Agricultural Production at a Late Classic Maya Household:
Off-Mound Excavations at the Medicinal Trail Site, Belize

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ABSTRACT

The organization of agricultural production has been proposed as a key variable for understanding changes in ancient Maya economies and livelihoods in Belize and elsewhere. My research examines the role of Maya farmers by investigating a Late Classic (650-850 CE) household, Operation 13 (Group C), at the Medicinal Trail site, a small hilltop agricultural site. This household is located roughly six kilometers east of La Milpa, the third largest site in Belize and a large regional center. This household is associated with numerous features such as agricultural terraces and small water reservoirs, or *pozas*. I compare the artifacts and spatial layout of this household with other households at the site in order to achieve an understanding of small households in agricultural production.

To examine the economic activities of household residents, I investigated the locations of activity areas, trash disposal areas, and garden areas on and off the household's courtyard platform. By analyzing the locations and types of artifacts within the houselot, and by examining botanical data at the site, I contribute to an understanding of the role of this household in the economy of Medicinal Trail and its larger network.

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CHAPTER I
INTRODUCTION

For the ancient Maya of northwestern Belize, the Late Classic period (650-850 C.E.) was a time of intense sociopolitical and economic development, followed by large-scale population declines for much of the Lowlands. Recent scholarship argues that drought, as well as deforestation and agricultural over-intensification, resulted in severe erosion that made it impossible for the region to continue to support large populations (Dunning *et al.* 1999). Other scholars regard deforestation and erosion as a localized or secondary contributing factor to population declines. Much scholarship focuses on identifying specific ecological indicators that would have significantly challenged Lowland populations. It is important, however, to understand the economic, political, and social landscape of each region in order to appreciate the role ancient Maya agriculture played during this critical period of history and to understand the relationship between environmental change and population losses in the Lowlands. Surveys and excavations of elite households have contributed to an understanding of agricultural production in northwestern Belize, but limited research has been conducted on commoners' or farmers' households and associated agricultural features.

Household archaeology is particularly appropriate for understanding these economic relationships because households "are the level at which social groups articulate directly with economic and ecological processes" (Wilk and Rathje 1982:618). Research on small individual households, especially those found in association with agricultural features, provides an important complement to survey and excavation of elite, or high-status, households because it provides specific information about the lives of commoners. When viewed more widely, "household perspectives can help archaeologists understand people, their everyday lives, and the

external socioeconomic and political roles, impact, integration, and independence in the broader arena of ancient societies" (Robin 2003:308).

The Medicinal Trail Site

My research involves the excavation and analysis of an ancient Maya household, Operation 13 (Group C), at a small hilltop site called the Medicinal Trail site, located between six and eight kilometers east of La Milpa, one of the largest sites in Belize (Hyde and Valdez 2007:15). The household, located about 50 meters south of one of the largest household groups at the site, is associated with numerous agricultural features such as terraces and small water reservoirs, or *pozas* (Figure 1).

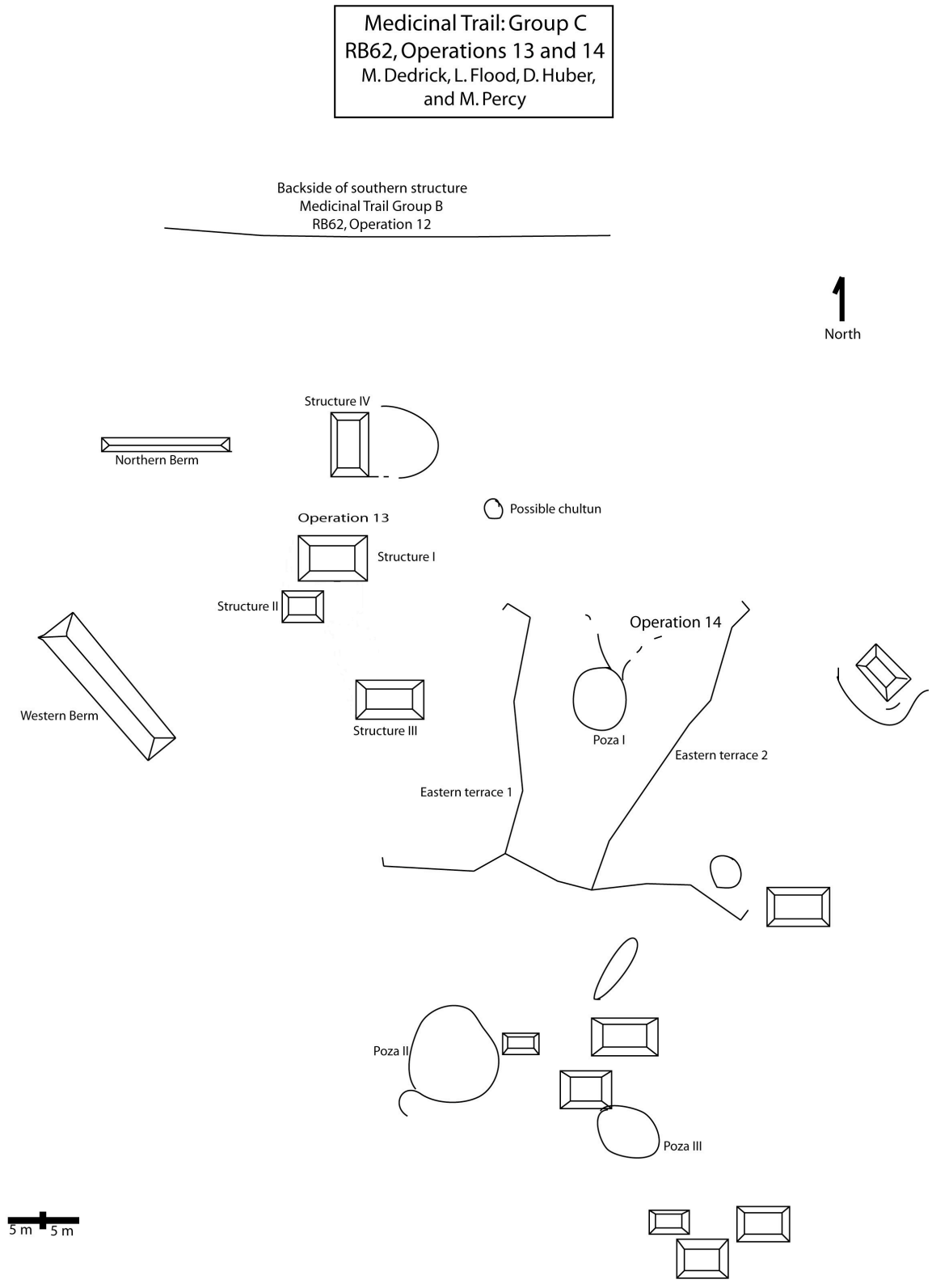

Figure 1: Map of the Medicinal Trail Site South of Group B
Prepared by Madelyn Percy, Maia Dedrick, Lauren Flood, and David Huber

In northwestern Belize, rural agricultural sites consist of larger, more economically prosperous household groups surrounded by small household groups, which were located near visible agricultural features. The role of these smaller households in the agricultural production of agricultural sites has not been studied in depth. Understanding their role is crucial for reconstructing the economic and political landscape of northwestern Belize. Although most analyses of environmental degradation and economics have been projected and characterized for whole regions, my research will develop a specific case study of how the residents of a farming household were using their resources, engaging in the local economy, and organizing their residential space.

The focus of my research will be to identify activity, disposal, and garden areas at Operation 13 of the Medicinal Trail site by analyzing the types and locations of artifacts and architecture within the household. I will then compare my findings with data from other households at the site. This analysis will allow me to assess the role of Operation 13 in the economy of the Medicinal Trail site and the larger region.

CHAPTER II
ENVIRONMENTAL AND CULTURAL CONTEXT

The environmental context of this study is extremely important because local environmental conditions and resources play a large role in a region's economic organization. The most important environmental factors to this study include the patterns of water scarcity in the region as well as the microenvironments that result from different elevations in the region. Water availability is a critical consideration in determining agricultural strategies and therefore is important background information for an analysis of farmers' lives. Many scholars believe that the presence of microenvironments in this region allowed for specialization and larger heterarchical trends in the region. In regions where resources such as fertile soil, high-quality chert, or clay are found only within restricted areas, surplus production becomes a likelier possibility. For these reasons, a brief description of the regional environment will be included here.

The basic cultural timeline offered for this region provides the reader with a context for the Late Classic, the time period of focus for this research. Because there was a long history of occupation before the Late Classic, it is important to understand environmental changes and economic strategies of earlier times in order to understand Late Classic approaches.

Local Environment

The Three Rivers Region encompasses areas of Mexico, Guatemala, and Belize that make up the watersheds of the three major tributaries of the Río Hondo (Adams 1995b as cited by Dunning *et al*. 2003:14, Figure 2). In the Three Rivers Region, the dry season runs from January through April, while the wet season runs from May through December (Kunen 2001:66).

The dry season could create severe water shortages, especially because water runs quickly through soil into the karstic[1] bedrock of this region (Dunning *et al*. 2003:14). In the dry season, any water in the soils may not be available to plants (Brokaw and Mallory 1993:23 as cited by Kunen 2001:65). This may explain the variety of water management features at the site, particularly the many small depressions that may have been used as reservoirs. Another important attribute of the karstic limestone bedrock is that it can expose deposits of chert, a material useful for tool production and platform construction (Dunning *et al.* 2003:16).

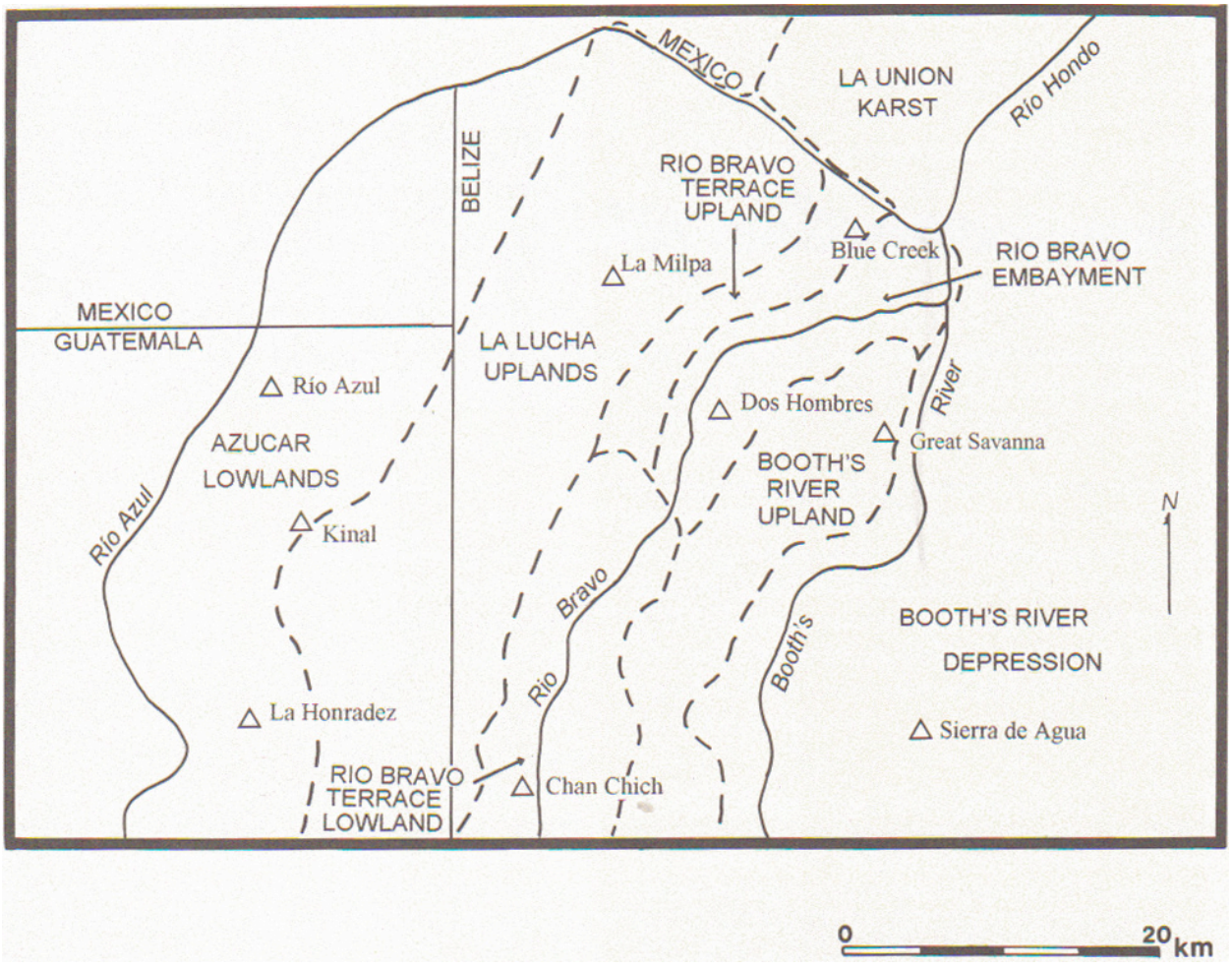

Figure 2: Map of the Three Rivers Region
(From Dunning *et al.* 2003:15)

[1] Karstic bedrock is limestone that has been weathered through chemical processes. Water flows quickly through this bedrock.

Elevation in this region occurs as a result of several karstic escarpments. The Medicinal Trail site is located on one of these escarpments, the La Lucha Uplands. *Bajos* in this region are areas of low-lying land that hold standing water in the rainy season. The vegetation in *bajos* consists of short trees and shrubs, because the soils and water content cannot support tall forests (Kunen 2001:68). A bit higher in elevation in this region are transitional forests, which occur on slopes between the hills and *bajos*. The escoba palm (*Crysophilia argentes*) often occurs at a high density within these forests (Kunen 2001:68). The highest elevations in this region contain upland forests, which make up the environmental setting for the Medicinal Trail site.

Soils of the upland forests are shallow, but fertile and well drained, with rich organic matter (Whitaker 2007:12). Though the soils are shallow and not great for mechanized agriculture, they could have been cultivated successfully by hand. The soils are mostly Mollisols, varying in pH from 7 to 8 (Fedick and Ford 2000:20). Phosphorous is the limiting nutrient of the soil, while soil erosion is the greatest threat to cultivation. In order to counter soil loss, many terraces were built and can be found across the region (Bullard 1960, Dunning *et al.* 1999, Farnand 2002, Guderjan 2007, Guderjan *et al.* 2003, Hughbanks 1998, Kunen 2004). While most of the upland forest would have been cleared at the time of Maya occupation, the forest canopy of the upland forest is currently 15-20 m high in this region and includes many economically valuable tree species (Kunen 2001:67).

Local Cultural History

The Maya area extended from Chiapas, Mexico, south to Honduras, and included all of El Salvador, Guatemala, and Belize (Figure 3). This territory can be broken down into the Lowlands and the Highlands, with lower elevations characterizing the north and east and

mountains located in the west and south. Within the Lowlands, areas have been classified as northern, central, and southern Lowlands. The Three Rivers Region is contained within the central Maya Lowlands.

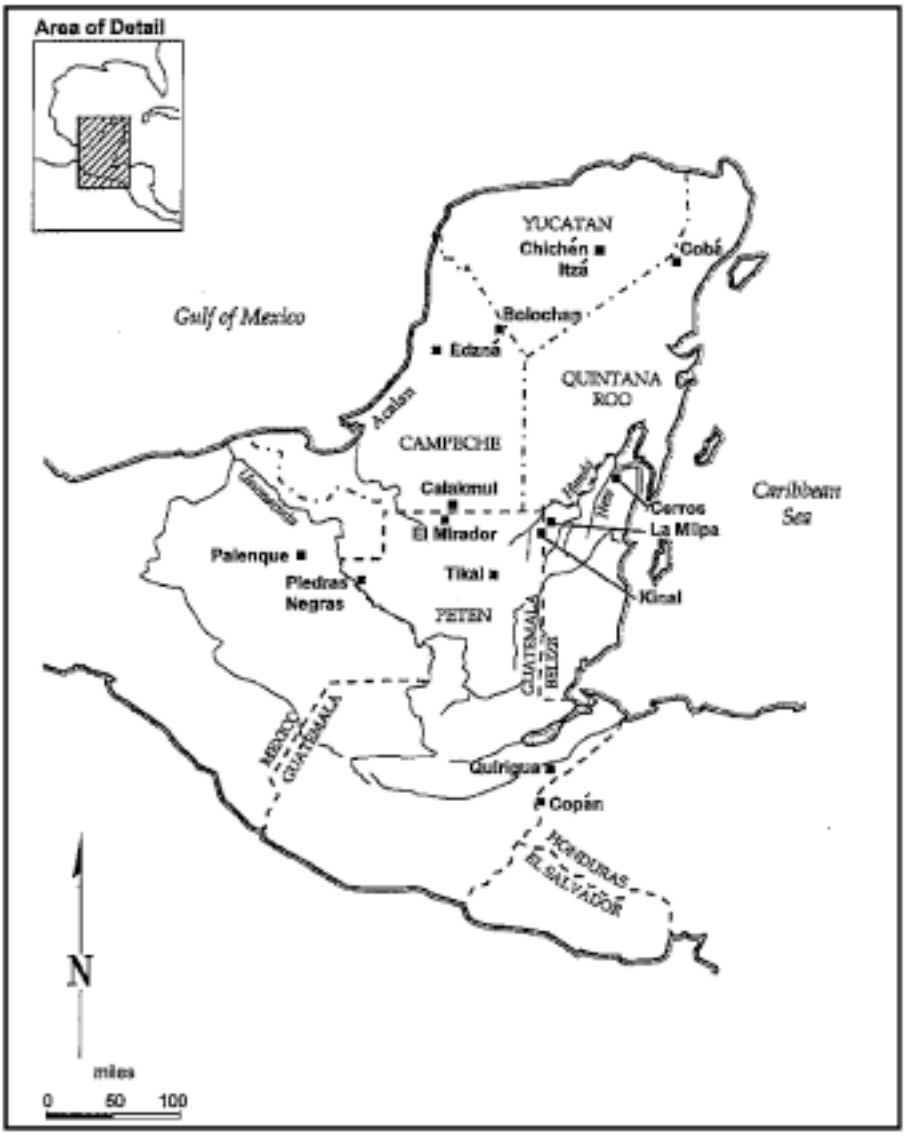

Figure 3: Map of the Maya Area
(From Scarborough 2008:27)

The next section presents the periods of Maya occupation of La Milpa and its surroundings, beginning at about 400 BCE (Table 1). This chronology will provide a context for

the type of population growth experienced in the Late Classic and provide insight into other time periods during which the Medicinal Trail site was occupied.

Late Preclassic. In the Late Preclassic (400 BCE-250 CE), population growth was widespread in the region, with evidence for occupation found at many sites throughout the Programme for Belize lands, including at La Milpa (Hammond and Tourtellot 1993 as cited by Trachman 2007:22) and at the Medicinal Trail site (Hyde and Atwood 2007). Urbanization and monumental architecture appeared at this time (Dunning *et al.* 1999:652). This may also have been the time that divine kinship ideology began among the Maya (Schele and Friedel 1990 as cited by Dunning *et al.* 1999:653). According to pollen studies, deforestation and maize cultivation were already widespread at this time, causing extensive erosion (Dunning *et al.* 1999:653).

Early Classic. In the Early Classic (250-600 CE), population densities became greater, although many people were moving to locations outside main city centers (Dunning *et al.* 1999:655, Sullivan 2002:203). Ceramics included many luxury vessels imported from outside the region (Sullivan and Sagebiel 2003:27). This may have been due to a change in the institutional control of resources. Elites may have begun to control the available water via reservoirs and check dams (Dunning *et al.* 1999:656). This control over water continued to a much greater extent in the Late Classic. From about 550-750 CE, many sites were abandoned (Dunning *et al.* 1999:657).

Late Classic. When growth began again at about 750 CE, it proceeded at a tremendous rate. There was an increase in the number of sites and amount of monumental construction (Sullivan 2002:212). In the Late Classic, architectural norms and site layout became more formalized (Houk 1996 as cited by Dunning *et al*. 1999:657). Ceramics consisted of more local

utilitarian wares and fewer prestige vessels compared to early time periods (Sullivan 2002:212). Ceramics may also have been produced at a more local scale (Rice 1987 as cited by Sullivan and Sagebiel 34), as high-quality ceramics have been found at large city centers as well as at rural sites (Sullivan and Sagebiel 2003:35). At this time, many terraces and other agricultural features were constructed, seemingly in a short period of time and perhaps due to serious concerns about soil erosion and drought (Dunning *et al*. 1999:658). The large population losses during and after the Terminal Classic (800/850-900 CE) may have been a result of environmental degradation.

Time Period	Dates
Postclassic- Late	A.D. 1200-1500
Postclassic- Early	A.D. 850/900-1200
Terminal Classic	A.D. 800/850-900
Late Classic	A.D. 600-800/850
Early Classic	A.D. 250-600
Late Preclassic	400 B.C.- A.D. 250
Middle Preclassic	1000-400 B.C.
Early Preclassic	1800-1000 B.C.

Table 1: Chronological Sequence for the Three Rivers Region
(Adapted from Trachman 2007:16)

CHAPTER III
MAYA SETTLEMENT PATTERNS IN NORTHWESTERN BELIZE

This section will address economic relationships in the Three Rivers Region at multiple scales in order to provide a context for the activities of a household in the region. While my research will not directly contribute to our understanding of these regional economic dynamics, it is important to keep these relationships in mind in order to ask relevant questions when performing household research. This section will present results from regional survey data and other research on the economic relationships between sites in the region. It will also provide examples of sites that pursued specialized economic activities that were important for regional trade, address the status of the Medicinal Trail site within its region, and present a possible model for intrasite household relations at agricultural sites.

Hierarchy and Heterarchy

One of the most important, yet difficult, questions about Maya resource exploitation that archaeologists have been trying to answer is: What was the organization of this resource exploitation and agricultural production within sites and regions (Rice 1993:45)? This question requires us to determine the extent of agricultural intensification within sites and regions. Specific forms of economic organization within and between sites may have facilitated the intensification of agriculture to create crop surpluses. For example, if a community specialized in agricultural activities in order to produce crop surpluses for trade, this community might depend on other communities specialized in ceramics, tools, or textiles in order to be able to focus on agricultural production.

Most of the research performed to determine economic organization in northwestern Belize has focused on interregional interactions, with survey as the primary field method (Guderjan 2007; Guderjan *et al.* 2003; Lichtenstein 2000; Hageman 2004; Hageman and Lohse 2003; Kunen 2004; Lohse 2004; Tourtellot *et al.* 2003). Debate has centered on the degree to which these relationships were hierarchical or heterarchical (Scarborough *et al.* 2003). Some scholars argue that the site of La Milpa was the primary locus of specialization and trade for all sorts of goods and the source of authority for smaller sites within a five-kilometer radius, an area they consider to be part of a single community with controlled resource distribution (Tourtellot *et al.* 2003). Others prefer a more heterarchical model in which some of the smaller sites were specialized, developing economic activities based on access to localized resources and the settlement's location within microenvironments (Scarborough and Valdez 2003). While these scholars emphasize different aspects of the regional economy, hierarchical and heterarchical approaches are not a real dichotomy, because some aspects of both could co-exist and be relevant in understanding this zone.

Marcus (1983) discusses both Mesoamerican regions in which the economy was specialized at the level of regional center (i.e. Teotihuacan) and regions that were specialized by village (i.e. Valley of Oaxaca). These regions provide good examples of the concepts of hierarchy and heterarchy, respectively. Much of the research used to distinguish between these frameworks derived from household excavation. Finds at this level of economic interaction can answer questions about the degree of household and site independence versus interdependence within a region. If households at villages across a region mass-produce goods for wide distribution, we would expect greater interdependence among sites. Information about previous research on specialized sites in the Three Rivers Region can be found in the next section.

Resource-Specialized Communities

Scarborough and Valdez (2003:5) have proposed a model of resource-specialized communities in which each small community specialized in one or two primary economic activities in order to trade with other sites to acquire their specialized goods. They propose examples of types of resource-specialized communities in this region, including *bajo*, terrace, and aguada communities. One example of a *bajo* community is Guijarral, a site further east from La Milpa than the Medicinal Trail site. Here, many agricultural terraces and reservoirs have been found at the margins of a *bajo* surrounding residential architecture that has begun to be excavated (Hageman 2004, Hageman *et al.* 2007). At this point, there is little concrete evidence for the aguada community category, although it is likely that communities with natural water sources would take advantage of that resource in this area prone to drought.

There are some sites in northern Belize that have been identified as specialized in chipped stone tool manufacture. Colha, the largest of these, with the highest quality chert, was a site producing specialized chipped stone tools from the Preclassic through the Late Classic (Shafer and Hester 1991). Lewis (2003) provides information on two sites with specialized chipped stone tool production in the Late Classic in the Three Rivers Region: Cabeza Verde and El Pedernal. Cabeza Verde was specialized at the household level, seeming also to pursue some agricultural production. The production intensity of chipped stone tools was low to moderate, with a great number of households producing these items (Lewis 2003:132). El Pedernal contained a limited number of producers with tremendously structured and productive output from the few workshops present (Lewis 2003:133). The specialists seemed to have attained elevated status within the community based on their access to elite goods (Lewis 2003:124).

The excavations of Hageman and Lewis show the importance of studying small households. Research on site specialization requires the comparison of sites and environments in a region. However, one can look for key indicators of such specialization at the level of household research. Household excavations will provide comparative examples of economic strategies, providing evidence for specialized resource use and economic relationships on a scale that demonstrates the variability in people's lives and takes into account the important roles of farmers and other commoners.

The Medicinal Trail Site in Context

It is important to consider here the relative sizes and presumed importance of sites in this region. As stated earlier, La Milpa was the largest center in this region, and it was located a mere six to eight km from the Medicinal Trail site. In addition, medium-sized centers have been found throughout the region, containing "pyramidal buildings and range structures, palaces, ballcourts, stelae and sacbe" (Rodriguez 2008:37). Of the sites mentioned in this thesis, Dos Hombres is considered one of these secondary centers. These centers were spaced across the landscape at distances no more than 10-15 km apart (Rodriguez 2008:38). In addition, tertiary level centers have been identified within the region, and these sites seem to have served as mid-level administrative centers (Rodriguez 2008:39). Each tertiary center was within 4 km of a secondary center. Finally, rural sites were the smallest and most numerous type of site in this region. The Medicinal Trail site was one of these rural and most common sites. Other similarly rural communities contained at least one large household group with plastered surfaces, benches, shrines, cut masonry architecture, and prestige items (Rodriguez 2008:50). However, Medicinal

Trail seems to have had more in common with rural communities pursuing agriculture, and specifically those located on hilltops. This site category will be discussed below.

The Corporate Group

One of the microhabitat adaptations detected via surveys conducted in the region is a hierarchical settlement pattern that may represent ancient corporate groups. A corporate group jointly owns economic resources such as agricultural land and management features, although the power to control these resources is held by only a few people in the group (Hageman and Lohse 2003:109). Corporate groups often form as a result of resource restriction (Hageman and Lohse 2003:109). In this region, the corporate group would probably have consisted of a lineage, with the head of the lineage controlling the economics of the group. In fact, "lineages have been described as unilineal descent groups that corporately own inalienable economic resources, usually agricultural land" (Hageman 2004:64). In addition, "Households within the lineage are ranked in relation to other households" (Freedman 1958:34 as cited by Hageman 2004:64). Rank depends on descent from a common venerated ancestor. It is widely thought, and has been ethnohistorically documented, that the ancient Maya practiced ancestor veneration, and that lineage heads were buried in eastern temple structures of elite households (Tozzer 1941:130 as cited by Hageman 2004:66). The households of lineage heads would also host feasts in celebration of the ancestors, as documented ethnographically (Nash 1970:213; Vogt 1969:674 as cited by Hageman 2004:66). In this and other ways, lineage groups would maintain strong intragroup identity.

Settlement Patterning of Agricultural Sites in the Three Rivers Region. A pattern of "first-tier" and "second-tier" households exists among small sites with agricultural features in the

region (Lohse 2004). Households in the Maya area often were made up of two or more structures surrounding a central courtyard. At the Medicinal Trail site and other hilltop agricultural sites in the region, the largest households at a site have four or more structures with complex basal platforms. These households, called first-tier, contain the main ceremonial structures and the most traded elite goods at a site, and may have been occupied by lineage heads, as suggested above. Scholars have suggested that residents of these households oversaw local agricultural production (Hageman and Lohse 2003:116). Hageman and Lohse give the example of Las Terrazas, a first-tier household associated with a box terrace. Because box terraces have been interpreted as the remains of seedbeds, the authors argue that the position of this group would have allowed residents to supervise the transfer of plants from one location to another (Hageman and Lohse 2003:116).

Clustering around first-tier households (and making up the next largest structural groups at the sites) are second-tier households. These households are often made up of two or three structures with a single basal platform and do not have eastern ceremonial structures. It is likely that the second-tier households participated in the ritual ceremonies of first-tier households. Second-tier households are often more directly spatially associated with agricultural management features at the site. While it is clear that second-tier households must have had close ties to agricultural production, our understanding of their role in the economic system is limited. If this settlement pattern suggests a lineage-based corporate group, these second-tier households would represent the next-ranking family in the lineage.

At the Barba Group, Hageman found intensive terracing and drainage features associated with households in the hierarchical formation described above. He also found household features that seem to support the conclusion that a lineage-based corporate group organized

economic production. First, he found consistent domestic architecture across households and found that mound length was similar for households at the site, with one household standing out as the largest. This household had a pyramid-like shrine that contained two burials, including an older male with five complete ceramic vessels, plausibly the lineage head (Hageman 2004:67). In addition, this household contained twice as many serving vessels when compared to the other households at the site (Hageman 2004:68). This research provides some examples of archaeological signatures that can be found to support corporate group organization. Hayden and Cannon (1982:152, Appendix A) have outlined additional archaeological signatures for corporate groups. Further comparisons between households at agricultural sites and an increasing emphasis on smaller households may continue to clarify economic relationships such as those described above.

This common site layout, in which first and second-tier households are found in close proximity but differ in size and status, seems to be unique to agricultural sites, and often to those on hilltops, although this settlement pattern has also been found near *bajos*. One survey found that the community with the greatest evidence for agricultural production was also the one with the greatest range of social strata as interpreted from the range of house sizes (Guderjan *et al*. 2003). This seemingly hierarchical social structure seems to be particularly characteristic of agricultural settlements. Lohse found a pattern in which there were groups of settlement near low *aguadas* in which residences did not seem to be ranked (Lohse 2001:151). These settlements contained field walls between residences, which are not present in the pattern described above (Lohse 2001:153). The consistency of the corporate group layout suggests the possibility of determining distinct economic roles played by various households within the settlement hierarchy. If the Medicinal Trail site represents a corporate group, then a thorough

understanding of the relationships between households at the Medicinal Trail site will have broader implications for the study of agricultural organization in the region.

Kunen (2004) conducted platform excavations of small house groups and associated terraces in low areas of the region, known as *bajos*, for her dissertation. She also collected survey data that allowed her to interpret the use of different zones within *bajos* for agriculture or residence. Kunen (2004) found that the residential *bajo* sites she examined were more than twice the size of those sites studied and proposed to be corporate groups by Hageman and Lohse (2003). Many residential areas she examined were removed from agricultural management features (2004:95). However, she noted similarities between large households at *bajo* sites and those at sites examined by Hageman and Lohse, "in that (a) they were the largest, most formal architecture in their settlements; (b) each featured a shrine on the east side of the plaza; and (c) each formed an architectural node around which smaller residential groups clustered" (Kunen 2004:94). She also believes that community founders controlled the natural resource base (Kunen 2004:95). Her assessment parallels that of Hageman and Lohse, but outlines the particular aspects that make *bajo* communities unique. There may be some comparisons between *bajo* and hilltop sites that could be useful in addressing regional trade and the organization of economic activities.

As part of the conclusion to his dissertation, Lohse poses questions that remain about hilltop agricultural sites in this region and that might be explored through my research, such as, "Did middle- or lower-status households maintain certain roles within a corporate group economic system?" (Lohse 2001:340). Other questions he asks point to subquestions of that one, all of which interest me in my analysis of Operation 13 at the Medicinal Trail site, such as, "Did access to cultivable land and other local and non-local resources vary directly according to a

household's status within a corporate group?" And finally, "what role did these groups play in the distribution of non-local resources across an entire community?" (Lohse 2001:340). Research at the Medicinal Trail site will begin to answer these questions by examining the possible roles of second-tier households at these sites and working to determine, over time and space, "the degree of elite control and commoner autonomy rather than assuming absolute elite control" (Marcus 2004:263).

CHAPTER IV
MAYA HOUSEHOLD ARCHAEOLOGY IN NORTHWESTERN BELIZE

While archaeologists can only interpret the material remains of households, there are social and behavioral components of households (Wilk and Rathje 1982:618). Archaeologists can attempt to infer these other components through ethnographic evidence, ethnoarchaeological modeling, and comparison between sites. This section will provide an introduction to this evidence and its importance to the present research. To begin, it will address developments in approaches to household archaeology and the identification of productive activities. Ethnographic information will be presented that addresses productive activities performed inside and outside of structures as well as social and economic organization within and between households. A review of the structure and archaeological signatures of Maya houselots will be presented based on ethnographic, ethnoarchaeological, and archaeological accounts. Finally, I will describe the household archaeology that has been conducted in the Three Rivers Region that is most relevant to my research.

Approaches to Household Archaeology

Households are families or extended families that are "dynamic, inherently flexible entities capable of adjusting to new economic opportunities and environmental circumstances" (Johnston and Gonlin 1998:157). All households perform the following activities: production, distribution, transmission, reproduction, and co-residence (Wilk and Rathje 1982:621; Ashmore and Wilk 1988:4). These can be identified through the analysis of spatial patterning and definition of activity areas and groups (Ashmore and Wilk 1988:5). By examining activities, archaeologists can contribute "both to understanding the organization of ancient societies and to

answering important anthropological questions about how changes in household activity are related to economic, ecological, and larger-scale social changes" (Ashmore and Wilk 1988:5). While the study of households is important because it involves the basic unit of economic involvement, households often compete with other levels of social organization such as corporate groups and allegiances to large, regional centers (Wilk and Rathje 1982:621). Therefore, it is important to keep in mind *several* levels of organization when interpreting household evidence.

Johnston and Gonlin (1998) outline three theoretical perspectives that have dominated the discourse about household archaeology in the Maya area. These are the cultural, functional, and social approaches. The cultural approach emphasizes the ability of a household to provide insights into ideology and culture as they appear in the daily life of a household. Studies using the functional approach attempt to identify the functions of structures within a household based on architecture and associated artifacts. This has been much more common than the cultural approach in the Maya area, but identifying function can be a difficult task; one has to consider the multi-use nature of many artifacts and spaces in commoner households. The social approach shifts the emphasis from the house to the house *and* its surroundings. It considers the economic and ecological factors to which household structure and function adapts, providing a more useful framework for addressing small households. According to Johnston and Gonlin (1998:159), an emphasis on off-mound excavations has grown in household archaeology with the development of the social approach (Robin 2003:312). They argue that in tropical environments, the *outdoor* areas were the loci for most productive activities. In a survey of recent developments in archaeology, Robin (2003:314) noted that "much of our archaeological evidence for what households do and the social, political, economic, and ideological implications of household life

come from areas around houses." This thesis will combine aspects of the social approach with elements of the functional approach.

Production "is human activity that procures resources or increases their value" (Wilk and Rathje 1982:622). Wilk and Rathje (1982:622) distinguish between linear and simultaneous labor, which require an individual or group effort, respectively. Within simultaneous labor, tasks can be complex or simple. A simple task requires many people to perform the same task, while a complex task requires specialized roles for a single objective. As an example, agricultural and architectural labor, both of which were important tasks at the Medicinal Trail site, often require simple cooperation of large numbers of people. Modern Kekchi Maya swidden farmers were found to cultivate a single large land plot, requiring the work of many small households that came together at one time to do this work (Wilk 1981 as cited by Wilk and Rathje 1982:623). On the other hand, complex tasks such as cash-crop production have been found to result in larger households (Wilk and Rathje 1982:625). A consideration of the relationship between tasks, required labor, and household form may help to identify the nature of non-elite working roles and the relationship between labor and household size at sites such as the Medicinal Trail site.

Household Activities and Relationships: Ethnographic Information

Ethnographic data provide examples of how households made economic decisions, performed activities, and interacted socially. According to Wauchope (1938:154), a house site was chosen in order to avoid "poor drainage, outcrops of rock, and deep gullies." Redfield (1934:34) added that a house would be placed in a location that could be leveled easily. Building occurred between the months of January through April, since those were the driest months and

farming was less demanding during that time of the year (Vogt 1969:91). Vogt (1969:130) explained that a son might build a house on "a plot of land across the terrace from his father's house, or on a nearby plot of land his father gives him." This and other ethnographic information as well as archaeological evidence compiled by Tourtellot (1988) demonstrate that expansion of a household was tied more to the growth of a family, and specifically to offsprings' marriages, than to economic factors.

Locations in which trees were large and abundant, and especially where palms grew, were identified as good places for *milpas* (Redfield 1934:43). Farmers planted twice as much maize as they could eat in order to sell any additional crops (Redfield 1934:51). The bulk of daily calories came from maize (Steggerda 1936, Steggerda 1941, Vogt 1969:35). The domestic group consisted of "kinsmen living together in a house compound and sharing a single maize supply" (Vogt 1969:127). This demonstrates the great importance of the household unit for agricultural production.

Wisdom (1940) provided information about an agricultural community in Guatemala and the relationships between households producing agricultural goods. He documented the types of activities performed outside the house (mostly food processing) as well as the types of crops grown, items traded, and tools used. Wisdom (1940:246) indicated that sites consisting of multiple houses were lineage groups, which functioned as corporate groups. Households within a lineage were dependent and acted "as a co-operating group in performing all their important social, economic, and religious activity" (Wisdom 1940:246). Households often performed cooperative agricultural labor, during planting or harvest, for example (Wisdom 1940:44). In addition, households and other structures were built cooperatively (Wisdom 1940:278, Redfield 1962:77). According to the research of Redfield (1962:77), men performed work-exchange.

Cooperative labor and its results, such as the houses in which people lived, were under the direction of the lineage head (Wisdom 1940:278). The lineage head also owned the extended family's ceremonial objects and controlled who got to use which land (Wisdom 1940:279).

Wisdom noted that lineage groups were mostly self-sufficient, although they imported clothing. He described the markets, at which fruits, vegetables, sugar, tobacco, musical instruments, copal, pottery, and textiles were sold (Wisdom 1940:19). He mentioned that there was considerable regional specialization, in which certain communities were known for producing specific products. He attributed the specialties to landscape characteristics such as climate, slope, trade proximity, water availability, and soil type (Wisdom 1940:20). This is a useful example of regional specialization and production for market that echoes arguments for heterarchy in the region (Scarborough and Valdez 2003, Marcus 1983).

Wauchope (1938:161) estimated that a household contained 3.8-7.5 people, on average. Ancillary household features included kitchens, storehouses, beehive shelters, piles of marl, ovens for baking, shelters for shrines, and corn bins (Wauchope 1938:161). Corn grinding and other food processing activities would often occur out-of-doors (Redfield 1934:36). Additionally, Vogt (1969:89) found that the patio had social significance as a place where guests were entertained, women wove cloth, men plaited palm, and children played. This demonstrates the importance of the patio for many activities. In terms of division of labor, women cared for the household gardens, collected water, made and washed clothing, ground corn, and performed other food preparation activities (Redfield 1934:68). Redfield (1934:68) noted that the space around a cenote[2] was women's space, an interesting observation in light of the number of proposed water-holding features in the immediate vicinity of Operation 13. Men performed

[2] A cenote is a natural well, or a sinkhole in karstic bedrock where groundwater is accessible.

agricultural labor, honey and firewood collection, basket making, hunting, and all building activities (Redfield 1934:68).

This ethnographic data provides examples of activities that occurred within and outside of household structures. Food processing and consumption commonly occurred out-of-doors. Maya communities used patios for many different types of social activities. In addition, ethnographic data shows us the importance of maize and other traded goods for modern Maya communities and gives us important information about the tools and processes used to perform agricultural and other specialized tasks. This data can contribute to our understanding of which ancient activities might have been gendered and who controlled what activities.

Archaeological Signatures of the Household

Laura Levi identified five classes of household arrangements at San Estevan, Belize. These ranged from small isolates to large composite groups of six to thirteen structures with multiple courtyards and platforms (Levi 2002:126, Figure 4). Maya households came in many different forms, and generally the greater the number of structures and diversity of construction phases of a household, the more elite a household has been thought to be. As mentioned earlier, elite households often contained large eastern structures, usually pyramidal in form, which were sacred structures important to the identity and social structure of the Late Classic Maya. The layout of Maya households has long been thought to have been organized according to Maya cosmology (Ashmore and Sabloff 2002). Many households have a shared basal platform on which structures were built, which also provides raised courtyard space for the household. The space of a household also consists of a larger area in which trash disposal and a wide array of

activities took place. The name for the entire space of a household is called the houselot, and it will be discussed first, below.

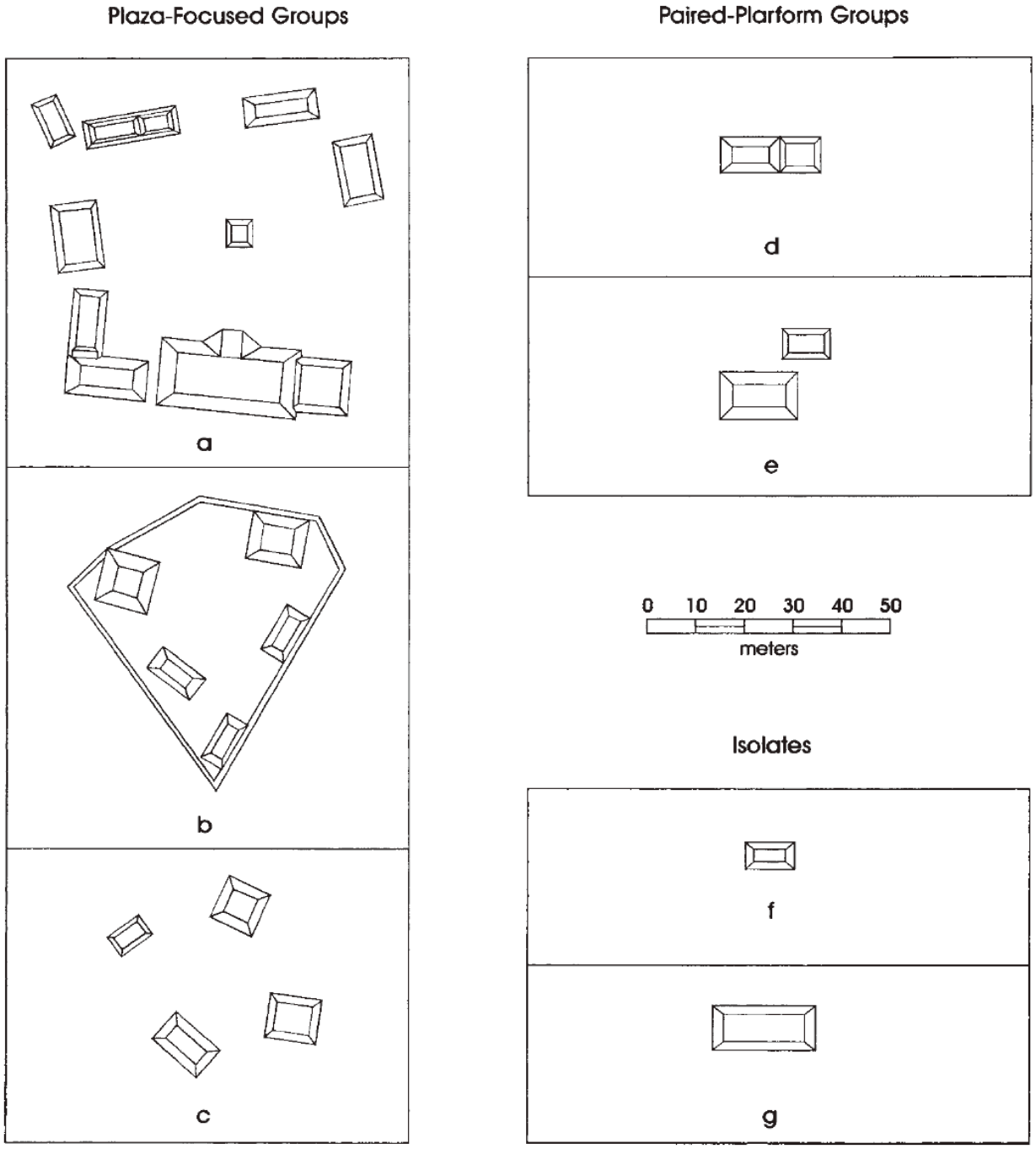

Figure 4: Basic Household Arrangement Types of San Estevan
(From Levi 2002:126)

The Houselot. Many studies in Mesoamerica have combined ethnographic and archaeological data to model outdoor activity space and trash deposits at a household level (Arnold 1990; Hayden and Cannon 1983; Hutson and Stanton 2007; Hutson *et al.* 2007; Killion 1990; Robin 2003). Hayden and Cannon (1983) famously studied refuse disposal behavior at households in the Maya Highlands and diagrammed the model layout of a houselot (Figure 5). In this model, cooking and sleeping structures were connected by a patio, around which many disposal and gardening activities took place. In the Three Rivers Region, common features outside of courtyards included water management features, quarrying features, and *chultunes*, or bedrock storage features (Brewer 2007; Hyde and Martinez 2007; Lohse and Findlay 2000; Weiss-Krejci and Sabbas 2002).

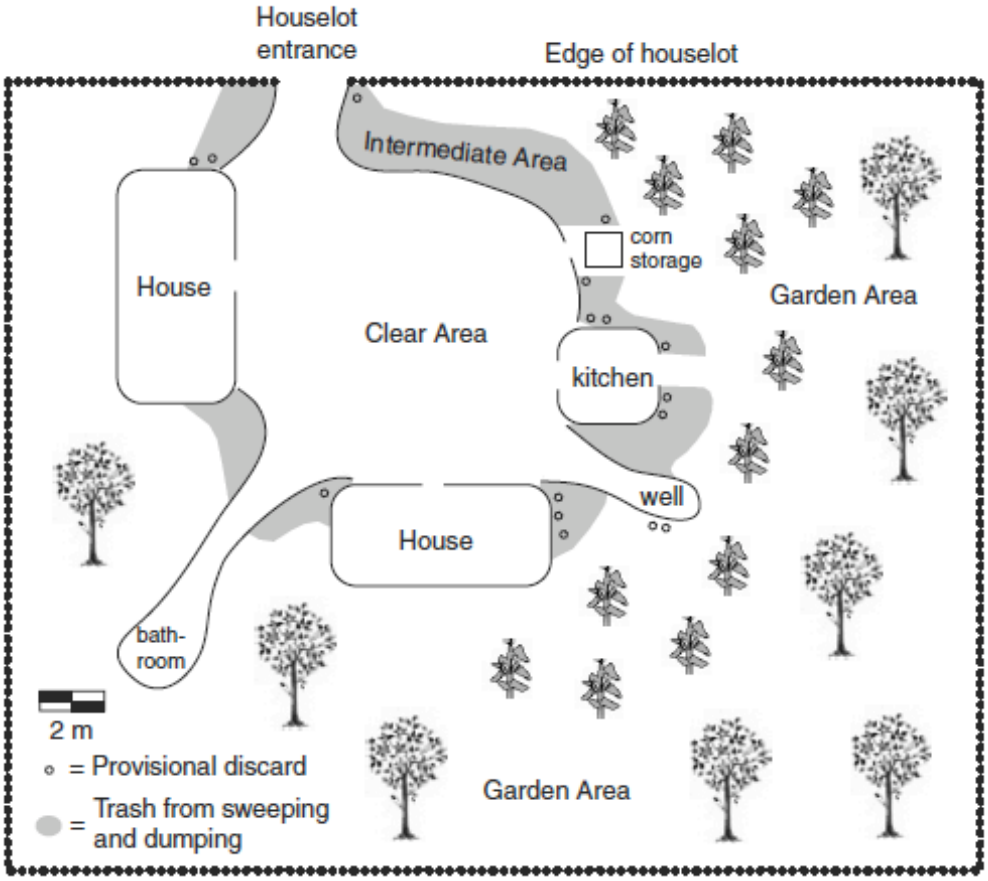

Figure 5: A Model Houselot
(From Hutson *et al.* 2007:444, adapted from Hayden and Cannon 1983)

According to Hayden and Cannon (1983:154), refuse disposal behavior is variable and complex, but can be explained by three main principles in the Maya Highlands: "economy of effort, temporary retention of potentially recyclable materials, and hindrance minimization." Based on those principles, small, harmless items can be disposed of casually with minimal effort, while potentially dangerous items will accumulate more densely in specific areas. Also, potentially recyclable materials may be kept close at hand. Other scholars have tested the causes and patterns of discard and have identified additional factors affecting discard decisions (Arnold 1990, Hutson and Stanton 2007, Hutson *et al.* 2007). For example, Hutson and Stanton (2007:138) found that, probably due to ritual associations of the west with death, "pottery dumps

are most commonly located on the west side, particularly off the northwest corner of the central patio." In another study, Arnold (1990) found that the more a household is spatially restrained, and the greater the number of activities undertaken by the household, the more intensively disposal activities will be structured and maintained.

Dwellings. Many of the structures that made up households were dwellings, or those residential structures thought to have been used for sleeping. These were most often located on the northern or western sides of the courtyard, perhaps because of weather patterns, but more likely because of Maya cosmology (Tourtellot 1988:112). Elite dwellings often contain bench features, which were used for sleeping. One bench was found by Rodriguez (2008) at Group A of the Medicinal Trail site. Tourtellot (1988:101) identifies dwellings by their rectangular plan, orientation to the cardinal points, "centered location on the side of a patio," and the presence of hearths, *manos* and *metates*, pottery for food preparation, utilitarian objects, and the absence of objects used for specialized production. He also indicates that dwellings at Seibal had a minimum floor area of 23 m^2 (Tourtellot 1998:107). The total surface area of Structure 2 in Group A of the Medicinal Trail site, excavated by Rodriguez (2008:85), was 24.5 m^2, with an interior surface area of 11 m^2. If these were the measurements of a dwelling from a first-tier household, one would expect the measurements of a dwelling from a second-tier household at the Medicinal Trail site or comparable sites to be less.

Ancillary Structures. Ancillary structures are small structures within household groups used for functions other than sleeping. The functions of ancillary structures today, noted by Wauchope (1938:161) and listed earlier, include uses as kitchens, storehouses, beehive shelters, marl piles, bread-baking ovens, shrine shelters, and corn bins. Ancillaries have squarer plans than other structures in a household. Kitchens are a common type of ancillary structure. They

are often located in corners of household platforms next to the largest dwellings or even off the side of household platforms (Tourtellot 1983:40). Tourtellot (1983:50) found that the presence of a kitchen structure in a household group does not indicate high status, for he found that as many of these ancillary structures could be found in low and high status groups. Data indicative of kitchens have included "small structure size, association of metates, ash zones, presence of lithics used for scraping and crushing, and occasionally the remains of animal bones and shell" (Gonlin 2004:233).

Pozas. The water management features surrounding Operation 13 at the Medicinal Trail site have been mentioned several times. Small reservoirs similar to those associated with Operation 13 have also been found associated with households throughout the region. These small depressions, known as *pozas*, may have been used for a variety of functions, from quarrying, to trash disposal, to gardening and water storage (Brewer 2007, Weiss-Krejci and Sabbas 2002). Weiss-Krejci and Sabbas (2002) have systematically studied these features at small sites around La Milpa and found that these *pozas* could have been important year-round water sources for communities. They performed calculations to determine the capacity of one *poza* they excavated and found that the depression could have supported the annual needs of much more than one household group, although water supplies in the dry season would have been quite low (Weiss-Krejci and Sabbas 2002:353).

Terraces and Berms. Terraces have been found associated with households as well as on their own, apart from households, throughout the region. Construction of terraces seems to have occurred as part of many decentralized efforts to slow soil erosion, retain water, and increase agricultural yields in the region. Berms, or "narrow and linear piles of stone" (Hughbanks

1998:112), are often found in conjunction with terraces and seem to have been built for the purpose of water management, but were not always built perpendicular to the slope of the land.

Site Formation Processes

Whitaker found that among the most important natural post-occupation processes affecting the distribution of artifacts at Operation 11 were floralturbation and argilloturbation (Whitaker 2007:58). Floralturbation includes the disruption of soils by root systems of trees and tree falls, both of which were observed often at Operation 13 of the Medicinal Trail site. Floralturbation can disrupt large construction elements as well as change the location of artifacts. Argilloturbation is the seasonal expansion and contraction of clayey soils as wet and dry seasons alternate (Dunning and Beach 2000 as cited by Whitaker 2007:13). This natural process pushes artifacts into higher or lower soil layers from their original locations, making stratigraphic analysis more difficult.

It is important to note that activity areas can be difficult to define, because artifacts were often removed at or after abandonment, and because many surfaces were swept clean, eliminating important evidence of economic activities (Robin 2003:314). In addition, even during the occupation of households, "Randomizing and dispersive processes such as children's play generally ensure that some portion of almost all refuse types ends up scattered about the compound" (Hayden and Cannon 1983:159).

Archaeological Research on Households near La Milpa

The Programme for Belize Archaeological Project (PfBAP) seeks to "define regional patterns of cultural development and decline within the study area" and to "use these patterns to

provide insight into several major research problems in lowland Maya archaeology" (Valdez 2007:4, Figure 6). Research as part of the PfBAP began in 1992 (Trachman 2007:9). The director of the project at that time, Dr. R.E.W. Adams, had completed previous research in Río Azul, Guatemala, also located in the Three Rivers Region (Trachman 2007:9). Many sites within the PfBAP have been investigated using a variety of methodologies with the ultimate goal of achieving a regional understanding of the archaeology.

Figure 6: Map of the Programme for Belize Archaeological Project
(From Hyde 2003:6)

While most household archaeology in the region has focused on elite residences, some research has been conducted on commoner or farmers' households. This research often involves

agricultural features associated with small households. For example, Lohse and Findlay (2000) excavated a houselot near Dos Hombres, Belize, and found a drainage system carved into bedrock off to the side of the houselot from the structural core. They also found what they interpreted to be lithic mulching for household gardening activities. Modern farmers in Yucatan prefer soils with high proportions of gravel, because the "stone content of this soil acts as a lithic mulch and helps retain moisture" (Lohse and Findlay 2000:179).

Research by Dr. Clarissa Trachman of Elon University, and Obsidian Analyst for the PfBAP, provides important information about households in the region. Trachman excavated three households in two different environmental subzones that fell along a survey transect that ran through the site of Dos Hombres (2007). Her research foci included identifying social reproduction of ideology and production and consumption. Her research emphasized the importance of off-mound exposures in order to test for midden and activity areas. She used special activity area test pits in which "each unit was excavated only down to the terminal occupation surface on the open plaza floor" (Trachman 2007:65). Trachman identified gardening and activity areas in the houselots. While the households studied by Trachman were of higher status than Operation 13, her field methods and results guided my research.

It is interesting that the one hearth Trachman (2007:129) found was located inside a structure. Wauchope (1938:117) has documented that hearths were usually situated in the corners of residential structures or in kitchen structures if they were separate. However, Gonlin (2004:239) argues that hearths also occurred outside of structures. In her research in rural Copan, hearths were most often found in patio areas just outside of structures (Gonlin 2004:239). Hearths have often not been found in the excavation of households in the Maya area, perhaps

because of their fragility, but also because hearths can be difficult to identify during excavations (Gonlin 2004:239).

At the Medicinal Trail site, three small households have been excavated (Ferries 2002; Muñoz 1997; Whitaker 2007). These studies constitute the foundation of knowledge to which I will be contributing, all of which are important in defining the role of smaller households in agricultural production. Five studies of water management features have been completed in the immediate vicinity of the Medicinal Trail site (Brewer 2007; Chmilar 2005; Farnand 2002; Me-Bar 2005; Weiss-Krejci 2002).

The Medicinal Trail site consists of the region bordered on the west by Turtle Pond and on the east by the edge of the Río Bravo escarpment (Hyde and Valdez 2007). There are two main household groups (A and B) at the site, characterized by their large ceremonial structures on the east side of the household platforms and their other large structures surrounding a central courtyard. Beyond these groups, Medicinal Trail site includes other smaller household groups and numerous features, including structures, terraces, depressions, and other water management features. Excavations at the Medicinal Trail site began in 2002 by Laura Ferries (2002) and Danica Farnand (2002). Farnand investigated terraces at the site, while Ferries excavated a small household group. Excavation of Turtle Pond, at the bottom of the slope on the east side of the Medicinal Trail site, took place in 2004 by Chmilar (2005). Excavation of Group A began in the 2004 season, while excavation of Group B began in the 2007 season (Hyde *et al.* 2006). Ceramics from Group A have confirmed that the site was occupied from at least the Late Preclassic through the Late Classic (Hyde 2005).

Of the studies on water management and small residences listed above, those of Brewer and Whitaker will be most important to my research, because they were thorough reports of

excavations that took place in the Medicinal Trail site center (Figure 7). Brewer investigated a depression at the Medicinal Trail site, while Whitaker excavated a small household at the Medicinal Trail site that has the same relationship to one large household at the site (Group A) as Group C has with the second large household (Group B, Figure 7).

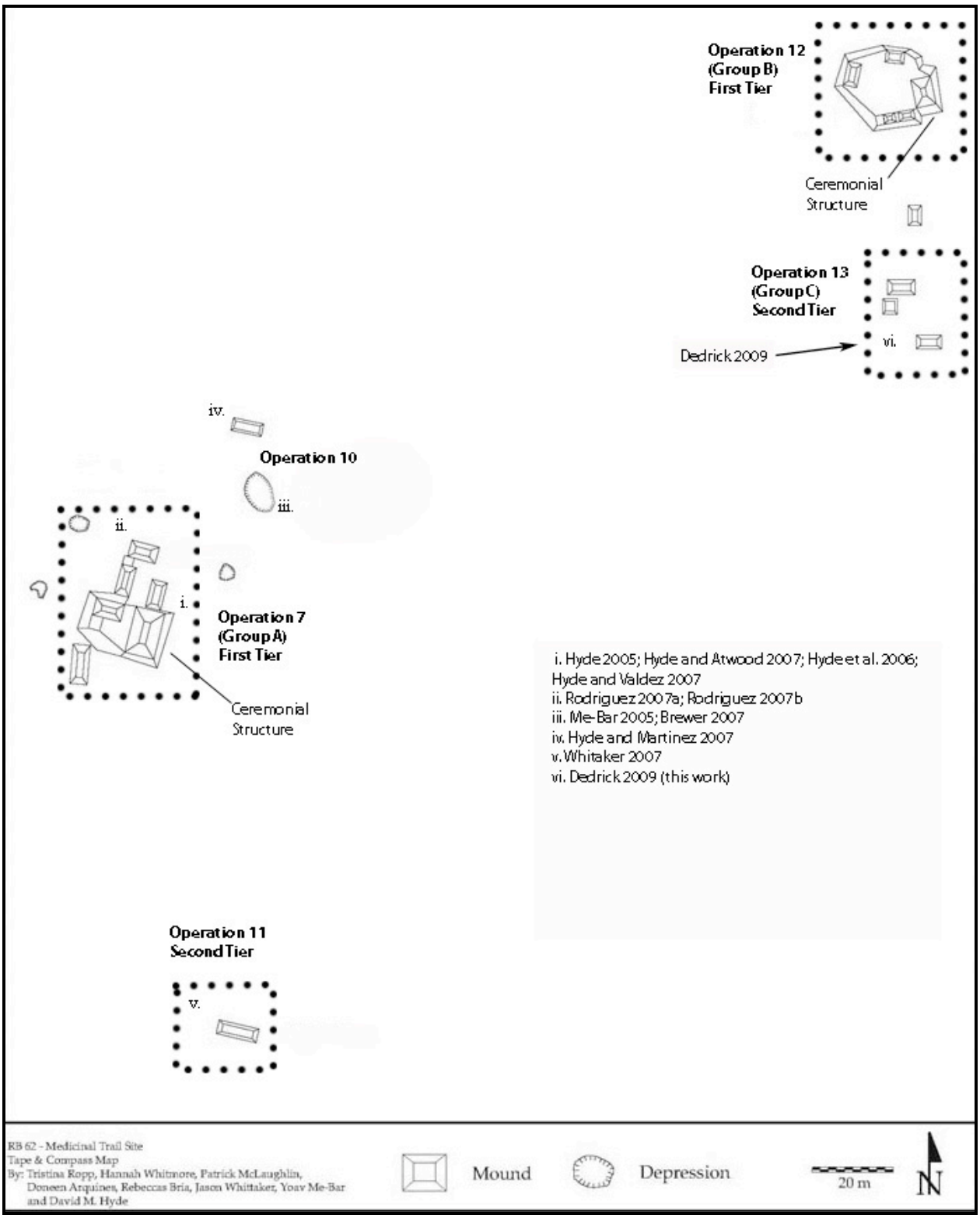

Figure 7: Excavations at the Medicinal Trail Site Center
(Adapted from Hyde and Valdez 2007:16)

Whitaker sought to identify the production and consumption activities of household residents as well as to determine the functions of the structures that made up the household. He did not find any evidence of ceramic or lithic production. He suggested, "occupants were trading agricultural products for essential household items" (Whitaker 2007:152). He did find a single groundstone spindle whorl and suggested that residents of Operation 11 may have produced some cloth (Whitaker 2007:150). Whitaker (2007:157) concluded that the structures were residential and probably multi-functional. Ultimately, he wished he had spent more time investigating areas surrounding the structures in order to study outdoor activities and spatial patterning (Whitaker 2007:157).

Brewer was the first to excavate a small *poza* at the site. The depression he excavated is just northeast of Group A. The depression looks like the many small depressions east and south of Group C, so it is important to understand its possible uses and relationship to the activities of Group A. Brewer concluded that the depression was used as a potable water source during the rainy season, a lithic activity area during the dry season, and at some point afterwards as a trash dump. Brewer (2007:102) found evidence of a gray, sealant layer thought to decrease porosity and increase the depression's ability to hold water. He suggests the depression experienced lengthy periods of use and disuse as a location for discard, because early and late ceramics were mixed together in the depression (Brewer 2007:104). Brewer also collected a soil sample for macrobotanical analysis and found nine seeds thought to be cf. Onagraceae, which David Goldstein argues are more ubiquitous at domestic locations (Brewer 2007:116). [I found these same seeds in my soil samples, which will be discussed later.]

Next to the depression studied by Brewer was a platform. Adjacent to the platform were areas in which the quarrying of limestone had taken place, as indicated by "scars outlining stone

blocks that appear to have been in the process of harvesting" (Hyde and Martinez 2007:53). Unused limestone blocks were stored at this location. They also discovered a midden inside a carved out bedrock depression. The midden contained "large amounts of charcoal, lithic debitage, fire modified rock, a charred marobotanical specimen (possibly a squash seed), and many large ceramic sherds many of which could be fit together" (Hyde and Martinez 2007:54). Ceramics spanned the Late Preclassic through the Late Classic. This research gives another example of the possible use of a depression and platform near a main household group at the site.

In order to understand the role of Group C at the Medicinal Trail site, it is important to understand its relationships with other households and features at the site. Other excavations that have been conducted at the Medicinal Trail site include those at Group A by David Hyde and George Rodriguez and, most recently, those at Group B by Lauri Thompson and Deanna Riddick, and those at the water management features east of Group C by Madelyn Percy and Erin Gill. Excavations that have not yet been published were not included in Figure 7. A limited portion of this research has been published, because work at the main center of the Medicinal Trail site began only five years ago and research is ongoing.

Data from a first-tier household at the Medicinal Trail site will be important comparative material to my own. Group C would have had a close relationship with first-tier household Group B at the Medicinal Trail site. While excavations at Group B have not yet been published, Group A is similar in terms of the size and layout of the structures and its relationship to other households and agricultural features. Therefore, I provide a summary of excavation results at Group A. This material will be important as I consider the economic and social roles of Group C at the Medicinal Trail site.

Group A at the Medicinal Trail site "consists of six mounds distributed around three contiguous courtyards aligned on a north-south axis" (Hyde and Valdez 2007:15, Figure 8). Like Groups B and C, the group is near to depressions, terraces, and other landscape modifications presumably related to agriculture. The main structures likely had perishable walls above the masonry walls that remain to some extent today. One structure in the group (A-6) was at a lower level and was cut off from the rest of the group by the vertical wall of the platform on which the other structures rested (Hyde and Valdez 2007:20). Structure A-2 may have restricted northern access to this upper courtyard (Rodriguez 2007:46). This spatial restriction emphasizes the elite nature of Group A as compared to the surrounding structures.

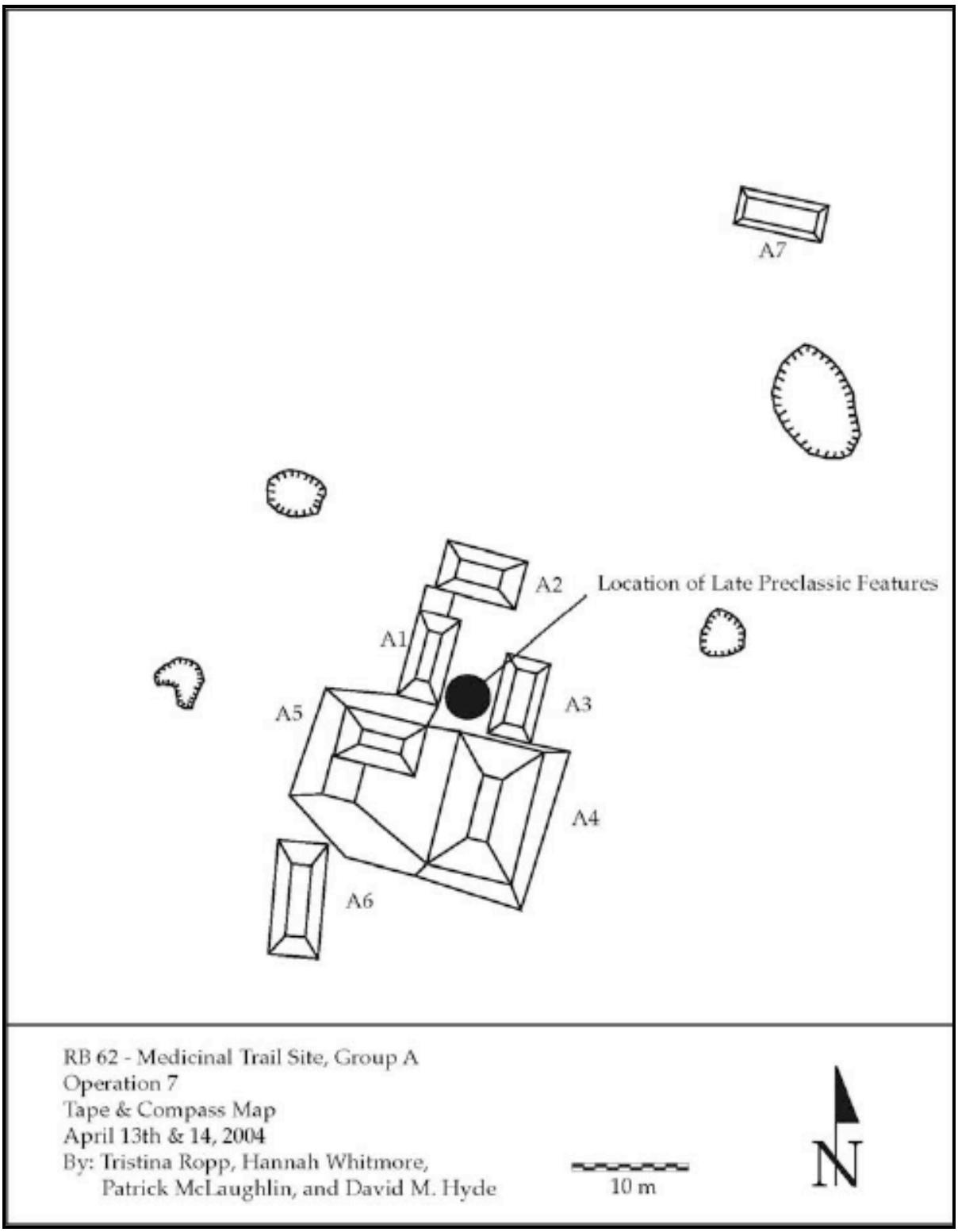

Figure 8: Map of Group A at the Medicinal Trail Site
(From Hyde and Atwood 2007:24)

Four caches have been recovered at Group A, all of which contained Late Preclassic (from before 300 C.E.) Sierra Red ceramic vessels (Hyde and Atwood 2007:28). These caches, evidence of early occupation at the site, were associated with burials perhaps of venerated ancestors who legitimated the ruling family of the site at this location (Hyde and Atwood 2007:30). Other early finds included a Late Preclassic round structure within an elevated courtyard that "likely was used for local ceremonial activities for the Medicinal Trail community" (Hyde and Atwood 2007:30), as well as jade pieces and a coral piece (Rodriguez 2008:98). This household group likely housed some of the earliest inhabitants of the Medicinal Trail site.

Late and Terminal Classic finds at Group A of the Medicinal Trail site have not yet included elite goods such as jade or shell (Rodriguez 2008:98). This may be partly because the eastern structure has not yet been excavated. Excavations in Structure 2 of Group A provided evidence that Structure 2 was built during the Late Classic, as it possessed mostly Tepeu 2-3 ceramic types (Rodriguez 2008:101). The walls of this structure stood at least 90 cm tall, and the structure contained a bench, which has not yet been excavated (Rodriguez 2008:102). Residents of Group A seem to have "cooked and prepared their own food, engaged in gardening and perhaps agricultural production, and by extension refurbished and recycled their own stone tools, and perhaps did some form of weaving given the recovery of spindle whorls" (Rodriguez 2008:104). Some of the elite architectural elements of Group A included "masonry construction, plastered surfaces, large residential buildings, vaulted roofs, an elevated central courtyard and a pyramidal shrine" (Rodriguez 2008:107). However, while artifacts included obsidian blades, granite *metate* fragments, and polychrome ceramic sherds, Structure 2 lacked elite items such as jade and shell (Rodriguez 2008:108).

Group B at the Medicinal Trail site is located 200 m northeast of Group A. "Unlike Group A, the courtyard space in Group B is large and could have facilitated a large number of people for community based ceremonial activities" (Hyde and Atwood 2007:30). It is clear, however, that both Groups A and B played important roles in the ritual and ceremonial life of residents of the Medicinal Trail site. It is possible that they also oversaw economic activities at the site.

From the ethnographic, ethnoarchaeological, and archaeological data presented here, the importance of the household as an economic unit has become clear. From ethnographic accounts, it is possible to identify activities more likely to have been conducted outdoors versus indoors, a distinction which will be important to my research. This section also presented expectations for the spatial layout of a household. In terms of the outdoor features of households, many small households in the Three Rivers Region were integrated in space with agricultural features and seem to have taken advantage of important microenvironments. Terraces and water management features often occupied spaces around households identified by Killion (1990) as household garden areas. Included in this section were also some examples of cosmology-based behavior that may have played a role in site patterning. It is extremely important to study the spatial layout of small households at agricultural sites to understand how production was structured socially.

CHAPTER V
EXCAVATIONS

This section will provide an overview of the archaeological evidence that forms the basis for this research, emphasizing the household's spatial layout and artifacts. A full excavation report can be found in Appendix C, while excavation and mapping procedures can be found in Appendix B, and botanical processing techniques can be found in Appendix G. First, an analysis of the map of Operation 13 and its surroundings will be presented. This spatial analysis helped me to determine my excavation strategies. Excavation data will then be presented, grouped according to whether the excavations targeted areas on top of the patio platform, on the edge of the platform, or off the edge of the platform. In my descriptions, suboperation is the term used for an excavation unit, and lot is the term used for a cultural layer. An artifact summary will conclude the presentation of data.

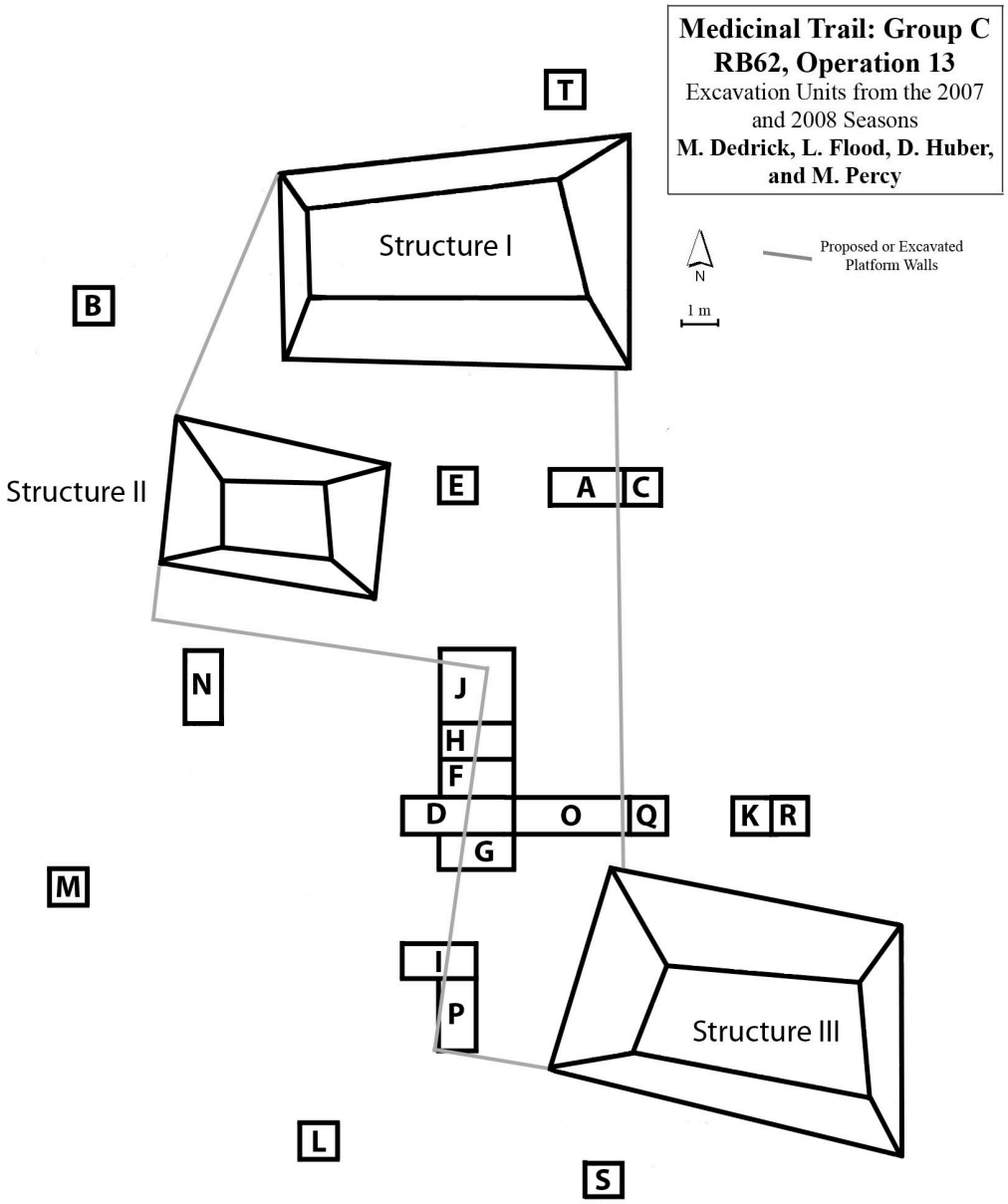

Figure 9: Map of Operation 13 Excavation Units, 2007 and 2008 Seasons
Prepared by Maia Dedrick, Madelyn Percy, Lauren Flood, and David Huber

Spatial Analysis

The mapping of the household was conducted in order to be able to make observations about the use of space in the household and the household's spatial relationship with other households and agricultural features at the site. As can be seen in Figure 1, there is a structure

(Structure IV) located immediately to the north of the three structures of Operation 13. There was no platform connecting this structure with the others I studied, and its orientation and distance from Structures I through III convinced me to leave the area around Structure IV for future research. Structures I through III looked most like a formal household of all the mounds and mound groups we found south of Group B. As can be observed on the map, Structure II is small and square, resembling plans of ancillary structures (Tourtellot 1988). Table 2 consists of measurements of structures from several households at the Medicinal Trail site as approximated from maps created by David Hyde (2005). While these data do not represent correct absolute areas, they should provide a somewhat accurate perspective on the relative areas of structures, because the maps were created under the guidance of a single person using similar measurement techniques.

Operation	Structure	Area (sq m), measured from David Hyde's maps
7	A-1	21
7	A-3	22
7	A-2	26
7	A-4	85
7	A-5	24
7	A-6	32
11	1	32
12	North	9
12	West	13
12	South	12
12	East	23
13	I	20
13	II	9
13	III	14

Table 2: Comparative Measurements of Structures at the Medicinal Trail Site
(Adapted from Hyde and Valdez 2007:16)

In terms of water management features, abundant *pozas*, berms, and terraces were visible in the areas surrounding Operation 13. Note that the Eastern Terrace 1 is less than 10 m from Structure III. There appeared to be a *chultun* immediately east of Structure I, also within 10 m of the household's structures. Scholars have suggested that *chultunes*, or storage features carved into bedrock, may have been used to store anything from maize to ramón to water, or may even have been used to ferment beverages (Dahlin and Litzinger 1986, Puleston 1971, Scarborough *et al.* 1995). Considering that there were many depressions that could have served to hold water, perhaps this served a different purpose. Trachman (2007:240) also found a household associated with both a reservoir and a *chultun*. In any case, the *chultun* was most likely related to production at the site.

Excavation on the Edges of the Platform

Stratigraphy. Areas just off the platform found in Suboperations, D, F, G, H, and I shared similar stratigraphic layers (Figure 10). On top of the platform there was a layer of humus and collapsed limestone pieces. About 40 cm back from and running parallel to the edge of the platform was an alignment of limestone stones. Off the edge of the platform there was a layer of humus at the top, usually between 10-15 cm thick. Beneath humus was a layer of limestone collapse about 30 cm thick. The collapse of large (20-30 cm across) limestone pieces extended about 60 cm past the edge of the platform wall, but any distance further consisted of small limestone cobble collapse. This was with the exception of Suboperation I, in which large pieces of collapsed limestone continued out 110 cm from the wall, but this boundary was less clear.

Beneath the layer of collapse, cultural debris such as lithic debitage and ceramic sherds started showing up. This material was mixed in with small chert cobbles. Beneath a certain point there was less cultural material, while the chert cobbles continued, but this boundary was not clearly distinguishable. The entire thickness of the layer in which chert cobble was found was 20-30 cm. What is interesting in Figure 10 is that Layer C, in which cultural material was found, was distinguishable in the profile from Layer D. Also, Layer C seems to slant down as it moves away from the wall, as though more stuff was piled up right next to the wall. In contrast, Layer D seems relatively flat, as though it may have been the leveled fill for a surface just off the platform. With this information, it seems likely that at least some of the artifacts found in the upper part of Lot 2 within each suboperation made up *in situ* trash deposits, but that these deposits may have been shuffled around somewhat through argilloturbation.

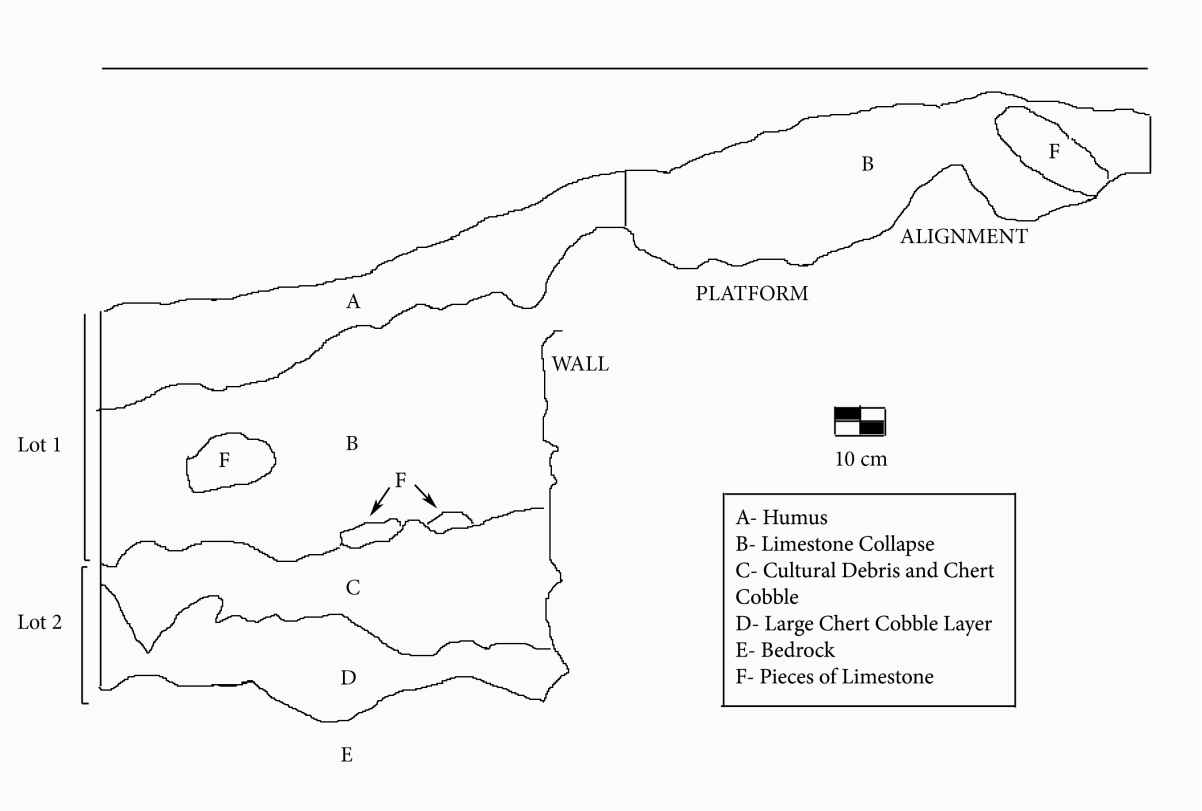

Figure 10: Northern Profile Wall, Suboperation F
Prepared by Daniel Elliott, Amanda Hernandez, and Maia Dedrick

Plaster Surfaces. Intact plaster surfaces were found in three locations in the excavated areas of Operation 13. All three surfaces were in units on the edge of the patio platform. The first of these was on top of the platform in Suboperation H, between the edge of the platform and the parallel limestone alignment (Figure 11). Artifacts from Lot 3 may have been resting on top of this surface or may have fallen onto this surface before any humus had the chance to accumulate. Several ceramic sherds and chipped stone tools were found, and both the ceramic and lithic debris densities were 0.002 grams per cm². While this surface was fairly clean, it offers an opportunity to observe some plausible disposal activity.

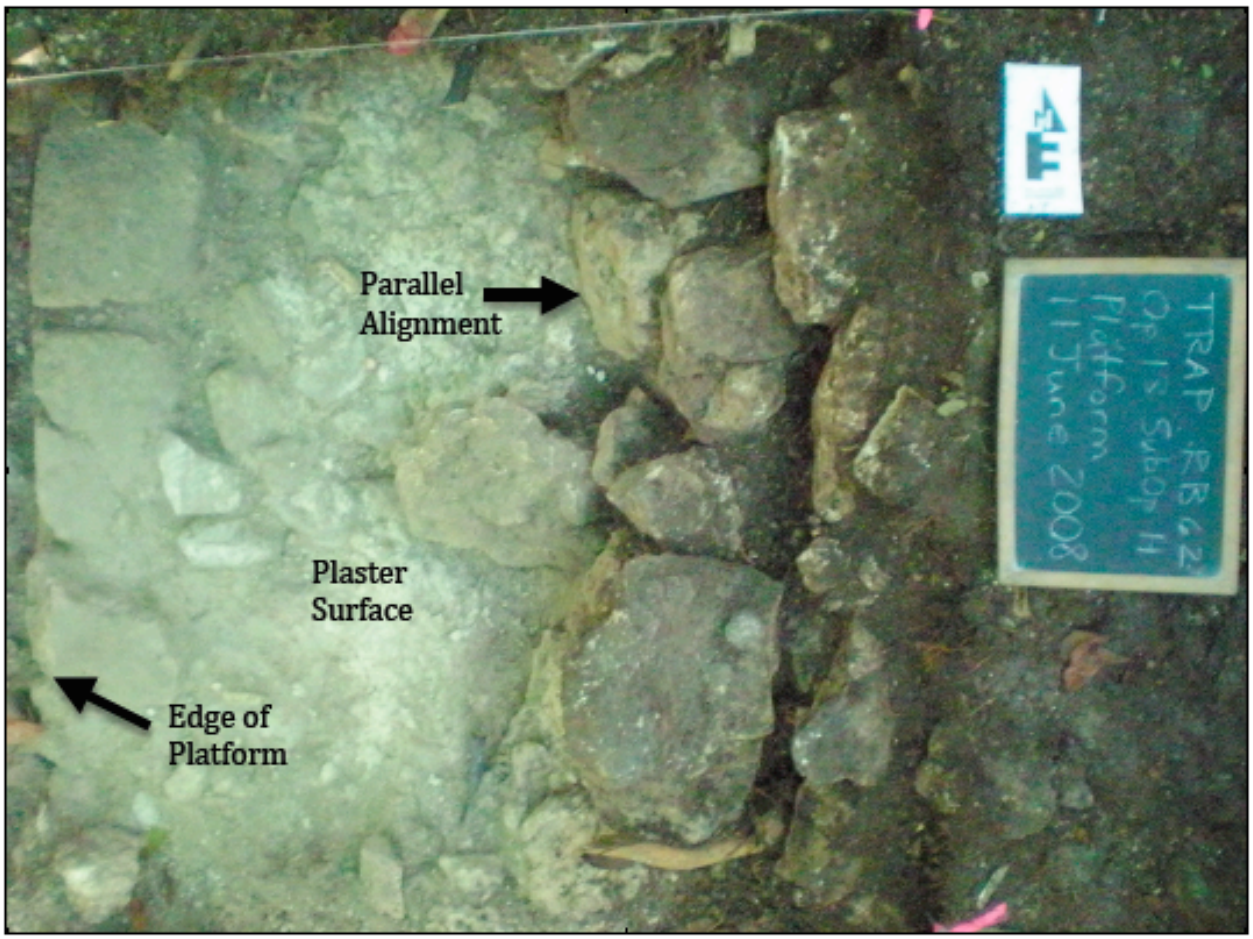

Figure 11: Suboperation H, Closing of Lot 3 with Intact Plaster Surface
Photo credit: Maia Dedrick

The other intact plaster surfaces were more difficult to define. One was found in the corner between the north-running and east-running platforms (Figure 12). As the plaster surface ran away from the corner, cultural debris on top of the surface and fill material below the surface became difficult to distinguish between. However, it is notable how thin the fill is under the plaster surface at this particular location, although plaster and bedrock were extremely difficult to distinguish between. The excavator noted that cultural debris was found in the matrix just above this plaster surface, so it is likely that some of the cultural debris found in other excavation units had rested on top of a surface rather than being incorporated into the fill supporting the surface. Also, the cultural debris layers in Suboperations D, F, G, H, and I were quite a bit

thicker than the fill found here and contained more artifacts. An additional piece of evidence that some of the artifacts came from disposal activity is that the layers entirely composed of fill from Operation 13 (in Suboperations E, Q, and K) contained much higher density lithic debris than ceramic sherds, while the artifact densities of assemblages just off the edges of the platform contained much higher proportions of ceramics (Table 3). Unfortunately, any artifacts left from disposal activities could not be distinguished from fill layers in these suboperations during excavation. Therefore an analysis of deposited artifacts will not be possible, except in special instances.

Subop	Lot	Artifact Class	Description	Weight (grams)	Density (g/cm^3)
E	2	Ceramic	33 total	unavailable	unavailable
E	2	Chipped stone	133 debitage, 2 tool	unavailable	unavailable
K	1	Ceramic	15 rims, 292 body	1913.7	0.003
K	1	Chipped stone	1099 debitage, 92 tool	28406.3	0.04
K	1	Obsidian	1 blade fragment	0.5	N/A
Q	2	Ceramic	28 rims, 339 body	2681.8	0.006
Q	2	Chipped stone	825 debitage, 92 tool*	18978.7	0.04
G	2	Ceramic	6 rims, 120 body	877.5	0.006
G	2	Chipped stone	71 debitage, 3 tool	785.5	0.006
H	4	Ceramic	6 rims, 193 body	1469	0.008
H	4	Chipped stone	18 debitage, 8 tool	321.5	0.002
H	4	Obsidian	2 blade fragments	2.8	N/A
I	3	Ceramic	31 body	177.5	0.001
I	3	Chipped stone	35 debitage, 1 tool*	113	0.0007

Table 3: Comparison of Chipped Stone Debris and Ceramic Sherd Densities from Fill Contexts (Suboperations E, K, and Q) to those from Contexts off the Edges of the Southwest Platform (Suboperations G, H, and I)

Figure 12: Plaster Surface in Suboperation J between Platform Walls
Photo credit: Maia Dedrick

The third plaster surface was found in Suboperations A and C (Figure 13). This again was difficult to distinguish from bedrock, but the smoothness of this layer and its relationship to the platform wall provided evidence. This plaster surface seemed to rest directly on bedrock. Some of the artifacts from Suboperation A, Lot 2, and Suboperation C, Lot 2, seemed to have been located just above the surface. These artifacts will be discussed later.

Figure 13: Possible Plaster Surface East of Wall Alignment in Suboperation A
Photo credit: Maia Dedrick

Wall Construction. A comparison of walls will be provided here. The wall in Suboperation A and the northern wall in Suboperation J had collapsed, but we were able to determine likely base stone alignments for each. In Suboperation A, this is the alignment shown in Figure 13. It is possible to see in Figure 14 why we thought this was a good alignment: all rocks behind the alignment were the chert cobbles that made up the inside of the platform, while all rocks in front of the alignment were limestone, the type of rock that lined the wall and made up most of the collapsed material. In Figure 12 it is possible to see the stones jutting out from the northern trench wall in Suboperation J that made up the collapsed upper levels of the wall. As can be seen in Figure 13, there is a layer of sandy fill underneath the wall in Suboperation A. This is quite different from the southwest wall and the wall in Suboperation Q, in which the platform rests either directly on bedrock or on a layer of small chert cobbles (Figure 15).

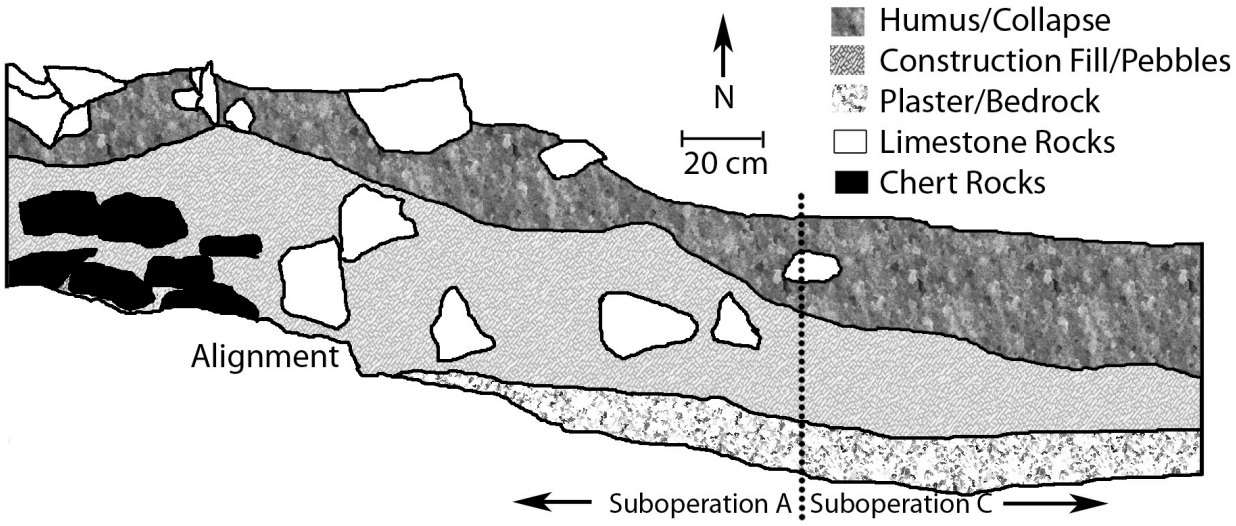

Figure 14: Northern Profile Wall of Suboperations A and C Showing the Possible Wall Alignment
Prepared by Colleen Goodrich, Michelle Hamilton, and Maia Dedrick

Figure 15: Platform Wall in Suboperation H, Facing East
Photo credit: Maia Dedrick

In the area where the north-south and east-west walls meet in Suboperation J it is possible to see that the north-south wall runs up to meet the wall running east-west, as nice cut blocks were set against the northern wall (Figure 12). This seems to indicate that the north-south wall, with its different construction features mentioned above, was built after the east-west wall.

Suboperation Q contained an eastern wall to the platform. Immediately next to the wall on the eastern side, there was fill packed against the wall as tall as the floor had been on top of the platform, seeming to extend the surface of the platform. The density of chipped stone artifacts in this fill stacked against the wall was nearly the highest density of any excavation units. Neighboring Suboperations K and R shared this high chipped stone density.

Artifact Densities. This section will address patterning found in artifact densities among excavation units on the edges of the platform wall. The lot with the greatest number of obsidian blade fragments was Suboperation A, Lot 2. At least two of these blade fragments were found lying at or near the floor, off the patio platform. There were also high ceramic counts in this lot and Suboperation C, Lot 2, which was adjacent. All along the southwest wall there was a high artifact density in the layer above bedrock, with a less dense deposit in the southernmost unit, Suboperation I.

The finds in Suboperation J are worth further mention. The top layers of both walls meeting at the corner had fallen inwards, causing better preservation of the plaster floor and other artifacts. Lots 8 and 10 included the compacted cultural material that seemed to lie at the base of the northern wall. In Lot 8, this material included a high density of lithics and ceramics, as well as some charcoal (unfortunately, a count of this charcoal is not available). In Lot 10, it included two groundstone tools and two obsidian blades, all just above bedrock, but seemingly at the level of the floor in Lot 8. It appears that if the groundstone tools had been in the fill, they would have poked through the plaster floor.

Excavation on Top of the Platform

All of the excavations on top of the platform demonstrated that the primary building material for the interior of the platform was chert cobble (about 10 cm across, on average) about 40-50 cm deep, with some artifacts mixed in. In addition, with the exception of the plaster surface found on top of the platform in Suboperation H, the surfaces of the platform must have either consisted of leveled chert cobbles or an overlying packed dirt or plaster floor that had eroded away and left no trace.

There are two lots in which artifacts can be thought to have been sitting on the platform. One of these has already been discussed: Suboperation H, Lot 3. The second is Suboperation P, Lot 2, which was a layer on top of the southwest corner of the platform. This lot contained the highest density of chipped stone debris at the site. Suboperation O consisted of excavations on top of the platform surface, but it was extremely difficult to discern which artifacts had tumbled in with the collapse and which might have sat on the platform. The collapse in Suboperation O in front of Structure III was quite deep and made up of large limestone blocks, while Suboperation E in front of Structure I contained no collapsed limestone debris.

Suboperations K and R contained an interesting feature in which the bedrock plunged two meters. The entire thickness of the feature from the bedrock to the surface consisted of fill composed of chert cobble and cultural debris. In Suboperation K, the analyzed diagnostic ceramics from Lot 2, which was a layer of fill that leveled off this depression to the level of the bedrock, consisted of ceramic types dating to the Early Classic (Appendix E).

Excavation off the Platform

Suboperation B was the only unit entirely off the platform in which a significant number of artifacts were encountered. Approximately 20 cm beneath the surface, a layer of cobble was found, which included 259 ceramic sherds as well as chipped stone debris and one obsidian blade fragment in a layer approximately 20 cm thick. The other off-platform suboperations (L, M, S, and T) contained few to no artifacts, with a total soil thickness of about 20-40 cm.

Artifacts

Ceramics. Project ceramicist Dr. Lauren Sullivan of the University of Massachusetts at Boston analyzed my ceramics in order to create a rough chronology for my studies (Appendix E). She recorded the ceramic phase types to establish this chronology, but was unable to complete an analysis of ceramic forms (jar, plate, bowl) at this time. The results show that most of the ceramics date to the Tepeu 2-3 ceramic phases. These are associated with the second half of the Late Classic (ca. 700-900 C.E., see Table 4). The only pottery sherds not from the Tepeu 2-3 phase were Chicanel Trace mixed in with later ceramic sherd types in Suboperation J, Lot 6, and Tzakol ceramics (Early Classic) of a few different types in Suboperation K, Lot 2, including a polychrome sherd (Figure 16). The find in Suboperation J, Lot 6 was not significant because it was mixed in with later sherds and was contained within a collapse or fill context. The finds in Suboperation K, Lot 2, however, may be significant. No late pottery was found in this layer, although it is possible that some of the eroded sherds in the unit dated to Tepeu 2-3. However, this lot does seem like a good candidate for early construction. That is because Lot 2 was a darker matrix that acted as fill leveling out the area over bedrock as it extended out from the eastern wall of the platform and plunged downward for about two meters. This fill could easily have been placed over bedrock long before the construction of the platform and mounds took place. However, it is also possible that the artifacts in this fill were simply acquired in the Late Classic from an Early Classic trash dump.

Time Period	Ceramic Phase	Dates
Terminal Classic	Tepeu 3	A.D. 800/850-900
Late Classic	Tepeu 2	A.D. 700-800/850
	Tepeu 1	A.D. 600-700
Early Classic	Tzakol 3	A.D. 450-600
	Tzakol 1-2	A.D. 250-450

Table 4: Ceramic Phases of the Three Rivers Region
(adapted from Trachman 2007:16)

Figure 16: Tzakol Ceramic Sherds from Suboperation K, Lot 2
Photo credit: Maia Dedrick

The most abundant types of ceramics from Operation 13 were Striated, Achote Black, Tinaja Red, Subin Red, and Cayo Unslipped. These are the same types found by Whitaker (2007:127) in Operation 11 and also some of those found across the region (Trachman 2007). At Operation 13, there was Cayo Unslipped that could be dated to the Tepeu 3 phase, showing that there was at least some late occupation of the household. This late pottery was found in a layer of collapse, so it is difficult to make any further assessments from this data.

Chipped Stone. The main formal chipped stone tool found at the Medicinal Trail site was the oval biface (Figure 17). Project Lithicist David M. Hyde of the University of Texas at Austin conducted the analysis of chipped stone tools at Operation 13. He has provided an article about the chipped stone tools found at Operation 13 for this thesis (Appendix F). His analysis of chipped stone debitage will be available in the near future. I will give a brief synopsis of his report included in Appendix F. Thirteen bifacial tools were found at Operation 13, and most of these tools were found in fill contexts. Nine of these tools were oval bifaces, two were bifacial celts associated with oval biface production, one was a general utility biface, and one was a drill. Oval bifaces would have been used for agriculture, while the general utility biface, drill, and celts would have been used within a household setting. Eight of the formal tools came from the fill in front of Structure III, while four of them came from the excavation units in front of Structure I. Informal tools included utilized flakes, cores, and scrapers. Utilized flakes, cores, and scrapers were found in the northern patio construction fill, and scrapers were also found in Suboperation B.

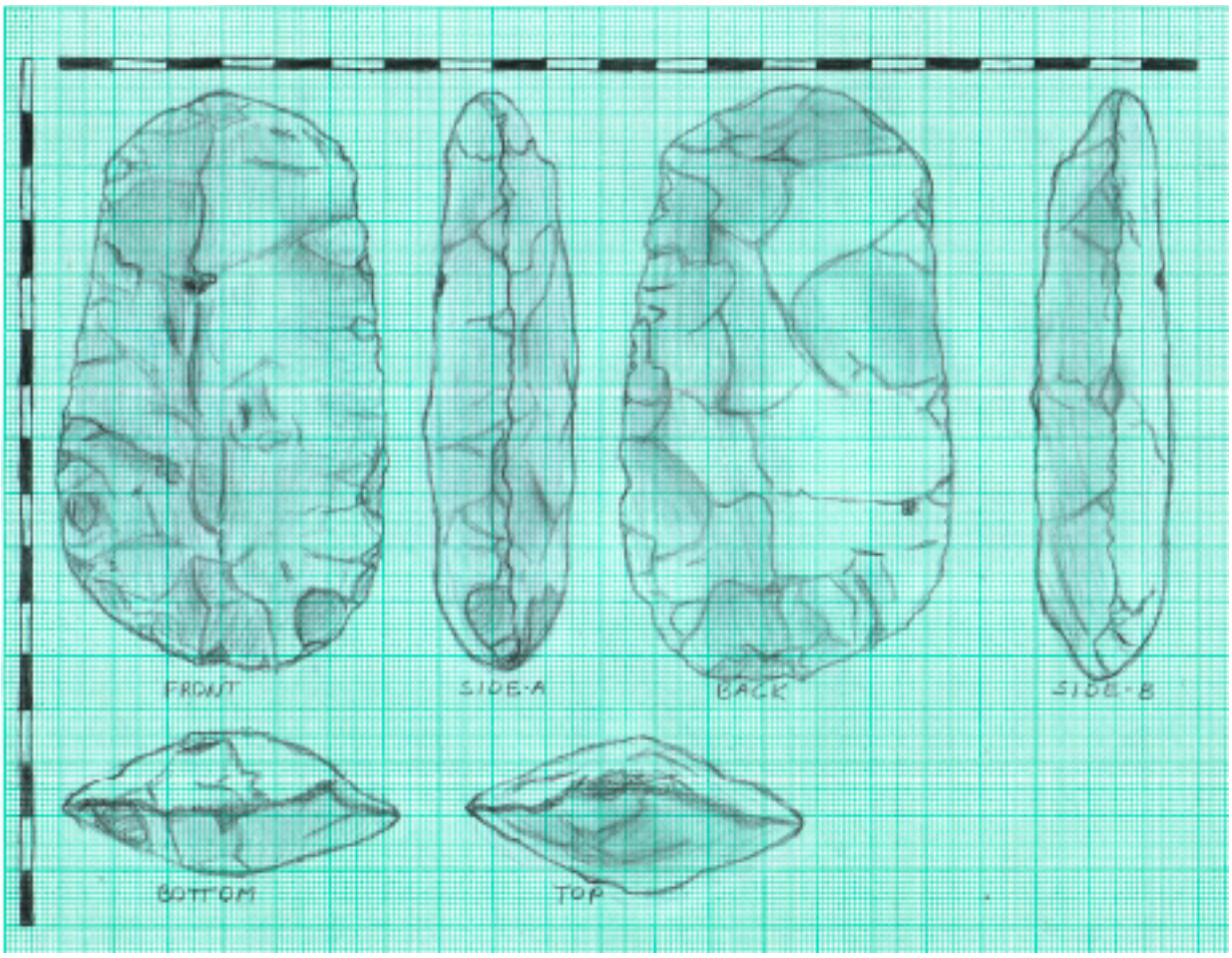

Figure 17: Oval Biface from Suboperation A
Drawing by Jason Glisson

The chipped stone composition of fill at Operation 13 differed according to its location and construction phase within the household. For example, Suboperations K and R were filled with large flakes such as those in Figure 18. Flakes of such size were not found in other areas. Lithic density differences between fill types at the household will be discussed below.

Figure 18: Chert Flakes from Suboperation K, Lot 1
Photo credit: Maia Dedrick

Groundstone. Two groundstone artifacts were found near the plaster floor in the corner between the north-south and east-west walls (in Suboperation J, Lot 10). One of these was a large *mano* broken at one end (Figure 19). The other groundstone tool was an egg-shaped, hand-sized artifact (Figure 20). Both were made of granite. Granite is not found in the immediate area. Therefore, the tools, or at the very least the materials, must have been imported. These tools were found in association with other debris indicating food preparation activities. Both tools were tested for starch grains and phytoliths. The results of these tests can be found below.

Figure 19: Groundstone *Mano* from Suboperation J, Lot 10
Photo credit: Maia Dedrick

Figure 20: Egg-shaped Groundstone Tool from Suboperation J, Lot 10, Before and After Washing
Photo credits: Maia Dedrick

Obsidian. Twelve obsidian blade fragments were found at the site (Figure 21), all from fill, collapse, or disposal contexts. Obsidian blades are traded over long distances, with most obsidian sources located in the Highlands of Guatemala, 400-500 km southwest (Dreiss and Brown 1989:63). However, these are typical household tools in this region and not unexpected. According to Trachman, "Obsidian prismatic blades are ubiquitous in not only domestic contexts, but most others as well" (Trachman 2007:159). This ubiquitous presence of traded goods among households has been found to be the case in the larger Maya area, for Robin (2003:319) states, "Even in the households of the humblest farmers there is evidence for the presence and use of nonlocal and status items, which suggests that all Maya people had some degree of economic interaction (be that participation direct or indirect) into the larger Maya political economy." It is interesting that in the excavation of three households, Trachman

(2007:322) found an even distribution of obsidian among households, suggesting access "may not have been hierarchical."

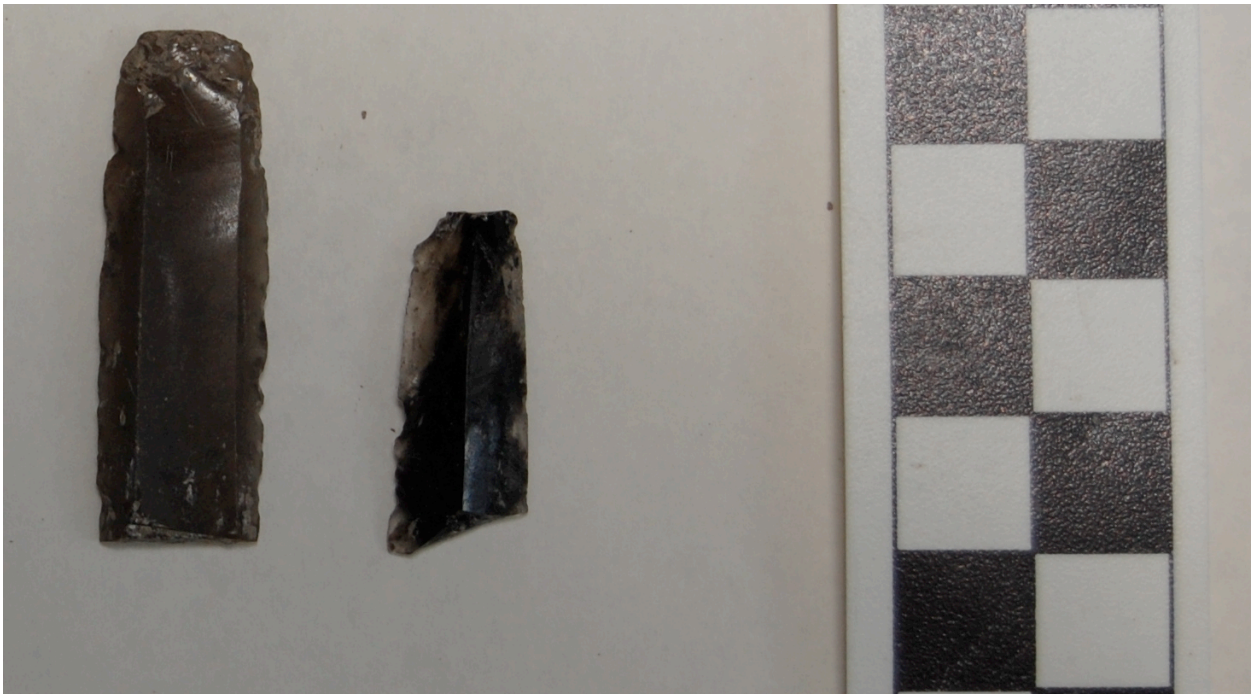

Figure 21: Examples of Obsidian Blade Fragments from Operation 13
Photo credit: Maia Dedrick

Botanical Results

Macrobotanical Remains. The sorted macrobotanical remains of three lots made it back to the University of Michigan's Museum of Anthropology for analysis. The three lots were Suboperation I, Lot 3; Suboperation O, Lot 1; and Suboperation K, Lot 2. Suboperation K, Lot 2 was associated with earlier ceramics and fill that may have dated to the Early Classic, but the other lots date to the Late Classic. In addition, I analyzed the macrobotanicals of four lots while in the field: Suboperation P, Lot 2; Suboperation J, Lot 7; Suboperation J, Lot 8; and Suboperation R, Lot 2. However, analysis of these units is incomplete, because only simple

sketches of the unknown seed types were drawn in the field. Eight additional lots underwent flotation for macrobotanical analysis but have not yet been analyzed. While the small set of macrobotanical data available at this time will not provide a comprehensive view of macrobotanicals present in the excavations, they will be discussed here with the understanding that this data might be useful for future studies.

Of eight lots, four contained the possible cf. Onagraceae seeds described above. In fact, Suboperation P, Lot 2, located on the southwestern corner of the platform and containing a high chipped stone density, contained 129 such seeds. Suboperation P, Lot 1, which could have been contaminated by seeds from the humus, contained 52 such seeds. Suboperation R, Lot 2, which consisted of the possibly Early Classic fill and began 75 cm below the surface, contained three such seeds. Suboperation O, Lot 1 contained two of these seeds. Images of several of the unidentified seeds and plants remains as well as a table with the seed counts from the eight lots can be found in Appendix H.

Starch Grains. Starch grains were found on both the large *mano* and the small hand tool, in the second sediment samples from each. The second sediment samples were obtained using a brush and water to remove soil from the tools. The unprocessed starch samples mounted for analysis as part of this research were easily scanned, suggesting that few processing steps may be required to successfully perform future starch grain analyses.

Starch grain analysis was performed using the criteria indicated on the form that can be found in Appendix I. The only diagnostic starch grain found (Figure 22) indicates the presence of maize on the *mano*. The identification of this starch grain was based on the description of maize starch grains provided by Pearsall *et al.* (2004:430). Further information about their criteria can be found in Appendix I. Smaller but similar starch grains were found on both tools,

although none were large enough to be diagnostic. On both the *mano* and the smaller hand tool, I also found what seem to be starch grains that suffered damage (Figure 23). These starch grains resemble modern starch grains that were subjected to grinding (Perry *et al.* 2006:78, Figure 24). As the starch grains found in this study were among the first identified in the Three Rivers Region, it is important to know that starch grain analysis can be applied in this area successfully.

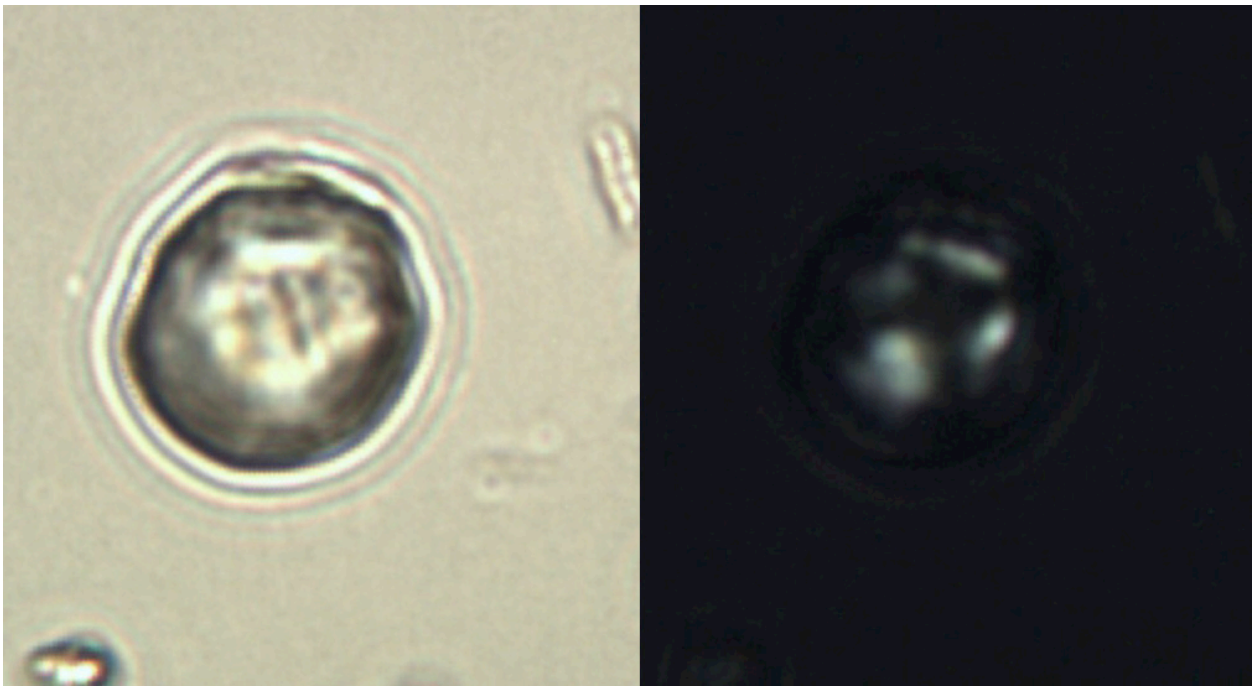

Figure 22: Maize Starch Grain from Large *Mano*
Dimensions: 13 μm – 14 μm across
Photo credit: Maia Dedrick

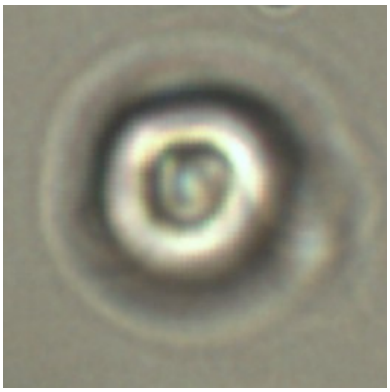

Figure 23: Damaged Starch Grain from Small Hand Tool
Dimensions: 8 μm – 10 μm across
Photo credit: Maia Dedrick

Figure 24: Modern Starch Grain that Suffered Milling Damage
(From Perry *et al.* 2006:78)

Phytoliths. At this point, phytolith slides from the first and second soil samples from the *mano* have been analyzed. No diagnostic maize phytoliths have yet been recovered. Analysis will continue, and additional results may be available in the future.

Conclusion

A basic construction sequence can be determined for the household based on the excavation data presented above (Figure 25). The ceramic evidence suggests that the plunging bedrock feature north of Structure III could possibly have been filled to the level of the surrounding bedrock in the Early Classic. Every other excavation can be dated to the Late

Classic based on the Tepeu 2-3 pottery found. Occupation of Operation 13 in the Tepeu 3 phase can be confirmed, as well, because Tepeu 3 ceramics were found in Suboperation J, Lot 4.

Here I suggest a construction sequence for Operation 13. On top of level bedrock, Structures I and II were built on top of a platform that was originally square. Later, Structure III was built on a platform that connected to the earlier platform by a "hallway." Finally, fill made of chert rocks and artifacts was piled against the former eastern wall of the platform to extend the platform surface available to household residents. This area has become depressed or sunken (when compared to the height of the platform underneath Structure III) since that time. This household expansion was probably due to the growth of the family occupying Operation 13 rather than economic changes for household residents. Therefore, this construction sequence does not help me answer my research questions. However, it is an important result of my excavations, and for that reason evidence for this construction sequence will be discussed below.

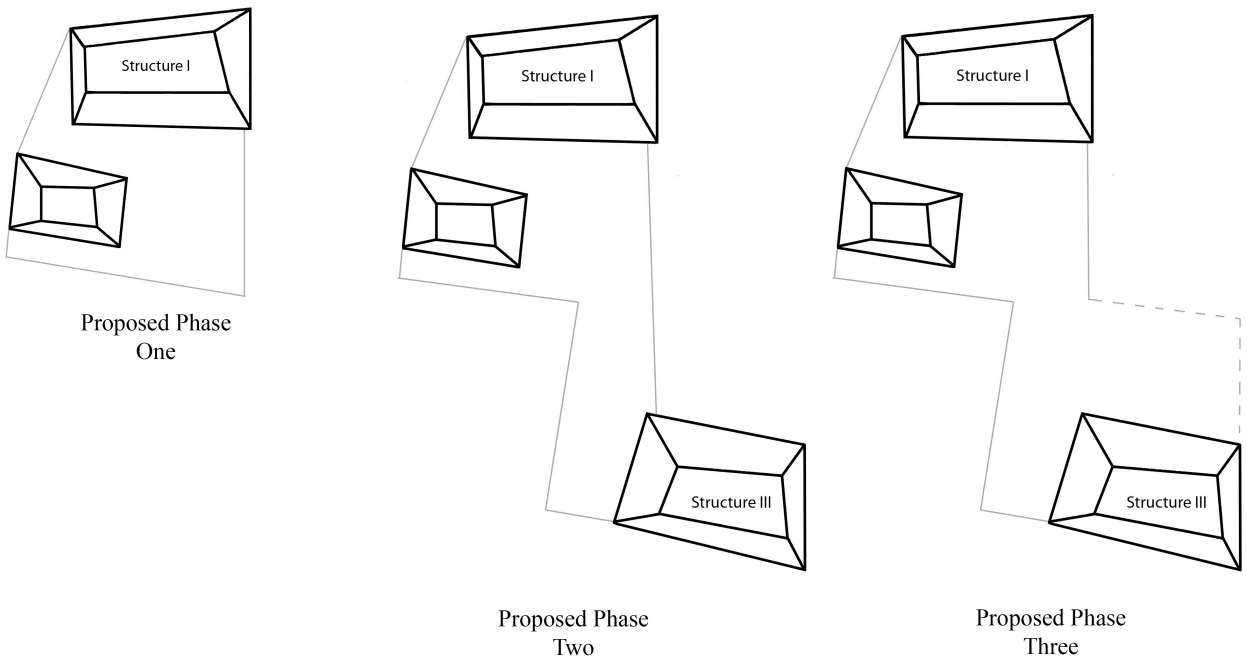

Figure 25: Proposed Platform Construction Phases, Earliest to Latest, at Operation 13, Medicinal Trail Site
Prepared by Maia Dedrick and Madelyn Percy

First of all, it is useful to compare factors of wall construction between the proposed first and second platform phases. In Suboperation A, a layer of soil laid under the basal level of stones in the wall alignment. In contrast, the southwest wall had its base rocks directly on bedrock or on dense cobble fill that had apparently been used to level the bedrock. Also, in both excavations of the walls of the proposed earlier platform, the walls had collapsed outwards. In comparison, the walls excavated south of this earlier platform construction were in good condition. Finally, it was observed in Suboperation J that the wall running north to meet the west-running wall seemed to have been built to meet up with the earlier construction. This can be seen because nicely cut rocks end at this wall and packed soil sits between these rocks and the wall I suggest was constructed earlier.

The dense fill material north of Structure III was packed against the previous southeastern wall of the platform. It is hard to explain this any other way than to assert that this

surface had been added at a later time to extend the platform surface, especially because the inside of the platform is made up of a similar fill material, as seen in Suboperation E. Also, this fill has a different composition than the material off the platform on the western side, which probably was also fill used to level the area before platform construction. See in Table 5 that Suboperations Q and K have much higher lithic densities than Suboperations F, G, H, and I, as well as than the earlier fill from Suboperation E. Because there was no such fill in Suboperation C, this surface did not extend very far to the north. Therefore, I propose that this added platform formed the shape of a square in front of Structure III, but this will need to be confirmed through further excavations.

Subop	Lot	Artifact Class	Description	Weight (grams)	Density (g/cm^3)
E	2	Chipped stone	133 debitage, 2 tool	unavail.	unavail.
F	2	Chipped stone	67 debitage, 15 tool	1005.6	0.007
G	2	Chipped stone	71 debitage, 3 tool	785.5	0.006
H	4	Chipped stone	18 debitage, 8 tool	321.5	0.002
I	3	Chipped stone	35 debitage, 1 tool*	113	0.0007
K	1	Chipped stone	1099 debitage, 92 tool	28406.3	0.04
Q	2	Chipped stone	825 debitage, 92 tool*	18978.7	0.04

Table 5: Comparison of Chipped Stone Artifact Densities East and West of Southern Platform Walls

When comparing the densities of ceramics between cultural layers off the southwest side of the platform and those in the corner between platforms further to the north, there is a higher density of ceramics in the corner in Suboperation J. This is particularly true for Lot 10, in which the groundstone tools and two obsidian blade fragments were found. If this material did indeed consist of trash deposits, it would seem that there was more deposition off the southwest wall as

it approached the corner, with the smallest amount of disposal off the platform just west of Structure III.

Table 6 shows that the ceramic density found off the proposed earliest wall excavated in Suboperations A and C was quite high. Based on the amount of matrix removed in the process of excavating these suboperations, it is likely that the ceramic density in Suboperations A and C was similar to that of Suboperation J. This is interesting because Suboperation J also contained a wall which I suggest came from the first construction phase.

Subop	Lot	Artifact Class	Description	Weight (grams)	Density (g/cm^3)
A	2	Ceramic	563 total	unavail.	unavail.
C	2	Ceramic	489 total	unavail.	unavail.
F	2	Ceramic	8 rims, 252 body	1130.8	0.008
G	2	Ceramic	6 rims, 120 body	877.5	0.006
H	4	Ceramic	6 rims, 193 body	1469	0.008
I	3	Ceramic	31 body	177.5	0.001
J	7	Ceramic	5 rims, 162 body	917.6	0.01
J	8	Ceramic	12 rims, 359 body	2629.3	0.01
J	9	Ceramic	17 rims, 416 body	3599	0.01
J	10	Ceramic	5 rims, 121 body	758.1	0.03

Table 6: Comparison of Ceramic Densities between Cultural Layers along the Southwest Wall and within Suboperation J

Some artifacts from my excavations were found in the locations where they had been discarded by household residents. Because of post-deposition processes, it is difficult to discern whether the layer of cultural debris found off the western edge of the platform and in Suboperation B were contained within a fill layer, were deposited on top of a fill layer, or were entirely midden debris. Because a plaster floor was intact in Suboperation J, it can be said that the artifacts and charcoal in Lot 8 were not from the fill but instead were either deposited there by residents of the house or by collapse of the wall or washing in of artifacts. Midden debris also

seems to have been found in several places, and at the very least in Suboperation J, Lot 10; Suboperation H, Lot 3; Suboperation A, Lot 2; Suboperation C, Lot 2; and Suboperation P, Lot 2.

High artifact densities were found in Suboperation B, although few to no artifacts were found in Suboperations T, M, L, and S. The stratigraphy in Suboperation B also resembled that just off the northeast wall of the platform. This space between (but behind) Structures I and II must have been used more similarly as an area of discard or surface than the areas behind Structure I and Structure III.

An area of notable artifact density was Suboperation P, Lot 2. The lithic density in this lot was 0.06 g/cm^3, the highest density of any artifact in any lot at Operation 13. This lot was located on top of the southwest corner of the platform, west of Structure III. It may have been an area of expedient tool making, storage, or disposal.

CHAPTER VI
DISCUSSION OF THE ARCHAEOLOGICAL EVIDENCE

The research objective for these excavations was to identify any artifactual and spatial evidence for economic (production and consumption) and other activities at the household in order to contribute to our understanding of the role of second-tier households at smaller sites in agricultural production of the Late Classic. While this research will not answer questions about the larger structure of agricultural production, site-wide and community structures must be kept in mind when considering evidence for this structure. This section will consider the types of activities that one would expect to find within a farming household and will address any evidence of such activities found at the second-tier households at the Medicinal Trail site (Operation 11 and Operation 13).

While Whitaker and I both looked for evidence of household production and consumption activities, we approached our excavations differently. Whitaker began by excavating a large portion of his Mound 1, the northern and largest structure of Operation 11 (Figure 26). In his second season, Whitaker focused more on excavation of the spaces between structures and defining smaller structures of the group that were barely visible above the surface. My own approach was described earlier. While a map of all his excavation units for both seasons is not available, I have read through his results and selected comparative excavation units based on their locations relative to structures or platforms and their contents, such as construction fill.

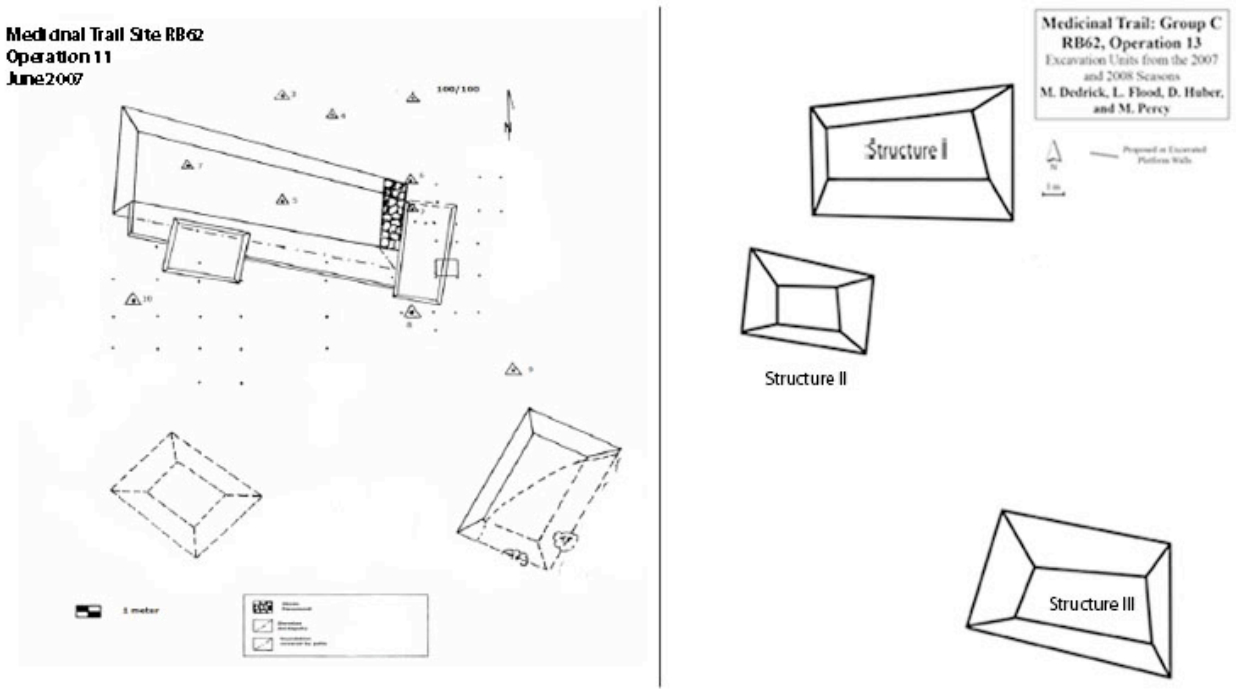

Figure 26: Operation 11 and Operation 13 Maps, Side-by-Side
(Adapted from Whitaker 2007:67)

Most activities at this household could have taken place either indoors or outdoors. Activities for which I found no evidence could have occurred inside the structures of Operation 13, although evidence for these activities may also be present in outdoor areas where I did not excavate. For example, no hearth was found in my excavations, but hearths could have been found within mounds or in off-mound areas not excavated as part of this research. Other activities for which evidence was not found at Operation 13 included the manufacture of cloth, as no spindle whorls were found. Because the excavations performed here consisted entirely of off-mound excavations, the artifacts found were in fill, collapse, or disposal contexts. Excavation within mounds is more likely to identify *in situ* artifacts providing evidence of activities, although at small households in this region even this possible outcome is unlikely, and no such artifacts were found through the excavation of Mound 1 at Operation 11.

Whitaker's excavations that were some distance off platforms produced similar results to my own. His excavation units were also between 20 and 50 cm thick, containing shallow bedrock and similar quantities of artifacts (Table 7).

Subop	Lot	Artifact Class	Description	Weight (grams)	Density (g/cm^3)
13-L	1	Ceramic	1 rims, 33 body	95.1	0.0002
13-L	1	Chipped stone	34 debitage	371.1	0.0008
13-M	1	Ceramic	22 body	32	0.0003
13-M	1	Chipped stone	81 debitage, 4 tool	265.2	0.003
13-M	2	Ceramic	1 rims, 33 body	69.7	0.0005
13-M	2	Chipped stone	19 debitage, 1 tool	87	0.0006
13-T	1	Ceramic	6 body	41.8	0.0003
13-T	1	Chipped stone	1 debitage	1.4	0.00001
13-T	2	Ceramic	1 rims, 78 body	312.7	0.0006
13-T	2	Chipped stone	7 debitage, 4 tool	42.2	0.00008
11-S	1	Ceramic	6 body	21.1	unavailable
11-S	1	Chipped stone	13 debitage	19.7	unavailable
11-T	1	Ceramic	0	0	0
11-T	1	Chipped stone	5 debitage	7.9	unavailable
11-X	2	Ceramic	10 body	27.1	0.0003
11-X	2	Chipped stone	10 debitage	17.2	0.0003
11-Z	1	Ceramic	11 body	29.3	0.0005
11-Z	1	Chipped stone	9 debitage	29.9	0.0004
11-AA	1	Ceramic	8 body	20.7	0.0002
11-AA	1	Chipped stone	8 debitage	16.7	0.0002

Table 7: Compared Artifact Counts and Weights of Off-Platform Excavations at Operations 13 and 11

In similar on top of platform contexts, ceramic compositions of fill seem to be comparable between households, but Operation 13 contained much greater concentrations of chipped stone debris (Table 8). This suggests the households were taking material to use for their fill from separate contexts. One difference between our data was that Whitaker often found fill in which large rocks were at the bottom and small rocks were at the top. This was not found to be the case for any fill construction at Operation 13. This difference may suggest that different

laborers constructed each platform, but it could also mean among other possibilities that construction methods had changed over time and these structures were not built simultaneously.

Subop	Lot	Artifact Class	Description	Weight (grams)	Density (g/cm^3)
13-E	2	Ceramic	33 total	unavailable	unavailable
13-E	2	Chipped stone	133 debitage, 2 tool	unavailable	unavailable
13-K	1	Ceramic	15 rims, 292 body	1913.7	0.003
13-K	1	Chipped stone	1099 debitage, 92 tool	28406.3	0.04
13-K	1	Obsidian	1 blade fragment	0.5	N/A
13-Q	2	Ceramic	28 rims, 339 body	2681.8	0.006
13-Q	2	Chipped stone	825 debitage, 92 tool*	18978.7	0.04
11-AF	1	Ceramic	63 body	212.5	0.0001
11-AF	1	Chipped stone	8 debitage	134.5	0.0001
11-AS	1	Ceramic	240 body, 19 rims	1861	0.006
11-AS	1	Chipped stone	25 debitage	221.1	0.0006
11-AS	1	Obsidian	2 blade fragments	N/A	N/A

Table 8: Comparison of the Artifact Densities of Platform Fill, Operations 13 and 11

Table 9 compares assemblages of artifacts that were found just off the edges of platforms from Operations 11 and 13. They seem to be quite similar in terms of the densities of lithics and ceramics. This suggests that the activities performed by household members, from which this debris most likely originated, may have been similar.

Subop	Lot	Artifact Class	Description	Weight (grams)	Density (g/cm^3)
13-G	2	Ceramic	120 body, 6 rim	877.5	0.006
13-G	2	Chipped stone	71 debitage, 3 tool	785.5	0.006
13-H	4	Ceramic	193 body, 6 rim	1469	0.008
13-H	4	Chipped stone	18 debitage, 8 tool	321.5	0.002
13-H	4	Obsidian	2 blade fragments	2.8	N/A
11-BE	1	Ceramic	310 body, 6 rim/base	1202.4	0.003
11-BE	1	Chipped stone	92 debitage, 2 tool	2983.1	0.001
11-BE	1	Obsidian	1 blade fragment	N/A	N/A

Table 9: Comparison of Artifact Densities from Suboperations off the Edge of a Platform, Operations 13 and 11

Food Processing

As found in the ethnographic studies mentioned above, food production activities often occurred outdoors in the tropics, especially at small households, although hearths have been found indoors. Evidence for food processing at Operation 13 comes entirely from disposal contexts at the site and includes two groundstone tools, broken obsidian blades, charcoal, and abundant ceramics. All of these types of evidence were found in Suboperation J. Three obsidian blades were found just above the plaster surface in Suboperation A. Because these artifacts were not found in their primary location, it is possible these artifacts could have been used inside a structure and discarded outside, although it is also possible the tools were used outside.

Manos were commonly used to grind maize, while broken *manos* may have been used "as temper grinders, or as pestles and mortars for breaking up calcite temper; for grinding salt or pigments; for grinding sugar, coffee [post-conquest] or cacao; for dehusking wheat [post-conquest], or for crushing medicinal herbs" (Hayden 1987:191). These uses suggest that the *mano*, and probably the other groundstone tool as well, were used for the processing of food.

This was confirmed by the presence of starch grains on both tools. The groundstone tools found at Operation 11 included a tenon stone and a spindle whorl, neither of which were found in their primary locations, but instead found within construction materials of the house mound (Whitaker 2007:28). Neither of these tools would have been used for food preparation.

While twelve obsidian blade fragments were found at Operation 13, sixteen were found at Operation 11 (Whitaker 2007:181, Table 10). None of these were found in their primary contexts. It is likely that this difference in quantity of obsidian blade fragments is a result of the extent and nature of excavations at the two sites, since almost all of the obsidian blades from both sites came from fill material. However, Table 10 shows that Operation 11 contained a much higher percentage of obsidian when compared to the total lithic material found at the site. While this could mean that Operation 11 had greater access to obsidian, it is more likely related to the fact that Operation 13 generally had a much higher chipped stone density than Operation 11, especially within fill contexts, but that obsidian is the exception to this rule. Obsidian was found in most areas within Operation 13 proposed to have been loci for primary disposal activities. As found at Operation 11, lack of evidence of obsidian reduction or maintenance suggests these household residents were obtaining obsidian already in the form of blades (Whitaker 2007:152).

Household	# obsidian	# total lithics	% obsidian of total
Op 11	16	2203	0.73%
Op 13	12	4082	0.29%

Table 10: Comparison of Obsidian Finds Compared to Overall Lithic Assemblages, Operations 11 and 13

The ceramic forms at Operation 13 have not yet been analyzed. In general, ceramic densities at Operation 11 did not seem to be as great as those at Operation 13. As at Operation

11, there was no ceramic manufacturing waste material found at Operation 13, but it is possible that this material could be found in specialized dumps elsewhere at the site (Whitaker 2007:149). The types of ceramics abundant at these households can also be found at sites such as those studied by Trachman (2007) outside of Dos Hombres, a site about 10 km from the Medicinal Trail site. It is likely then that there was specialized ceramic production and export occurring somewhere in the region. It is hard to say much about this considering so little is known about the location of ceramic manufacturing in the region and in the wider Maya area.

Structure II at Operation 13 is an ancillary structure according to the characteristics defined by Tourtellot (1988), as it is too small to make sense as a dwelling and has the square footprint common among ancillary structures. It is also the structure closest to the lot in which the groundstone tools and other food processing artifacts were found, but this may simply be coincidence. Structure II is also next to Suboperation B, in which scrapers were found. These scrapers may have been used for food preparation. Whitaker (2007) considered Mounds 2 and 3 at Operation 11 to be ancillary structures, but he found no diagnostic artifacts suggesting their function. The surface areas of these mounds were about 12 sq m, which is similar to that of Structure II at Operation 13. Further excavation at Structure II may help to elucidate the function of this potential ancillary structure, which may or may not have played a role in food processing activities.

Agricultural Production

Chipped stone provides the strongest evidence for agricultural production activities at the site. As mentioned above, some of the chipped stone tools found at Operation 13 were oval bifaces, which were used as forest tools, woodworking tools, or agricultural implements

(McAnany 1992). Unfortunately, most, if not all of these tools were found in fill contexts. For that reason, they were not necessarily used by household members but were drawn from local middens and incorporated into the other materials used in the construction of the patio platform. However, it is important to note that most bifacial tools found during excavations were produced at the site from the low-quality chert available locally. Further research in starch grain and phytoliths from these tools could confirm the uses of these artifacts.

Because the southwest corner of the platform contained dense chipped stone debris, this could have been an area in which expedient tool production took place, or it could have been an area where chipped stone was deposited. Brewer (2007:103) found evidence for tool working at the depression he excavated, and he postulated that this activity may have taken place there in the dry seasons, when water retention in the depression would have been low. Considering the number of depressions surrounding Operation 13, it is possible that residents of this household would have pursued tool production at those locations.

This household contained a high density of chipped stone debitage from fill contexts as well as from the surface of the platform. This chipped stone debris most likely originated from expedient tool production or the reworking of oval bifaces. These densities were unmatched by those found at Operation 11. See Table 11 for a list of the lots with the highest lithic densities. Two of these lots were fill north of Structure III. Suboperation K, Lot 1 contained the latest construction fill I have been able to determine from my excavations, as that layer was added to the courtyard after the construction of the wall in Suboperation Q. While the matrix of Suboperation K, Lot 1 seemed to have consisted of fill, which would have extended the courtyard activity space, there is a slight possibility that the lot could have been the result of dense trash disposal of inorganic materials at which formal tool production, and specifically the

production of oval bifaces, took place. This idea is supported by the high lithic and tool density in this lot, the fact that there was little soil mixed in with the chert and artifacts found in this area (Figure 27), and the depressed nature of this area compared to the platform in Suboperation O. However, it is hard to imagine that such a dense collection of chert stones would have been gathered without the intention of constructing a platform.

Figure 27: Eastern Wall Profile, Suboperation K
Photo credit: Catherine Aimola

Suboperation K, Lot 2 was the lot with Early Classic ceramic sherds. The highest density lot was on top of the southwest corner of the platform, suggesting a chipped stone workspace or deposition area in that location (Suboperation P, Lot 2). Expedient tool production and biface

reworking do not solely suggest use for agricultural production, but may more closely relate to this pursuit than the other activities discussed here. Kunen (2001) found that the predominant artifacts associated with agricultural features are chipped stone debitage and tools (Kunen 2001:205).

Subop	Lot	Artifact Class	Description	Weight (grams)	Density (g/cm^3)
K	1	Chipped stone	1099 debitage, 92 tool	28406.3	0.04
K	2	Chipped stone	51 debitage, 4 tool	727	0.02
P	2	Chipped stone	274 debitage, 7 tool	3352.8	0.06
Q	2	Chipped stone	825 debitage, 92 tool*	18978.7	0.04

Table 11: Lots with the Highest Density of Chipped Stone Artifacts from Operation 13

The presence of such varied water management features as those surrounding Operation 13 does seem to imply some involvement in agriculture by household residents. Berms and terraces are commonly accepted to have been structures used for planting and/or control and allocation of water. While *pozas* have mainly been considered sources of potable water, they also provided water for agriculture (Brewer 2007:100). *Chultunes* are also common features present at commoner household and agricultural households (Scarborough 2008:28). An important question about specialized agricultural production in the region is: Where would any crop surpluses be stored? A *chultun* may have been used for this purpose. According to the ethnographic research of Vogt (1969:89), maize was "stored in a bin inside the house or in an especially constructed granary at the edge of the patio." Such storage features, if they existed at Operation 13, could possibly be detected through further botanical analyses of archaeological soils at the household.

Diet

While maize was present at the household, not much about the diet of residents of Operation 13 can be said based on the evidence found at the site at this point. However, research by Goldstein and Hageman (n.d.) shows that there was a wide variety of plants used by residents of Guijarral, including tolerated weed species and fruits from successional trees in addition to crops from gardens and fields. Ancient Maya villagers were probably less dependent on maize than modern Maya villagers, and maize consumption may have been variable depending on status and location within a site (Goldstein and Hageman n.d., Hammond 2005:50).

Building Techniques and Materials

The building techniques used at Operation 13 resemble those at Operation 11 (Whitaker 2007:151) and Group A at the Medicinal Trail site (David M. Hyde, personal communication). At all households at the Medicinal Trail site, the predominant building materials are chert and limestone, as seen at Operation 13. As mentioned earlier, chert can be found in abundance at specific locations throughout this region (Dunning and Beach 2000; Barrett 2004). It seems likely that there was a chert source nearby considering the sheer quantity used to construct this platform and the commoner status of the household. Whitaker (2007:151) came to the same conclusion.

Limestone was quarried at the site of Medicinal Trail (Hyde and Martinez 2007) and probably everywhere (Joyce Marcus, personal communication). As discussed earlier, plaster was used on surfaces and was preserved in three areas I excavated. While slight differences in wall construction could be detected, generally a surface was cleared to bedrock, leveled, and platforms were built with limestone walls and chert interiors (Ferries 2002; Whitaker 2007).

Platform surfaces for the most part appeared to have consisted of a layer of exposed chert, although the platform may have had a plaster surface at one time.

Disposal Activities

Possible areas of disposal include many locations around the houselot, including just off the walls of the platform, further northwest off the wall of the platform in Suboperation B, and on top of the southwest corner of the platform. It is difficult to determine whether the artifacts just off the walls were present in the fill underlying the floors at the base of the platform or whether deposited artifacts were resting on top of the floor, but it was probably some of each. Deposition in Suboperation B, off the northwest edge of the platform, is interesting because, as mentioned earlier, areas off the northwest edges of platforms were identified by Hutson and Stanton (2007:138) as common locations for pottery dumps, possibly due to ritual associations with the west. However, the ceramic count in Suboperation B is not particularly high when compared to other suboperations. I was surprised that the suboperations around the periphery of the household structures contained few to no artifacts, as I expected they would be areas of trash disposal. Instead, this area containing extremely thin soil seems to have been kept cleared. Abundant midden debris must have been available to household residents for use in the construction of fill beneath floors and within platforms at Operation 13. Brewer (2007:104) found evidence that the depression he excavated had been used periodically as a trash pit. The depressions surrounding Operation 13 may also have been loci for trash disposal by residents of the household.

Trade

Many crucial resources at Operation 13 seem to have been imported into the household. Groundstone, obsidian, and ceramics all seem to have been brought in from beyond the site. Ceramics could have been acquired within the region, while obsidian and granite would have traveled long distances. It would seem that a household importing so many of its daily items would need to be producing some goods for trade. Due to the evidence for intensified agriculture present at the site, it makes sense that these goods would have been agricultural goods, and that residents would have important reasons to produce surplus goods. Whitaker (2007:150) also came to the conclusion that Operation 11 was producing agricultural goods based on his findings of agricultural bifaces, the lack of evidence for other economic activities at the household, and previous research.

There is no evidence that Operation 11 was producing goods needed by residents of Operation 13 or vice versa. There may have been little interdependency between these households, although laborers might have cooperated and worked together during times of harvest and construction. Based on the research of Rodriguez (2008), it seems that Group A did not have a large number of elite goods in the Late Classic compared to Group C; in fact, Groups A and C obtained similar artifacts assemblages from this period. This may suggest an important degree of interdependence between households at the Medicinal Trail site in the Late Classic. The extent to which Groups A or B might have controlled Operation 13's access to traded goods will be an important but difficult question to continue to examine in the future.

Other Activities

Spinning. While no evidence for weaving was found at Operation 13, the spindle whorl at Operation 11 may suggest spinning occurred at second-tier households. Spindle whorls were also found at Group A (Rodriguez 2008:105). While the spindle whorl at Operation 11 was not found in context, it was found on the house mound rather than in off-mound space. As mentioned earlier, Vogt (1969:89) found that the courtyard of a household was a common place to weave cloth. Vogt (1969:101) describes clothing manufacture and the loom used by Zinacantan women in great detail. In his study, the loom was made of perishable materials that could be transported easily. Therefore a wooden loom would leave little trace archaeologically.

Drilling. A chipped stone drill was found in Suboperation G. Eldenderfer *et al.* (1989:55) found that drills were used in a rotary motion to drill wood, shell, and fine-grained, hard stone. This drill provides evidence of craft production occurring at Operation 13.

CHAPTER VII
CONCLUSION

This study analyzed the economic role of a small household at the small, rural Medicinal Trail site. It has been found that many of the tools used in daily life at the household, such as groundstone tools and obsidian blades, were imported. Because household residents needed these implements, and because we do not find evidence for other specialized activities at the site, it makes sense that this site produced agricultural surpluses to exchange for these and other specialized goods. The presence of a maize starch grain on the *mano*, while not surprising, suggests maize may have been one of the crops grown near the household, possibly for export. It appears that residents of the household had oval bifaces (agricultural tools) that were manufactured at the Medicinal Trail site from the low-quality, locally available chert.

In comparing Operation 13 to Operation 11, excavated by Whitaker (2007), Operation 11 may have maintained greater control of resources due to the large size of Mound 1 and the greater concentration of obsidian found at Operation 11. However, Operation 13 had a built-up patio with a greater overall concentration of chipped stone, and the lower concentration of obsidian compared to other chipped stone found at Operation 13 may simply be a result of this difference. On the whole, Operations 13 and 11 appeared similar based on the types of ceramics and other artifacts found at each household and the correlation between locations and densities of these artifacts. They also utilized similar construction techniques. Both households may have been second-tier households within a larger corporate or lineage group, in which they might have shared agricultural labor during parts of the year.

Based on the initial Late Classic artifact data from Group A (Rodriguez 2008), the artifact types found at the first-tier household were similar to those found at Operations 13 and

11. This may be evidence that the households were interdependent, sharing resources to some extent. The quality and size of structure construction at first-tier households has been shown to be greater than that of structures at second-tier households. First-tier households at the site had larger courtyards, a greater number of construction phases, and eastern pyramidal shrine structures, which were the largest structures at the site. Operation 13 and other households at the site were laid out along the cardinal directions, as would have been proper according to Maya cosmology. If this site consisted of one or more lineages, it is likely that the lineage head was the ritual leader, as well as the economic facilitator, for residents of the site. These lines of evidence support the hypothesis that this site might have consisted of a corporate group. It will be important to continue to compare evidence from these households in order to get a better sense of how first-tier and second-tier households interacted economically.

In the future, I hope additional excavations will be conducted at Operation 13 both on and off the household platform. This would allow us to get a more thorough sense of the types of activities taking place at the household, not only out-of-doors, but also indoors. It may be worthwhile to complete an analysis of the ceramic forms found at the household in order to search for additional patterning in this data. Data from Operation 13 can continue to be compared with the artifact and spatial analysis data that will continue to be collected at Groups A and B and other features at the Medicinal Trail site.

It will be important to try to find evidence for the trade of agricultural goods in this region. For example, it might be possible for us to identify components of the storage of these goods either at La Milpa and other larger sites in the region or at the Medicinal Trail site. Identification of marketplaces or other areas that may have been important in the control and distribution of specialized goods would be one helpful component to moving forward with this

research. One might also look for evidence of specialized ceramic vessels for trade or look for storage features at sites. At Operation 13 of the Medicinal Trail site, I hope someone, equipped with the proper safety gear, will be able to excavate the possible *chultun* located just east of Operation 13 and take residue samples from this bedrock feature to try to determine function.

In the future, I also hope that more work can be done to collect botanical data from the site including continued starch grain, phytolith, and macrobotanical analysis. Now that it has been shown that starch grains survive in this environment, it will be possible to expand the use of this analysis to other groundstone or even chipped stone tools. Other botanical data may be available for analysis through the study of agricultural features surrounding the household. It will be important to compare botanical data found at first-tier and second-tier households to see if residents of these households were eating different types of food based on status, family size, or trading patterns.

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APPENDIX A

	Types of data relevant for identifying corporate groups:
#1	Size of structures and number of households
#2	Environmental evidence addressing exploitation levels and availability of critical resources
#3	Evidence for trade
#4	Evidence for differential status within corporate structures
#5	Proximity and geometrical patterning of individual households
#6	Repetition of certain public structures in community neighborhoods
#7	Stylistic similarities of artifacts manufactured within corporate groups as compared to between corporate groups
#8	Evidence of defense concerns
#9	Evidence from associated middens of relative wealth, trade items, and craft manufacturing

Table 12: Archaeological Signatures of the Corporate Group
(Adapted from Hayden and Cannon 1982:152)

APPENDIX B
Mapping and Excavation Procedures

Mapping was completed using a fiberglass measuring tape, sighting compass, and clinometer. A datum point was established, and additional datum points were formed as needed while mapping continued. Measurements were taken by holding a tape measure at an established level above ground level, at which point compass bearings and clinometer readings were taken. The clinometer readings were used to account for elevation changes so we could construct an accurate 2D representation of the area south of Group B at the Medicinal Trail site. All mounds were measured by taking four top corner points for each mound and four bottom corner for each mound.

For excavations, a grid was established. An arbitrary base point was established and named (100, 100). In order to support and maintain this base point, which was set into the ground, two additional points were laid down: one 2 m north and one 2 m east. From these points, all excavation units were set at even meter lengths. For vertical control, several datum points were set as necessary during the excavation procedure. These datum points will be added to a larger grid through GPS points to be taken in future seasons.

Field notes were taken and PfBAP standard lot and site forms were completed (Figure 28). Other excavation records included profile and plan maps. Each suboperation that contained notable features or stratigraphy was recorded in at least two maps. A level baseline was created from which distance and height measurements were taken. A plumb bob was used to facilitate accurate height measurements for profile maps. All measurements were taken in the metric system. Photographs were taken of everything that was mapped as well as of excavation unit closing profile walls.

PfBAP **- Lot Record Form** **RB**_____

Project:_____ **Site**_____

Recorder: | Excavator(s):

Operation_____ SubOp_____ Lot_____ | Date Opened_____ Date Closed_____

Lot Type (Check Appropriate)
☐ Burial ☐ Cache ☐ Construction Fill ☐ Floor ☐ Hearth ☐ Humus ☐ Interface
☐ Midden ☐ Surface ☐ Wall ☐ Other_____

Lot Location
Horizontal_____ Vertical_____

Lot Description

Materials Observed and Collected (O=Observed, C=Collected)
☐ Bone ☐ Ceramic ☐ Groundstone ☐ Lithic
☐ Obsidian ☐ Shell ☐ Other_____

***Collected Samples** (Check Appropriate and Define Below)
☐ Botanical ☐ Bone ☐ Carbon ☐ Flotation
☐ Hydration ☐ Soil ☐ Other_____
**ALL collected samples must be accompanied by a Sample Record Form*

Association Schematic
Physically Below _____ _____ _____ _____ _____
Physically Above _____ _____ _____ _____ _____
Associated With _____ _____ _____ _____ _____

Termination/Elevations
☐ Cultural_____ (type) ☐ Arbitrary_____ (type)
Beginning Elevation_____ Ending Elevation_____
Total Thickness of Lot_____ (e.g., 10cm, 38cm, 1.2m, etc.)

Documentation *Photographs*
Photographer_____
B&W Roll_____ Frames_____
Color Roll_____ Frames_____

Illustrations/Maps (Check Appropriate)
☐ Plan Map ☐ Artifacts
☐ Profile ☐ Other_____

Comment, Descriptions, Interpretations

Figure 28: Standard Programme for Belize Archaeological Project Lot Record Form

Excavation equipment included trowels, brushes, and hand axes. All soil was sifted through quarter-inch screens. Stratigraphic units, called lots, were determined by changes in cultural activity or soil horizon (no arbitrary levels were assigned).

Project Ceramicist Dr. Lauren Sullivan of University of Massachusetts at Boston analyzed as many of the ceramics as she could while at the field station in Belize, aiming to provide at least a brief chronology of what has been excavated (Appendix E). Project Lithicist David Hyde and students from the Programme for Belize field school analyzed the chipped stone artifacts while in the field laboratory, prioritizing certain excavation units for analysis according to my instruction (Appendix F). Obsidian was counted and weighed.

APPENDIX C
Site Report, 2007 and 2008 Seasons at Operation 13, Medicinal Trail Site

This section will describe the excavations that took place during the 2007 and 2008 seasons at Operation 13 and their results. In order to make the descriptions easier to read, the excavation units have been grouped according to whether they contained an edge of the platform, were on top of the platform, or were off the platform. The excavations along the edges of the platform helped to define the extent of the platform and determine a possible horizontal construction sequence. Excavations on top of the platform attempted to retrieve any *in situ* artifacts and obtain information about the platform surface and stratigraphy. Excavations were placed off the platform in order to detect midden debris, examine bedrock depth, and identify any bedrock modifications.

Excavations Along the Edges of the Platform

Suboperations A and C. These excavation units were located just south of the eastern wall of Structure I. Suboperation A was a 2 x 1 m unit oriented north to south, while Suboperation C, a 1 x 1 m unit, extended the excavation of Suboperation A to the east. The location of Suboperation A was chosen to expose what appeared to be the eastern wall of the patio platform as well as a good amount of the debris east of the wall. Suboperation C was added when it was clear that the extent of the collapse of the platform was going to restrict movement and the exposure of space east of the wall.

The first lot of *Suboperation A* consisted of humus and limestone collapse about 15 cm thick on average. A nearly complete oval biface was found in the humus layer along the southern wall. Artifacts included more than twenty ceramic sherds per bucket, a broken obsidian

blade, and chipped stone. This lot also contained chert cobbles 8-12 cm across that had collapsed into this unit and were removed. Lot 2 consisted of a 15 cm thick layer dense with artifacts, including 3 obsidian blade fragments, which were found resting just above what appeared to be a plaster floor. Lot 4 consisted of excavation through plaster floor into bedrock. The wall of the platform was not intact, and Lot 3 was opened in the western half of the suboperation in order to begin removing collapse in order to find a wall alignment. This lot was 20 cm thick when a possible alignment was found and mapped. However, Lot 5 was opened in order to look for a better alignment. The lot was 20 cm thick and a plausible alignment was found 30 cm from the western edge of the pit. This alignment is discussed in the body of this thesis.

Lot 1 of *Suboperation C* consisted of a 15 cm thick humus and collapse layer. Beneath this lot was a layer of chert cobbles and dense artifacts about 10 cm thick. Before bedrock was found, there was a layer of what seemed to be eroded plaster floor 10 cm thick.

Suboperations D, F, G, H, and I. I will group these excavation units because they together exposed a length of platform wall on the southwest edge of the platform that shared similar stratigraphy. The goal of exposing this wall was to identify any trash deposits that may have been swept there or dropped off the side of the platform, yielding evidence of production. In addition, in exposing a large expanse of the wall, I was more likely to observe any idiosyncrasies in the construction or residential history of the household that would provide special insights into decisions or motivations of the household's residents, something that test pitting would have been unlikely to do. These suboperations consisted of excavations exposing the surface of the platform and following the edge of the wall down to bedrock to expose trash deposits, floor surfaces, and fill materials.

Suboperation D was located on the edge of the southwest area of the platform, between Structures II and III. The dimensions of the pit were 2 x 1 m, oriented north to south. Lot 1, the humus and collapse layer, was about 25 cm thick. The collapse consisted of limestone rocks of various sizes (4-12 cm) and large rims of ceramic vessels on the eastern end of the pit. Humus had washed from the structural components in the eastern end of the pit into the lower western end of the pit. Lot 1 was closed on the eastern end of the unit when two nice rock alignments were found, one of which was the top of the platform wall. The collapse of many limestone blocks reached past the wall of the platform for about 60 cm and not much collapse extended further. Lot 2 was a layer west of the platform wall with limestone pebbles and little cultural material about 25 cm thick that ended at bedrock. The wall seemed to extend into a cut in the bedrock.

Suboperation F, a 1 x 2 m unit oriented east to west, continued to follow the wall found in Suboperation D as it ran northeast. It was excavated in two lots to bedrock, a depth of about 75 cm. The eastern section of the unit was on top of the platform, so it was only excavated to expose the platform, at a depth of about 35 cm. This suboperation was excavated in only two lots because the stratigraphy had been studied thoroughly in Suboperation D. In addition, maps of this suboperation included all four layers. In Suboperations G and H the bottom two layers were difficult to distinguish and so were mapped together. Excavating the layers quickened the process of exposing the wall. Lot 1 consisted of both the humus layer, which was a moist dark brown soil with many organic inclusions about 10-20 cm thick, as well as a layer of limestone collapse, about 15 cm thick on top of the platform and 45 cm thick west of the platform, although of course this layer sloped with the contour of the collapse, as did the humus resting above it. The limestone collapse layer consisted of humus with limestone rock inclusions that were

between 5 and 20 cm across. This lot was closed when ceramic sherds and chipped stone were found at a greater density. On top of the platform, the lot was closed when the matrix became a lighter color. On top of the platform we continued to encounter the stone alignment about 50 cm east from the edge of the wall, as we had found in Suboperation D.

Lot 2 began with cultural materials to the west of the platform at a depth of about 50-60 cm beneath the surface and ended at bedrock, for a thickness of about 30 cm. Within this lot were again two layers. Above, there was a layer of cultural debris and small chert pieces, with sherds dominating the assemblage. The layer underneath, approximately 70 cm below the surface, consisted of chert cobbles interspersed with significantly fewer sherds and limestone pieces, although some ceramics were found on the bedrock. It was difficult to define the point at which artifact density decreased.

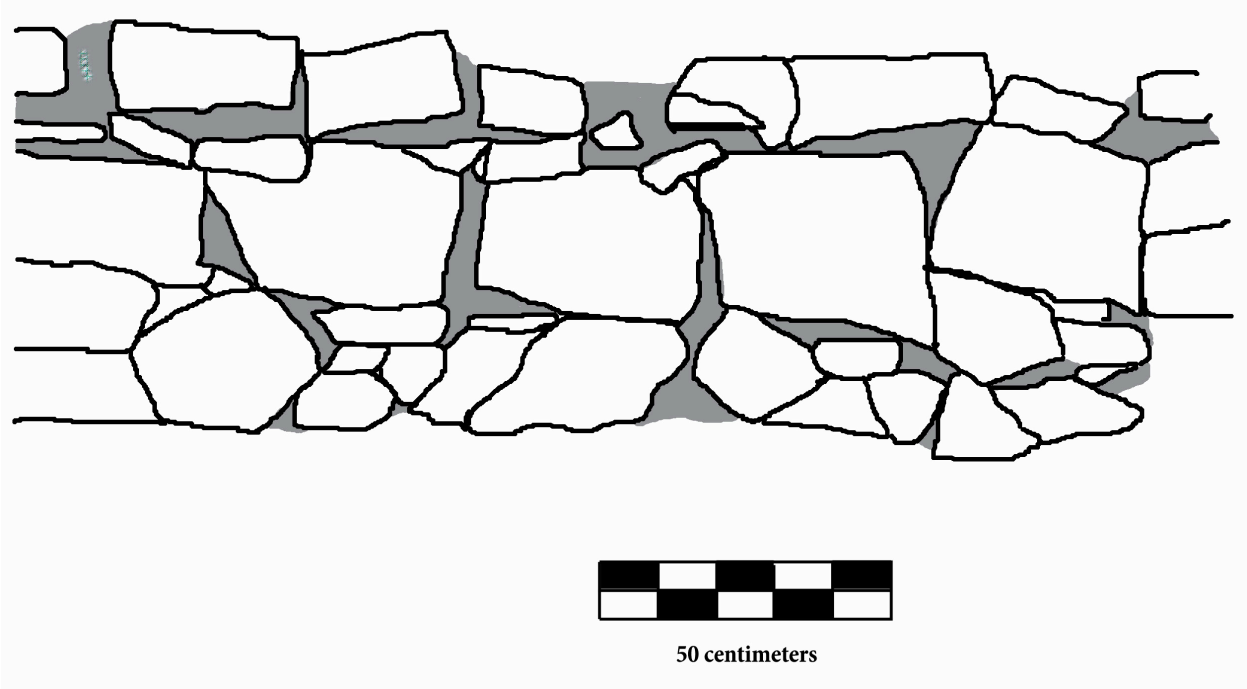

Figure 29: Platform Wall Profile, Suboperations D and F
Prepared by James Burnes, Victoria Menchaca, and Maia Dedrick

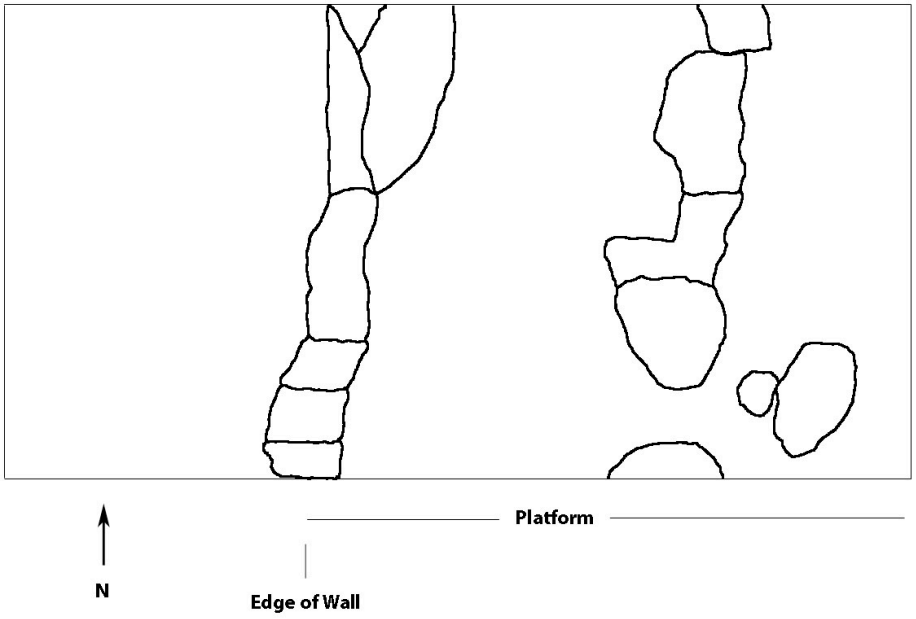

Figure 30: Plan Map, Suboperation F
Prepared by James Burnes, Victoria Menchaca, and Maia Dedrick

Suboperation G, a 1 x 2 m unit oriented east to west and following the wall found in Suboperation D to the southwest, shared the stratigraphic layers of Suboperations D and F. Like Supoberation F, it was excavated in two lots. Lot 1 contained larger ceramic sherds than in other units, but this was probably just a result of collapse. Not all of the top wall rocks were in place as in the other units; two of these stones had been pushed west of the wall, but their position on the wall remained clear. At the beginning of the cultural layer, Lot 2, large ceramic rims were found.

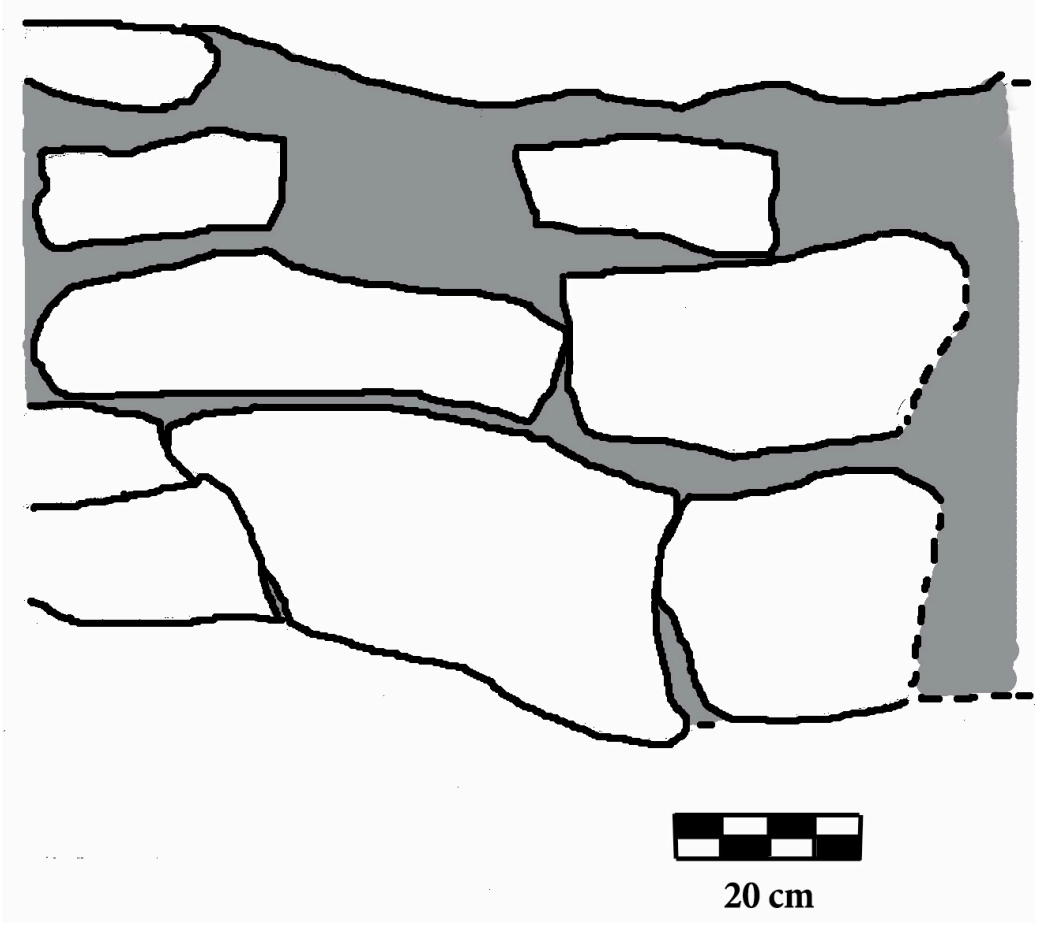

Figure 31: Platform Wall Profile, Suboperation G
Prepared by James Burnes, Adam Stephens, and Maia Dedrick

Suboperation H, a 1 x 2 m unit oriented east to west, followed the wall northeast of Suboperation F. The apparent stratigraphic layers of this suboperation were similar to those in the previously described suboperations along the southwest platform wall. A different excavation approach was taken in this excavation unit. Lot 1 consisted of the humus and limestone collapse layer on top of the expected platform, while Lot 2 was the humus and limestone collapse west of the expected platform wall. This distinction was made in order to take two separate soil samples that might provide evidence of any remains on top of the platform, for example. More importantly, it allowed us to move through the dirt to the west of the wall more quickly than we otherwise would have been able. Lot 1 was about 20 cm thick, while Lot 2 was about 60 cm thick. Lot 1 was closed when the matrix turned a light tan color, where we had left the previous excavations along the top of the platform. At that point, Lot 3 was opened beneath Lot 1 on top of the platform. This layer was 10 cm thick and was closed upon the exposure of a plaster surface on the platform between the edge of the platform and the alignment of rocks, which continued to run parallel to the wall about 40 cm back from the edge of the wall. The tan matrix was eroding plaster. Within the layer were found two large rim sherds and four flakes. Under Lot 2, Lot 4 was opened west of the platform. It was about 20 cm thick above bedrock. Again, large rim sherds were found near the top of this cultural layer, while only chert cobbles were found over the bedrock.

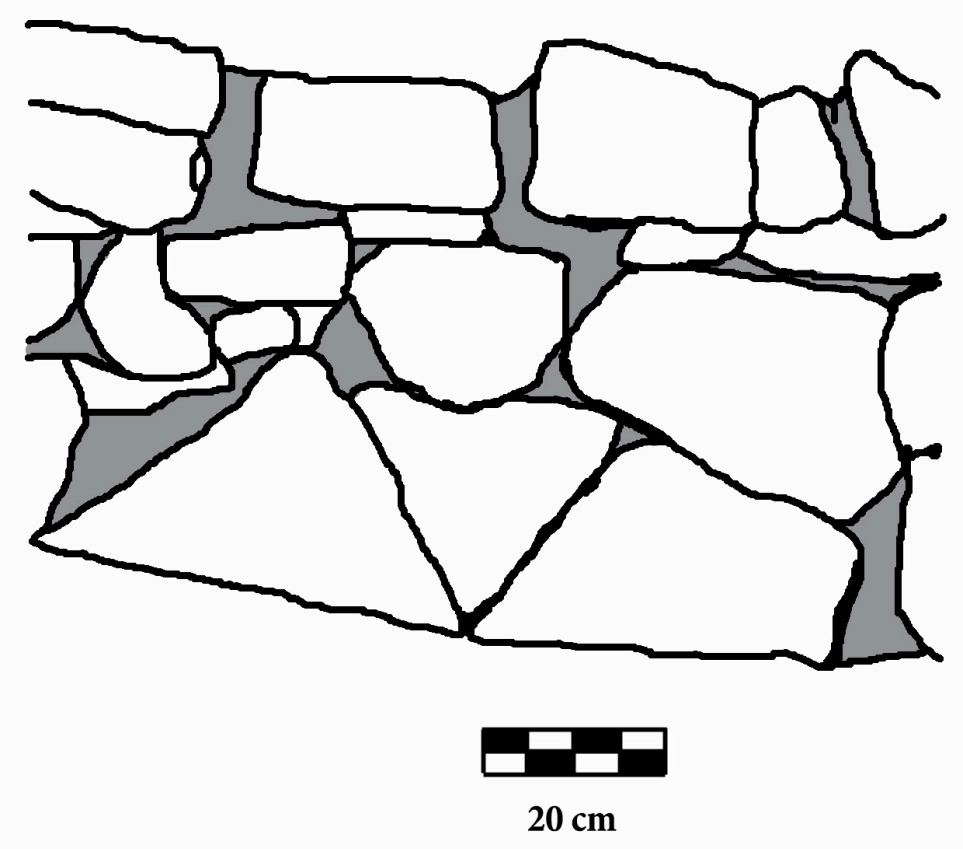

Figure 32: Platform Wall Profile, Suboperation H
Prepared by James Burnes, Adam Stephens, and Maia Dedrick

Suboperation I was a 1 x 2 m unit, oriented east to west, located three meters south of Suboperation G. The space between suboperations was left unexcavated in order to avoid a large tree and its roots. Because the wall was moving southwest, this unit was displaced one meter further west than the other units discussed here. Bedrock was found approximately 75 cm beneath the surface. Lot 1 consisted of humus and was closed upon the determination of the wall alignment. This lot was about 15 cm thick, on average. Within the humus were chert cobbles and large limestone pieces up to 50 cm across. Lot 2 consisted of the limestone collapse that continued west of the alignment. There was not much cultural material in this layer. The lot was closed when a layer of chert cobbles and clay was found. Lot 2 was about 30 cm thick. Lot 3

was presumably construction fill consisting of chert cobble with little matrix between the cobbles. This lot, closed at bedrock, was about 15 cm thick.

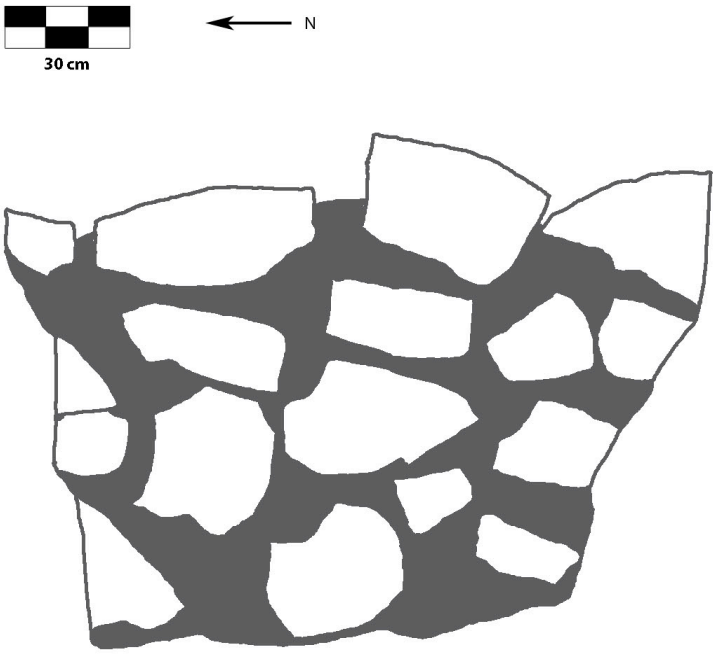

Figure 33: Platform Wall Profile, Suboperation I
Prepared by Hal Baillie, Catherine Aimola, and Maia Dedrick

Suboperation P. Suboperation P was a 1 x 2 m unit oriented north to south. It was located south of the eastern end of Suboperation I. The goals of the excavation were to follow the wall found in Suboperation I and determine the location of the corner of the platform.

Suboperation P was excavated in four lots. The first lot was a humic layer with chert and limestone fallout about 15 cm thick. It was closed when what seemed to be the surface of the platform, made up of consistent chert cobbles, was found. Because the soil in the southern half of the unit was darker, Lot 2 consisted of excavation in only the southern half of the unit. The lot was a mix of chert stones and limestone fallout about 5 cm thick. The lot was closed when five large limestone rocks were encountered. The rocks were not aligned in any way, and therefore

appeared to be some kind of fallout or fill material. Lighter soil was found in the northern 40 cm of Lot 2. Lot 3 was opened to investigate the area of lighter soil in the northern 140 cm of the unit. The goal was to expose any wall stones present. The lot was about 15 cm thick and the limestone blocks indicating the edge of the wall were found in the northern meter of the lot, on the western edge. Now that these stones had been found, Lot 4 was opened in the southern 60 cm in order to try to find a continuation of these stones at the western or southern edges of the unit. The major stones were worked around in order to try to determine some kind of order. Unlike in the other wall excavations, a mix of large chert stones, more than 25 cm across, were interspersed with limestone stones of a similar size. These rocks seemed to run along the western edge of the unit and then there were a lot of them that did not seem to be in any particular order or alignment, including those that ran along the southern edge of the unit and even into the eastern edge of the unit. These could have been blocks used to reinforce the corner construction. I do not think we found the corner of the wall. If I had had time, the excavation could have been extended one meter further and we probably would have found the corner.

Suboperation J. Suboperation J was opened as a 2 x 2 m unit north of Suboperation H with the goal of identifying the corner at which the north-south wall met the east-west running wall. I wanted to know whether the two walls were constructed simultaneously or as two separate construction phases. I had a hard time identifying the wall in Suboperation A in the northeastern corner of the platform, which I expected would be the same construction event as this wall I was planning to identify as I approached it from the south. By moving along the north-south wall I thought this wall would be easier to define. I was interested in whether the artifacts found at the edge of this perpendicular wall would differ from those along the areas of the wall I had excavated earlier.

Bedrock was a bit deeper here, at about 100 cm beneath the surface. This was because the humus was at a higher level overall due to the location of the unit over a large area with thick collapse. Lot 1 consisted of humus about 10 cm thick. It contained much more chert than did the suboperations described above. Burnt limestone pieces from 4 to 15 cm long were found. There were also small limestone cobbles only 2 cm or so across. The lot terminated when the soil changed from humus to a dry, silty soil. Lot 2 was dug in the southern half of the suboperation. This split was made because the southern half seemed to contain a boundary of large limestone blocks whereas the northern half contained chert. Also, the soil in the southwest of the unit was still moist and dark, so I suspected this southern lot would not come down on the wall running east to west. Lot 2 was about 15 cm thick. More chert and small limestone cobbles were exposed. The platform was identified in the eastern end of this lot. Lot 3 was meant to consist of any soil on top of the platform surfaces. However, I postponed its excavation in order to perform vertical excavation. I knew where the wall was on the southeastern side of the unit, so it was just a matter of following the wall north until the east-west running wall was found. I opened Lot 4 in order to achieve this. A seeming alignment of large limestone blocks was found running east-west 60 cm north of the southern boundary of the suboperation. This alignment was found later to be fallout from the wall, which was found about a meter further north from that alignment. Lot 4 was terminated at this supposed alignment in the north and at the cultural layer in terms of depth. Lot 5 was opened in order to collect the cultural material above bedrock as far north as the suspected alignment. This excavation showed that there were no base stones for this alignment, assuring us that the previously expected alignment must be wall collapse.

Lot 6 consisted of excavations moving north, again in search of a wall. The limestone collapse and artifactual debris layers found along the wall in other areas were not easy to

distinguish here, so they were excavated together. The lot was closed when many limestone rocks were encountered in a seemingly vertical arrangement. To the east of that was a soil of a slightly lighter brown color that did not contain the collapse of the surrounding matrix. Above this was a layer of small limestone pieces that looked like it could have been eroded plaster. Lot 7 was opened in order to take out that limestone and expose the lighter soil underneath it, in case it was a feature. This area was about 20 cm in diameter and about 70 cm deep. The possibly eroded plaster was just small limestone pieces. The soil matrix was a different color because large limestone chunks to the west had fallen over this area, sparing Lot 7 from a collapse layer. This was useful to know, because we then expected better preservation in this area. Lot 8 was opened in order for the excavator to follow the wall northward again in search of an east to west wall. The wall was finally distinguished when a cut stone was found running perpendicular to the north-running wall and resting on bedrock. The upper levels of the wall were not well preserved. The wall was found about 30 cm south of the northern boundary of the suboperation. The excavation of this lot extended to bedrock, but it was noted by the excavator that 90% or more of the artifacts were found near bedrock, resembling the cultural deposits found earlier along the edge of the wall. There was charcoal in this lot near bedrock, but unfortunately a count of the charcoal was not kept. The wall running west was more deteriorated than the north-south wall.

Lot 9 consisted of cleared out the remaining collapse in front of the east-running wall, but terminated upon the recognition of a cultural layer before bedrock. The lot was primarily composed of large (20 cm long) limestone and chert cobbles. Lot 10 consisted of the cultural layer with compacted soil and chert cobbles just south of the wall running west to east. The excavator came down to a plaster surface above bedrock. It makes sense that the plaster was

preserved in this area because the area was protected from some of the collapse, leading to better preservation. On the same level as the floor, but in an area in which it was completely eroded, a *mano* and another egg-shaped groundstone tool were found. There were also two pieces of obsidian found in this layer. Dense chert cobble was found above bedrock in the areas where the plaster floor had eroded.

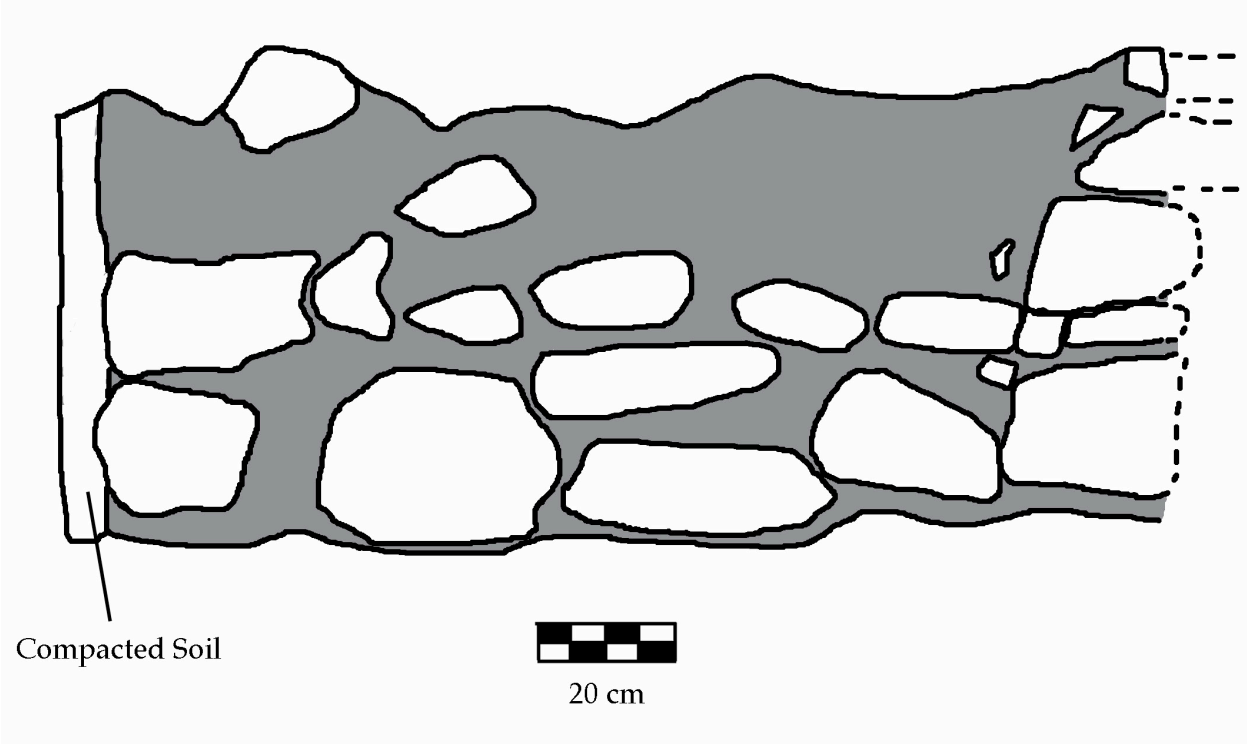

Figure 34: Eastern Platform Wall Profile, Suboperation J
Prepared by Kirby Farah, Jennifer Mills, and Maia Dedrick

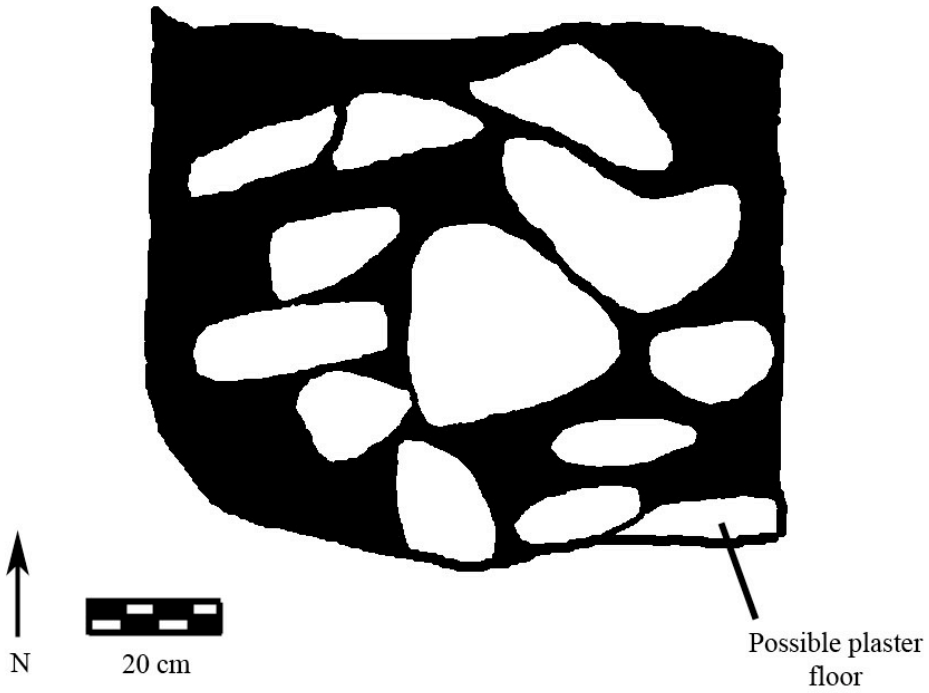

Figure 35: Northern Platform Wall Profile, Suboperation J
Prepared by Kirby Farah, Jennifer Mills, and Maia Dedrick

Suboperation Q. Suboperation Q was a 1 x 1 m unit just east of Suboperation O. It was opened in order to examine a possible platform wall. With excavations east of Suboperation Q already in progress, this suboperation would complete a cross-section of the courtyard and provide information about its spatial layout.

Lot 1 was the humic layer including limestone collapse, as usual. The layer was about 15 cm thick. At the closing of the unit, the soil turned reddish-brown and silty. An alignment was found along the western edge of the suboperation. Small, 2-8 cm chert cobbles met up with the alignment, presumably forming a surface. Bigger chert chunks, up to 20 cm across, were found interspersed with the smaller chert cobble at the end of Lot 1. Lot 2 was opened to excavate through the cobble and determine whether there was a wall beneath the alignment that had been found on the western edge of the unit. The lot was about 50 cm thick and was terminated at

bedrock. A wall was found in the western end of the unit. The light-colored soil found in this lot may have resulted from degraded plaster that might have covered the wall. The cobble that was removed from the unit was artifact-rich and included many pieces of chipped stone and pottery.

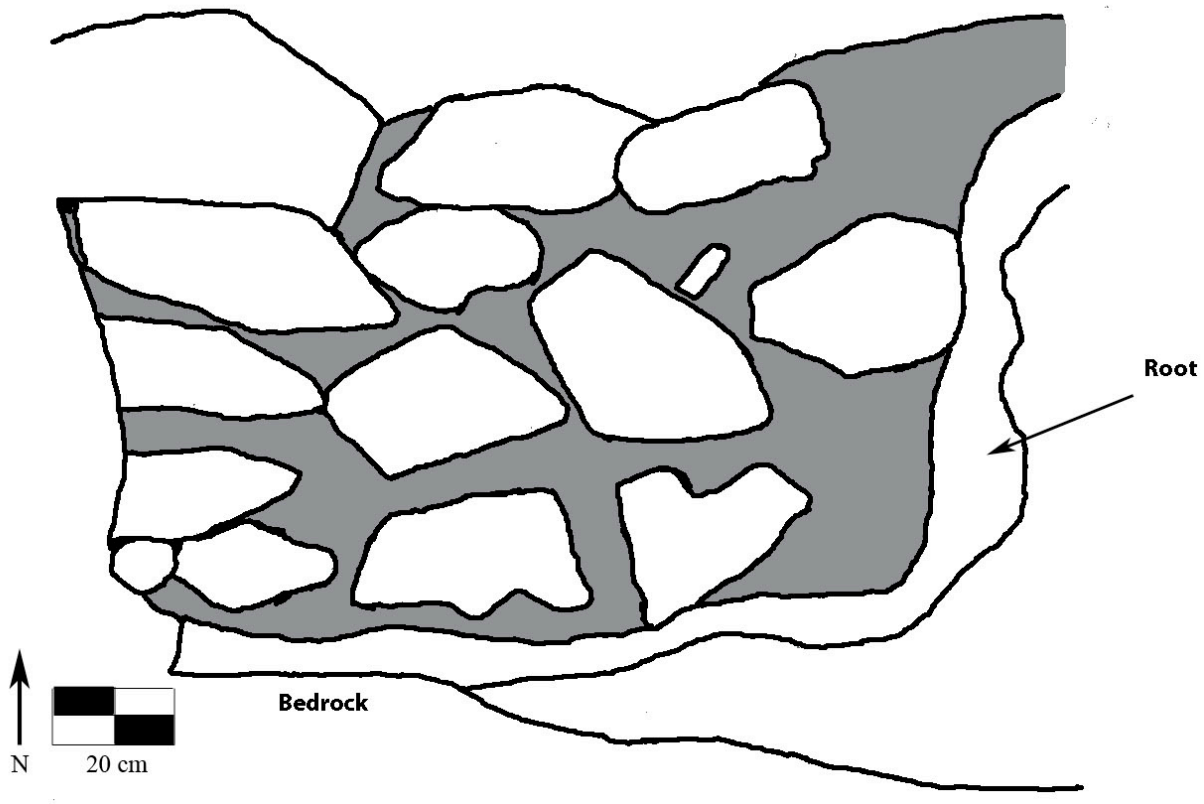

Figure 36: Platform Wall Profile, Suboperation Q
Prepared by Hal Baillie, Juliet McGraw, Daniel Appel, and Maia Dedrick

Excavations on Top of the Platform

Suboperation E. This excavation unit was located on the north-central section of the patio. This location was chosen for two reasons: (1) to try to avoid collapse from Structure I, and (2) to avoid the destructive tree falls that damaged the edge of the *plazuela* further to the south. The trench was 1 x 1 m.

My principal goals were to determine the stratigraphy and any vertical construction sequences of the platform. There were only two stratigraphic layers identified in this suboperation. Bedrock was reached at a depth of just over 50 cm. Lot 2, beginning below the humus layer and about 40 cm thick, was made up of dense cobble consisting of 2-10 cm long pieces of chert and limestone. This dense cobble layer was interspersed with many chert chunks up to 25 cm across. Artifacts in this layer consisted of many pieces of chipped stone and a small number of sherds.

Suboperation O. Suboperation O was a 1 x 3 m unit oriented east to west. It was located east of Suboperation D. The goal of the excavations was to expose a length of the platform surface in order to collect any artifacts that may have been left *in situ* and to find the other side of the platform in order to better determine the platform's dimensions and any construction events. By moving perpendicularly to the wall excavations, I hoped this excavation would be most effective in providing data about the spatial layout of the household.

Suboperation O was excavated in a single lot consisting of humus and limestone tumble. The lot was about 30 cm thick. In addition to limestone collapse, large ceramic pieces were found, particularly along the southern edge of the unit, in the center. These sherds were mixed in with the collapse. The lot was closed at a layer of chert cobbles, approximately 13-19 cm across, which ran across the unit and presumably made up the surface of the platform. On the easternmost and westernmost ends of the unit were found alignments of large limestone stones running north to south. The alignment on the west seemed to be a continuation of what had been found in Suboperation D, while the alignment on the east suggested that with further investigation the other edge of the platform might be found.

Suboperations K and R. Suboperations K and R were located east of an eastern wall for the platform, however, it seems that this area had been raised up later to create additional platform space, so these suboperations will be discussed in this section. Suboperation K was opened in order to get a sample of the stratigraphy in front of Structure III. In Suboperation K, the bedrock was found to plunge downwards, as described below. Suboperation R was opened to continue to define this possibly modified bedrock.

Suboperation K was a 1 x 1 m unit east of Suboperations D, O, and Q. It was excavated in two lots. The first lot included humus and dense chert cobble, which began immediately below ground surface. The lot was about 50 cm thick in the southern end of the unit and about 90 cm thick in the north. Chert cobbles in this lot were about 4-7 cm across, while limestone bits were about 3 cm across on average. As depth increased, chert cobbles became more densely packed and less limestone was encountered. The soil was dark and moist, although there was not a lot of soil because of the density of cobbles. There were some larger stones greater than 20 cm across. Many sherds and fragments of chipped stone were found. Lot 1 was terminated when bedrock was found in the western portion of the unit and the soil in the eastern portion of the unit became darker. Lot 2 was opened to remove the remaining soil, chert, and artifacts, exposing the bedrock beneath, which slanted downward on the eastern side of the unit. I was interested in how deep the bedrock extended and whether this might be a possible water management feature such as a drain carved into the bedrock (as found by Lohse and Findlay 2000). In order to explore this possibility, Suboperation R was opened.

Suboperation R was a 1 x 1 m unit just east of Suboperation K. It was excavated in two lots. Because the artifacts, and chipped stone particularly, had been so dense in Suboperation K, screening for artifacts took a long time. We were short on time and the laboratory was having a

hard time getting through all our chipped stone from Suboperation K, so we were advised not to sift the soil. Soil was placed in a pile next to the trench as it was removed, and it was all put back into the unit during the backfilling process. Because there was not much in terms of stratigraphy in this unit, this procedure preserved the artifacts in case a future archaeologist takes interest in the unit.

Lot 1 was about 75 cm thick. This included a humic layer about 10 cm thick followed by chert cobble starting about 10 cm below the surface. At about 30 cm below the surface there were larger cobbles. We closed the lot because there was more limestone, including large blocks starting at 70 cm below the surface. At this point the soil also became much darker. Lot 2 terminated at bedrock with a thickness of about 100 cm at the deepest point. The bedrock seemed to step downwards a couple times before it leveled out at the bottom of our unit. It could possibly extend deeper to the east of this unit. There were fewer artifacts in Lot 2. The soil color was dramatically different in this lot, which seemed to begin at about the same level as Lot 2 of Suboperation K. It was unclear whether there was evidence of quarrying along the bedrock. One excavator thought she saw tool marks, but it might have been damage caused during excavation, as bedrock was extremely crumbly and difficult to distinguish.

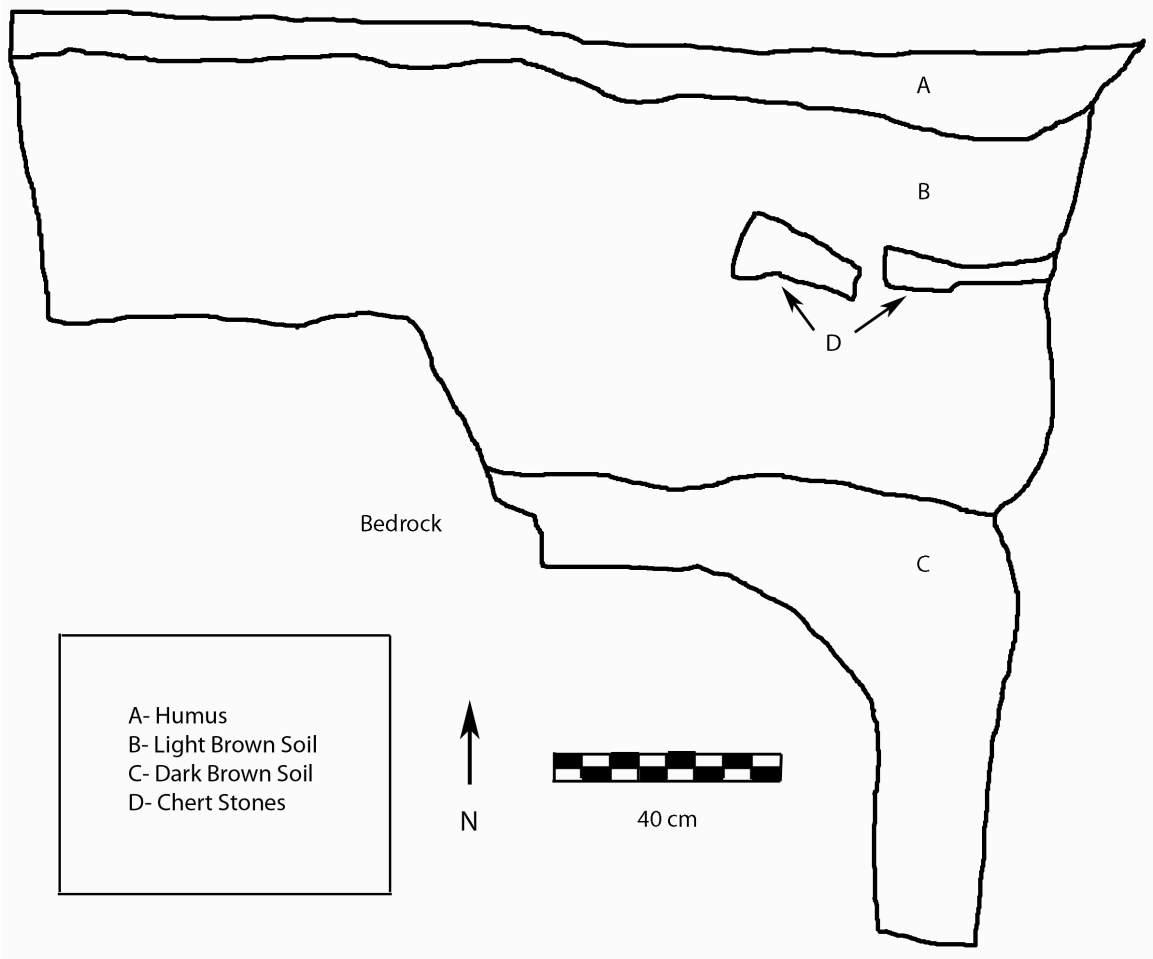

Figure 37: Northern Trench Wall Profile, Suboperations K and R
Profile prepared by Hal Baillie, Nadya Prociuk, Travis Cornish, and Maia Dedrick

Excavations Off the Platform

Suboperation B. This suboperation was located to the southwest of Structure I and to the northeast of Structure II. It was a 1 x 1 m unit. Lot 1 consisted of a 15 cm thick layer of humus. Beneath the humus layer, Lot 2 consisted of a 20 cm thick layer of cobble and debris that included ceramic sherds, chipped stone, and a broken obsidian blade. The debris layer tapered out slightly and contained degraded bedrock before bedrock was hit at about 50 cm below the surface. No intentional modification of the bedrock was detected in this or any of the other four suboperations discussed in this section.

Suboperations L, M, S, and T. These suboperations were opened around the periphery of the structures of Operation 13 in order to test for midden deposits, bedrock features and depth, and stratigraphy.

Suboperation L was a 1 x 1 m unit to the southwest of Structure III. It was excavated in one lot to bedrock. This lot had a thickness of about 45 cm. The soil was clayey and contained a few chipped stone fragments and ceramic sherds. There were no soil changes down to bedrock, which was badly decayed and damaged by root action. There was a scattering of small chert cobbles throughout.

Suboperation M was a 1 x 1 m unit west of Structure III, a distance from the platform. It was excavated in two lots. The first lot was about 12 cm thick. The soil was hard, compact, and clayey. It was a dark soil everywhere except for the southwest corner, which contained redder soil. There were very few artifacts. Lot 1 was closed when chert cobble was consistently found. Lot 2 was about 15 cm thick. The clayey soil was intermixed with chert cobble. The matrix was gray and very compact. The unit was closed upon finding bedrock, which was soft and disintegrating.

Suboperation S was a 1 x 1 m unit located to the south of Structure III. The unit was excavated in one lot that was about 50 cm thick. The soil was a thick gray to black clay with no detectable stratigraphic changes and few artifacts. Some small chert cobbles were interspersed with the clay.

Suboperation T was a 1 x 1 m unit located north of Structure I, excavated in two lots. Lot 1 was about 15 cm thick. It consisted of dark gray-brown clayey soil. The lot was terminated because of a growing presence of chert cobbles (1-8 cm across). Lot 2 ranged from about 40 to 75 cm thick. The chert cobbles were in a dark gray matrix, whereas the soil became dark gray-

brown as limestone increased and a light gray directly above bedrock. More ceramic sherds were recovered than chipped stones.

Suboperation N. Suboperation N was a 1 x 2 m unit oriented north to south, south of Structure II. I had observed that there was a depression at the surface, and it ran along what appeared from the surface to be a wall, so I suspected there may have been some kind of bedrock modification. However, as soon as excavation began it was clear that the depression was the result of a tree fall. The soil within the depression was thick with bark. After excavating down approximately 5 cm, the unit was closed.

APPENDIX D

Subop	Lot	Artifact Class	Description	Weight (grams)	Density (g/cm^3)
A	1	Ceramic	62 total	Not Available	Not Available
A	1	Lithic	55 debitage, 2 tool	Not Available	Not Available
A	2	Ceramic	563 total	Not Available	Not Available
A	2	Lithic	117 debitage, 2 tool	Not Available	Not Available
A	2	Obsidian	4 blade fragments	Not Available	Not Available
A	5	Ceramic	76 total	Not Available	Not Available
A	5	Lithic	43 debitage, 2 tool	Not Available	Not Available
A	5	Obsidian	1 blade fragment	Not Available	Not Available
B	1	Ceramic	17 total	Not Available	Not Available
B	1	Lithic	16 debitage	Not Available	Not Available
B	2	Ceramic	259 total	Not Available	Not Available
B	2	Obsidian	1 blade fragment	Not Available	Not Available
B	3	Ceramic	3 total	Not Available	Not Available
B	3	Lithic	1 debitage	Not Available	Not Available
C	1	Ceramic	80 total	Not Available	Not Available
C	1	Lithic	10 debitage	Not Available	Not Available
C	2	Ceramic	489 total	Not Available	Not Available
C	2	Lithic	84 debitage, 4 tool	Not Available	Not Available
D	1	Ceramic	64 total	Not Available	Not Available
D	1	Lithic	7 debitage	Not Available	Not Available
D	2	Obsidian	1 blade fragment	Not Available	Not Available
E	1	Ceramic	1 total	Not Available	Not Available
E	1	Lithic	20 debitage, 2 tool	Not Available	Not Available
E	2	Ceramic	33 total	Not Available	Not Available
E	2	Lithic	133 debitage, 2 tool	Not Available	Not Available
F	1	Ceramic	2 rim, 31 body	487.1	0.00081
F	1	Lithic	4 debitage	130.2	0.00022
F	2	Ceramic	8 rim, 252 body	1130.8	0.0079
F	2	Lithic	67 debitage, 15 tool	1005.6	0.007
G	1	Ceramic	4 rim, 49 body	733.9	0.0013
G	1	Lithic	12 debitage, 1 tool	239	0.00042
G	2	Ceramic	6 rim, 120 body	877.5	0.0063
G	2	Lithic	71 debitage, 3 tool	785.5	0.0056
H	1	Ceramic	4 body	63.5	0.00034
H	2	Ceramic	1 rim, 39 body	245	0.00045
H	2	Lithic	8 debitage, 1 tool	284	0.00052
H	3	Ceramic	2 rim, 6 body	186.5	0.0018
H	3	Lithic	8 debitage, 5 tool	187	0.0018

H	4	Ceramic	6 rim, 193 body	1469	0.008
H	4	Lithic	18 debitage, 8 tool	321.5	0.0018
H	4	Obsidian	2 blade fragments	2.8	N/A
I	1	Ceramic	4 body	7.6	0.000025
I	1	Lithic	11 debitage	51.2	0.00017
I	2	Ceramic	1 rim, 31 body	139.7	0.00039
I	2	Lithic	30 debitage, 7 tool	81	0.00023
I	3	Ceramic	31 body	177.5	0.0011
I	3	Lithic	35 debitage, 1 tool*	113	0.00068
J	1	Ceramic	3 rim, 6 body	384.4	0.00083
J	1	Lithic	23 debitage, 5 tool	591.3	0.0013
J	2	Lithic	7 debitage, 1 tool	190.2	0.00073
J	3	Ceramic	1 rim, 14 body	155.1	0.00054
J	3	Lithic	7 debitage, 1 tool	361.9	0.0013
J	4	Ceramic	7 rim, 156 body	848.3	0.0045
J	4	Lithic	5 debitage	18	0.000096
J	6	Ceramic	5 rim, 32 body	423.3	0.0015
J	6	Lithic	16 debitage	89.4	0.00033
J	7	Ceramic	5 rim, 162 body	917.6	0.013
J	7	Lithic	19 debitage, 3 tool	194.5	0.003
J	8	Ceramic	12 rim, 359 body	2629.3	0.014
J	8	Lithic	58 debitage	1072.5	0.0057
J	8	Obsidian	1 blade fragment	1.5	N/A
J	9	Ceramic	17 rim, 416 body	3599	0.012
J	9	Lithic	32 debitage, 1 tool	811.8	0.0027
J	10	Ceramic	5 rim, 121 body	758.1	0.03
J	10	Lithic	16 debitage	119.2	0.0047
J	10	Groundstone	2 tools	Not Available	N/A
J	10	Obsidian	2 blade fragments	Not Available	N/A
K	1	Ceramic	15 rim, 292 body	1913.7	0.0029
K	1	Lithic	1099 debitage, 92 tool	28406.3	0.043
K	1	Obsidian	1 blade fragment	0.5	N/A
K	2	Ceramic	17 rim, 213 body	1839.7	0.037
K	2	Lithic	51 debitage, 4 tool	727	0.015
L	1	Ceramic	1 rim, 33 body	95.1	0.00021
L	1	Lithic	34 debitage	371.1	0.0008
M	1	Ceramic	22 body	32	0.0003
M	1	Lithic	81 debitage, 4 tool	265.2	0.0025
M	2	Ceramic	1 rim, 33 body	69.7	0.00049
M	2	Lithic	19 debitage, 1 tool	87	0.00061
N	1	Ceramic	30 body	1032	0.013
N	1	Lithic	12 debitage	28	0.00035
O	1	Ceramic	2 rim, 20 body	471	0.00067
O	1	Lithic	190 debitage, 4 tool	1887.3	0.0027

P	1	Ceramic	7 body	29.5	0.00012
P	1	Lithic	36 debitage, 1 tool	639.4	0.0025
P	2	Ceramic	5 body	48	0.0009
P	2	Lithic	274 debitage, 7 tool	3352.8	0.06296
P	3	Ceramic	1 rim, 11 body	94	0.00042
P	3	Lithic	23 debitage, 2 tool	356.5	0.0016
P	4	Ceramic	1 rim, 72 body	111.1	0.0013
P	4	Lithic	12 debitage, 2 tool	117.4	0.0014
Q	1	Ceramic	16 body	99.4	0.00069
Q	1	Lithic	18 debitage, 1 tool	368.3	0.0025
Q	2	Ceramic	28 rim, 339 body	2681.8	0.0056
Q	2	Lithic	825 debitage, 92 tool*	18978.7	0.04
R	1	Ceramic	4 rim, 52 body	780.9	N/A
R	1	Lithic	121 debitage, 1 tool	3087	N/A
R	2	Ceramic	9 rim, 73 body	917.3	N/A
R	2	Lithic	130 debitage, 6 tool	4147	N/A
T	1	Ceramic	6 body	41.8	0.00029
T	1	Lithic	1 debitage	1.4	0.0000099
T	2	Ceramic	1 rim, 78 body	312.7	0.00061
T	2	Lithic	7 debitage, 4 tool	42.2	0.000082

Table 13: Artifact Counts, Weights, and Densities

APPENDIX E
Ceramic Analysis

Provenience					
RB#	Op	Subop	Lot	Time Period	Types Included in Lot*
* Types listed are included in lot but do not represent all of the ceramic types present.					
62	13	A	1	Tepeu 2-3	Achote Black, Cayo Unslipped
62	13	A	2	Tepeu 2-3	Achote Black, one Achote sherd with mend hole, Tinaja Red
62	13	A	3	Tepeu 2-3	Cayo Unslipped, eroded red slipped
62	13	A	5	Tepeu 2-3	Achote Black, Cayo Unslipped, Subin Red, Tinaja Red
62	13	B	1	Tepeu 2-3?	striated, eroded body sherds with surface pitting
62	13	B	2	Tepeu 2-3	Achote Black, Chilar Fluted, striated, Yaha Creek Cream
62	13	B	3	Tepeu 2-3	Tinaja Red, striated
62	13	C	1	Tepeu 2-3	Achote Black, Alexanders Unslipped, Subin Red
62	13	C	3	Tepeu 2-3?	eroded body sherds - no diagnostics
62	13	D	1	Tepeu 2-3	Achote Black, Cayo Unslipped, Subin Red
62	13	E	1	Tepeu 2-3	Achote Black, Garbutt Creek Red, very eroded sherds
62	13	E	2	Tepeu 2-3	Cayo Unslipped, Garbutt Creek Red, Meditation Black
62	13	F	1	Tepeu 2-3	Achote Black, Cayo Unslipped, striated
62	13	G	1	Tepeu 2-3	Cayo Unslipped, Tinaja Red, striated
62	13	G	2	Tepeu 2-3	Cayo Unslipped, Tinaja Red, Yaha Creek Cream
62	13	H	4	Tepeu 2-3	Achote Black, Cayo Unslipped, Subin red, striated
62	13	H	?	Tepeu 2-3	Cayo Unslipped, striated
62	13	I	2	Tepeu 2-3	Subin Red, Tinaja Red, small gunshot
62	13	I	5	Tepeu 2-3	Achote Black, Subin Red, striated
62	13	I	?	Tepeu 2-3?	eroded body sherds - no diagnostics
62	13	J	1	Tepeu 2-3	Cayo Unslipped
62	13	J	4	Tepeu 3	Cayo Unslipped (large - Tp. 3 style), Subin Red

62	13	J	6	Tepeu 2-3, Chicanel trace	Achote Black, Garbutt Creek Red, Sierra Red
62	13	J	7	Tepeu 2-3	Achote Black, Cayo Unslipped, thin Late Classic Buff
62	13	J	8	Tepeu 2-3	Achote Black, Cayo Unslipped, Subin Red, Tinaja Red, striated,bowl rim with eroded red slip
62	13	K	1	Tepeu 2-3	Garbutt Creek Red, striated,Subin Red, eroded Tinaja Red, eroded orange polychrome with mend hole
62	13	K	1	Tepeu 2-3	Cayo Unslipped, striated, eroded red slipped plate rim
62	13	K	2	Tzakol	Dos Arroyos Orange Polychrome, Rio Bravo Red, eroded orange polychrome, 1 nubin foot - diagnostics are Early Classic but could have some eroded later sherds mixed in.
62	13	L	1	Tepeu 2-3?	1 jar neck, erode body sherds with pitted surface
62	13	M	1	Tepeu 2-3?	eroded body sherds - no diagnostics
62	13	M	2	Tepeu 2-3	Achote Black, Subin Red,eroded sherds with black paste and large calcite inclusions
62	13	N	1	Tepeu 2-3	Achote Black, eroded Tinaja Red
62	13	O	1	Tepeu 2-3	Achote Black, Subin Red, eroded red slipped sherds
62	13	O	1	Tepeu 2-3	Achote Black, Cayo Unslipped, Subin Red, Tinaja Red, thin Late Classic Buff
62	13	P	1	Tepeu 2-3?	striated, eroded body sherds with surface pitting
62	13	P	2	Tepeu 2-3?	striated, eroded body sherds with surface pitting
62	13	P	3	Tepeu 2-3	Achote Black, Tinaja Red, striated, eroded body sherds
62	13	P	4	Tepeu 2-3	Subin Red, Tinaja Red
62	13	Q	1	Tepeu 2-3	Achote Black, striated, Tinaja Red, thin Late Classic Buff
62	13	Q	2	Tepeu 2-3	Achote Black, Cayo Unslipped, Subin Red
62	13	T	1	Tepeu 2-3?	eroded body sherds - no diagnostics
62	13	T	2	Tepeu 2-3	1 hollow foot fragement, thin Late Classic Buff

Table 14: Chronological Ceramic Analysis
Analysis by Project Ceramicist Dr. Lauren Sullivan, University of Massachusetts at Boston

APPENDIX F
Analysis and Summary Report of Lithics from Group C, Medicinal Trail Site, Belize, Central America

By
David M. Hyde

This paper provides the results of an analysis of the lithic assemblage recovered from Group-C at the Medicinal Trail Site, northwestern Belize. The assemblage consists of 49 tools, 1124 flakes, and 1168 pieces of shatter. All specimens date to the Late to Terminal Classic. The tool typology used for this analysis is the one established by Hyde (2003). Before presenting the results I will provide definitions for the attributes and terms used in this analysis.

Background

The quality of the raw material refers to our subjective determination of how well the raw material can be controlled during the manufacture of the stone tool. Consistency of material and coarseness of grain are considered. Consistency of material refers to the presence of bedding plains and inclusions that can negatively affect the ability of the flintknapper to control the removal of flakes from a nodule (Valdez and Potter 1991). This variable is a continuum from very good to very bad. If the raw material is fine grained with few inclusions, the quality of the piece is considered to be very good. Conversely, if the raw material is flawed by inclusions and bedding planes and has a coarser grain structure, the quality of the piece is considered to be very bad. There are a total of five states: very good, good, intermediate, bad, and very bad.

This analysis used Andrefsky's (1998) morphological typology flow chart as a starting point, and modifying it as necessary to match the specimens in the Three Rivers region (Figure 1). According to Andrefsky (1998:75), the first distinction in segregating lithic material is made

between tools and non-tool artifacts. Tools "are objective pieces that have been intentionally modified or modified by use to produce a product that has less weight than before it was modified" (Andrefsky 1998:75). Unmodified pieces removed from objective pieces are called debitage.

The non-biface category is divided into two groups depending on whether or not flake characteristics are present. If the non-biface tool has been made on a flake it is classified in the flake tool category. If the non-biface tool is not made on a flake it is classified as a core tool. Flake tools are defined as tools that have remains of an objective piece with a recognizable ventral and dorsal surface. Andrefsky (1998:79) divides the flake tools into three types based on the location of wear or retouch. A flake tool modified only on either the ventral or dorsal surface is a unimarginal flake tool. A flake tool modified on both the ventral and the dorsal surfaces at the same location is a bimarginal flake tool. Flake tools that exhibit unimarginal modification in one location and bimarginal modification in another are classified as combination tools. Endscrapers generally fit into the unimarginal category since they are generally modified by retouch on the dorsal surface only, and usually at the distal end of the original flake.

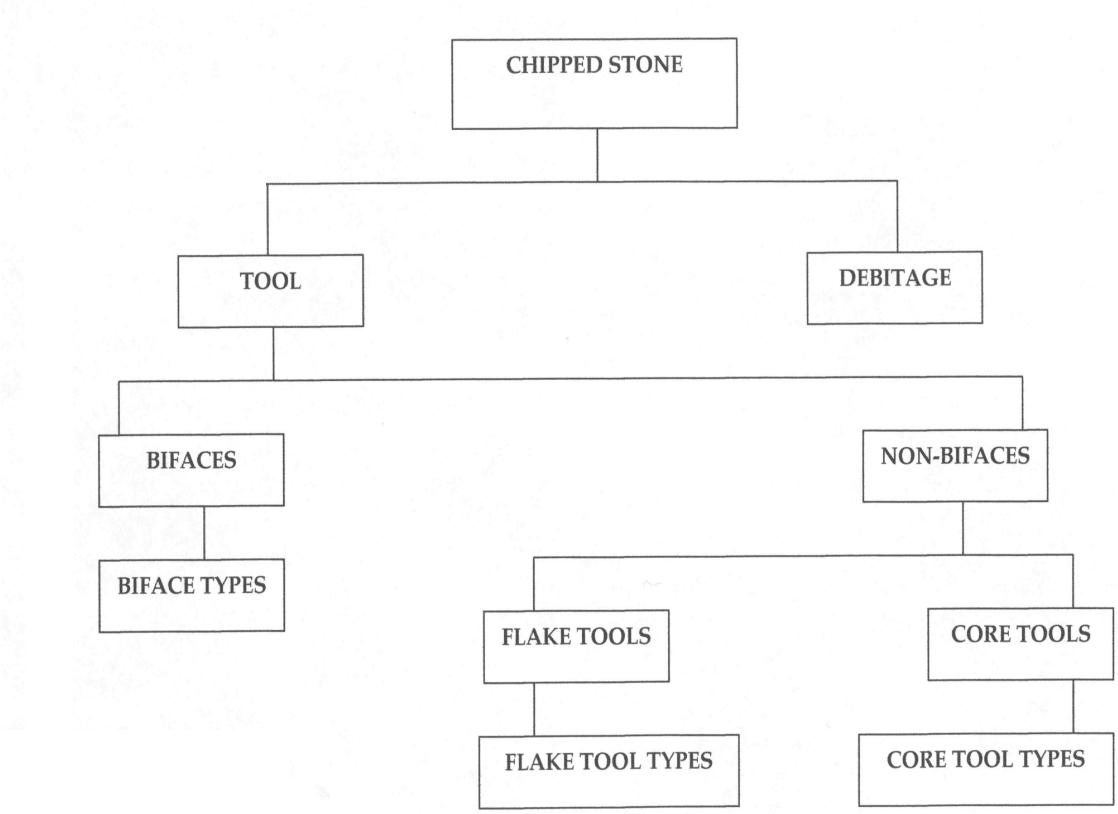

Figure 1. Flow chart showing morphological segregation of chipped stone. (From Hyde 2003; adapted from Andrefsky [1998: Figure 4.2]).

Core tools are the other major category of non-bifacial tools and they are also non-flake tools. According to Andrefsky (1998:80) these artifacts must contain some kind of human modification and have no characteristics that would classify them as flake or bifacial tools. A core is an objective piece that has had flakes removed from its surface. Cores are included with tools and not debitage because of the presence of human modification. Core tools include traditionally recognized cores as well as tools that are non-bifacial and not produced on a flake. For this typology, a core is a modified mass of chippable stone that is neither a flake nor a biface. Moreover, this definition does not refer to a particular tool function.

Core tools are subdivided into two categories. Unidirectional core tools have detached pieces removed from a single direction. Conversely, multidirectional core tools have detached pieces removed from more than one direction.

Tools

There are a total of forty-eight tools in the RB 62 Op13 lithic assemblage. Seventy-three percent are informal tools (n=35) and twenty-seven percent are formal tools (n=13), and all specimens are made of chert of varying quality.

Biface Tools

There are a total of thirteen biface tools, consisting of nine oval bifaces, two bifacial celts, one truncated general utility bifaces, and one drill. The oval biface has been shown to be primarily used for agricultural activities (Lewenstein 1987; Shafer and Hester 1986), and Hester (1985) and Shafer (2000) have shown that the bifacial celt is part of the oval biface system. Most of the bifacial tools are made from chert of intermediate to bad quality, with two being very bad quality.

All but one of the thirteen formal tools then, were agricultural in function. Two of the eleven were unfinished, one of which broke during production due to flaws in the material. Of the nine that were finished, there are three complete oval bifaces (average length of 133.1 mm) and one complete bifacial celt (86.3 mm). The incomplete oval biface specimens consist of medial and proximal fragments, whereas the bifacial celt consists of a distal fragment. The truncated general utility biface was also incomplete and consisted of a medial fragment.

Sixty-two percent (n=8) of the formal tools were recovered from excavations in front of Structure C-3, while thirty-one percent (n=4) were from units placed in front of Structure C-1. The drill was located to the west of Structure C-3.

The evidence from the biface tools indicates that at Group C this class of tools was used for agricultural activities. The fields were likely located some distance away since distal fragments are missing from the assemblage. As the hafted bifaces break in the field the haft is brought back to the household to be retooled. The distal fragment would be left in the field and the fragment remaining in the haft is returned (McAnany 1992). The general utility bifaces, the drill, and the celt likely were used at the household. The bifacial celt may have become too reduced for field work and was used in a household garden or took on some other function altogether.

Informal Tools

A total of thirty-five informal tools were recovered from excavations at RB 62, Operation 13. Utilized flakes make up 54.3% (n=19) of the informal tools, cores make up 34.3% (n=12), and scrapers 11.4% (n=4).

The utilized flakes range is length from 16.1 to 108.5 mm, with an average length of 54.7 mm, however 73.7% (n=14) are between 41 and 81 mm. The quality of the raw material ranges from bad to good, with most (57%; n=11) categorized as intermediate. All the utilized flakes were recovered from suboperations located in courtyard area of Group C.

The four scrapers were recovered from both the courtyard area and from behind Structures C-1 and C-2. The scrapers range in length from 73 to 100 mm, with an average of 91.3 mm. The raw material quality is mostly intermediate (n=3), with one of good quality.

Twelve cores were recovered from Group C, all but one of which were multidirectional. The one unidirectional core is of very bad quality chert, weighs 257 grams and was recovered from the courtyard in front of Structure C-2. The multidirectional cores are highly variable in size, with weights ranging from 38 grams all the way up to 647 grams, with an average of 252 grams. Seventy-three percent (n=8) are of bad quality chert, eighteen percent (n=2) are intermediate, and nine percent (n=1) is very bad.

The utilized flakes are of a generally overall higher quality than the cores they presumably came from suggesting that the cores were of poor quality with seams of limited amounts of decent chert. These seams were purposefully selected for expedient flake tools and scrapers.

Discussion and Conclusion

The stone tool assemblage at Group C of the Medicinal Trail Site consists of bifaces and informal tools with preferential selection and utilization of raw material, as well as differential distribution based on these classes. The bifaces consist of mostly agricultural tools, dominated by the oval bifaces, made from poor quality chert. The informal tools consisted of mostly utilized flakes but also scrapers made from mediocre to good quality chert. The agricultural bifaces are found only in front of Structures C-1 and C-3 whereas the informal tools are also located to the side of and behind the group.

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APPENDIX G
Botanical Methodology

Soil samples were taken from relevant excavation units and levels for flotation at the field camp in a Flote-Tech machine, Model #A1, Serial #79. Some light fractions were analyzed in the field. Due to time restrictions, many light fractions and all heavy fractions were not analyzed. Of those light fractions that were analyzed, identification was made based on reports and manuscripts on the region. A simple light microscope was used for identification.

Starch grain and phytolith retrieval and processing followed guidelines set forth by Chandler-Ezell and Pearsall (2003). This process was developed in order to be able to extract both starch grains and phytoliths from a single sample. First, samples are collected from the tools. I sampled not only groundstone in the field, but also any impressive chert bifaces. However, of all the samples I took, the groundstone samples were from the context most likely to provide meaningful results, so due to monetary and time constraints I only analyzed these two samples. In the field, the first sampling step consisted of brushing any dirt remaining on the tool into a plastic bag. The second sample from each tool consisted of washing the tool with water while brushing to help remove any possible phytoliths or starch grains. The third sample involved the sonication of the tool in water to remove any remaining particles. Processing continued in the United States at the University of Michigan Paleoethnobotany Laboratory. The analyzed samples were washed and starch grains floated with a heavy liquid (a water and cesium chloride solution) first because they are fragile and would be destroyed in the process required to remove phytoliths from soil. Starch grains cannot survive exposure to heat, while phytolith chemical processes can be accelerated through heat. Once the starch grains were extracted, the process of zinc iodide flotation continued in order to remove phytoliths from the samples. This

is all in accordance with the laboratory procedure laid out by Chandler-Ezell and Pearsall (2003), as described above.

Starch grains were mounted on slides with glycerine. Slide mounts were made from both the starch washes that had been processed as well as the unprocessed starch in order to make sure the near absence of starch grains was not due to processing errors. Phytoliths were mounted on slides with Canada balsam. A compound light microscope at 400x magnification was used for identification of both starch grains and phytoliths. Identification was based on comparison with published material.

The groundstone tools were also washed according to a chemical process performed as part of the research of Dr. Grant Aylesworth, affiliated with Mount Allison University, for comparative analysis of phytoliths. Their results are not yet available.

APPENDIX H
Macrobotanical Analysis

Location	I-3	J-7	J-8	K-2	0-1	P-1	P-2	R-2
cf. Onagraceae	0	0	0	0	2	52	129	3
Unknown Seeds	0	0	0	0	3	4?	4?	0
Unidentified Plant Material	0	0	0	2	7	1?	0	0
Volume of soil sample (L)	3.8	0.8	0.8	1.75	6.65	5.4	5	2.5

Table 15: Macrobotanical Counts from Eight Lots at Operation 13, Medicinal Trail Site

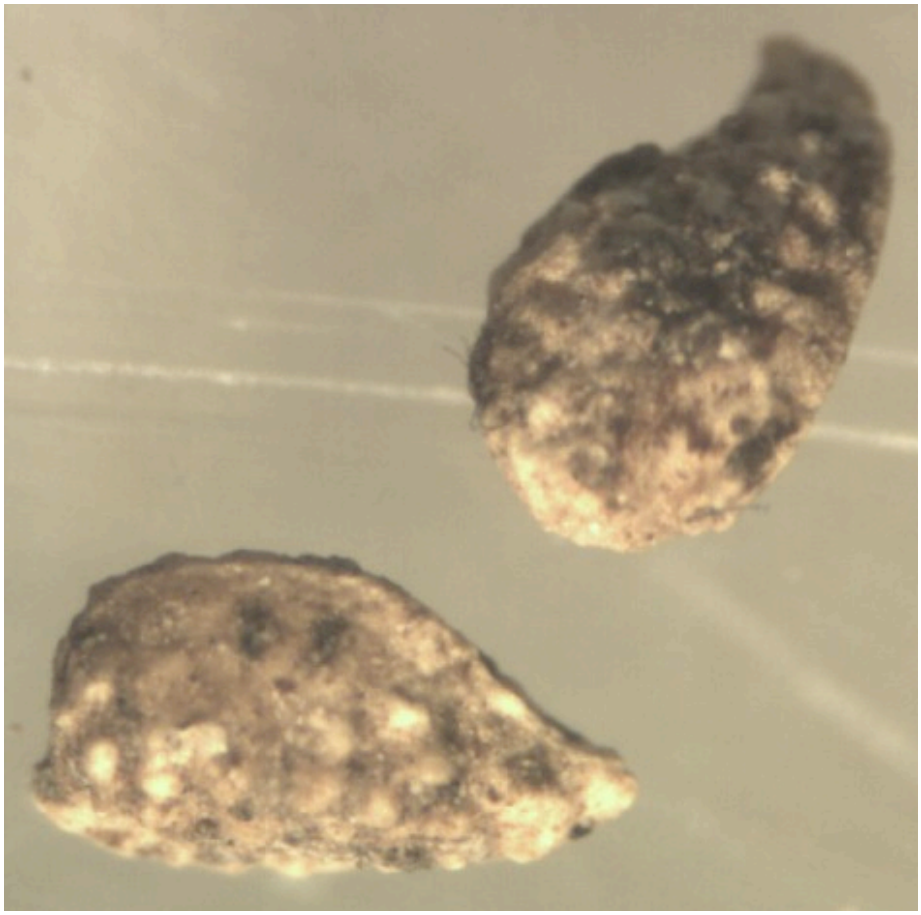

Figure 38: Cf. Onagraceae, Suboperation O, Lot 1
Dimensions: 0.8 mm – 1.5 mm
Photo credit: Maia Dedrick

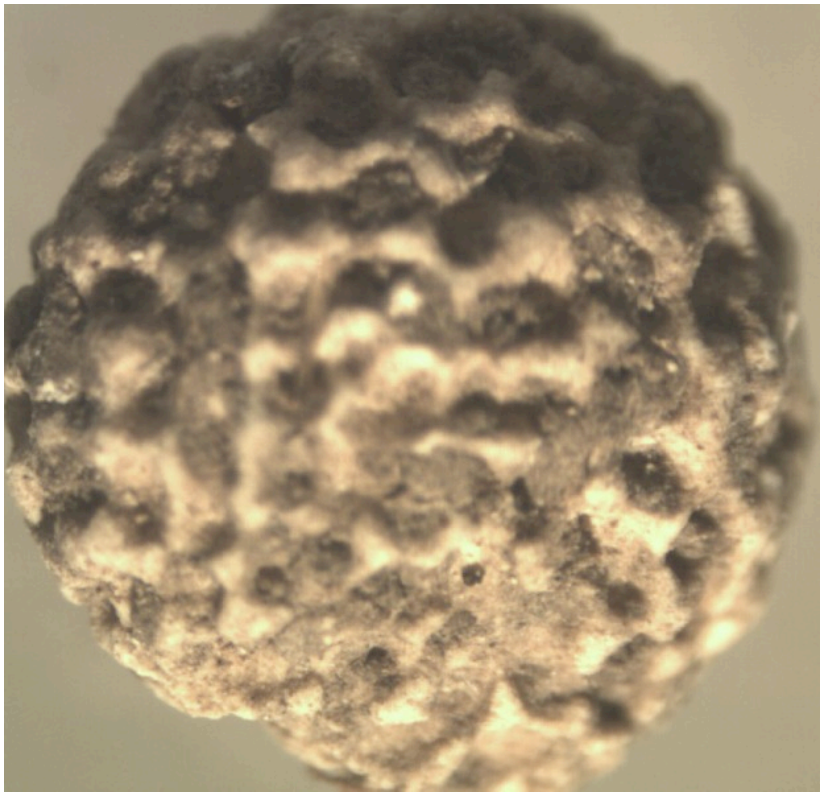

Figure 39: Unknown Seed, Type 1, Suboperation O, Lot 1
Dimensions: 4.7 mm – 5.6 mm across
Photo credit: Maia Dedrick

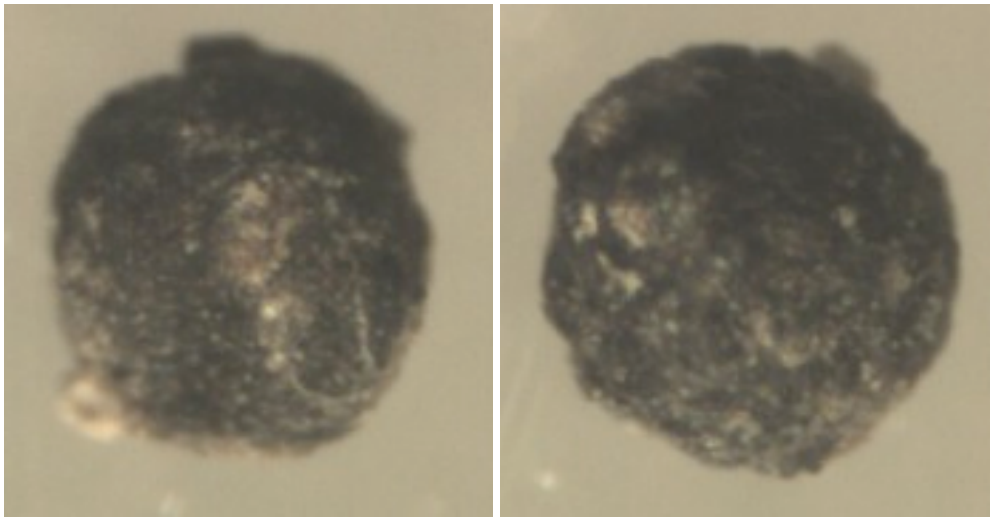

Figure 40: Unknown Seed, Type 2, Suboperation O, Lot 1
Dimensions: 0.7 mm – 0.8 mm across
Photo credit: Maia Dedrick

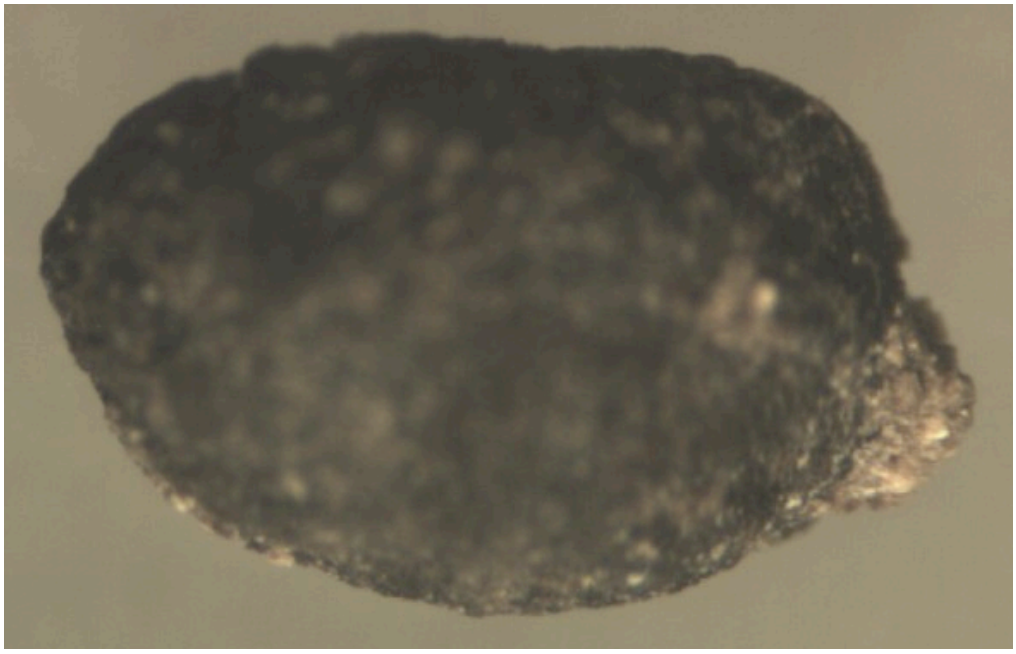

Figure 41: Unknown Seed, Type 3, Suboperation O, Lot 1
Dimensions: 1.7 mm – 2.4 mm
Photo credit: Maia Dedrick

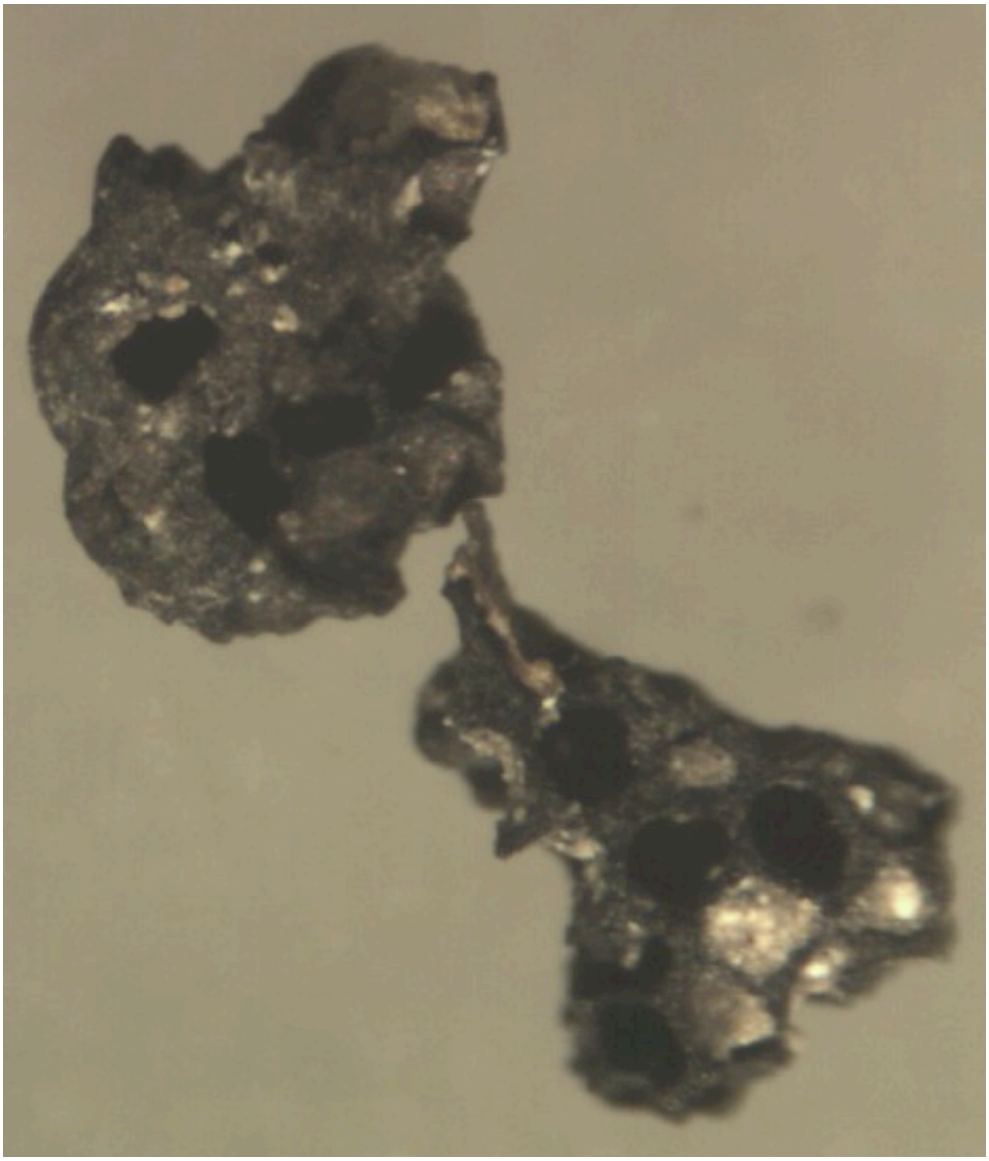

Figure 42: Unidentified Plant Material, Suboperation K, Lot 2
Dimensions: 1.0 mm – 1.5 mm and 1.2 mm – 1.4 mm
Photo Credit: Maia Dedrick

APPENDIX I
Starch Grain Analysis and Identification

The criteria in the form below were used in the analysis of each starch grain found. This form was provided to me by Amanda Logan, Ph.D. Candidate in the Department of Anthropology at the University of Michigan. She obtained the form from Dr. Deborah Pearsall of the University of Missouri, with whom she pursued her Master's research.

Granule:	1	2	3	4	5	6	7	8	9	10	11
EXT. CROSS											
absent											
strt arms											
bent arms											
narrow arms											
broad arms											
right angle											
other angle											
vacuole											
periph isotr											
GRANULE SIZE											
Lg diam											
sm diam											
GRLE SHAPE											
spherical											
ovate											
triangular											
cylindrical											
clam-shell											
reniform											
quadrilateral											
flattened											
hemispherical											
ANGULARITY											
round											
facets rd											
facets straight											
facets banded											
facet basal, 1											
facets basal, 2											
facets, 3											
facets, many											
LAMELLAE											
not visible											
fine											
coarse											

Figure 43: Starch Grain Analysis Form, Side One

Granule:	1	2	3	4	5	6	7	8	9	10	11
HILUM											
absent											
open											
closed											
semi-open											
centric											
slightly ecc											
eccentric											
v. eccentric											
FISSURES											
absent											
simple linear											
wing											
Y											
crossed											
stellate											
SURFACE											
smooth											
granular											
bumpy											
cuniform depr											
radiat lines											
PROTUBER.											
rounded											
pointed											
mammiform											
cone-shaped											
OUTER WALL											
single											
double											
smooth											
irreg angled											
COMPOUND											
2 equal size											
3 equal size											
2 unequal											
mult basal att.											

Figure 44: Starch Grain Analysis Form, Side Two

According to Pearsall *et al.* (2004:430),

> "Maize starch granules are simple, with a central (sometimes slightly eccentric), open hilum. Distinctive lamellae are absent. Shape varies from spherical to oval-spherical to polyhedral (edges showing multiple pressure facets), depending on how tightly packed granules were in the kernel."

They range in size from 4-24 μm across, although wild grasses can produce smaller, similar starch grains (Pearsall *et al.* 2004:431). For that reason, the largest starch grain found was considered the best indicator for the presence of maize on the *mano* (Figure 22). This starch grain had an extinction cross with straight, narrow arms at right angles from each other. Its size was 13-14 μm across. It was spherical, without lamellae, and had an open hilum with a small, linear fissure. Its surface was smooth, and it had a double outer wall. These characteristics adhere to the description above, and this starch grain looked similar to those published in many scholarly articles.