	FLAKE	BASALT	FLAKING	OTHER FRAG	1		103	6	2
7	MIDDEN	FLAKE	UNID ROCK	FLAKING	COMPLETE	1	38	134	13	3
7	CR SHELL	FLAKE	UNID ROCK	FLAKING	COMPLETE	1	25	82	9	2
7	SHELLMIDDEN	FRAG,UNCLASS	L MAMMAL	GRINDING	MID FRAG	1		92	5	3
7	SHELLMIDDEN	FRAG,UNCLASS	SHELL	GRINDING	MID FRAG	1		100	20	
7	MIDDEN	FRAG,UNCLASS	L MAMMAL	FLAKING	MID FRAG	1		155	15	1
7	SUBLITTER	GROUND MATL	SLATE	GRINDING	OTHER FRAG	1		8	3	1
7	MIDDEN	HARPOON	ANTLER	CARVING	COMPLETE	1	93	208	11	3
7	CR SHELL	KNIFE	SLATE	GRINDING	COMPLETE	1	74	129	16	2
7	SHELLMIDDEN	MAUL	UNID ROCK	PECKING	TIP FRAG	1		104	20	
7	CR SHELL	MICROBLADE	OBSIDIAN	FLAKING	BASE FRAG	1		50	3	4
7	MIDDEN	PENDENT	SHELL	DRILL-GRND	COMPLETE	1	13	39	4	4
7	CR SHELL	POINT,BARBED	ANTLER	SAWING	MID FRAG	1		71	1	4
7	MIDDEN	WEIGHT,ATLATL	QUARTZITE	SAWING	COMPLETE	1	90	204	11	3
8	SANDYGRAVEL	HISTORIC	IRON	NON-ABORIG	MID FRAG	2		117	16	1
8	SANDYGRAVEL	HISTORIC	IRON	NON-ABORIG	OTHER FRAG	1		16	2	2
8	LITTERMAT	HISTORIC	IRON	NON-ABORIG	COMPLETE	1	30	14	9	1
8	SANDYGRAVEL	HISTORIC	IRON	NON-ABORIG	OTHER FRAG	2		118	16	1
8	SURFACE	HISTORIC	IRON	NON-ABORIG	COMPLETE	1	52	13	9	1

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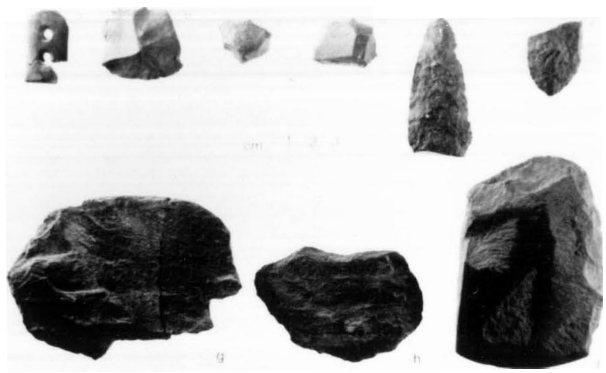
8	SANDYGRAVEL	HISTORIC	IRON	NON-ABORIG	OTHER FRAG	1		116	16	1
8	SANDYGRAVEL	HISTORIC	IRON	NON-ABORIG	OTHER FRAG	1		12	4	1
8	SUBLITTER	HISTORIC	IRON	NON-ABORIG	BASE FRAG	1		28	8	1
8	LITTERMAT	HISTORIC	UNID META	NON-ABORIG	OTHER FRAG	1	203	11	4	1
8	GRAVEL	HISTORIC	IRON	NON-ABORIG	OTHER FRAG	4		119	7	1
8	NOT APPLIC	HISTORIC	IRON	NON-ABORIG	COMPLETE	1	150	9	11	
8	LITTERMAT	HISTORIC	SYNTHETIC	NON-ABORIG	COMPLETE	1	35	97	13	1
8	GRAVEL	HISTORIC	IRON	NON-ABORIG	OTHER FRAG	1		122	16	1
8	SUBLITTER	HISTORIC	IRON	NON-ABORIG	OTHER FRAG	1		17	3	2
8	SANDYGRAVEL	HISTORIC	IRON	NON-ABORIG	MID FRAG	1		4	7	1
8	SUBLITTER	HISTORIC	IRON	NON-ABORIG	COMPLETE	2	66	3	3	1
	NOT APPLIC	ARMING TIP	SLATE	GRINDING	TIP FRAG	1	23	137	0	
	NOT APPLIC	CORE	BASALT	FLAKING	BASE FRAG	1		114	0	
	NOT APPLIC	CORE	QUARTZITE	FLAKING	COMPLETE	1	39	111	0	
	NOT APPLIC	CORE	SLATE	FLAKING	COMP.ROLL	1	108	89	0	
	NOT APPLIC	CORE	QUARTZITE	FLAKING	COMPLETE	1	44	110	0	
	NOT APPLIC	FLAKE	BASALT	FLAKING	COMP.ROLL	1	34	58	0	
	UNCERTAIN	FLAKE	BASALT	FLAKING	COMPLETE	1		206		
	NOT APPLIC	FLAKE	BASALT	FLAKING	COMP.ROLL	1		314	0	
	NOT APPLIC	FLAKE	BASALT	FLAKING	COMP.ROLL	1	30	32	0	
	NOT APPLIC	FLAKE	ANDESITE	FLAKING	COMP.ROLL	1	40	24	0	
	NOT APPLIC	FLAKE	ANDESITE	FLAKING	COMP.ROLL	1	30	136	0	
	NOT APPLIC	FLAKE	BASALT	FLAKING	COMP.ROLL	1	32	150	0	
	NOT APPLIC	FLAKE	BASALT	FLAKING	COMP.ROLL	1	30	29	0	
	NOT APPLIC	FLAKE	GREENSTONE	FLAKING	COMP.ROLL	1	19	1	0	
	NOT APPLIC	HARPOON	ANTLER	CARVE-GND	COMPLETE	1	65	30	0	
	NOT APPLIC	MICROBLADE	OBSIDIAN	FLAKING	MID FRAG	1		161	0	
	NOT APPLIC	POINT	BASALT	FLAKING	BASE FRAG	1		361	0	
	NOT APPLIC	POINT	BASALT	FLAKING	COMPLETE	1	48	115	0	
	NOT APPLIC	POINT	BASALT	FLAKING	COMP.ROLL	1	55	172	0	
	NOT APPLIC	POINT	SLATE	FLAKING	COMP.ROLL	1	120	86	0	
	NOT APPLIC	POINT	BASALT	FLAKING	MID FRAG	1		186	0	
	NOT APPLIC	POINT	BASALT	FLAKING	TIP FRAG	1		247	0	
	NOT APPLIC	POINT	CHERT	FLAKING	COMPLETE	1	47	201	0	
	NOT APPLIC	SINKER	DIORITE	PECKING	COMPLETE	1	178	138	0	

Appendix 3b

REPRESENTATIVE ARTIFACT TYPES

Fig. 13 **Artifacts: Stratum 3, Layer 3.**
Top a)Whatzit b)Bipolar Core c-d)Retouched Flakes e-f)Bifaces g-h)Chipped Discs i)Adze Blade.

Fig. 14 **Artifacts: Stratum 3, Layer 3.**
Bottom a-c)Bipolar Cores d-f)Abraders.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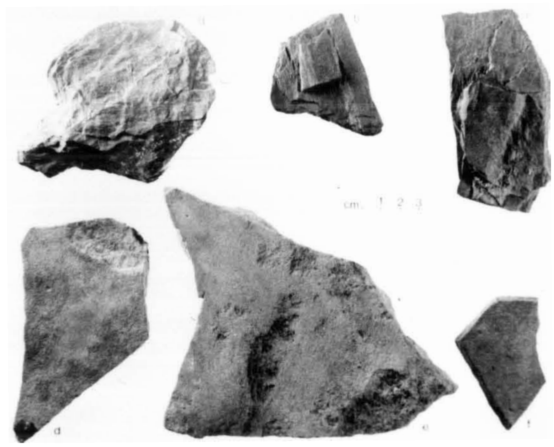
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Fig. 15 Top — **Artifacts: Stratum 4 Layer 4.**
Microblades: a-d)Quartz Crystal e-k)Obsidian.

Fig. 16 Middle — **Artifacts: Stratum 4 Layer 4.**
Anchor Stone.

Fig. 17 Bottom — **Artifacts: Stratum 4 Layer 4.**
Boiling Stones.

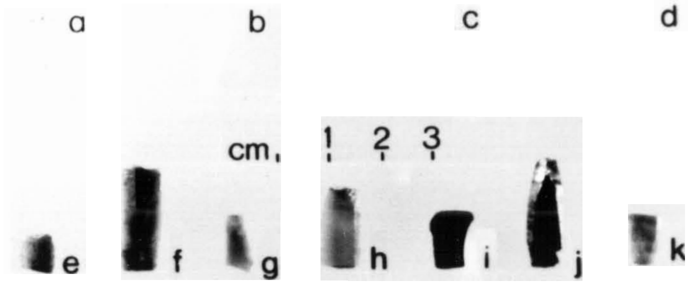
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Fig. 18 Top

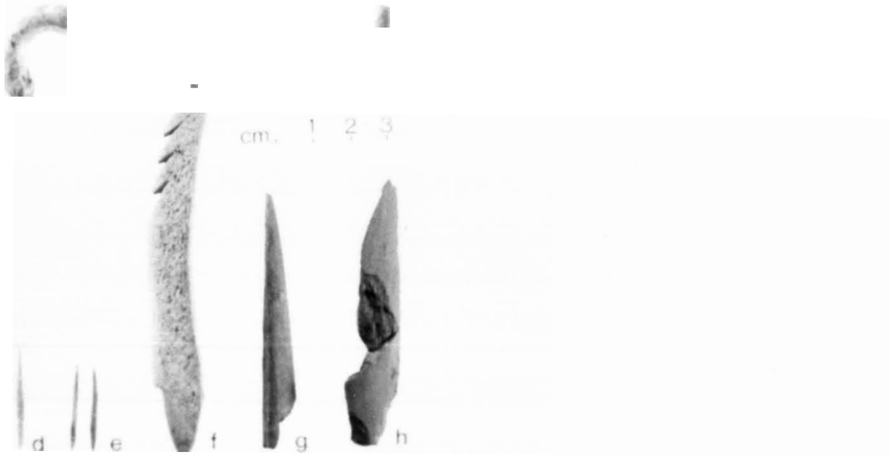
Artifacts: Stratum 4 Layer 4.
a)Ring b)Bead c)Blanket Pin d-e)Barbs f)Barbed Point g-h) Projectile Points.

Fig. 19 Middle

Artifacts: Stratum 4 Layer 4.
a-e)Awls f-k)Hide Scrapers.

Fig. 20 Bottom

Artifacts: Stratum 4 Layer 4.
Woodworking Tools: a-b)Chisels c)Drill d-g)Adze Bits.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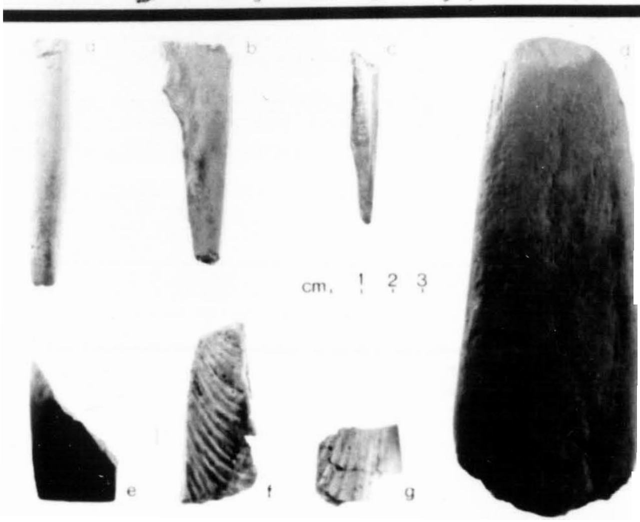
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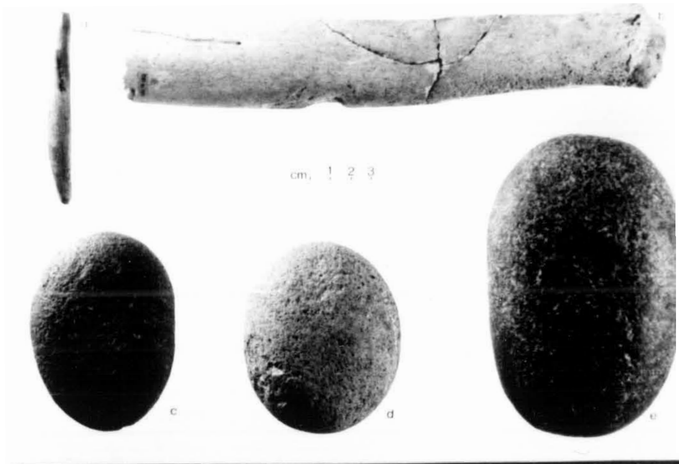
Fig. 21 Top — **Artifacts: Stratum 4 Layer 4.**
a)Flaker b)Billet c-e)Hammerstones.

Fig. 22 Middle — **Artifacts: Stratum 4 Layer 4.**
a-c)Abraders d-e)Saws.

Fig. 23 Bottom — **Artifacts: Stratum 4 Layer 4.**
a-b)Retouched Flakes c-f)Preforms g-i)Cores j-l)Chipped Discs.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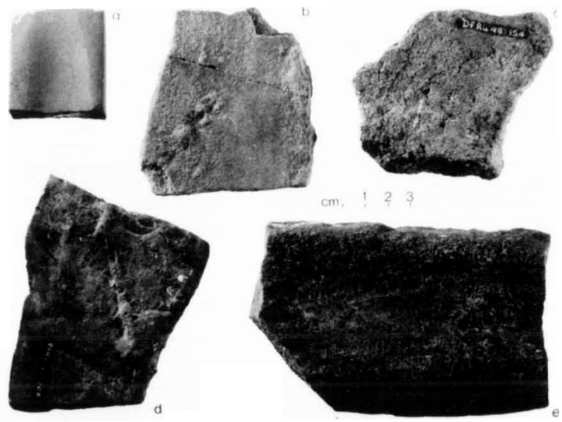
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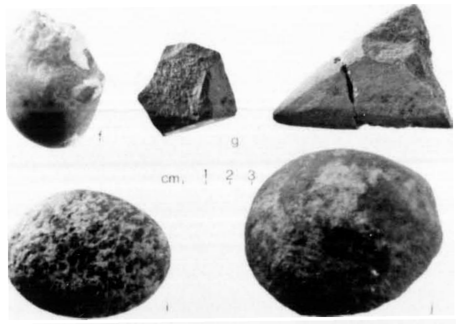
Fig. 24 **Artifacts: Stratum 4 Layer 5.**
Top a)Retouched Flake b-e)Microblades f-h)Cores i-j)Anvil Stones.

Fig. 25 **Artifacts: Stratum 4 Layer 5.**
Middle Manufacturing Tools: a-d)Saws e)Abrader f-i)Hammerstones.

Fig. 26 **Artifacts: Stratum 4 Layer 5.**
Bottom Woodworking Tools: a-b)Wedges c)Chisel d-f)Gouges.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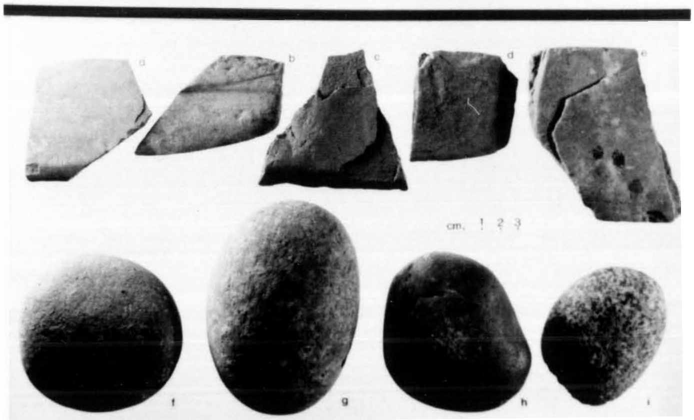
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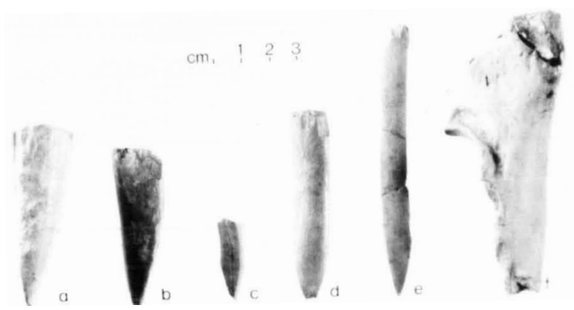
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Fig. 27 Top

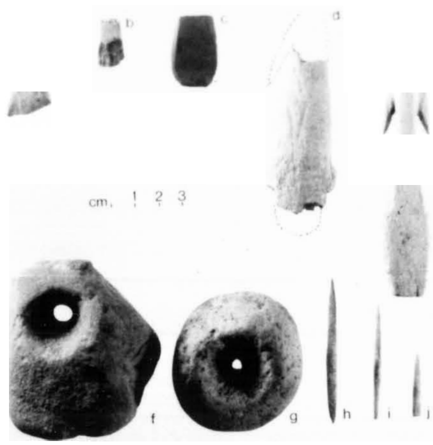
Artifacts: Stratum 4 Layer 5.
a-b)Foreshafts c)Arming Tip, Harpoon d-e)Harpoon f-g)Weights h-j)Barbs.

Fig. 28 Middle

Artifacts: Stratum 4 Layer 5.
Points: a)Barbed b-e)Ground Bone f-g)Chipped Stone h-l)Ground Stone.

Fig. 29 Bottom

Artifacts: Stratum 4 Layer 5.
a-d)Beads e)Hide Scraper f-g)Awl h-i)Gouge.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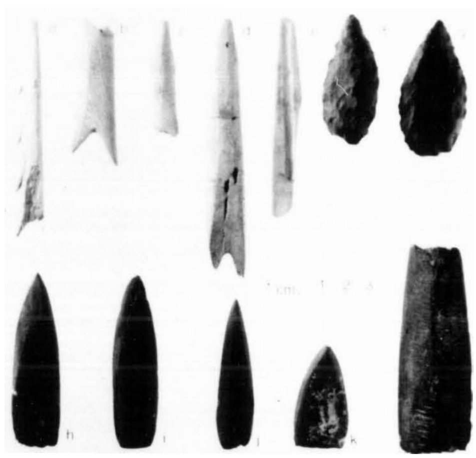
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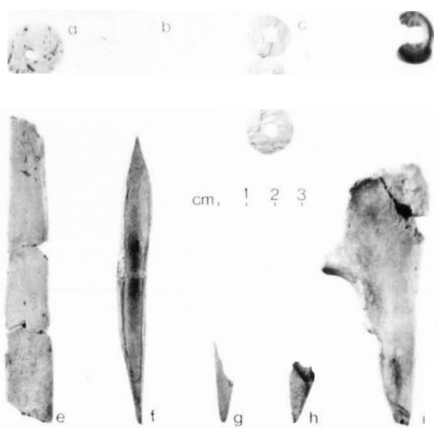
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Fig. 30 Artifacts: Stratum 4 Layer 6.
a-e)Microblades f)Bead g)ochre h)Pendant i)Barb j)Point

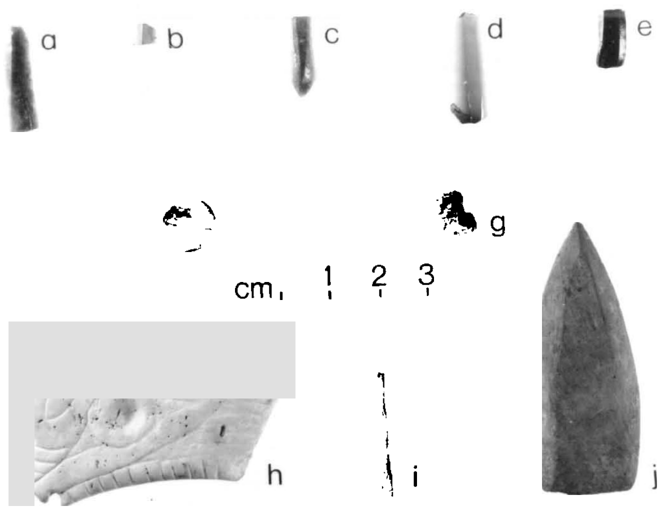
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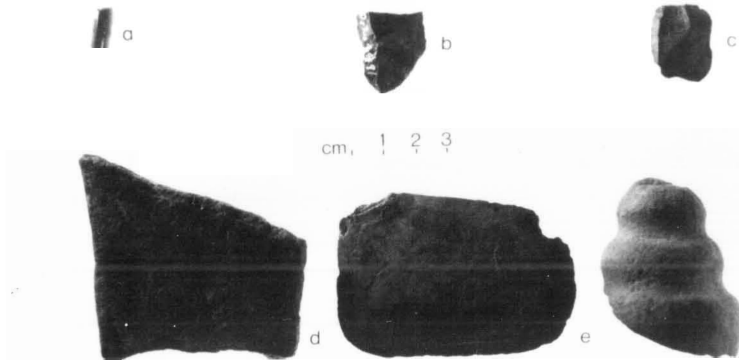
Fig. 31 **Artifacts: Stratum 4 Layer 7.**
Top a)Microblade b-c)Bipolar Cores d)Saw e)Knife f)Maul.

Fig. 32 **Artifacts: Stratum 4 Layer 7.**
Middle a-d)Barbs e)Arming Tip, Harpoon f)Valve, Harpoon g)Barbed Point h-i)Awl j)Bead k)Pendent l)Carved Antler m)Atlatl Weight.

Fig. 33 **Artifacts: Stratum 4 Layer 7.**
Bottom a-e)Preforms f-h)Abraders.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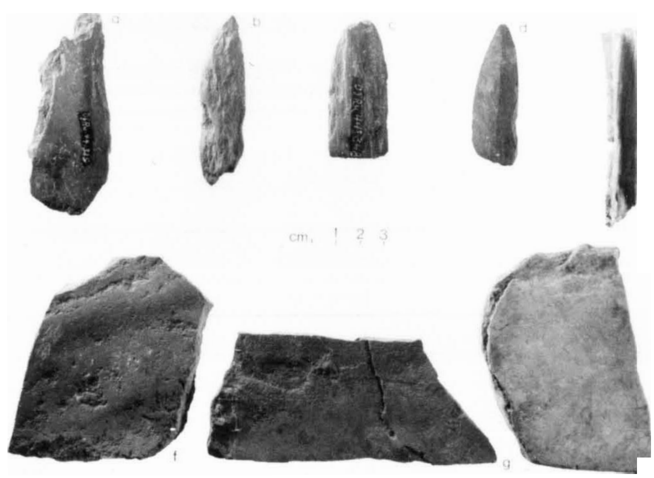
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Table 18
Features by Type and Layer

LAYER	TYPE	UNIT	NUMBER	COMMENTS
3	Hearth	7	87-17	-
3	Hearth	8	87-25	Fauna: Elk, Crow
3	Hearth	7	87-18	-
3	Hearth	8	87-30	-
3	Hearth	7	87-15	-
3	Hearth	8	87-28	-
3	Hearth	11	88-06	Fauna: Rock Oyster
3	Pit	1	88-08	-
3	Pit	18	88-07	-
3	Postholes	8	87-33	(4)
3	Steaming Pit	4	87-19	Fauna: Mammal
4	Hearth	9	87-34	-
4	Hearth	4	87-12	R.C. Sample 87-2
4	Hearth	15	88-04	R.C. Sample 88-1
4	Postholes	17	88-22	(11) Linear, 2 sizes
4	Refuse Pit	16	88-09	Fauna: Clam,Sea Lion
4	Steaming Pit	15	88-05	R.C. 88-2, Herring
4	Steaming Pit	2	87-26	Fauna: Sea Lion
4	Steaming Pit	10	87-29	Assoc. Rock Pile
5	Box Burial	17	88-12	Assoc. Large Rock
5	Hearth	8	87-16	Fauna: Dog, Mink
5	Hearth	3	87-14	-
5	Hearth	7	87-06	Fauna: Deer, Clam
5	Hearth	18	88-10	-
5	Hearth	14	87-23	-
5	Hearth	51	87-36	-
5	Hearth	21	88-02	-
5	Hearth	50	87-05	-
5	Hearth	10	87-21	-
5	Pit Burial	20	87-27	-
5	Pit Burial	7	87-07	Assoc? with f87-06
5	Pit Burial	8	87-20	-
5	Pit Burial	17	88-13	-
5	Pit Burial	19	88-03	-
5	Pit Burial	4	87-02	-

LAYER	TYPE	UNIT	NUMBER	COMMENTS
5	Pit Burial	11	88-18	Assoc. Rock Pile
5	Surface Burial	12	88-14	-
5	Surface Burial	15	88-20	-
5	Surface Burial	16	88-15	-
5	Surface Burial	17	88-11	-
5	Surface Burial	15	88-21	-
5	Surface Burial	16	88-17	-
5	Surface Burial	14	87-35	-
5	Surface Burial	19	88-01	-
5	Surface Burial	15	88-16	-
5	Surface Burial	15	88-19	-
7	Box Burial	52	87-32	-
7	Hearth	51	87-13	-
7	Hearth	9	87-04	-
7	Pit Burial	13	87-24	2220+/-60 BP
8	Hearth	17	87-22	Circular, Historic

Appendix 4b
FEATURE DIAGRAMS

Top (left to right)

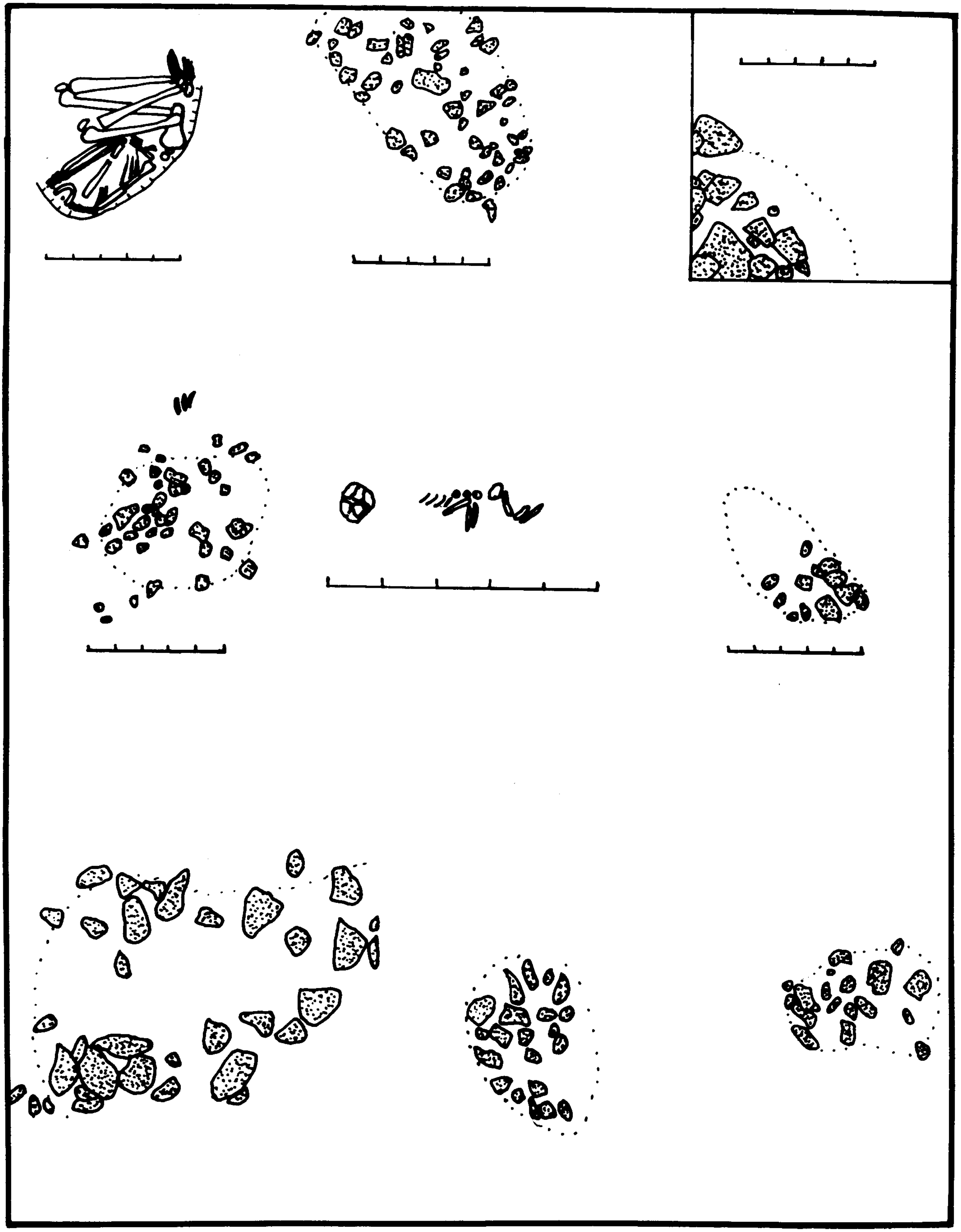
Fig. 34 Feature 87-02 Pit Burial
Fig. 35 Feature 87-04 Hearth
Fig. 36 Feature 87-05 Hearth

Middle

Fig. 37 Feature 87-06 Hearth
Fig. 38 Feature 87-07 Surface Burial
Fig. 39 Feature 87-12 Hearth

Bottom

Fig. 40 Feature 87-13 Hearth
Fig. 41 Feature 87-14 Hearth
Fig. 42 Feature 87-15 Hearth



Top

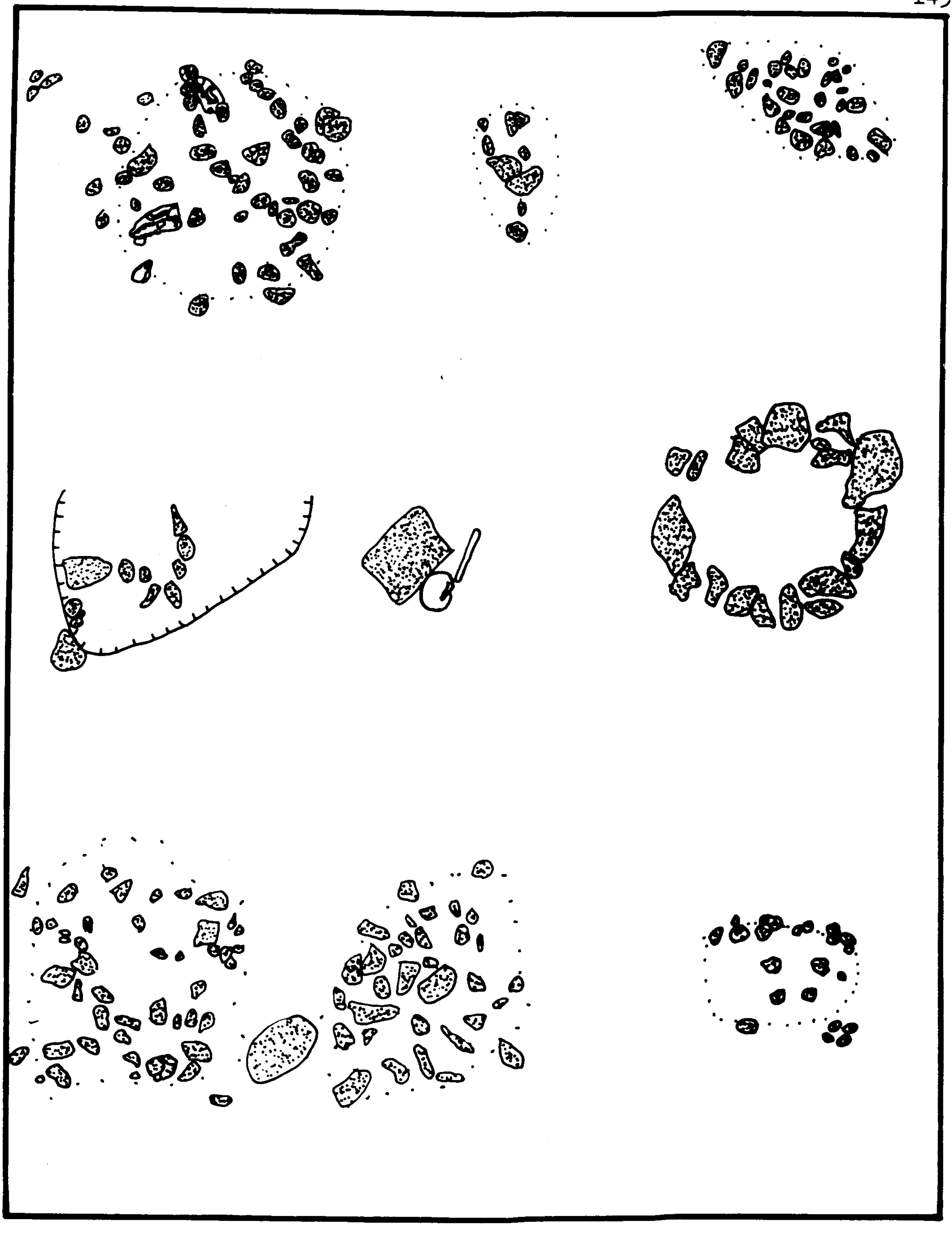
Fig. 43	Feature 87-16	Hearth
Fig. 44	Feature 87-17	Hearth
Fig. 45	Feature 87-18	Hearth

Middle

Fig. 46	Feature 87-19	Steaming Pit
Fig. 47	Feature 87-20	Secondary Burial
Fig. 48	Feature 87-22	Hearth

Bottom

Fig. 49	Feature 87-21	Hearth
Fig. 50	Feature 87-23	Hearth



Top

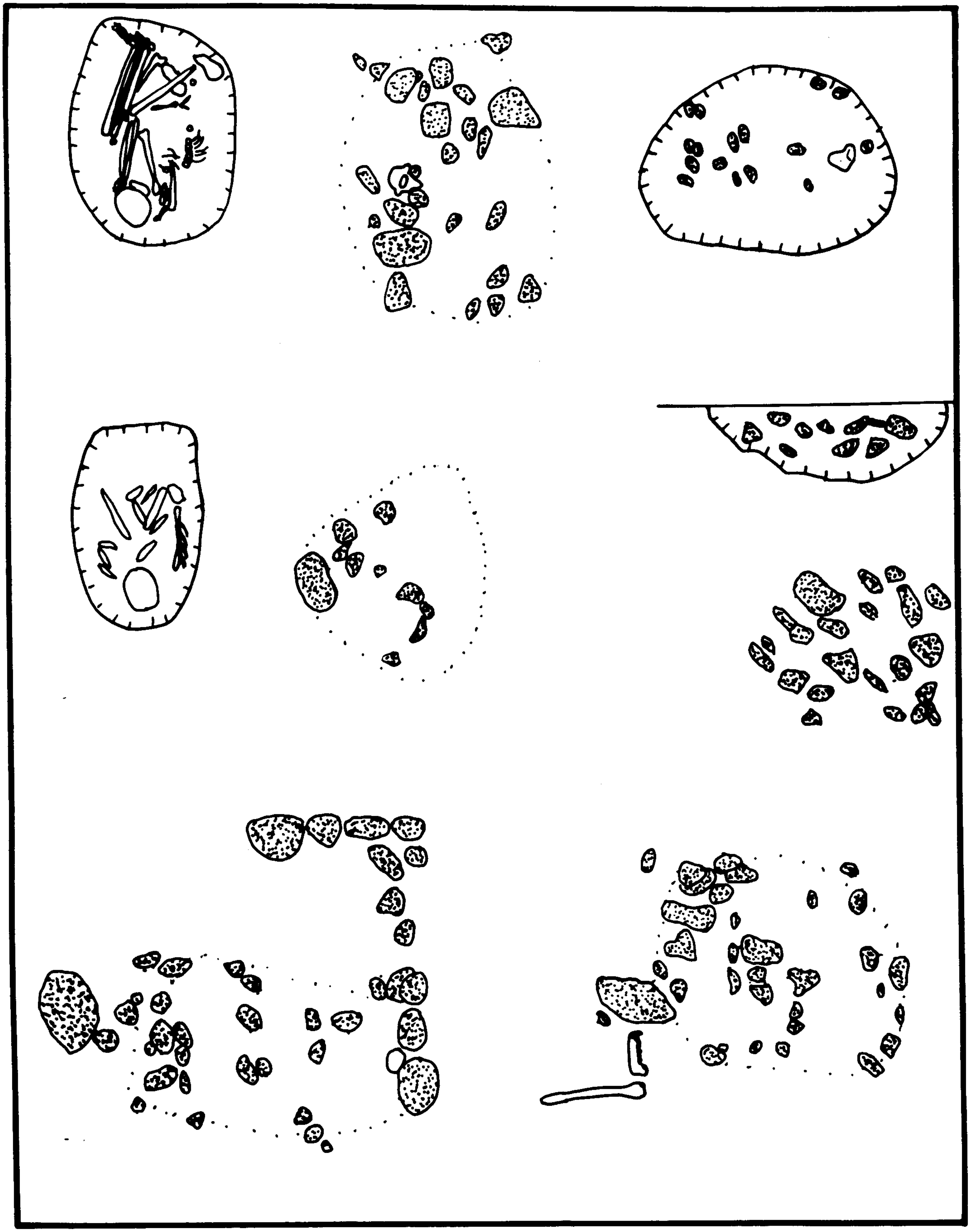
Fig. 51 Feature 87-24 Pit Burial
Fig. 52 Feature 87-25 Hearth
Fig. 53 Feature 87-26 Steaming Pit

Middle

Fig. 54 Feature 87-27 Box Burial
Fig. 55 Feature 87-28 Hearth
Fig. 56 Feature 87-29 Steaming Pit with Rock Pile

Bottom

Fig. 57 Feature 87-30 Hearth
Fig. 58 Feature 87-31 Hearth



Top

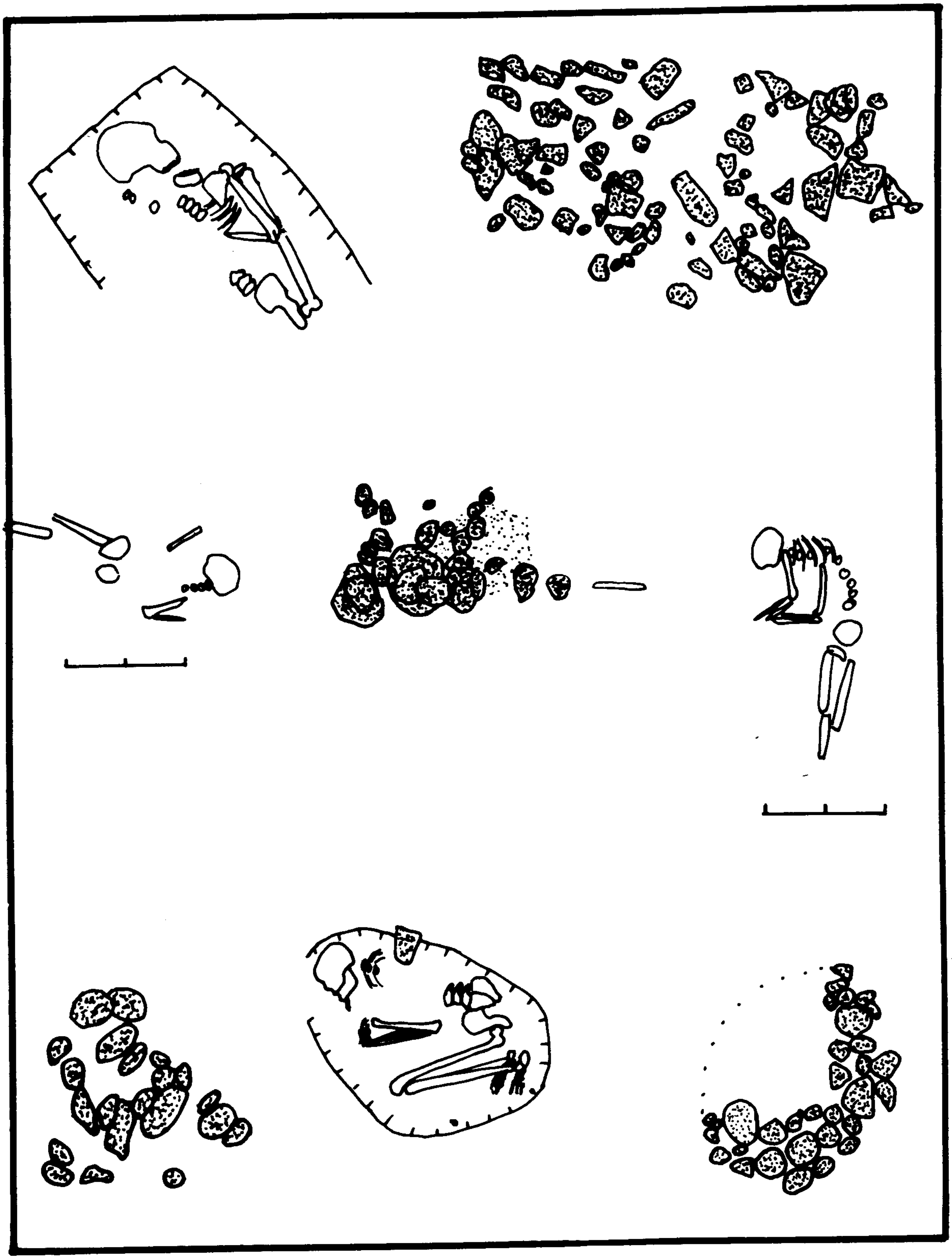
Fig. 59	Feature 87-32	Pit Burial
Fig. 60	Feature 87-34	Hearth

Middle

Fig. 61	Feature 87-35	Surface Burial
Fig. 62	Feature 87-36	Hearth
Fig. 63	Feature 88-01	Surface Burial

Bottom

Fig. 64	Feature 88-02	Hearth
Fig. 65	Feature 88-03	Pit Burial
Fig. 66	Feature 88-04	Hearth



Top

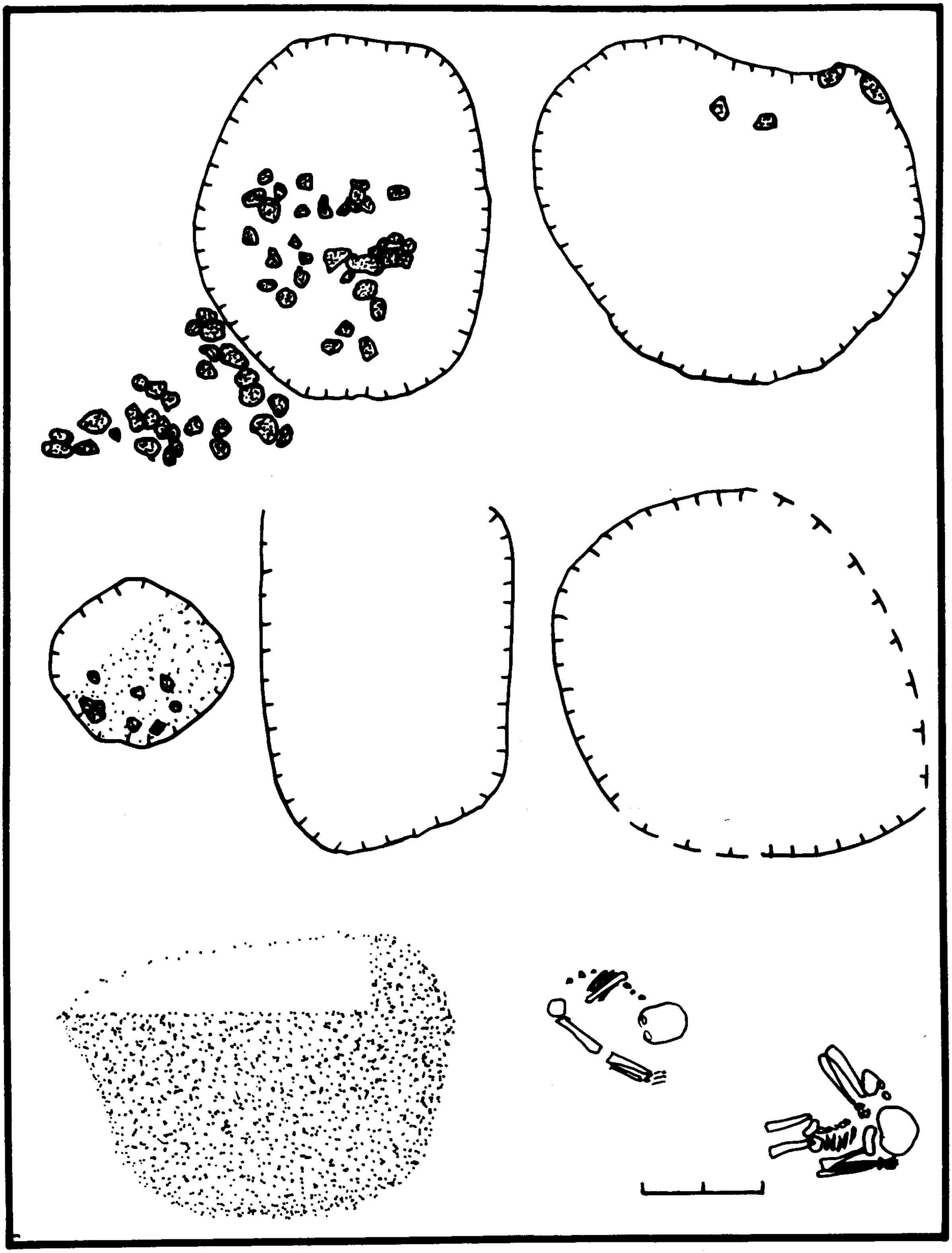
Fig. 67	Feature 88-05	Steaming Pit and Rock Pile
Fig. 68	Feature 88-07	Pit

Middle

Fig. 69	Feature 88-06	Hearth
Fig. 70	Feature 88-08	Pit
Fig. 71	Feature 88-09	Steaming Pit

Bottom

Fig. 72	Feature 88-10	Hearth
Fig. 73	Feature 88-11	Surface Burial



Top

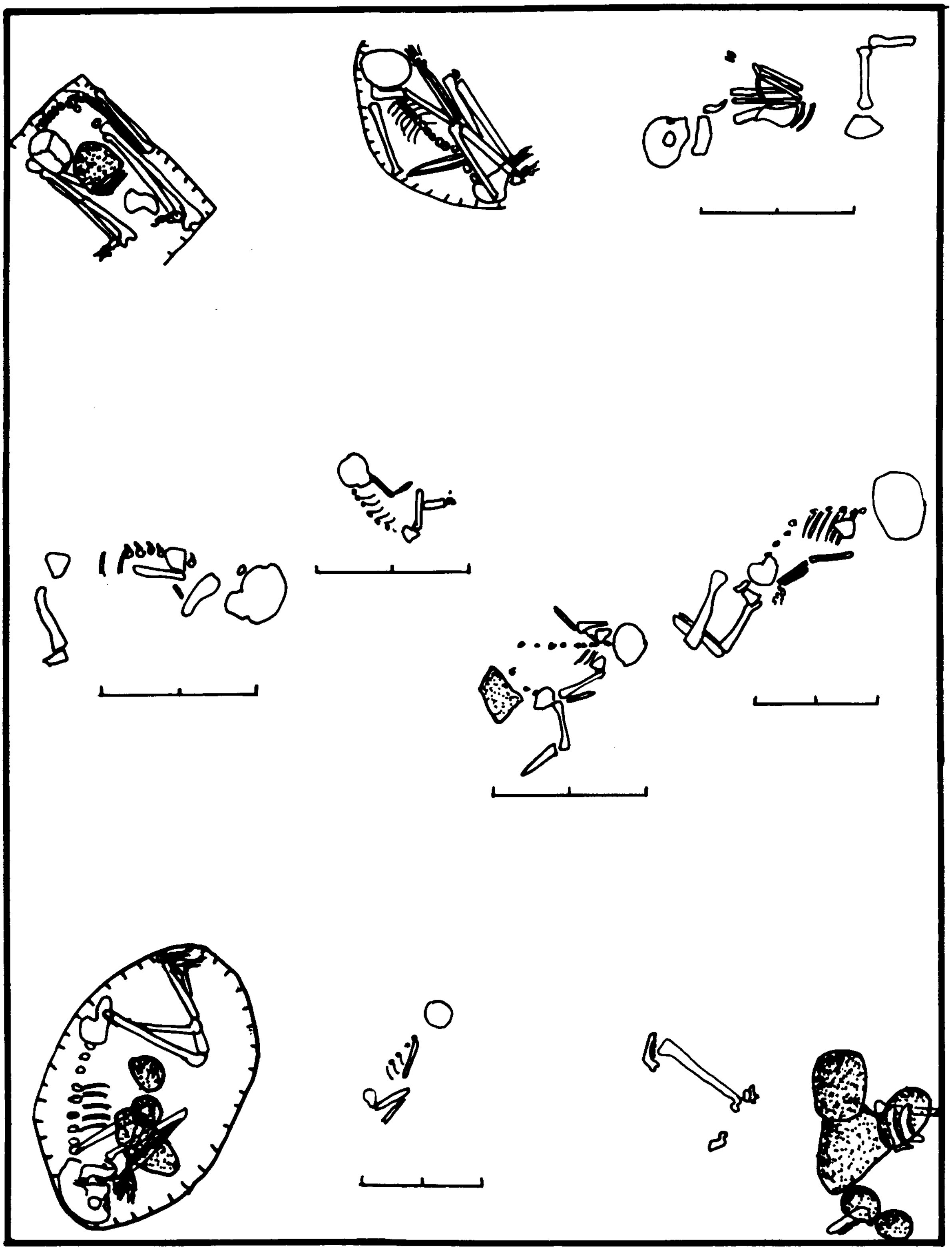
Fig. 74 Feature 88-12 Box Burial
Fig. 75 Feature 88-13 Pit Burial
Fig. 76 Feature 88-14 Surface Burial

Middle

Fig. 77 Feature 88-15 Surface Burial
Fig. 78 Feature 88-16 Surface Burial
Fig. 79 Feature 88-17 Surface Burial
Fig. 80 Feature 88-19 Surface Burial

Bottom

Fig. 81 Feature 88-18 Pit Burial
Fig. 82 Feature 88-20 Surface Burial
Fig. 83 Feature 88-21 Secondary Burial

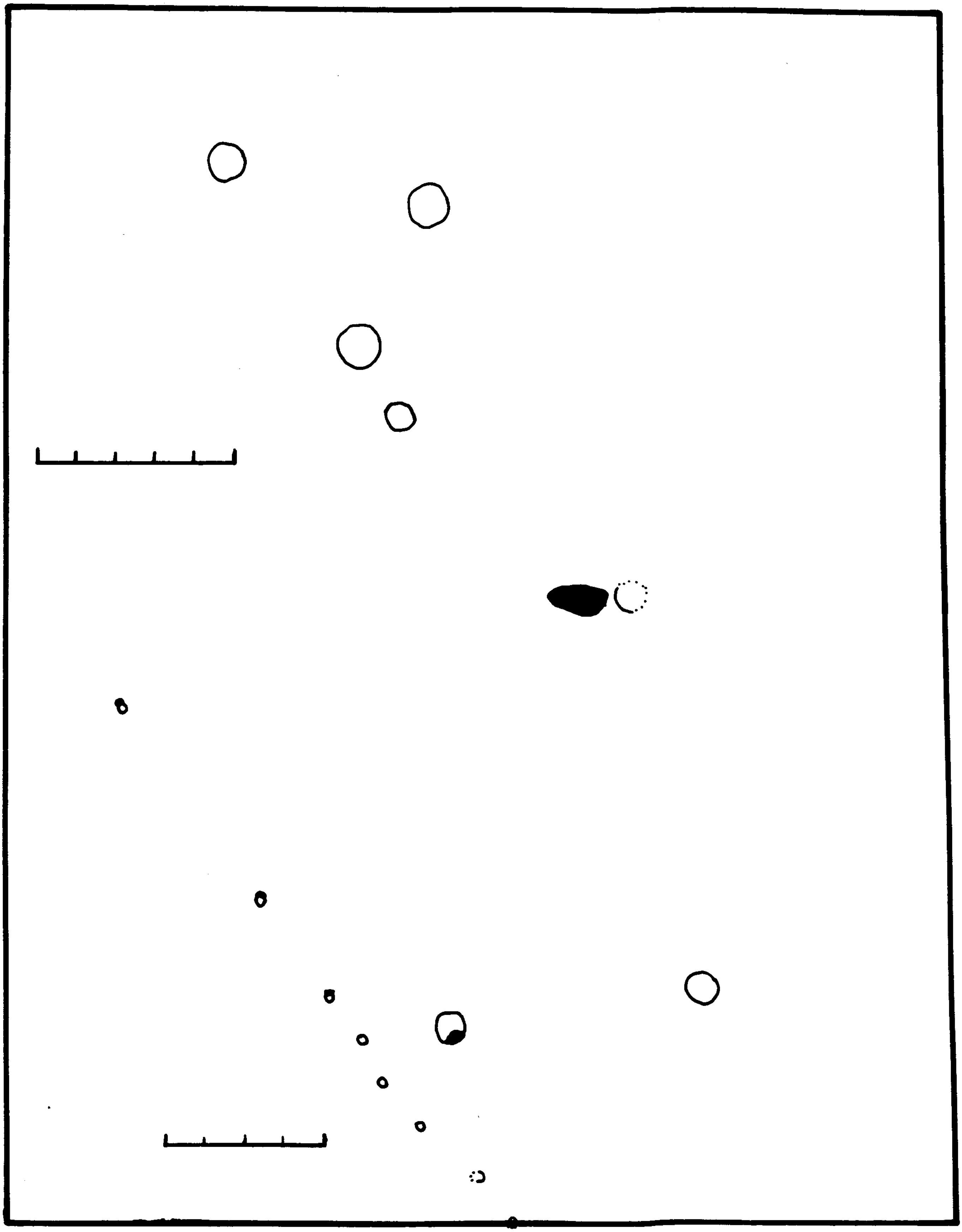


Top

Fig. 84 Feature 87-33 Postholes

Bottom

Fig. 85 Feature 88-22 Postholes



Appendix 5a
HUMAN REMAINS

TABLE 19
Burial Catalogue

NO.	L	TYPE	INTEG.	DEG	POSITION	PLCEMENT	ASSOCIATIONS	AGE	SEX	PATHOLOGIES	YR.BP
8701		PRIMARY	ARTICU	220	T FLEXED	L SIDE	AN BONE	O ADULT	MALE	SEN+PERS	.
8702		PRIMARY	ARTICU	270	STRAIGHT	BACK	AN BONE	INFANT	INDETER	NONE	.
8703		SECONDARY	SCATTR	.	INDETERM	RANDOM	ROCK PILE	O ADULT	MALE	PERSONAL	
8704		PRIMARY	ARTICU	195	T FLEXED	L SIDE	PIT	M ADULT	FEMALE	MULTI	2220
8705		PRIMARY	ARTICU	180	T FLEXED	BACK	PIT	O ADULT	FEMALE	SENILE	.
8706		PRIMARY	DISTUR	315	T FLEXED	L SIDE	NO ASSOC	M ADULT	MALE	SEN+PATHO	.
8707		PRIMARY	ARTICU	96	L FLEXED	R SIDE	NO ASSOC	INFANT	INDETER	NONE	.
8801		PRIMARY	ARTICU	260	L FLEXED	BACK	NO ASSOC	INFANT	INDETER	NONE	.
8802		PRIMARY	ARTICU	280	T FLEXED	R SIDE	PIT	O ADULT	FEMALE	MULTI	.
8803	A	PRIMARY	DISTUR	130	L FLEXED	R SIDE	BURIAL	INFANT	INDETER	NONE	.
8803	B	PRIMARY	ARTICU	88	T FLEXED	R SIDE	BURIAL	INFANT	INDETER	NONE	.
8804		PRIMARY	ARTICU	315	T FLEXED	BACK	PIT	M ADULT	FEMALE	SEN+PERS	.
8805		PRIMARY	ARTICU	325	T FLEXED	L SIDE	PIT	Y ADULT	FEMALE	NONE	.
8806		PRIMARY	ARTICU	260	L FLEXED	L SIDE	NO ASSOC	INFANT	INDETER	NONE	.
8807		PRIMARY	ARTICU	95	L FLEXED	L SIDE	NO ASSOC	INFANT	INDETER	NONE	.
8810		PRIMARY	ARTICU	310	L FLEXED	L SIDE	NO ASSOC	INFANT	INDETER	NONE	.
8811		ACCIDENTAL	SCATTR	.	INDETERM	UNKNOWN	NO ASSOC	INFANT	INDETER	NONE	.
8812		PRIMARY	ARTICU	210	T FLEXED	R SIDE	PIT+CAIRN	O ADULT	MALE	SEN+CULT	.
8813		PRIMARY	ARTICU	45	STRAIGHT	L SIDE	NO ASSOC	INFANT	INDETER	NONE	.
8814		PRIMARY	ARTICU	40	INDETERM	UNKNOWN	NO ASSOC	INFANT	INDETER	NONE	.
8815		SECONDARY	SCATTR	90	INDETERM	UNKNOWN	ROCK PILE	JUVENILE	INDETER	NONE	.

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Appendix 5b
SCATTERED HUMAN REMAINS

TABLE 20

Human Remains: Stratum 4 Layer 4

ELEMENT	AGE CLASS/(sex)												
Bone	In	Ch	Ju	YA	(f	(m	MA	(f	(m)	OA	(f	m)	Total
Tibia							1						1
Talus (right)							1	1					1
Total							1						1
MNI							1	1					1
Tooth													
Premolar							1						1
Total							1						1
MNI							1						1

TABLE 21
Human Remains: Stratum 4 Layer 5

	AGE CLASS/(sex)												
ELEMENT	In	Ch	Ju	YA	(f)	(m)	MA	(f)	(m)	OA	(f)	(m)	Total
Cranium							2	1		4	2	2	6
Frontal		2					1						1
Temporal (right)			1				1	1		1			3
Parietal (right)							1						1
Parietal (left	1			1									2
Maxilla							2						2
Mandible				1	1		4	2		1	1		6
Cervical Vert							1						1
Thoracic Vert							2						2
Rib (left)							6						6
Clavicle (right)							2	1	1				2
Clavicle (left)							1		1				1
Scaplua (right	2												2
Humerus (right	1						1						2
Humerus (left)							2						2
Radius (right)							2						2
Ulna (left)							1						1
Phalange (manus)							5						5
Lumbar Vert			2										2
Sacrum			1				2						3
Illium (right)	2												2
Pelvis (right)							3	1	1				3
Pelvis (left)							3	1	2				3
Femur (right)	2		1				6		1				9
Femur (left)							5	2					5
Tibia (right)							2						2
Tibia (left)	1			1			1						3
Fibula (right)							1						1
Fibula (left)							2						2
Calcaneus (right)							1						1
Metatarsal (left)							2						2
Total	9	2	5	3			62			6			85
MNI	2	2	1	1	1		6	2	2	5	2	2	17
Incisor		8		2			1			1			12
Canine		4	1							1			6
Premolar		8		3			1						12
Molar	1	4	1				3						9
Total	1	24	2	5			5			2			39
MNI	1	1	1	1			1			1			6

TABLE 22
Human Remains: Stratum 5

ELEMENT	AGE CLASS/(sex)												
Bone	In	Ch	Ju	YA	(f	(m	MA	(f	m)	O	(f	m)	Total
Cranium							1						1
Mandible							1						1
Humerus							1						1
Raduis (left)							1						1
Ulna (left)							1						1
Femur							3						3
Femur (right)							1						1
Femur (left)							2						2
Total							11						11
MNI							2						2
Tooth													
Premolar							1						1
Total							1						1
MNI							1						1

TABLE 23
Human Remains: Stratum 4 Layer 7

ELEMENT	AGE CLASS/(sex)												
Bone	In	Ch	Ju	YA	(f	(m	MA	(f	m)	O	(f	m)	Total
Parietal		2											2
Mandible		1											1
Humerus		1											1
Total		4											4
MNI		1											1

Appendix 6
MATRIX CONSTITUENTS

TABLE 24
Matrix Constituents: Stratum 3

PERCENTAGE BY WEIGHT

	Main Excavation Area					
	Unit 3 level 1	Unit 5 level 11	Unit 8 level 14	Unit 8 level 15	Average	Std.Dev
Shell	0.50	0.00	6.30	2.20	2.25	2.48
Bone	0.00	0.00	0.00	0.00	0.00	0.00
Organic	0.02	0.60	1.00	0.40	0.51	0.35
F.C.R.	2.50	4.20	7.40	0.00	3.53	2.69
Gravel	94.60	85.00	77.00	92.00	87.15	6.83
Unanalysed	2.30	10.00	8.00	4.50	6.20	2.99

	Secondary Excavation Area					
	Unit 51 level 1	Unit 51 level 2	Unit 52 level 1	Unit 52 level 2	Average	Std.Dev
Shell	0.10	0.20	0.00	0.00	0.08	0.08
Bone	0.00	0.00	0.00	0.00	0.00	0.00
Organic	0.20	1.40	0.10	1.80	0.88	0.74
F.C.R.	1.00	1.70	2.60	2.50	1.95	0.65
Gravel	86.40	43.90	92.30	48.50	67.78	21.74
Unanalysed	12.10	52.50	4.80	47.10	29.13	20.92

PERCENTAGE BY VOLUME

	Main Excavation Area					
	Unit 4 level 13	Unit 10 level 16	Unit 10 level 17	Unit 10 level 18	Average	Std.Dev
Shell	0.60	1.10	0.30	0.30	0.58	0.33
Bone	0.06	0.60	0.00	0.00	0.17	0.25
Organic	1.20	0.50	0.90	0.30	0.73	0.35
F.C.R.	1.20	0.00	1.10	0.00	0.58	0.58
Gravel	81.90	57.80	86.70	82.20	77.15	11.33
Unanalysed	14.90	40.30	11.40	17.70	21.08	11.32

TABLE 25

Matrix Constituents: Stratum 4 Layer 4

PERCENTAGE BY WEIGHT

	Main Excavation Area						
	Unit 3 level 12	Unit 7 level 10	Unit 8 level 10	Unit 8 level 1	Unit 8 level 1	Unit level 1	Unit 9 level 12
Shell	12.50	59.50	22.10	16.90	23.70	15.80	20.40
Bone	0.02	8.60	0.20	0.08	0.01	0.00	0.00
Organic	2.60	0.30	1.80	1.20	0.10	0.10	12.00
F.C.R.	1.40	8.50	24.50	4.60	2.30	3.90	0.30
Gravel	55.80	4.30	25.60	39.50	39.60	55.30	26.10
Unanalysed	27.60	18.50	25.40	37.40	34.00	24.70	40.90

	Average	Std.Dev
Shell	24.41	14.76
Bone	1.27	2.99
Organic	2.59	3.94
F.C.R.	6.50	7.75
Gravel	35.17	16.89
Unanalysed	29.79	7.33

PERCENTAGE BY VOLUME

	Main Excavation Area							
	Unit 4 level 10	Unit 4 level 1	Unit 10 level 10	Unit 10 level 11	Unit 10 level 12	Unit 10 level 13	Unit 10 level 14	Unit 10 level 15
Shell	20.80	11.50	15.30	20.10	19.60	6.50	10.60	6.90
Bone	0.30	0.08	0.70	0.20	0.20	0.20	0.10	0.10
Organic	0.30	0.50	0.15	1.90	2.00	9.90	2.80	0.30
F.C.R.	1.60	1.10	1.20	12.90	5.90	2.40	0.10	0.30
Gravel	46.00	36.90	17.80	19.00	30.80	19.10	33.00	38.20
Unanalysed	30.80	49.90	65.40	47.20	41.40	61.80	53.30	54.00

	Average	Std.Dev
Shell	13.91	5.49
Bone	0.24	0.19
Organic	2.23	3.04
F.C.R.	3.19	4.05
Gravel	30.10	9.80
Unanalysed	50.48	10.32

TABLE 26

Matrix Constituents: Stratum 4 Layer 5

PERCENTAGE BY WEIGHT

Main Excavation Area

	Unit 3 level	Unit 7 level 7	Unit 8 level 5	Unit 8 level 6	Unit 8 level 7	Unit 8 level 8	Unit 8 level 9	Unit 9 level 4	Unit 10 level 4	Average	Std.Dev.
Shell	36.60	42.30	12.00	47.50	37.80	34.00	37.10	45.50	27.60	35.60	10.09
Bone	0.10	0.04	0.80	0.60	0.90	2.00	0.40	0.06	0.05	0.55	0.60
Organic	2.20	0.50	0.80	1.70	0.60	0.80	1.90	4.00	0.05	1.39	1.14
F.C.R.	11.90	14.40	8.00	3.30	27.80	31.40	21.60	2.90	27.10	16.49	10.25
Gravel	20.60	16.80	14.10	12.50	7.70	10.50	21.90	16.80	19.60	15.61	4.52
Unanalysed	28.10	25.60	64.00	34.20	24.80	21.90	18.30	30.70	25.60	30.36	12.67

Secondary Excavation Area

	Unit 5 evel	Unit 51 level 2	Unit 51 level	Unit 5 level	Unit 51 level 5	Unit 51 level	Unit 5 level	Unit 51 level 8	Unit 51 level	Unit 51 level 10	Average	Std.Dev.
Shell	61.80	70.40	75.20	70.40	80.50	78.60	73.80	64.80	49.50	2.20	69.44	6.21
Bone	0.09	0.00	0.00	0.05	0.00	0.00	0.30	0.10	0.06	0.00	0.07	0.03
Organic	0.90	0.70	0.10	0.40	0.10	0.50	1.90	2.50	8.60	0.90	1.74	0.29
F.C.R.	6.40	2.40	0.10	1.50	1.60	1.80	2.50	3.10	5.80	6.70	2.80	1.96
Gravel	8.00	8.20	7.00	9.60	4.00	6.70	3.10	5.30	12.20	65.60	7.12	1.73
Unanalysed	22.60	18.10	17.40	17.80	13.70	12.10	18.10	23.90	23.50	24.30	18.58	3.37

PERCENTAGE BY VOLUME

Main Excavation Area

	Unit 4 level	Unit 4 level 8	Unit 1 level 3	Unit 10 level	Unit 10 level 5	Unit 1 level 6	Unit 10 level 7	Unit 10 level 8	Unit 10 level 9	Average	Std.Dev.
Shell	7.80	18.50	46.10	29.20	28.30	38.30	31.60	47.00	20.80	29.73	12.17
Bone	0.10	0.14	0.20	0.10	0.10	0.00	0.30	0.20	0.40	0.17	0.11
Organic	0.20	0.80	4.70	0.40	0.20	0.60	1.20	0.70	8.30	1.90	2.62
F.C.R.	6.10	2.80	0.80	29.50	11.50	2.20	1.40	20.30	15.00	9.96	9.43
Gravel	45.70	42.90	11.50	11.40	10.50	9.10	13.30				

TABLE 27
Matrix Constituents: Stratum 4 Layer 6

PERCENTAGE BY WEIGHT
Secondary Excavation Area

	Unit 51 level 1	Unit 51 level 2	Unit 51 level 3	Unit 51 level 4	Unit 51 level 5	Unit 51 level 6	Unit 51 level 7	Unit 51 level 8	Averag	Std.Dev
Shell	62.60	67.00	63.30	71.60	67.00	83.50	72.30	70.50	69.73	6.20
Bone	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.08	0.02	0.03
Organic	0.06	0.90	0.15	0.10	0.30	0.70	1.50	0.50	0.53	0.46
F.C.R.	6.90	3.20	10.50	3.60	11.20	0.40	5.20	11.10	6.51	3.83
Gravel	4.80	6.40	5.50	5.90	4.20	3.80	4.50	2.70	4.73	1.12
Unanalysed	25.30	22.90	20.50	18.50	17.10	11.40	16.30	14.90	18.36	4.18

TABLE 28
Matrix Constituents: Stratum 5

PERCENTAGE BY WEIGHT
Main Excavation Area

	Unit 4 level 3-4	Unit 8 level 2	Unit 8 level 3	Unit 8 level 4	Average	Std.Dev.
Shell	7.10	12.30	17.00	3.70	10.03	5.06
Bone	0.20	0.00	0.00	0.10	0.08	0.08
Organic	0.20	0.30	1.40	0.80	0.68	0.48
F.C.R.	37.70	0.09	12.80	11.50	15.52	13.73
Gravel	27.00	51.30	38.20	36.50	38.25	8.66
Unanalysed	27.50	35.70	30.50	47.10	35.20	7.47

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TABLE 29
Matrix Constituents: Stratum 4 Layer 7

PERCENTAGE BY WEIGHT

	Main excavation area					
	Unit 3 level 3	Unit 3 level 5	Unit 7 level 3	Unit 8 level 1	Averag	Std.Dev
Shell	60.80	16.20	24.30	57.50	39.70	19.69
Bone	0.07	0.20	0.00	0.00	0.07	0.08
Organic	2.80	1.60	5.40	4.20	3.50	1.43
F.C.R.	0.50	19.30	16.20	3.20	9.80	8.08
Gravel	10.40	26.20	27.40	6.70	17.68	9.23
Unanalysed	27.00	39.00	26.30	28.20	30.13	5.17

	Secondary excavation area				
	Unit 51 level 1	Unit 51 level 2	Unit 51 level 3	Averag	Std.Dev
Shell	55.10	51.60	50.30	52.33	2.03
Bone	0.07	0.60	0.00	0.22	0.27
Organic	2.70	1.80	3.80	2.77	0.82
F.C.R.	3.00	6.50	2.90	4.13	1.67
Gravel	5.30	10.30	7.10	7.57	2.07
Unanalysed	33.80	29.00	35.70	32.83	2.82

PERCENTAGE BY VOLUME

	Main excavation area					
	Unit 4 level 2	Unit 4 level 3	Unit 10 level 1	Unit 10 level 2	Averag	Std.Dev
Shell	13.20	17.20	20.20	25.80	19.10	4.60
Bone	0.00	0.00	0.00	0.10	0.03	0.04
Organic	1.80	0.20	13.10	6.30	5.35	5.00
F.C.R.	4.60	0.40	7.90	0.70	3.40	3.08
Gravel	44.30	39.20	11.90	13.00	27.10	14.77
Unanalysed	35.80	42.90	46.60	54.20	44.88	6.64