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Neighborhood Networks: Social and Spatial Organization of Domestic Architecture in Greco-Roman Karanis, Egypt

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Neighborhood Networks: Social and Spatial Organization of Domestic Architecture in Greco-Roman Karanis, Egypt

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Archaeology

by

Bethany Lynn Simpson

2014

ABSTRACT OF THE DISSERTATION

Neighborhood Networks: Social and Spatial Organization of Domestic Architecture in Greco-Roman Karanis, Egypt

by

Bethany Lynn Simpson

Doctor of Philosophy in Archaeology

University of California, Los Angeles, 2014

Professor Willemina Wendrich, Chair

My doctoral thesis examines how physical architectural remains preserve ancient concepts of spatial organization and reflect neighborhood social organization. I document the architecture of Karanis, Egypt, a small Greco-Roman town of the Egyptian Fayum (250 B.C.E. to the first half of the seventh century C.E.). Through functional architectural analysis and space syntax analysis, I quantify and compare how private space and social control varied from individual private properties and local neighborhood interactions to the larger system of settlement-wide public access.

Previous scholars have suggested that as a Roman province, housing in Greco-Roman Egypt was defiantly conservative of native practices, insular, and isolated from Roman tradition. My research challenges this assumption through the use of space syntax theory to evaluate how architectural spaces reflect networks of social interaction at the level of household, neighborhood, and settlement. Space syntax theory offers a quantifiable method to measure relative values of accessibility and privacy. This study therefore demonstrates that instead of

remaining resistant to cultural interaction and change, the inhabitants of Karanis were heavily invested in maintaining complex social networks that transcended binary conceptions of "private" versus "public" designations of space.

The results prove that houses were often accessed by individuals from outside the immediate household group: extended family, friends, visitors, guests, business associates, and any other individuals who may have had cause to enter the house and interact with the inhabitants and their domestic spaces. The creation of local pathways and shortcuts through neighboring properties facilitated movement and provided alternative routes to the public street system. Because access to privately-owned land had to be granted by the owner, the use of these alternate routes required negotiation and interpersonal agreements which created and reinforced social ties between neighbors. Thus the architecture of Karanis was designed to foster varying degrees communal interaction, and adaptations over time show that private property owners strove to balance their own needs and rights to privacy with the essential social role of maintaining good relationships with their neighbors.

This study therefore provides important insight into the negotiation of interpersonal agreements relationships as reflected in architectural space, on global and local scales: far from being resistant to socio-cultural change, ancient Karanis was highly adaptive cultural environment. The site is therefore potentially comparable to other Hellenistic and provincial Roman towns across Europe and the Near East, and provides rich insight into their temporal development from foundation and into Late Antiquity.

The dissertation of Bethany Lynn Simpson is approved.

Kathlyn Cooney

Diane Favro

Willemina Wendrich, Committee Chair

University of California, Los Angeles

2014

To Mom and Dad, who put up with me during this last year

(and let's face it, all the years before this, too…)

Also to Anne, Emily, and Eric for going through the process with me,

and to Dena for providing sanctuary from it.

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Education

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M.A. in Archaeology, University of California, Los Angeles

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Wendrich, W., B. Simpson, and E. el-Gewely, 2014. "Karanis in 3D: recording, monitoring, re-contextualizing, and the representation of knowledge and conjecture." *Near Eastern Archaeology*, Vol. 77, issue 3, September 2014.

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Book Reviews

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Chapter One: Introduction to the Study of Greco-Roman Karanis

Introduction

This thesis examines how physical architectural remains not only preserve ancient concepts of spatial organization, but also reflect strategies for managing social organization by studying the built environment of Karanis, Egypt, a small town of Egyptian Fayum, as it existed during the period of Roman rule (30 B.C.E. to the first half of the seventh century C.E.). The study uses space syntax analysis to quantify and compare complex systems of access, ranging from individual private properties and local neighborhood interactions to the complete global system of settlement-wide public access. The results demonstrate that ancient people accepted a greater deal of variation and flexibility in their definitions of private space and social control than previously thought. Analysis shows that even when civic institutions did not maintain the full functionality of the public street system, these local strategies for ensuring access between properties not only became essential components in the practical reality of access and movement through a settlement, but are evidence of a close network of social interaction. This indicates that the ancient inhabitants of such settlements were not necessarily resistant to change or guardedly insular even with respect to their own private properties, but were in fact invested in maintaining complex networks of social interaction that transcended legal conceptions of "privacy" and property.

The study begins in **chapter one** with a general introduction to the site of Karanis, a town of the northern Fayum region in Egypt. Like many Fayum settlements, it was first founded during the reign of Ptolemy II (ruled 283-246 BCE) as part of his program to expand agricultural land and the production of grain for the growing Hellenistic empires. Karanis was therefore first

occupied by Hellenized military veterans and other foreign settlers in addition to native Egyptians (Clarysse and Thompson 2006, Lewis 2001, Mueller 2006). Because of this, Fayum sites have been used extensively as examples of multicultural interaction under Hellenistic and later Roman rule.

Archaeological evidence for villages of Greco-Roman Egypt is generally quite limited, due to despoliation, modern habitation over ancient sites, and the method of early twentieth-century excavation. However, excavations at Karanis were extensive, and demonstrated high levels of preservation not only of architecture but organic objects rarely found in other parts of the Greco-Roman world. Many of the finds pertained to daily life, and papyrological remains were especially abundant; all of these have greatly enriched the understanding of life in Greco-Roman Egypt. Therefore, Karanis is often cited as one of the most extensive datasets available for study: "it is late Karanis that informs us best about villages throughout the country" (Bagnall 1993:111, see also Bagnall 1993:6, Alston 1995 and 2002, Bowman 1989). It has been used by various scholars as evidence not only of a typical village of Greco-Roman Egypt, but even more broadly as illustrative of life in the Hellenistic East (Nevett 2010) and Late Roman Empire (Brown 1971:142).

However, the data from the various excavations at Karanis have never been studied in a truly comprehensive way. Since its modern discovery, the site has seen at least three major archaeological investigations, as well as several other excavations, legal and illegal, that have interrupted site stratigraphy and further disturbed the archaeological context of remains. The largest scale excavation was conducted by a team from the University of Michigan from 1924 to 1935, and their initial survey established the full extent of the site at nearly 788,000 square meters (Husselman 1979:7). However, this excavation only published a small percentage of its

findings, and most of it remains entirely unpublished. Unfortunately, most of the studies of Karanis listed above relied exclusively upon the Husselman publication, and therefore relied on extremely limited evidence for their analyses of the site.

Chapter one of this study therefore includes a brief analysis of each of the projects that have made a mark on Karanis, comparing various techniques for exploration and especially the limits of what was recorded by each project. This also includes a discussion of the work of the URU Fayum Project, an expedition of the University of California, Los Angeles, the Rijksuniversiteit Groningen, Netherlands, and the University of Auckland that has been excavating in Karanis since 2006. This project has included targeted excavation (and sometimes re-excavation) of structures to clarify questions of stratigraphy and dating for the site. In particular, the site-wide survey of extant structural remains conducted by Hans Barnard (Barnard et al forthcoming a) has been essential in producing a single accurate unified map of the site so previous historical data can be "repositioned" in their correct geospatial locations. This makes it possible to reconstruct "missing" spatial data for thorough analysis of the ancient spatial system of organization that is so central to this study.

Chapter two explores the more general ways in which ancient architecture has been used to explore ancient concepts of spatial organization of the built environment, and how this relates to social organization of the occupants of such spatial systems. This includes analyses on both the macro and micro levels, from the design of entire settlements to the order of individual private houses.

Many of these studies rely on standard typologies of architectural structures as specific to individual cultural groups: therefore, this chapter includes separate discussions of Egyptian, Greek, and Roman architecture. The possibility of multicultural interaction is considered,

especially at the level of settlement analysis: Karanis has been most consistently used to test hypotheses of interaction of cultures, in order to determine how "Greek", "Roman" or "Egyptian" the town (and therefore its inhabitants) would have been. Discussions of these interactions and potential mixing of cultures have included everything from colonial and post-colonial theory of enforced assimilation (Frankfurter 1995), to incentivized adaptation and the creation of multiple cultural identities (Clarysse and Thompson 2006, Quaegebeur 1992, Van Minnen 1994, Woolf 1994) and the creation of syncretic cultural practice (Ostenfeld 2002, Riggs 2005, Steward 1951, Woolf 1997 and 1998).

Most studies use archaeological evidence only to identify various aspects according to their native cultural origin. For architectural remains, houses in particular are often judged by how well they fit the presumed cultural standards: conventional definitions of the Greek *oikos* or Roman *domus*, for example. Deviations from expected forms are commonly referred to as "misinterpretations" or misunderstandings of the authentic culture. This is a particularly misleading view, as the very types being used as standards of ancient practice are in fact largely modern inventions, based on limited examples preserved in the archeological record: much of what is "known" of the Roman domus comes from Pompeii and Herculaneum, and therefore reflects a very specific regional and temporal point in cultural development. They are not necessarily reflective of broad practice, and may be specific local variations of architecture rather than indicative of broad cultural practice.

Functional analysis is slowly taking the place of cultural-historical models for the study of ancient architecture: it proposes the contextualization of multicultural social interaction as well as spatial context, "houses within a city and society" (Metraux 1999:393). Accordingly, this particular study of Karanis is not focused on identifying separate Greek, Roman, or Egyptian

cultural markers, but instead focuses on a functional analysis of architecture and the role of the built environment in organizing many types of social interaction. Attributes are not discussed in terms of cultural origin, but are significant once considered in their larger context—both social context of a mixed cultural environment, and the spatial context of their relative location within a building or larger spatial environment. To that end, chapter two includes analysis of culture-historical type studies in describing past scholarship of settlement and private property organization.

Chapter two concludes with an examination of sources specific to Greco-Roman Egypt itself. Textual sources, in particular, are useful evidence, often revealing the details of civic and municipal offices for town management, as well as an analysis of property law as it may have pertained to private structures in Egypt. Documents also preserve a great deal of vocabulary concerning the house and domestic structures, giving potential names to construction features and individual areas of the Fayum house. However, it is difficult to successfully attribute these words to known extant architecture. Even interpreting the significance of such terms can be fraught with difficulty. As preserved documents from the Fayum are largely written in Greek, such evidence has often been used to prove the "Greekness" of such structures, However, words such as *pylon* and *obelisk*, like any aspect of culture, change in meaning and significance over time. So textual sources, too, must be interpreted with care.

Having considered other scholarship on Egyptian, Greek, and Roman spatial organization, it becomes clear that most studies rely on description and anecdotal evidence as well as some problematic interpretation of cultural ideals. In fact, little has been done to link theory to the physical evidence of material remains. It is therefore necessary to find a way to identify and quantify archaeological evidence, to examine the variations within architecture and

the general organization of space, in order to analyze which patterns are purposeful strategies for maintaining culturally-held values, and which might more reasonably be dismissed as non-significant variation.

Chapter three begins with a discussion of how material culture is used to express identity in multicultural environments, and especially the role of individual agents as well as group authority in negotiating social boundaries. It includes an examination of theories of social boundary maintenance and strategies for negotiating individual- and group- interactions, while explaining how material culture can be used to signal individual identity as well as group membership. The old trope of "pots equal people", developed from the culture-historical approach (Kossina 1911, Childe 1930), is of course too simplistic, as the strategies for either maintaining or manipulating categories of identity are always changing in both type and intensity of relative importance (Broom et al. 1954, Hall 1997, Barth 1969). However material objects certainly have symbolic and identifying uses as well as practical functional ones, and these signifiers, embodied through what Bourdieu referred to as the *habitus* (1977), can be used to share non-verbal messages of personal identity and group-belonging.

In this, architectural structures are no different than any other category of material culture, and can be studied for their physical structural attributes as well as their decorative aspects. For this reason, attribute analysis (as discussed in Chapter 2) of architectural features and especially decoration are among the major ways in which architecture has been examined as signifying of cultural and social identities for occupants and particularly for heads of household in domestic properties (Ling 1991, Wallace-Hadrill 1194, Crocker 1985).

However, such markers are not only significant by their mere presence or absence, but also by their relative position in a larger organizational scheme: spatial context is an important

consideration, as many of these signifiers are only truly valuable as indicators of cultural belonging if they can be viewed and interpreted as such by a human agent within the space. Thus the relative position of architectural and decorative features within a structure affects the probability that these details can be seen and made effective at signifying identity. Fortunately, architecture is different from many other categories of material culture preserved within the archaeological record, specifically because it is not portable: instead structures establish their own spatial contexts of use. The physical human experience is not abstract or insubstantial, but occurs in real space, as defined by architectural structures and the built environment.

Any given space must meet certain criteria determined by the mechanistic of activity and use of that space—for example, activities involving the storage and preparation of grain for baking require that wind disturbance be kept to a minimum, and therefore must be conducted inside an enclosed space. Likewise, most human activities also have social determinants that affect spatial organization: concepts such as privacy and propriety, the separation of genders, age groups, and family members from outsiders are all socially- and culturally-constructed. Thus, a building is designed to give practical spatial organization to both these physical and social needs, and ancient architectural remains preserve evidence of ancient social practices, how they may have been regulated, prohibited, or permitted, based on those same socio-cultural standards of behavior that were then made physical in the form of structural barriers, access routes, and spaces for social interaction.

Architecture establishes not only the location of human action and interactions, but also organizes the potential movement of people through and between various spaces. The design of the system introduces degrees of closeness and separation, ease of access and obstacles to movement, that all reflect socio-cultural standards and intentions of the builders and occupants,

and establishes relative position and routes of access as physically codified in architectural remains. Architecture defines use and preserves the context of not only of attributive features, but of human spatial interaction as well. Therefore preserved archaeological remains of structures and larger built environments can thus be used as evidence not only of spatial interaction, but potential social interaction as well.

The interconnection of any spatial system thus affects the possibilities of travel as well as the likelihood by which social interaction may occur. Rather than pure random chance, these systems can be examined for the measurable mathematic probability that any given space will be used as part of the larger spatial network. The work of Hillier and Hanson (1984) established the general methodology for space syntax analysis, the method by which the organization of space can be systematically recorded and studied, and the theory by which spatial relationships may be related to social use. This study has huge value, particularly in their discussion of "space" as a complex, multi-variable concept: that the nature and perception of a single room is constructed by far more than just its own simple dimensions, but in reality affected by the complex relationships with a larger spatial environment.

The methodology for analyzing space in a quantifiable manner, set forth by Hillier and Hanson, was further developed by Mark Grahame (2000), as applied to the houses of Roman Pompeii. His study raises many valid concerns about the multiple factors affecting access control and the opportunities for social interactions between occupants of a space or sequence of spaces which must be taken into account for any thorough study of domestic spatial relationships. Chapter three therefore provides specific explanations of each space syntax value as defined and calculated in this study, all of which are also included in Appendix A.

The method for analysis for this study of Karanis architecture includes not only

architectural and stylistic features, but also the thorough contextual analysis of the spatial systems created by them. Each measurement or observation recorded is linked to its spatial coordinates through a Geographic Information Systems (GIS) database, as features in attribute tables. Thus not only the physical attributes but their contextual relationships to other structures and spaces can be easily sorted, grouped, and visualized as needed. While the majority of the study focuses on the syntactical analysis, the contextualized attributes are often used as a way of finding potential meaning behind the larger spatial patterns: the relative location of ovens and other bread-making equipment, for example, suggests that the well-connected spaces of domestic courtyards were often shared among close neighbors and other acquaintances, even though they were technically on privately owned properties.

Once the theory and method for this study are established in the first three chapters, **chapter four** begins by questioning if Karanis was a deliberately planned settlement, rather than developing "naturally" through interpersonal negotiations of individual settlers and local groups, with no official civic oversight. As a definitive answer to this question could only be made through a thorough examination of the town's Ptolemaic remains, this chapter includes a necessary reassessment of the existing dataset. Most of the town's Ptolemaic structure is unknown, as it was destroyed before archaeological exploration began. The remains left for formal excavation represent diverse areas and time periods, none of which can truly be directly compared. They are certainly not comparable to any of the ancient districts (*amphoda*) that would have defined local neighborhoods for the inhabitants of the town.

However, using the information from these various excavations (Michigan, Cairo/IFAO, and the ongoing URU Fayum Project) a general assessment of the town's original layout and gradual growth has been retraced. In particular, the area of Karanis Center (KAC) provides a

large continuous area (26,000 square meters) that was fully excavated and recorded so that at least three different layers of construction and occupation were identified. Further exploration by the URU team has created a combined dataset that is sufficient for analyzing not only the early origins of the Karanis settlement, but preserved with enough detail to allow for analysis of global as well as local spatial organization.

Although area KAC is unique in being the most thoroughly excavated and recorded section of Karanis, it appears to have grown according to a pattern typical to other Karanis neighborhoods: from foundation and early construction and occupation through expansion and alteration. Changes were made necessary by the accumulation of debris and sand causing rising street surfaces, as well as due to changing social needs. Periods of localized abandonment and collapse also created opportunities for building brand new structures, which were established either over or alongside older ones. This created a complex partial palimpsest of a built environment, in which constant various decisions are made in the negotiation of space.

The civic model began as a well-defined system for public access, with a fairly regular street system and consistent orientation of surrounding buildings, clear evidence of ancient town planning. The consistency of the alignment of Karanis roads and pathways suggests that the organization could not have happened "organically" though interpersonal negotiations at the local level of property and neighborhood, but was likely managed by an overseeing civic authority and implemented according to a pre-existing plan.

As the town expanded, changes were gradually made to the existing street pattern. Most were small and appear to have occurred only in response to specific localized needs: for example, a natural slope in the town causing the necessity of a small retaining wall terrace. Such changes were limited and only cause a very narrow degree of deviation from the original plan.

Overall, the system of access and organization remained in effect for centuries.

However, over time larger deviations did occur, and the strategies for coping with these changes became more varied. This appears to be evidence that local agents were directly involved in negotiating spatial needs and solving such problems, rather than relying on a central authority which would have had more regular strategies for facilitating order. Civic oversight may have been lax as individuals took it upon themselves to settle interpersonal conflicts as well as the general maintenance of certain public and shared spaces. Therefore social interaction became an essential way by which spatial order was organized, and the inhabitants of Karanis likely took very active social roles in the management of their own town.

In contrast to the open and interconnected public streets that unite all of Karanis, **chapter five** discusses private properties, which represent a much more restricted sphere of spatial organization. Individual parcels of land can be identified by their extant structures, as nearly all private space within Karanis included perimeter walls that clearly established the property limits. Accordingly, the houses of Karanis have been previously assumed (Alston 2002, Bagnall 1993) to be independent units with high standards of privacy, enclosing and isolating the inhabitants within. However, space syntax analysis creates the opportunity to examine individual spaces for their connectivity and integration, values that tend to reflect standards of relative privacy within a house and its associated areas. The distinction between spaces used for transitional movement only and those that were occupied for longer durations becomes very clear, and allows for the systematic identification of patterns of movement through space versus occupation of space. Areas for socialization are noted, and especially areas for the entertainment of guests and other visitors to the house are made clear.

This in turn gives evidence of the social organization of households, how daily tasks may

have been divided into personal responsibilities, or shared among family members. There is even evidence that some chores such as food production involved the sharing of private space with those from outside of the household, in order to share the cost and burden of work with others. In this way, many tasks became opportunities for socialization with those outside of the immediate household group, and likely strengthened neighborhood relationships.

The role of close neighbors and spatial negotiation is further examined in **chapter 6**, where the legal rights of occupancy and land ownership are explored as often in contention with social codes of behavior. Under the laws of Greco-Roman Egypt, a privately-owned property was under the total control of its owner or occupant, and no outsider had the right to access this property in any way without permission. However, practical needs of life in an increasingly dense urban environment created conflicting needs, where sometimes the only logical route to a property was by cutting across the land of another. These conflicting "rights" of property required complex social (and sometimes even legal) negotiation before satisfactory solutions could be reached, and many of these negotiations left lasting physical traces on the architectural structures and the spatial organizations created and enforced by these measures. Changes over time suggest a great deal of ongoing negotiation between local agents of space, suggesting that while neighborhood relations might not always have been friendly, neighbors were in constant contact and not socially distanced from each other.

Finally, in **chapter 7** I draw conclusions about the social implications of life in Karanis. It is immediately clear that the town was in a constant state of change, as streets were used, alternate routes chosen or rejected based on daily choices of individual agents, but also driven by practicality as some paths became impassable over time, blocked by construction, collapse, or rising debris. While there were some attempts to maintain the functional order of the town, most

of the change was negotiated through local and individual action rather than civic management, leading to a complex variety of strategies for the adaptation of spatial order over time. While property was considered an important right and control of its use was officially at the discretion of the owner, social pressures could lead to a variety of necessary compromises. Some were practical and even mutually beneficial, as households shared courtyards as well as workloads while casually socializing with each other. At other times, guests were invited into private houses for social events that could range from casual to formal events filled with aspirational display and complex social negotiations of proper behavior. Conversely, some interactions were not so pleasant, as conflict between neighbors could lead to the alteration of shared access routes, the blocking of courtyard access and rescinding permission to use facilities that had previously been shared.

In any case, the social life in Karanis was extremely important: for good or ill, there seems to have been little chance of escaping interaction with the neighbors. Privacy, while legally definable for standards of spatial use, was not ever wholly possible from a social standpoint, and everyone was likely very closely involved with the lives of others.

A Site History of Karanis

Discovery and early activities

As with many ancient sites in the Fayum, its modern "discovery" was in the late 19th century. The general location was described as an ancient site by Petrie in his report on the Fayum (1888), and there is ample evidence that the town mound, called Kom Aushim, had already begun to be exploited for various materials (archaeological or agricultural): Karanis was

particularly affected by the *sebakhin*: native agricultural workers seeking fertilizer and organic deposits (*sebakh*) to enrich their own fields. Because the kom provided a rich source of organic materials, including unfired mudbrick, this activity continued into the early twentieth century when it took on an industrial aspect: an Italian-based company secured official permission from the Egyptian government to mine the site for sebakh (Husselman 1979:1). As a result, the center of the mound was destroyed down to the natural bedrock by the sebakhin activity before scientific excavation or recording ever began.

As organic materials were removed, the discovery of papyri created a new motivation for digging on the site, at first by native diggers who sold them, unprovenanced, through dealers to European collectors. The name of the ancient town of Karanis began to raise interests as "a town mentioned more often in the Faiyûm papyri than any other beside Arsinoë and Socnopaei Nesus" (Hogarth and Grenfell 1896:15). The latter ancient site had already been identified as modern Diméh, and although the site of Kom Aushim had been suspected to be ancient Karanis, it was Hogarth and Grenfell who were able to state that this was true "beyond a doubt" (1896:16) due to the papyri they uncovered in situ during their 1895-96 excavations.

These early excavations were little more than treasure hunts, collecting small objects and especially papyri but with no description of the location of their discoveries other than "Karanis" itself. It was not until the University of Michigan began their work at the site in 1924 that a systematic recording of the site began. This included an extensive topographical survey, which established the limits of the site as reaching "approximately 750 m. from south to north and 1050 m from west to east" (Husselman 1979:7). However, of the resulting 787,500 square meters of site, only about 180,000 square meters were surveyed for architectural remains, or included in the actual excavation. This second measurement also includes the central destroyed area of the

site, so that in actuality only a small percentage of the town was ever investigated or recorded in any formal way.

The full results of the Michigan excavation were never published, and the final report (Husselman 1979) included the detailed analysis of only thirteen mudbrick structures; this is in comparison to over 400 houses excavated by that team. Maps were included, but at such a reduced size as to make it impossible to discern architectural detail. Fortunately, while unpublished, the extensive field notes and journals kept by the Michigan team have survived, as have multiple maps and over 6,000 photographs, all kept within the archives of the Kelsey Museum in Ann Arbor. Thanks to the help of Sebastiàn Encina, collections manager of the Kelsey, I was able to access the unpublished maps, notes, and original photographs for this study, and to use this legacy data in analyzing many previously-excavated structures which are no longer extant at the site.

Four decades after Michigan's work at the site had ended, the University of Cairo conducted further excavations in northern Karanis for several seasons in the 1970s, which were admittedly characterized as "a search for papyri and ostraka rather than in the architecture of the village's ancient buildings" (El-Nassery et al. 1976: 231). There is very little published from this time apart from a detailed report on the excavation and conservation of a Roman-era "grand bath" which was undertaken in cooperation with *l'Institut français d'archéologie orientale (IFAO)* and published in their bulletin (ibid). The IFAO headquarters in Cairo houses a collection of documentary materials from the 1970s expedition at Karanis, including multiple black and white photos of the excavation and (presumably) the subsequent restoration of the north Karanis bathhouse. I have already arranged to study these materials in the future, but could not access them in time to include for this study. It is hoped that they will provide a significant

source of data for future works on Karanis architecture.

The site in the early 21st century

Since 2003, Karanis has been studied as part of the URU Fayum Project, a joint expedition of the University of California, Los Angeles, the Rijksuniversiteit Groningen, and the University of Auckland. This project includes targeted excavation of outlying areas that had not been studied before, as well as some re-excavation of previously-explored areas, which "showed several features which had not been published by the University of Michigan expedition, and it demonstrated … the level of degradation compared to the status just after the original excavation was found to be substantial" (Cappers et al. 2013:40). The Fayum Project also includes an extensive topographical and architectural survey, begun in 2007 by Dr. Hans Barnard (Barnard et al forthcoming a), who has created a plan of all currently-visible Karanis architecture. Using a differential total station to survey the site, Barnard has ultimately created a digital elevation map and top plan that pinpoints the location of all ancient structures that are still extant on the modern surface of the site (Barnard et al. forthcoming a). As the Barnard plan is geo-rectified to not only preserve local but also global positions, it has made it possible to make comparisons with the unpublished documents of the original Michigan excavation, even those that were drawn up with few specific coordinates. By comparing historical plans to the modern digital map, it has been possible to identify the extant structures according to their Michigan designations. Unfortunately, the comparison has revealed substantial loss for the site: many of the structures left exposed by Michigan have eroded and collapsed in the intervening years, and as much as 57% of the structures uncovered by Michigan no longer visible (Simpson architectural report 2010, unpublished).

Although erosion has devastated the areas once excavated by Michigan, the Barnard survey included previously-unrecorded structures for large areas of the settlement, including the extensive east and west "suburbs" that had previously been identified by aerial photography (Boak 1926:plate IX, and see Bagnall and Rathbone 2005:132 for the use of the term "suburb") but never systematically recorded. The results expand the recorded architecture of Karanis to the full extent of the settlement and include significant aspects of the adjacent necropolis as well (Barnard et al forthcoming a, and see Appendix B for further maps). Following this work, I have undertaken an architectural survey, annotating the Barnard map with measurements and observations on each extant structure's material and architectural makeup, all of which have been listed in the previous chapter's description of attributive survey.

Figure 1.1. Extant architecture as recorded by Michigan, 1924-1935. In contrast, the only structures still visible in 2008 are outlined in red.

Modern Survey Areas

Even with the information of the recent URU survey, there is no immediate or easy solution for the problem of "uniting" the disparate areas of the town: over eighty years of erosion and decay have decimated the architectural remains left exposed by the Michigan excavation, while other intact areas are currently buried under backdirt and potsherd heaps that are several meters high. Any attempt to uncover them would require excavating huge volumes of archaeological debris, in short, digging on a scale similar to that of Michigan's, which will likely never happen again given current archaeological attitudes favoring careful targeted excavation rather than the uncovering of broad areas.

Since there is no opportunity to study a united access plan for the entire site of Karanis, the modern site has been divided into discrete and well-defined areas within what must have been a larger unified network of the entire town. In terms of analyzing access and spatial organization, it is particularly important that these represent well-defined subsystems with controlled limits: Karanis Centre (KAC) in particular (discussed in detail below), represents a large contiguous and temporally continuously-occupied portion of Karanis, with high standards of preservation, reflected in the subsequent detailed recording and publication by Michigan (Boak and Peterson 1931, Husselman 1979). As such it forms the basis of this study's examination of Karanis spatial organization. The other areas described below represent areas where preservation is not nearly so high or so consistent; they are often inadequate for examining full syntactical patterns of access. However they still provide valuable supplementary evidence on the full range of architectural styles, sizes, and typological variation in Karanis structures.

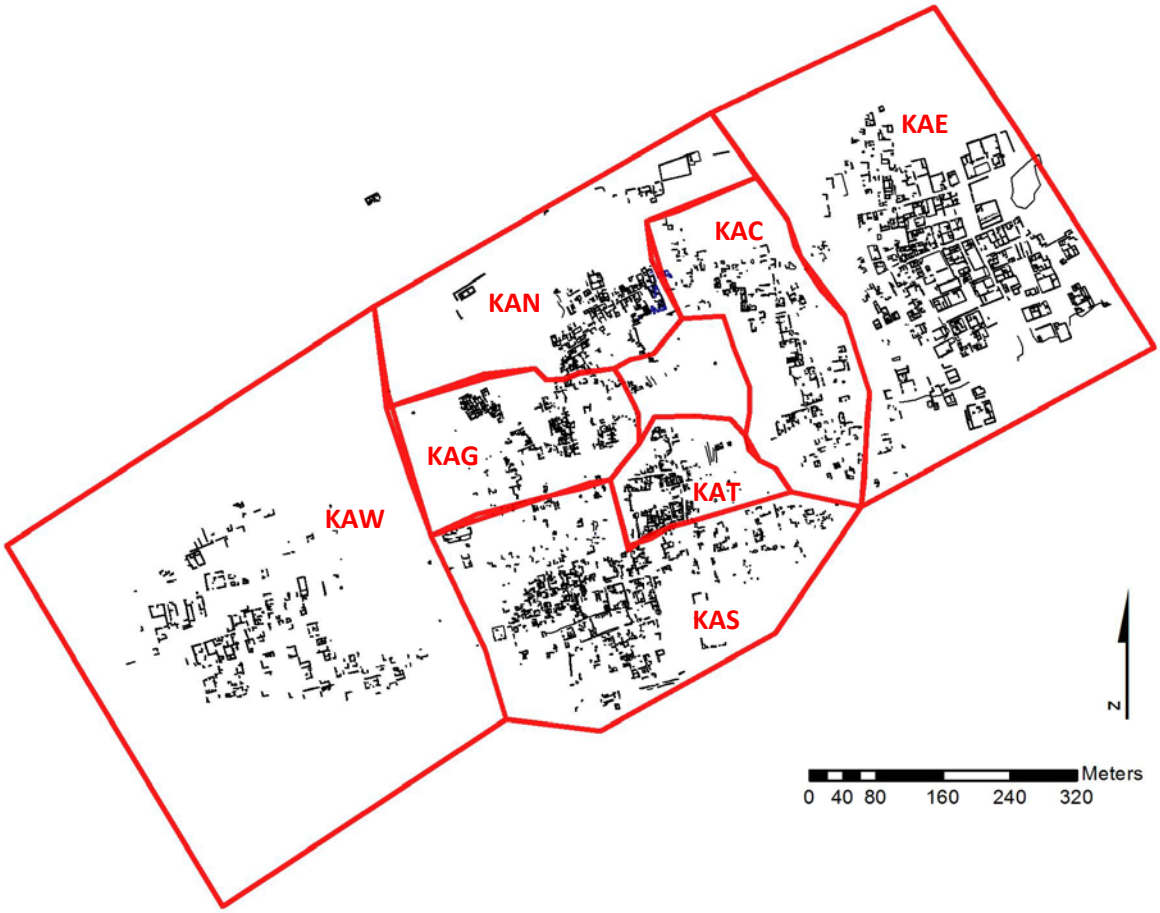


Figure 1.2. Modern area designations shown superimposed on the Barnard survey map of Karanis structures (2007-2012).

Karanis Center (KAC, and see map in Appendix B)

This is the single largest continuous area of Karanis explored by Michigan, representing almost 18,000 m² of excavation. The eastern and southern limits of this area are an irregular ridge created by the sebakheen and the adjacent Central Destroyed Area of the kom. The northern limit was unexcavated by Michigan, largely because there were few visible structures preserved in this area to warrant digging; that was certainly not true of the western limit, which was defined by one of the site's major north-south thoroughfares. While there were certainly structures all along the western border of this street, as well as significant crossroads, the area

was never excavated and in fact used as a spoils dump for the rest of the excavation. Despite the several tons of pottery above, future excavations in this area might in fact be able to shed light on several questions of the site's development, including possible routes linking this area to KAE, the eastern 'suburb' of the site.

KAC was recorded and published with information for all of the site's known stratigraphic levels, E through A, though only the C through A levels are sufficient in size to warrant study of access patterns for this analysis. Most of the values calculated and observed in this area are based on the Michigan evidence, though whenever possible extant structures have been reexamined for further analysis.

Karanis North (KAN, and see Appendix B)

The area of the North temple was largely destroyed by sebakheen; although Michigan was involved in the "excavation" of some of this area, few notes survive beyond token descriptions and photographs of a few structures (figure 1.3). The area was apparently surveyed and dated to the fourth century C.E. before being removed by the Michigan excavation (Boak 1926:20). The area was subsequently left unpublished apart from the North Temple itself (Boak 1933): the information in this study for the late antique (top) phase of KAN, comes from a few such unpublished survey maps which have been archived in the Kelsey Museum.

Figure 1.3. The North Temple in the foreground, with a view of mudbrick structures to the north. These were largely unrecorded by Michigan. (Image published in Boak 1933:figure 2)

The same area was surveyed in 2007 by Hans Barnard and Gregory Marouard, and with architectural features recorded in a survey by G. Marouard (2007 preliminary report, unpublished). This area was also excavated during the 1970s by Cairo University and by the French Institute, but it is only the area of the Roman baths that has been published in any detail (El-Nassery et al.1976). Dating for the bath itself is tentative: possibly early first century C.E., but it was constantly remodeled, repaired, and still in use by the Late Antique Period. These baths were investigated and ultimately re-excavated in the 2012 Karanis season as Trench 30.

It appears certain that the area was at one point relatively continuous with the A level of northwest KAC (see also Husselman 1979:2), and seems closely related on its eastern extent to area KAG. Further information on its western limit may become available in the future through the *Institut français d'archaeologie orientale* (IFAO), as they hold records of their 1970s

excavation, but it cannot be incorporated into this study as of yet.

Karanis "Area G" (KAG, and see Appendix B)

"Area G" (Boak and Peterson 1931) was the site of some of Michigan's earliest excavation, but never fully published. Survey maps of the area were prepared, however (figure 1.4), and have since been rectified according to the present-day surface remains of the area. At first Area G was recorded as if a separate neighborhood from other areas in its general proximity, but closer analysis of both published and unpublished maps suggest it is relatively contemporaneous and contiguous with streets and structures from the B and A layers of nearby published maps H7 and H8 (Husselman 1979). Partial descriptions for this area were included in multiple excavation reports by the Michigan team (Boak and Peterson 1931, Boak 1933) and a complete top plan of the area is included in the summary of the reports (Husselman 1979). Today the area represents the highest remaining section of the Karanis mound, just northwest of the Southern Temple. The northern extent may in fact join KAN, but the western edges were never excavated and slope down towards the old Michigan excavation house. Edges to the east and west are affected by destruction: the central destroyed area of the sebakheen, and a modern road used by the police to access the site which divides KAG from any clear relationships to Karanis South (KAS).

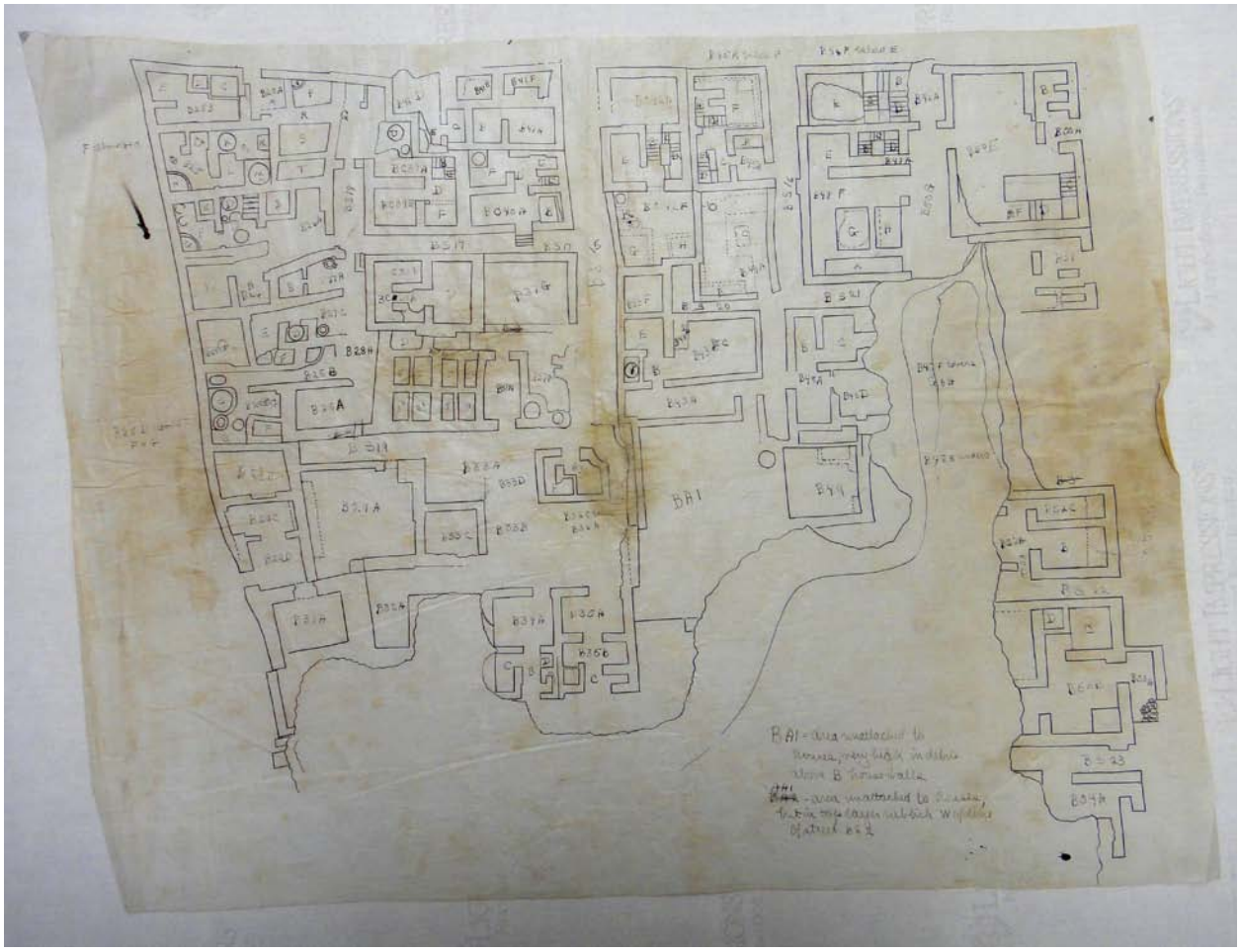


Figure 1.4. Original Survey map of the upper levels of KAG, as prepared by the Michigan excavation (Courtesy of the Kelsey Museum, photo B. Simpson)

Very little of KAG was excavated past the C layer: only a 6,000 square meter area in the southeast corner was examined with respect to E and D layer remains, published as map H10 in the Husselman report (1979:map 7). There may well be earlier levels of occupation below more of this area; ongoing URU Trenches 4, 14, and 24 are adjacent to this area, part of same street network and can provide more specific dating/phasing evidence.

Karanis East (KAE and Appendix B)

KAE is the eastern extension of the settlement, currently under excavation by the Fayum Project and field schools, from its obscure western limit under the Michigan KAC dump pile, to the far northern, eastern, and southern extremities of the ancient site. As excavation proceeds, more walls are constantly being uncovered, and as such the area is still not fully understood as a complete access system, although major routes are highly visible, including a central east-west thoroughfare designated NS 200, which has been excavated across its full width and has already added rich information to the area's stratigraphy and changing strategies for access.

Although most of the mudbrick structures in this area have eroded away, the architecture is characterized by a high percentage of stone foundations, often extant high enough to yield data about the location of doorways and even niches. The relatively clear remaining floorplans certainly includes a few spots where access information is obscured, but the area is generally clear enough for some space syntax examination.

Karanis South (KAS, and see Appendix B)

This is the area south of KAG, divided by the modern police road, and east of the South Temple. Standing architecture here is often exposed to foundation levels and bedrock, thus can be used as example of "original" floorplans, comparable to area KAE and earliest level of KAC. Survey of chosen blocks was completed in 2012; ongoing excavation nearby in Trench 30 may further refine dating. Some construction material suggests Ptolemaic dates, but this is likely indicative of a high-level of reuse of architectural materials. Pottery dates in foundation layers suggest third- to fifth-century C.E. construction.

Karanis West (KAW, and see Appendix B)

This large area to the extreme western limits of the site was surveyed in 2011, and test areas were excavated in the 2006 season, uncovering some late-antique kilns and production areas. The organization of streets, largely running east-west, seems comparable to the "eastern suburb" of KAE. However, this area has yet to be fully studied in terms of the detailed architectural survey (though see Barnard et al forthcoming a), and as such has not been included in this dissertation.

Interpreting the Excavation: absolute and relative dates

Because the preservation and excavation created such a complex and disparate stratigraphy, discussing dates for any part of Karanis is difficult. The South Temple is the only structure that can be dated with certainty, as several dedicatory inscriptions link specific construction projects to the reign of Roman Emperors (Boak 1933, Schuman 1947). For all other buildings and areas of the townsite, dates can only be estimated based on related material finds, or on the relative stratigraphic chronology observed and relatively dated by the Michigan excavation.

Absolute dating

Papyri and coins were among the few means by which Michigan established their dating system for Karanis, as other materials, including pottery seriation, were considered "less reliable" (Husselman 1979: 8, see also Pollard 1998) and largely overlooked. It is widely accepted that the town was founded under Ptolemy II's programmatic development of the Fayum for agriculture (Cappers et al 2013), and the earliest documentary attestation of the settlement

comes from a document dated to 250-230 B.C.E (UC inv. 31907, and see Alston 1995:228). While most of the architecture excavated at the site is Roman, small areas of Ptolemaic structures have been recorded as well (Husselman 1979:10-11). The area of the South Temple was occupied in the Ptolemaic period as well, and a stone block discovered by Michigan preserved an inscription from year 19 of the reign of Ptolemy Alexander (95 B.C.E, see Schuman 1947:269), although the stone-built temple is from the Roman period, and was dedicated in 59-60 C.E during the reign of Emperor Nero (Boak 1933: 50). Other dedicatory inscriptions date to the reign of Commodus (Schuman 1947:271, Boak 1933:42).

However, all further attempts to assign any detailed chronology for the site have met with difficulty. There is particular controversy in discussing the end date for Karanis occupation. Owing to the sharp decline of papyrological evidence after the third century CE, the Michigan team concluded that Karanis was in serious economic and population decline by the third century, and "no longer in existence after the middle of the fifth century" (Husselman 1979:9). However, some outlying evidence within this same dataset has caused scholarly consternation, such as the document P.Haun. III 58 which mentions Karanis as home to two priests and five deacons in the year 439 C.E. (Keenan 2003: 126, Rea 1994); an alternate reading suggests twelve priests and five deacons (Bonneau 1979, Bagnall 1993), each of whom may have run a separate church or monastery, suggesting fifth-century Karanis supported far larger a population than the archaeological estimates have suggested for the "dying village" (Bagnall 1993:283, Van Minnen 1994).

Relative dating

The occupation of Karanis must clearly be extended beyond the fifth-century terminus

assigned by the Michigan reports (Boak and Peterson 1931, Husselman 1979), as ceramics have been identified from both the Kelsey collection (Pollard 1998) and as found by the ongoing URU excavations (Barnard et al. forthcoming a) that prove the site was still active in Mediterranean trade in the late fifth century, and continued to house a significant population "at least until the early sixth century CE" (Pollard 1998:161).

Scholars relying on pottery seriation to adjust the site's chronology have also noted consistent "discrepancies between the dates assigned to the contexts of the vessels by the excavators and those given to the same forms" (Pollard 1998: 150, Johnson 1981). However, many of these studies have been dismissed due to the relative sample size of vessels as preserved in the Kelsey Museum: Johnson used only 613 vessels compared to the quantities that were originally uncovered by the excavation. Owing to the admittedly low statistical significance of such finds, scholars have been hesitant to accept the results of their finds even though they suggest much later dates than the chronology of Boak and Peterson. To this day, various studies which date the material culture of Karanis to late antiquity reject their own conclusions simply because of the persistence of belief that the town was defunct by the end of the fifth century. Nigel Pollard reflects that "arguments pertaining to the chronology of the site had gained a certain circularity," (Pollard 1998:148) based on the established Boak and Peterson chronology that nevertheless remains widely accepted: "It is very unlikely, to say the least, that these finewares found in Karanis were deposited there in the sixth century, when the town was deserted" (Van Minnen 1995:53). This is all the more troubling considering that the Boak and Peterson dates were published in 1931, three years before excavation of the site had ceased, and seem to have been accepted without further adjustment for the 1979 publication of the "final" Michigan excavation report (Husselman 1979: 10-29, and see also Pollard 1998:148).

Scholarship accepting of later dates (Wilfong 1999:310, Keenan 2003) is only now becoming more frequent; current estimates of the end of Karanis place it at or just before the Islamic Conquest of Egypt in 642 CE, with a few potential textual attestations of the name of the village itself which may date as late as the eighth century (Keenan 2003:129), suggesting that even if it had become deserted, the site remained in local memory.

For this study, the question of dating Karanis is more a matter of identifying relative chronology and areas with broadly comparable occupation phases than deciding on the absolute dates of any structures or street systems. Except for the few dated inscriptions on structures within the South Temple precinct described above (Boak 1933, Schuman 1947), no other structures can be so firmly dated, and only the most general date ranges have been presented for each of the stratigraphic "levels" excavated by Michigan, the beginning and end of each usually estimated to the nearest half-century at best. While a fifty-year variance might be considered sufficient for a site with an eight-century occupation history, serious questions for the method by which these dates were calculated still remain:

> Often constructions of late date were contiguous to buildings that remained from earlier periods. Nevertheless it has been possible to determine with reasonable certainty the plan and extent of the town, as well as the structures within it, in five separate levels, although changes may occur within them and levels may overlap. (Husselman 1979:7)

Quite frankly, these layers are often inadequate attempts to clarify the complex temporal growth (and periodic recession) of the townsite: there is very little evidence to see any of these disparate sections as existing contemporaneously across the disparate areas of the site. However, the Michigan layers are based on relative stratigraphy but not spatial distribution: as layers were identified independently of each other in various locations about the site, the top layer was always called "A", the second "B", etc, and the temporality of any layer across separate regions

of the site may differ greatly. Strictly speaking, there is no "C period", just various "C layers".

However, lacking any more thorough system for describing Karanis' temporal development, the Michigan layers serve as basic broad categories of relative dates, and therefore provide at least some standards for describing and categorizing the architectural evidence. Various efforts to reexamine dating for the site seem to agree on a very general relationship between areas of Michigan excavation, and contemporaneous systems of streets and properties can be at least tentatively identified for each area. The general range of accepted dates and characteristics for each "layer" are described in chapter four.

It is again important to emphasize that these areas do not reflect ancient distinctions, but reflect only the spatial characteristics of the modern site. However, for analyzing access and spatial organization, it is particularly important that any spatial system be a large contiguous area as well as roughly contemporaneous. For Karanis, the area known as KAC is the most significant dataset for spatial analysis, as it was the most extensive contiguous area excavated by the University of Michigan, reflected in the subsequent detailed recording and publication (Boak and Peterson 1931, Husselman 1979). As such it forms the basis of this study's examination of Karanis spatial organization. Other areas described above represent areas where preservation is not nearly so high or so consistent; they are often inadequate for examining full syntactical patterns of access. They still provide valuable supplementary evidence on the full range of architectural styles, sizes, and typological variation in Karanis structures, but the following chapters will focus on area KAC in exploring spatial organization in Karanis, including the public street system, spaces within private properties, and the network of communications between individuals and groups at both the house and neighborhood level.

Chapter Two. Culture-Historical Approaches Towards Egyptian, Greek, and Roman Spatial Organization.

The origins of Karanis date back to the second century B.C.E. and the rule of Ptolemy II, who transformed much of the Egyptian Fayum for agricultural development. This was part of an important geo-political strategy of the Ptolemaic regime to gain economic influence in the greater Mediterranean and to compete with the growing power of the Roman Republic, although by the end of the first century it had proved unsuccessful and Egypt was annexed to the emerging Roman Empire in 30 B.C.E.

This period of Egyptian history is notoriously difficult to characterize, even in terms of simple nomenclature: the phrase "Greco-Roman Egypt" is very commonly used, and often used explicitly to define the period during which Egypt was under Ptolemaic and Roman rule. This term is therefore useful in its temporal precision, starting with Alexander the Great's conquest in 332 B.C.E. and ending with the partition of the Roman Empire in 395 C.E., though often extended to reflect the continuation of rule for the Eastern Roman Empire until the Islamic Conquest (642 C.E.). However, when used as a blanket term for the era, "Greco-Roman Egypt" often carries the incorrect connotation of a single period with no major political change, when in fact the incorporation of Egypt into the Roman Empire represented significant administrative and legal reorganization of the Ptolemaic kingdom (Capponi 2005).

The alternative of dividing the period according to political rule is still problematic, as it undercuts the strong social continuity that would have been experienced by most average inhabitants of the country, for whom the shift in daily life between Ptolemaic and Roman cultural practices would have been much more gradual. For this social aspect, the term "Hellenization"

has become a widely-used descriptor of the cultural situation, wherein interaction between native Egyptian and foreign groups is characterized as leading to an eventual dominance of Greek-inspired cultural practice. However this too falls short of explaining the complex socio-political dynamics of such interaction. As the emphasis of this study is largely on small-scale social interaction of individuals and groups operating in a provincial settlement, I prefer to use the term "Hellenistic Egypt" in reference to the temporal period. And while this particular study of Karanis focuses on architectural remains dating from the first to sixth centuries C.E., all firmly within the period of Roman rule in Egypt, I maintain that it is important to consider the broader political and social influences that would have affected the development of Karanis from its founding to its eventual abandonment 800 years later. For this reason, I present not only a brief examination of current scholarship on multiculturalism in Egypt during this period, but I also include an overview of studies concerning architecture and the built environment for more traditionally-defined Egyptian, Greek, and Roman cultures that may have contributed to the background of cultural influences in the development of ancient Karanis.

Theories of Multi-Cultural Interaction

Political models of cultural interaction have been very popular in analyzing Hellenistic Egypt: colonial and imperial theories, in particular, have been used to examine the extent of multicultural interaction and policy under both Ptolemaic and Roman rule. Unsurprisingly, these studies tend to emphasize a strong separation between cultural groups with an inherent imbalance of power, often assuming suppression of native practice and even the forced assimilation to the traditions of the ruling power (Ferray 1988, Frankfurter 1998, Harker 2008).

Such theories often include rather strict judgments of cultural authenticity, suggesting that native practice can only succeed if guarded against all outside influences, otherwise the culture will be irretrievably transformed into a less-authentic adaptation. Such studies have been heavily criticized not only as insufficient for the experience of Greco-Roman Egypt (Bartel 1980, Bagnall 1997, Capponi 2005), but as misrepresentative of "culture" itself, presenting any single culture as an unchanging concept, when in reality it is constantly adapting. In fact, many scholars argue that "[the fact that] groups have a tendency to persist over long periods of time despite the permeability of their boundaries demonstrates their employment of highly effective adaptation strategies" (Hall 1997:29). Egypt had a long and active history of participation in widespread Mediterranean and Near Eastern trade and politics, and was in contact with Aegean culture (Bietak 2010) thirteen centuries before the Ptolemies could be credited with introducing Greek culture to Egypt.

Rather than enforced assimilation, it seems better to describe cultural adaptation as *incentivized* by both the Ptolemaic and Roman administrations. Individuals could make symbolic shows of support with the ruling administration through participation in the army or bureaucratic posts (Brashear 1992, Clarysse 1985). Individuals may have signaled their willingness to adapt through the adoption of "Hellenized" or "Romanized" (Brunt 1976, Hall 2005, Woolf 1994) forms of self-presentation in personal dress and in artistic depictions (Baines 2004), but it seems by far the most effective means of adaptation was in embracing Greek literacy: individuals demonstrating specific knowledge of written Greek language were valuable to both Ptolemaic and Roman bureaucracies, and could obtain valuable employment opportunities. But even beyond formal governmental participation, individuals who were literate in Greek were often rewarded with both social and civic honors, even including exemption from

certain taxes (Clarysse and Thompson 2006:128, Montserrat 1997, Thompson 1992). This demonstrates a real ability for individuals to transcend certain aspects of the cultural divide, suggesting that social mobility, even in terms of perceived cultural affiliation, was indeed possible.

Because these adaptive strategies allow for a great deal of exploration and variation in their use, many recent studies have rejected the strict conservative models of colonialism and imperialism, and instead characterize culture interaction in Greco-Roman Egypt as more syncretic in nature (Webster 2001, Goudriaan 1988:94, and Woolf 1994 and 1997). This model assumes high levels of interaction and even the effectiveness of cross-cultural influences, the result being a new cultural group that combines the practices and beliefs of both groups. It does not imply that all cultural groups become equal: Hellenistic practices were preferred over native ones. However, studies characterizing the multiculturalism of Egypt according to syncretic practices often manage to avoid the statements of relative value with regards to cultural authenticity that are inherent in so many colonial studies (Frankfurter 1998, Lewis 1983, Harker 2008), instead embracing the exploration and innovative strategies by which individuals negotiated both cultural and individual identity (Baines 2004, Hall 1997, Quaegebeur 1992). Studies of art and iconography, especially, emphasize the continuity of native Egyptian culture through its interaction with Greek styles, especially in the way that such adaptation could be used to communicate personal identity within a multicultural framework (Corcoran 1995, Baines 2004, Riggs 2005).

However, in many cases, little has been done to link theory to the physical evidence of material remains, and how stylistic adaptation may reflect the intricacies of cultural interaction, negotiation, and change. At best, such studies tend to become exercises in identifying typologies

of style and cultural *origins* for each attribute, as if each is a signifier of an absolute and unchanging social identity, and the results of such analyses could tell us very little about *why* certain attributes were retained, other adapted or rejected, and how these decisions may have reflected specific aspects of cultural identity for the groups and individuals involved in such processes.

At least in terms of ancient architecture, this is slowly ceasing to be the case, where "the functional analysis of houses within a city and society, rather than a concern for their typicality or 'Greekness', is now the scholarly norm" (Metraux 1999:393). My study follows this trend of "functional analysis", not identifying the attributes of Karanis architecture according to their cultural origin, but according to their prevalence, and moreover in order to contextualize them with respect to the logistics of their arrangement, spatial characteristics, and possible use according to the spatial characteristics outlined in space syntax theory and method, as shall be explained in the next chapter. However, even while this approach does not attempt to identify the cultural origin of any particular architectural feature, it must include consideration of the various cultural developments that may have influenced the inhabitants of ancient Karanis and provided potential strategies for negotiating social interactions as well as spatial organization. As such it is necessary to examine the relevant scholarship on spatial organization, at both the level of settlement and more localized private (domestic) construction, for each of the major cultures involved.

Organization of Egyptian Space

Settlement and Public Space: organization by design and by social negotiation

While the field of urban archaeology was experiencing a surge in popularity in the 1960s and 70s, studies of Egyptian settlements were arguably "in an elementary state" (Bietak 1979:98), with some scholars even insisting that Egypt was a "civilization without cities" (Wilson 1960, though see Kemp 1972). These conclusions were in no small part due to past tendencies in Egyptological excavation (Bietak 1979, Wilkinson 1999:327) to concentrate more on monumental architecture than on domestic quarters of ancient settlements. However, long-running excavations of major urbanized centers such as Elephantine (Seidelmeyer 1996), Tell el-Dab'a (Bietak 2010), and Amarna (Kemp 1997 and 2012) are continually adding to our understanding of complete settlement layout and growth, and scholarship has begun to discuss aspects of emergence, town planning, and especially the spatiality of social interactions of ancient settlements (Bietak 1996, 2010, Uphill 2001).

The rise of the city in ancient Egypt is often tied to the Protodynastic period and the formation of the state, the result of the "interaction between central organization and local communities" (Seidelmeyer 1996: 127), although many hallmarks of Egyptian settlements appear in early prehistoric sites (Uphill 2001, Wilkinson 1999). Settlement enclosure walls provide evidence of a certain level of social organization, both in the coordination of labor and in the concern for the defense of the inhabitants. The major structure inside the settlement is often described as a temple, but appears to have had both religious and administrative functions (Adams and Ciałowicz 1987, Friedman 2009, Hikade 2011). The two concepts were often conflated throughout Egyptian history, as the king was the de facto high priest of Egypt, with members of the elite priestly class serving as his representatives and proxy while performing the official functions at state temples. The prominence of temples in the center of settlement sites may well reflect the social prominence of religion and administrative authority for local culture,

and the temple complex remained at the center of many Egyptian settlements and townsites throughout pharaonic history (Arnold 1999, Hikade 2011).

This centralized authority certainly affected the organization of Egyptian settlements, and ritual practice in particular remained a driving force in the spatial orientation of towns: as ancient religious rites often included ceremonial processions (Bell 1992, Es-Saghir 1992), temple architecture included axial roadways, parade routes for celebrations to and from the temple. This processional road, now commonly referred to by the Greek term *dromos* (pl. *dromoi*) became just as central to a settlement's organization as the temple itself: it remained the major access running through a townsite, and was usually extended along the same axis rather than being blocked or rerouted as the settlement grew. Other structures clustered around the sides of such roadways, but with a rather informal attitude towards what are now considered central concerns of town planning, notably lacking the formal street grid that subdivided plots of land into separate blocks while providing access throughout the settlement.

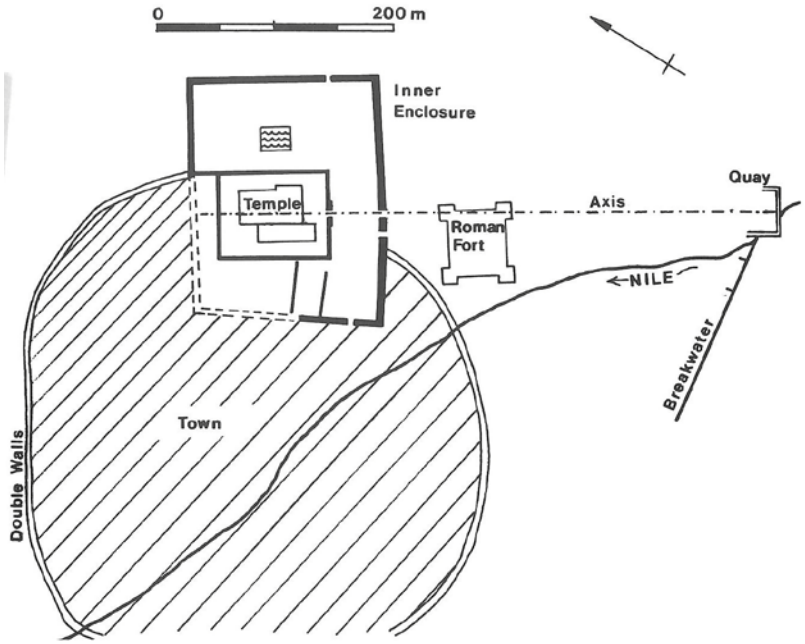


Figure 2.1. Plan of the town of Nekheb, developed from a predynastic settlement within a circular enclosure wall, to later phases of temple construction including a processional route

leading to a quay on the Nile. In Roman times, a military fort was built along the same axis. (Image from Uphill 2001).

Within the earliest settlements themselves, little is known about the spatial organization beyond the placement of temples and festival courts, and the general assumption is that more detailed organization was not enforced by any overarching authority, but left to develop without official pre-planning or oversight. While this attitude is again perhaps biased by the earlier Egyptological preference for excavating tombs and temples rather than domestic areas, it appears that for many Egyptian settlements throughout the culture's long history, formal organizational efforts were indeed focused around temples and other administrative buildings. While some sites may have had more specialized areas or 'districts' for industrial or domestic structures (Hoffman et al 1986, Hoffman 1980, Takamiya 2008), they appear to be more loosely-defined areas for construction and are far less integrated into the town fabric than the temples. The most noticeable evidence is the lack of formal street network which is often the hallmark of intentional town planning. The 18th-dynasty capital of Amarna is a particularly useful example: although there is ample evidence of planning with respect to the layout of religious and administrative buildings (see especially Tietze 2008: 45-54) around formal processional routes, there seems to be *no* overarching plan for the specific location of houses, allowing them to grow up informally in whatever space is available in and around the organized spaces of the central administrative city and larger houses of officials (figure 2.2).

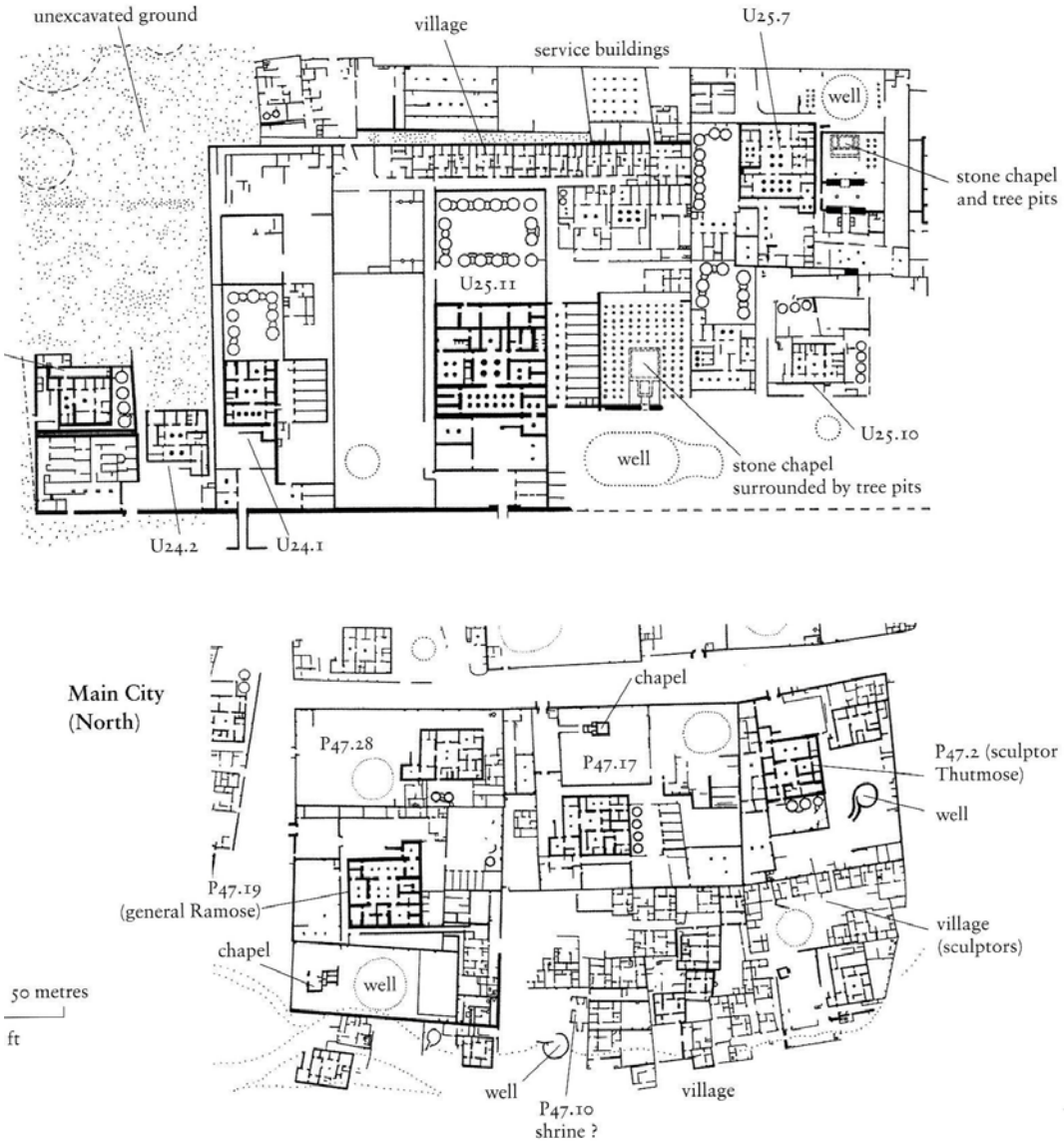


Figure 2.2. Layouts of Amarna neighborhoods, demonstrating how non-elite houses formed miniature "village" clusters among and between elite structures. (Image from Kemp 2012:167)

This type of growth is often described as "natural" (Uphill 2001: 9) or "organic" (Bietak 1979: 109), terminology that while emphasizing the lack of overarching plan does little justice to what must have been in reality a complex system of social interaction of individuals to negotiate rights to space for housing and for access within the town site. Barry Kemp, in contrast,

characterizes this urban domestic development according to active negotiation between individuals for use of space and socially-proscribed rules, “in which small-scale local decisions, made by a large number of people following a few simple rules of interaction, collectively and more or less spontaneously, create a complex kind of order” (Kemp 2012:166). Kemp emphasizes the flexibility of this “rule of consent” as a very effective strategy for negotiating space in a society had a notable lack of institutional control of settlement space.

No discussion of Egyptian settlements is complete without mentioning the so-called “pyramid towns” and “workmen’s villages”, the fully-planned settlements that were constructed in order to house the specialized communities of craftsmen involved in the creation and decoration of various royal tombs, as at Deir el-Medina (Bierbrier 1989) and in Amarna (Kemp 2012) and in some cases also the priests that maintained their mortuary cults, for example at Giza (Uphill 2001) and Kahun (Uphill 2001, Quirke 2005). These villages are the exception to the Egyptian administration’s *laissez-faire* towards the organization of domestic space, as the pre-planning strategy seems to have provided a quick way to establish a functional village without the lengthy processes by which individuals and family groups usually organized space. The state imposed the construction of major “arterial roads” (Uphill 2001:29 and see figure 2.3) which branch off into secondary streets of front-door access housing. This represents a major development in settlement planning, creating a very organized way in which inhabitants were guaranteed clear unobstructed access not only to their own doors, but throughout the settlement.

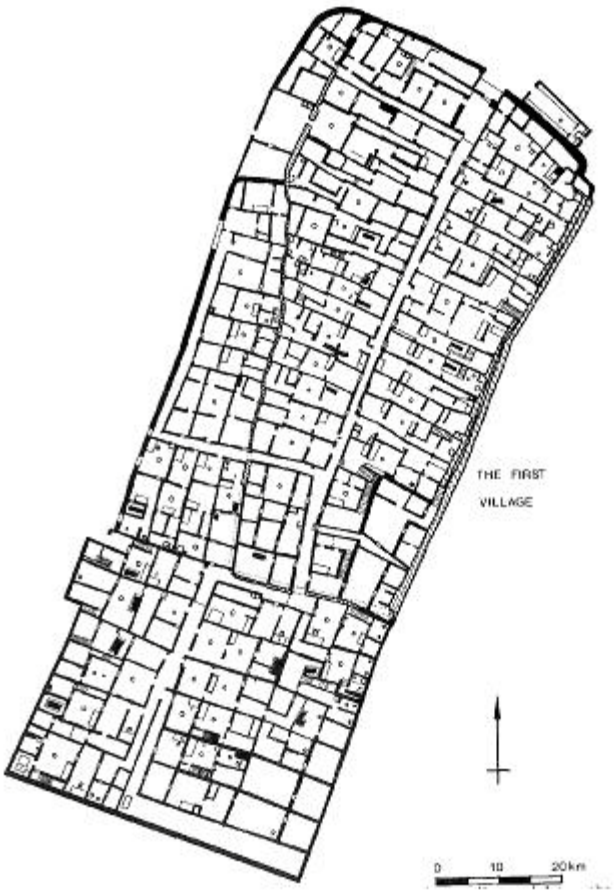


Figure 2.3. Plan of Deir el-Medina. Note the street system, which while efficient at providing access throughout the village, is limited in terms of alternate routes, as each branch street forms a dead end. (Plan after Bruyère 1939)

However, unlike the labyrinthine systems created by informal social networking, the arterial systems of workmen's villages do not allow for alternate means of access: they are organized to create direct access but no other options, no shortcuts or even scenic winding routes throughout the settlement. There is no circular perimeter wall that provides a further connection to the arterial routes; instead nearly ever street "dead ends" at the settlement enclosure wall. Because of this, the village system is extremely susceptible to widespread disruption: the damage or obstruction of a single route, even by something as simple as a temporary "traffic

jam" congestion, could separate the entire settlement into two isolated systems with no possibility of accessing one from the other.

The relative breadth of the streets—four meters at Kahun (Uphill 2001:29)—may have been one strategy for reduced the chances of heavy congestion and potential blocks. However, even small obstacles, such as potholes or garbage in the street, could create significant temporary obstructions, before a street would be effectively closed to through-traffic. Even windblown sand was known to present significant problems for streets and open spaces in Egyptian villages (Husselman 1979:7-8), and without regular maintenance to clear them, the streets would have quickly become impassable. In the case of workmen's villages and other state-sponsored settlements, this work may have been officially overseen and organized by village administration, similar to other efforts to keep the village provisioned with food and fresh water (Meskell 1998, Bierbrier 1989, Cerný 1973). In this sense the workmen's villages could be said to be truly state-managed rather than simply founded by the state: they required continual support in order to function, as opposed to other self-sustaining villages.

The investment of resources that was necessary to maintain such settlements may have proven a deterrent against wider acceptance of this model. While pre-planned communities had been utilized since the Old Kingdom, as in the pyramid towns at Giza, they did not develop into any broader program of widespread settlement management or town planning, and the majority of the Egyptian villages were left to develop through local social negotiations and the rules of consent. Again, Amarna proves the most useful, if confounding, example: that site was envisioned by its founder with such explicit regards to architecture and order that he had his intentions engraved on at least sixteen boundary stelae around his townsite (Kemp 2012:34), but in terms of actual implementation, no particular oversight was given to any organization beyond

those of the palaces in the north and the temple and administrative center of the town. That they were linked by a central roadway is essentially no different in form than the dromos that lay at the center of other Egyptian towns, and indeed Amarna's central road seemed to have been used by the king as a daily processional route as he ceremonially made his way from the palaces to the city center and back (Tietze 2008:66). Beyond this single point of spatial organization, no further efforts were made to standardize access throughout the city: even the routes leading south to the major residential quarters were badly realized, "neither their edges nor their general alignments were kept straight" (Kemp 2012:163, and see figure 2.4 below). The location of houses was certainly left to local social negotiation, as described above. The only places where order over domestic space and access seems to have been officially planned and imposed are, again, in the two workmen's villages—the Eastern Workmen's Village and the Stone Village—both of which are separated from the rest of the settlement by several kilometers of desert landscape (Kemp 2012: 194). Again it seems that the Egyptians only practiced and enforced real settlement planning when it was deemed truly required: either for monumental architecture including religious symbolism, or for establishing settlements when there was no other means of possible support.

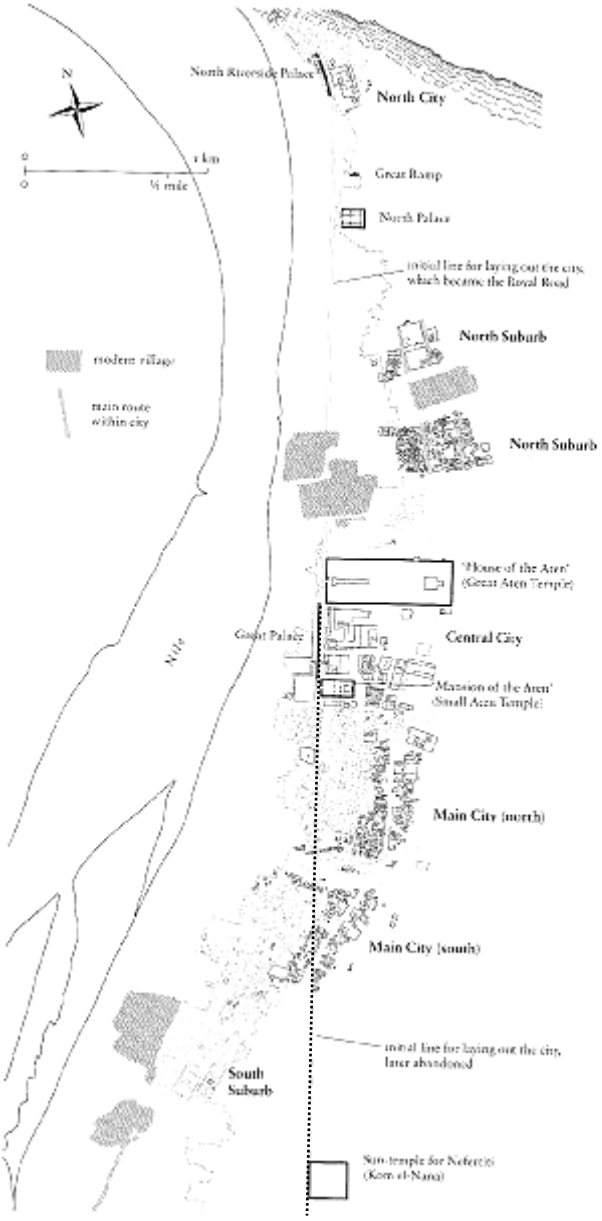


Figure 2.4. Plan of the city of Akhetaten. Note how the axis of the site deviates from the initial plan in the south. (Image from Kemp 2012)

The regularity of pre-planned settlements may at first lead to assumptions that the government restricted personal expression. In fact, rather than creating row after row of identical houses, it seems that many of the homes were greatly modified by their occupants, not only with respect to their interior decoration, but even with bright inscriptions on exterior doorways

announcing the name and titles of the owners (Meskell 1998). This suggests that the inhabitants of such villages felt real ownership and agency over their state-provided homes, and adapted them to reflect and even advertise their own social standing through broadly visible means. Beyond mere decoration, the inhabitants were also known to adapt structures with rather extensive architectural alteration, (Toivari-Viitala 2011:5, Meskell 1998, Kemp 1977), suggesting that the inhabitants were allowed to alter space according to their specific needs, even if it meant developing away from the originally-imposed plan. Again we see that while workmen's villages may have imposed initial standards of spatial order and worked to maintain public works in such settlements, there is little evidence that they were interested in overseeing all the minutiae of daily social life.

The one important way in which workmen's villages restricted more widespread Egyptian social behaviors was in the limitations of space, in terms of area, provided for each family unit. While there is evidence that some properties could be expanded over time (Toivari-Viitala 2011:5), in general only a standard-sized house was provided, with little room for the exterior courtyard facilities. However, some of these spaces, especially animal pens and areas for food storage and preparation, were simply essential to daily life at every social level: while food rations were provided for inhabitants of the workmen's villages, the official organization of such villages did not extend as far as preparing the food for consumption. This consideration seems to have been taken into account during the early stages of Deir el-Medina, at least: space for animal pens and household cooking was provided. But by the Ramesside period the settlement had been transformed to maximize occupation at the expense of house courtyards and animal pens (Uphill 2001:24).

The solutions involved certain compromises on the part of the administration: the

inhabitants were apparently given permission to use some space outside the village wall for their animals, a strategy also put into effect at Amarna where land near the workmens' villages was available to "develop it as they wished" (Kemp 2012:193). The result was a typical organic sprawl of loosely-organized structures that provides immediate visible contrast to the order of the walled settlement (figure 2.5).

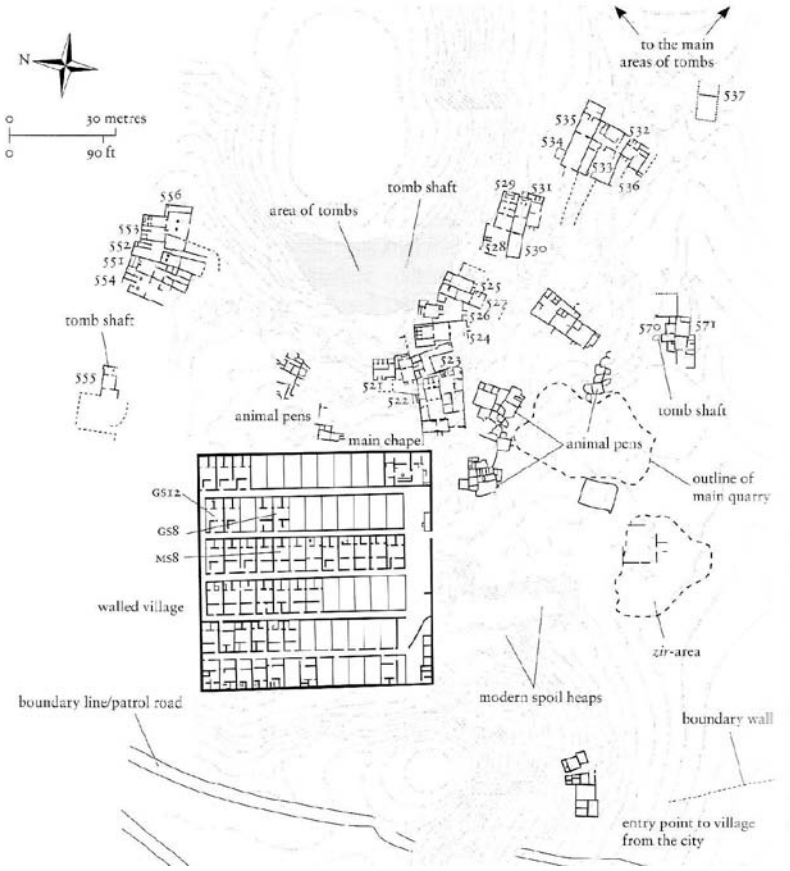


Figure 2.5. Note the imposed order of houses and streets of the Amarna Workmen's Village, but the informally-oriented clusters of pens and tombs that make up the landscape directly outside the village wall. (Image taken from Kemp 2012).

Bread-making equipment, in contrast, was often kept inside of settlements, either carefully retained for each household (as at Amarna, see Kemp 2012:220), or shared between adjacent houses and other close neighbors (Samuel 1999). This evidence suggests that many aspects of daily life in such villages were the result of decisions that were made through

localized social negotiations rather than administrative oversight or control.

Egyptian domestic space: private comfort and social display

The frequent use of workmen's villages as evidence of traditional Egyptian housing has, however, led to some oversights in the analysis of domestic and social space, namely, that these houses do lack the courtyards and exterior structures that would have been so typical of houses in unplanned communities. Many studies which claim to examine the social aspects of Egyptian houses often focus on the house alone (Koltsida 2007, Spence 2010), overlooking the existence of various subsidiary structures and spaces. Unless these external areas are included, the tendency is to interpret Egyptian daily life as insular, only existing within the privacy of house interiors, instead of incorporating the large numbers of exterior features and spaces that were essential to both domestic and public activities. If these features are left out of investigations of Egyptian domestic space, interpretations of ancient social life will be incomplete, with respect to both house and settlement. Courtyards and open spaces were locations of frequent social interaction (Meskell 1998, Samuel 1999). Even simple benches (*mastabas*) are important to note: if they are overlooked, we lose sense of the relaxed and often sedentary social interactions that would have occurred between friends and neighbors, and in fact transformed many streets into highly social centers of activity.

Features exterior to the private house itself were also socially indicative: inscriptions of ownership, complete with honorifics, were often located on house facades, essentially serving as public advertisements of the owner's status (Crocker 1985:58). Similarly, the very existence of features such as "gardens, stables, byres, granaries, kitchens, storehouses, servants' quarters, etc" (Davies 1929:233, and see figure 2.6.) were potent visible indicators of the socio-economic

status of the inhabitants (Tietze 2008:124-139).

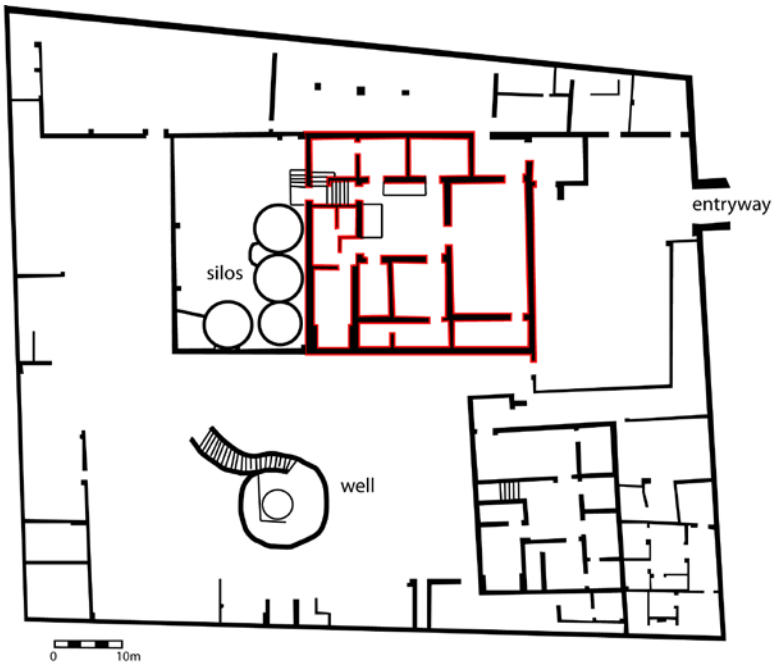


Figure 2.6. Plan of the estate of Thutmoses at Amarna. For many studies of domestic space in ancient Egypt, such properties are examined with respect to the house only (shown here outlined in red). Other areas including multiple grain silos, the well, and subsidiary production areas, are frequently ignored.

Social aspiration (Crocker 1985, Shaw 1992) was certainly a major contributor to the development of Egyptian houses, as proved by both archaeological evidence of remodeling and house expansion as well as in textual accounts that describe how to lead better lives:

> Make a garden, enclose a patch, in addition to your ploughland; set out trees within it, as shelter about your house. (*Papyrus of Any*, Lichtheim 1973:139)

While some of this aspirational advice, dating back to the pharaonic New Kingdom, may be beyond the reach of all but the most elite, even modest house owners had ways of improving their homes' ability to provide comfort as well as shelter. Many scholars have noted Egyptian domestic architecture for its ability to provide a haven from the harsh Egyptian climate, relying

on ethnographic comparisons from throughout Africa and the Near East (Shaw 1992, Lehman 2013) and citing the ability of unfired mudbrick (Kemp 2000, Spencer 1979) to moderate extreme temperature swings. The Egyptians also developed specialized architectural features including wind vents (Menu 1998) to encourage the circulation of cool, fresh air around properties and through interior spaces. Studies of Amarna houses indicate that of all the features to be found in elite housing, bathrooms may be among the most important indicators of relative social status for their owners (Shaw 1992). This represents a marked contrast to expectations based on artistic or literary evidence, which more frequently emphasize picturesque gardens and pools as part of the mansions of the rich. In contrast, bathrooms are "rarely reflected in the contemporary texts and paintings of the elite in Amarna" (Shaw 1992:148) and may not seem to be particularly useful as socially-visible indicators of status, however their value seems to have been in improving the private lives of occupants.

This demonstrates how archaeological finds often provide contrast to the evidence gleaned from artistic or literary sources. Artistic depictions of Egyptian houses most frequently come from tomb decoration (Davies 1929), and other funerary equipment including tomb models (Shaw 1992, Nowicka 1969, Taylor 2001). While this certainly provides supporting evidence for architectural detail, decoration, and room-use, the mortuary context may be more reflective of the ancient desire for a comfortable afterlife than an actual aspiration to higher status in life, and should therefore be used with caution.

Other aspects of Egyptian houses are more obviously tied to social status and interaction: the presence of pillared halls in larger houses seem to indicate reception rooms for the elite, where the size, materiality, and decoration of the room would have been interpreted as direct evidence of the occupant's social status. Religious piety played an important and highly visible

role in many houses, and ancestor busts and *akh-i•r-n-Ra* stele seem to have been common and highly visible features in Deir el-Medina houses (Demarée 1983). These foci of domestic religion were "meant to serve a ritual function while still communicating information about the prestige, class, etc. of the objects' creator" (Cooney 2007:260), and therefore served as prominent reminders to all who saw them that the occupants were pious Egyptians, linked not only to their own family histories but participants in a larger shared tradition of Egyptian socio-cultural practices and beliefs.

Participation in this shared "Egyptianness" required careful social negotiation: even if domestic space was not subjected to great administrative oversight and control, an individual's use of private space was apparently controlled by strong social pressures and codes of propriety. *The Instructions of Ptahotep*, a document of the Old Kingdom, describes visiting the houses of others as a process of negotiating individual status with respect to the proper use of space:

> If you are in the antechamber, stand and sit as fits your rank, which was assigned you on the first day. Do not trespass—you will be turned back…The antechamber has a rule, all behavior is by measure; it is the god who gives advancement, he who uses elbows is not helped. (Lichtheim 1973:67)

This quote contains several valuable insights into Egyptian concepts of space and social permissiveness. First, it implies there was a specific correlation between a discrete space and the expected actions and behaviors for one occupying it. This means that definitions of "proper" behavior would necessarily vary based on the relative status of the people involved. Secondly, it states that a visitor's degree of physical access within a house is directly equated with his rank, and that transgression of these boundaries is not appreciated. While the thought behind it may seem conservative and dismissive of the potential of social advancement, it can be placed within the larger context of Middle Kingdom instructional texts, which often stress good behavior and hard work as the keys to achieving a better life, rather than aggressively promoting oneself ("he

who uses elbows") beyond what is appropriate.

Therefore use of space is acknowledged to be driven by socially-constructed identities, and the degree to which these identities are expressed in this space are encoded and expressed, embodied in the architecture according to spatially-specific terms. The lack of strong oversight for managing settlement organization suggests an inherent lack of municipal involvement, but a very firm reliance on the individual agency to manage social boundaries, which seems to have taken the place of any need for stronger administrative-level oversight.

Greek Space

Settlements and public space: incorporating the enfranchised citizens

As with Egyptian settlements, many early Greek sites clearly grew gradually, without the benefit of formal town planning. However, by the height of Greek Classicism in the fifth and fourth centuries B.C.E., the concept of the Greek settlement had developed into a highly specialized and politicized model that tied space directly to both individual- and group-identity formation (Hall 1997). The Athenian model of polis-based democracy, in particular, was instrumental in developing the link between social interaction and city organization, and fostered great interest in what would now be considered true town planning and theory of urbanization (Gates 2003, Owens 1991).

Scholars largely agree that Greek town planning was influenced by Near Eastern (including Egyptian) traditions wherein the state oversaw some aspects of civic infrastructure, especially the management of street systems and other large-scale construction projects (Owens

1991:31, Gates 2003). The Greeks themselves credited the evolution of their own planning theory to the work of Hippodamos of Miletos and his application of street grid planning to settlement space (McCredie 1971, Owens 1991). Unlike the dromos and arterial road plans of Egyptian settlements, which allowed for access but included very few options for movement along alternate routes, the Hippodamian grid divided a town into discrete neighborhood blocks which could be freely accessed from all four sides (figure 2.7). Thus the implementation of a formal Hippodamian street grid created a high level of access in and around the city: rather than including only a few access paths that could easily become congested, the grid allowed for the diffusion of traffic patterns throughout alternate routes.

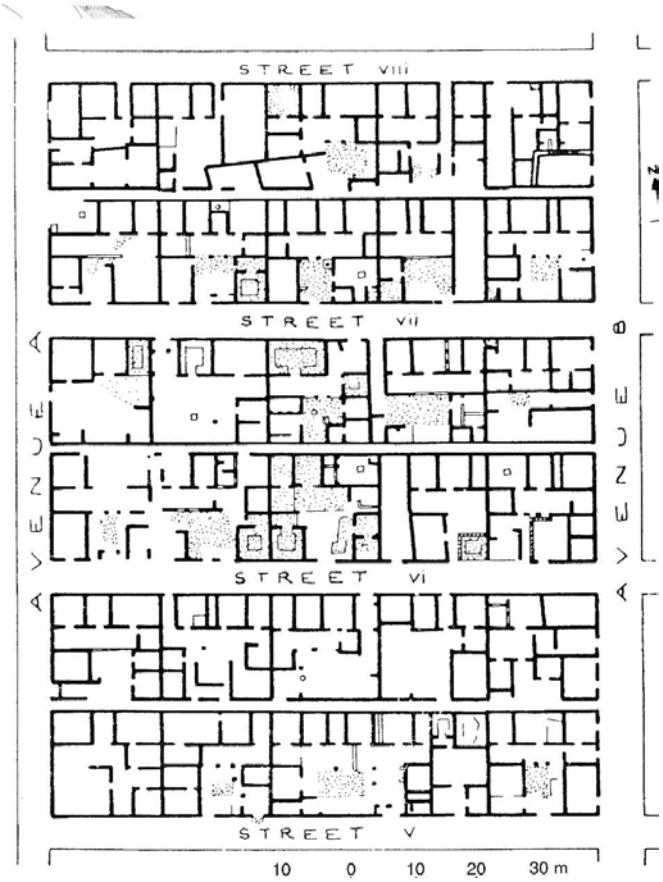


Figure 2.7. Housing blocks from fifth-century B.C.E. Olynthos, showing the regular rectangular blocks that result from the street grid. (Image taken from Gates 2003)

The spatial organization of the polis was more than mere practicality, but affected the way the city was viewed, socially. The increased access of the street grid created a sense of settlement-wide cohesion and group belonging, not only among close-range neighborly interactions but also increased the ease of movement and socialization throughout the entire city (Owens 1991:60). Pericles' famous funeral oration included the boast, "We throw our city open to the world" (Thucydides 2.34.1), explaining that even foreigners were allowed access to the great resources that Athens had to offer. Theories of town planning thus inspired philosophers in the development of theories for the ideal city. Aristotle especially (*Pol*. ii 1267b, 22ff; vii 1330b, 21ff) saw the imposition of strict spatial order as a way to increase social order, through the districting of urban space according to demographics of the population as well as highly localized zoning for industry, production, and ritual space. While long-occupied urban environments like Athens made it difficult to embrace such sweeping reforms, the establishment of Greek colonies throughout the Mediterranean presented the opportunity to explore these philosophical attitudes towards space without having to adjust to a palimpsest of a pre-existing settlement. Settlements like Classical Rhodes were considered planned cities (Strabo xiv.2.9 654, and Owens 1991:57), built with intentional forethought and according to some of these specific theories of organization. Often the central cores of such sites were organized specifically for public socialization: marketplaces, religious structures, and civic buildings—the *stoa* form in particular (Gates 2003:216) became popular for various social and civic activities.

Because of the emphasis on civic and political participation that was essential to the idea of Greek citizenship and identity, many of the efforts of individual Greek men were channeled into the common good of the city through the public offices that managed the construction and upkeep of civic works (Owens 1991). Economic patronage of civic projects and other public

donations were encouraged. However these *euergetistic* donations (Erskine 1994, Van Minnen 2000) had a way of distinguishing individuals through inscriptions and other publicly-visible honors—even Athenian democracy did not erase competitive aspects of public display of social identity. Thus public space became an opportunity for individual men engaged in the formation of social identity to exploit and aggrandize aspects of their individual identities and status.

Private space: the oikos *and those inside*

While many studies stress the open, integrated spatial environment of the Greek polis (Hoepfner and Schwandner 1994, Jameson 1990) and its association with civic participation, scholars have often viewed Greek domestic architecture and the development of various oikos forms (Rider 1916, Nevett 2010) as a functional opposite: the secluded private space and sphere where smaller-scale private identities are developed away from the public social world of the polis and civic participation.

Information describing the city, from either contemporary or later Roman sources, especially Pausanias, is often ample in detail, including the positions and decorations of civic architecture (Francis and Vickers 1985). However, sources of information on oikos interiors are sorely lacking. Attic drama, in particular, could be said to emphasize this dichotomy (Papathanasopoulou 2013): many dramas were written so that the theater *skêne* served as a house façade, with the central stage door representing the door to the house. Many plays even emphasize the symbolic importance of this threshold as lying between the public world of the polis and the inward-focused private structure of the oikos (Lowe 2006, 63). It is notable that in early drama, the interior of the oikos was never seen, and only the later addition of the *ekkyklêma* to Attic stagecraft allowed for glimpses of this internal space (Ley 2007).

A great deal of scholarship has characterized the oikos not only as inward-looking but as physically controlling, limiting the physical freedom of movement and social participation for those within, particularly with respect to the lives of women (Nevett 2004). If the polis represents the sphere of social interaction for citizen males, then the oikos is often described as the realm of those who were marginalized and excluded from civic participation: women, children, foreigners, and slaves. Ancient literary sources discussing the proper role of Greek women seem to emphasize their invisibility: "greatest will be hers who is least talked of among the men whether for good or for bad" (Thucydides. 2.45.2, and see Kallet-Marx 1993).

So too it would seem for the spaces women inhabited: there is very little specific textual evidence about the interior of Greek houses at all, and what we do have by way of description is almost entirely focused on the *andron* (alternatively, *andronitis)*, the part of the household designed exclusively for the male head of household to entertain (male only) visitors. In contrast, little is ever said about the form or decoration of the *gunaikon (gunaikonitis)* (Nevett 1999, Ault and Nevett 2005, Graham 1974), to the extent that scholars argue if any such space can even be successfully identified in the archaeological record on the basis of such vague description (Nevett 2004:103, Graham 1974).

In general, the gunaikonitis is suggested to be the main interior of the house, encompassing most areas of daily activity in terms of providing for the house, notably including the open-air courtyards at the center of the house and an adjacent portico (*pastas*, and see figure 2.8).

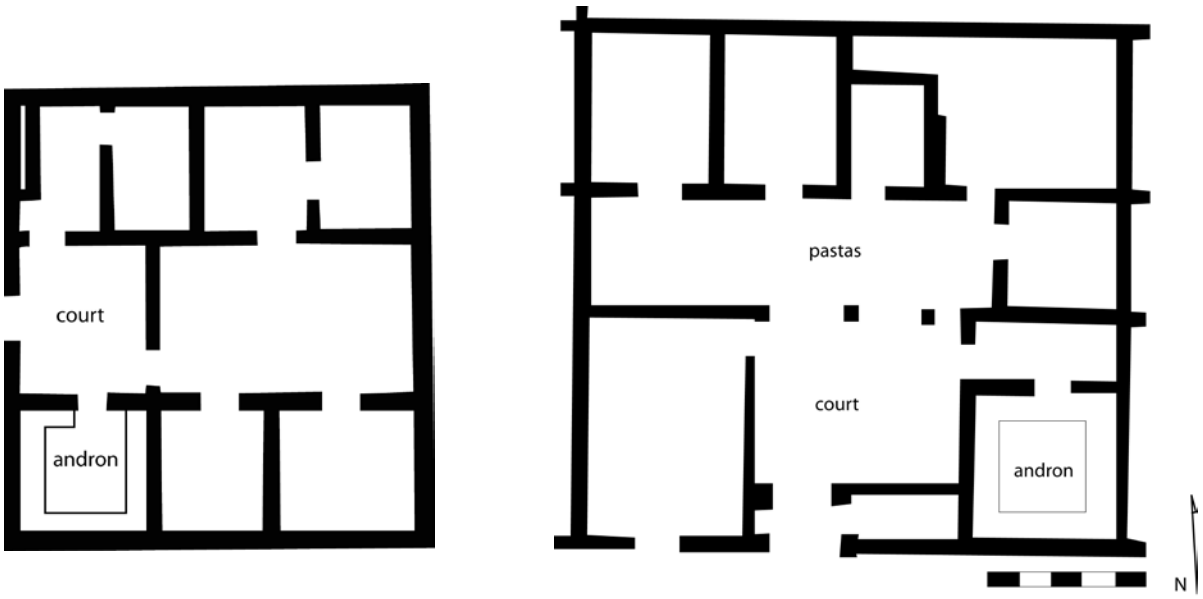


Figure 2.8. Plans of two Classical Greek oikia: the dining room (andron) and related service areas are towards the front door, with other rooms (traditionally associated with female activities) further in the house interior, radiating off of the central courtyard and/or portico. (Images based on Nevett 2002)

However, the relative location of this space shows a different approach towards daily social interaction and gender roles than compared to those in Egyptian models: in contrast to the exterior courtyard activity areas of ancient Egyptian houses, Greek household production was located within the house itself. The gunaikonitis space was open-roofed in order to provide natural light to facilitate "domestic activities" (Nevett 2002:88), however the area was not external to the oikos but surrounded by it, enclosed on all sides by the house walls. This severely limited the opportunity for those within to socialize with anyone beyond the immediate household occupants. Scholars frequently described the gunaikonitis as having highly restricted access to the exterior world, and the andronitis is often characterized as having the secondary function of a guardhouse, its location near the front door providing a level of visual oversight and control (Foucault 1982) over any women attempting to leave. Proponents of this argument often cite the gunaikonitis in Xenophon's *Oeconomicus*, which is described as so essentially

private that it is "divided by a bolted door" (*thura balanôtê ôrismenên apo tês andrônitidos)* from the men's quarters (Xenophon *Oec* 9.5). Thus both textual and archaeological evidence has led many scholars to conclude that Greek women were fairly restricted in terms of movement even within their own homes, and almost completely invisible outside of the private sphere of the oikos.

However, the actual texts confirming such strict gender separation are rare (Nevett 2004, and Jameson 1990:171), and the nature of the oikos interior as restrictive and concealing may therefore be more according to relative social status than gender division. Lisa Nevett rightly points out that the central courtyard of many houses, while a center of domestic activity, would necessarily have been used by visitors to the house as well, and that many "rooms designated for male use only can be approached through so-called female areas" (Nevett 2004:101-102). Nor is there strong evidence that females were systematically physically curtailed in their movement: while bolts, towers, and other fortifications both within and outside the house certainly existed, they are often characterized as defensive rather than oppressive (Morris and Papadopoulos 2005:192). Physical restriction of individuals inside such structures may have been limited to slaves rather than free women: even an example from Xenophon, often cited as evidence for the forcible seclusion of women, suggests this when contextualized. The episode comes from the story of a man showing his future wife the interior of the house he intends to provide for them both: the gunaikonitis is referenced as the habitation of female slaves, in contrast to the living rooms (*diaiteterion*) of the previous sentence (Xen. *Oec* 9.4, see also Morris and Papadopoulos 2005:187), described to the wife as comfortable and decorated with the implication that she too will be able to enjoy the space.

Even if the oikos was organized according to strict gender-based partitions, such a

division certainly became less rigidly enforced over time. While Plutarch, writing around 100 CE (*Mor*. 145B, and see also Nevett 2002:81), maintains the distinction between the gunaikon and andron still existed, it seems doubtful that the Hellenistic house was so structurally divided (Nevett 2004:100 and cite more). Some modern scholars assume that Greek culture maintained the spatial division of genders specifically because of multicultural interaction, that strong public restrictions on women were considered essential towards the continuation of Greek culture (Nevett 2002). However, instead of finding any increased architectural isolation of women within the home, archaeological remains suggest that many of the traditional forms of oikia disappeared as new amalgamated architectural styles (Grahame 1966, Lang 2005) appeared, often combining Greek courtyards and peristyles with more socially integrated, open floorplans. In particular, the difference between the Greek oikos and the Roman domus became increasingly hard to define (Metraux 1999, Ostenfeld 2002, Graham 1966).

Roman Space

Public constructions and the construction of social identity

The Ancient Romans seem to have defined themselves as an inherently urban people: the founding of Rome itself was often described as the seminal moment of Roman culture, the point of origin from which the passing of years was measured (*ab urbis condita*), and the establishment of the city's first walls was so sacred an act that Romulus thought himself justified in the murder of his own brother for climbing over the foundations (Livy I.7). Throughout Roman history heroic acts were commemorated publically with statues, inscriptions, and

structures that remained permanent fixtures in the visible cityscape. Thus the city was an explicit and continual lesson in what it meant to be part of Roman history and culture.

The association of urbanization and building programs to Roman social identity extended into their imperial ventures, and Roman town planning was imposed upon conquered tribes of Gaul and the Western Empire (Woolf 1998) as an essential part of Romanization, especially of the local elite (Rippengal 1993). Agricola, the general tasked with civilizing Roman Britain, was praised thus:

> He gave encouragement to individuals and assistance to communities to build temples, market-places, and town houses, praising the energetic, and reproving the indolent. Thus an honorable rivalry took the place of compulsion. … The result was that those who had just lately been rejecting the Roman tongue now conceived a desire for eloquence. (Tacitus *Agr.* 21)

Archaeological evidence confirmed similar town planning and construction projects all over Western Europe (Woolf 1998), throughout Britain (Hodder 1972), in Gaul (Hasslegrove 1995), and even in the settlements of the Italian peninsula (Perring 1991, Ellis 2011). New sites were organized according to the Romanized street grid, with a regular street grid forming rectilinear blocks of properties, including prominent civic constructions such as fora, amphitheaters, and markets.

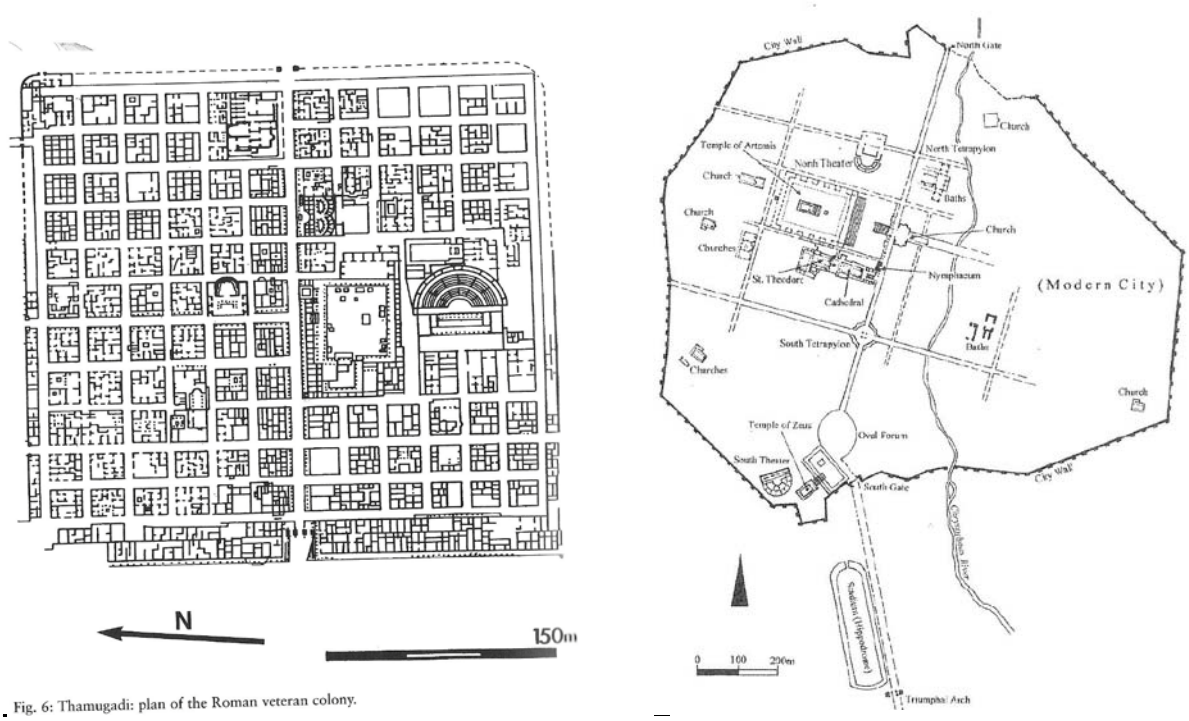


Fig. 6: Thamugadi: plan of the Roman veteran colony.

Figure 2.9. Left: plan of the Roman colony at Thamugadi (Timgad, Algeria), showing the establishment of regular blocks and a perpendicular street grid. Right: Romanized Jerash (Jordan) with the tetrapylon emphasizing the intersection of the cardo and decumanus. (Images taken from Gates 2003)

In the Eastern Empire cities had been growing in the urban tradition for thousands of years (Keith 2003, Stone 2007, Kramer 1982): Hellenistic cities such as Jerash and Lepcis Magna were given imperial *tetrapylae* to emphasize major crossroads comparable to the cardo and decumanus models (Gates 2003, and see figure 2.9). Roman architectural forms included domes and semi-dome apses (Fakharani 1965), which were not only incorporated into Roman structures but also adapted for use in Hellenistic buildings, becoming particularly common in temples and other religious settings, whether monumental, funerary, or domestic in nature.

Roman government was highly involved not only in the planning and construction of the urban fabric, but also in its maintenance, with many governmental offices to oversee civic works. Cities were planned for practical access to the street grid in order to limit traffic congestion

(Laurence 1994), and the management of both water and waste was considered among the essential services that a government should provide to an urban public (Owens 1991). These responsibilities fell under the auspices of the *aedile*—which unfortunately was a position of little prestige and great responsibility, and therefore seems to have been an office no one wanted. The picture that develops of Roman bureaucracy is one that gives lip-service to the importance of protecting civic institutions, while in practice they were subject to a great deal of uneven application, outright neglect, and even corruption and misuse of public funds. In contrast, Dio Cassius describes the aedileship of Marcus Agrippa, a man who was himself an essential component of Augustus' propagandistic building program in Rome, as astonishingly productive:

> The next year Agrippa agreed to be made aedile, and without taking anything from the public treasury repaired all the public buildings and all the streets, cleaned out the sewers, and sailed through them underground into the Tiber. (DioCass 49.43.1)

This quote betrays a certain admiration of just how unusual Agrippa's effectiveness was considered to be: despite the offices meant to protect and maintain the Roman urban system, few seem to have been actively involved with improving the city, hence the amazement at Agrippa's enthusiastic degree of involvement. However this service itself can also be seen in the light of Greek euergetism, a way in which Agrippa distinguished himself quite publicly as a benefactor of Rome. Euergetism continued as an important way to express and celebrate the Roman identity, not merely through association with works of past ancestors, but by benefactors themselves adding to the visible landscape of Rome with public donations and building projects in their own rights. The tradition of manubial building (Favro 1996: 82), the celebration of military victories through the creation of public monuments, began to shift away from celebrating victorious armies to the celebration of individuals, and their donorship celebrated not only their euergetism and sincere philanthropy, but became an opportunity for self-promotion and aggrandizing

through visible public inscriptions of names and deeds (Rykwert 1976, Favro 1996). The Augustan age in particular saw an increased focus on civic works as a way to gain political power through public opinion, Augustus himself being the master of this sort of architectural propaganda. By the end of his life Augustus' reforms for the city were so sweeping that "he could justly boast that he had found it built of brick and left it in marble" (Suetonius *Aug*. 28.3).

Roman houses and the display of individual identity

There is a Latin phrase, "*domi forisque*", which appears in every manner of textual source, from Cicero's private letters and most celebrated speeches (*Sest*. 95, *Phil*. 2.109,) to the inscription on the Arch of Septimius Severus in the Roman Forum. Most commonly translated as "at home and abroad", it seems to neatly encapsulate the Roman concepts of public and private space, comparing the private house (*domus*) with the *forum*, the symbolic location at the heart of all Roman public and civic life. However, unlike the Greeks, who could often be interpreted as contrasting these two concepts as binary opposites, the Romans often seem to conflate the two, emphasizing that Roman standards of behavior do not vary whether one is home or abroad. Various literary texts seem to stress the openness and permeability of the domus as a particular virtue of Roman life: Augustus, in establishing his new house on the Palatine, is praised as having "made it all state property, either on account of the contributions made by the people or because he was high priest and wished to live in apartments that were at once private and public" (Dio 55.12.5). Cicero was known to comment, "my house, as you know, is a forum" (Cic. *Att*. 12)[1]. The availability of such men even in their own homes indicated their great social involvement not only through legal order and governmental service, but in systems of social

[1] but see also Treggiari 1998 for a more critical assessment of Cicero's views

patronage with individuals who relied on them for support. Therefore, the public nature of the house is also indicative of social order: Romans live free and in the open, not lurking behind closed doors in conspiracy nor need they fear outside harm in the form of intruders or thieves.

However, while a closed house might have been viewed with suspicion, the domus was nonetheless private and considered completely under the control of the male head of household, the *pater familias*. Legally speaking, his authority to control both his house and the members of his household was absolute: even if he rented his domestic property, he was considered legally free from interference of landlords, who had no right to intrude on the occupants without express permission (Taubenschlag 1955:361). Thus, having an "open" house is a choice rather than a necessity, and expresses the virtue and might of the pater familias who can so confidently make his private life visible to the world.

Just as the landscape of the city itself contained reminders of the deeds of great individuals, the interior of the house itself was a particularly important opportunity to express the greatness of the owner. The importance of domestic architecture to fashion identity was very much an explicit concern: Vitruvius' first-century CE work, *De Architectura*, describes the preferred methods and techniques for designing a house, from the dimensions of the rooms and the layout to the proper decoration and even use of furniture. His work shows a particular interest in perfecting the views between house-rooms and the proper positioning of specific decorative features for maximum effect. The emphasis he places on view, visibility, and accessibility shows a major tendency for Roman houses to be used as places of social interaction.

Houses were important locations not only for entertaining guests, but for holding business interactions as well; the importance of patron-client relationships were in fact ritualized by the *salutatio*, a ceremony which "secured the power and fortune of the paterfamilias through those

who served his interests" (Clarke 1991:4). Social rituals were essential in shaping the physical structure of the domus: the entryway and atrium provided easy access and broad views through the space of the larger house, which often "indicated the owner's command of *Romanitas* and his public accessibility, giving the impression that everyone is invited" (Hales 2003:105), while the *tablinum* was the main focal point along this access and the setting for the salutatio itself (Wallace-Hadrill 1994:124, Clarke 1991).

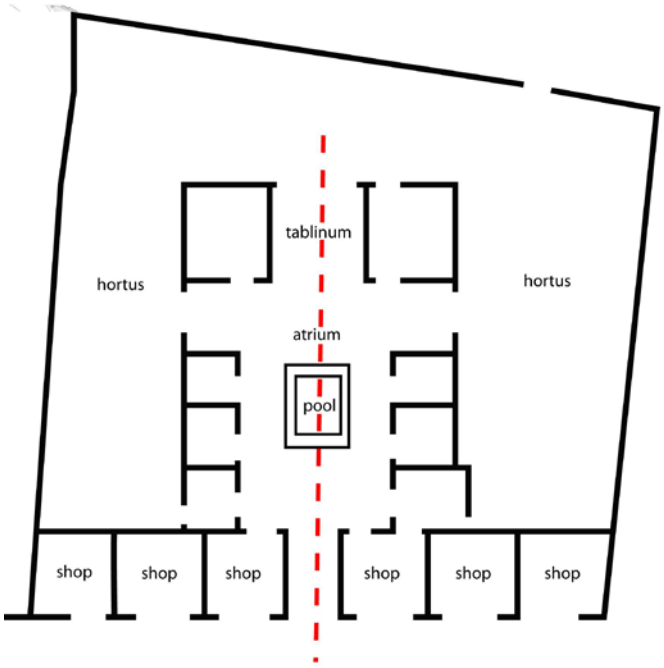


Fig 2.10. Roman houseplan showing the central visual axis (shown in red) which runs symmetrically through the largest and most public rooms of the structure: atrium, tablinum, hortus, and the peristyle of later house-types. (Image based on Zanker 1995.)

Rituals of formal dining were also given specific location in special rooms called *triclinia*, designed so that the three dining couches (*klinai*) could be placed so as to optimize sight lines for honored guests (Clarke 1991:205) and again emphasize the house owner's command of Roman tradition as well as personal tastes. The important social aspects of these spaces made them very

popular throughout the expanding Roman Empire: extant floorplans show the existence of formal spaces for salutatio and dining traditions within houses of the local elites from England (Rippengal 1993) to North Africa (Carruchi 2007) and into the Near East (Butcher 2003).

The spacious floorplan of the domus is of course an indicator of socio-economic prosperity, as the large floor areas suggest little concern for maximizing usable areas, in terms of both interior and exterior property space. However, for much of the Roman world, such sprawling ground-floor constructions were simply not possible. Much of the urban population of Rome itself, as well as cities like Ostia, Pompeii, and Herculeaneum, inhabited shared apartment blocks known as *insulae*, large adjoined constructions of separate domestic units much like today's condominiums and high-rises. Overall, the solution to finding sufficient space in Roman cities was to build up, not out, and multi-story dwellings were seen as one of the necessary compromises for city living:

> But with the present importance of the city and the unlimited numbers of its population, it is necessary to increase the number of dwelling-places indefinitely. Consequently, as the ground floors could not admit of so great a number living in the city, the nature of the case has made it necessary to find relief by making the buildings high. In these tall piles reared with piers of stone, walls of burnt brick, and partitions of rubble work, and provided with floor after floor, the upper stories can be partitioned. (Vitruvius 2.8.17)

These apartments, with their shared partition walls and lack of spacious floorplans that included tablina, triclinia, and the other marks of elite social display, were widely considered the domain of the poor. Ancient literary accounts suggest that it is perfectly natural for non-elite houses to be so different in construction and even in social use than those of the elite, as the lower classes would not hold salutatio in their own homes: they are not patrons and have no clients or guests in their homes, but are in fact themselves clients who would go to the houses of their betters (Vitruvius VI.5.1). Thus what need would they have for such domestic spaces as tablina, triclinia,

or other areas of public display?

However, Vitruvius' denial that the poor had equivalent social customs ignores a wealth of other evidence, both literary and material, that aspiration was deeply entrenched in the social fabric of the Roman Empire and the explicit adaptation of elite cultural materials and styles was a major strategy for realizing aspiration to more elite status (Woolf 1998). The lower classes in Roman Italy seem to have had "equivalent" spaces for the necessary social activities of dining and entertaining. So even when space and economic concerns could not allow for a formal triclinium, the apartment-dwellers of Rome and Ostia relied on *mediana*—rooms that were large enough to entertain guests, often shared between two or more separate apartments in a single insula (Brothers 1996, Packer 1971).

In fact, as Vitruvius suggests, the increase in apartment living seems to have been driven by simple spatial necessity and availability rather than pure economic factors. Certainly not all apartments were exclusively inhabited by the poor: the preserved architecture indicates varying degrees in quality of construction as well as decoration, including some very high-end examples. The elaborate mosaic floors of Ostia's House of the Yellow Walls (figure 2.11) suggest that even the reasonably well-off inhabited these structures, and moreover did consider their homes to be suitable places for social display and the entertaining of guests. Thus it seems that, despite Roman authors suggesting a complete socio-cultural divide between the houses of the rich and the poor, in reality there were many acceptable alternative strategies for adapting a house to one's social needs.

However, at the same time there seem to have been certain socio-cultural restrictions over certain strategies, especially those that involved aspirational display. While a Roman head of household had the right to build and decorate his domus as he saw fit, he was not totally free of

social pressure to conform to good taste: should his efforts be considered beyond what is acceptable for his own social status, he would be mocked. Thus, while Augustus was praised for his unusual degree of restraint in creating a modest public house, the attempts of rich freedmen to emulate and surpass their social betters were lampooned by authors like Petronius, in his descriptions of the house of Trimalchio (*Satyricon* 5.XXIX). As long as the interiors of Roman houses were open to broader public view, they could be used to emphasize and even aggrandize the inhabitants' status, but could also open those same inhabitants to the potential for public censure and ridicule.

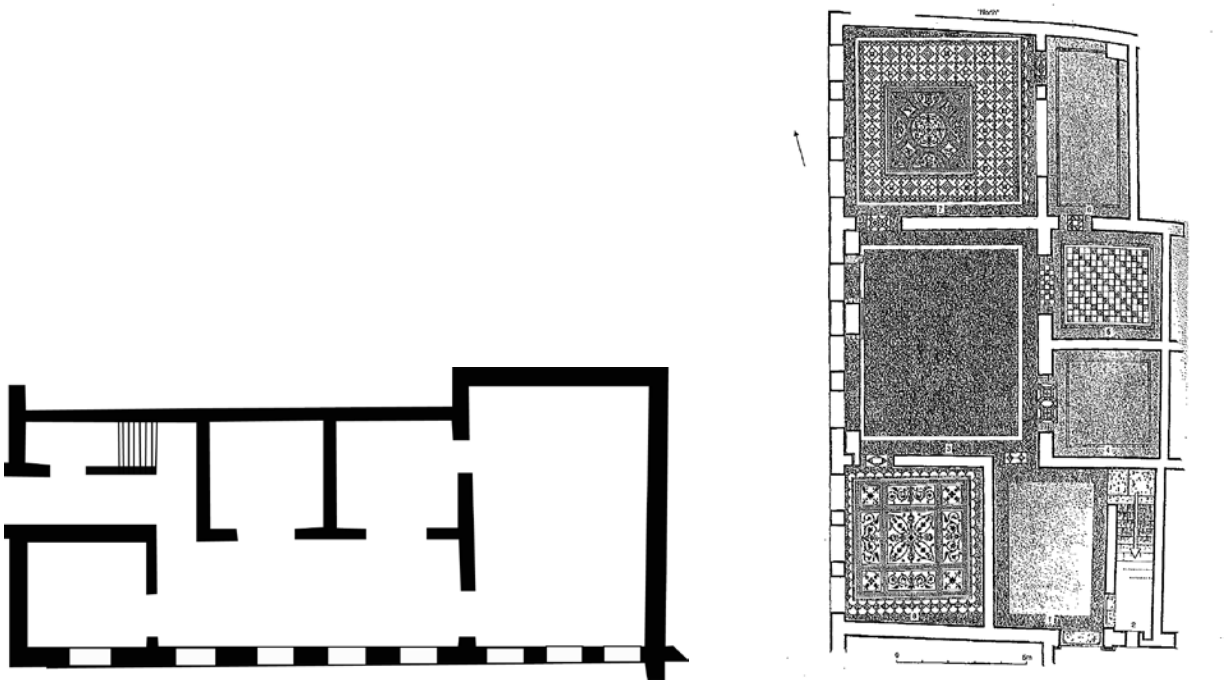


Figure 2.11. Left, a typical example of an Ostian apartment floorplan: space number 4 represents the "medianum" social space, significantly located along the outer wall where multiple windows provide illumination. Right, the plan of the House of the Yellow Walls, showing the arrangement of floor mosaics that display the wealth and social status of the occupants. (Images from Clarke 1991)

While the Roman domus therefore served an important public socializing function, they were of course also significant in the socializing of the private inhabitants: the domus had a

deeply symbolic and ritual purpose centered around the family. These *sacra privata* (see Clarke 1991:6) provide a ritual context for family members to socialize and construct their *lararia*—household shrines dedicated to family-based deities that included the *lares* and the *genius* (collectively known as the *penates*). These lararia had even more central presences in the house, usually being located in the atrium and serving as the focus of many household ceremonies, including coming-of-age rituals, marriages, and births (Clarke 1991:9-10, Boyce 1937). Many lararia were often centrally-located, serving as reminders to both inhabitants and visitors alike of the family's ancestral greatness and continued piety (Bakker 1994), but some other shrines were located deeper in the house in areas reserved more for private use: these altars appear to have been focused around rituals of cooking (Foss 1997) and attest not only to the importance of the family, but also the relationship of slaves to that same household, offering worship to the lares of their owners.

The domus was also said to have an important role as the center of family life and especially in the early childhood development of cultural values. The most frequently-cited evidence of this comes in the form of wall paintings and other figurative decorations which seem to not only reflect cultural values and beliefs of the inhabitants, but may have been seen as *reinforcing* the importance of these values for all who saw them (Scott 1997). Ancient authors also describe the moral influence on children of seeing pictures of their ancestors—the *imagines maiorum* ("images of the greater ones", i.e. the elders, portraits of ancestors), which Vitruvius (*De Arch.* 6.3.6) describes as an essential component of the proper furnishing of a house. A fine example is the so-called "house of Marcus Lucretius Fronto" (Pompeii house V.4) a first-century A.D. Pompeiian residence preserved by the A.D. 79 eruption of Vesuvius. The structure's "yellow cubiculum" was probably used as a children's bedroom: not only were the occupants

themselves mostly likely represented in the little portraits of a boy and a girl, but the room included scenes from mythology meant as moral instruction “for the child or children who slept there” (Clarke 1991:159, and see figure 2.12).

Figure 2.12. Images from the House of M. Lucretius Fronto (Pompeii V.4), room a, west wall.

Thus the house could be seen as containing and advertising deeply-held cultural beliefs

about identity for both the individual and the larger cultural group. As chapter three will shortly demonstrate, increased scholarly interest in the interaction between such categories of identity has led to more systematic studies of space in the Roman house (Grahame 2000), of how these spheres might have been physically expressed in the architecture. We shall see more of this in chapter three.

Greco-Roman Egypt and studies of space

Having examined the scholarship on the culturally-specific attitudes towards spatial and social organization for Egypt, Greece, and Rome, we can see that each culture has fairly specific attitudes towards the use of space and its function according to specific social activities. However we have already discussed how the degree to which any of these cultural attitudes can be mapped directly onto Greco-Roman Egypt is contentious: the name reflects more of a political reality than a cultural one. The same may well be true of administrative theories of site organization and management: while the Fayum townsites were established as locations for the settlement of veterans of the Alexandrian and Ptolemaic armies, they were more like the colonies of Sulla than the colonial model of settlement than the earlier Greek city-states had established across the Mediterranean (Bagnall 1997a). The Ptolemaic veterans who settled in the Fayum did not necessarily share a specific place of origin as with the Greek colonies (see for example Hall 1997) or even the same cultural traditions and social practices. Indeed their backgrounds were diverse: early registries from the Fayum and other sites in Ptolemaic Egypt attests to the presence of Greeks, Medes (Persians), Jews, and Aramaic soldiers taking up allotments of land (Clarysse and Thompson 2006, Clarysse 1985, Bagnall 1997b). Having been in the Macedonian

army, they may all have shared some Hellenized cultural practices, but even then the degrees to which each had embraced and adopted (or adapted) Hellenism would vary. Thus, it seems likely that the early years of Fayumic settlements would have been characterized by a great deal of social negotiation between inhabitants to establish local ways of doing things. This may in part account for a wide variety in spatial organization and architectural characteristics of Fayumic townsites, and why close clusters of villages like the North Shore sites of Karanis, Soknopaiou Nesos, and Bakchias (Davoli 1998) seem to have more in common with each other than with other sites around the Fayum basin.

Settlement patterns

In terms of formal administrative organization, there is certainly no particular reason to see Ptolemaic settlements of Egypt as following traditional polis-type patterns of foundations (Mueller 2006). In fact, the Ptolemaic kings may have avoided the polis model whenever possible owing to its close political association with democracy and civic privileges and rights which the Ptolemies may have preferred to dole out more sparingly to their native population. The capital at Alexandria was developed as the most traditionally 'Greek' city, one of only three recognized poleis in Egypt, and as such the citizens of Alexandria had preferred legal statuses as "Hellenes" of the city, compared to the native Egyptians of the *chora* (Bowman 1986:124-5, Cherry 1990). While this legal identity does not necessarily denote actual cultural practice, the citizens of Alexandria are also more likely to have had greater opportunity and access to traditional Greek cultural institutions in addition to those of native practices.

Alexandria was a highly multi-cultural city, which at times caused conflict (Haas 1997, Harker 2008), but with a general tendency to tolerate diversity. The city was organized according

to the typical Hippodamian grid system, divided into districts and blocks by the city streets. While we cannot recover the entire layout of the ancient town, the abundance of surviving architectural materials, both in archaeological remains and reused in buildings throughout the city's history, attests to the existence of many Classical-styled structures. The prevalence of classical architectural styles appearing in Alexandrian monuments (Bailey 1990, Ling 1990) has led many scholars to assume that the city had a decidedly Greek appearance, although more recent analysis suggests a more complex adaptation of Greek and Roman styles with local Egyptian iconography that creates a new style unique to Alexandria (McKenzie 2007:34).

Settlements of the Greco-Roman Fayum, including Karanis, may have had similar Hellenized features, even with a local tradition of euergetism; however, rich individuals were more likely to donate in major centers rather than the provinces (Van Minnen 2000, Kelly 2011). Although we know that Karanis was a sizeable town and therefore a site of some local importance in the Fayum (Alston and Alston 1997, Alston 2002), local elite may well have made donations to Fayum's capital in Krokodilon Polis rather than in their own farming village. Still, there is evidence that the local citizenry was involved in both administration and euergetistic donations to cultural institutions including the Hellenistic gymnasium (Van Minnen 2000) as well as in the local temples (Schuman 1947 and figure 2.13). In addition, a great deal of local administration relied on the participation of local inhabitants, from the *boule* (town councils) that ran local administration and public offices, to the *gymnasium*-members, an organization of elite Hellenized families with powerful social influence (Montserrat 1997).

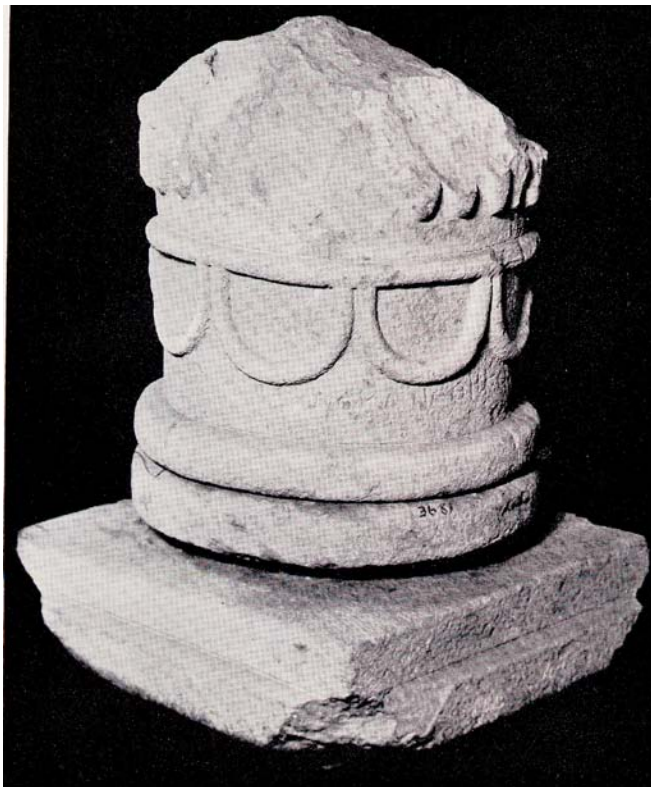


Figure 2.13. An altar found in Karanis' North Temple, inscribed as a dedication made by "Sarapion" (Image from Boak 1933:plate 8)

Many discussions of the Greco-Roman Fayum focus on papyrological evidence, especially for studies of the local populations and demographics of such towns (Clarysse and Thompson 2006, Alston 2006). However, as we have already discussed with pharaonic settlements, cohesive archaeological evidence on such sites remains uneven, due largely to the manner in which they have been excavated and recorded. The commonality of the Hippodamian grid is obvious on many site surveys (figure 2.14); however most excavations have focused on temples and their associated structures. Therefore we have sites like Tebtunis (Rondot 2004), Soknopaiou Nesos (Davoli 2012), and Narmouthis (Bresciani et al. 2010) which were excavated with respect to the temples and other monuments along their *dromoi*, with only the occasional investigation of small areas off the main axis, as in Tebtunis (Hadji-Mingalou 2007, Rondot

2004). This presents limited opportunities to explore aspects of social organization beyond religious-oriented behaviors; for example, how isolated or integrated housing may have been from major social centers of the town, and thus how likely it was that domestic structures, too, constituted space for social use.

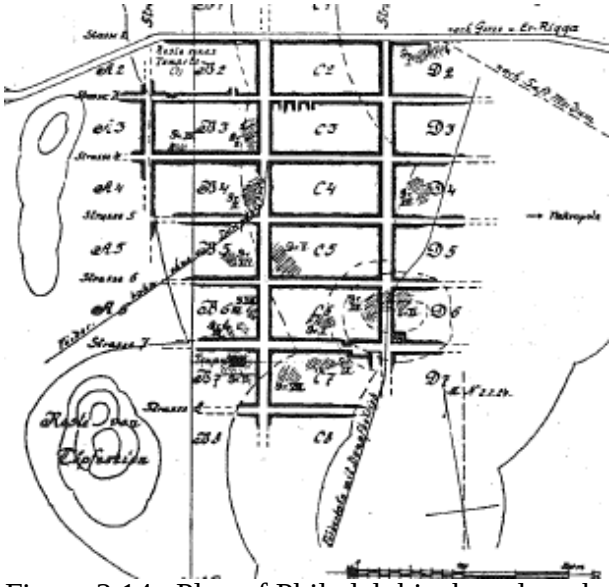


Figure 2.14. Plan of Philadelphia, based on that of Borchardt in 1924.

Modern investigations at Karanis and Bakchias have expanded to include not only the temples (Rossetti et al 2011, Schuman 1947) but also mudbrick structures including granaries (Husselman 1952), dovecotes (Husselman 1953), baths (El-Nassery et al. 1976) and domestic structures, as well as larger studies of town layout (Husselman 1979, Van Minnen 1994, Alston 2002, Cappers et al. 2013, Barnard et al. forthcoming a). For Karanis, in particular, papyri have assisted in providing some evidence of social as well as spatial organization for the town. Even without an extant *gymnasium* to study, surviving texts mention donations to its construction and operation as an important social institution for the town. (Van Minnen 2000). Other texts have given information as to the existence of specified administrative districts (*amphoda*) which may have organized the settlement into more local spheres of neighborhood interaction (Rink 1924,

Alston and Alston 1997:212). The names of amphoda and even the names of some streets have been discovered, giving tantalizing clues about Karanis' topography. However, there are severe methodological issues in successfully linking any such attested spaces or structures to a specific location within the site: despite finds from the 1975 French excavation that attested to a "royal road" (*rumê basilikê*) in Karanis (El-Nassery et al. 1976:234), there is little corroborating evidence to associate it with its findspot, especially when the street in question is compared to the larger organizational pattern of the town (see chapter four, p. 134).

In general, the degree to which individual documents or even archives can be linked to the properties on which they were found or to any extant properties is limited (Van Minnen 1994), and the privileging of such papyrological information without more complex contextual understanding of the archaeology can lead to many misassumptions as to building functions. The so-called Karanis "barracks" (Hussleman 1979:55), and several "granaries", all largely identified by nearby papyrological finds, are not all corroborated by the archaeology of these buildings, which in fact suggests such structures had more domestic use than any particular administrative function. When papyrological and archaeological evidence are combined, positive identifications can be made, as with the *thesauros* at Bakchias (Tassinari 2009), but such matches are admittedly rare. Unfortunately without such precise knowledge, there is little chance of reconstructing the relative location of important civic buildings, which thus presents a severe limit to the scholar's ability to discuss the social implications of the structure's incorporation within or isolation from the larger access networks of the settlement's spatial system. This in turn obviously affects understanding of social behaviors for the ancient settlement.

Domestic structures

In comparison to the study of settlement spatial organization for Greco-Roman Egypt, much more has been written on the specifics of domestic structures, including the establishment of a basic typology, the most common types being the villa and the tower-house. Tower-houses are defined as multi-story dwellings, some of which were as much as five stories high (Nowicka 1969:108, Lehman 2013, Husson 1983) and are evidenced not only in architectural remains but in terracotta and stone models of the same period (figure 2.15). These are often described as "townhouses" (Davies 1929) and part of the urban landscape, and are contrasted to the more sprawling villa-models which Nowicka describes as "*la maison rurale*" (1969:129). While the image of these rather bucolic and spacious villas was popular even in ancient times as seen in the mosaics and wall-paintings of Roman houses, in reality both types of architecture existed in the rural communities of the Fayum and should not be characterized as specific to any type of settlement.

Figure 2.15. Left, stone house model from the Greco-Roman period (image available from the British Museum website, object #EA2462). Right: wall painting from the house of M. Lucretius Fronto, showing waterfront villas (image courtesy of the VRoma Project).

Less is certain about the interiors of these structures; while textual sources give us the

names of several rooms, features, and external structures for domestic properties, it is again extremely difficult to discover the significance of these words in terms of use and in the extant architecture. Many of the early studies of Egyptian housing for this period were quick to stress the Greek and Roman natures of the Egyptian oikia, "*definit le charactère de la maison particulaire et signale son evolution: depuis le type à oikos du IIIe siècle jusqu'au type à peristyle du IIe siecle av n. ère*." (Nowicka 1969: 26, but cf. Luckhard 1914 and Schütz 1936). As with the Roman domus, some relied heavily on discussions of mural decoration (Pagenstecher 1919) as their evidence. However most studies focused on papyrological evidence; as the majority of this material is in Greek, Genevieve Husson's work *Oikia* (1983), a collection of the ancient vocabulary of domestic architecture from documentary papyri, remains one of the most important studies and an invaluable reference for the study of Fayum houses.

However none of these studies were able to effectively bridge the huge gap of information and understanding between the rich information of the written sources and the complicated nature of actual archaeological remains: with very few exceptions, the terminology gleaned from text could not be satisfactorily applied to any surviving architecture. Just because a term is familiar to us from Classical Greek sources, its use in Greco-Roman Egypt does not always satisfactorily match the traditional use of the word. While "andronitis" and "gunaikonitis" are both preserved in documentary papyri of the time (Husson 1983:37-40), none have been successfully identified in the Egyptian archaeological remains: "*ce qui est certain, c'est que cette dernière ne correspondait pas au type de maison grecque classique qui comportait deux parties differents: l'andronitis et le gynaikonitis avec deux cours sur un seul axe*" (Nowicka 1969:143). It seems that whatever connotations the terms originally held, their usages in Greco-Roman Egypt were quite different, certainly in terms of physical form and most

likely with regards to the specifics of function as well. Even words that seem to denote simple architecture-based forms are not easily interpreted: we might feel we can safely identify such basic features as tower, gate, and courtyard in the extant architectural remains, but such structures do not necessarily match the usual Greek forms of *purgos*, *pylon*, or *aulê*. For example, a purgos (tower) in ancient Greece was often a specific architectural form of a rounded, unsupported tower, frequently serving as either storage or defensive structures (Morris and Papadopoulos 2005), but the use of the same term in the documents of Greco-Roman Egypt suggests that "tower" was applied locally to almost any structure (or part of a structure) that had multiple stories (Husson 1983), including entire houses. The opposite is also true—that while Greek writers had long applied their own native words to purely Egyptian features, as with the famous pylon structure of Egyptian temples, when the word is applied to houses of Greco-Roman Egypt, there is no reason to see it as anything other than a simple "gate" or "vestibule".

Out of all papyri of the period that deal with domestic structures, there is a single example that combines an illustration of house form with labeled terminology: this is Papyrus Oxyrrhynchus XXIV 2406 (Maehler 1983, Lobel et al. 1957, Smith 1970, and see figure 2.16).

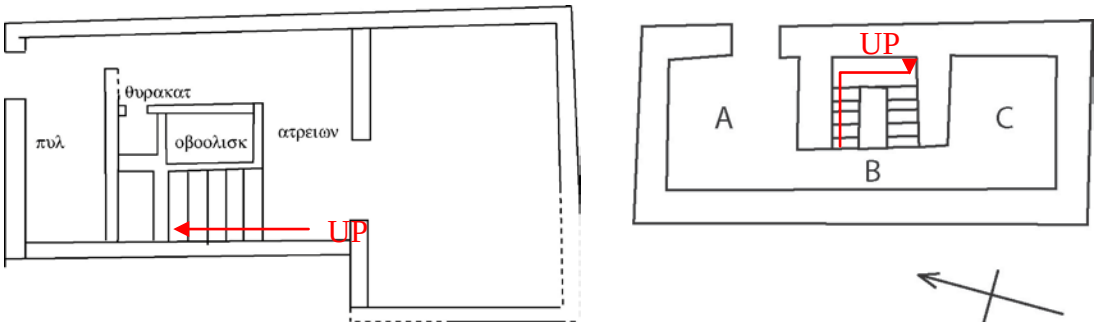


Figure 2.16. Left: drawing from P.Oxy. XXIV 2406. Right: simplified top plan of Karanis house C194. Note the staircase room B includes stairs leading up to a second level, and down to the basement (*thura katagaiou*). The pillar in the center would therefore correspond to the *obeliskos* of P. Oxy. XXIV 2406.

The image has been accepted as a sketched floor plan of a three-roomed house with courtyard as seen from above. The rooms are defined by solid walls colored in with yellow pigment, and while it is not thought to be drawn to scale some notations on the image may be abbreviations of dimensions (Maehler 1983, Lobel et al. 1957). While the basic structure depicted appears in fact very similar to a multitude of extant Karanis houses, some papyrologists have engaged in rather creative contortions of logic in order to make the labels conform to our usual understanding of the terms. The first room, the one with the entryway, is labeled as a pylon, incontestably a gate or gatehouse in function, whatever specific architectural form or style it may take. Adjacent to that is a small space leading down—*thura katag(aiou*)—presumably to underground space, likely for storage. Adjacent to this is a rectangular feature enclosed by four walls labeled *obel(iskos)*, and more stairs filling in the space between the feature and the wall—these presumably go to an upper story. There is a label reading "atreion" directly to the right of the "obelisk", which has led many to conclude that the room is a local equivalent of a Roman atrium, and the obelisk must be serving as the *impluvium*, the pool at the center of the room. Maehler (1983:137) cites the possibility of obeliskos referring to a water feature, although this is more usually the case for a conduit or drain (Liddell et al. 1935). Owing to the contested feature's proximity to both the staircase and the access "thura katagaiou", I would suggest that the obelisk must be structural and should be viewed as a column or pillar supporting a spiraling-stairway, as is evidenced in nearly all the houses of Karanis (Husselman 1979:77 and figure 2.17). A reading of obelisk as "needle", "spar", etc is certainly more in keeping with its architectural usage, especially in Egypt.

Figure 2.17. Left, photograph of a house showing the staircase, with the central pillar (obelisk?) partially destroyed (Kelsey Museum Archive photograph 503). Right, a similar example observed in the 2010 survey, with the pillar still largely intact (photo by B. Simpson).

Despite all the difficulty in using papyrological evidence, such documents can reveal much about the legal and social restrictions on both public and private property. The administration of Fayum towns has been reconstructed (Alston 2002, Geremek 1969, Goodspeed 1902, Husselman 1971, Lewis 1967), and we have solid evidence not only of offices and the names of individual office-holders, but extant examples of citizen petitions made to them, requesting better street maintenance, or the safe demolition of derelict structures (Kelly 2011). As with Ancient Rome, the degree to which these officers actually acted upon their authority is unknown—the very presence of multiple complaints and petitions on the same topic suggests that progress may have been slow at best (Kelly 2011), but their existence implies at least a

theoretical acknowledgment of governmental and civic responsibility for such issues, if not the truth of regular practice.

This brings us to the question of private property, and how far the influence and regulation of the state extended over concepts of personal "rights". A wealth of text from Egypt and the larger Roman Empire inform us of some of the legal statutes themselves, and the survival of contracts from Egypt itself gives great insight into the disputes over such rights (Taubenschlag 1954, Kelly 2011). Certainly, there were some legal restrictions over construction on private property, mostly in regard to the safety and rights of others. One could not encroach upon public space, as with construction in a roadway or through the extension of balconies past a certain distance from the house (Owens 1991:167 and see *Cod. Just*. VIII 10, 12.b). Restrictions on the heights of buildings as well as their proximity existed, to prevent collapse and the spread of fire; Augustus set the maximum limit at 70 feet (Strabo 5.3.7). It is not known to what extent these Roman codes, which had arisen out of the need in the urban environments of Rome itself and the other densely-developed settlements of Roman Italy, were enforced or even accepted as law for provincial settlements. While the highest attested structure for the Egyptian Fayum is five stories (Nowicka 1969), it is unknown if that reflects concern for the Augustan law described above, evidence the result of a more local restriction, or for other reasons; in any case, it was been well established that the mudbrick buildings of the Egyptian Fayum could structurally certainly support many more stories (Lehman 2013).

It is likely that, due to both the rural characteristic of the Fayum settlements and what may have been a more local approach to settlement organization and building code enforcement, there were in reality few legal restrictions on what the private owner could do—and so long as his actions did not interfere with those beyond the limits of his own property, there were likely

few social ramifications of violation. Instead, social agreements in the form of formally-written interpersonal contracts seem to have filled this need. One of the most detailed contracts of this type of neighborly interaction was found in the Archive of Teianteus, a collection of third-century B.C.E. papyri all focusing on the construction, inheritance, and sale of a single house in ancient Luxor. At one point, when the owner of the house wished to reconstruct part of his home, he secured the permission of the adjacent neighbor, swearing:

> I am responsible to thee if I build my house which forms the western (boundary) of your house…and I will build my house from my southern wall to my northern wall up to thy wall, provided that I do not insert any timber in it (i.e. thy wall), except the timbers of the building which was there before. (B.M.10524, translation from Glanville 1939:21)

The contract repeats the stipulation several times, giving every assurance that the remodeling will in no way adversely affect the neighbor's property. The particular concerns are not only for structural security, but to protect the neighbor's access to sunlight and prevent his windows from being blocked in the construction process —through the maintenance of a "light well" (*wyn n ššt*). "And I will leave the light-well opposite thy two windows the distance of a brick from the bricks which are built against thy house opposite thy windows" (Glanville 1939:22). The agreement includes consequences for violating the terms (a payment of 5 silver pieces), and adds a stipulation that if the neighbor goes on to deny this agreement the contractor may "undo these according to everything foresaid, And I will build my house, without leaving (?) for thee a light-well" (ibid). Similar concerns for access to light and air are reflected in later Roman law, which even had formal distinction between *fenestrae luciferae*, windows for light, and those designed for allowing exterior views, *fenestrae prospectivae* (*Cod. Just*. VIII 10,12, 3). Windows that provided view were taxed more, clearly evidence they were considered more of a luxury, however views were only later given legal protection against obstruction, whereas *fenestrae luciferae* seem to have always been protected (Hermansen 1981:94-95).

Another factor which may have been considered something of a regular right among property owners is the rights of access from private property to and around the public street grid. However, there is evidence from Greco-Roman Egypt that this "right" was regularly threatened, and in the course of construction contracts were often deemed necessary to assure access to neighbors in the instance that new construction should block direct access to the street; that this happened frequently is evidenced in many contracts of *eisodos kai exodos* (Husson 1983:65-72, also Taubenschlag 1955), guaranteeing individuals that they may freely travel "through a gate into a public road, along a path around the four boundary lines of the building, through a public square, or lastly, through another building" (Taubenschlag 1955:256).

It is interesting to note these contracts are characterized more as social agreements than legal ones: examinations of law in Greco-Roman Egypt suggests that many such documentary papyri are evidence of contracts that are not exactly legally binding, "not meant to be a real right but merely an obligatory one as in local law" (Taubenschlag 1955: 259). The documents are thus characterized as social contracts which may attain the practical force of law through the extreme cultural importance placed on the written word (Kelly 2011, Youtie 1971). The individuals involved in the Teianteus case reached their own interpersonal agreement, including fines and penalties for breaking the contract "to ensure its execution…the arrangement being enforceable against the neighbor alone, thus creating not a real but obligatory right" (Taubenschlag 1955:261, and see also BM10.524 and 10.500), and taking the extra steps to formalize their arrangement through the notarization of witnesses; formal court action may have been threatened in order to pressure quicker resolution —but the extent to which such a contract would actually be enforceable by law is debatable (Kelly 2011).

In this way, the contractual documents are important evidence of the success of social

negotiation to maintain order and organization even in areas that are not highly attended to by official legal administration. Likewise, when the effectiveness of official offices may have been low, there is ample evidence of small-scale social attempts to negotiate issues of property and space, sometimes with surprising results (as when individuals claim public land for their own use simply by fencing it in as part of their property—a strategy that seems to have been both commonplace and often successful (for more details, see chapter five).

Having examined the scholarship on the culturally-specific attitudes towards spatial and social organization for Egypt, Greece, and Rome, we can see that each culture has fairly specific attitudes towards the use of space and its use according to specific social interactions. While the review of this scholarly material presents evidence for both large-scale public organization at the level of settlement and for more localized private spatial organization of domestic properties, there are very few studies that attempt to address the interface between the two, as if civic and private interests never overlap, intersect, or in any way interact with each other, socially or spatially. However, without admitting that these two aspects actually create an integrated network of a continuous and united built spatial environment, attempts to explain the very need for boundary maintenance, either by allowing permeation or prohibiting it, are meaningless. It is only through close examination of the interactions between distinct social spheres that identities can be ascriptively defined and managed.

Although so many of these studies emphasize the importance of civic and domestic space to shape social identities, very few attempt to detail a quantitative method for their analyses concerning the overall contextualization of space. Instead, their processes are nearly all observational and descriptive in nature. This lack of a systematic method for quantifying and analyzing space is a major stumbling block in the use of architecture to understand past social

behaviors as it forces a great deal of unsubstantiated interpretation of the evidence based on a theoretical understanding of ancient culture. The next chapter will discuss more formal theories for understanding the way these social practices are reflected in the archaeological record, and how in turn archaeological remains may be used to uncover aspects of ancient social attitudes towards space including social boundary maintenance, concepts of privacy and permissiveness, and even the identity of agents engaged in the use of architectural structures.

Chapter 3. Theory and Methodology

The overview of the scholarship on the spatial and social organization of settlement and domestic space for Egypt, Greece, and Rome, in the previous chapter has shown that each culture has specific attitudes towards the physical organization of space and its use according to specific social activities. While the review of this scholarly material presents evidence for both large-scale public organization at the level of settlement and for more localized private spatial organization of domestic properties, there are very few studies that attempt to address the interface between the two. Of course civic and private interests overlap, intersect, or interact with each other, socially or spatially, and form an integrated network of a continuous and unified built spatial environment. It is only through close examination of the interactions between distinct social spheres that identities can be ascriptively defined and managed.

Moreover, though many studies continue to rely on observation and empirical theory (Smith 2011:167), there is a need for more systematic analysis of spatial environments that allows for comparisons between separate systems, or the comparative changes in one particular system over time. Quantitative analysis of architecture can greatly aid our understanding of past social behaviors, as it avoids interpretation of the evidence based on a theoretical understanding of ancient culture. Fortunately, both the theory and method for such investigation have been developed: this chapter will discuss the development of social theory with regards to architectural and other built spatial systems, especially the theory and method of Space Syntax Analysis, as well as outline the standards of definition and calculation of spatial values by which spatial systems can be analyzed.

General Theory: habitus and the formation of cultural identity through social use of material culture

Archaeological inquiries rely heavily upon ancient material culture as evidence of past social practice and cultural identity. The particular way in which material culture may be used as a signifier of identity has developed far from a simplistic equation that "pots equal people", which arose out of early studies including those of Gustav Kossina (1911) and Gordon Childe (1930). This culture-historical approach was further refined by the contextual archaeological movement and adapted by Ian Hodder (1989) and others (see for example Graves-Brown 1996, Hides 1996, Leach 1976, and Smith 2007), so that today there is a general acknowledgment that material objects not only have practical functions but also symbolic and identifying ones (Cooney 2007), for the object's creator or user. Thus material goods, whether luxury items or objects of daily use (Smith 2007), may be understood as personal statements of identity, working to create a non-explicit but shared understanding of "group-feeling" between members of a cultural group or society.

This particular phenomenon of socialization was identified by Pierre Bourdieu (1977) as the *habitus*: an indexical marking in which actions and objects come to have cultural value and meaning, creating a non-explicit but shared understanding of "group-feeling" among a culture or society. The habitus is a multi-variable concept; no single thing ever defines it, and various aspects of its expression through use of "both material and non-material culture" (Jones 1997:123) are always changing in both type and intensity of relative importance (Barth 1969,

Bloom et al 1954). However, cumulatively, it can be seen as nonverbal messages of identity that reinforce cultural values and the structure of daily life. While self-identification can certainly be shaped by actions and behaviors that occur in a relative state of privacy (Smith 2007), even the construction of a single individual's identity is shaped ascriptively—by comparative reference to the identity of others. Therefore the social aspects of the habitus are apparent in both self- and social-identity construction.

As with other categories of material culture, architectural structures are physical products marked with cultural value, and through use of them an individual expresses agency in negotiating the expression of both group-membership and more personal-based identity. The nature of the link between buildings and their ability to express order (both in physical and social terms) has been noted by Bourdieu (1977) and Michael Foucault (1977), and domestic structures in particular are described as the practical embodiment of the habitus, "structuring structures" (Alston 2002: 50) that give order and organization to many expressions of cultural belonging.

The role of architecture in defining location for human interactions is therefore complex, and much has been written about the "duality of structures" (Giddens 1981 for an in-depth discussion of this duality): how they have a two-part, dialectical effect on establishing and constantly reinforcing cultural norms. While structures are built according to certain spatial and cultural needs, once built the organization of a structure places very real physical limits on the "interaction potential" (Grahame 2000:56) of agents within the system. Walls are both physical and social barriers, with opportunities for permeation at a limited number of interfaces (doorways) so that individuals from different spatial origins might interact. In this sense, buildings can be said to "literally transform the character and personality of the individual" (Grahame 2000:2) as they exhibit controlling and structuring forces over human interactions. As

such, it is assumed that the physical remains of structural environments may be used as indicators of social structure, by comparison the relative arrangement of rooms within a given system to the probability that such spaces might be the locations of human social interactions.

The use of architecture as evidence of social interaction is explored through Space Syntax theory and method, described in greater detail below. While Space Syntax Analysis has developed to encompass multiple avenues of spatial research, it was first developed as a way to describe and define precisely the nature of connection between discrete spaces and areas, and to track the potential ways that human agents could move throughout the system (Hillier and Hanson 1985), so that "by analyzing how different houses shaped interaction, it was possible to identify a trend in the social patterns generated by them" (Grahame 2000:4). The result of space syntax study is therefore not only the description of space, but also a calculation of its potential use, the probability for which any given space in a system might be occupied as an area of possible use by human agents within the system.

Agency and identity in built environments.

While spatial theory and especially Space Syntax Analysis might be used to assume probability of access to any space within a system, it is not suited to defining agency in the construction and uses of such spaces, or in telling us anything about identities of such individuals. Scholars aligned with structuralism or the New Archeology (see Smith 2011:172, Watson et al. 1971) often react positively to such broad theory as reflecting universal human experiences, whereas post-processualists insist that such theories, rather than being removed from all bias, are in fact heavily influenced by modern Western cultural beliefs and experiences,

so that scholars applying them to ancient datasets often "find it so like their own urban experience in the modern world that they interpret what they see in the light of their knowledge of the modern city" (Laurence 1994:1).

Deterministic theories of spatial organization tend to avoid questions of agency, such as: what individual or groups within any given culture exercise the control over decision-making with respect to the design, construction, and use of built spatial environments? We have already seen some of this in Chapter Two where emphasis was often placed on the primary house-owner or head of household as the one who controlled space and who was particularly emphatic in manipulating the spatial environment to serve his own self-aggrandizing social needs. Similarly, spatial theory and space syntax analysis are better suited to examining broad cultural attitudes towards concepts such as privacy and spatial permeability, and not particularly useful in determining aspects of individual identity or the relative degree of importance for any specific expression of cultural identity. Simply put, it is very difficult to identify the presence or point of view of any particular agent: there are too many variables to consider.

Multiple users exist for almost any given spatial system, even a relatively private one like a domestic building. A single house might be thought of as containing a very limited range of social identities, all members united by shared familial, ethnic, caste or social status, but in fact even within these groups there are differences of age, gender, economic influence and other factors of identity that might lead to social debate over relative social standing and even legal conflict (Kelly 2013, Huebner 2013)[1]. The relations between occupants of a single domestic property may go well beyond blood and marriage: the entire household (Blanton 1994) may

[1] For discussions of women as property owners and heads of household, see Sheridan 1998; also Hobson 1983, Muhs 2008, Glanville 1939. Boak 1921 includes discussions of single domestic properties under divided legal ownership.

contain individuals of various social standing including servants and slaves, groups that are only recently fully considered as significant factors of household organization and as physical presences that must be accounted for when discussing the realities of spatial organization (see Foss 1997, Morris and Papadopoulos 2005).

To further complicate matters, there is no single aspect of identity that is privileged in all social situations: instead, identity is constantly changing, "manipulated according to subjectively constructed ascriptive boundaries" (Hall 1997:32). Therefore, there are times in which an individual's status as a slave might bar him from admission to areas designated for the use of citizens, but if that same slave is an initiate in a certain religious cult he may have the right to enter sanctuaries that even a rich free man is forbidden to access. If specific structures and locations within a system can be identified in terms of use and cultural significance, perhaps it is possible to discuss some aspects of permissiveness and relative rights of access; however none of these will be necessarily significant outside of that particular spatial or social situation.

Considering the multiplicity of cultural identities and variable levels of permissiveness for agents within any single structure, let alone a complete system, it must be stressed that

> we are dealing rather with a spectrum that ranges from the completely public to the completely private, and with an architectural and decorative language that seeks to establish relativities along the spectrum. One space is more or less open or intimate in relation to the spaces around it, and contrasts of disposition, shape, and decoration establish such relativities. (Wallace-Hadrill 1994:17)

Instead of the individual agents, studies incorporating space syntax theory often focus on the broader social levels at which groups interact to make decisions: for example, "generative planning theory" (Smith 2011:179) examines the relationships between civic planning and so-called "organic" growth of spatial systems at the level of private property. Such studies demonstrate the complex relationship between local and global patterns of spatial control, often

arguing in favor of a bottom-up process of network formation and management: "we do not believe that these large patterns, which give so much structure to a town or a neighborhood, can be created by a centralized authority, or by laws, or by master plans" (Alexander et al 1977:3, see also Smith 2011:179).

Ancient Karanis provides an excellent dataset for exploring theories of spatial organization along these themes: the prevalence of its well-preserved domestic architecture has already been incorporated into many studies as an example of social space in the Roman and Late Antique house (Marouard 2005, Alston 2002, Bagnall 1993), however until now these studies have remained largely descriptive and anecdotal rather than a presentation of significant quantitative data. In addition, the excavation of Karanis allows for a wider examination of spatial systems beyond the house itself, to include the possibility for examining the existence of civic or municipal levels of town planning and spatial management (and see Husselman 1979:29). Such architectural evidence is also supported by a wealth of social contracts from Roman Egypt, many from the Fayum and some from Karanis itself, that stress the importance of personal agency and local-level neighborhood negotiations in the management of organic settlement growth.[2]

Therefore, in this study I examine the ways that architecture could have been used through a more systematic analysis of spatial organization, especially physical accessibility (in terms of the probable movement of individuals through a spatial system). The results of this study show the importance architecture had in providing context for human social interaction,

[2] Previously addressed in Chapter 2, but see Glanville 1939, Taubenschlag 1955, and Kemp 2012: 165-6.

and also examine the potential and probability that decoration and the encoded message of the habitus would have been viewed.

Definitions of "Space"

The publication of Hillier and Hanson's *The Social Logic of Space* (1984) established the general method by which the organization of space can be systematically recorded and studied, and the theory by which spatial relationships may be related to social use. This book responded to a specific need:

> to outline a new theory and method for the investigation of the society-space relation which takes account of these underlying difficulties. First, it attempts to build a conceptual model within which the relation can be investigated on the basis of social content of spatial patterning and the spatial content of social patterning. Second, it tries to establish, via a new definition of spatial order as restrictions on a random process, a method of analysis of spatial pattern, with emphasis on the relation between local morphological relations and global patterns. (Hillier and Hanson 1984:xi)

More than simply defining a vocabulary for explaining spatial relations, the authors provided formulae for calculating these relations in numerical form, giving measurable and comparable value to the ways in which the interrelation of spaces can be described.

In designing their terminology for the exploration of social space, Hillier and Hanson have essentially used the term "space" as the basic unit of location within a larger spatial system. This definition of space is related to, but not synonymous with, architecturally-defined areas or 'rooms' within a structure: a single room might be describes as including multiple spaces, but a space does not span several rooms. While Hillier and Hanson were somewhat vague in defining exactly "any theory governing what legitimately counts as a bounded space" (Grahame 2000:31), giving several possible and conflicting methods, the more specific category of "convex space"

(Hillier and Hanson 1984:17) as defined by geometric convexity has become the most frequently-accepted definition: a single "space" is such that "if a tangent is drawn between any two points in a convex space, it will not pass through its boundary" (Grahame 2000:31, and Figure 3.1); despite the relative architectural unity of any area that fails this test, it must be divided into multiple convex units.

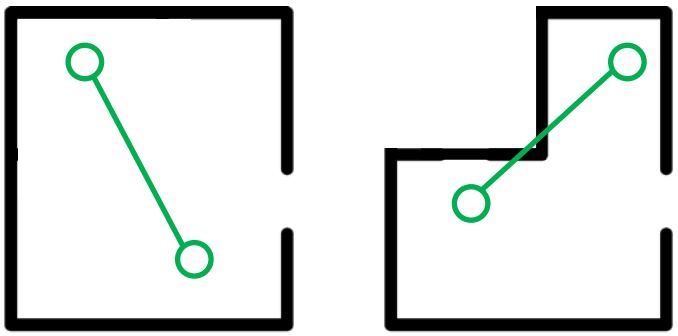


Figure 3.1. The figure on the left is convex: for any two points inside the space, a line connecting them will not cross the perimeter of that shape. In contrast, the right figure is concave, as the line drawn between the two points passes outside the spatial boundary.

Not all decisions in the division of space are immediately obvious: "when an architectural arrangement has 'low' definition, it is obviously possible to describe its configuration in a number of different ways" (Grahame 2000:31, and see figure 3.2). As can be seen in this configuration, the top-left space is clearly defined on all four sides; the presence of the door in the "bottom" wall does little to detract from our understanding of what constitutes a bounded space. However, the L-shaped room is a more complex example: based on the rule of convexity it cannot be considered a single space, but it otherwise lacks the clear architectural features (doorways, thresholds) of exactly how it may be best divided into individual units.

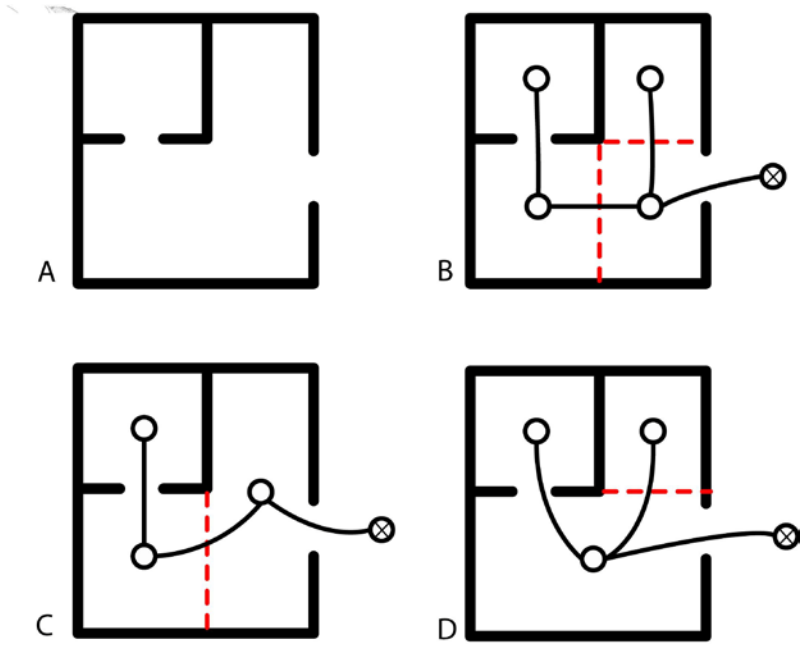


Figure 3.2. Possible divisions of architectural arrangements into convex spaces.

While it may in theory be divided into many spaces, the more usual rule (Grahame 2000:31) is to divide only to the *minimum* number that is necessary to achieve convexity, ruling out Figure 3.2B. In general, divisions also follow the highest convexity of all possible spaces: that is, "fat spaces prevail over thin ones" (Hiller et al. 1984:62). In such an example the narrow, oblong space on the right side of Figure 3.2C would have too low a convexity, compared to the relatively wide spaces of figure 3.2D.

Because much of space syntax analysis is concerned with the visibility of individuals within and across various spaces, how spaces are divided is usually dependent on the human scale of the architecture: small decorative features protruding from a wall, such as an engaged column (figure 3.3A), may not necessarily divide an area into separate spaces, although a screen-wall of columns that obstruct continuous visibility (figure 3.3B) might be. Other determinations may rely on the difference between physical access instead of changes in view, such as going up a step to a higher-floor area, or moving around a feature such as a pool or built-in bench (Figure

3.3C): it is up to the individual scholar to determine the level at which such features have significant bearing on the intended analysis.

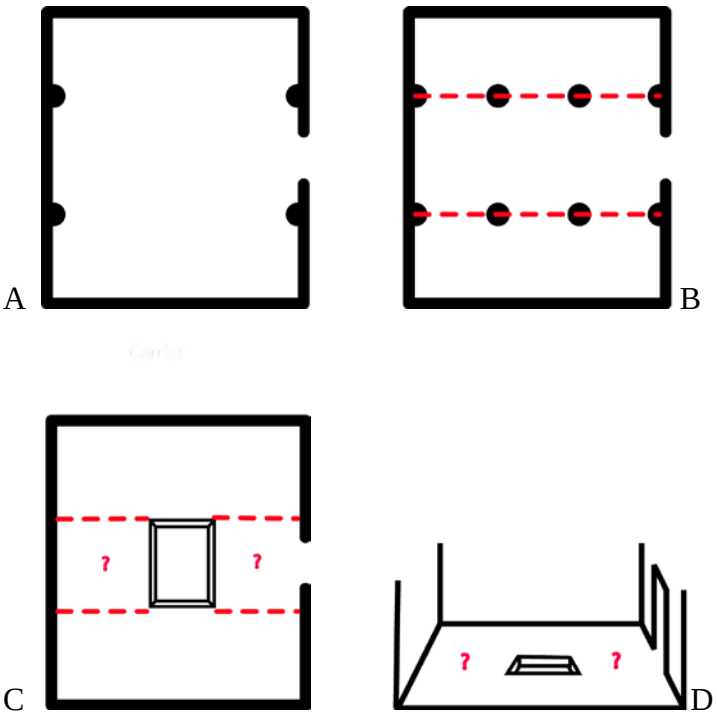


Figure 3.3. Obstacles in determining divisions of convex space by access and visibility.

Access analysis

There are various analytical methods included under the auspices of space syntactical studies, but perhaps the most prevalent, especially in terms of examining archaeological datasets, is based on the creation of the "access map", a schematic plan showing the interrelations between spaces for the complete spatial system. While these can be drawn with specific reference to an architectural top plan, thus maintaining relative values of scale and dimension for all spaces studied, they are most frequently drawn up in simplified form (figure 3.4), in order to minimize the importance placed upon the particular material aspects of architecture—materiality,

decoration, even scale—so culturally-specific assumptions of value and importance will not influence interpretation of space more than the syntactical values alone (see Grahame 2000:33).

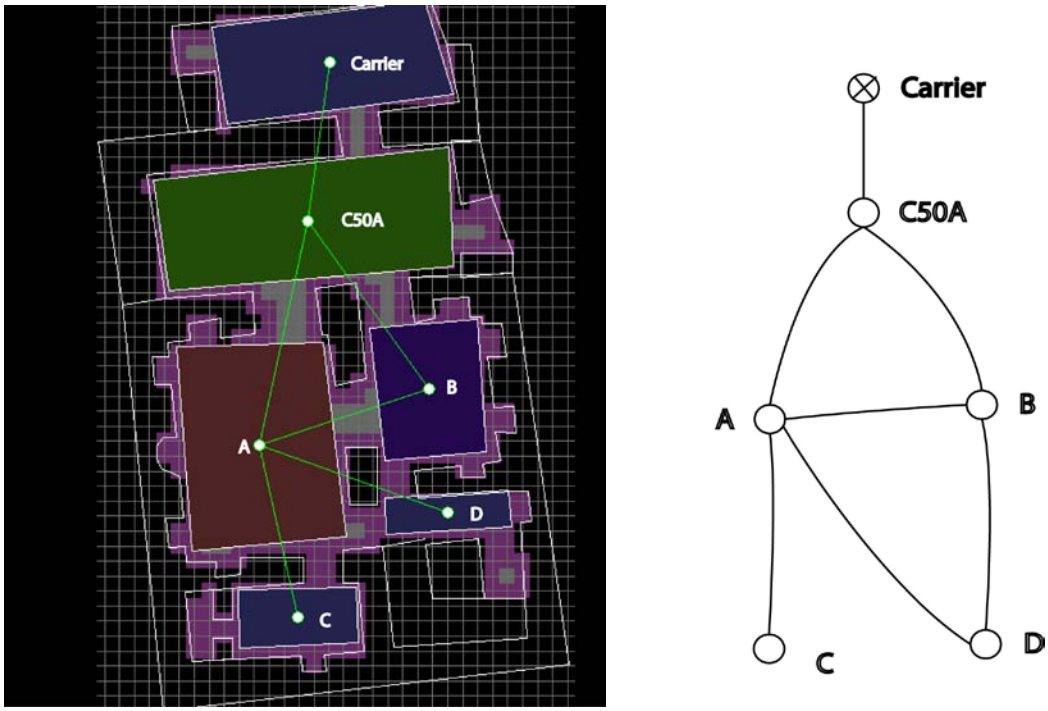


Figure 3.4. Left, an access map of a Karanis house produced in DepthMap, showing scalar aspects and real relative position of rooms on the floor plan, superimposed with a more traditional schematic access map, and on the right, a schematic map of the same structure, justified with respect to the exterior of the building.

Access analysis relies on the interdependence of all spaces within a single united system. The scale of this system is up to the analyst, but it is based on an understanding that there can be nothing within the system that is not in some way connected to the whole, refuting the concept behind the old New England cliché, "You can't get there from here." In a properly defined system, there are no wholly isolated spaces, no areas that are unreachable. That does not mean that all spaces are easily accessible: there may be locations that are very isolated from the larger network, and only reachable through circuitous routes, but it is important to emphasize that they

are, in fact, connected in some way.

However the system is defined, there must be something "outside" of it, an undifferentiated void of space that surrounds the system and in fact defines its limits. For access analysis, this space is often described as the "exterior", beyond the enclosed interior system of a single structure, but for larger spatial networks including settlement analysis that can be a misleading term as many locations within the system are also exterior in the sense of being unroofed or not fully enclosed in architectural terms. For this reason, the space beyond a system is instead often called the "carrier" (Hillier and Hanson 1984:66). Access maps, as a schematic visual representation of a spatial system, are often "justified" (Grahame 2000:32) from the point of view of this carrier (figure 3.5B), as if it is a point of origin, although as we shall discuss further, this step is neither necessary nor necessarily beneficial for all aspects of spatial analysis.

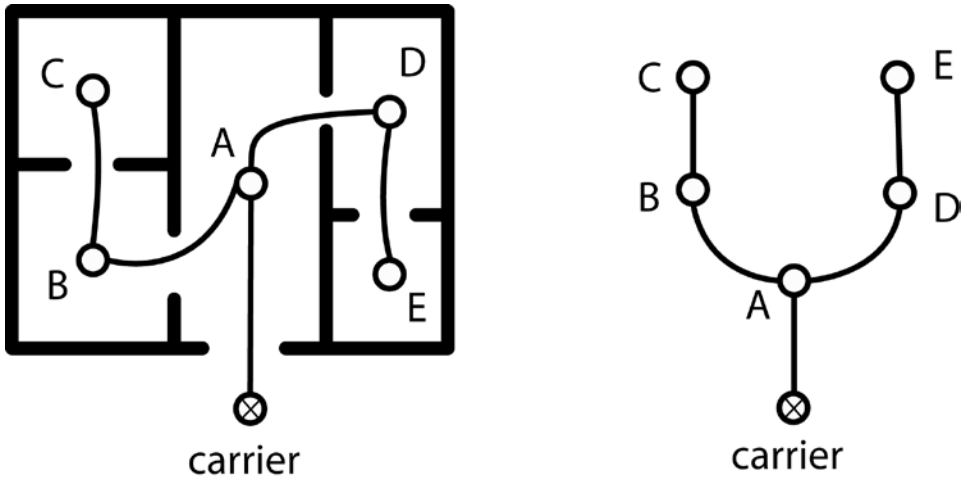


Figure 3.5. At left, an architectural access map and on the right, a "justified" schematic access map.

Space Syntax values

As the system itself, the syntactical qualities of any space in a given system are so dependent on many related and inseparable measures, that it can be hard to define and describe the exact meaning of each measured value, as all are necessarily related as part of the system. While space syntax does provide quantitative values for spatial relationships, there is not necessarily an easy correlation to each value and its importance in terms of general theoretical significance, let alone for cultural interpretation of meaning and use.

The formulae as suggested by Hillier and Hanson are so notoriously complex that even at the time of their 1984 publication they recommended "calculations should be done by computer" (Hillier and Hanson 1984:109), a hindrance that seems to have slowed the acceptance of this methodology for many fields of study, archaeology among them. Any serious investigation of Space Syntax required either very specific software or the ability to program values by oneself—a skill that even now is outside the realm of possibilities for many archaeologists, though some programs have been created to fill in the gap.

Some scholars have found it possible "to stay on the less mathematical side of Space Syntax" (Weilguni 2011:17) and proceed according to more generalized, simplified principles of system analysis. Although these reduced measures often fail to account properly for every variable acting upon a system (see for example the discussion of RRA, Grahame 2000:35), if applied consistently to a dataset they can be used to identify patterns within a spatial system and therefore direct further analysis.

Many scholars (Hillier and Hanson 1984, Grahame 2000, Fisher 2009) have dedicated volumes to explaining the calculation and interpretation of such values: simplified explanations for the values relevant to this study are below, as well as appended to this:

1. Step Depth, or, more precisely **Threshold Depth**, is often the first value mentioned in discussions of access analysis, as it is a relatively easy value to calculate once a justified access graph has been created. Threshold depth for any given space is simply the number of connective interfaces (thresholds) crossed from a point of origin, usually identified as the "carrier" space exterior to the structure/system (see figure 3.6). Threshold depth increases as one goes further into the interior of a building; in structures with multiple exits to the exterior, value is calculated by the minimum number of thresholds (shortest route), so establishing a complete access graph including alternate routes and "ringy" systems is essential, although that can add to the complexity of justifying the graph itself.

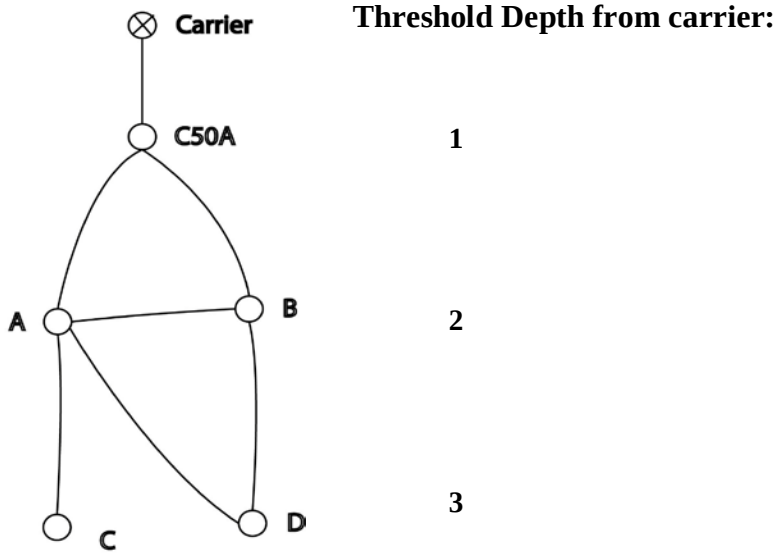


Figure 3.6. A justified access map showing threshold depth at each successive level away from the carrier.

Deep (high threshold value) spaces are frequently considered to be "the domain of the inhabitant" (Hillier and Hanson 1984:17) as compared to areas visitors would frequent, all closer to the front door. This may be a useful value for analyzing domestic structures, but becomes more problematic in a system of access that reflects broader social complexity, such as a settlement-wide system where for any agent, identity as either inhabitant or visitor changes based on the particular location being occupied.

Even within a domestic structure, the agent's ability to permeate "deep" within a house may rely on far more than simple status as visitor versus inhabitant: in a culture with strict gender rules a woman may have a female friend visit in her bedroom where even the male inhabitants of the household would not be allowed. Neither are all potential routes in and out of a house accessible to all people: close family friends and neighbors may share "kitchen door" relationships, crossing through backyards to visit the more family-based spaces that, while geospatially "at the back' of a house, still have low threshold depth, whereas a salesman would be required to knock on the more formal front door. Threshold depth is thus a useful measure for comparing depth of spaces and aspects of social control that may be reflected in these areas, but is not evidence of the precise nature of such social control.

2. **Control Value (CV)**: a local measure of how important any given space is in controlling access to its immediate neighbors. Control Value assumes a single value of 1 for each space, then divides this equally amongst its directly-connected spaces—if a space connects to three other spaces, the value it gives to each will be 1/3, etc. Once these values are calculated for *every* space in the system, the fractional values assigned to each

space are added together, resulting in the Control Value for each space.

A high value suggests that the given space is very influential over its neighbors, being a space that is frequently used in systems of movement. A less-controlling space may not be used as often, especially as a route to other spaces. Low CV locations tend to be more "private" in this sense, as they are not used by individuals seeking through-access and therefore occupants are less likely to be interrupted by the intrusion of others.

3. **Connectivity**: this value measures how many spaces directly connect to a given space, i.e. its adjacent neighbors with direct access via an interface such as a threshold, door, etc. A space that is essentially a "dead end" in the system, with only one way in and out, will have a value of 1, a room in a linear chain will have a value of 2. A room that connects to multiple spaces will have a high value of connectivity.

   Like control value, connectivity is a local measure: it only considers spaces immediately adjacent to a given location. As a local measure, it can be useful in determining specific techniques to control movement. For example, if the areas with the highest connectivity seem to be narrow hallway spaces, areas that for the most part are unoccupied themselves, then that might suggest that agents within this local system may come and go as they please with little chance of being interrupted—it is a more "private" system.

   However, connectivity cannot be directly compared to the ability to control access to a space, as the presence of multiple "ring" options within the system may provide alternate possibilities of access: what if one could "bypass" the terminal waiting room and somehow go directly to the gate?

Integration is the term given for defining this sort of accessibility, whether a given space is well-connected within the system, provided with shortcuts and alternate routes and generally "easy" to get to, or whether it is isolated and only reachable by a single, potentially long route (again, in terms of threshold depth, not metric distance). Unlike connectivity, integration is calculated as part of the global system and not just the immediate local spaces.

4. **Integration:** the relative accessibility of any space within the given global system is defined as integration, and depends on the mathematical concept of symmetry (Grahame 2000:34). It is essentially a sort of average "threshold depth" for any space, in relation to any other space throughout a given system, measuring "the boundaries that have to be crossed, on average, to reach a space from any start point in the system" (Grahame 2000:34). Systems with high symmetry tend to have many spaces with the same degree of closeness (Figure 3.7a), whereas degrees of closeness will vary more for an asymmetrical system (Figure 3.7b). Hillier and Hanson measure these global values in terms of **Relative Asymmetry (RA)** for each space, although these values could be misleading as the size of the overall system has a disproportionate affect on the calculated values (Grahame 2000:35). To produce values that are more comparable across spatial systems of varying size and complexity, scholars now calculate **Real Relative Asymmetry** (**RRA**, see Hillier and Hanson 1982:112, Grahame 2000:35), which adjusts for differences of system size.

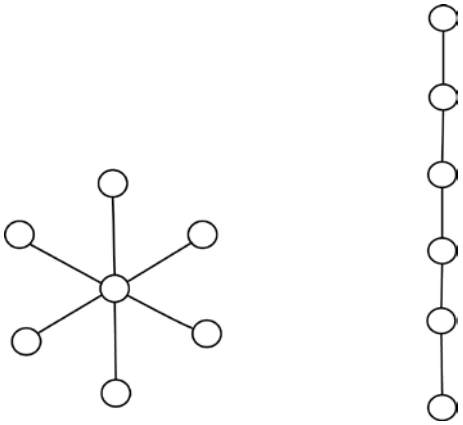


Figure 3.7. At left, a symmetrical configuration, and a highly asymmetrical one on right.

Not all spaces are equally accessible, there are different degrees of privacy possible. In a system (or subsystem) with high RRA values, access is often non-distributed: there are few traffic rings, fewer alternate routes, and spaces are generally more "distant" from each other. Culturally, this may be indicative of different degrees of familiarity and privacy, wherein high RRA spaces are locations for specific types of culturally-proscribed social interactions: in domestic structures this is often called "the domain of the inhabitants" (Hillier and Hanson 1984:166)— as opposed to a more open socializing space that would include guests.

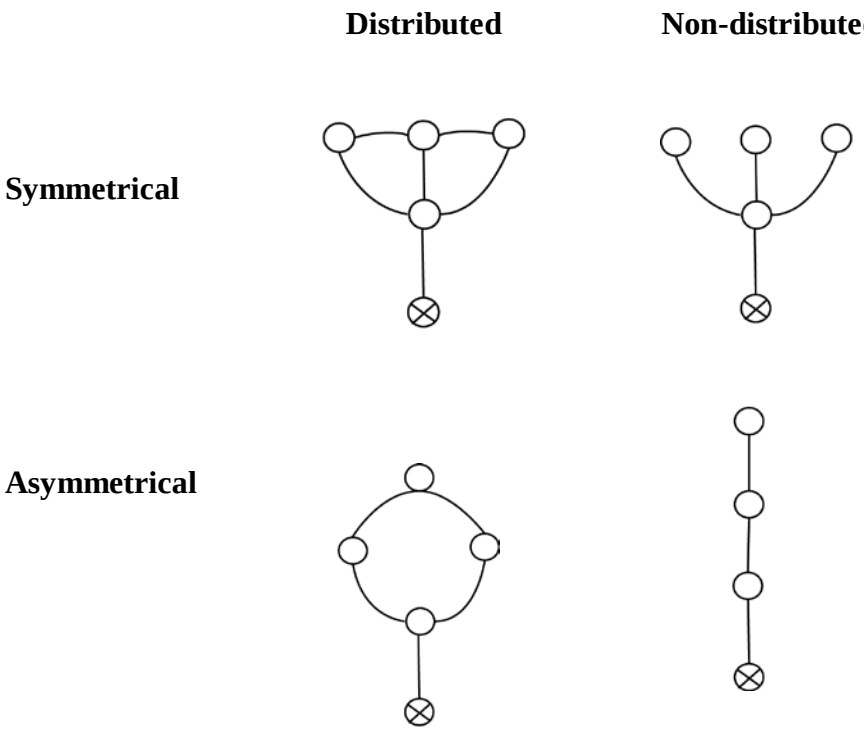


Figure 3.8. Properties of distribution and symmetry for access configuration

By comparing areas of relative asymmetry across systems, it may be possible to identify specific concerns over spatial control, though the social reasons for this concern may vary greatly and be difficult to interpret based on the access system alone: asymmetric, distributive systems may represent restricted access, but it could be for any number of cultural reasons: religious precincts that forbid entry to the unsanctified or uninitiated, storehouses attempting to limit thievery, or simply private property owners who enjoy their solitude and wish to curb trespassers.

5. **Distribution:** access "shares" the ability to control movement with multiple spaces and multiple potential routes. Options of movement through distributed systems can be said

to be “ringy” as opposed to non-distributed “linear” or “branch” systems: characteristics made very visibly clear by access graphs (Figure 3.9). **Ringyness** itself is a calculable value: relative ringyness for a single space is defined by the number of (non-intersecting) rings that go through a given point, divided by the maximum number possible for that point. R=#rings/(p-1). **Relative Ringyness** can also be calculated for any entire system: #rings/(2p-5). This is a relatively easy measurement to calculate, and useful for discussing overall choice within a system: the more rings there are, the more potential for taking alternate routes, detours in case of bad traffic or street blockages. Not all of these routes may be equally preferable in terms of metric length, surface conditions, etc, but they do provide potential alternatives for movement that may help distribute the flow of traffic and lower the ability of a single access route to “control” all movement through the system.

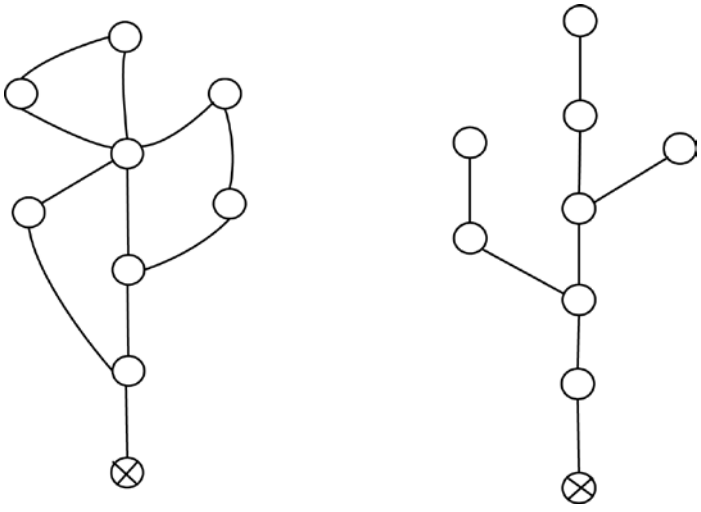


Figure 3.9. Aspects of access distribution. On the left is a ringy system, on the right is the linear/branch type.

Hillier and Hanson (1984:166-7) suggest that distributed systems are the domain of visitors, because agents are less likely to trespass on a private area or end up in a remote location, but stay within the more open system of nearby rooms. Systems that are non-distributive are thus the domain of inhabitants, who would have more complete knowledge of the entire system and where each route led, so they would not end up getting lost down the incorrect hallway, for example.

Limits of "space" in two-dimensional analysis

It should be noted that all these examples only include two-dimensional floor plans, and lack any consistent reference to differences in elevation or relative height. This oversight certainly has strong implications for spatial analysis and the interpretation of spatial use, especially concerning experiential aspects of spatial use including the effect of low versus high ceilings, aspects of lighting, air circulation and temperature control, as well as full range of visibility. These might easily be considered significant factors in determining separate convex spaces, even though they are not readily apparent from what is observable on floor plans (figure 3.3D), and theoretically should be used as part of the standard methodology for dividing spatial units and for considering all other relevant aspects of a space's inherent qualities:

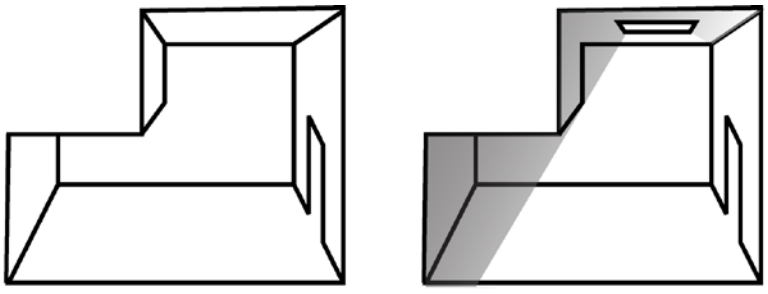


Figure 3.10. View of a room with no discernible need for division based on floor plan, but not differences in three-dimensional space, especially considering potential lighting patterns.

However, this type of syntactical spatial theory is currently discussed in terms of areas instead of volumes, the surfaces people lived on rather than the spaces they lived in. This reflects the practical limits of traditional two-dimensional print media, which drove methods for both recording and publishing three-dimensional data through the use of top plans and limited section and elevation drawings[3]. As space syntax theory developed before digital rendering was a real possibility for most scholars, the development of a method for syntactical analysis largely followed this two-dimensional tradition.

Current advances in three-dimensional modeling and the virtual rendering of spatial environments are now making it possible to include more complex analyses, including viewshed across irregular elevations and uneven terrains, and even the ability to assess certain access routes in terms of their "cost" (Conolly and Lake 2006:214) in time and energy expenditure as defined by grades of slope and other variations in path surfaces. These are obviously welcome advances in analyzing the realities of human interaction with complex spatial environments. However, there is currently no standard by which such three-dimensional models are created, annotated, published, or peer-reviewed (Limp 2010, Eppich et al 2006), which means their acceptance by the larger scholarly and scientific community is still tenuous.

As space syntax analysis has become popular with archaeological datasets, the potential to reconstruct accurately the full three-dimensional built environment becomes even more problematic. Ancient structures are not frequently preserved beyond aspects of foundations and floor levels. Even in the rare archaeological cases such as Pompeii and Herculaneum, where

[3] See Husselman 1979:xi on the expense to produce and print such illustrations, and the resulting compromises in the publication of the final report.

architectural remains are preserved enough to allow for detailed examination of complex structures in all three dimensions (ibid.), many such studies are content to use three-dimensional models as visualizations of theoretical reconstructions, illustrations of 'ancient life' scenes for heritage use (Müller et al 2006,) rather than as quantifiable evidence for testing specific hypotheses.

Recent survey efforts at Karanis have begun to rectify this lack of data, through both differential total station recording and terrestrial-based laser scanning of the extant architecture (Barnard et al forthcoming, Wendrich et al. forthcoming). However, these sources of information on the spatiality of Karanis are not yet available for full three-dimensional analysis, and this study is unequipped to consider the implications of such spatial aspects at this time. Fortunately, unlike visibility or other experiential aspects of space syntax analysis, access patterns can be studied with less dependence on three-dimensional data and therefore form the bedrock of this study.[4]

Archaeology and temporal concerns for defining the spatial system

It is important to remember that space syntax developed out of the fields of modern architecture and urban planning, and so is used to discuss any given spatial dataset as a fairly contemporaneous, clearly defined, complete system. Such is rarely, if ever, the case for archaeological datasets: even the famous examples of ancient Pompeii and Herculaeneum, which preserve a single moment in time (with respect to the architectural remains if not the material culture, see Allison 2004) are not complete spatial systems: the cities are only partially excavated, with large areas still unexplored, and of the portions of the sites that were uncovered,

[4] The presence of multiple stories, however, including basements and upper levels, is discussed in Chapter 5.

the preservation, excavation, and recording of finds varied greatly between areas and expeditions, over the centuries of archaeological investigation there (Laurence 1994).

Many archaeologists are therefore inherently suspicious of the intense mathematical nature of space syntax analysis, as

> putting archaeological data, which are rather more tentative and the result of continuously changing excavation results and discussions, into such an exact mathematical system would make them take on an absoluteness that simply is not there. (Weilguni 2011:16)

Although space syntax analysis includes some highly local measures, where values are calculated for each space based on only its immediate neighbors (Grahame 2000:33), most are the product of the entire global system, and therefore the unknown areas that may be peripheral or even in the center of an archaeological investigation present serious obstacles to the proper calculation of spatial value.

Admittedly, the question of contemporaneity for ancient spatial datasets remains problematic: even modern spatial environments are rarely limited to a single period of construction followed by endless use periods during which nothing is altered. Much of the archaeological scholarship has mitigated the problems inherent with the phasing of a spatial dataset, again by limiting studies to individual structures; especially domestic structures (see Grahame 2000, Spence 2012, and especially Alston 2002 for an attempt at analyzing C-level Karanis houses).

Aspects of temporal change through built environments have been addressed in the construction and implementation of some virtual reality models, where the creation of multiple phased models makes it possible to examine developments and architectural changes over time, and essentially creates the possibility of studying spatial and structural development for any

chosen “moment” in a site’s history. This strategy has proved successful for presenting the development of structures with a well-established development history (Wendrich 2014), but is not easily adapted to the level of settlement, where so many separate events of construction, alteration, demolition, and simple habitation may have happened simultaneously throughout the site.

The method of space syntax provides its own practical definition of contemporaneity, although its logic can be circularly applied: a single system, in that it presents a single complete united network of access, must be contemporaneous: if a space is physically connected to the system, it has the potential to be accessed and used and will be considered occupiable. This assumes that any space not being used will be physically separated from the system by boarding up entrances or creating other barriers to use.

Of course, there is a real possibility that buildings could become abandoned while still structurally sound enough for potential occupation: however, the peculiarities of life in ancient Karanis may have in fact limited the period for which a structure could be used without real investment in the maintenance of access. The constant accumulation of windblown sand and debris in the Karanis streets created the necessity for continual maintenance of access routes, not only with respect to the public streets but especially in terms of their connections to houses and other structures (Husselman 1979:8, Marouard 2005). Strategies were varied, and will be discussed in detail later in Chapter 5, but all attest to the invested interest that inhabitants had towards negotiating their access to space in the face of constant change. This shows logically that without such investment, a street would become quickly impassable, a building’s interior inaccessible. Thus, for Karanis we may assume a sort of broad, continuous contemporaneity of spatial environments: although we cannot pinpoint the time at which a new strategy was

deployed in order to maintain access, we can at least assume that most structures were being used throughout the period. Further decisions on the temporal phasing of Karanis for this study will be discussed in chapter 4.

Is Space Syntax a theory for "social" space?

The Social Logic of Space contained far more than mere formulae: it was a deeply theoretical exploration of the possibilities of using space syntax as a method for exploring the link between socio-cultural interaction and spatial environments. However, as already discussed above, one of the most persistent critiques of space syntax analysis is that it involves too many assumptions in the link between physical relationships of spaces and social practices contained in them (Leach 1978, Parker Pearson and Richards 1994). While it appears that many of these critiques come out of a misunderstanding of Hillier and Hanson's intentions (Grahame 2000:25, and see Hillier et al 1978, Hillier and Hanson 1984 as direct refutes of Leach's 1978 critique), many archaeologists remain reluctant to embrace or even adapt the scope of the theory. Instead, Space Syntax today is often viewed as little more than "a method, not a body of theory, within archaeological research" (Smith 2011:176) and its use limited to more quantified description of space rather than a true means of analysis and the testing of hypotheses (ibid, and see also Moore 1996:184-210).

But even then, the method itself is sometimes attacked for being too dismissive of the materiality and decoration of architectural space, instead reducing each unit to a "dimensionless space" (Grahame 2000:33, also Brown 1990) represented by a single point in access maps. While we have already seen (figure 3.4) that some access maps can retain information on the

size, shapes, and real geo-spatial positions of spaces within a system, it is true that most access maps are drawn up as a schematic plan that effectively dismisses all the variation of architecture and focuses on connectivity and potential movement between spaces. Rather than include such architectural observations and scalar measurements in access analysis, Mark Grahame argues that its "very strength …is that it does reduce the spatial layout of a building to its barest relations" (Grahame 2000:33), thus avoiding the problems inherent in making any assumptions as to value of meaning for an ancient culture:

> it is all too easy to focus on the fabric of the building itself and we can be easily seduced into thinking that what defines a building is the material used in its construction and the nature of the décor applied to its walls. Although these are important, if we concentrate on them we lose sight of its primary importance. (Grahame 2000:1)

While I agree with Grahame that the spatial organization of any building can (and in fact should) be considered independently from the more physical and experiential aspects created by humans interacting with actual architecture, I do not necessarily support the full implication that the "primary importance" of a structure is to define location that reflects human cultural interaction, as this can be taken in some ways to imply that complexity of a culture's architecture is in close relation to the complexity of its social relationships. A useful counter-example to this would be one-room domestic structures, so prevalent a form of architecture throughout human history, but not necessarily reflective of a lack of social distinctions between the inhabitants of one. Hillier and Hanson themselves recognize this, and attempt to consider more culturally-specific and even cosmological attitudes towards spatial organization in their analysis of nomadic structures, though they might still be accused of dismissive attitudes towards such "elementary buildings" (Hillier and Hanson 1984:177).

A combined method for observational and syntactical data

Following the caution of other archaeologists listed above, notably Weilguni and Fisher, I believe Hillier and Hanson's theory and method remain extremely useful tools available to me in analyzing structures and built environments, and so accept the analytical method while treading more carefully when it comes to interpreting ancient "meaning" out of their theories of social space.

Similarly, while I am wary of the view of some scholars that the ancient habitus can be successfully decoded, I do agree that it is possible to use decoration and other similar details of architectural space as evidence in ancient daily life and social practice, therefore, it may be interpreted for "meaning" to some extent. Thus while I may still experience unease at the prospect of actually interpreting decoration as aspects of a culture's habitus (following Grahame 2000:6, and also see Tilley 1990), space syntax analysis provides a method by which specific architectural attributes may be contextualized, so that broader patterns between location and social message may be identified, potentially providing evidence of culturally-specific normative values and "tastes".

In fact, initial observations of many houses of the ancient Mediterranean suggest that areas of high accessibility frequently correspond with the placement of specific visual clues as to identity (Clarke 1991, Hales 2003), and thus certain aspects of decoration can be shown to be intentional displays of social messages. The characteristic of such decoration often varies along with the particular type and even expected duration of spatial encounters, so that hallways and other transitive spaces were:

> tailored to quick recognition of simple patterns rather than long, tarrying analysis. In static, or resting spaces, the view out was of primary importance. Decoration within this

> kind of space tended to be complex, requiring the viewer's prolonged attention. (Clarke 1991:16, also see Ellis 1995:166)

A methodology that combines both spatial analysis and observational attributive analysis is therefore mutually beneficial: the attributes cannot be interpreted in terms of use and agents without contextualization, and the spatial system can have little significance in terms of social use unless it is referred back to the human level of moving through, observing and experiencing space. Values related to the system of access would be calculated, as Grahame recommends, without specific references to scale, dimension, or features of individual convex spaces, but represented in a schematic access map that demonstrates the connectivity of the system. However, just as each convex space is associated with the calculated values given by its spatial system, it may also be associated with attributes of its spatial and architectural reality: material and style of construction, built-in features and decorations, as well as simple metric aspects of scale and dimension.

Accordingly, my study will attempt to discuss any attributes of architecture with respect to their larger spatial context: not only in terms of their location and relative distribution, but by linking them specifically to the syntactical values of the spaces that they inhabit within the given system. This will at all times keep such features contextualized in terms of their social visibility and the likelihood that they could be seen and identified as useful symbols in the creation and maintenances of social identity; likewise, in terms of attributes that are located in less-visible, more private areas of limited access, these are more likely to be evidence of the inculcation and maintenance of value and identity according to smaller, more localized scales of interaction, including self-identity and familial roles.

The guidelines by which the Karanis architecture will be quantified and analyzed are described below. Because syntactical analysis is based on the defined extent of a global or local system, this section is further subdivided to include analysis of different foci, including the public street system, individual private properties, and finally the localized "neighborhoods" in which the public and private spheres overlap.

Space Syntax Analysis

The first level of analysis will concern values related to the system of access. I have chosen to preserve some of the complex aspects of Hillier and Hanson's formulae, combined with and compared to measures calculated according to other scholars, and rather than repeat all the work done by other scholars to describe the processes by which such values are calculated, and how they might be fully employed to discover "meaning' in the dataset, I am instead calculating all values for space syntax analysis for this study through the use of DepthMap software, which was pioneered at University College London (Turner 2004).[5] While I have already outlined the particular syntactical values that are calculated, the limits of each system of analysis have yet to be defined. Analysis will focus on three major levels, or "spheres" of spatial interaction:

[5] Now made available by Tasos Varoudis through the Open Source community at http://www.spacesyntax.net/software/ucl-depthmap. Only a recently-released version (Depthmap X) allows for user-defined scripts which "can be used to create user-defined formulae and simple graph measures" which would allow for more control over the particulars of calculated values. Unfortunately, access to Depthmap X was not possible until this study was in its final stages; hopefully the updates will provide opportunity to improve future work on the Karanis data.

1. Firstly, at the macro-level of street, focus is on the interconnectivity of the street system and large-scale questions of public access and organization throughout the settlement. Here analysis focuses on the ability of the street network to support effectively the movement of agents throughout the system, provide access to different private properties as well as more general access across the network, as well as the existence of alternate paths to certain areas and therefore limit the potential for blocked access and heavy traffic congestion.

2. Secondly, individual property systems are examined, in order to test assumptions on the control of privately-owned land in opposition to both the public street and surrounding properties with (presumably) different ownership. Investigations of space at this micro-level in fact indicate that our assumptions of what constitutes a discrete property may incorrectly rely on modern interpretation of "privacy" and control rather than a more emic understanding of how such property limits were maintained and regulated, or left open for more active social negotiation.

3. Finally, an exploration of more local neighborhood organization of each single settlement "block", defined by the surrounding streets and public accessways. This examines the complex internal systems of control that, while technically on privately-owned land, might provide alternate access to the public street system. By exploring the types of interfaces between convex spaces within a single block, various strategies for either limiting or facilitating local access-routes are analyzed.

These spheres are not totally separate: some include overlapping areas of investigation, and for some individual spaces values may in fact remain identical despite the various limits assigned for each successive analysis. However, because access analysis is so dependent on the complete system, there can be no shortcuts in calculating what may be at first glance perceived as "extraneous" values for unchanging spaces. Further details follow here on the exact parameters established for each type of analysis:

1. *Street analyses*

Street-wide analysis is based on the understanding that there was some overseeing level of town organization responsible for maintaining standards of public access. All streets in this way must have connected to the same entire system: the fact that some of the Karanis systems can be interpreted as having a few isolated rings in some areas is due to the uneven preservation—notice how the only examples of this occur at the irregular borders of preservation created by the sebakheen destruction. In reality all streets must have connected to the network in some way: even if they were "dead end" streets with no through-access, they must have had at least the one way in from the network. Any spaces that are wholly isolated, surrounded by private property, cannot truly be considered part of the public street system and may have been privately-controlled and owned passages.

While for all other convex spaces there can be no overlapping areas that belong to multiple convex units, I have decided that streets will *not* be subdivided across intersections. While some studies have provided methods and standards by which such problems can be

mitigated,[6] for this study I have chosen to interpret the area of intersections as belonging to both or all of the streets involved, and thus such areas and other attributes will be included in the data for each. This raises the concern of certain property spaces that are positioned on such intersections and corners, and thus have access to multiple streets though it may be through a single door or other point of interface (see for example C91, figure 3.11 below)

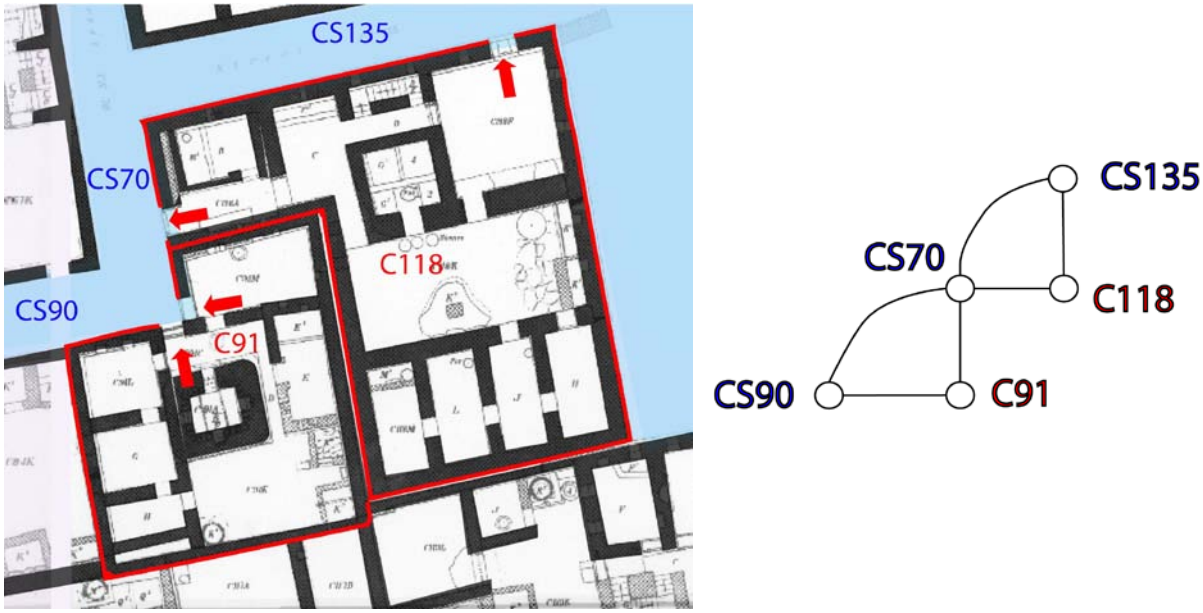


Figure 3.11. A detail of the area KAC properties from the C layer. Both properties (C91 and C118) are "ringy", but not in a true distributive way: C91 has direct access to two different streets, but this is only due to its position on a street intersection. C118 is not on a corner, but its doorways connect it to two streets that are themselves directly connected (CS70 and CS90): in this case C118 can serve as a "corner shortcut" from one street to the other, although the advantages of taking such a path are not immediately obvious (for more see chapter 6, p. 260).

[6] Porta et al. 2004 gives a thorough comparison of generalized models versus intersect continuity negotiation (ICN).

These properties and space are inherently "ringy", interacting with each street (as following Hillier and Hanson 1984:135). The relative convexity of some streets is also a concern, as along the length of any given street the width may narrow or expand, and certain obstacles including mastabas and windscreens may interrupt the strictly convex values of the space. For this study, the subdivision of such streets into separate convex entities is very restricted, except in cases where the resultant geometry severely changes the potential flow of traffic through particular points.

2. Property analyses

In the University of Michigan's excavation of Karanis, the boundaries of individual properties were defined according to both a perceived unity of access and structural features—that is, a single property usually has direct access to the public street system and is bounded by perimeter enclosure walls which unite the single property in terms of structures (including but not limited to the houses themselves) as well as the privately-owned courtyards and other exterior spaces. The frequency with which enclosure walls were used to define these limits is most helpful (figure 3.12a), however such boundaries tend to become less obvious with the extensive expansion and partition of properties over time (figure 3.12b), and in some cases even bring the initial logic of Michigan's decisions into question.[7] By commencing access analysis for Karanis spaces at the restricted level of "Property", this study is able to examine the validity of Michigan's initial assessments, and suggest changes as needed, before the study is broadened to include the more complex systems of Block and Street-based analysis.

[7] see for example property C112 and its relationship to C92, in appendix).

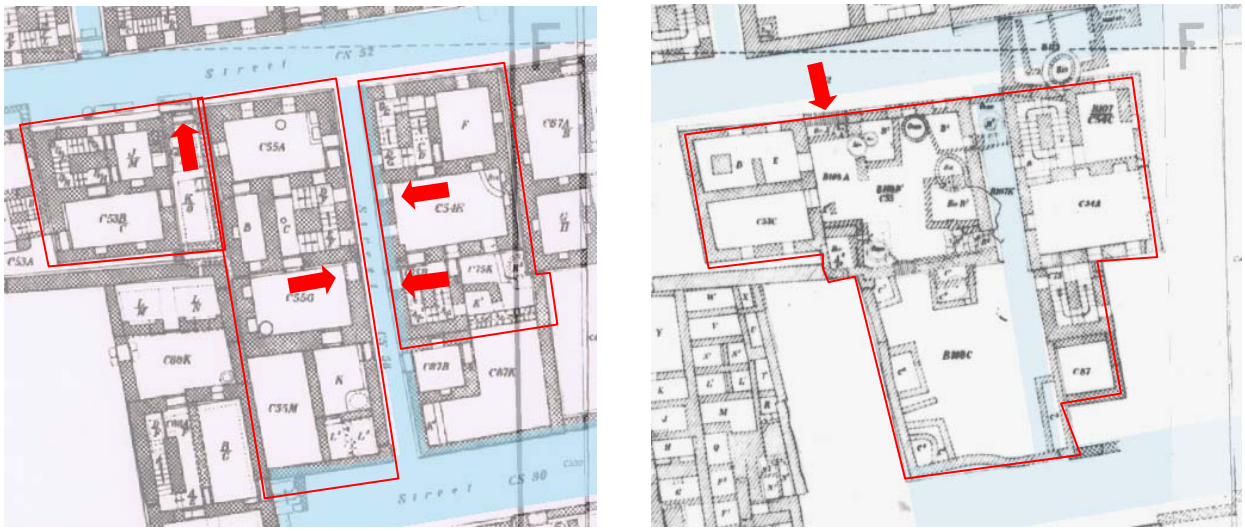


Figure 3.12. The left image shows a group of properties in the early C level of Karanis, defined by their various courtyard walls and doorways. By the later B level (to the right), most of the structures are contained within the same enclosure with only one main entrance on the north, however Michigan still gives separate property labels to various structures within.

3. Block analyses

Despite fairly common use of the word "insula" when describing the Karanis blocks, I am avoiding the term altogether, on the grounds that while it often seems synonymous with a city block, the particular form of Roman insula housing carries many specific connotations that simply do not apply to the Karanis architecture. Within the Roman settlements of the Italian peninsula, the term "insula" referred to a single architectural structure that often spanned an entire city block, but contained separate housing units within the united structure, so that different households lived in close proximity and often with shared "party walls" between them. Insulae also often demonstrate shared systems of access around a central courtyard, sometimes with several separate insulae grouped around a single shared "garden" space (Hermansen 1981,

and see figure 3.13).

Figure 3.13. Plan of apartment complex in ancient Ostia, Italy. A single unit is outlined in red, with an arrow indicating the entryway for both groundfloor and upper stories: this floorplan repeats with minor variation for the other units, as well as those which would have stood above. Each unit is similar in plan to the example from figure 2.11. (Image based on Cervi 1998, figure 2.)

None of these features are consistent with the Karanis blocks, which lack the characteristic shared-wall construction of Roman insulae: all Karanis houses are freestanding separate entities and only a few properties even share walls between property limits (in contrast, see Ostian example in figure 3.13 again). For these reasons I consistently avoid referring to Karanidian insulae even despite the term's use throughout the original Michigan studies (Boak and Peterson 1931, Husselman 1979), thus hopefully minimizing implications of ancient architectural structure and style as well as of culturally-specific values of use, ownership, and

control over such spaces.

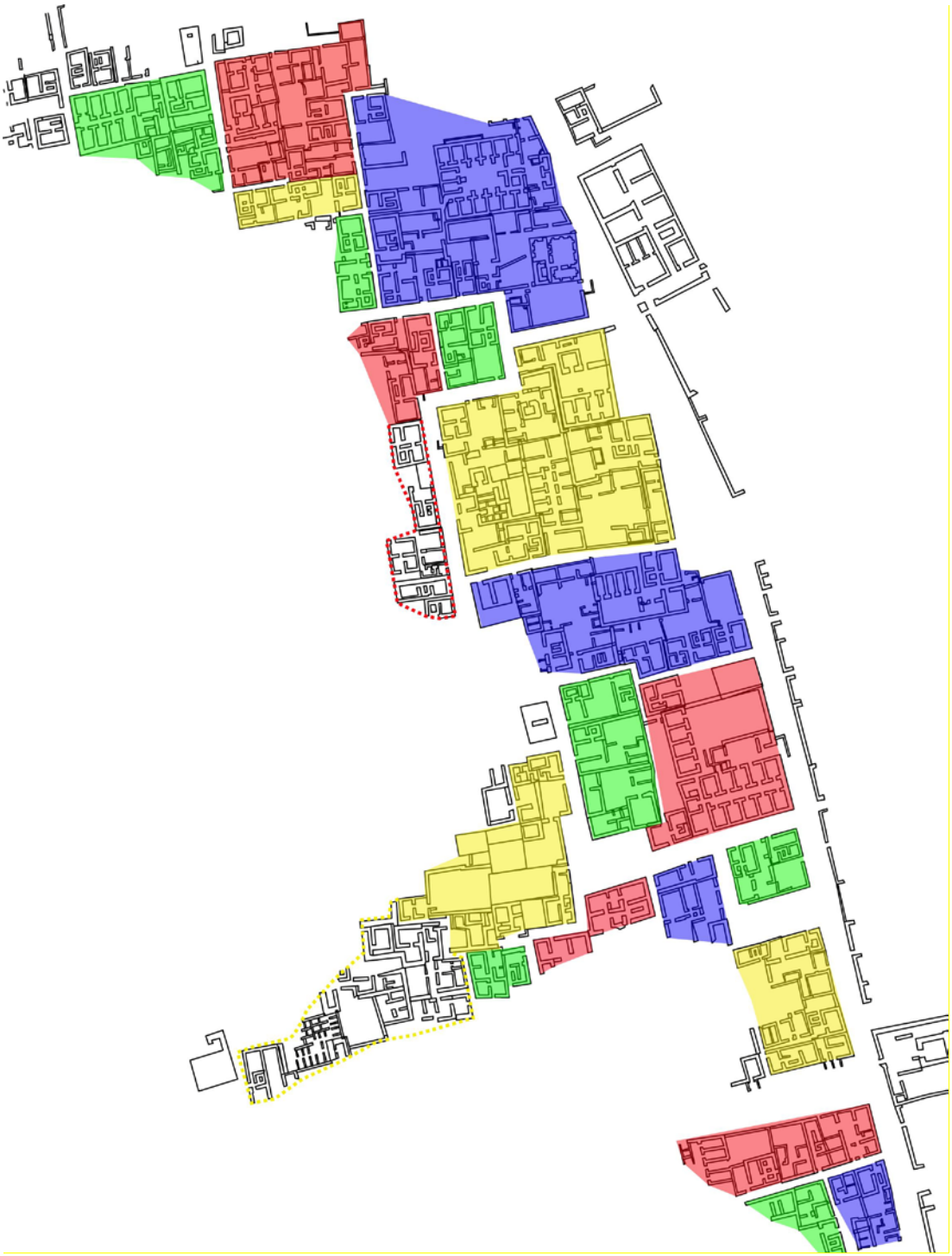


Figure 3.14. The twenty blocks of the Karanis C layer studied in this analysis.

Attribute Analysis

The second level of analysis is the more descriptive form of architectural analysis known to most archaeologists, and will include the data compiled from the Karanis Architectural Survey (2007-2011) as well as heritage data from the University of Michigan's excavation, now housed at the Kelsey Museum archives. Attributes include the following:

1. *Scale and relative dimension of space*

This category includes measurements of floor-space area as well as convexity for each space. Scale and Dimension are important factors in the nature of social occurrences and potential interaction within space (Grahame 1979:56), and including these measurements makes it possible to discuss space in terms of the human scale, the practical limits on the movement of agents, not only through the system but even within a single space. For this study, area is calculated automatically by the GIS software, and values are recorded in square meters. Convexity is expressed as a simple ratio of width versus length, approaching 1 as convexity increases.

While for space syntax analysis "convex spaces" have been envisioned as dimensionless nodes in order to determine the pure theoretical potential for human movement between them, it is also important to consider human movement *within* a single space—circulation around a room. Such movement may not cross any boundaries, but still produces potential differences in ranges of "closeness" in interaction, both socially and physically (figure 3.15). While standards of

casual and intimate proximity vary based on culturally-specific attitudes, these values must ultimately consider basic practical limits on human occupation of space (carrying capacity) and the potential for high volumes of traffic to move efficiently through the system.

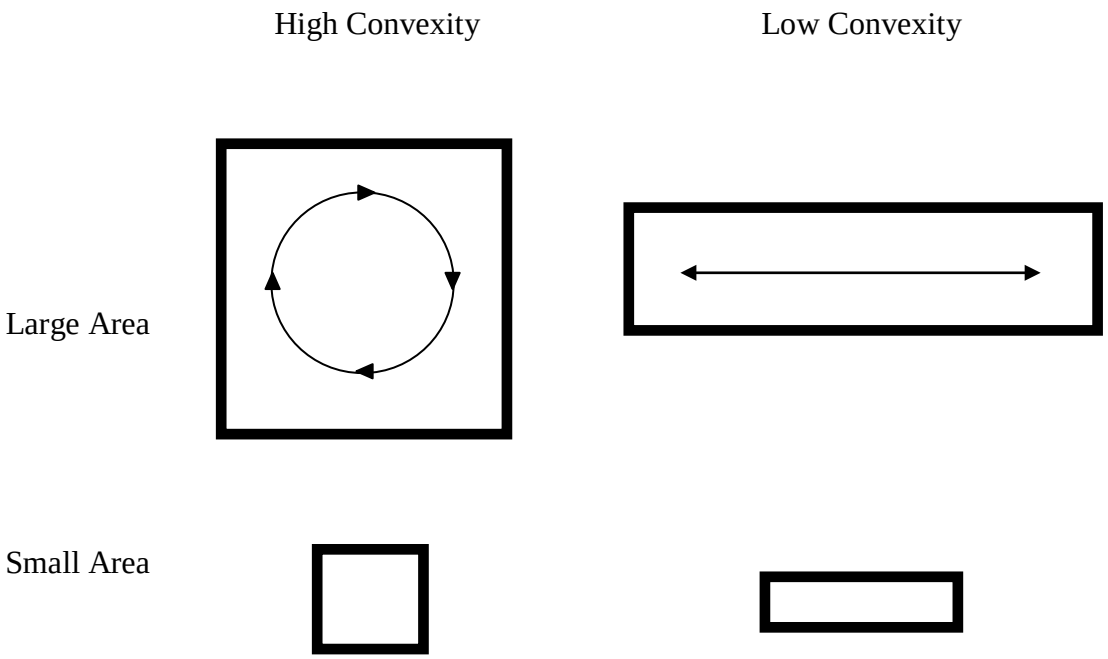


Figure 3.15. Chart comparing relative size and convexity (following Grahame 2000:57). While highly convex spaces tend to promote circulation within a room and low convexity suggests directional movement, the relative size of a room also affects movement within a space.

2. Construction materials

Unfired mudbrick is by far the most prevalent building material in the site, found in every structure except for the main buildings of the two temples. However, details of brick size and dimension, color, and the makeup of the mortars and bricks themselves may be useful in categorizing structures, especially according to period of construction (Husselman 1979:33). Techniques in bricklaying also seem to change over time, and will be classified following

typologies established for Egyptian mudbrick architecture by A J Spencer (1979). Stone and wood were also used in Karanis architecture, often providing structural support as foundations, binding ties, and roof support. However, sometimes these materials were used beyond what was needed simply for practical purposes, and thus may also have been decorative (figure 3.16). As both were relatively expensive materials in Roman Egypt, their presence could be considered a form of economic display (Husselman 1979:36).

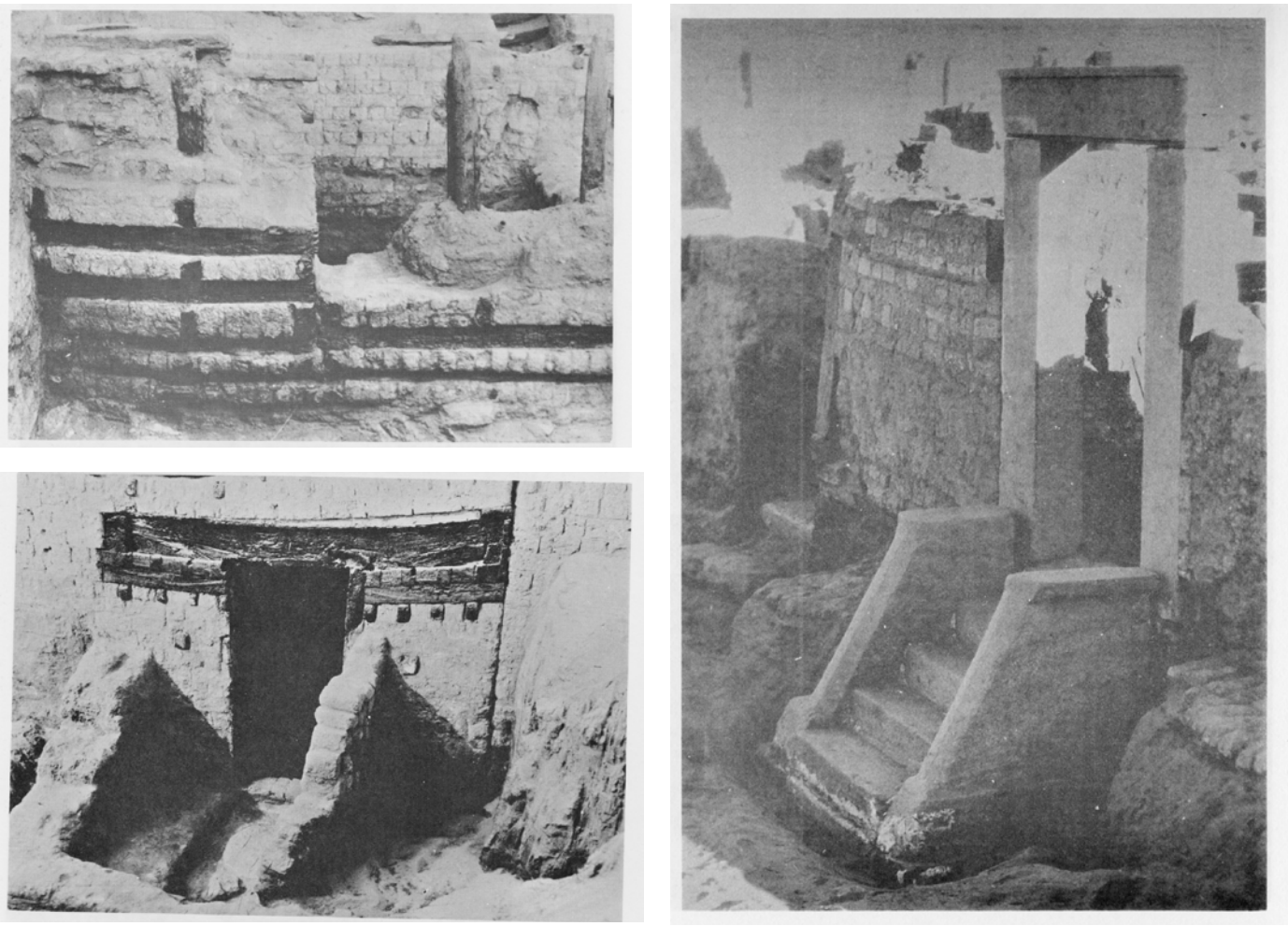


Figure 3.16: Karanis examples of the use of stone and wood that goes beyond structural need and instead creates intentional display/decorative effect. (Images published in Husselman 1979)

3. Architectural and built-in features

Immovable features that are inherent to either a wall or other part of architectural construction include wall niches, windows and air vents, storage pits, ovens, and large millstones. Some of these are highly decorative features, especially the elaborate shrine niches in the walls of some houses (see for example figure 5.17, also Husselman 1979:47-8, Fakharani 1965), which can be categorized according to geometric form (usually semi-dome, occasionally temple façade frame) as well as decoration/colors. These may also be cross-listed under category 4, below.

All such features and objects are recorded relevant to location (on the GIS map), and their relative dimensions are also included in the appended attribute tables. In determining the boundaries of convex spaces such features have frequently been used as grounds for dividing up rooms, if large enough to interfere with access or visibility across the space. This is mostly true for objects located at the periphery of an area: although large millstones often existed in the middle of courtyards and therefore presented significant obstacles to traffic, they are not used to subdivide areas for this particular study.

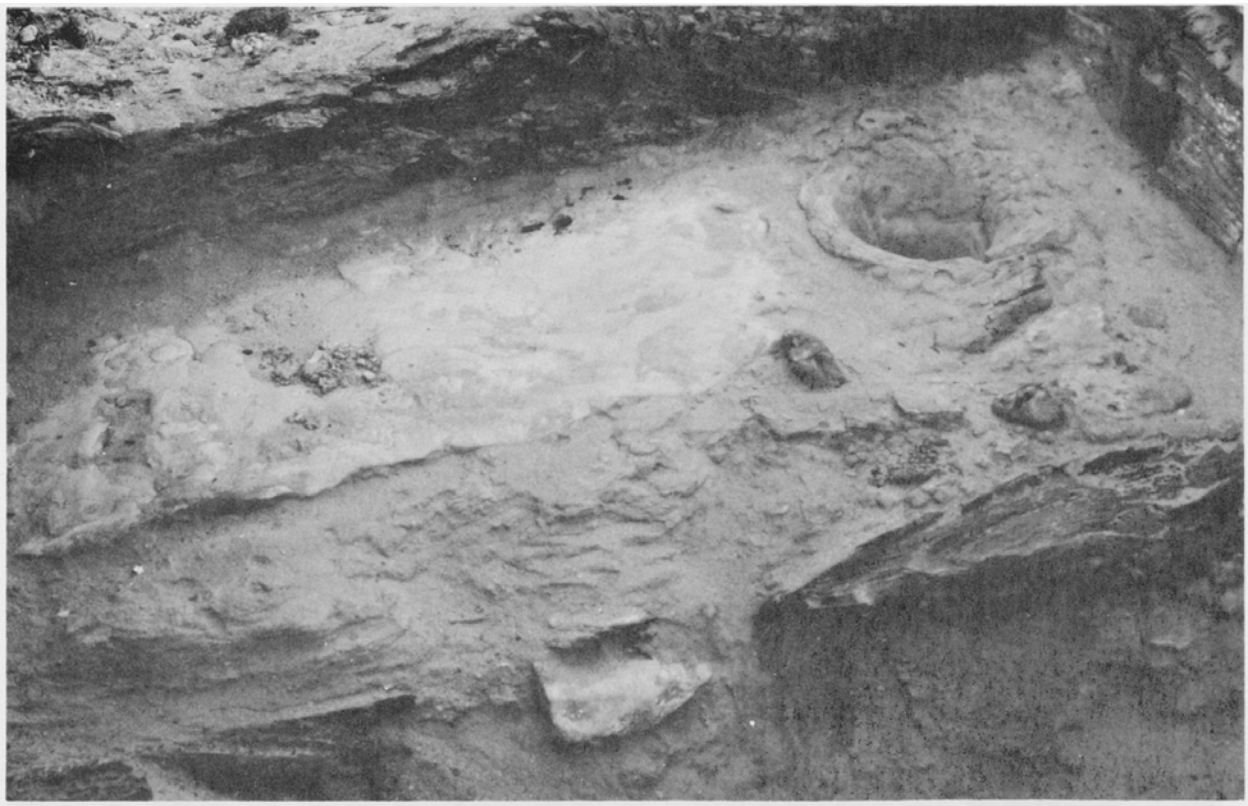
4. Decoration and surface features

This category includes descriptions of plasters, paints (geometric patterns or figural), mosaics or the use of other special materials for visual effect. These have been recorded with respect to location on a specific wall or floor surface but also cross-referenced to the "room" or convex space. As noted above, highly decorative architectural features, including some niches and window treatments, are included in this category as well.

5. *Physical aspects of access-control*

This category includes evidence for the existence of raised or demarcated thresholds between spaces, doors, as well as bolts and locking mechanisms that could be combined with doors to further control access and movement through space. While technically such features belong to the liminal connection between convex spaces, it is important that they be recorded as factors for each of the two spaces with which they interface.

The existence of thresholds, either raised to some degree or merely a visible feature that is otherwise flush with floor surface, has been consistently noted on Michigan maps of Karanis: in fact, most houses include two thresholds—an inner and an outer beam that define the narrow limits of the doorway. The Karanis remains also preserve many examples of wooden doors, though few in situ, as the valuable wood would have been removed when the structure was finally abandoned (Husselman 1979:42). Still, the possibility remains that many "doorways" were open spaces without doors, or perhaps with temporary and more psychological barriers to access like movable screens or curtains. Notes have been made in instances where doors or evidence of their pivots (see figure 3.17) were preserved. Doors must also have accompanied all thresholds and entryways that included door bolt slots, empty areas built into the walls where a horizontal beam or block of wood could be fitted to bar the door from pivoting open (for more see Chapter 5). Some included decorative frames that mimicked house or temple facades, and all were included on Michigan plans whenever observed. All recorded instances in the publication and other Michigan documents have been included in this study, as well as notes of decorative features if applicable.



a. Plastered threshold of C45J, with conical hole as socket for door pivot.

Figure 3.17. Images of threshold door pivot from the Michigan excavation at Karanis. (Image published in Husselman 1979, plate 45a.)

Conclusion

The link between such observational data and their relative spatial context is essential: it is only by combining the two that it becomes possible for such trends to be analyzed for more specific cultural meaning. As each of the features or attributes can be appended to the "spatial location" as defined by the access map, this allows for the examination of possible correlations between access and architectural structures. If, for example, a majority of the highly-connected

and well-integrated spaces in the system also show characteristics of extensive social use such as large, well-decorated spaces, we might conceive of the spatial organization of Karanis as having been fairly open to public use and view. If, however, the most integrated spaces are characterized as narrow hallways or passages that would limit traffic, this might suggest a general concern for controlling access to certain areas and a sense that only specific individuals had rights of access to private space.

Chapter 4. Town Planning in Karanis.

> One could see that some attention had been given to topographical planning in Karanis as the city grew and expanded, north, east, and west. This was, however, rather a result of the mode of life and living of the times than of any carefully planned method of building. (Peterson unpublished manuscript, p. 3)

This quotation from the original excavation report nicely sums up the confusion inherent in describing "planning" for ancient Karanis, for how can there have been "topographical planning" without "any carefully planned method of building"? Peterson's statement reveals a desire to define settlement planning as *either* according to a centralized authoritative body or the result of informal social negotiation, when in fact, it was clearly both. Karanis was certainly laid out according to an initial plan that established the position and orientation of public accessways: major streets and even smaller roads throughout the town show ample evidence that they were designed to be part of a cohesive whole, a network to connect all areas of the diverse town. However, in the construction that followed on private properties, some decisions may have been made on a more local, socially-discursive level that operated without strong civic oversight. In fact, both civic and social organization seem to have acted in cooperation as the townsite developed, resulting in a settlement plan that balanced the needs of individual private inhabitants with the greater good of the city itself.

Early excavation and factors influencing interpretation

Because the very center of Karanis was so heavily affected by sebakheen activity (see p. 14, and Boak 1931), Michigan's excavation divided the site into eastern and western ridges, and

excavation alternated between these two separate areas as the team explored various areas of interest. Early reports from the Michigan excavation reveal unease with this situation, although they clearly believed all would be made clear as excavation continued:

> Until the lowest layer of all be excavated and planned it will not be possible to answer the question whether the town had been laid down on a definite plan or left to grow up haphazard; the general plan of the town in the middle layer even when it be fully and completely recorded will not solve the problem. (Starkey unpublished manuscript: 25)

Ultimately, these hopes of achieving a stratigraphic unity between east and west proved impossible, as excavation in the direction of "the junction of the northern and eastern escarpments" (Husselman 1979:2) only began in 1935, the last season of Michigan spent at Karanis.

As a result, attempts to interpret both the topographical and temporal organization of the town remain problematic, as outlined below, but fortunately the excavations were conducted with a thoroughness of documentation that was exemplary for the time, and the data observed and recorded by the team are plentiful and detailed, and many of the original materials were made available to me for use in this study.

Ancient Districts and Organization

As discussed in chapter one, great care must be taken in comparing results across separate areas: it is essential to remember that they are defined by the modern state of preservation in the site, not necessarily reflective of any ancient boundaries, nor do the extant remains necessarily represent contemporaneous levels of occupation.

Yet even despite the significant distances and temporal distinction between several of

these areas, it is interesting to note that they all have strong similarities in terms of structural makeup: each area has examples of granaries, dovecotes, and large-scale mill facilities (Husselman 1952, 1953, and 1979:55-66), and houses existed side-by-side with properties that were used for economic purposes. This mix of domestic and economic properties was frequently the case for the ancient Roman world (Alston and Alston 1997:211, Wallace-Hadrill 1994:77-8, Laurence 1994:131-2) although there are examples for Hellenistic and Roman-era towns where formal zoning policies may have been enforced.[1] A basic examination of property distribution by type suggests that the organization of industrial properties may have been regulated, as with the clustering of pottery workshops along the southern edge of town. However this is as likely due to practical considerations for health and safety as it is due to any official restriction: the placement limited the degree to which smoke from the kilns would blow over the village, and would reduce the risk of fire to the settlement (Cappers et al 2013:42, Papadopoulos 2003). Still, examples of some kilns and even potential glass workshops have been found throughout the site (El Nassery et al 1976), suggesting that there was not strictly enforced zoning of domestic or economic/industrial areas.

[1] See Moyer 2011:157, an example from Hellenistic Delos where a man attempting to build a Serapeion was taken to court, the charge potentially involving restrictions on private domestic land being used for cultic purposes. See also White 1990:36, and Zarmakoupi 2013 on commerce and urbanism at Hellenistic Delos.

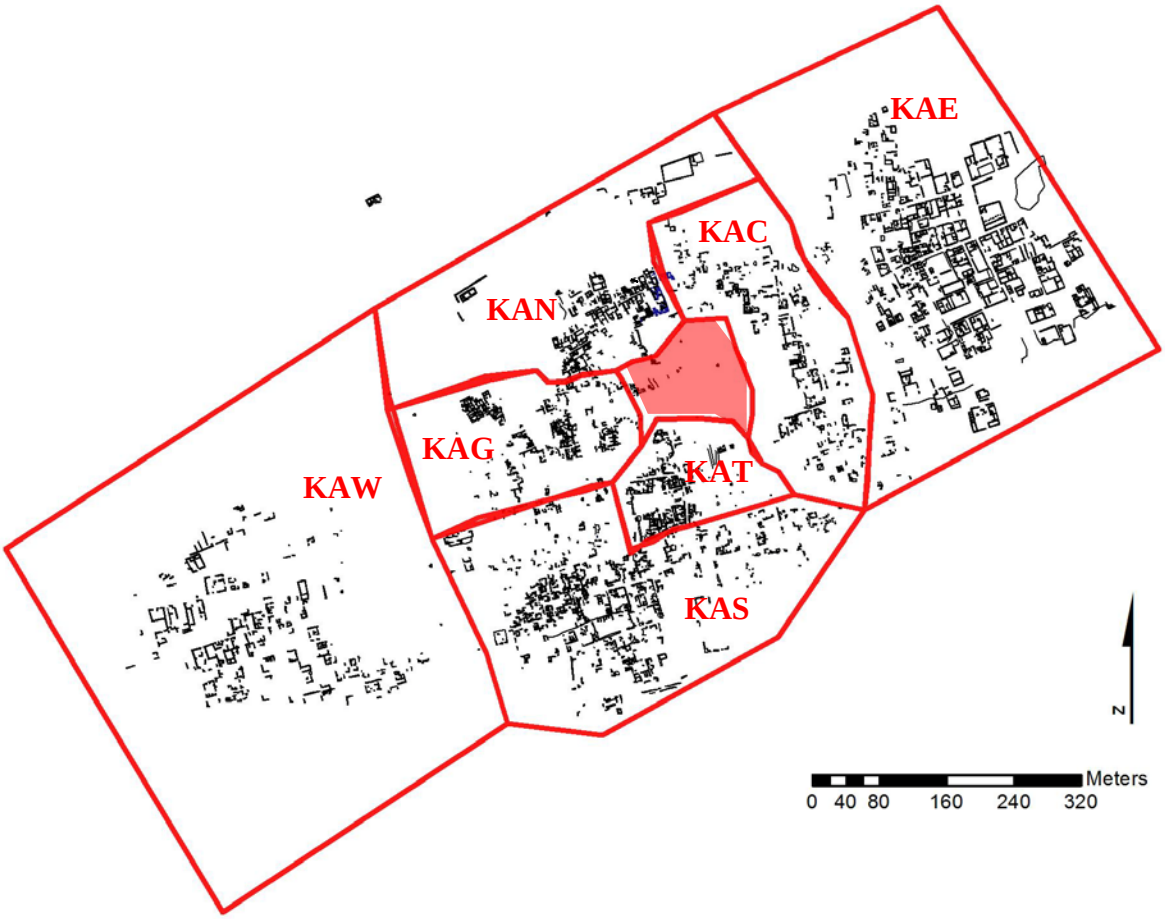


Figure 4.1. A basic zoning map of Karanis modern survey area designations (see also Appendix B). The central shaded area was destroyed down to bedrock before any archaeological recording could take place, but the surrounding zones preserve varying levels of stratigraphic remains.

In fact, although there were no purely residential neighborhoods in Karanis, domestic properties (and their inhabitants) *were* organized and categorized based on topographically-defined districts called *amphoda*, which were "used systematically for official registrations of people and property" (Alston and Alston 1997:212, see also Daris 1981, Rink 1924, Saba 2008). Because the amphoda of some Greco-Roman towns seem to have been named according to ethnic or vocational terms, for example the "Jewish alias Cretan" amphoda at Oxyrhynchus, (P. Oxy. I 100, P. Oxy II 335, P. Oxy. XVIII 2186), it has been suggested that these represent socially distinct populations grouped together in specific areas of the town. However, when

actual registries have been examined and the individual inhabitants organized according to their amphoda, there are no discernible trends suggesting "concentrations of trade or ethnic groups in particular areas of the city" (Alston and Alston ibid). Nor do they reflect clustering of elite households into specific neighborhoods: registries show members of the *gymnasia* are frequently distributed across multiple amphoda (Alston and Alston 1997:83).

All of this suggests that the demography of each amphodon was more based on the accident of location rather than specifically designed around close social ties between the inhabitants. It is unknown if inhabitants of a single amphodon had a sense of pride in their 'home district' or shared any group-feeling based on aspects of location alone. Examinations of spatial "closeness" between neighbors will be examined further in chapter six.

A few names for Karanis amphoda have come to us through the papyri, including the *amphodon Borra, amphodon Dêmêtrios*, and *amphodon Kommagrammateôn* (El Nassery et al, 1976:234). However, no attested names of amphoda, streets, or other landmarks have ever been successfully mapped onto any known areas of Karanis. While some efforts to link textual evidence to their find-spots have claimed to be successful (Van Minnen 1995, El Nassery et al 1976) they frequently ignore or minimize the larger archaeological context of such finds, which places papyri in trash heaps and other discard locations rather than the spatial context of their daily use. Moreover, on further analysis of the architecture, few textual descriptions seem to reflect accurately what is known about the ancient spatial environment based on contemporaneous architectural remains. This study therefore makes no attempt to associate ancient names with extant structures, or to make a hypothetical topographic reconstruction of the ancient city plan based on textual evidence. Instead it relies almost completely on the architectural remains of a single continuous excavation area, Karanis Center (KAC) to examine

trends in the management of the spatial environment, and only uses textual sources in order to suggest avenues of socially-significant meaning behind these trends. Areas from outside the defined KAC area are included occasionally, but are not counted in the full dataset of the space syntactical study. Instead, they serve as comparisons and contrasts to the KAC examples, to illustrate the full variety of Karanis architecture.

Ptolemaic Origins of Karanis: Layers F-E-D (and see also maps in Appendix B)

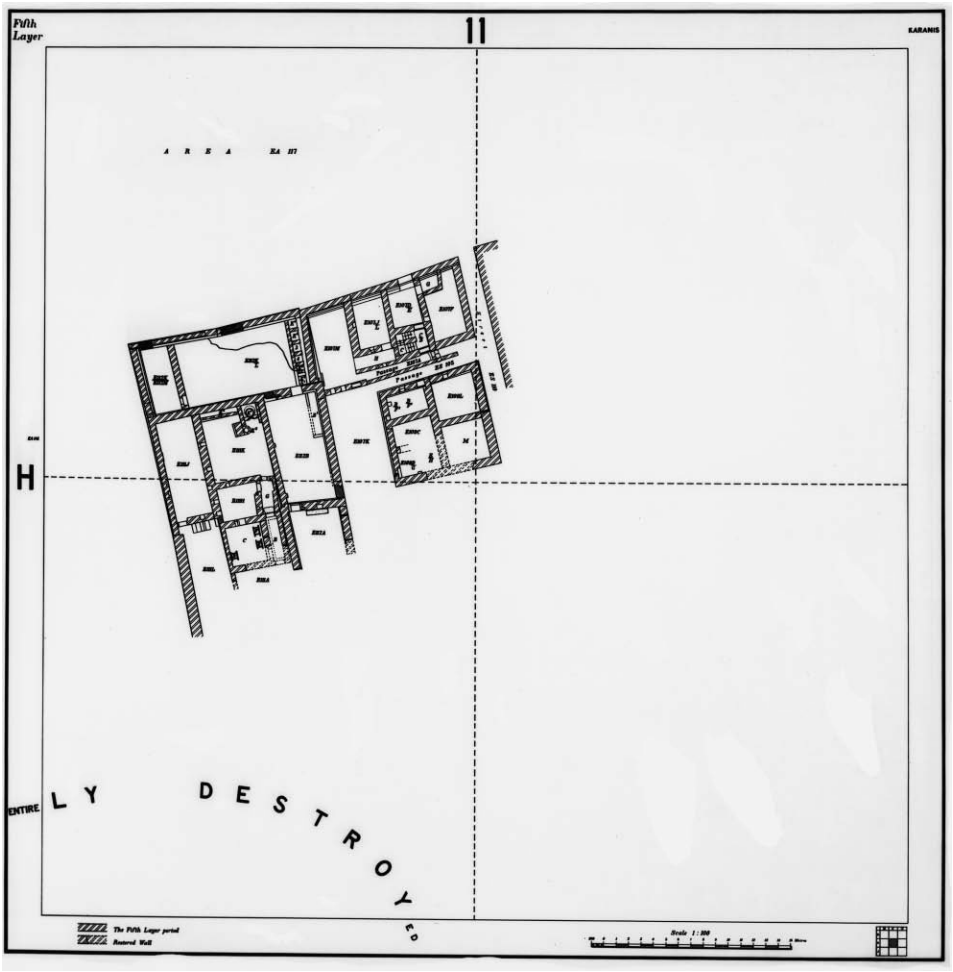


Figure 4.2: Map showing the few Ptolemaic remains as recorded and published by the Michigan excavation (Husselman 1979:map 5).

This Ptolemaic core must have served as the center of the expanding settlement through its entire occupation, with structures continually built up as the street levels rose over time to create the kom. However, as outlined above, despoliation by sebakheen had destroyed the center of the town to bedrock (Husselman 1979:7). Whatever public buildings and other more formal facilities that served the town would no doubt have existed in this area: the Michigan records indicate a variety of worked stone and architectural fragments that might have adorned these buildings (see figure 4.3). However, there is no information as to their original stratigraphic or even relative positions: neither their temporal or spatial context can be reconstructed..

Figure 4.3. Examples of architectural stone fragments from the Michigan excavation. None can be identified with specific structures or even areas of the town.

In contrast to the aforementioned sebakheen damage to the North Temple (p. 20-1), the precinct of the South Temple was virtually untouched, and excavation revealed structures dating to the first century BCE (Boak 1933). This area includes the only instances of Michigan's F layer, as well as the slightly better attested E and D, and is full of architectural remains that likely had domestic as well as religious functions. However, because this study is concerned largely with domestic structures and the incorporation of such privately-owned properties into the civic order of the public street system, I have chosen not to include any of the mudbrick structures from within the South Temple enclosure wall (*temenos)*, as their close association with the

temple raises too many other variables about the nature of domestic space and the ability of owners/inhabitants to manipulate social boundaries. Temple precincts carried spatial associations of ritual purity for those who enter, and as such the rules that governed the daily lives, actions, and identities of those who inhabited such space would have been in many ways different than those of the average Karanis population. This does not exclude the possibility of future work along these lines, and I hope for the opportunity to study the presumed priestly "houses" (Boak 1933:21) of the South Temple at a future time.

The remaining structures dating to the Ptolemaic period are all part of Michigan's little-attested E and D levels, discussed together in the 1979 report as fairly non-differentiated. The D level evidence consists largely of several re-used structures from the E level, and might easily be considered little more than a later expansion of the E level's same settlement pattern. Level E was dated to the second and first centuries B.C.E, while the following D level "may be roughly dated in the late first century BC and the early first century A.D." (Husselman 1979:10). This same area would continue to be heavily developed into Roman times even as the town apparently began to expand to the north and east and cover previously undeveloped ground. The resulting Karanis Center area (KAC) represents the largest known extent of this development over time.

Planning in the Roman Town: the C layer

Figure 4.4. C layer map of area KAC.

Unlike the isolated remains of the E and D layers, C layer structures have been preserved, excavated, and recorded as part of large stratigraphically-linked areas, making it possible to discuss the architecture of the early Roman town in more statistically relevant terms, and allowing for a large continuous system of access to be analyzed using space syntax method. The most notable preservation of a C layer network is in the KAC area, but there are also significant portions to the west in KAG which were documented by Michigan, and likely continue even further west under areas still unexcavated.

In examining the C layer street system, many scholars have characterized Karanis as a network of winding, disjoined access, suggesting that the town lacked the formal regularity of other preplanned settlements: compared to the plans of sites like Philadelphia (Davoli 1998:145 and also see figure 2.14), Karanis streets are not regularly spaced nor so well-connected, and that in particular streets lacked continuity and connectivity:

> there were no through streets from east to west in Karanis. In order to traverse the town from east to west it was necessary to follow a zigzag course along several interconnected short streets. All streets leading west from CS210 led only to other cross streets or to dead ends. (Husselman 1979:12)

However closer examination of the evidence suggests this observation is untrue, the result of uneven preservation and excavation at Karanis, not reflective of the actual ancient patterns: forty-six percent of the original C level KAC streets are incompletely preserved—that is, their full extent is not known, whether they originally continued for long distances, ended at intersections with other streets, or even dead-ended in neighborhoods similar to modern cul-de-sacs (figure 4.5). In fact the only street that seems to have been intentionally followed by Michigan's excavation was CS210 itself, significantly the longest street in the KAC system.

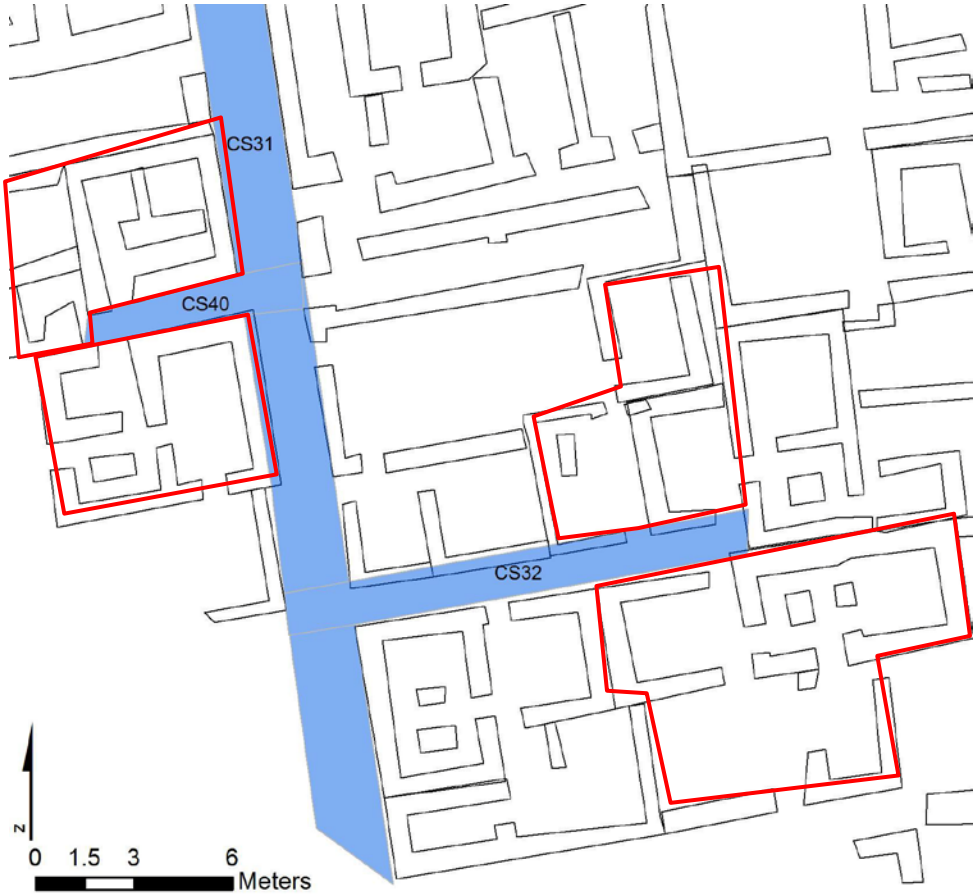


Figure 4.5. Detail of some dead-end streets of Karanis in the C layer. Streets CS40 and CS32 connect only to private houses (outlined in red), but no other streets besides the larger arterial road CS31. They cannot be used to travel "through" to another public area.

In contrast to Husselman's oft-repeated assertion (see for example Bagnall 1993:111), several east-west streets were identified by Michigan but not completely excavated: intersections along CS210 suggest several examples that extended to the eastern section of town. There were also examples of streets running west from CS210, although they were not preserved beyond the edge of KAC before reaching the ridge of the Central Destroyed Area (figure 4.6).

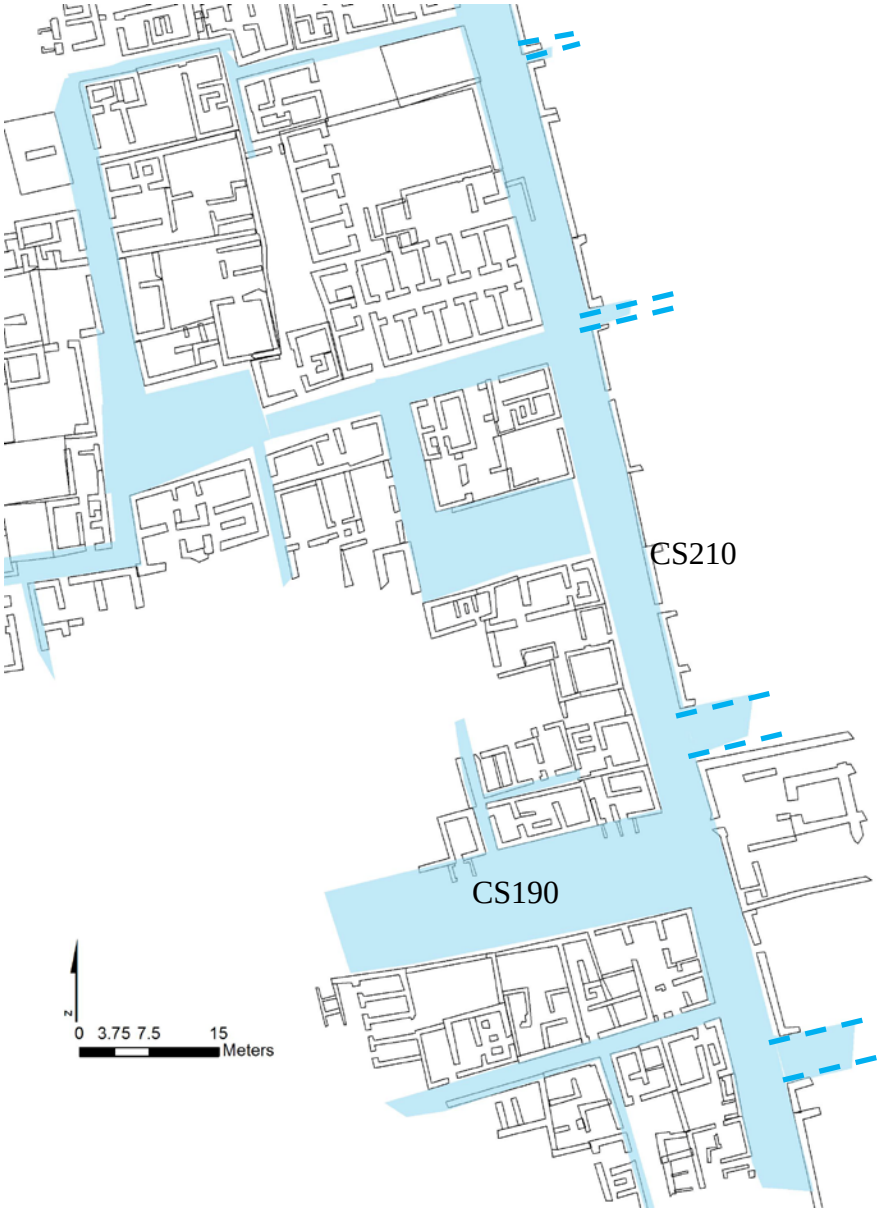


Figure 4.6. South KAC is not well preserved, but has definite evidence of major streets (in blue) running east and west from CS210.

Street CS190, in particular, must have been an important route: not only does its width (10 meters) suggest it had the capacity for a great deal of traffic throughout the town, it was significantly one of the only paved streets known in the city. In fact, the only other known example of a paved street in Karanis is the South Temple dromos, which while only partially preserved could potentially have been the same street as CS190. The difference in orientation

between the two streets is only 3.6 degrees, an easy adjustment considering the distance between the known extents of each is 148 meters. Moreover, if building C178, the eastern terminus of CS190, is to be accepted as a shrine—the Michigan team tentatively suggested the building may have been a *mithraeum* (Husselman 1979:55)—then the idea of a continually-paved processional road between the two religious structures is particularly enticing.

For areas outside of KAC, broad east-west avenues appear to be the norm: all the widest routes of KAE and KAW follow this orientation, preserved at lengths comparable to CS210. These areas may in fact favor east-west orientation over north-south orientation, suggesting these areas may have been designed as intentionally separate from the center of the town. However, it is also significant that KAE and KAW are the so-called "suburbs" of Karanis, and seem to be Late Roman in date (third to sixth centuries C.E.) suggesting they were designed according to quite a different town plan than that of the early first century.

Orientation

Even if area KAC can be said to lack evidence of continuous east-west streets, there is no need to assume that Karanis neighborhoods developed without any formal planning. In fact, the area provides ample evidence that Karanis was designed and constructed according to a preexisting formal plan, united by a highly effective plan of public access. It seems apparent that the street system was the major method by which the town was oriented and organized: as part of the town plan, the lines of streets were laid out first, and private properties grew up with respect to their borders. Structures were often built directly parallel to street edges, so even if intersections were not strictly perpendicular, structures often reflected these angles.

Orientation in Karanis seems to be conservative across large distances: area KAG follows the same orientation as KAC despite the 160 m. of the Central Destroyed Area separating them (see again figure 4.1). Although speculative, the similarity seems too close to be purely coincidental, and it suggests that all of central Karanis was once designed and built according to this shared orientation. This degree of cohesiveness is practically unknown in sites with no pre-existing "plan", as for example in the villages of Pharaonic Egypt (Uphill 2001) and even in the non-royal outskirts of Amarna (Kemp 2012:167).

Originally there may have been slight differences between the town core and the periphery, in terms of the unity of this orientation: structures that were on the periphery of the early town tend to have a slight "drift" in orientation compared to the center of the city—though this is typically a shift of only one or two degrees. In addition, in times when the boundaries of Karanis expanded to develop new areas, consistency in orientation suggests town planning at the civic level remained important and even enforced. During the early C level, a northern "city gate" (Husselman 1979:12) was dismantled and the town expanded to the north. While a few structures north of this gate deviated from the official orientation by a few degrees, other buildings seem to have adjusted to compensate (figure 4.7).

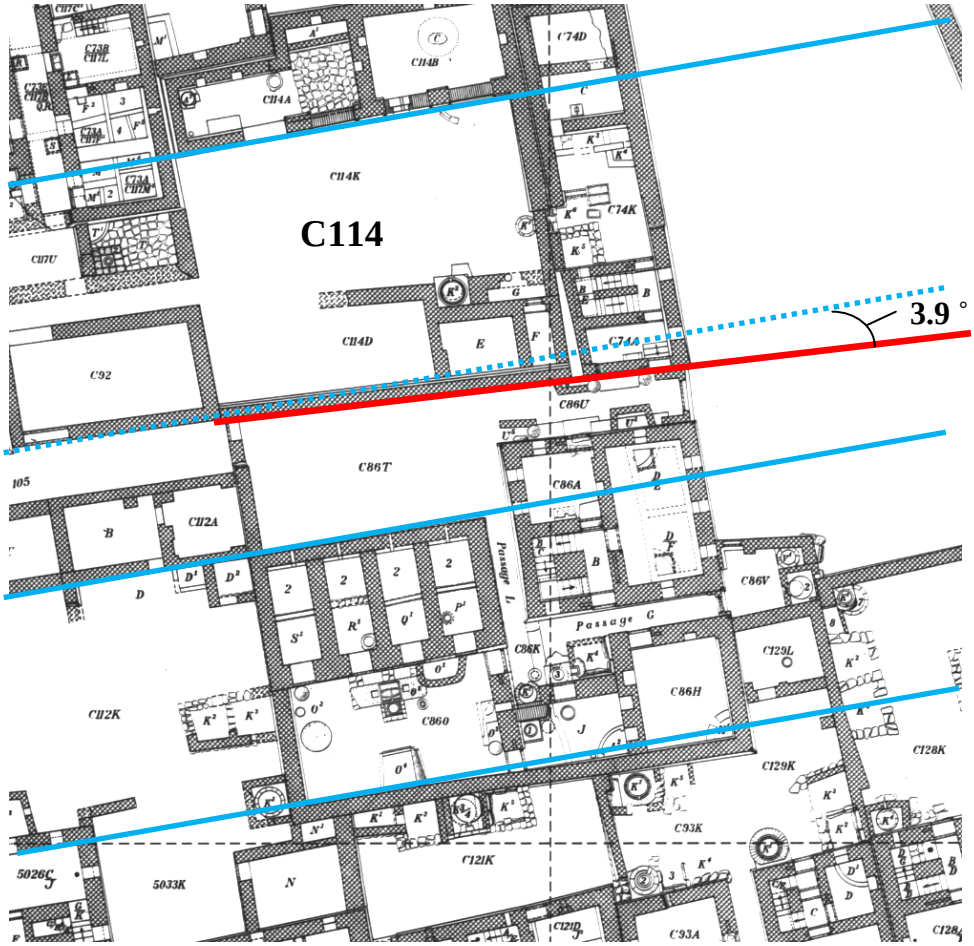


Figure 4.7. Compared to the usual east-west orientation of the town (examples shown with blue lines), the south wall of enclosure C114 deviates several degrees (3.9˚, with the deviating line shown in red). However, the original orientation is restored in C114's northern perimeter.

Essentially, the change "rights" itself so that the northern extension continues to lie along the same orientation as the earlier southern streets and properties. This suggests that whatever civic planning mechanism may have governed the layout of the original town, it was still being followed for large-scale expansions, and that instances of deviation were only local solutions to solve specific local spatial problems in adapting the grid.

The Karanis plan was not followed slavishly, however: where pre-existing buildings severely interrupted the uniformity of the town layout plan, it seems that every effort was made towards negotiation: the so-called "barracks" of Property C63 seem to have predated the C-level

expansion, and was located according to a separate orientation in an area that had been well beyond the outskirts of the original village. This was apparently a common strategy in Fayum towns: barracks or *castra* are found in similar locations in Medinet Maadi and Dionysios (Davoli 1998). However, as Karanis expanded to include the area around the barracks, part of the town's plan was apparently adjusted to compensate for this new orientation: there is a significant deviation in the street pattern north of the original "city gate" location, as street CS210 angles 26 degrees west of north—a 12 degree difference from its southern half (which, like most other north-south running streets, is about 14 degrees west of true north).

However this deviation was not allowed to completely control subsequent organization of the site, but was limited to the eastern edge of the street; the western border was constructed according to the previous orientation, as were nearly all west-side buildings. The only exception is in the north of the area, where a few angles are changed on the street edges C71 and C65, presumably in order not to restrict the width of such a major route (figure 4.8).

Figure 4.8. Structures to the east of CS210 follow the orientation of C63, which probably predates the structures to the west. Buildings of the west side follow the overall orientation of KAC, but here a few walls are angled (in red) so as not to narrow street access.

Therefore, while there is ample evidence that Karanis was laid out according to a general plan, its application was practical rather than absolutely restrictive. Adjustments were made to incorporate pre-existing structures and compromise was possible. Structures that deviated from the overall plan were not razed to the ground and rebuilt "correctly", but neither did a few instances of deviation allow the plan to be ignored for all future construction. In general, the status quo of spatial organization according to a larger plan was upheld. Even in times of significant expansion, when the opportunity to experiment and deviate from earlier strategies was potentially high, growth remains conservative with respect to the original plan. This suggests the civic strategy for planning, implementation, and maintenance of the spatial organization was accepted as widely successful.

Access analysis: connectivity of streets

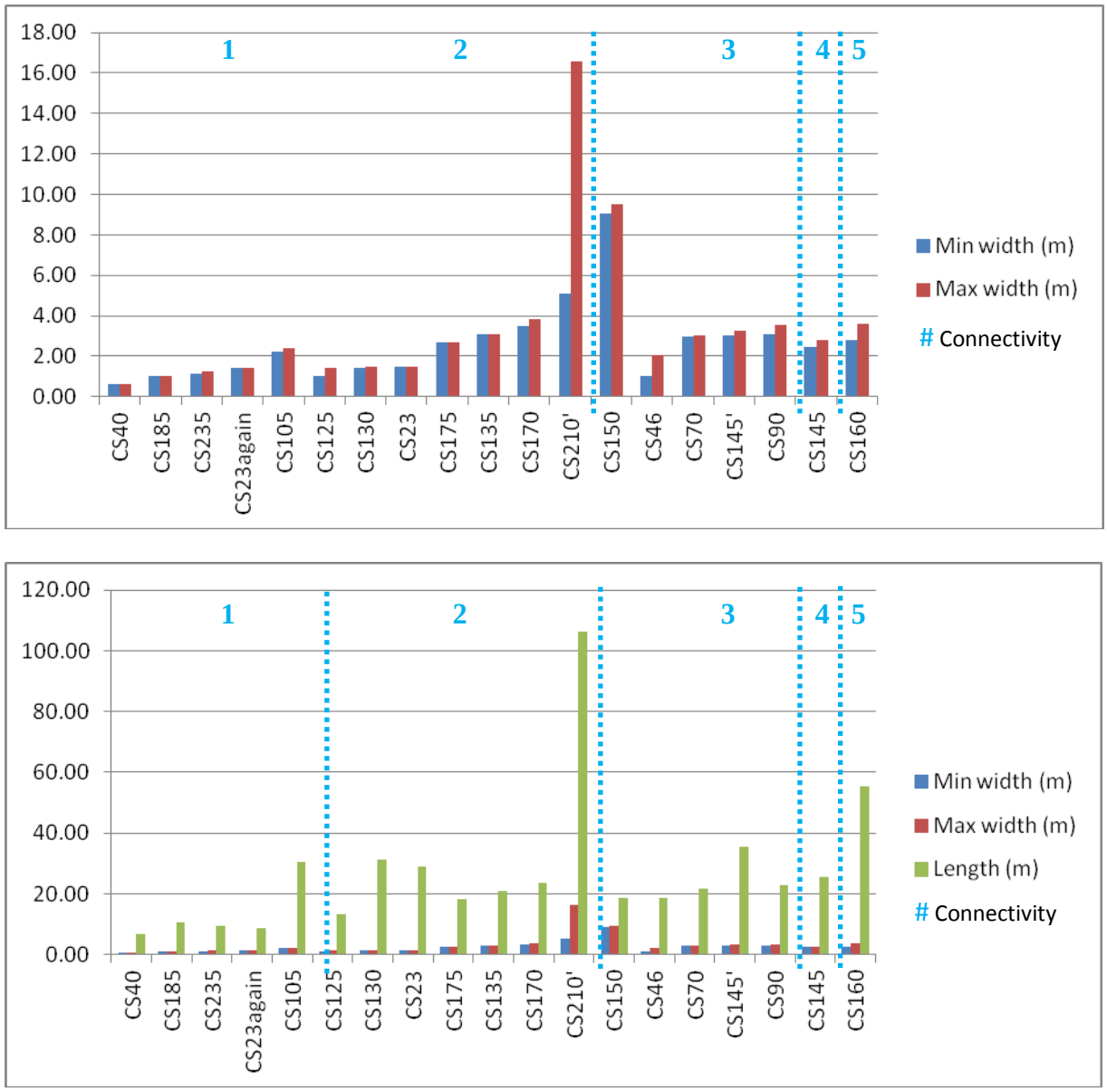


Figure 4.9. General statistics for the C layer KAC streets that can be considered "complete" (have been preserved and excavated to their ancient limits). Both graphs are sorted according to increasing street connectivity: note that while length values tend to fluctuate regardless of relative width, there is a definite correlation between low connectivity and streets under 2 meters in width.

The Karanis streets can thus be seen as a major strategy by which spatial organization was managed in the town. As part of the public system, it is not surprising that they should be held to a different standard of civic control and management than privately-owned properties. However private properties were not organized in major opposition to the public order, but in cooperation with it: it was outlined above that properties tended to follow the streets as guidelines for their own orientations, even for interior walls that shared no direct adjacency to the street edges themselves. Also, rather than creating elaborate buffers between the space of the public roads and the private houses, many properties were constructed so that house facades were directly up against the streets: apparently the owner's ability to access the street far outweighed any annoyances that may have been caused by living so close to the traffic, dust, and noise of major routes.

The Karanis street system was essential to both domestic and economic life in Karanis, providing an efficient means by which the town was connected and movement was made possible. As we shall discuss in Chapter six, some private routes were known between neighborhood properties, but in general the public streets were the major provider of access throughout the settlement.

Of the 51 streets attested in the C layer, 20 were excavated and recorded to their fullest extent as "complete" street spaces. Including what is positively known of the "incomplete" streets, all but four connect to the same system of access. These four anomalous streets are obviously included among the "incomplete" set of streets, and positioned on the extreme peripheries of the KAC excavated plans, along the edge of the sebakheen-damaged area. If larger stretches of these streets were known, there is no doubt that they would have eventually connected to other streets and joined up to form part of the same system, for as mentioned

earlier, ancient Karanis must have originally provided a single unified system of access for the entire town. However, because not enough is known about certain spaces to provide firm evidence of their connection within the spatial network of access, examples where access is uncertain are not included in the space syntax analysis portion of the study, regardless of whether they are streets, properties, or any other category of space.

The original layout of Karanis may not have been as strictly designed as in some Hellenistic and Roman town-planning: the city blocks at Philadelphia, for example (see again figure 2.14) were far more regular in both size and dimension. The streets of Karanis tended towards a loose "grid" system of streets, and while slightly irregular, it was still successful at providing access throughout the settlement. Connectivity of public streets was frequently at a value of 2 or higher, meaning that they connect to multiple streets instead of proving to be dead-end routes. Of course, the longer the street, the greater the likelihood that it joined with other routes via intersection; the southern segment of CS210 significantly has the highest connectivity at six streets and is the longest preserved street length in KAC.

However the incomplete preservation (and excavation) of many Karanis streets means it is difficult to assess this evidence with any certainty: streets that disappear into the destroyed town center may have connected across the town, but they may also have ended abruptly at intersections with other streets, or even dead ends. Certainly even within the preserved area of KAC, some dead-ends (connectivity=1) do exist, although even among this group some can be reconstructed as original through-streets that were blocked by later construction: CS23 appears to be an example of this, running further north before the construction of property C21 rerouted it towards the east (figure 4.10).

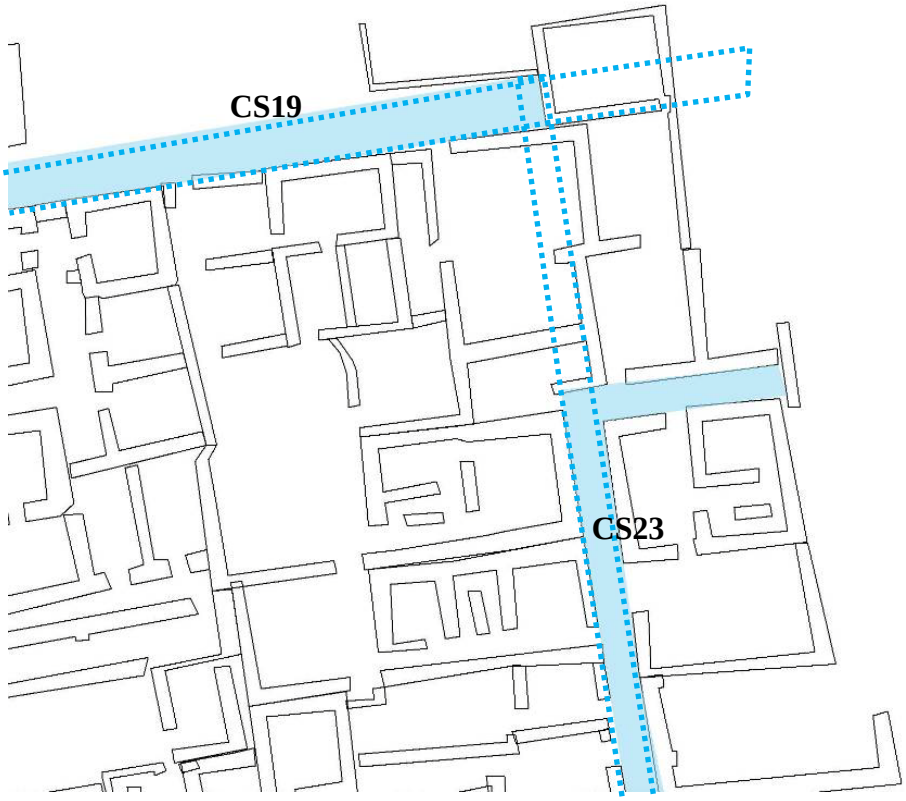


Figure 4.10, map of KAC streets of the C layer showing the probably original route in dashed lines

Connectivity seems to be in direct correlation to street width—the wider the street, the more connected the route was. This may well be the result of intentional and practical planning: the streets with high connectivity would have the width to mitigate the volume of traffic, and reduce the potential for bottlenecking and blocked access. Therefore for some of the wider streets that are incompletely preserved, we may be able to assume they had a more central role in the traffic patterns of the town.

That is not to say that all narrow streets were not connective: some in fact seem to have provided more direct access through areas of the town than the more circuitous major roads. CS58, only 1.30 meters wide, could be used as a shortcut from CS52 to CS100, which would save 12.91 meters of walking around Block VI (figure 4.11). Of course the narrow width would

have restricted its usefulness for some agents, such as those traveling with wagons or cart, and so were not likely to be major commercial routes throughout the city.

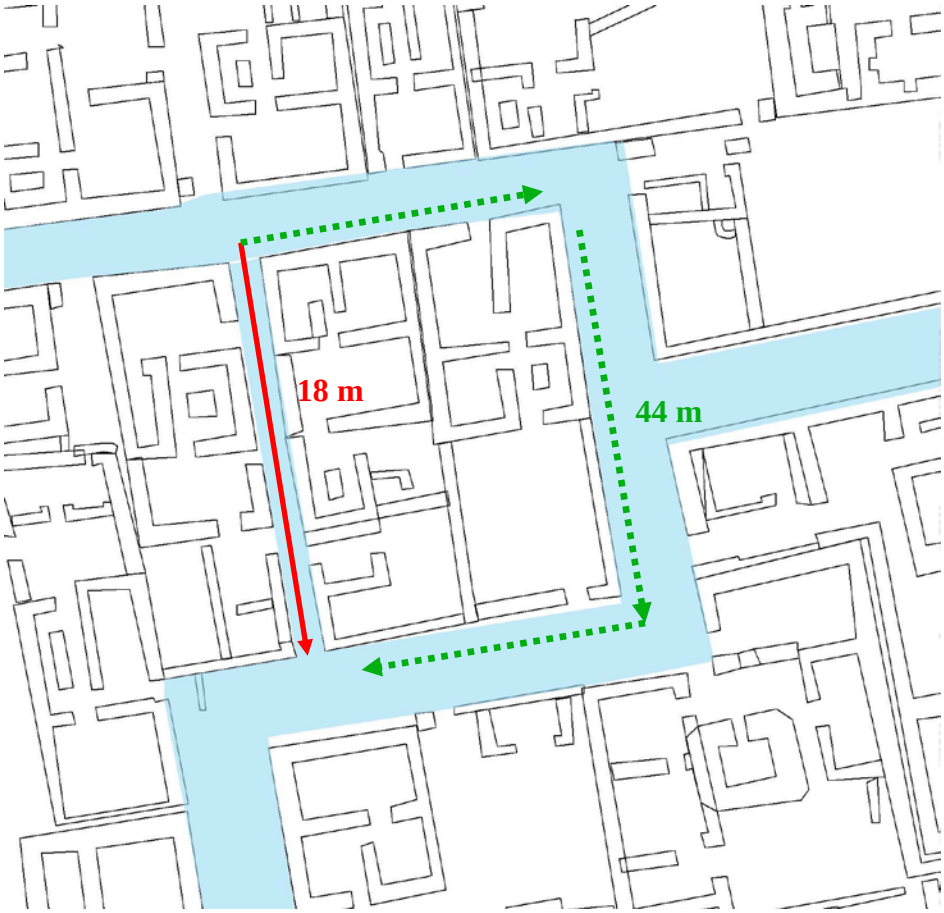


Figure 4.11: alternate route of CS58 (in red) compared to longer path of the major streets.

Of streets with a completely-known length, those with a width below two meters are on average 25% shorter than their wider counterparts, suggesting that they were designed as alternate pathways of access on the local neighborhood scale. Though they were not particularly useful for access across long distances of the town, they may have been used by local inhabitants of the immediate area. These narrower pathways would have created opportunities for access within the *neighborhood*, compared to the wider (and busier) streets that served as the major arteries of traffic throughout the town.

The C-level street system is therefore not only highly connective, but highly ringy: for any starting point in the system, there are likely to be multiple pathways possible. For the C layer in area KAC, the relative ringyness of the street system is at about 23.5%, a fairly high value (by the B layer this will have fallen to only 11%). Alternate access is also reflected in the high distribution values for Karanis streets (figure 4.12), low Real Relative Asymmetry, and low Mean Depth: essentially, all spaces are equally accessible and no single space is deeply isolated from any other in the system.

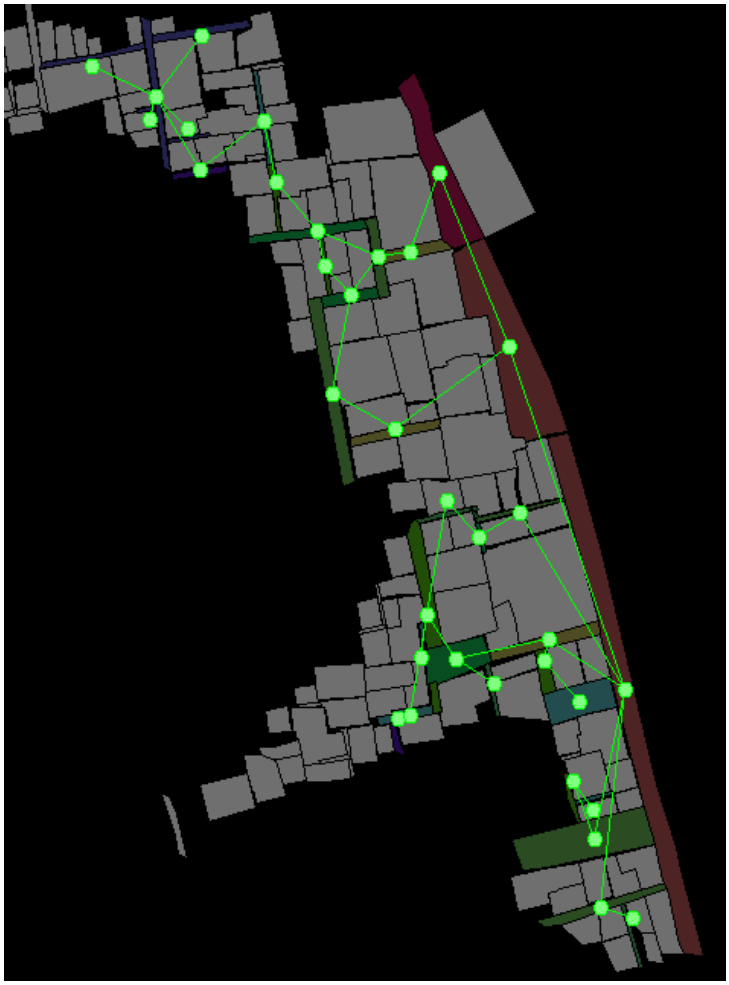


Figure 4.12. Depthmap-generated image and chart of calculated values for street system of C layer. (chart shown on next page, see also appendix A for definitions.)

MI Designation	Connectivity	Integration [HH]	Mean Depth
CS100	2	0.6981743	4.9117646
CS105	2	0.74285746	4.6764708
CS120	2	0.54302442	6.0294118
CS125	2	0.60690969	5.5
CS130	2	0.70346349	4.8823528
CS135	2	0.74285746	4.6764708
CS145	4	0.56277078	5.852941
CS145'	1	0.46897566	6.8235292
CS146	2	0.55603105	5.9117646
CS150	3	0.64935088	5.2058825
CS155	1	0.52759761	6.1764708
CS160	3	0.7549364	4.6176472
CS165	1	0.40548986	7.7352943
CS17	2	0.60296869	5.5294118
CS175	2	0.47376111	6.7647057
CS180	2	0.55603105	5.9117646
CS180ew	1	0.46428591	6.8823528
CS190	2	0.68277341	5
CS190	1	0.34519398	8.9117651
CS20	1	0.34519398	8.9117651
CS210	2	0.7936511	4.4411764
CS210'	3	0.85978872	4.1764708
CS210s	5	0.86782414	4.147059
CS215	1	0.49656245	6.5
CS23	2	0.49392116	6.5294118
CS280	2	0.67287815	5.0588236
CS31	5	0.39346263	7.9411764
CS32	1	0.34519398	8.9117651
CS40	1	0.34519398	8.9117651
CS48	2	0.44008142	7.2058825
CS58	2	0.59523833	5.5882354
CS60	3	0.62741339	5.352941
CS70	3	0.6981743	4.9117646
CS90	3	0.65856159	5.147059
CS205	1	0.54302442	6.0294118

Connectivity is not only high within the public street system itself, but once private properties are considered with respect to street access, we see just how effective the system is: for nearly all Karanis properties, the C-level streets provide direct street-to-property access, so that each property has a threshold depth of 1 when a public street is used as a "carrier" (see Space Syntax Appendix A, for definition). This is true for over 97% of the C layer properties, with only three known examples of properties that relied on a neighbor for access (all of which will be examined in detail in Chapter six). Rights of *eisodos kai exodos* (see again p. 82-3*)* could be agreed upon between such properties, however the majority instead maintained direct access. The rarity of *eisodos* type access systems in Karanis suggests that it was not a standard practice but only a strategy that was used in less than ideal situations to facilitate acceptable spatial compromise for all involved parties.

Thus it appears that the early layers of Karanis show intentional preplanning for a cohesive town layout, with consistent orientation and a street system designed for high levels of access throughout the town. This plan was apparently successful in balancing the needs of private property owners with those of the state: private properties remained closely connected with the public street system rather than isolated from it. Variations in orientation and other features of construction demonstrate that there was some flexibility in the rules and a certain degree of deviation was allowed. Therefore the development of Karanis shows evidence for civic oversight and official management rather than uncontrolled "organic" growth.

Change over Time: Adapting the Built Environment in the B Layer

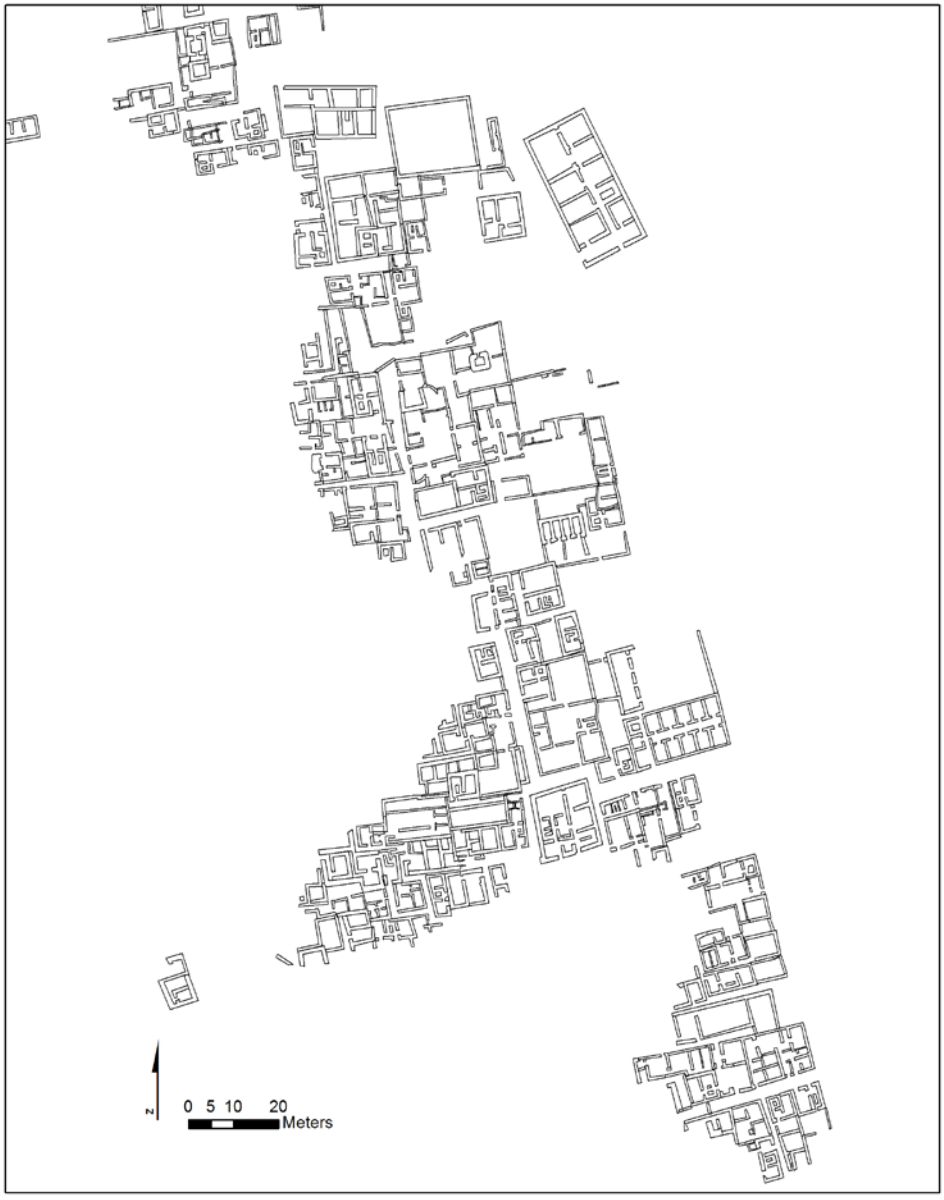


Figure 4.13. B layer map for KAC.

In contrast to the outward expansion of the town during the C layer, the majority of B layer construction within KAC can be characterized as expanding upward: street level rose considerably and new structures were built over existing ones. These changes were neither contemporaneous nor consistent across the area, and there was no clear break in occupation or

architectural style between the C and B "layers". However by the "latter part of the second century" (Husselman 1979:21) the C layer town has been effectively obscured and the B layer can be said to be flourishing.

The motivator for change in Karanis during this period was the accumulation of garbage, windblown sand and other debris that was common to all open areas of Karanis, and over time caused street levels to rise. Accumulation could be gradual or sudden depending on the strength and frequency of the wind: as noted by the various Karanis archaeological teams, many days' worth of excavation could easily be covered during a single windy night (El Nassery et al 1976:34, Boak and Peterson 1932:1). For the ancient city, this accumulation caused street levels to rise over time. If the civic government of Roman Karanis had any organized measures to control or mitigate the accumulation of debris, they were not particularly effective, and in general it seems the streets were simply allowed to rise. Not even the impressive paving stones of street CS190 were kept clear but were obscured by organic matter.

Streets in the B level therefore greatly changed, not only in surface level but in manner of access they provided. One must consider the effects that variable street surfaces would have on traffic patterns: potholes and other uneven surfaces could have impeded some travel, and the irregular slopes and grades of the streets across the kom seem to have led to some areas where intersecting streets had contrasting surface levels: "The original level of streets CS46 on the east was lower than that of CS52 on the south, and it served more as a private passageway than a street since it had been closed off from CS52 by a doorway" (Husselman 1979:17). This may actually have been more of an isolated threshold construction that did not include an actual door (the lack of vertical framing beams suggests it was not). This would have mitigated the difference in street levels by essentially providing a low retaining wall and a reinforced step

rather than leaving an unstable ridge that could have provided constant issues of access-maintenance. However, this strategy could not have been wholly effective: the existence of the raised threshold would provide a significant obstacle to wagons, carts, and even animals being led through the streets. Therefore its use seems to have been limited to passageways that were already quite narrow and restricted in terms of access.

Private adaptation and change in the public system

This in turn affected not only exterior areas but the interiors of private structures and "made reconstruction necessary" (Husselman 1979:8) as ground floors disappeared below the street surfaces. In reaction to the street level rise, private properties constructed features to facilitate the changing heights between street level and doorways, including mastabas, steps, and windscreens. However, these features could protrude into the street area as much as 2.5 meters. Some streets had been planned wide enough to allow for such intrusions (CS2120 is 5.76 meters wide at the area of the C123 windscreen), leaving ample room to maneuver around such obstacles. Still, the restriction represents 43% of the street width. Several mid-range streets must also have become severely congested and were in fact eventually blocked entirely to all but the narrowest pedestrian traffic (figure 4.14).

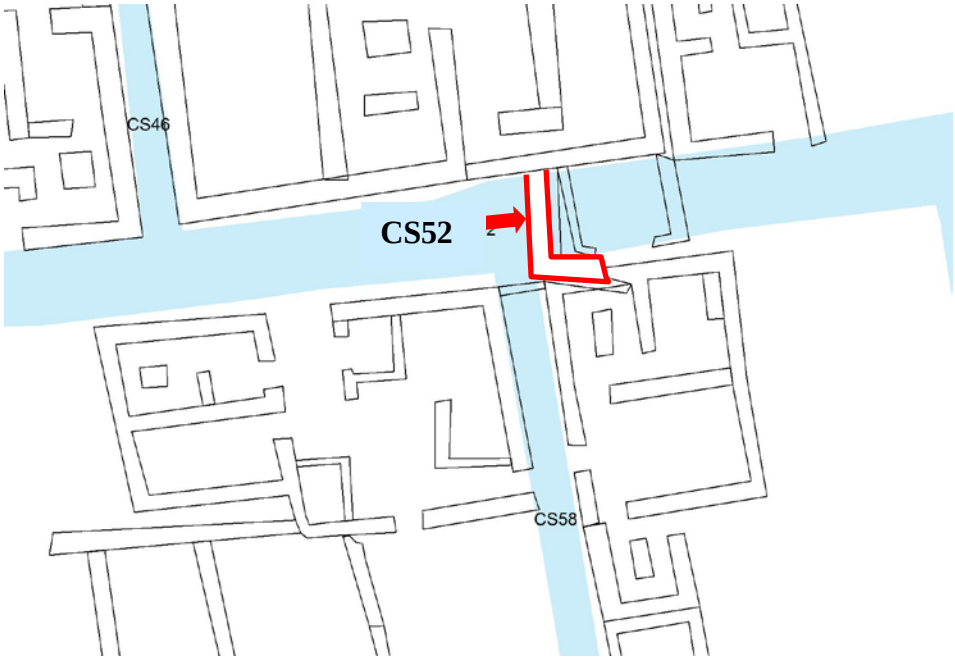


Figure 4.14. Street CS52 (original route in blue) has been totally blocked by construction (red arrow) during the B layer of occupation.

Therefore, while the B layer retained the general position and layout of many earlier streets, their connectivity was greatly changed: multiple streets were blocked along the middle of their lengths, creating two non-adjoining streets where there was once a single direct line of access. Some of these, as mentioned above, were only the partial blocks of private property construction encroaching on the street, but their significance in restricting traffic to pedestrian use rather than wagons, carts, or even animal traffic should not be overlooked. Some instances suggest it may in fact have been intentional: street BS150 was divided by the construction of a wall that effectively created two smaller streets of limited use. This likely reduced the level of traffic that went past the entrances to properties B153 and B154. Street BS155, in particular, was effectively transformed for private use by those seeking access to Property B154 (figure 4.15).

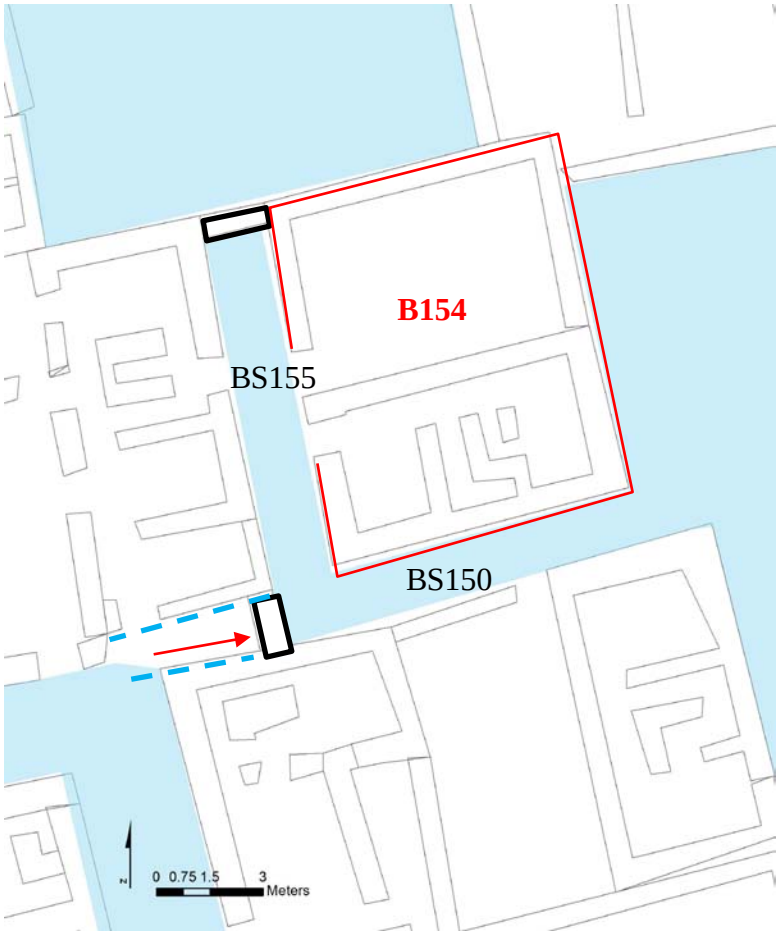


Figure 4.15. Blockings in both BS150 (original extent shown in dashed blue outline), and the north end of BS155 create an extremely isolated, private route to property B154: it can no longer be accessed from a western or northern route.

While this change may have benefitted the inhabitants of both properties in the form of increased privacy and control over access, it also had the interesting social effect of greatly reducing any possibility for close interaction between the two of them: if the inhabitants of B154 wished to visit with their neighbors in B153 (a distance of 1.87 meters apart), they would have had to travel a street route of 137 meters to reach each other's front doors, and 154 meters by the late B period, once property B213 was blocked for any through-access by B211 (figure 4.16).

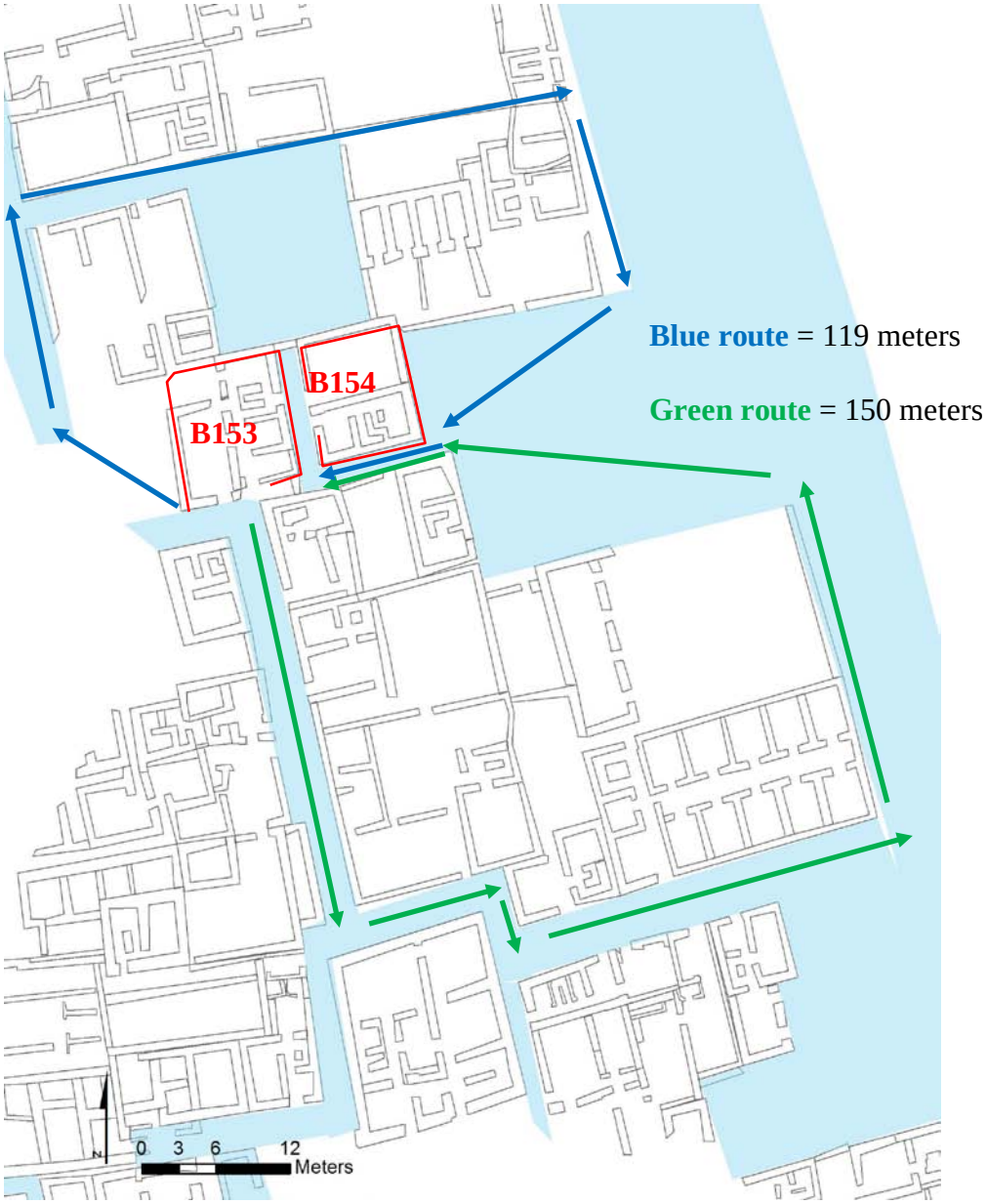


Figure 4.16. Map showing the circuitous routes between B153 and B154. Additionally, the blue route was blocked in late B layer construction, making longer (green) route necessary.

This sort of blockage is not unusual: in fact, the entire B layer system of the public streets marked trends towards restriction of alternate routes and increasingly lengthy routes to any given point. In the C layer, the high connectivity within the street system meant that all spaces were relatively easily accessible, and the mean depth—the average number of spaces one must cross to reach any given place in the system—was low with a range of 4.1 to 8.5, with an

average value of 6.05. By the B layer the complexity of these routes had increased, so it was necessary to pass through more thresholds in order to reach any given space. Variation on the mean depth was greater, reaching as high as 9.86 for some properties. As noted, many such changes seem to be driven by private action rather than by the intention of a larger civic plan. At times the results seem to reflect what might be considered selfish needs, where continued access and the security of property were assured at the expense of the greater public system.

Stealing space: privatization of public property

In addition to those streets that became limited or even dead-end components of the system, some streets were effectively removed from the public sphere altogether, and in the B level specific constructions began to encroach upon space that was previously open to full public access. An extreme example can be found in the construction of B224, which occupied a location across much of the width of earlier street CS190. The function of this building is unknown, however such a large building (the floorplan covers 174 m^2) suggests that the land may have been purchased before it was built rather than just informally co-opted for construction. Certainly, the builders were sympathetic to the access-requirements of adjacent structures, or B224 would not have been built at such an angle: the remains of street CS190 are considerably narrowed to the north but do manage to provide access to property B223, preserving a width of.46 meters (figure 4.17). Still, this way, each property maintains its own direct access, and the deviation from more usual structural orientation may be a preferred solution over the more complex social contracts involved with securing *eisodos kai exodos* of neighboring properties.

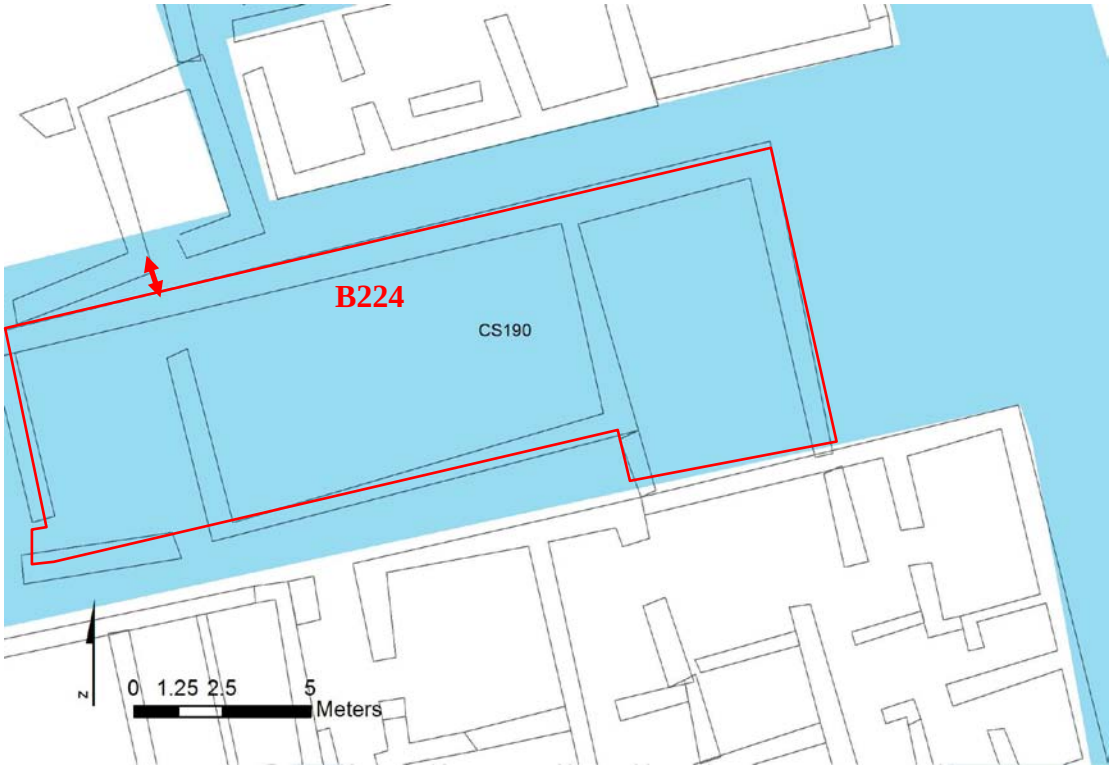


Figure 4.17: Construction of building B224 (red outline) in what was previously the space of CS190 (shown in blue). Note how the property on the northern edge of the old street, has only .46 meters wide access point (red arrow), thanks to the orientation of the new construction.

In contrast to this rather extreme example of building on (previously) public land, many smaller streets in Karanis may have been privatized more informally: we have already outlined how the C level showed examples of virtual privatization of streets that had limited connectivity; the B level shows several examples of such space being completely fenced in as if indeed part of private property. CS170 was a fairly wide street (3.5 meters) but with low connectivity, only leading to a single further dead-end area (CS215) and so when it was converted into a courtyard for property B203 (figure 4.18) the change may have had a fairly low impact on traffic patterns through the city.

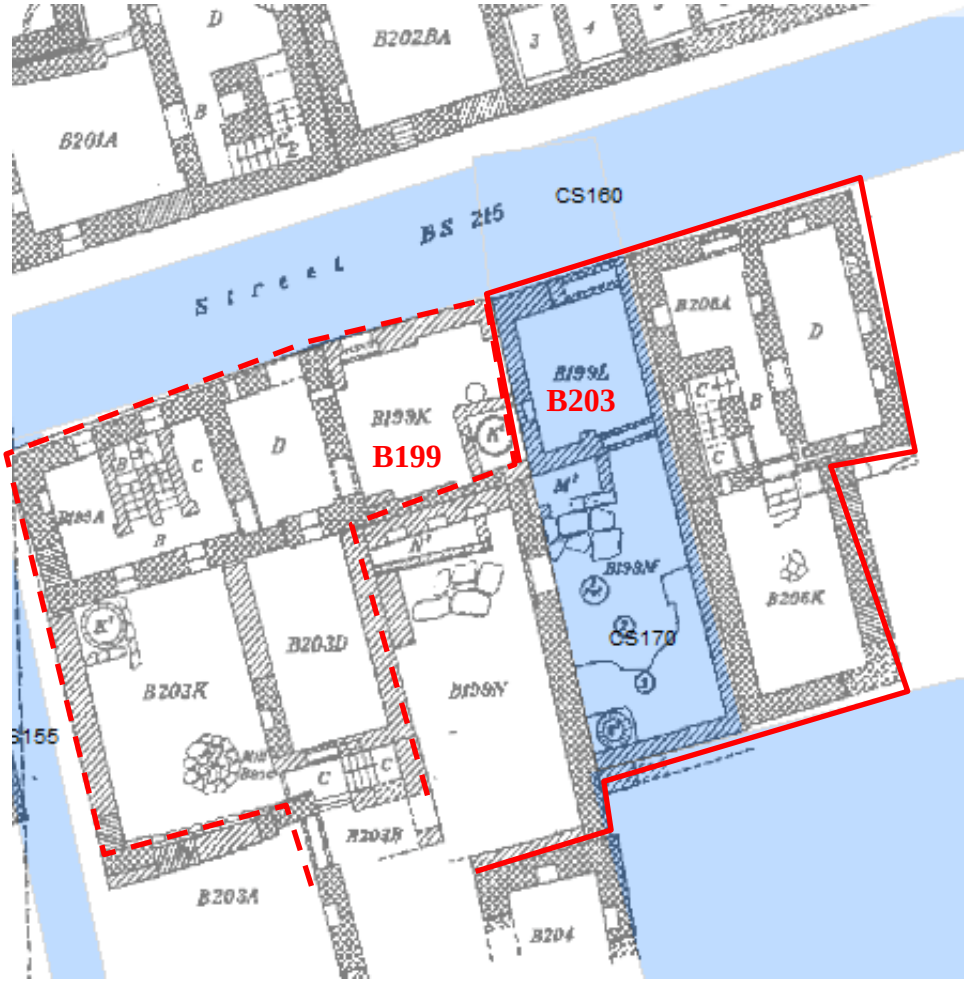


Figure 4.18. Original C-layer *streets* in blue. NB: Michigan erroneously labels part of property B203 as part of B199 (boundaries show in dashed line)

The same cannot be said of Property B108 (figure 4.19): it was formed out of two separate C level units, the street between them (CS58) was also turned into courtyard space, blocked from through-traffic and filled with domestic equipment including ovens.

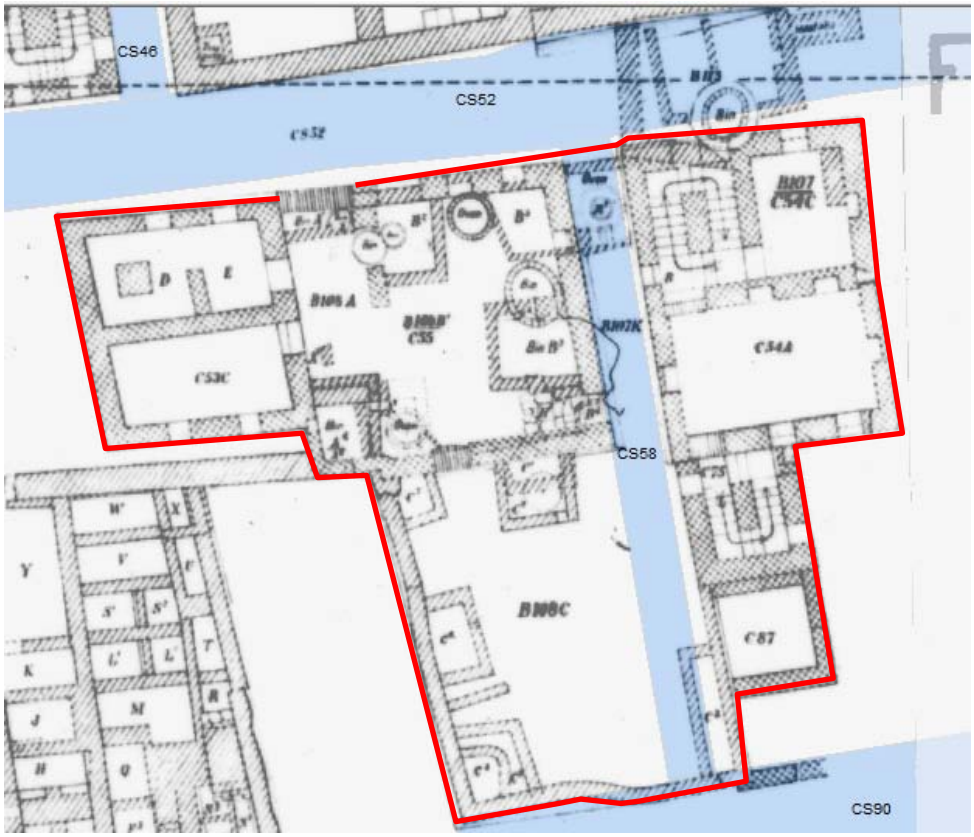


Figure 4.19. Original streets of C layer shown in blue, with B construction superimposed; boundary lines of Property B108 shown in red.

However narrow such streets may have been, in enclosing them the owners of adjacent properties removed important routes of access from the Karanis street system—a system which was already severely restricted by the imposition of several *mastaba* (benches) across other potential routes of access. This resulted in a localized system that had minimal linear, circuitous routes instead of the varied options of a ringy system of distribution (figure 4.20). However it appears to have been an accepted practice in Karanis: many such examples were preserved through the end of the B layer, suggesting that there were no major efforts to prevent such actions, or to reverse them. Instead, attempts at civic control over the "ownership" of such spaces seem to have been low.

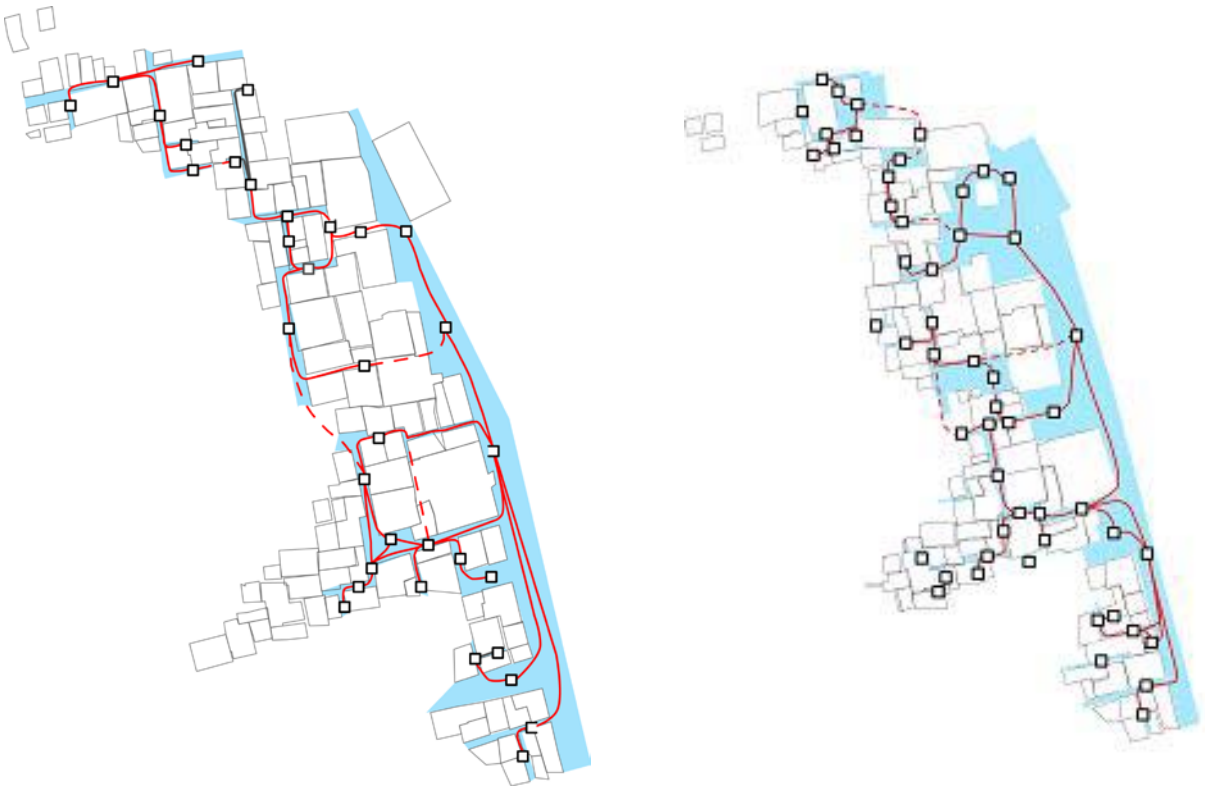


Figure 4.20. Image comparing the "ringyness" of street routes of layer C (left) to later B routes. Dotted lines show routes that were blocked or incompletely attested by the later B layer.

As the maintenance of the public system apparently decreased, private construction in the B layer seems to have compensated by creating local measures to ensure access. While the threshold depth of many properties remained the same with respect to the street (Depth=1), Mean Depth throughout the system increased dramatically, showing that the entire built environment became increasingly segmented, circuitous, and restricted in terms of both public and private access (see figure 4.21).

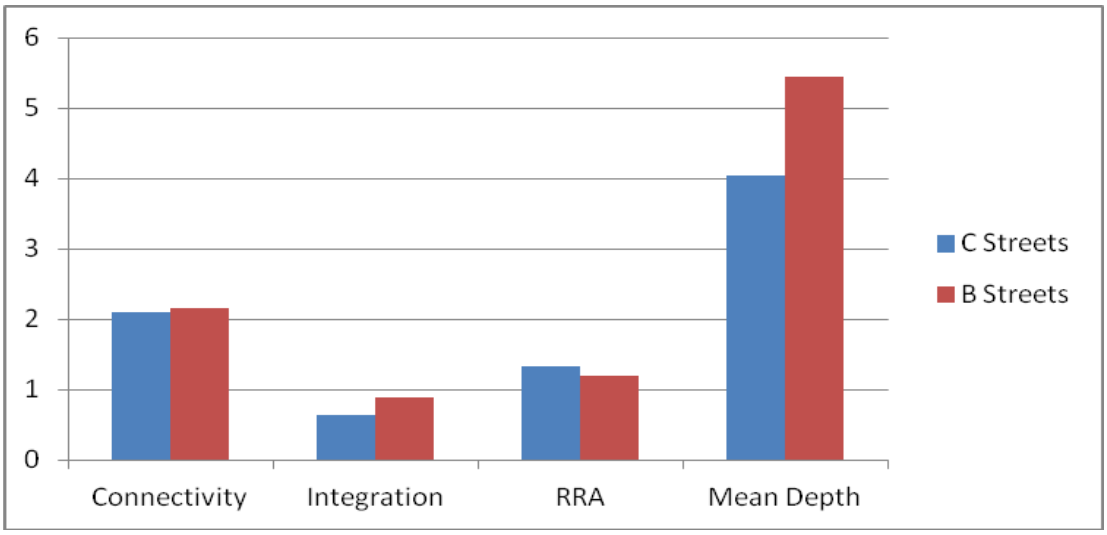


Figure 4.21: Comparison graph of C and B layer space syntax values. While the B layer has more rings than the C layer, these later traffic rings are longer in threshold depth, made of many successive street spaces that eventually link back up to the larger system. This accounts for the higher mean depth values in the B layer even as integration and connectivity appear to increase slightly.

It has been suggested that such change over time demonstrated that Fayum villages "lacked internal political and social structures as much as their villages lacked spatial articulation" (Bagnall 1993:114). However, a decrease in civic oversight is not necessarily combined with a lack of *social* organization: rather, as large civic oversight decreases, local social measures seem to have become even more important in negotiating space. The role of private property in providing alternate access to the public street system will be examined in chapter six, but in general even the public roads must have been sufficient for inter-settlement travel. The B layer is described as having lasted for about a century: simply put, the system must have worked or it could not have been maintained for as long as it was.

"Abandonment" and reorganization: the A Layer

At the same time as all this B layer privatization of public land was creating crowded structures and narrow alleys near the center of the town, many properties along the eastern margin of area KAC were apparently being abandoned and left to decay. Even without the rising streets, mudbrick structures require constant upkeep or slide into "inevitable decline" (Bagnall 1993:112), and so once abandoned could quickly be obscured from view entirely. Defining features such as property enclosure walls disappeared under the sand, and so effectively became open to public access and use.

The opening of these public areas was on a fairly significant scale: whereas 73% of the C layer surface was covered by private properties as opposed to public streets, by the B layer it had decreased to 57%. The change is almost entirely due to the appearance of these abandoned areas. In the A layer the value was only 55%.

Abandonment was not only limited to private property: large economic complexes including a major granary (Husselman 1952) were apparently affected in this way. Exactly why these properties were left to decay and be buried is unknown, but the end of the B layer was apparently marked by similar and more widespread abandonment throughout KAC. Scholars have previous interpreted this as representing a real period of socio-economic depression for the town. It may have begun with the 145 C.E. Antonine plague (Husselman 1979:9, Boak 1959), when the population of Karanis may well have dropped significantly and the town retracted towards its center to create a more compact settlement. Relative dating suggests a third-century emergence of the A layer as a time of renewed fortunes of the town. A gap in occupation of over 100 years would certainly account for the amount of windblown sand and other relatively sterile debris between the tops of B-level houses and the foundations of the A level, which reached an average of 3 m. of height between the tops of old walls and the foundations of the new

(Husselman 1979:26, also figure 4.22).

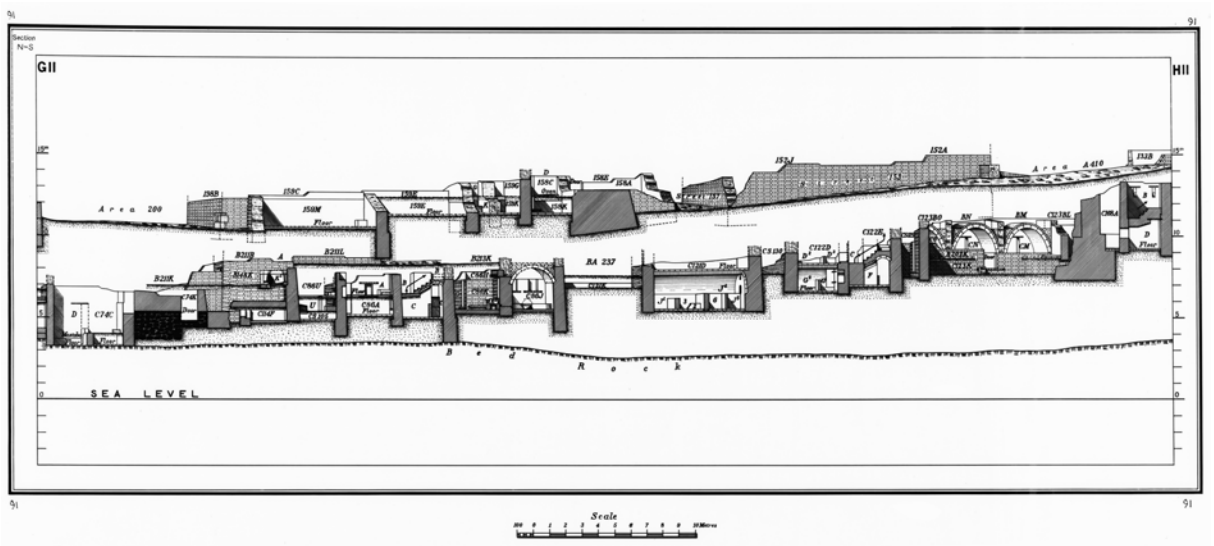


Figure 4.22. Note the layer of sand between B and A construction that reflects about 100 years of abandonment for area KAC. (Image courtesy of the Kelsey Museum.)

Unfortunately, any attempt to interpret why this shift occurred, or to characterize the new type of occupation according to social use, is hampered by the low preservation of the architecture: for many structures, "the lack of evidence for doorways lay in the fact that generally only the lowest courses of bricks were uncovered and these were beneath the natural threshold levels" (Husselman 1979:26). This makes it impossible to consider any significant space syntax analysis for the A layer. However, it is immediately clear that the organization of public space in layer A was certainly different than in previous layers. Much of the A layer constructions seem to have been built with little knowledge of what lay directly below. Unlike the continuity of C to B foundations, "the orientation of [A layer] buildings and streets remained much the same as in earlier levels, but the actual streets and buildings no longer followed the same lines" (Husselman 1979:26). In fact, 55% of all A structures (N=58) were completely new, only 26 incorporating the remains of any earlier walls. Only six streets remained in the same location as before (figure 4.23). All the others were blocked or rerouted, or their borders became

diffuse thanks to structural abandonment. Significantly, these examples represent the majority of the recognizable street system for KAC in the A layer: instead of relying on formal streets, the area seems to have developed as a series of open spaces with wide-open access circulating around individual clusters of structures.

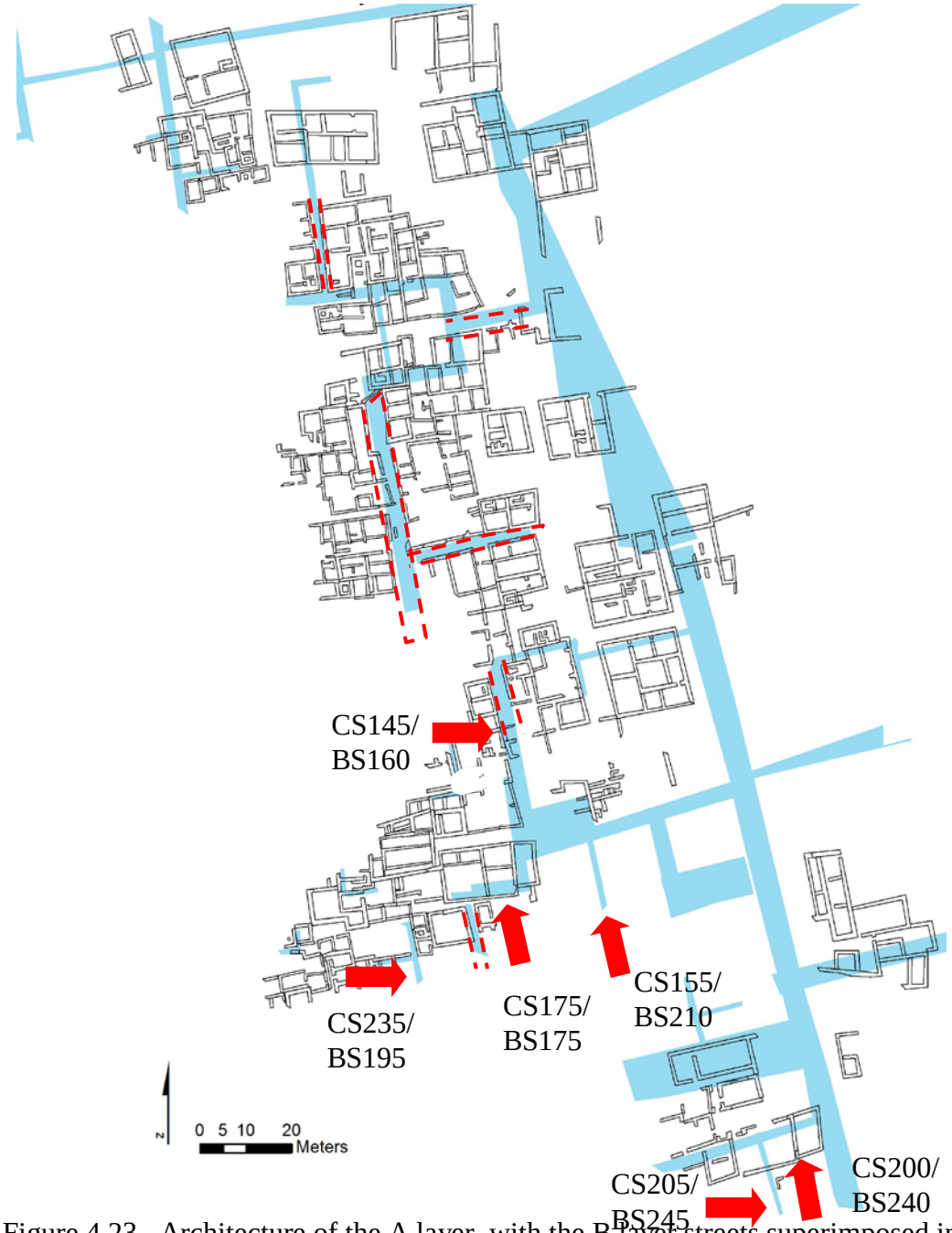


Figure 4.23. Architecture of the A layer, with the B layer streets superimposed in blue. The segments of streets that were original to the C layer and still retained in the final stages of the

town are shown outlined in red. Red arrows detail streets that began in the C layer and were still in use in the B layer, but did not survive into the A layer.

While this certainly increases the potential for access to any point within the space system, it does not necessarily reflect an increase in ease of access: little is known about the integrity of the surfaces for such large areas, whether they were even and well-compacted for travel with carts or wagons, or whether the uneven terrain made passage difficult even for pedestrians. This suggests a lack of large scale public planning, but a reliance on localized social interactions and "rule of consent" (Kemp 2012:166) to negotiate space and organization throughout the area.

This loose organization is also found in other areas of Karanis—notably in parts of the town with the longest occupation history, towards the center of the settlement. Although the majority of the center was destroyed by the sebakheen, the western edge of the area, KAG, preserved at least three layers of occupation that appear to be roughly contemporaneous to those of KAC. Listed in the Michigan reports as belonging to the same C, B, and A layers, the development of area KAG shows a gradual shift away from a clearly preplanned and defined street network and towards a looser and more informal organization of public access (figure 4.24). To the north, area KAN also seems to have followed the same trend of development into the Late Antique Period.

Figure 4.24. Area KAN, left, and area KAG, right. Streets from C-B layer are superimposed (in blue) over top layer A structural remains

However, KAC is atypical compared to these areas, as it is the only region of town that seems to have experienced such large-scale abandonment, and as a result may have had less opportunity (or need) for such large scale reorganization. While the eastern side of the central mound had a layer of separated sand and debris, the west side (KAG) was characterized by layers "directly superimposed upon the other without any intervening layers of accumulated rubbish" (Boak and Peterson 1931:4). It remains unclear exactly why KAC was abandoned while the other areas flourished, but the intervening meters of windblown sand show that the area was in fact unoccupied for some time.

As described above, previous studies of Karanis architecture have relied heavily on the published maps of area KAC (Husselman 1979, and see Bagnall 1993, Alston 2002) for evidence of planning and organization, so it is not surprising that they have often concluded that Karanis was a town "in its final spasms of life" (Bagnall 1993:111) by the third century, a network of haphazardly arranged houses and "poorly articulated space" (ibid). However, these studies had

no access to the results of more recent survey, which established the full extent of architectural remains for the townsite (Barnard et al. forthcoming a). In fact, to the east of the town, the settlement was expanding by about 93,000 square meters: KAE appears to be a Late Roman addition to the town, with ceramic analysis suggesting fourth and fifth century C.E. occupation (Cappers et al 2013), but otherwise the hallmarks of spatial organization for properties are comparable to the early C-layer of KAC.

Figure 4.25. KAE, showing street grid and overall spatial order according to a preplanned and implemented design.

In contrast to the central mound, where the palimpsest of earlier built environments affected change over time through social negotiation and necessary compromise, the construction of *new* areas on previously undeveloped land shows definite evidence of intentional town planning. Although roughly contemporaneous (third to fifth century C.E. construction) with the apparently chaotic development of A layer KAC, Karanis' eastern "suburb" (Bagnall and Rathbone 2004:132, and Barnard et al. forthcoming a) KAE is characterized by a well-defined street system and consistent orientation of structures (fig 4.25). The same is true for all known extant areas constructed on previously undeveloped land: the bedrock foundations to the south (area KAS) and to the extreme west (KAW) of the site all date to Late Antiquity, and demonstrate regular street access along long straight avenues, creating well-defined blocks of private properties built to the same alignments (fig 4.26). In fact, the length and continuity of their streets is even higher than in area KAC's C layer, which has been often described as having "no through streets from east to west" (Husselman 1979:12). Contrary to that statement, the Late Antique town seems to have emphasized east-west travel, in keeping with the increased length of the settlement itself along that orientation.

Figure 4.26. The western suburb (KAW, to left) and south Karanis (KAS, to right). Although the area between them has not been excavated, it seems clear that the orientation of these districts is according to a similar plan, emphasizing east-west street connections and consistent orientation of properties.

While the center of the town may have been developing with limited governmental oversight during this time, the original organization by which it was founded was still accepted as a good strategy for creating spatial and social order: the continued application of the same old plan for settlement organization suggests that the systems of civic planning and local socially-organized maintenance was seen as a success. Conversely, if the change in area KAC from orderly street grid to informally-designed winding neighborhood routes was considered a failure of the system, Late Antique additions to the town would not have been built following the original "faulty" plan.

Overall, we have seen how Karanis began as a pre-planned settlement, and was designed to incorporate high levels of public access with the ability to expand and develop over time. By the Roman period the town had expanded to create complex networks of streets and properties, and large-scale oversight may have decreased over the years, resulting in a need for more local-level measures to negotiate spatial needs. However, the strategies deployed at the local level seem to have been sufficient, allowing daily life to continue despite the increasingly complex spatial environment. Even in the Late Antique period, when areas of Karanis began experimenting with new spatial (and likely social) organization strategies, other neighborhoods were still being constructed, occupied, and managed according to the original tenets of the town's plan. Had the entire settlement lasted beyond the sixth century C.E., the street order of KAE, KAW, and all other "new" areas may well have followed a similar trajectory of development as KAC, turning into complex winding neighborhood routes instead of long, wide boulevards and ringy access. However, this strategy for change over time was so widespread that it should not be seen as a failure of spatial order or evidence of the town's socio-economic

decline, but proof that the town was still alive and well, effectively negotiating space to maintain a functioning town that provided for the spatial and social needs of the inhabitants.

Chapter 5. Properties in Karanis: discrete units of spatial organization and control

The Michigan excavation reports classify nearly all Karanis architecture into units described as "houses" (Boak and Peterson 1931, Boak 1933, Husselman 1979). The choice of this word is somewhat surprising, as "house" has a very strong connotation of private domestic space. In contrast, Michigan applied the term not only to domestic structures but to economic and industrial properties such as granaries and milling facilities. "House" is also too specific an architectural term, for while many of the private properties included houses, very few were limited to *only* a house structure. Instead, the average domestic property included a house as well as various secondary structures and facilities, for storage, food preparation, and animal husbandry.

While the Karanis architectural report (Husselman 1979) did make an effort to distinguish between private complexes and "public and semi-public buildings" (Husselman 1979:55-65) in discussing granaries and potential military structures, even these were more broadly referred to according to "house" designations, as in House C123, etc, instead of a more specific "Granary C123" or even the neutral "Property C123". The indiscriminate use of the term "house" in the Michigan publications has therefore led to several misinterpretations by later scholars, as when vaulted storage bins in Karanis granary C78 (see Husselman 1952) were described as a house structure "with cell-like rooms…These houses had easily separable units and we shall meet this type or arrangement again in the much later houses of Byzantine Alexandria" (Alston 2002:57)[1].

[1] While granaries often do include house-like constructions of rooms and staircases, these areas do not include the storage bins, nor are they similar to other domestic properties in either constructions or daily use, as will be discussed later in this chapter.

In trying to avoid such assumptions and misconceptions, I have decided to use the term "Property" to describe the basic single unit of privately-owned and controlled space, which for domestic properties includes not only the house itself, but any related exterior spaces such as courtyards, animal pens, storage bins, and areas for food preparation such as ovens and milling installations, that belong to the same spatial unit. In this sense, a "property" need not even specifically include a house at all in order to be categorized as a unit of non-public space, although as we shall see in this study, most of the Karanis properties do.

Identifying property units in the archaeological remains

As well as changing the nomenclature, it is also necessary to reevaluate the boundaries of these property units as defined by Michigan, and re-evaluate the criteria by which the excavated structures were grouped together into related units. Michigan's method for this was never made explicit: although it becomes apparent that it relied on clues in both architectural and access-routes to define single "units" of property, there are some notable instances where Michigan's decisions to group spaces together do not follow consistent logic. For example, there is the case of B199 and B203, where a considerable portion of space is labeled part of "B199" despite having nothing in common with it in terms of access or shared construction: the areas in question are much more positively associated with B203. In such cases, I have redrawn property boundaries according to the criteria developed for this thesis; the complete database preserves the Michigan names for individual spaces in a way that renders them searchable for future

researchers. The geospatial component of this study[2] also visually indicates the changes that have been made, as seen in the example image below (figure 5.1), using various "layers" of information that show differences in property boundary lines, as well as the labels and designations given to any given space by this and other studies.

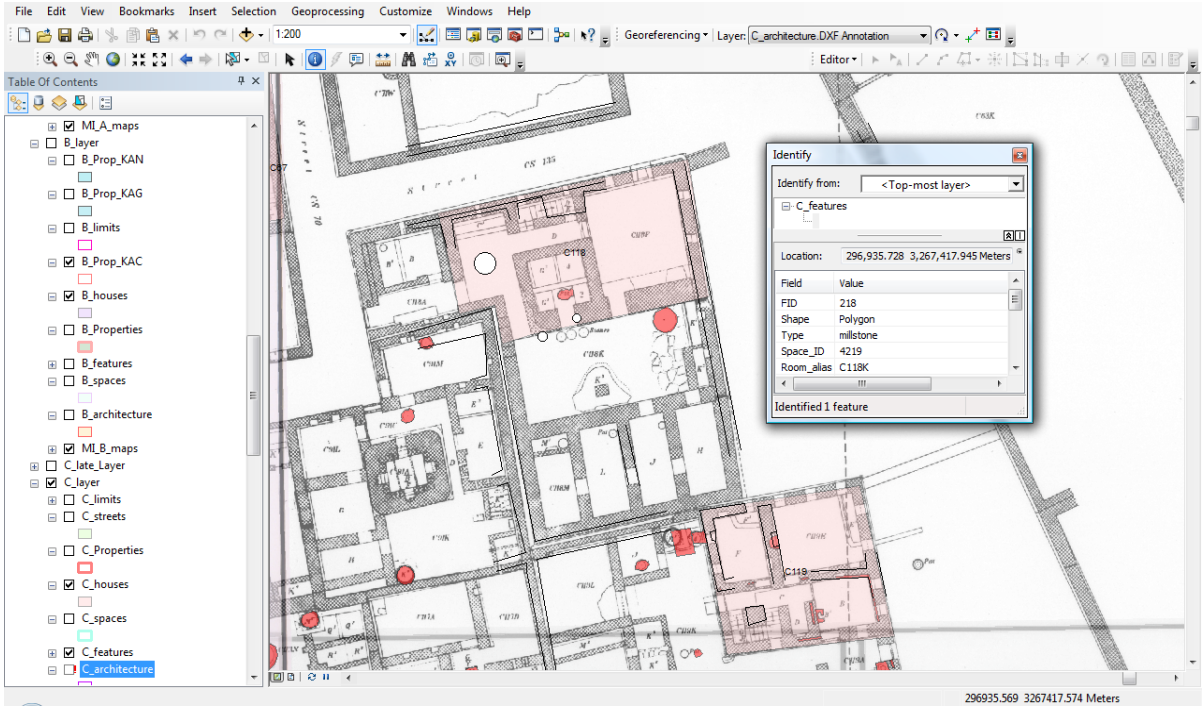


Figure 5.1. A sample from the geospatial database demonstrating how the original Michigan maps have been refitted to reflect global position accurately, and how information of various archaeological phases can be preserved in annotated "layers" in the ArcGIS format.

Evidence from the early C layer (first to early second century C.E.) suggests that Karanis properties were designed as distinct units, well-defined by the presence of perimeter walls: adjacent properties were very rarely left wide open to each other, and when interfaces did occur, they were most frequently limited to narrow doorways. This high degree of spatial division and distinction makes it easy for the modern scholar to distinguish between most properties. But

[2] Managed in a GIS database, see Appendix B

while the original construction may have allowed for fairly clear definition of property units, over time many changes were made that could complicate the modern scholar's ability to determine ancient spatial boundaries. Alterations were not only in terms of access and basic spatial organization by construction or remodeling, but also could include very significant changes in the overall size and dimensions or a property, as portions were inherited, bought and sold over time. Multiple documentary papyri discuss the sale of courtyards as independent from the house (Muhs 2008, Husson 1985), and alterations were made in the defining property perimeter walls to reflect changes of ownership in terms of access-control (figure 5.2).

Figure 5.2. Property boundaries over time: the space of both courtyards was fairly evenly divided in the C layer occupation (left, along the dashed red line), but clearly shifts by the B layer (right image, compare position of the new property boundary to the original dashed line) to belong exclusively to the eastern property.

Structures of the C and B layers were maintained fairly consistently, as those periods were characterized by continuous occupation and adjustment of existing structures and boundaries rather than complete reorganization. This is however not true for the A layer, which followed a break in occupation, at least for the KAC area of the town, and with the third century C.E. began a period of extensive reorganization as most earlier structures were by then buried

beneath windblown sand (Husselman 1979:26). While it is obviously desirable to trace the strategies by which this new level was organized, unfortunately the preservation and recording of the area make this a very difficult task.

For example, in "the top layer it was also often impossible to determine the location of doorways, either of doors giving access from the neighboring streets, or of doors between rooms" (Husselman 1979:26), as in many cases only a few courses of bricks remained in place that were part of the foundations and thus well below the original floor surfaces or thresholds of doorways. It is often impossible to make decisions as to internal organization or even general limits of such properties with any consistency. The Michigan team seems to have erred on the side of caution, often assigning different "house" numbers to separate areas within a single conglomeration of buildings, or even giving a separate identification number to individual rooms. Wherever information could be obtained from the Michigan excavations, whether published or in the Kelsey Museum archives (see chapter one, p. 15), I have given some attention to analyzing these relationships, and made decisions to group specific spaces into discrete properties according to my criteria. The results are all fully annotated in a layered GIS database, referencing both the positions of the "new" property boundaries created for each phase, as well as retaining the original designations of the Michigan excavation.

Domestic Properties: house and household

In examining the various properties attested in Karanis, examples of economic and industrial properties were known; however, about 84% were in fact domestic in nature for the C layer, 86% for the B layer (and see figure 5.3). The courtyards of these properties included many

examples of food preparation areas and equipment, mostly mortars, ovens and handmills of the so-called "Theban" or "Olynthus" type for the milling of grain (Frankel 2003). All of these indicate production on what could only be a domestic scale, for provisioning a single household[3]. The material finds of excavation from such properties are also associated with daily domestic life, including the remains of personal items such as clothing (Thomas 2001), jewelry, and even children's toys (Gazda 2004).

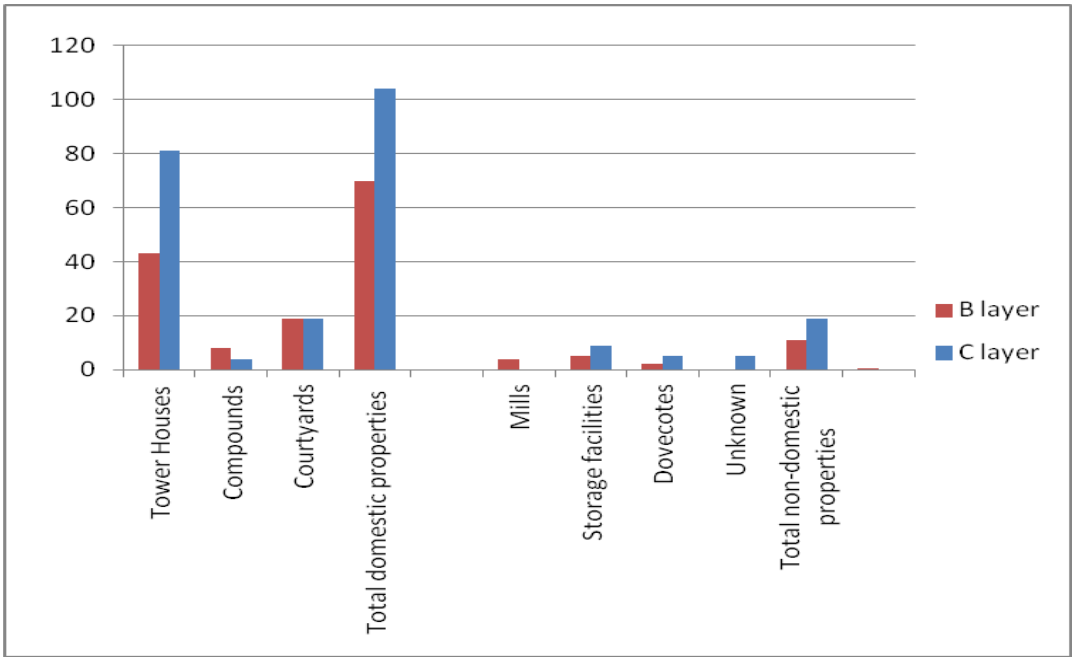


Figure 5.3. Chart showing total number of properties by type for the C and B layers of area KAC.

While we may then accept the identification of such units as both domestic and a single cohesive structural unit, it may not necessarily be reflective of a socially-relevant unit as well. Many scholars suggest that a direct correlation of one family to one domestic structure is anachronistic for much of the ancient world (Alston 2002:69, Hobson 1985), however that may be more a reflection of the incapability of the word 'family' to encompass various ancient social

[3] Examples of larger industrial mills and bakeries have been noted in association with distinctly different types of architectural structures, for example see the later discussion of storage facilities on p. 221-223.

groups. Instead, the word "household" is accepted to describe a social unit that extends beyond strict nuclear family and even blood-relationships but is based on cohabitation and closely-related daily activities (Blanton 1994, Huebner 2013, Stone 1987).

Still, the question remains if the Karanis domestic properties were inhabited by a single household, or shared between two or more groups at once. Multi-unit housing structures were not unknown: we have already discussed Roman urbanism as characterized by close dwellings in *insula* groups and even high-rise apartments. Some textual evidence exists that they were in fact divided and shared, including documentary papyri that discuss the partial sale of properties, not only courtyards but sometimes portions within the house itself. Fractions of houses, such as ½, 1/3, even as little as 1/27 (Hobson 1985:225) have been noted, leaving one to wonder just how small these house-units must have been. However, these documents are not usually bills of sale or even rental contracts, the latter of which are notably lacking in the records from the Roman Fayum, suggesting there was little to no rental market (Hobson 1985:3) that would make the "high-rise" apartment model of housing a worthwhile economic investment.

In fact, texts describing the division of houses into parts are most frequently documents of inheritance and thus more accurately reflect partial shares in overall value of properties rather than physical divisions of structures (Muhs 2008, Hobson 1985). Indeed, one might wonder how someone would be expected to occupy 1/27 of a house, especially in Karanis where the average house size is only 45 meters square. In addition, such contracts are usually silent with respect to the specific location of such divisions: who inherits the ground floor versus the third, for example. There are a few instances where spatial divisions are in fact made explicit: the Teianteus Archive from Luxor gives evidence of several siblings inheriting specific portions of their father's house. In the contract they agree to specific structural changes for the house upon

inheritance: "they are to make a door in the centre of its north side northwards to the King's street, and to close the door of the north side which opens to thy pylon" (P.Strassburg I, translation from Glanville 1939:xxviii), essentially creating two separate houses out of the original one. Another example from the Ptolemaic Fayum (Hawara), P.Cairo 50125, mentions, specifically, "three walls and another wall in the middle between" in addition to shares of common areas as part of a son's inheritance (Muhs 2008:194), but there is no specific mention of the need to construct any type of additional partition.

It is important to note that in nearly all examples of house division contracts, the shares are between family members (siblings) rather than members of unrelated family groups; thus even if they were to share habitation of the house physically, they would not necessarily be wholly separate households. It must also be remembered that these divisions, whether real or imaginary, may not necessarily reflect attitudes towards broader social access or use of such spaces by visitors or others outside the household.

Thus even though textual sources indicate housing was frequently shared, the architectural remains of Karanis suggest very limited possibilities for any house to have been used by multiple households at any time. They lack the usual strategies by which multiple units of housing are created. In contrast to the apartment of Roman Ostia, for example, which had easily-accessible staircases leading to suites of rooms, typical of an apartment floorplan (see again figure 2.11), the Karanis houses lack any cohesive arrangement of connected spaces, being much more frequently individual rooms clustered around a small stairway. Because of this, there was essentially no chance for privacy among members of a single household: there must have been constant interaction between them as they negotiated the limited narrow routes through the house. Any social boundaries between different households would be in constant contact and

negotiation, and difficult to maintain; therefore it seems most likely that they were indeed designed to be used by a single household.

Tower house living: construction and social characteristics

The overwhelming majority of Karanis houses (see figure 5.4) were built with simple tripartite floorplans, consisting of only two convex living spaces per level joined together by a central passageway that also contained a stairway. Basements as well as upper levels were very common (Husselman 1979) and although underground spaces were frequently subdivided into separate storage areas and low bins, each story followed the same basic floorplan as the ground level.

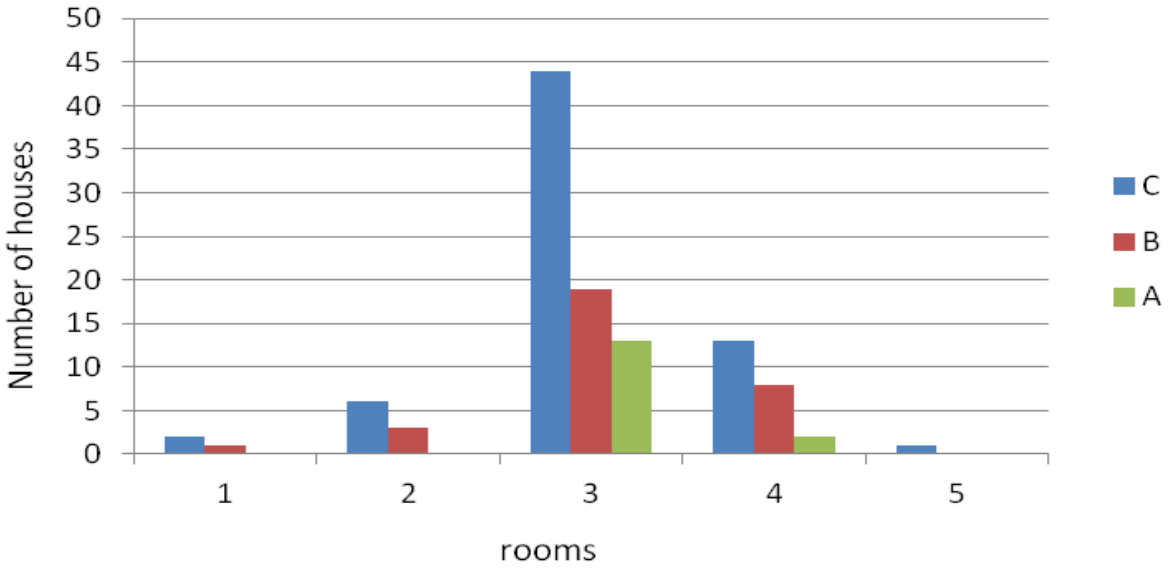


Figure 5.4. The total number of rooms per house, by stratigraphic layers C through A.

None of the Karanis houses were preserved to full height, but it seems very clear that all houses had a flat open-air roof surface that could potentially be used as additional space for

household activities. This theory is supported by site archaeology: despite the high preservation of various other construction materials, even perishable organic ones, not a single terracotta tile has been found to suggest the pitched roof of more traditional Greek or Roman models. This flat roof is also consistent with known models of houses dating to this period, that show multistory "tower" structures with flat roofs, occasionally including small enclosed kiosks with a doorway providing access between the roof and the top of the stairwell (see figure 2.15 again, and Nowicka 1969:109).

While the stone and terracotta house models frequently depict towers of great height—the model in Cairo shows five stories plus the roof—there is no way to know how many stories were typical for Karanis houses, or even how many above-ground stories any single house had. Written evidence has been found that the majority of Fayum houses for this period were modest, consisting only of a ground floor plus one above: structures of this type appear as *oikia distegos* in the papyri (Nowicka 1969:108 and see also Hobson 1985). A few texts mention more substantial heights: as much as four or more stories high (Alston and Alston 1997:208), though these examples are usually assumed to be unrepresentative of the general Fayum settlement landscape. The highest preserved example for a Karanis house, C51, suggests two full stories above ground floor, plus partial evidence of more rooms above (Husselman 1979:71). It is possible that this uppermost level was not a full floor but a roof with a single room or kiosk. However this house is itself unusual among Karanis examples for its size and decoration and should not be considered typical. However, analyses of both the Karanis houses and other similar mudbrick structures (Nowicka 1969, Lehman 2013) prove that even more stories were certainly possible.

In comparison to the "tower" type, Karanis has very few examples of the more extended,

sprawling "villa" model, even though it is well-attested at other Fayum sites (Davoli 1998, Hadji-Mingalou 2007, Pernigotti 2005). The villa form is frequently associated with economic prosperity, as the large floor areas suggest less concern for maximizing usable areas in terms of both interior and exterior space. As we have previously discussed, compact multi-story dwellings were seen as an urban necessity rather than desirable for the Roman world (Vitruvius 2.8.17 and see chapter 2, p. 64-66). However, for Karanis, even in the earliest Roman phases (layer C), when space was at its greatest availability, villa properties are almost entirely absent from the town, and even the largest Karanis properties (both in terms of house size and overall area) rely on tower-type construction as opposed to villa design. This suggests that the decision to use this type must have been driven by more than mere economics, but likely reflected specific socio-cultural needs of the inhabitants, probably revolving around the importance of exterior courtyard space to daily domestic activity. The few known Karanis examples of villas and villa-like housing will be discussed later in this chapter as a special separate category of domestic spatial organization; the majority of this study will focus on the tower houses and their associated properties.

Nearly all Karanis houses were designed to be single structural units, walls continuously built and adjoined rather than abutted at corners. This means that houses were essentially free-standing and independent in terms of structural support, and may be representative of attitudes towards autonomy and independence of the ancient house and household, cultural concerns reflected in the design of the structure. It is also reflective of an extremely practical desire to control the structural integrity of one's own property, a concern multiplied by the complex structural engineering requirements of supporting such tall buildings. By allowing houses to stand independent of outside support, owners could make changes to their property without

adversely affecting the neighbors' structures, a concern that was in fact formalized by a social contract in Papyrus BM10524 (see again p. 81), an agreement where a house owner promises that his new construction will not sink support beams into a neighbor's wall or affect his property in any way. This example shows just how strongly spatial organization and control of private property were valued.

Unfortunately, this point has not been successfully emphasized or even understood in previous studies: scholars have often described the houses as "terraced, sharing sometimes three walls with neighbors" (Alston 2002:53). In fact, for all of the tower-houses of Karanis, there is only one known example that shares a wall with other properties, seen in figure 5.5 below.

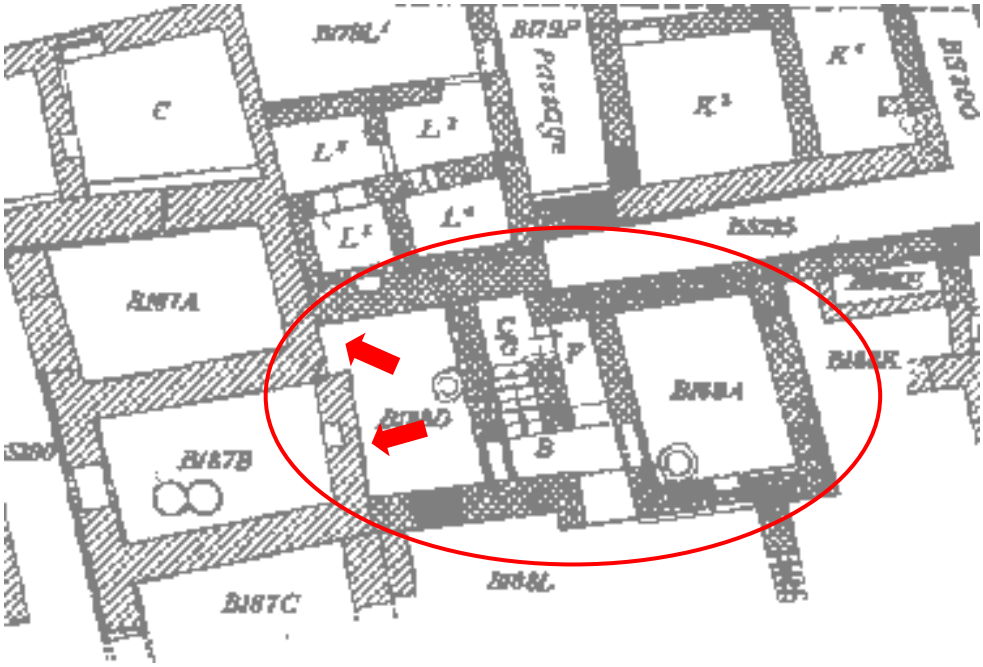


Figure 5.5. The only known house structure to be built abutted to another (earlier) property, relying on a neighbor's construction for the western exterior wall and part of the north as well.

This misinterpretation likely arose from the Michigan publications' use of the word "house" rather than property, as single *perimeter* walls were frequently shared between adjacent properties, only built alongside each other in double-thicknesses in the rare examples where two

actual houses stand side by side (figure 5.6). However this only further emphasizes the structural self-sufficiency of Karanis houses, proper, in direct contrast to the partition walls of terrace houses described by Alston. A freestanding house allowed property owners to act independently to alter their houses as needed, instead of relying on the permission of neighbors, as for instance terrace houses must have done if wishing to extend a shared wall up to build an additional story.

Figure 5.6. Examples of properties with adjacent walls (in red) only occur where at least one wall is load-bearing; most frequently both walls are parts of house structures. Otherwise a single width of wall is considered sufficient for separating properties (shown in blue).

Karanis houses seem to have been consistently and intentionally designed as freestanding structures, independent of all other architectural features. This strategy likely reflected a concern for maintaining symbolic control over domestic space in addition to practical control over all other practical aspects of the structure, including access to and within the property, and the ability to conduct changes in the structure over time without having to rely on an outside authority for permission. In short, the Karanis house was designed to emphasize ownership control.

Dimensions of the Karanis house: engineering restrictions and conventions of convexity

Karanis tower houses had two strategies that allowed for the support of weight of upper stories: they were designed as complete freestanding units and had compact floorplans (an average area of 90 m2). The rooms themselves were rather small and compact as well (figure 5.7) as an additional strategy to maintain the structural integrity of upper levels as well: as even roof space was occupiable, each ceiling was essentially a floor to a space above, and had to be able to support the weight of multiple people.

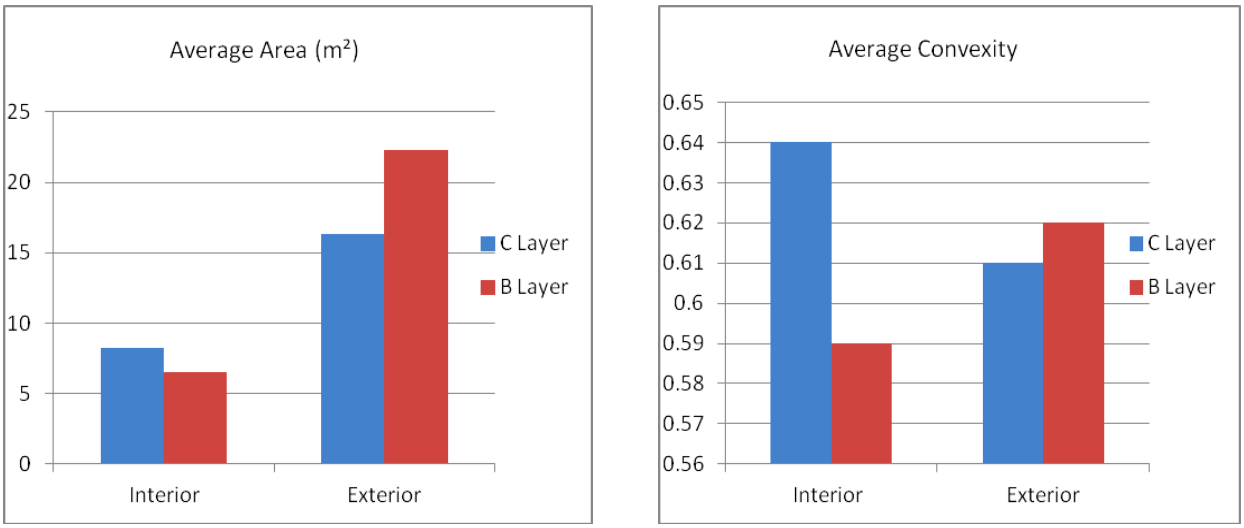


Figure 5.7. Charts showing the average scalar dimensions for convex spaces, separated into interior and exterior convex space (Note: stairways are not included in this calculation of average interior spaces).

Such ceilings and floors were created by spanning the width of the room with wooden beams, which were then covered with mats or palm fronds and finally bricked and plastered over (figure 5.8). This means that all rooms were essentially limited in size of their maximum width by the length of roof beam available. This is somewhat a function of economics, as we have already seen instances in which wood was considered valuable, and potentially harder to obtain

in the later levels of Karanis architecture, as it was frequently reused from earlier structures (Husselman 1979:26, 34). The decrease in average convexity of interior spaces for the B layer may indicate that long beams were more scarce, making it necessary to construct more oblong and narrow rooms.

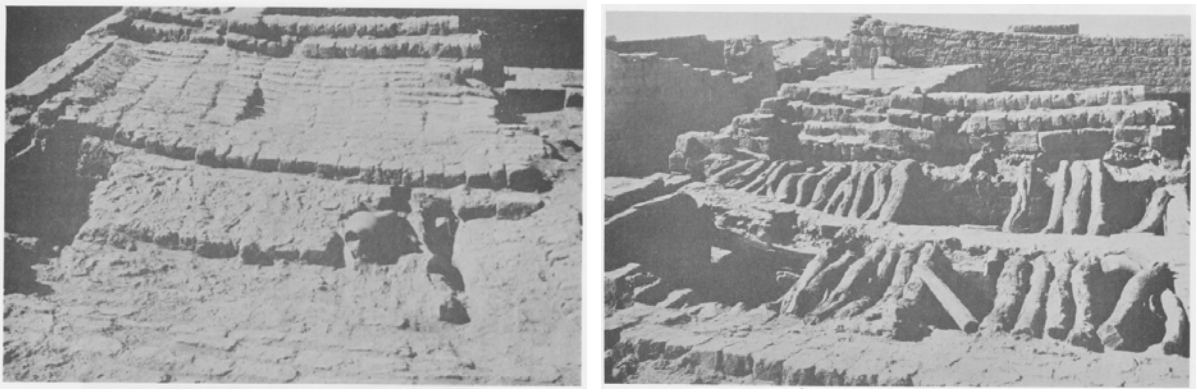


Figure 5.8. The creation of floor surfaces in Karanis. Left: detail of a house floor made of mudbricks; on the right, the same floor after mudbricks have been removed, showing beam supports (photos previously published in Husselman 1979: plate 29).

Overall there seems to have been a general limit on the width that could be spanned without additional support before the beam would necessarily start to sag under the pressure. Secondary support features such as columns were extremely rare in Karanis architecture, with only three known examples: one is simply a courtyard with a central paving-stone that may have doubled as a column base (El-Nassery et al. 1976, Starkey unpublished report:57-8, and see figure 5.9 top). The other two examples are structures on the outskirts of eastern Karanis that included stones arranged potentially as a screen wall of columns (figure 5.9 below). None of these structures bear the other hallmarks of domestic properties.

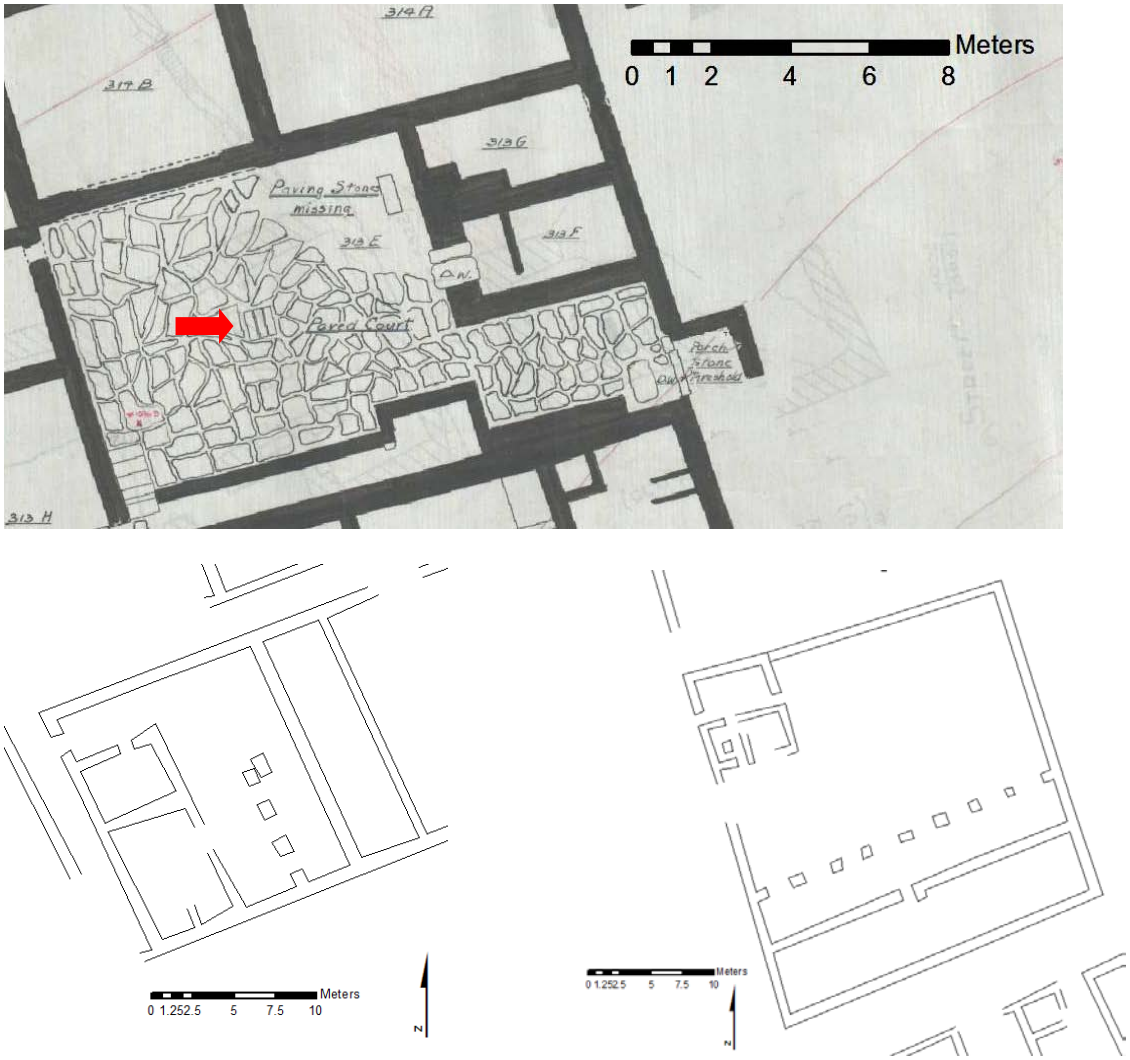


Figure 5.9. Examples of potential use of pillars in roof support. Above: placement of what might have been a pillar base in a paved floor (image from the Kelsey Museum archives). Below: two structures located in area KAE with multiple pillar bases (images from Barnard survey map).

For all domestic architecture in Karanis, the largest identified span that supported a living surface above was 5.27 meters wide, in house C118, itself a rather anomalous structure compared to the other Karanis houses (see figure 5.10). A single larger example is found in room R of Property C63, where a width of 6.41 meters was roofed. However, this is not a typical domestic structure and hence falls outside the category of privately owned and inhabited architecture: in fact the Michigan team identified it as army barracks (Husselman 1979:55). The

room is also unique in having no discernible room above it, although the rest of the barracks building did have upper story rooms. Essentially, the area above C63R was inaccessible, so this large ceiling span did not have to be engineered to produce a stable load-bearing surface above.

Figure 5.10. Detail of C layer Map, detailing rooms of C71, C63, and C118, three of the widest roof spans in Karanis.

While width may have been limited for Karanis rooms, there is no such structural demand on relative length. In theory, rooms could have been built as long as property space would allow. Therefore it is interesting that nearly all Karanis living spaces have a high degree of convexity, restricting length in respect to the relative width, rather than attempting to increase the area of living spaces by creating oblong rectangular rooms. In fact, the average convexity for Karanis rooms is a little higher than 1:2 (.58), reaching an even higher ratio of .704 if only living

spaces are counted instead of including stairways and other obvious passages, the reasons for which will be examined shortly.

When one examines the convexity of spaces within Karanis houses rather than a relatively even distribution, there is a marked and seemingly intentional break between high and low convexity. This distinction maps almost directly onto the separate categories of living space versus passageways (see figure 5.11 below):

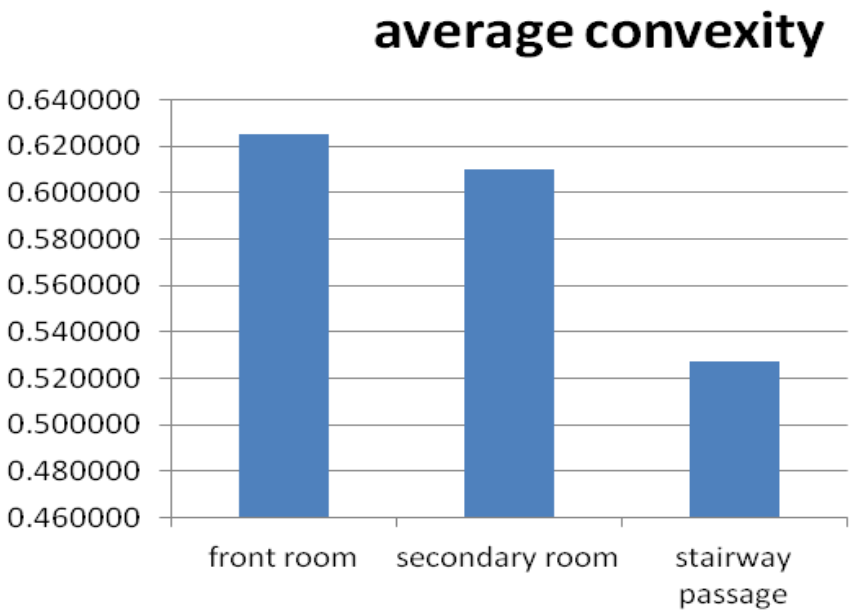


Figure 5.11. Convexity is out of a total possible 1.000 (1:1 ratio of width versus length). While the two types of living spaces are roughly equal, stairway spaces are much more narrow and oblong.

Access and social interactions in the house: space syntax analysis

Thus for many reasons of engineering and cultural preference alike, Karanis houses and their rooms were fairly limited in size: the average floor-plan for a house is only 90 m^2, and even if estimates are extended to include the area of the basement and upper stories, living space

was still highly restricted. The majority of houses in Karanis area KAC (67%, n=66 for the C level) consist of only three rooms per story: two living spaces, generally with high convexity, and a central staircase unit that included through-access between both rooms. Some houses showed elaboration on this basic design, adding extra rooms to the floor-plan, but these were most frequently narrow storage-spaces rather than extra convex living rooms.

Stairways and passages

In terms of connectivity, Karanis stairways have the highest values of any given house space, and not only are connected to multiple rooms but usually exert high direct local control over every other given space. Nearly all passageways in Karanis houses are in fact formed as part of stairways. As mentioned above, such passageways are usually narrow and restrictive, as the design of the room relies on a substantial central core, usually about one meter squared, supporting the weight of the stairs. Individual straight flights of stairs rise up around the sides of this square or rectangular pillar, which is itself potentially synonymous with the *obeliskos* of papyrus P.Oxy 24,2460 (Lobel et al 1957, Husselman 1979:77). Depending on the pitch of the stairs and the height of the stories (figure 5.12), stairways may take three or all four sides of the pillar to reach the next level; if three, it leaves one side as a level hallway as the connection for access between rooms on the same story, if all four sides are used than only a small landing remains for same-floor access or the small space of a single landing for same-floor access.

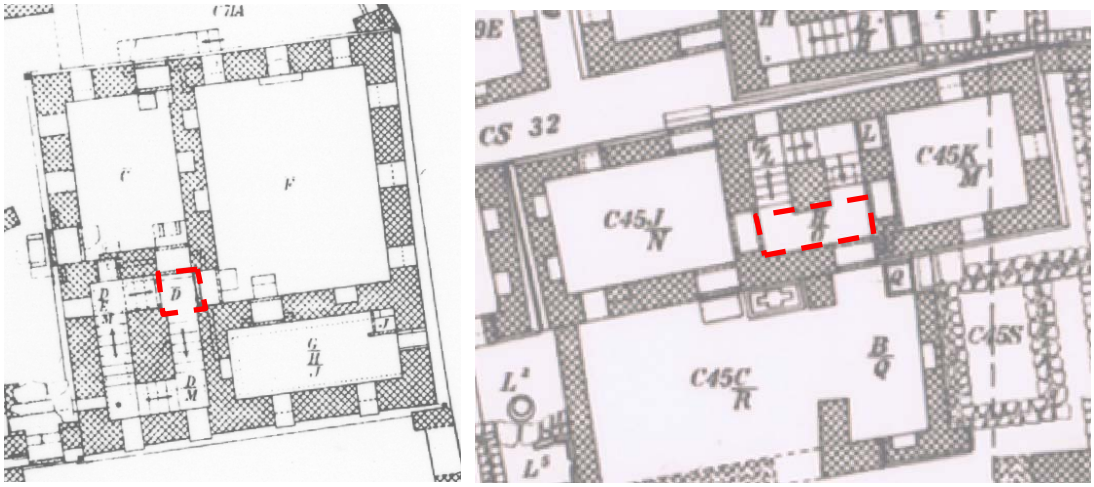


Figure 5.12. Images from the Michigan maps showing the two major types of stairway passages: "landing" and "hallway" type.

These narrow areas represent a vastly different strategy for connecting spaces compared to the traditional Roman *domus*, which had a central distributive core of wide and directly-connected convex living rooms which provided access through the house (see figure 2.10). It also differs from the villa house type known in other parts of Greco-Roman Egypt, where a central unroofed courtyard (*aithrion*, see Husson 1983) served as the central core of household activity and access (Nevett 2010, Grahame 1966). The narrow passageway seems so standard to Karanis houses that even the few examples which are not directly attached to a stairway were still designed with similar convexity (see figure 5.13 below), suggesting that it was in fact an accepted design rather than regretted but necessary spatial compromise.

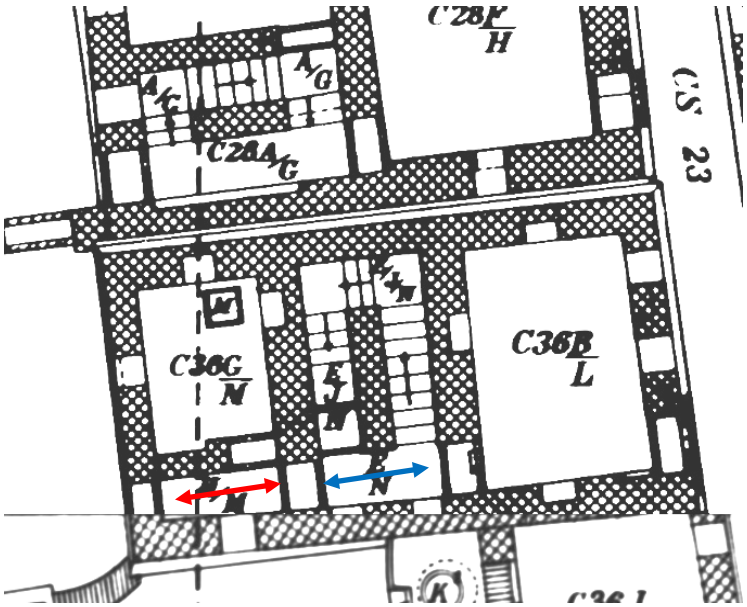


Figure 5.13. Plan of C36. Note passageway F (red arrow), which is independent of stairway passage E (blue arrow) and even separated by a threshold.

Of course, room use and convexity are also linked to relative scale and size of the space (see again figure 3.15). This may explain the relatively high convexity of stairway passages of the corner "landing" type, which are often square in dimension (average convexity approaching 1) but with an area only large enough to hold a single person (the average is less than 1 meter square). In this instance, despite high convexity, it is likely not a social space. However the reverse is not true: there are very few examples of oblong roofed spaces large enough to contain social interaction between multiple agents. This suggests that the decision to create convex rooms for social interaction was in fact intentional.

The importance of the staircase as central to access throughout the house is often overlooked, most likely because the simplicity of most Karanis floor-plans makes it appear insignificant: if the average house only has three rooms including the stairway itself, how many permutations can possibly exist? However, even in extended floor-plans with extra rooms, the staircase remains central to access for most spaces, and in fact the few examples of houses that

originally had complex “ringy” access were adapted over time to restrict all traffic through the stairway again.

It is also important to remember that even in these simple tripartite house plans, the staircase is a central distributive space by nature of its connection to upper and lower stories, thus immediately multiplying its significance as a connecting and controlling space (figure 5.14). The importance of the staircase has been previously noted as a method of controlling privacy in upper floor living spaces, most notably Alston (2002:54-5). However, his assessment that “access within the upper stories was organized on a linear rather than a clustered basis” (op. cite 2002:57) is incorrect: while they have a limited linear access (particularly on the ground floor), the stairway itself is definitely a cluster that controls not only access between levels but also frequently serves as the only point of access to each room along this non-ringy floorplan , or even in otherwise ringy ones, as with property C51 (figure 5.14).

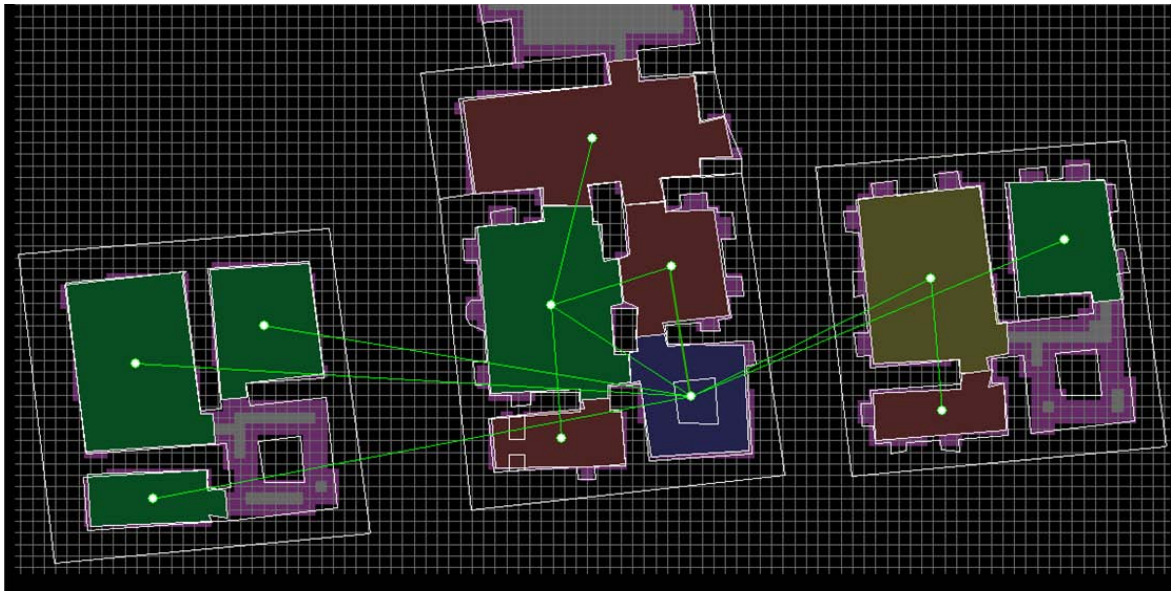


Figure 5.14. Depthmap image of the house in Property C51, C layer. Colors show connectivity values: red is a low value (1) and blue is the highest, most connective space (here a value of 7).

The nature of "privacy" in Karanis houses is thus best discussed in terms of potential interruption: no one is using them for through-traffic, so an occupant of such a space is likely to remain undisturbed. In contrast, Karanis houses typically lack the sort of privacy that is associated with *deep* spaces: the stairway preserves high degrees of connectivity and symmetry rather than creating spaces that are isolated from the rest of the system. The result for Karanis houses is a collection of separate rooms that could be used for either private or social occupation with little chance of casual interruption, although upon exiting these private spaces one is immediately within the busy, potentially crowded stairway that is central to movement throughout the house. This plan thus maximizes the potential for privacy in each space without isolation from the larger system: every space is well-connected and easy to access, with no single space being significantly "further" in threshold depth from the others.

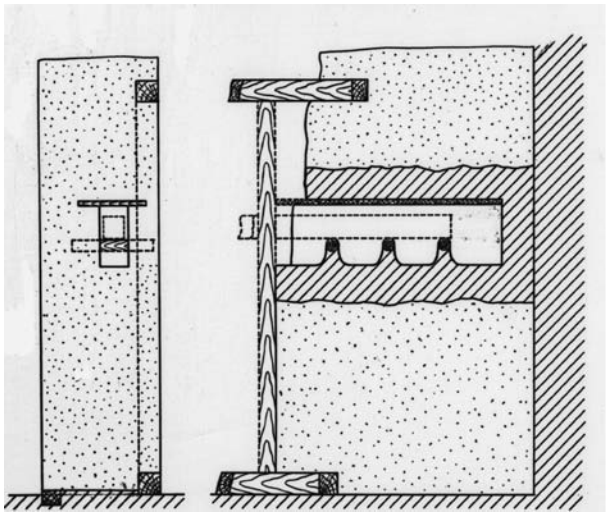
Front rooms

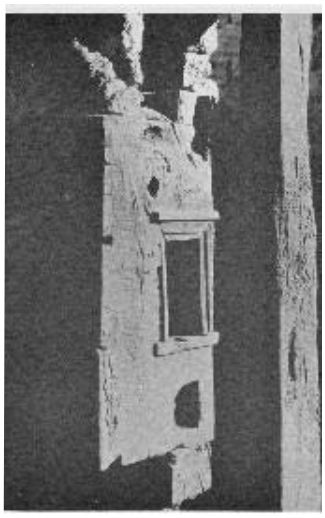
Karanis houses were entered from the exterior through a single "front door", typically into one of only two major living spaces per floor. Some Karanis houses had extra interfaces between the exterior and interior worlds, often "back doors" from a secondary living space (ie other than the front room) that frequently led to a private courtyard space on the same property, rather than to a public street. These were therefore likely to be reserved for less formal use by members of the household as opposed to visitors coming from outside the property.

Front rooms thus created linear access into the house, and most commonly had a connectivity of 2, including the front door as a threshold to the exterior, and the second space, (usually the stairway). Although we have already discussed how stairways had direct local control over a higher number of spaces, the front room had enormous potential for controlling

access within the entire house, or possibly barring individuals from entering or exiting altogether. It is therefore worth noting that on papyrus P.Oxy2406, the corresponding space is labeled a *pylon*, a gateway, suggesting the room's importance in facilitating and potentially monitoring access, as was widely assumed of traditional Greek houses (see again figure 2.16). Physical impediments including doors with bolt-mechanisms were well-attested, further suggesting that this area could be used to limit access.

It is also significant that where examples of door bolts were preserved and excavated, the example from the front door was often particularly decorative, with the bolt case including a temple façade (figure 5.15). Other examples of the period show bolts shaped like lions. These symbols suggest various aspects of religious protection of thresholds (Arnold 2003:75) and a potential socio-cultural link between the practical physical control of house access and the autonomy and protection of the household. Less decorative door bolts commonly existed not only in front rooms but throughout house plans.





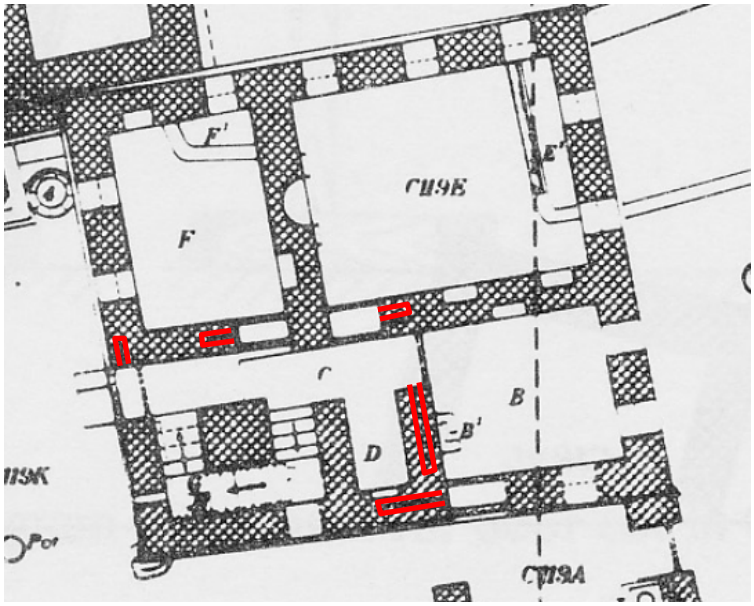


Figure 5.15. Above left, line drawing of the door bolt resting in its channel inside the house wall. Above right, decorative exterior case for the door bolt, here in the shape of a naos. Below: house C119, with door-bolt channels located in nearly every doorway, here outlined in red for clarity.

The convexity of these front rooms, in addition to the high frequency with which they included windows for allowing natural light, suggests that such spaces were occupied, but more likely used for household activity rather than formal entertaining space. Later phases for many such rooms were adapted to include storage bins and other features previously common to exterior courtyard spaces.

The connectivity of front rooms and the overall control they exert over the rest of the house shows that such spaces would have been frequently interrupted by agents "passing through" to other locations inside and outside of the house. This too suggests a certain degree of informality, as if the space served as a transitional area between the exterior world and the more private, contained interior of the house. It would have been used fairly indiscriminately by those individuals entering or exiting the house, regardless of their relative social status.

Front rooms, like the vast majority of interior rooms throughout the Karanis house, were finished with a simple plaster and black wash, frequently with horizontal white lines following the mortar of the brick courses (figure 5.16). While all instances of further wall decoration are extremely rare (only nine structures have preserved examples for the entire KAC area), it is more common in deep spaces rather than front rooms, the latter appearing to have been more simple and utilitarian in design. Even in the rare instances where front rooms are decorated, they are usually trumped by more elaborate schemes in the secondary rooms of the same houses: house C119, for example, seems to have had a front room with a rather simply-drawn scene of grapevines which pales in comparison to the elaborately-decorated semi-dome niche which must have served as a shrine in the secondary living space.

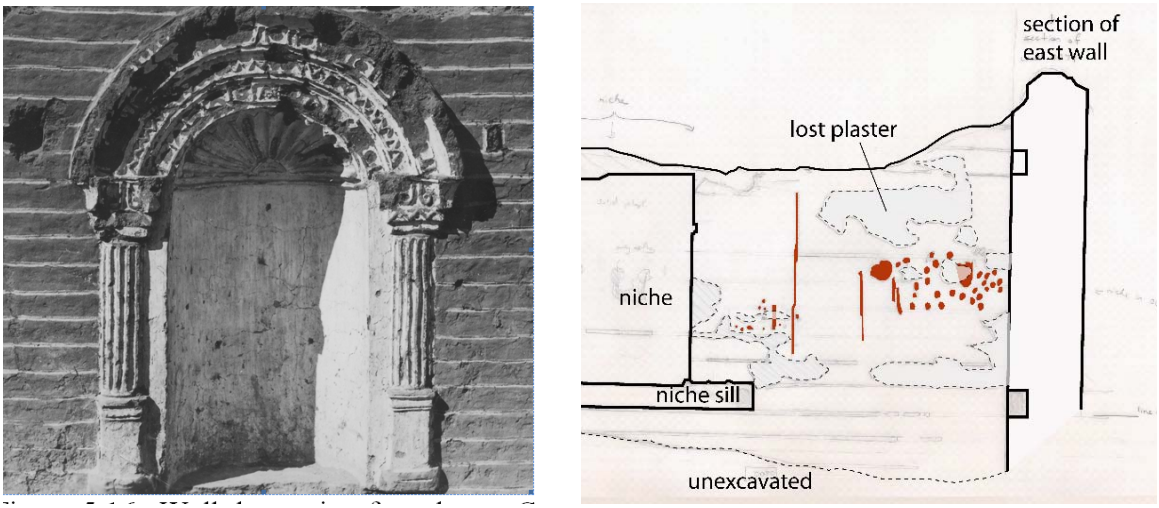


Figure 5.16. Wall decoration from house C119. Left: decorative niches are a very exclusive form of decoration, limited to secondary living spaces of the largest houses, but the white horizontal stripe on a black wash is standard for most Karanis interiors. A few houses do have less formal painted designs, often described as graffiti: for example, Right: the "grapevines" in red paint on the northern wall of C119B. (Photograph A from the Kelsey Museum Archives, drawing B from 2007 excavation, B. Simpson.)

Deeper rooms: privacy, exclusiveness, and social display

Compared to the front room with its relatively high degree of control, other living spaces in Karanis houses were frequently limited in terms of access to a single door from the stairway: this means that they were essentially dead-end spaces (connectivity=1) within the house access system, as the way in was also the only way out. While this made them highly susceptible to being blocked from the outside, they were also much more private space than the front room's busy through-access. These spaces were therefore likely to be more formal or specialized in use than the multi-purpose front rooms, as one only had to enter the former for the specific purpose of occupying it, rather than just passing through.

Significantly, these deeper rooms are frequently more richly decorated than front rooms: about 71%[4] of all known interior wall decoration comes from deep spaces rather than front rooms, suggesting the former may have been important areas of social display, for the entertaining of visitors and other important guests. Examples of decoration for such rooms in Karanis often include religious imagery (El-Nassery et al. 1976, Maguire et al. 1989, Clarke 2003, Rondot 2013). Several instances of wall-paintings depicting pagan deities are known (for example see top image of figure 5.17) as well as more abstract but potentially cultic symbols (Husselman 1979). There is also a notable example from Karanis which may in fact be a Coptic cross, and several examples of decoration including grape-vines have been suggested to be Christian rather than pagan symbols (See Husselman 1979, Rondot 2013). Elaborately-designed semi-dome niches were built into the walls of some rooms and likely served as religious shrines, though again uncertainty remains if they were limited to pagan practice or used by Christians as

[4] Because the attestation in the KAC area is so low, this statistic includes all known examples for the entire site, regardless of relative location or time period.

well. Overall, both the dates and imagery of most known Karanis examples suggest they were pagan, however the architectural and decorative forms were broadly accepted by later Christian practice and in fact formed the central focus of the Roman basilica and early churches.

Figure 5.17. Top: a watercolor reproduction of a wall painting from house 5020, showing several deities with both Egyptian and Hellenistic characteristics. (Image courtesy the Kelsey Museum archives). Lower left: a decoration from a house interior, with potential cultic scene painted into the niche; additional more abstract representations on wall above. Middle: back of a niche decorated with symbols, potentially including a Coptic (Christian) cross. Right: semi-dome decorative niche of house C119, a type later popular in Roman basilica and later churches. (Photos published in Husselman 1979).

If religious practice in ancient Karanis was considered private and family-based, then the consistent placement of such features in back-rooms as opposed to the front space may be evidence of privacy and protection of such spaces against the intrusion of outsiders. This argument is frequently favored by those wishing to see Roman oppression of native Egyptian cult, or a later strategy of early Christians to conceal their religious practice from persecution (Frankfurter 1998). However, there is not necessarily a need to separate religious iconography from the potential for intentional socio-economic display: frescoes, including religious ones, cost money to commission, and of course there is the broader social role of iconographic and religious imagery as aspects of the *habitus*, expressing the taste, power, and socio-cultural affiliation of the house owner (Clarke 1991).

While overall evidence for elaborate painting and decorative schemes is low in Karanis, its use is consistently relegated to groundfloor spaces. This may be simply a reflection of the lower rates of preservation for upper stories; however extant examples suggest that they were more simply designed than their ground-floor counterparts. Even compared to the few examples of ground-floor wall paintings or decorative niches, none were recorded for upper-level rooms. Upper floors certainly had the cupboard or storage-type niches, which may have potentially held terracotta shrines or other religious equipment (Husson 1975, and see figure 5.18), so it is not impossible that upper stories were used for religious practices, however this type of wall niche was also common to ground floor rooms. Similarly, we should also consider the possibility that *all* rooms were decorated with more portable features—furniture, cloths, etc, none of which would have remained in situ through the abandonment and decay of the town. However, even considering the limits of the preserved dataset, there remains a significant distinction between the

decoration of ground-floors and upper stories that suggests upper stories were less-frequently used as spaces for entertaining guests, and therefore less relevant as areas of display.

Figure 5.18. A terracotta shrine from Karanis. (Kelsey Museum Archives, photo 122.)

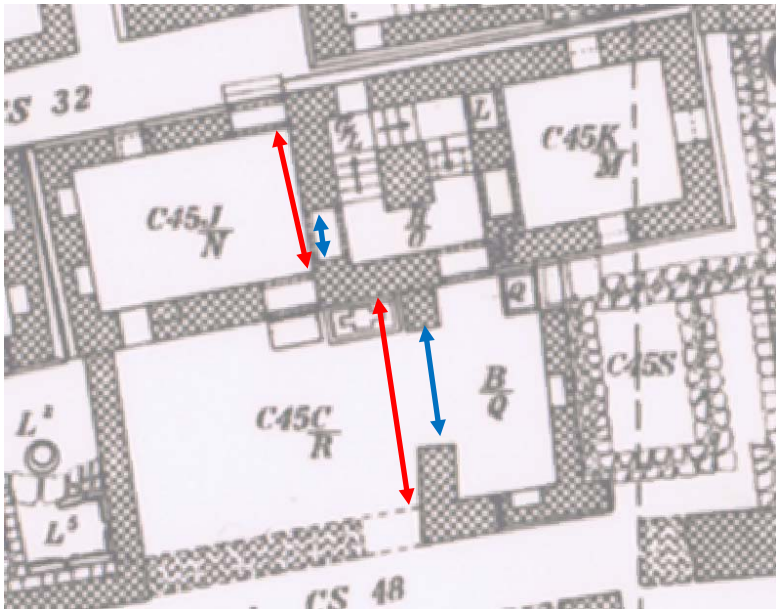
Courtyards and exterior spaces

Outside of the structure of the house itself, few spaces in domestic properties were completely enclosed or roofed: a few animal pens and small areas were known to have roofing over them of reeds or plaster and mudbrick (figure 5.19), but nothing truly structural or significant in load-bearing. A single example may be the paved courtyard space of A313, which had a central paving stone which may also have served as a column base and therefore be evidence of a supported roof. Another example is in a courtyard space in Property C71, where

not only windows but the remains of a flight of stairs suggest not only a ceiling/roof, but even a potential upper storey.

Figure 5.19. Animal pens from a Karanis courtyard, stone walls with wood reinforcement and a mudbrick plastered roof.

Spaces in Karanis courtyards had much lower distinction between convex spaces than in house interiors: compared to the narrow doors and passages of the interior, exterior spaces were often so wide open to each other that dividing them into discrete convex units is essentially an academic exercise, necessary for conducting space syntax analysis, but not highly reflective of ancient attitudes towards spatial organization. Compared to the full length of adjacency between spaces, many courtyard properties have extremely large interfaces, so that the ratio of actual to potential opening length approaches 1 (figure 5.20).



Interior (rooms H and J)

.88/2.39=37% open

Exterior (courtyards B and C)

1.80/3.30= 55% open

Figure 5.20. Compare the length of the total potential for interaction between adjacent spaces (red arrows) to the actual size of the openings (blue arrows). The difference is far more pronounced for the interior spaces of houses than for the courtyards (spaces B and C). This suggests there is less of a desire to control access between courtyards of a single property, although there was still high control and spatial differentiation between interior rooms of a house.

Because so many courtyard areas have high interface ratios and low definition, decisions on how to divide them into separate convex areas are somewhat arbitrary (see figure 3.3). They do not necessarily reflect ancient concepts of spaces as separate. Therefore, rather than closely analyzing the variations in such quantified data, courtyards have been used as an example for more general aspects of spatial organization and especially for the distribution of specific domestic facilities among such exterior property spaces.

Unlike the interior rooms of houses, courtyards preserve many permanent features and installations that help define the actual ancient use of space. Ovens, mills for producing flour as well as olive oil, and open storage bins are among the most common features of courtyards. Small granite millstones of the Theban type (see Cappers et al. 2013:41-42) were portable and not frequently found in situ, but seem to have been common to domestic properties; larger two-

stone installations were also found in association with domestic spaces but may represent economic production beyond the needs for provisioning of the household itself. Such stones were also found associated with properties that completely lacked house-structures and were likely fully economic or industrial properties (figure 5.21).

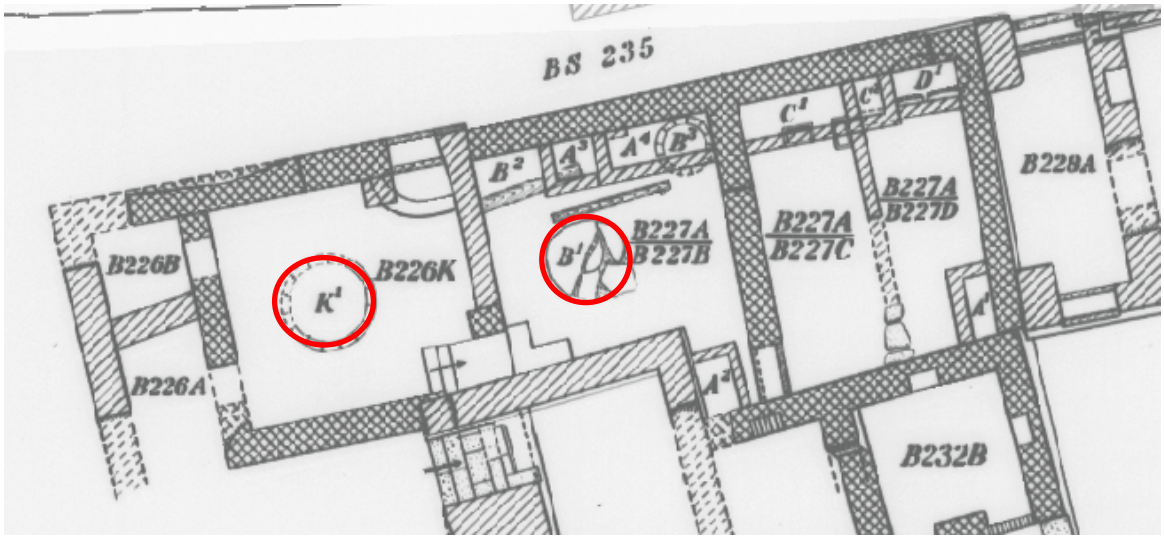


Figure 5.21. A structure in the south of area KAC. This series of enclosures has no discernable roofed space and is not domestic; two of the courtyards held large circular bases for millstones. Notably, this property was directly adjacent to an identified granary property to the south.

Storage bins were extremely common, almost ubiquitous for Karanis courtyards, and multiple bins per property were not unusual. As they were not load-bearing they seem to have been built and changed quite frequently. A few examples of storage bins built on a larger, more formal scale exist for private properties, such as C118 and C86: for C118 the existence of a double wall with C119 suggests that in this case the bins may have been roofed (see p. 188-9). C86 was a complex property but definitely domestic in nature—the bins, ovens, and even olive press all suggest economic productivity, but the property centers around what is definitely a private house (figure 5.22).

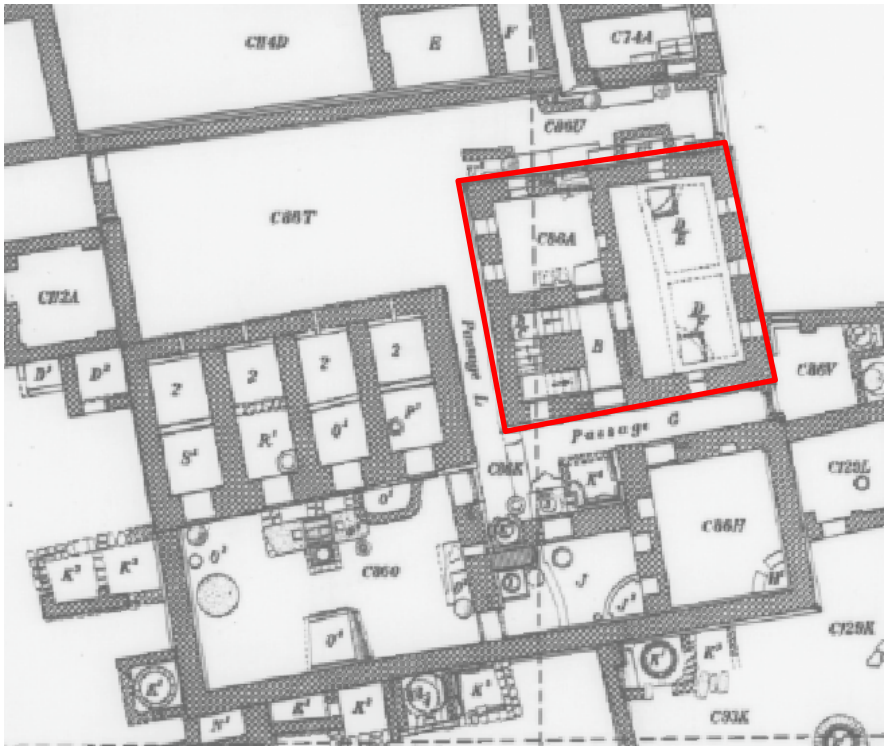


Figure 5.22. Property C86, house outlined in red.

Ovens, like mills and bins, were often domestic installations, although it is possible that some properties were in fact professional bakeries (figure 5.23). Often they were associated with granaries or mill installations, suggesting a centralized bread-production industry. But many private houses also included ovens, circular constructions of either mudbrick or fired clay (figure 5.24) that were likely for baking the "daily bread" of the average Karanis household.

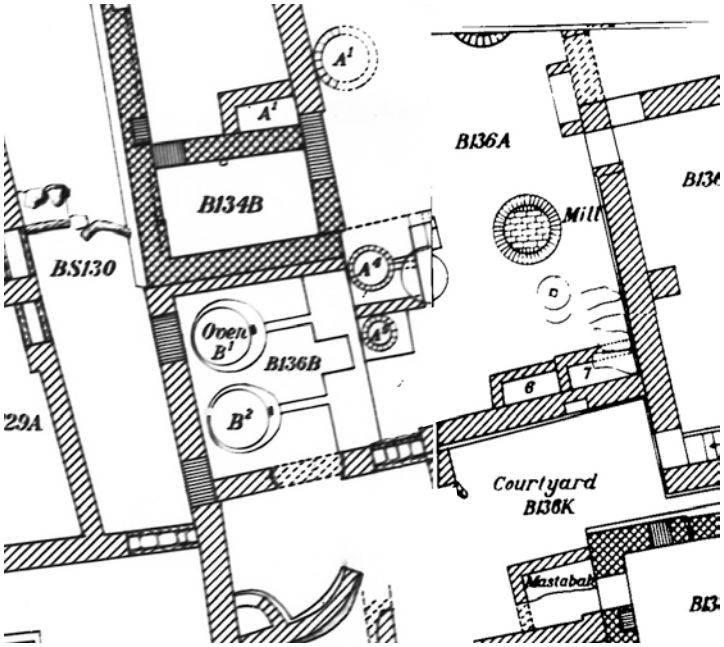


Figure 5.23. The dual ovens of B136 next to the milling courtyard. This property may have been involved in large-scale economic production of flour and breadmaking. (Image courtesy the Kelsey Museum Archives).

Additional cooking installations included balancing a pot above a simple arrangement of bricks to contain heat of a fire (figure 5.24) or a more formal stove-range created by terracotta vessels sunk into a surface with space for fire below. Both types have been included as "ovens" in this study, though indicated in the notes as a separate type. The circular bake-oven was by far more common. Many properties demonstrate two or more ovens side-by-side, although in some cases they might represented different stages of occupation, as second ovens seem to have been built in a way that blocks access to the first. Apparently old ovens were not frequently demolished but left in place (Husselman 1979:50).

Figures 5.24. A bread oven, left, and to the right a cooking installation comprised of mudbricks arranged to hold cooking vessels over small fires (note discoloration from fire and ashes still in situ).

There is apparently no minimum courtyard size for the construction of an oven: a property of only 17 meters square has one, although this small space is an anomaly. Ovens are more commonly found in property spaces of minimally 42 square meters; in contrast over 80% of the properties without ovens are larger than this. Clearly the presence or absence of ovens is due to more than just restrictions of available space. Ethnographic and earlier historical Egyptian evidence suggest that breadmaking may have been a social task shared between those of separate households (Samuel 1999) and therefore neighbors may have had access to ovens on a nearby property. The opportunity to share such access would have had added benefits of economy: reducing the amount of fuel required as only one oven would be used instead of two or more. Overall, the presence of features such as ovens in the courtyards of private properties shows good spatial distribution within the town, suggesting local relationships were important in the daily provisioning activities of the average household.

Figure 5.25. Map showing the distribution of ovens as recorded in the C layer of KAC.

Of course, perimeter-walls would have restricted the access of outsiders to such courtyard spaces. These walls were constant feature for all types of properties, domestic and

economic/industrial, throughout all known periods of Karanis occupation; this suggests that properties were designed to limit access by outsiders through social monitoring by the inhabitants. The use of private baking facilities was likely only through invitation and not extended to the broader public[5].

However, it is not necessary to see walls as obstructive to neighbors: more likely they were designed as measures against broader intrusion. The presence of animal pens and feeding troughs (Husselman 1979:52-53) in domestic courtyard spaces indicates that property walls were also essential in the management of a household's livestock. In such a case, the integrity of enclosure walls could be a necessary strategy for preventing animals to escape altogether. Walls also have more functions than simply barring human (or animal) access: they are essential components in managing spatial environments so they are practical suitable areas not only for general habitation, but for the performance of specific tasks. Even outside of the house itself, walls protected the privacy and comfort of individuals working in the courtyards: they must have blocked the dust, as well as noise and prying eyes, that could potentially have invaded from the street. They were also essential for blocking wind and limiting the intrusion of windblown sand that was a major problem throughout the city and a major factor in street level rise (see chapter 4). Additional structures were built to aid this, especially windscreens surrounding entryways. In areas that were used for the threshing and processing of grain into flour, walls were essential to prevent interference by wind: such spaces were often enclosed by additional walls to create further protected environments. However, no single strategy seems to have

[5] The degree to which separate properties were connected by means of access will be discussed in further depth in chapter six.)

proved wholly effective, and sand and debris ultimately collected everywhere (Husselman 1979:8).

Property walls were also essential in preventing intrusion and damage to private property. The street traffic of Karanis could be particularly intrusive: apart from blocking the dust that must have been stirred up by cart and foot traffic along the unpaved roads, there is evidence that private properties needed strong physical boundaries to prevent damage from individuals seeking shortcuts across unfenced land. For properties situated at busy intersections, "cutting corners" seems to have been a concern, as many properties constructed extra defenses including stone blocks and wooden beams were set into walls where street traffic came particularly close, apparently as a strategy to limit erosion and damage of mudbrick (figure 5.26) from the constant contact of passers-by.

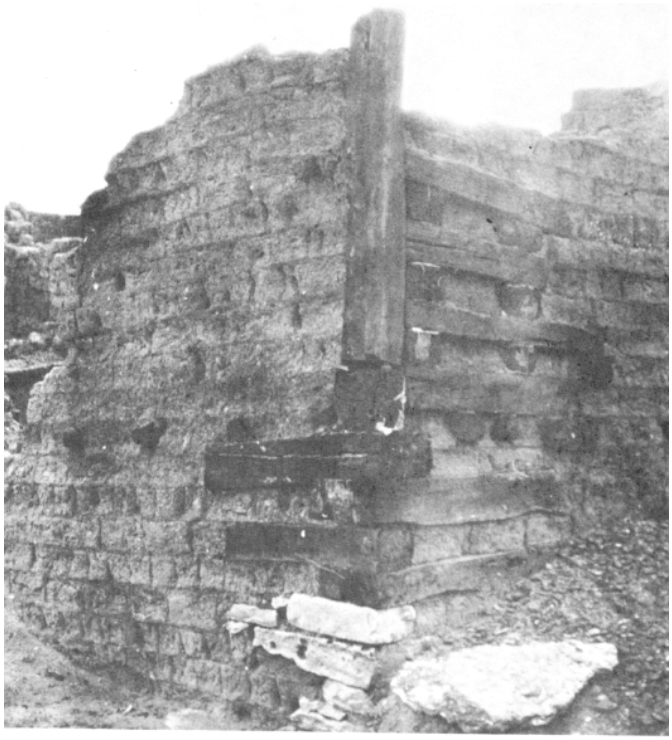


Figure 5.26. Photograph from the Michigan excavation of the stone and wood corner protection on house C5024.

Towers, villas, and other types of properties

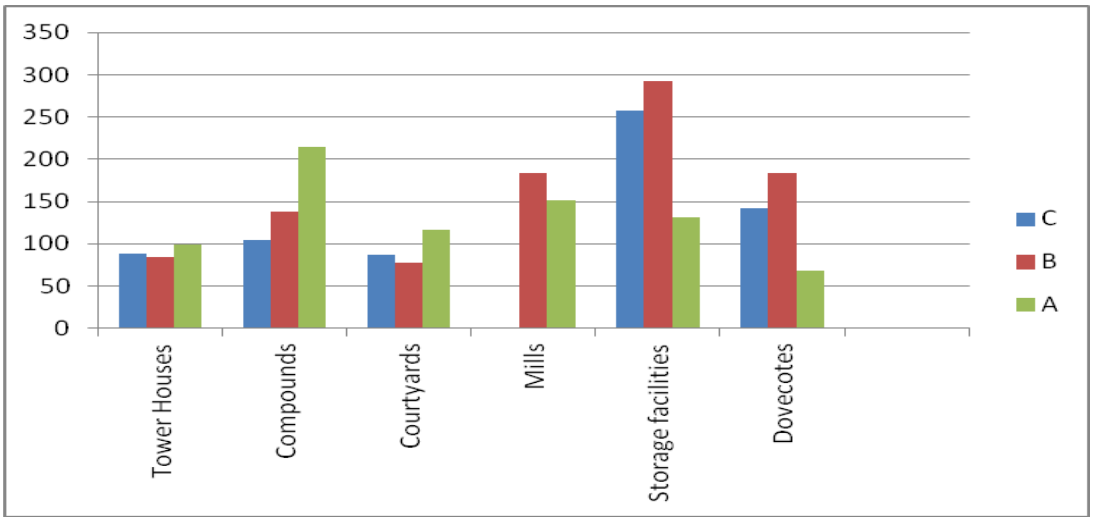


Figure 5.27. Chart comparing average property areas according to types.

Although tower-house properties of the type discussed here make up more than 60% of all known properties for Karanis, they are far from the only type identifiable. Other types of properties existed, each with their own strategies for organizing space according to the social and practical needs of their inhabitants. These strategies varied even within the category of domestic properties, as well as for economic and other less-private holdings. Of the several types of properties observed in the Karanis architecture, the other potential domestic types are:

Compounds

"Compound" is the term I have given to describe properties that have no discernible tower house structure, but still contain evidence of interior roofed spaces, and potentially even multi-story access, as most compound properties include a stairway. They remain distinctive from the tower house designs in that they lack a unified compact floorplan of enclosed space;

certain areas within this 'house' construction may in face have been unroofed central courtyards, the *aithria* attested in documentary papyri (Husson 1983, Nowicka 1969, and example from Gohran), and these properties may therefore be examples of a more traditional Hellenistic villa-type of domestic construction.

Courtyards

This type of property lacks a definable house-structure, though still frequently has spatial aspects similar to courtyards of house-properties, in the arrangement of storage bins, for example. These are often closely associated in the topography and general layout to a known house structure: for example B154K, a courtyard associated with an adjacent house (see figure 4.16). Although house and courtyard have separate street entrances, they appear to have been owned as part of a single ancient property.

Towers versus villas, and villas with towers

We have seen the effectiveness of the Karanis tower house in creating a well-connected system of house access by means of a central stairway. However it is not the only method for obtaining such results: the villa plan, as known from other Greco-Roman sites throughout Egypt and even in the Fayum (Davoli 1998, 2011) is effective in maintaining similar access plans, using the central courtyard (*aithrion*, cite Nowicka 1969, Husson 1983) as the major distributional cluster to the other interior spaces (figure 5.28). The villa model is, however, more difficult to adapt over time to increasing spatial needs; as the central courtyard is enclosed on all sides it cannot be expanded with the addition of adjacent space. There is also less information known about the potential upwards expansion of villa structures: some may have had "further

accommodation above some of the ground floor rooms" (Nevett 2010:46) but this is speculative rather than attested in extant examples. In contrast, the tower house may have proved a more flexible model in adapting to changing circumstances over time.

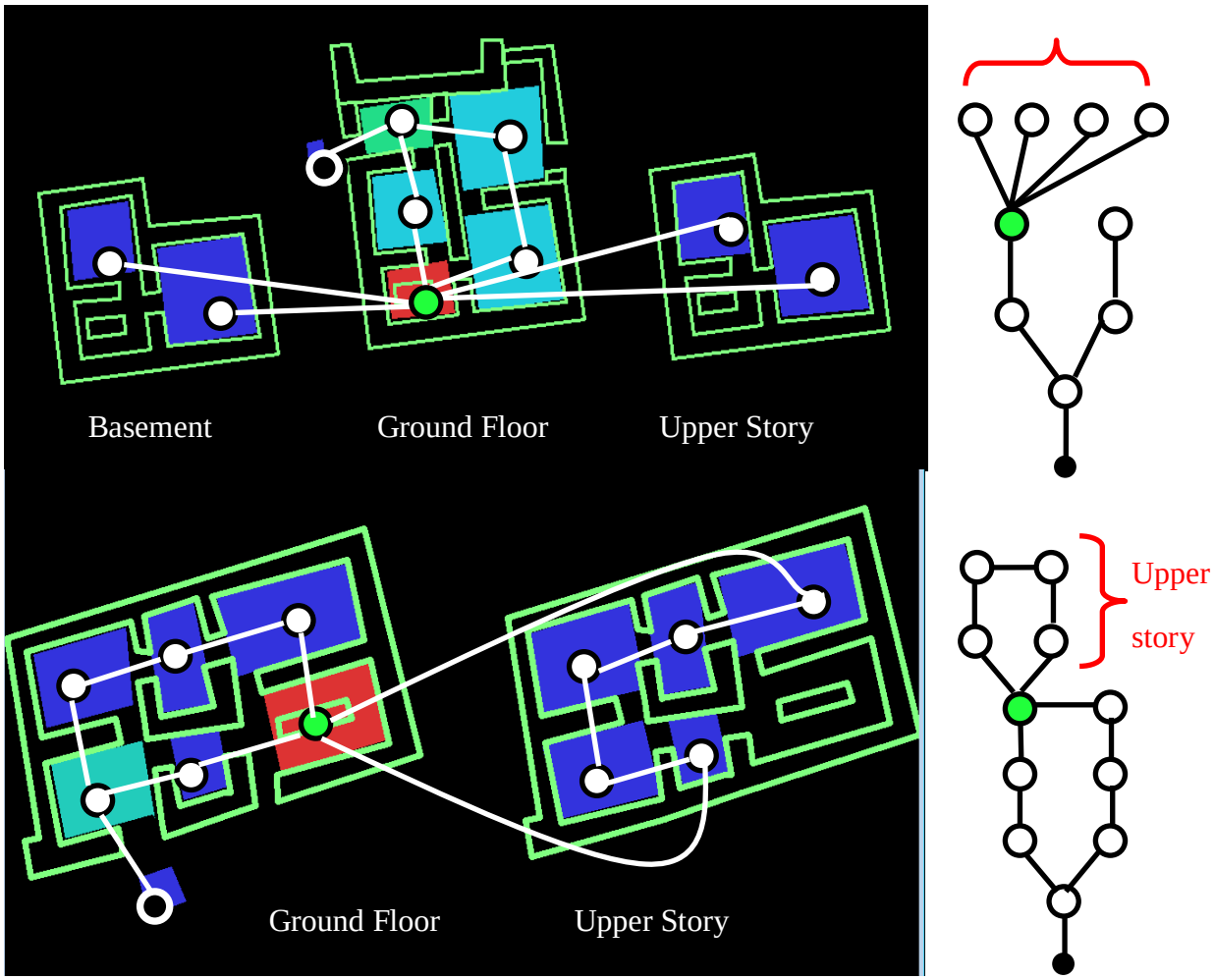


Figure 5.28. Comparisons of a tower house (above) and villa house (below). Depthmap images show connectivity, with blue being the lowest value (=1) and increasing to red for the most connected spaces. Note the linear nature of the tower house compared to the rings of the villa's access plan.

Because they are largely a feature of later Karanis layers, many potential villa structures are poorly preserved, to the point that it can be difficult to identify many non-tower properties as domestic at all. Many resemble complex exterior courtyard systems but often lack features such

as ovens and storage bins, though this does not preclude the possibility that these spaces served domestic functions. Evidence for interior space is limited: the occasional preservation of a window suggests the necessity to illuminate an enclosed, roofed space. The most important indication of roofing and interior space among these potentially domestic compounds is the presence of a staircase, proving the existence of at least one small upper-level space, even if the width of many ground-floor rooms precludes the possibility of creating load-bearing roofs. As staircases were compact and well-built in order to provide structural support, they are the only consistently-preserved evidence that such properties had roofed spaces at all; therefore they are the essential criteria by which I have distinguished villa "compounds" from other simple "courtyard" properties.

Even if the properties are accepted as domestic, determining their significance in contrast to the tower-house models remains difficult. Villas are traditionally considered the prerogative of the upper classes[6] as they require larger property area than the compact footprint of tower houses. However, in Karanis the villa type remains almost wholly absent in the earliest phases of the settlement, even though the town was prosperous and in fact expanding, so property was readily available to facilitate the construction of such sprawling buildings. Indeed, the largest known tower-houses are very comparable to villas in terms of maximum interior space (figure 5.29), and far larger when comparing overall property size (see figure 5.27 again to compare the average property sizes). Therefore the so-called villas of Karanis must represent more than an economic distinction but an entirely different attitude towards spatial organization and social practice as well.

[6] Vitruvius VI.5.1 and see chapter two

Figure 5.29. Tower-house C71, at left, has a floorplan of 103 square meters and a total property space of 390 square meters; the villa house property (C142) to the right is only 123 square meters total. (Images courtesy Kelsey Museum Archives.)

The compound type certainly became more prevalent by the A layer of Karanis, when the KAC area of the town in particular seems to have drastically changed with respect to architectural style and social use. They are possibly reflective of economic shifts in Late Antiquity, as agricultural practices turned towards consolidated estates rather than individual ownership (Bagnall 1993, see also Alston and Alston 1997:209) and thus represent a growing distinction between elite architecture and the more common tower type. However at present there is simply too little evidence to corroborate this idea.

Textual reference to houses with both a courtyard (*aithrion*) and a tower (*purgos*) do exits, as well as properties with two or more towers, *oikia dipurgia* or *oikia dipurgiaia* (Husson 1983:251). This suggests that the staircases like those in Karanis compounds may have led to tower spaces, increasing their total available interior domestic space. However the towers

included in villa properties must necessarily have been different in terms of spatial organization to the tower houses, as the former is simply part of the larger house-space, a feature of the oikos but not central to the house itself. Therefore there are documents that specify towers as areas of dedicated or limited social use (Morris and Papadopoulos 2005). Such towers are also unlikely to have had complex floorplans but had very limited room divisions, owing to the structural design of the ground floor rooms below.

In contrast, the tower-houses as defined by the Karanis examples are not simply part of the house, but the entirety of house itself, plus additional exterior courtyard space. All interior domestic space is united in a single structure that is (as we have discussed at length) a complete, freestanding, independent and indivisible unit.

Non-Domestic Properties

As mentioned above, some doubts remain that the "villas" of Karanis were even domestic, but perhaps represented properties with more diverse social characteristics. There are many examples of properties that consist of exterior space and have no evidence of a house, lacking the stairway feature common to both tower houses and villas alike.

Areas dedicated to economic production are not necessarily separate from domestic properties: the very origin of the term economics in Greek (*oikonomia*) should provide the reminder that a great deal of ancient production activity was centered around the house and household (Nevett 2002, Sheridan 1998, Zarmakoupi 2013). However, there are some properties that take production beyond the level of the household and engage in what can only be considered specialized for-profit activity on a scale that transcends household production.

Examples include milling compounds, pottery production, and storage facilities. Because these facilities are not organized around domestic life but a larger, more public relationship with a broader public of workers, clients, and suppliers, these properties are not included in this study as examples of domestic spatial organization, and do not factor into the statistics of space syntax analysis. They are, however, included as illustrations of the different strategies Karanidians employed in the organization of domestic and public space, proving that they indeed actively considered such properties as existing in different social categories. The most common types for Karanis, storage facilities and dovecotes, are described below.

Storage facilities

Storage structures, or "granaries" (Husselman 1952 and 1979) are identifiable by a very formalized (and similar across all known examples) floorplan of storage bins, often constructed with great attention to structural stability and the protection of discrete storage units. They are by far the most common non-domestic property type attested at Karanis, and represent about 13% of the overall property area of KAC during the first and second centuries CE (C layer of excavation). These "granaries" in Karanis were not only used to store grain, but various agricultural products including safflower (Cappers et al 2013), and they should therefore be more correctly referred to with a general term, such as "storage buildings" or warehouses. The importance of precise and nuanced use of terminology has already been discussed in relationship to Michigan's "houses", including notable errors where granaries were interpreted as private houses (Alston 2002:57). The ancient Greek texts refer to them as *thêsauroi* (Husson 1983, Tassinari 2009, and Pernigotti 1997), in Latin they would be considered *horrea* (Cappers et al 2013:44).

While storage complexes often do include house-like constructions of rooms and staircases, they are not identical to domestic properties in either construction or likely use. In fact they show a far different attitude towards spatial arrangement and organization: house-like units area invariably built attached to the storage bin portion of the structure itself, sharing a wall in way that purely domestic constructions very rarely do. This shows that they were originally designed as an inherent part of the warehouse, not a later addition or in any way separable from the bins. While they were possibly used for occupation, perhaps by the owner or overseer's family, they could never be separated and sold from the more economic sections of property.

The largest warehouses (C65, C123) are often assumed to be state-controlled granaries (Husselman 1952) for the collection, storage, and shipping of Egyptian grain. There is certainly a high degree of regulation and oversight apparent in their design, so much that the plans of large storage structures are nearly identical not only across Karanis, but across the northern Fayum (Davoli 1998, Tassinari 2007, and Pernigotti 1997). Compared to domestic properties, they were held to more strictly controlled norms of spatial arrangement, and the organization of the structure is not oriented around the house but the control of access to storage bins.

Elinor Husselman's work on the Karanis "granaries" in fact agrees that there must have been a distinction between some major economic granary structures and other examples that were purely examples of domestic properties with storage. Properties C118 and C86 (as previously discussed) seem to be just houses with bins, well constructed and similar to granary models (Husselman 1952:58) but private in use as opposed to either the civic or commercial uses of larger granary complexes such as C65 and C123. In contrast there are properties that both lack the 'domestic' area of the larger granaries (C101/113) and seem less formally designed overall: these structures may have developed over lengthy periods rather than been the

intentional planned constructions of C65 and C123. In Karanis East (KAE) recent excavations have examined an additional granary that was in use in the Late Roman period (unpublished report of the 2012 URU season), which demonstrates considerable expansion over multiple phases of development. Further comparison to the less-explored KAC examples may clarify various strategies for the organization and alternation of such structures.

Dovecotes

Pigeons and doves (Husselman 1953) were raised in specially-constructed towers, usually free-standing, but with no interior space for human habitation (the average interior floorspace of a tower is 8 m^2) but for the nesting of birds (Husselman 1953). They are only infrequently located within house properties, but usually in association with granaries (C63, C101). A few properties seem to have been designed around the dove-towers themselves: C92 is such an example, and C37 includes three towers, although both properties also include enough bins to possibly designate them as small storage facility constructions (Husselman 1952:58).

Of all of these property types, tower houses are the most consistently attested type of property, although in the A layer they decrease in popularity to be about equal in attested numbers to compounds and properties.

Number of Properties per layer, sorted by type			
	C Layer	B Layer	A Layer
Tower Houses	81	43	18
Compounds	4	8	22
Courtyards	19	19	19
Mills	0	4	2
Storage Facilities	9	5	1
Dovecotes	5	2	0
Unknown type	5	0	0

Figure 5.30. Chart of number of each property type for area KAC, by layer.

On average they have a relatively low property area (see figure 5.27), especially compared to the economic properties of mills and storage facilities, however they consistently outrank these non-domestic properties in terms of overall area per layer (figure5.31).

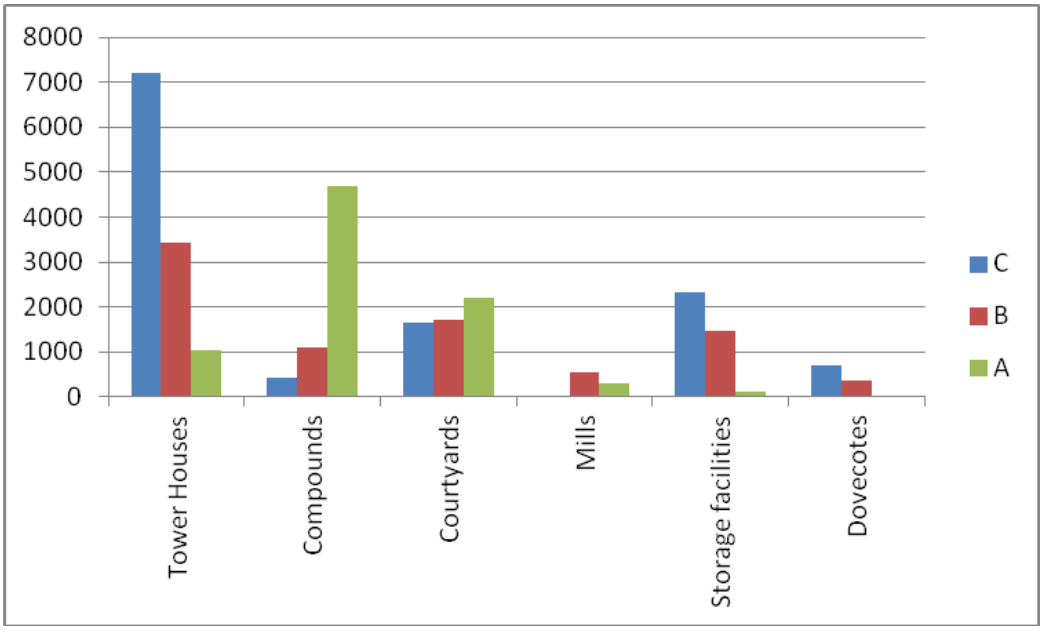


Figure 5.31. This shows the total area of all identfiable properties by type, for each of the three major layer of Karanis.

Development of private property over time

At its greatest extent in the C period, KAC was 17,726 m². Of this, 73% was taken up with private property. By the B period this had fallen to 53%: many of the properties had apparently fallen vacant, with the perimeter walls buried under the accumulating sand and debris (Husselman 1979:8). After a period in which much of KAC must have been abandoned, the few structures left above the sand were incorporated into new buildings, resulting in the different architectural style of the A layer. At its final stage, the KAC area was apparently only 55% privately controlled; the rest was left open to public use as various open areas and marginally-defined streets. However, as previously discussed in chapter four, this does not necessarily reflect a broader trend towards the progressive constriction and abandonment of Karanis, but a localized change in spatial organization that does not reflect the developments in the town as a whole.

There is in fact a decrease over time in the use of tower houses: compared to the 81 examples from the earliest C layer, only 43 of these were in use by the subsequent B layer, and there were no new tower houses constructed in that time. There is also an increase during the B level in the number of unidentifiable property types, although this is at least partially the result of uncertainty from low preservation rather than a marked change in the overall architectural makeup of the town.

The variety in the B layer may also be due to the palimpsest of the town environment, wherein properties were adapted to changing spatial needs rather than designed to fit a particular need. Thus the emerging "popularity" of compounds and courtyard properties may simply be evidence that individuals were adapting whatever space was available and making as few

changes as necessary to adapt to their own needs. As previously discussed in chapter 4, the B layer of occupation might best be characterized as "making do" with the extant built environment, adapting pre-existing structures when necessary, but doing little to redesign or reorganize on a broad scale. The increasing restriction of the public street access seems to have led to an increase in local measures of control, concerns for both protecting access to one's own property and limiting the access of outsiders.

The A layer, in contrast, having followed a period of abandonment during which most structures were buried under windblown sand, presented a virtual blank slate for the intentional reorganization of area KAC. This clearly included a return to some earlier standards: tower-house construction recommenced after a few hundred years of absence: although in use in the B layer, tower houses had not been built as new since the C layer. This resurgence in domestic architecture suggests that KAC was a functioning residential neighborhood, even if other structures in the area seem to indicate an increase in industrial or economic function for the area.

Unfortunately the low level of preservation, not only for the architecture but for associated material finds, makes it difficult to come to any conclusions about structural function in the A layer, or to interpret spatial organization in terms of accessways and connectivity of spaces. However, the structures are preserved well enough to make for interesting comparisons in terms of property size and typology: compounds are twice as popular as in earlier levels, constituting 22 of the known properties for the A layer compared to a total of 12 for both the C and B layers within KAC. Some A-layer compound "villas" reached as much as 435 square meters in ground floor area; the average value, 248 meters square, was almost 200 m^2 more than the earlier B layer average.

It is clear that the A layer represents a marked shift in area KAC: even when using old

architectural forms like the tower-house, the methods of construction and structural engineering did not follow the previous standards. Walls of the A layer were frequently abutted rather than adjoined (figure 5.32). Brick placement became more irregular and spaced more widely, and several structures included bricks reused from earlier phases of construction, resulting in buildings of varied color and composition. The changes were not merely cosmetic: the sharing of support walls became more common, suggesting that adjacent properties were engaged in localized social agreements that resulted in interdependency rather than self-sufficiency (see Glanville 1939). Thus the change in Karanis architecture necessarily must have reflected a social shift as well.

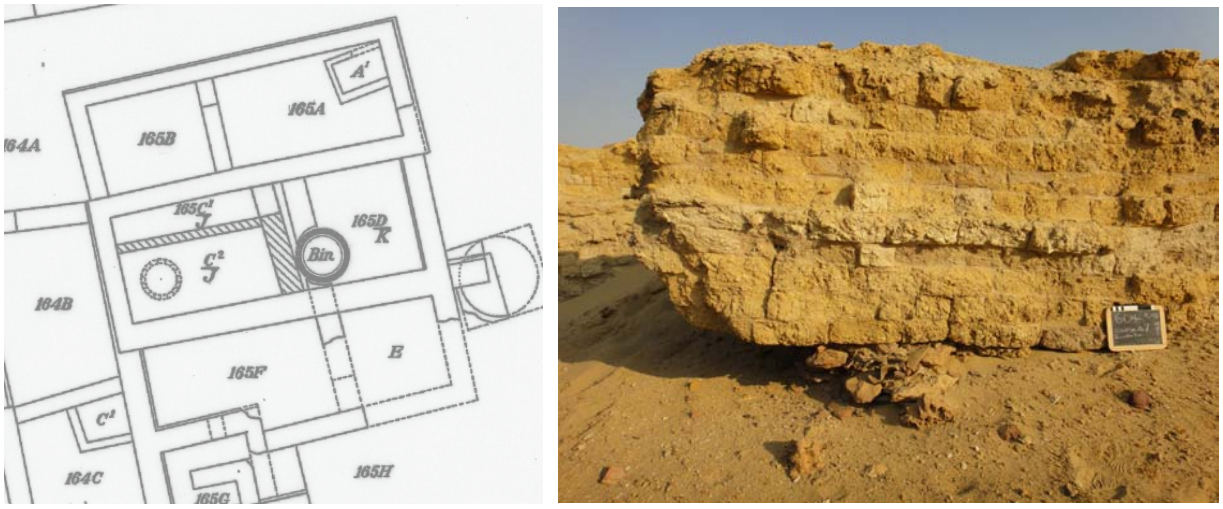


Figure 5.32. Detail of plan of Michigan layer A, KAC, showing the confusing series of adjoined and abutted walls that are typical of A-layer structures. Right, a wall from Karanis South (KAS) showing mutiple types of building materials in a single wall, including grey and yellow mudbricks, as well as stone and debris fill.

Conclusion

Adapting to the changing built environment of Karanis clearly required flexibility: in adapting older structures to new or continuing uses, and a multitude of different strategies were

employed to achieve this. However, most changes were still conservative: rather than demolish and rebuild a structure entirely, small alterations were made to existing structures. Changes often involved the buying or selling of adjacent property spaces, but the most noticeable changes revolved around efforts to secure and assure continued access to the public street system. Over time private properties were designed to be more restrictive in terms of access, focusing on maintaining their own connectivity to the public system, sometimes even at the expense of other neighboring properties, by blocking access routes that had been previously shared.

The altering of the public access through private means might be taken as evidence that civic authority had disintegrated or disappeared completely in later periods of Karanis. However other parts of town do not show such a breakdown of organization and documentary papyri suggest that the town's administration continued to function well into Late Antiquity (Keenan 2003), as did various socially-influential groups such as the local elite of the "gymnasium" class (Alston and Alston 1997). Considering the strong administrative involvement in the foundation, planning, and even expansion of the town, the lack of official involvement in maintaining spatial order is noteworthy, but not necessarily unusual: many government officials in ancient times as well as today seem to have limited interest in following up on the development of projects beyond the initial planning and implementation. In fact, for ancient Karanis, this lack of oversight may have been beneficial, and characterized as a lack of interference rather than neglect. Without having to wait for official intervention, individual agents may have been able to act with greater expediency and flexibility, following whichever strategy seemed best based on extremely specific local knowledge. The potential to invoke administrative or legal authority remained for extreme cases: as described in chapter two, analysis of documentary papyri suggests that contracts outlining property rights between neighbors may have had social

authority but may not have been considered truly admissible legal evidence (Kelly 2011). However, individuals relied on these contracts and other social measures to negotiate their property rights, suggesting a high degree of agency on this local interpersonal level. In the end, the system seems to have functioned well enough without having to rely on official intervention of a civic authority.

Chapter 6. Local interactions: negotiation with the neighbors

The previous chapter concluded that private domestic property in Karanis was designed to maximize the potential for control by the owner, to limit the degree to which any privately-owned structure depended on outside support, physically or socially. Houses were designed to be freestanding, and perimeter walls enclosed property and limited the potential for access and interference from outsiders. Courtyards were centers of household production of food, and areas for storing valuable commodities that were essential to domestic economy.

In such a paradigm, domestic property could be construed as wholly private and in direct contrast to the public systems of streets and other civic spaces established for use by the entire town. This is not unlike the familiar trope of the Classical Greek cities (see chapter two) where civic space is described as operating in direct contrast to the private world of the house. However, these concepts of space did not accurately reflect the complexity of social interaction, but instead created a false binary system of "public" and "private", "inhabitants" versus "strangers". In reality, social and spatial spheres do interact and indeed overlap, and categories of relative identity are not limited to "inhabitants" or "visitors", but could also include 'stranger', 'acquaintance', 'business partner', 'friend', 'relative', or any other *degree* of familiarity.

In space syntax analysis, any system is by definition complete and comprehensive; all spaces are connected, and therefore create varying degrees of privacy that operate on local levels. These local relationships are some of the most significant spheres of daily social interaction, occurring in both public and private spaces and between agents of varying degrees of familiarity. This chapter is about the specific local-level negotiations that must have happened to mitigate

such social interactions and potential conflict between neighbors, using architectural features as evidence of how physical access around and between such properties was managed.

Karanis was not so small a settlement that all the inhabitants knew each other—estimates based on papyrological evidence suggest a population of as many as 4,150 people in the year 145-146 C.E., but as low as about 2,600 in the 170s, following a period of economic destabilization and the outbreak of plague in 165 C.E. (Geremek 1969:39, Boak 1955 and 1959). Therefore, social relationships in Karanis existed along a highly varied gradient of familiarity, from total strangers to members of one's own household and family group. While these were not necessarily directly tied to proximity—family ties being perhaps the most obvious and enduring of social relationships even over long distances—physical distance is a significant factor in determining social "closeness". The closer physical proximity is, the higher the probability that social interaction will occur, and with frequent contact comes a higher chance of maintaining familiarity and creating interpersonal ties. These are not necessarily all equal, or equally pleasant: they may include casual acquaintances, business relationships, friends, strangers, neighbors, and even unwelcome elements that might include lawbreakers or other social deviants (Laurence 1994). However, because all of these interactions occur in real spaces, preserved by the architectural environment of Karanis, there is the potential for examining the various strategies the ancient inhabitants used to limit—or conversely, encourage—such interactions.

Spheres of social and spatial "closeness"

We have previously outlined the existence of a district type known as an *amphodon*, an administrative unit whose primary purpose seems to have been providing a more specific local

context for the registration of inhabitants. As the boundaries of amphoda were drawn up according to settlement topography (Alston and Alston 1997:212, Rink 1921), the units reflected spatial proximity, essentially forming a type of local "neighborhood" for Greco-Roman towns like Karanis. However, despite the survival of papyri from Karanis that give clues about the demography and even names of such districts (see again p. 134), it remains impossible to reconstruct topographic positions or borders of amphoda in any significant and accurate spatial way. We cannot even guess their size, as there seems to be little consistency from site to site: the Delta town of Thmouis had at least twenty amphoda with numeric designations, the twentieth containing 178 houses. However, at Oxyrhynchus, at least one amphodon contained only 50 houses (Alston and Alston 1997:201-2). Therefore for Karanis, we cannot say how large the area of the average amphodon was, or if it was a compact unit based on radial closeness, or oblong and following the physical layout of the settlement. Nor do we have a clear depiction of how socially significant such districts were: did all the inhabitants of a single amphodon know each other? Did they express shared pride and a sense of belonging based on these categories, creating ties of familiarity and closeness? Or were the amphoda rather administrative designations that had little to do with actual social and daily life of the inhabitants?

Without a clear understanding of the spatiality of such districts, it is difficult to analyze the extent or nature of their social roles. However, using what is known of the townsite's spatial organization, an alternative means for identifying localized spheres of spatial interaction presents itself: the "blocks" of properties grouped together by the surrounding street grid. All properties within a single block are directly adjacent: their borders touch each other and are actually defined by these points of contact, or by contact with (adjacency to) the street system. Even if such properties are not syntactically related by direct access routes, the mere fact of adjacency is

evidence of a social negotiation and acceptance of spatial boundaries: in continuing to occupy his own space within its limits, each property owner is essentially acknowledging his property limits and those of his neighbors.

Ownership of property in Greco-Roman Egypt carried very few restrictions, and even the rights of renters were strongly guarded under Roman law: landlords were prevented from interfering with their tenants, unable to enter their own rented property without permission of the occupants (Taubenschlag 1955:361). This suggests the degree to which the right to control one's own domestic space was held almost sacrosanct. Apart from a few public safety codes (Owens 1991: 166-170), there were almost no restrictions on private construction, and generally the only thing that limited an owner's rights were instances where his actions impeded the rights of another property owner.

We have already noted that, in general, civic oversight of private building practices was low, so low that in Karanis the public streets were apparently subject to privatization by anyone enterprising enough to extend his property boundary walls. There was likely even less official interest in getting involved with conflicts between individuals—these seem to have been left up to social negotiation and private lawsuits, with only the most extreme examples being brought to real legal action.

Instead of habitually relying on formal legal measures to guarantee property rights, inhabitants seem to have entered into social agreements to respect the rights of the neighbor's own property while managing their own, so as not to infringe on another's rights. The case from the P.Strass.I (Glanville 1939 and see again p. 81) is illuminating, where a neighbor promises that his own house construction will not interfere with any of the adjacent structures in any way. The willingness of the property owner to assign potential monetary penalties should he break

what is inherently a social agreement rather than a legal one (Taubenschlag 1955, Kelly 2011), shows how seriously these relationships were taken, but does not necessarily mean there was any preexisting mistrust or ill-will between the parties. The stipulation of fees may have been included as a gesture of faith and goodwill. In this way, interpersonal contracts can be viewed as a preventative measure to avoid future conflict, rather than the final solution to a long history of interpersonal conflict.

Physical adjacency of town blocks

The formality of regular street grids in preplanned Greek and Roman settlements created well-defined block units that were often highly uniform in shape and even sizes (see for example figures 2.7, 2.9). Because they provided such an obvious system of spatial order, they were often directly referenced by archaeological explorations when assigning designations for ancient structures. For example, the Pompeiian structure casually known as the "House of M. Lucius Fronto" is more formally catalogued as Pompeii V.4.a: the number 4 here reflects the block designation. Modern studies of Pompeii refer to these blocks as *insulae*, a particularly descriptive Latin word suggesting how such blocks were surrounded on all sides by public routes—a "little island" of property amidst the flow of traffic. This term has become fairly common for archaeological investigations of Greek and Roman settlement structures, and is often used synonymously with a city "block". It was in fact used to describe the Karanis organization in several of the Michigan publications. However, the term seems particularly alien to the Karanis evidence, even linguistically, as Greek, not Latin, is by far the more common language used in documents of the period in Egypt, especially in documents describing domestic

properties (Husson 1983)[1]. More crucially, none of the Karanis architecture is reminiscent of multi-unit domestic properties: instead, each house is independent and free-standing rather than conjoined, with individual rather than shared points of access to the public streets. Each block consists of multiple properties made absolutely discrete by perimeter wall enclosures, and many blocks demonstrate a mix of domestic and industrial properties. In fact, nine of the twenty identified blocks of the Karanis C level include industrial properties such as storage or milling complexes. Although the term "insula" may have a long history of association with Karanis (being used in all of the original field notes as well as appearing frequently in the final publication (Husselman 1979), I prefer to avoid terminology which has the potential to color preconceived notions of spatial and social use (see also p. 76-78), and so this study shall use the more general term "block" to refer to all groupings of adjacent private properties, shaped by the position of the town's streets.

Sharing activity space on private properties

While there is no evidence of directly adjoined house-structures in early Roman Karanis, some properties shared direct access to their respective courtyard spaces. Spatially, this type of close-neighborhood social interaction is attested in the access points that frequently exist between two or more adjacent properties: a threshold or gate, or even an open expanse instead of a solid perimeter wall. Such interfaces allow for direct access to private courtyard spaces with no need for agents to go through the intermediate spaces of the public streets. For the C layer, there are 33 properties that shared direct access with another, resulting in 13 systems of shared

[1] P.Oxy 2406, a preserved sketch of a house plan labeled in Greek (see figure 2.16), includes the word "*atreion*". Many papyrologists have taken this as a Hellenized version of the Latin atrium (Lobel et al 1957:143, Maehler 1983:137. In contrast see Husson 1983:29-37 for an analysis of "*aithrion*", the Greek word for courtyard. In either case, the space depicted on the papyrus does not resemble the typical Roman atrium or a Greek aithrion courtyard; the word seems to have taken on a different meaning entirely .

adjacent access: some included only two participating properties, but others included up to four properties. This means that of the 123 properties included for the C layer sample, more than a quarter (26.8%) share direct access with at least one other property.[2]

Some access between private properties was actually quite wide open: an oven appears to have been shared equally between properties C26 and C28, where there was no clear boundary wall between the two properties. This likely reflected a close social relationship between the households, as in combined properties like the houses of C108. The difference here is that C26 and C28 still each have their own direct access to a street; one cannot truly said to be dependent on the other. Other inter-property relationships were facilitated by narrow interfaces that sometimes included threshold features and possibly doors as well (figure 6.1).

As touched upon in chapter 5, the main reason for sharing access seems to have been sharing areas for households activities such as milling grain and baking bread. These activities may have served as significant social occurrences, in which neighbors and other local acquaintances may have organized to take turns at a single oven, or even worked together in direct cooperation to share both work and fuel expenditure (Samuel 1999). Of these 13 systems, only three did not include a property with an oven.

[2] These numbers also include eisodos-type connections, as discussed later in this chapter, even though they are more likely evidence of permitted through-access and not shared activity space.

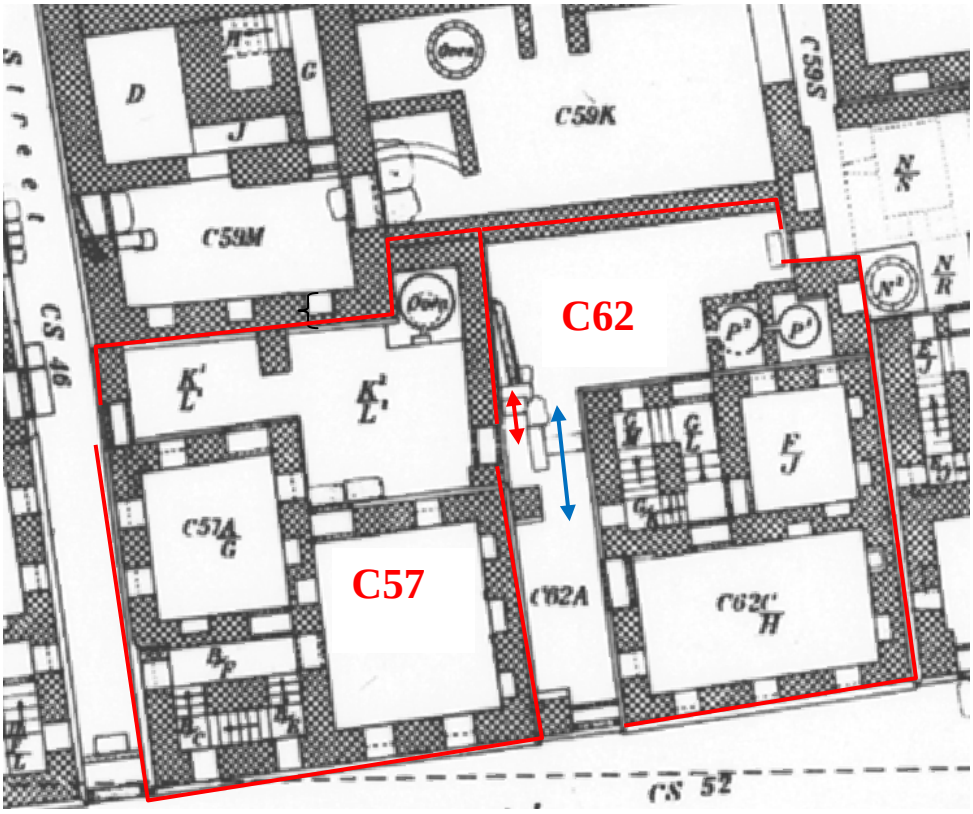


Figure 6.1. The connection between properties C57 and C62 is maintained by two threshold beams, though evidence of an actual door is uncertain. The possibility for an agent travelling from the courtyard of C57 to the back of C62 is also provided by an extra set of steps down (see red arrow), technically unnecessary as there is already a step in place for inhabitants of C62 (see blue arrow).

A significant example of inter-property through-access is in the C level's block V, where what appears to be a private passage links the back courtyards of multiple properties. This sort of relationship is actually roughly comparable to some Roman insulae, especially at Ostia, etc, where a central courtyard or even garden space (see for example figure 3.13) provided access within the highly localized community of inhabitants. However, we cannot be certain that the Karanis example is truly reflective of this pattern, as the upper northern end of the block was poorly preserved and recorded: the passage may in fact be remnants of a public access system, similar to street CS32 which protrudes into the semi-united blocks II and III (see detail in figure

6.3 inset, below). For block V, we cannot be certain if this passage was open to wider public use—if it was indeed part of the street system, it may have been. However that would have opened up these properties to increased potential access in their private "backyard" spaces, many of which had ovens and storage bins.

Such access is rare amongst the other properties of Karanis, where back yards are usually more isolated and "deep", and multiple thresholds away from public street access. This suggests that even most routes across private properties were *not* intended primarily for through-access, but for local social relationships between neighbors, who might have reasons to visit each other or to use each other's properties. The mill of C59, the ovens of C57 and C62 all suggest a localized social network to facilitate daily breadmaking activities. They are essentially larger, longer shared routes but otherwise identical to the double-property relationships described earlier.

Considering that breadmaking was likely a social activity, there may have been some motivation to seek out agreements with households that were not only located nearby, but also shared previously-existing social relationships. In the course of daily chores, a woman might reasonably wish to work alongside a close friend or relative and take the opportunity for extended conversation and other social interaction. Therefore, one might expect that many instances of shared access to courtyard spaces were not dependent on direct adjacency, but access was facilitated by the public street system.

However, practicality of physical distance likely restricted many of these relationships, and a woman was probably less likely to take the time to walk across town, carrying her grain for milling or her flour for baking, for the chance of talking to a friend when she could accomplish the same task more efficiently if she stayed nearer to home. A shorter path would be far more

practical. The existence of the adjacent private property routes preserves direct physical proof that some of these close spatial relationships were valued, and that they may have been preferred over the use of the public street as a more direct and controllable way of organizing the sharing of space and activities.

These connections between properties seem to have been an interesting combination of informal social agreements yet limited and restricted in nature: such rights of use were likely made available only to specific individuals or households, and not extended to the general public. On the other hand, the mechanisms by which they were regulated are unknown: contractual agreements for the sharing of ovens or other private facilities are uncertain (though access through private properties was secured through legal contracts, as shall be discussed below.) It seems more likely that these relationships existed only by private agreement and invitation. This may explain why they seem to have lacked real permanence or even great endurance over time: most of the shared courtyard interfaces were blocked or otherwise altered within a single generation before the doorways were bricked up or otherwise altered. Thirty percent of the shared access routes in KAC's C level were in fact blocked before the B layer construction ever began; the same is true for 62.5% of the B layer examples before the abandonment that preceded the A layer.

This suggests that neighborly relationships may have deteriorated, or possibly that there ceased to be a convincing reason to share access. In many instances it appears that the sharing of courtyards simply became unnecessary over time, as a household previously dependent on a neighbor's oven for daily baking might construct an oven on their own property. At some point during the early C layer formation, house C45 had access to the yard of C47, where there was an oven. However, multiple phases of dividing walls in the C47 courtyard area seem to have

eventually blocked access between the two properties. Although excavation of the courtyard showed several major changes over time that made it difficult to identify specific use-areas, it is unclear if property C45 ever had its own oven. Certainly property C47 was under no obligation to continually allow such access: it was a privilege rather than a right. In fact, there are multiple examples in Karanis where old points of inter-property access were in fact blocked by the construction of an oven in that very space (figure 6.2). Many properties seem to have blocked their inter-property access points over time even if the neighbors did not have obvious alternative access to courtyard facilities. Overall, it appears that there was little or no compulsion to continue to offer such access indefinitely.

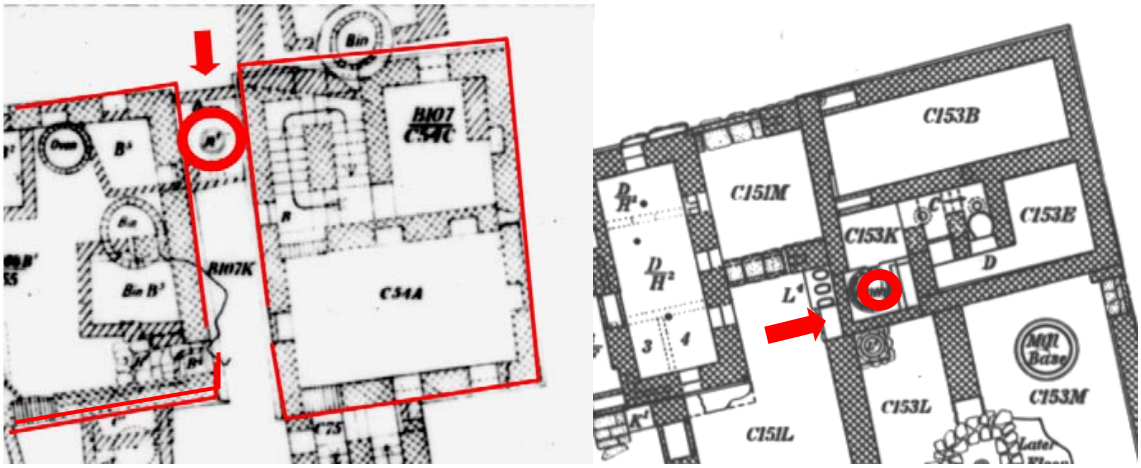


Figure 6.2. Images of ovens constructed across previous (or potential) access points.

Despite the social and even economic benefits of sharing labor and fuel between households, there is evidence that many Karanidians preferred the security and privacy of maintaining total access-control over their own courtyard spaces. This does not mean that the entire private property became isolated or that agents from outside the household were barred entirely: even though courtyards ceased to be areas for work-sharing and casual socialization, guests may still have been invited over to socialize, probably inside the house itself.

Neighborhood relationships also likely remained important, even if this particular opportunity for interaction decreased. There were also several remaining strategies by which occupants might allow certain outsiders to use private property—not necessarily for the use of courtyard facilities, but as semi-private routes of access that may have formed important local pathways and therefore maintained social and spatial "closeness".

Access-based analysis of neighborhood closeness

Analysing the block system

The blocks of Karanis are not perfectly-formed quadrilaterals, as the street "grid" of the settlement was irregular, and increasingly so over time. There may have been some early intentions to keep them more uniform: the evidence from the early C level shows that originally the blocks were generally rectangular in shape and of small size. However, it has been demonstrated that even in the early phases of Karanis, private decisions often caused alterations to the civic plan. Therefore, many of the blocks became conjoined, increasing their size and spatial complexity from the original plan. The examples recorded in area KAC demonstrate a large range of variation in shape and size; for the C level, the smallest completely-preserved block is 197 m^2, the largest 1724 m^2. The average size of complete blocks only is 619 m^2.

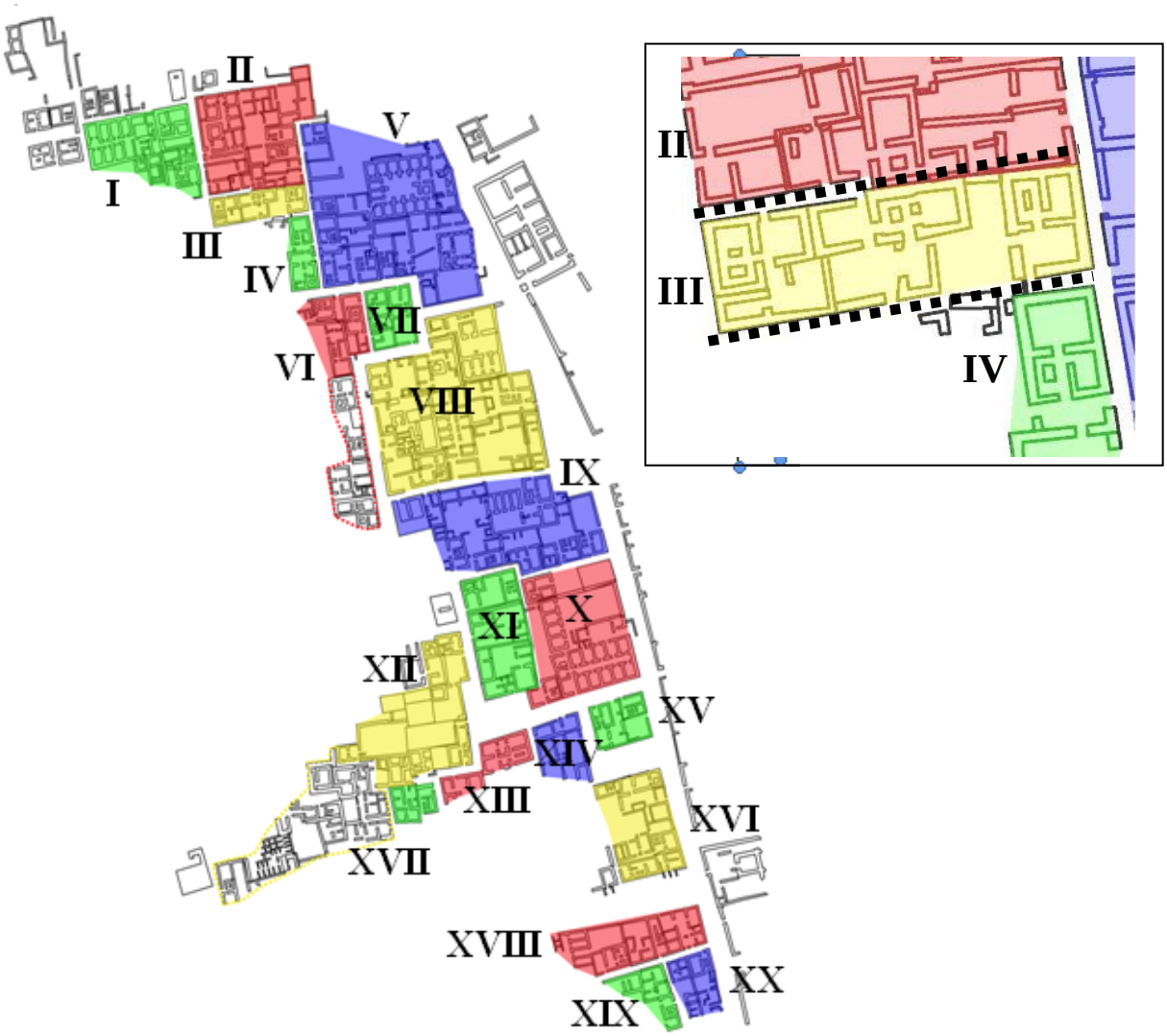


Figure 6.3. Image of the KAC system, color coded by blocks. The inset (at top right) shows a close-up view of blocks II, III, and IV, which were designed as separated by through-streets (see dashed lines) but were later blocked with construction and hence joined into one amalgamated block.

Blocks X and XI are examples of areas that were originally separated, with a roadway running north and south between the two. However, the construction of property C146 effectively privatized this route, and the remaining north end of CS125 seems to have been converted into a series of narrow alleys and an additional courtyard for the thesaurus of C123. I

have retained the separate labels for these two blocks, even though their division is only academic and not practical from this point on: access between them along what remained of the original route would have required traveling through the interior space of room C146A.

Similarly, in the north, the areas labeled as blocks II, III, and IV seem to have been all planned separately, with street segments like CS48 originally serving as continuous through-routes joining with other streets on both ends (see inset in figure 6.3). However, the construction of the house in property C42 created practical adjacency with the wall of C45, forming too narrow a space for traffic to go through. In such situations individual distinctions of multiple blocks becomes a matter of debate; certainly there would have been no real distinction between blocks from this point on, as those individuals wanting to get around such units. By the time property C21 blocked the northern extent of CS23, the result was a single conglomerate block with an area of at least 1208 m^2 and a perimeter of 195 meters. Without any public routes through this group of private properties, the general public would have to navigate around it in order to access any spaces beyond. Only a few inter-property access points may have created shortcuts, but likely had only limited private use (figure 6.4).

C	Preservation	Perimeter (extant)	Area (extant)	B	Preservation	Perimeter (extant)	Area (extant)
I	incomplete	69	520	I	incomplete	49	122
II	complete	106	745	II	complete	61	211
III	complete	60	197	(II)/III	incomplete	48	88
IV	incomplete	36	149	IV	incomplete	127	468
V	incomplete	148	1666	V	complete	179	936
VI	incomplete	110	800	VI	complete	42	239
VII	complete	58	200	VII	incomplete	49	584
VIII	complete	183	1724	VIII	complete	172	1523

IX	incomplete	136	1191	IX	complete	163	727
X	complete	119	500	X/XI	complete	160	1286
XI	complete	98	796				
XII	incomplete	62	1065	XII/(XVII)	incomplete	249	1560
XIII	incomplete	54	300	XIII	complete	56	209
XIV	incomplete	47	212	XIV/XV	complete	76	296
XV	complete	46	175				
XVI	incomplete	77	521	XVI	incomplete	93	538
XVII	incomplete	86	142				
XVIII	incomplete	32	456	XVIII	incomplete	115	648
XIX	incomplete	35	190	XIX	incomplete	67	203
XX	incomplete	46	190	XX	incomplete	59	190
				XXI (new)	incomplete	62	245

Figure 6.4. Comparison of blocks for layers C and B.

Previously, chapter 4 discussed the ways in which the blocking of ringy-access routes within the public street system over time reduced total connectivity and closeness for the settlement; these effects were also significant at the local level. Many alternate pathways to second locations were blocked, leaving a single route that was often more circuitous than direct. By the B level, few of the original C-level block designations remain unchanged; many were in fact unrecognizable compared to what they had been. This created longer distances, both metrically and syntactically: as the size of the average block grew, so did routes around said blocks. The average block perimeter increased from 80 to 98 meters between the C and B layers of occupation. Of course, not all perimeter routes are synonymous with shortest-path possibilities (for example, the northern route around block IX is certainly shorter than if one follows the perimeter (figure 6.5).

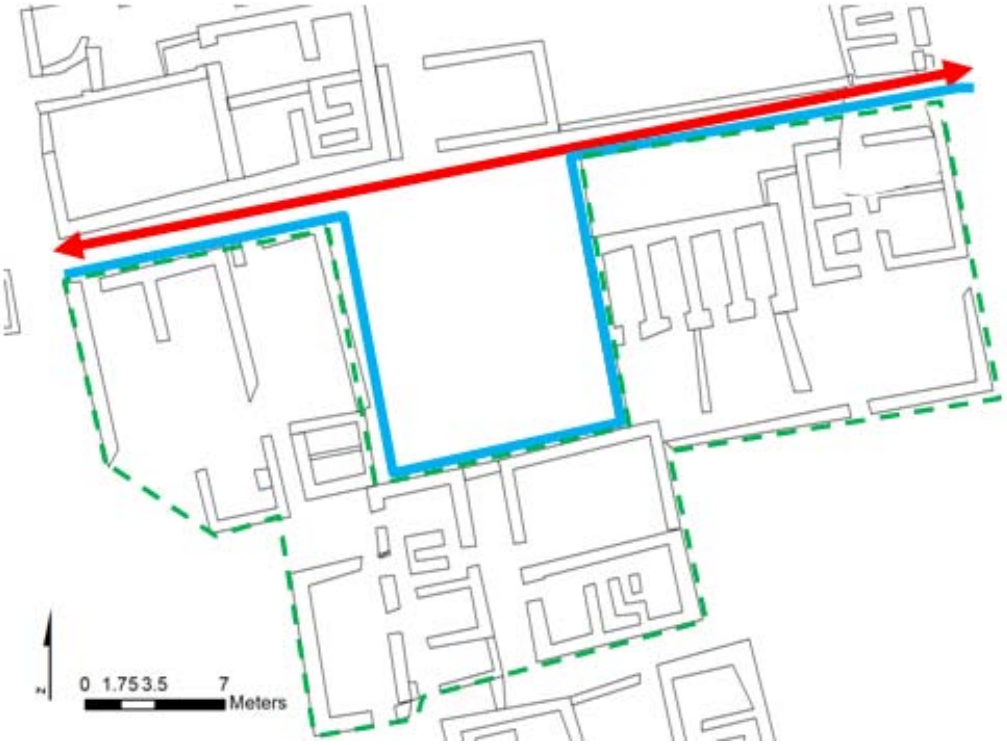


Figure 6.5. Block IV as it existed in the B layer, outlined here in green. The most direct northern route across it is 44.5 meters (in red), compared to the northern perimeter of the block which is a total of 70.8 meters and an extremely inefficient route (in blue).

It must also be noted that not all routes could be followed completely as circular pathways: constructions across many streets prevented several blocks from true circular ringy access around their perimeters: B layer blocks IX and X/XI were all technically conjoined by block streets if not by adjacent properties.

Additionally, because area KAC shows an increase in poorly-differentiated public "areas", some structures were left "floating" in the middle of space independent of any other adjacent properties. Blocks of two or even only one property became more common: House C26, once neighbor to several properties in block IV, was completely isolated in the B level

system, surrounded by wide-open areas that were freely accessible to the general public (figure 6.6).

Figure 6.6: Detail of Block II, at left, shown in the C layer with the perimeter in red. The same perimeter is superimposed on the image of the same area, at right, during the later B layer. Also note property C26 (shaded in blue), extensive in the C layer but with its courtyards gone and only the house itself in use in the B layer.

It becomes apparent that adjacency alone did not necessarily create significant enduring social relationships: conflicts could arise between neighbors, but once settled there was little need for continued contact between the involved parties. If their properties shared no direct access, they might even manage never to see each other, except in passing in the public streets, with no obligation to speak or interact. In fact, the very idea of a settlement "block" seems to lose some of its spatial as well as social relevance.

Syntactical analysis of individual property routes

In contrast to simple adjacency and metric analysis of distance, space syntax analysis allows for the examination of direct social interaction, by measuring the probability by which individuals occupied the same space and had the potential to engage in conversation or other social activities. In this case, the Karanis block system may not have been the most significant spatial unit, as many properties that shared physical adjacency were syntactically distanced from each other over time. The spaces of the public streets and open areas were most likely more significant areas of socialization, as they were used by everyone for both global and local routes.

The blocking of street BS150 (and to a lesser extent, street BS155) significantly altered neighborhood access, increasing the distance necessary to travel between the front doors of adjacent properties from a mere 1.87 meters to over 137 meters by the time of late B construction. In this sense, the unit of "block" becomes practically irrelevant compared to closeness based on space syntax access, as many properties are more accessible from parts of other blocks than from their own adjacent neighbors. A comparison of block relationships and syntactical access routes can be seen in figure 6.7 below:

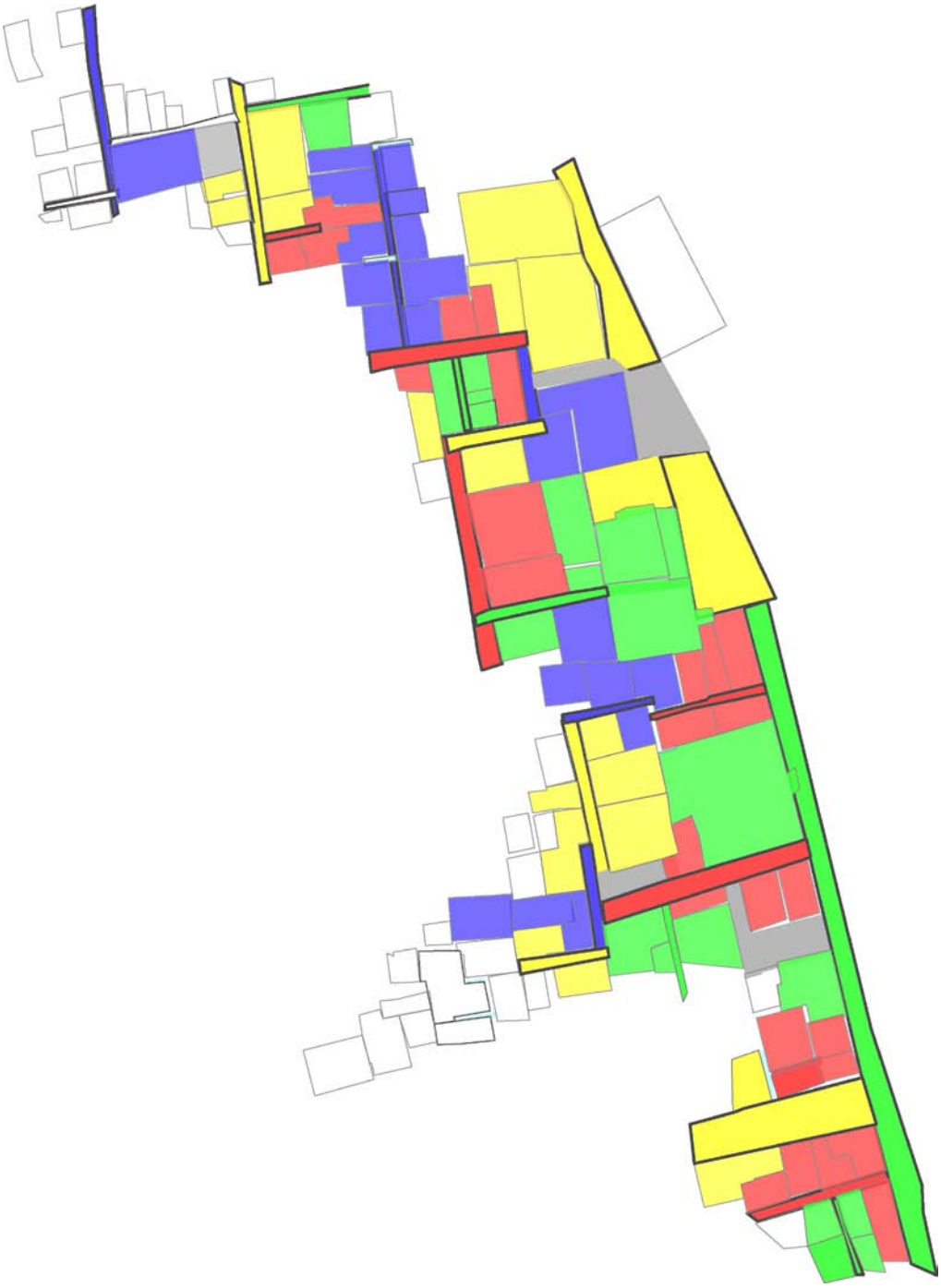


Figure 6.7. In contrast to the blocks of figure 6.3, here individual properties are colored to match the nearest street connection (streets outlined in bold black line). Note how traffic patterns create a different sense of relative spatial “closeness” than the block pattern suggested.

In contrast to the physical block relationships, these syntactical routes might be said to create local *system* relationships, where proximity can be measured in threshold depth rather than metric distance. As seen in the image above, such local systems did not rely exclusively on the public streets to provide access: some routes were possible through private properties and, while technically subject to strict access-control, may have been made available for somewhat broader social use. The degree to which properties could be accessed by outsiders varied considerably: some properties were indeed private "dead ends" with no possibility of adding alternative access routes to the street system. Others did have potential through-access, though the degree to which they provided practical alternatives to the street system must be questioned. Analysis based on the syntactical access systems of the Karanis built environment shows many different strategies were employed to create varied degrees of spatial and social closeness.

Dead End Properties

Of all the studied properties of the C layer (N=87), 66 are simple dead-end spaces, with only a single point of interface to a public street space and no other forms of syntactical spatial relationship (though, as discussed above, adjacency with other private properties was also spatial as well as social). Their threshold depth with respect to the public street is therefore 1, as is their connectivity. This means that while these spaces are not distanced or "deep" from the public system, they are nevertheless very private in terms of access, and unlikely to be subjected to through-traffic.

Such non-distributive spaces are often described as the "domain of the inhabitant" (Hillier and Hanson 1984:19), as the only people who would regularly enter and occupy these spaces are the members of the household, and outsiders who had a particular reason for accessing

that space, instead of just casually passing through en route to another location. This means that even the agents from outside the household group were more likely characterized by the occupants as 'visitors' rather than 'strangers'—a relationship that suggests enduring and habitual use of space as well as social familiarity between the involved agents.

Such properties may be private in the sense that the inhabitants are unlikely to be interrupted by intruding strangers, yet even so there seem to have been extra efforts made to preserve the greater privacy of the house itself: of all KAC C-layer properties, 41% have direct front door access from the house to the street. However, for the dead-end properties, this figure drops to only 18%. This figure reflects the use of intermediate spaces as a buffer between the busy street and the interior of the house, to create an even higher standard of privacy and seclusion for the inhabitants of such dead-end spaces compared to those properties that shared greater access, as described below. However, in nearly all of these cases, there is only a single intervening courtyard space, serving as an annex or buffer between the street and the house. This means that all interior spaces continue to have a very low threshold depth from the street itself: the front room has only a value of 2, compared to the courtyard annex's value of 1. This suggests that inhabitants still found direct shallow access to the public street system to be important even while they valued the privacy that came with isolation from the street itself.

"Eisodos kai exodos" relationships

While direct street access was highly desirable, it was not always possible for each property to achieve: some parcels of land were located further within a block's core rather than along a perimeter, leaving some without direct street access. This was a particular problem of the late B layer construction, when the dimensions of the conglomerated blocks often made it

impossible for all properties to exist along perimeters: some parcels of land lay completely within the interior of such blocks. The inhabitants of such spaces were therefore reliant on at least one of the surrounding properties to provide an access route between their home and the public street.

Legally, use of the public street system was a real right held by all; however, crossing private property was a privilege that could be bestowed or denied at the discretion of the owner. Properties with no direct access thus existed in a legal gray area, in which the rights of one owner cannot be fully realized without the potential for infringing on the rights of another.

This is summed up in the contracts including clauses of *peri eisodos kai exodos* – "concerning entry and exit" a specific property for the purpose of accessing a space beyond (see again chapter two, p. 82). While these were part of legal contracts of sale or property inheritance, the very fact that access had to be specified suggests that it was not obligatory, and was not considered a true legal right. "The limitation, both personal and temporal to which the grantee is subject, contradicts the assumption that it was a real right" (Taubenschlag 1955:258); it was not automatically given and in theory could be withheld at any time.

To this end, eisodos seems to have been considered a social right rather than a legal one: not all instances of eisodos kai exodos were necessarily formalized in written property agreements. Scholars examining Roman law in Egypt have even questioned the extent to which clauses of eisodos in contracts were even actionable—they may not have carried legal weight at all (Kelly 2011, Taubenschlag 1955) but only served as interpersonal agreements. However, the importance placed on the written word suggests that eisodos contracts were taken very seriously as *socially* binding: some contracts took the extra step to specify that access rights would

continue as true obligations, “the terms bound the parties and all their legal successors” (Taubenschlag 1955:258).

As we have previously examined the existence of inter-property access for adjacent spaces, it is important to consider how eisodos-type relationships follow a different spatial model. Extant documents demonstrate that eisodos kai exodos rights were about transitional access only, and *not* the same as permission to otherwise *use* the space controlling property. Many documents were explicit as to the very route that could be used, and meandering unnecessarily from the most direct path was certainly not encouraged. Varied examples of such routes are described: through a courtyard, around the perimeter of a property, though a gate, etc. There are even examples of routes that passed through the interior of a building (Taubenschlag 1955:257) suggesting that the need for access was serious enough to provide a reason to compromise the potential privacy of other structures. In every case such access is granted under very specific situations, and with the clear understanding that such through-access is to be as quick as possible and have as little impact on the controlling property as possible. It was certainly not an invitation for extensive socialization or use of facilities.

While the explicit nature of the contracts seems to be designed to prevent such routes from becoming public access, in reality they would never be used for broader traffic: controlled eisodos properties are essentially still dead-end spaces, and the controller itself is often non-distributive and poorly integrated with the larger system, leading only to the second property as well as the street. An example from the C layer, property C92, in fact, controlled access to two separate areas, properties C114 and C117, yet was otherwise non-distributive, allowing for only those two linear dead-end pathways. Similarly, property B137 controlled multiple properties:

B138, B122, and even B142, which was itself directly controlled by property B122. This latter example thus includes a linear chain of spaces as well as a clustered distribution (figure 6.8).

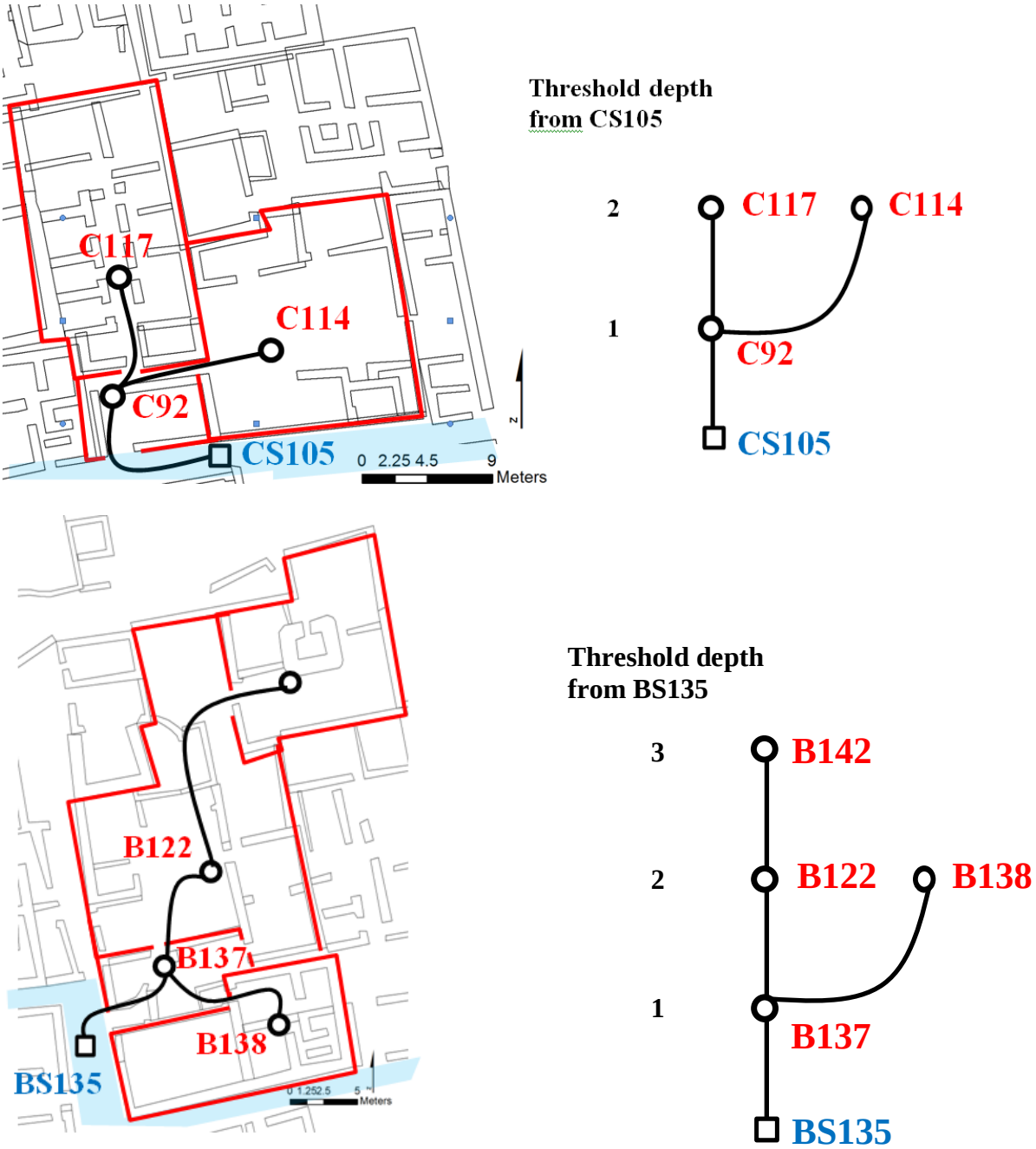


Figure 6.8. Structures demonstrating non-distributive access and high levels of control over neighbors. Above: property C92 is a small courtyard area that serves as an annex to two further properties, C114 and C117. These deeper properties appear to be independent properties of each other, but both rely completely on the right to pass through C92 in order to reach any public space (here via street CS105). Below: Property B142 is even more reliant on eisodos rights: not only is it directly controlled by B122, but also requires traffic through B137 to the street BS135.

Such contracts were not only explicit as to exactly which spaces could be used, but sometimes even by whom. An inheritance document from the fourth century C.E., P.Gen. 11, promised one heiress "exclusive right of passage" (ibid: 259) to her portion of the property. Presumably this also gave the woman in question the right to have people use that passage on her behalf, extending that access to others of her household, but what if she wanted to have visitors? What if she wanted to share her courtyard oven with another neighbor? The controlling-property owner might easily have been irritated by these additional people going across his property. The contracts, whether legal or strictly social, were one way of mitigating some of these issues, but were unlikely to settle all interpersonal conflicts that could arise between close neighbors in constant contact.

Of course, without the ability to match specific contractual documents to extant structures, there is no sure way to identify the exact social relationships between close neighbors based on the spatial evidence alone. Instead of identifying restricted access routes as evidence of ancient eisodos contracts, it could be that many of the associated properties actually belonged to the same owner, as part of a large conglomerated estate. Notably, of the six potential eisodos-type relationships included in this study, three lack a second house feature, suggesting that perhaps some of these properties were not separately-owned spaces. Many of the controlled property spaces seem to revolve around the storage and preparation of grain, though in contrast to the larger more formal floor plans of facilities C123 and C65, the architecture of these controlled-property storage facilities suggests that they were not planned or built as single cohesive structures but were constructed over time. These are more likely examples of private properties that expanded over time to include economic/industrial features in addition to having a

domestic function. The original 'house' may otherwise have taken on a professional function of administrative office space, as in the more official Karanis thesauroi (see the discussion in chapter 5, p. 221-223). In either case, the entire spatial system would have functioned as a conjoined property unit, and the "shallow' position of the house would have protected the economic space of the courtyards and other structures from interference by outsiders.

An important example of this sort of gradual accumulation of property is B138 (see again figure 6.8 right, above), which may have originally been limited to the house area but by the later B layer was expanded to control access to the large adjacent properties B136, B122 and B142. The only other existing access to this series of spaces was in B122, but by the later B layer this was blocked by the construction of two adjacent ovens. This area may have served as a semi-professional bakery. The only significant structure in property B142 was a dovecote tower. The entire system seems to be a single sprawling complex, perhaps purchased in sections over time to consolidate into one property, all revolving around the grain industry: storage, milling, and baking, along with the raising of pigeons that was frequently paired with granary space (Husselman 1953).

It is also important that we not necessarily assume being "controlled" by the property of another was an indicator of lower social or economic status. Properties B128 and B118 may serve as an example of this: both are large houses with four rather than the more usual three rooms per story (see chapter six for statistics), and the deeper B118 is the larger of the two by 17 square meters. Both properties share access to courtyard space to the west of the houses, and probably shared at least one oven. They may in fact have been part of the same extended family, living and working in closely related domestic spaces. However, while the space of the oven is

shared, it appears that each property had its own storage space, suggesting that they may in fact have been two separate properties, representing two distinct household groups:

The social relationship between eisodos properties is therefore difficult to determine based on the spatial evidence alone: as some of the contracts suggests, some relationships did not reflect real social closeness or even goodwill between neighbors so much as simple necessity and the wish to avoid ongoing conflict. However, it is not impossible that some close spatial relationships were positive, even socially desirable: there are indeed examples of adjacent properties that were not spatially required to share access, but *chose* to.

Just as an enterprising Karanidian could buy up properties adjacent to his and create a bakery complex over time, he could just as easily buy a neighboring house and add it to his extended property. The second house might be useful as extended domestic space for the same household, or more likely house a separate branch of that same family. Certainly intergenerational family relationships were socially significant factors of life in the Roman Fayum (Huebner 2013); a married son and his growing family, for example, might live on the same property as his aging parents, but in their own separate house. This would allow the son to show proper socio-religious respect to his parents (especially his father as head of the extended family) while still having his own sphere of local influence in which to raise his own children. Keeping family nearby but not necessarily under the same roof may have been a good strategy for maintaining good family relationships. This strategy is not unique to Greco-Roman Egypt, but was common throughout the ancient Mediterranean and Near East, including Pharaonic Egypt (Metraux 1999, Nevett 1999, Shaw 1992, Blanton 1994).

An example of potentially related houses and household may be Properties C93 and C129 (figure 6.9). Technically, neither one is the controller or the controlled, as they share the same

single access route equally between them. Significantly, the two houses shared nearly all of their exterior property space: the courtyard at the back was not divided by perimeter walls, but completely undifferentiated. Although there were two separate ovens, the degree to which either could be "owned" by a specific adjacent household seems based purely on their relative location and not on any real syntactical distinction. Essentially, they share a single enclosure. Any of the daily activities exterior to the house itself must have had a high rate of "occasions" (Grahame 2000:56), a high probability that social interaction would occur. It is therefore likely that the two households were closely related, if not by blood or marriage then at least by regular social contact. They were friendly neighbors as opposed to strangers to each other.

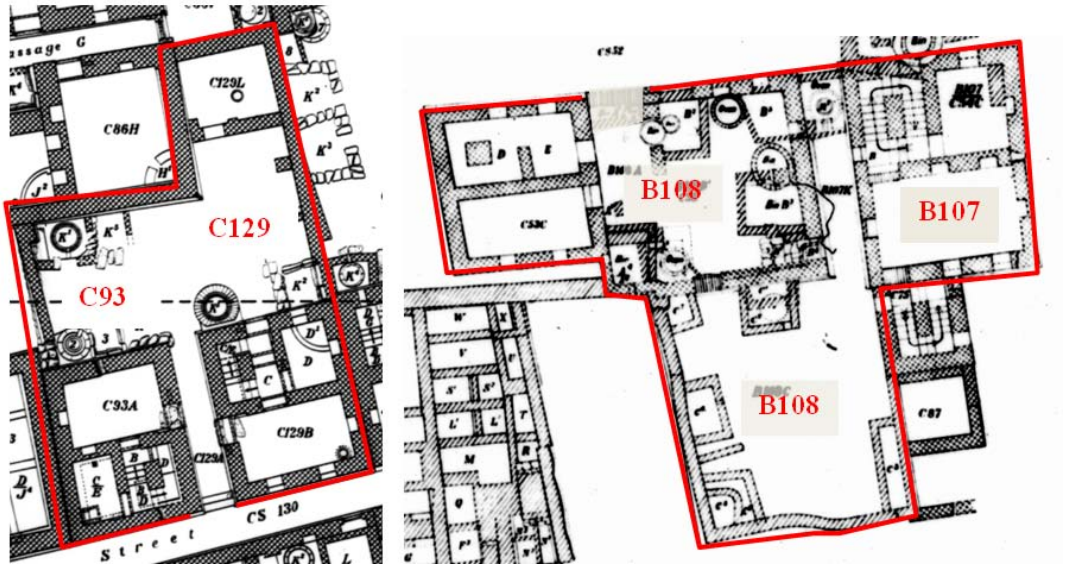


Figure 6.9. Left: neighboring properties C93 and C129, which lack a physical barrier separating their adjacent courtyard spaces. Right, conjoined property B108, as listed by Michigan, includes two separate house structures within a single compound enclosure.

Another example can be found in the case of properties B107 and B108, shown above in figure 6.9. Apart from the eastern house structure of B107, all the courtyard space accessed by the two house structures is listed as if it belongs to B108. In fact, the western property does seem to be the controlling one: the point of street access is adjacent to the house of B108 itself,

and it even appears to have its own series of courtyard spaces, well-defined by an enclosure wall. In comparison, any courtyard space belonging to B107 is less defined by enclosure walls, and members of the household must have had to travel through B108's courtyard in order to access the public streets. However, the character of that courtyard path suggests that a higher level of familiarity and trust must have existed between the two households, as the western property allowed for access past several major storage bins as well as ovens. This is not the usual "empty" pathway space provided by controlling properties, but a busy area of daily household activity in addition to being the location of storage from valuable commodities. In addition, there are further courtyard spaces to the south that are equally accessible by both houses.

Perhaps the most convincing evidence that these houses were *voluntarily* reliant on shared access is the ease with which a second access point could have been created, but was not: the property was not surrounded on all sides by adjacent structures. In fact, it was one of the smaller "floating" blocks of the B layer. If direct access had been a priority, an additional door could have quite easily been inserted in any of several points in the wall. In fact, the area directly adjacent to the eastern house was once itself a street (CS52), and was only closed with a short length of abutted wall. For some reason, this blocking was not only retained, but the resulting alcove was used as the location for an oven instead. The oven itself was not strictly needed, as the property contained a total of three. Instead, the inhabitants of both houses seem to have accepted their reliance on a single shared-access door by the western house, and seem likely to have had full access to the courtyard spaces of both properties. The result is a courtyard that is particularly well-equipped to provide space and facilities for the daily activities of not one but two households.

These examples show cooperation between the two households in the sharing of space and facilities, which likely maximizes the productivity of each group. The degree to which each house represented separate groups is unknown: they may have been part of the same larger family structure, two generations sharing the same family compound space but under two separate roofs. They may conversely have been wholly unrelated, and only maintained a syntactic link because of the necessity for an eisodos contract. Overall, the low number of completely controlled properties in Karanis (N=6 for the combined C and B levels) suggests that street access was completely preferable to any private strategies: even for related households, multiple points of access may have been preferred. In general, restrictive access routes, including resulting examples of eisodos relationships, were probably not considered ideal by either of the involved parties, but rather the best solution to an awkward situation.

Shortcuts and alternate "through-access" across private property

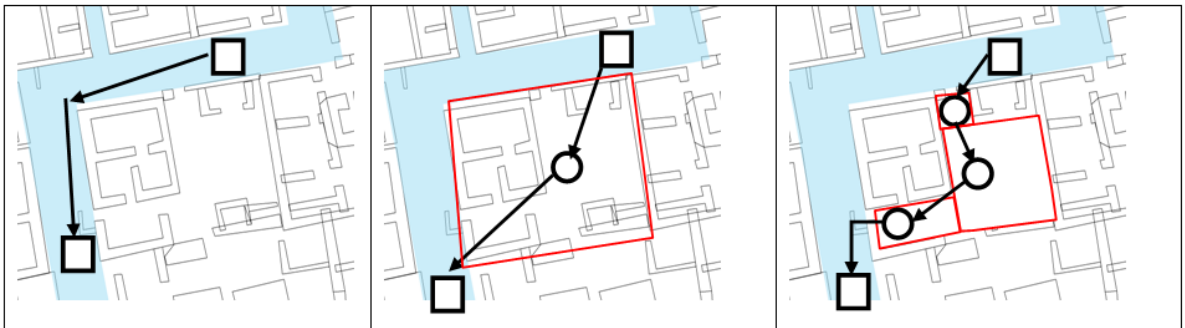
The inter-property relationships described above were all restricted in use: instead of being available to the general public, the agents accessing these spaces required the permission of the property owner. Additionally, the access routes between the properties were restricted by their low integration values: instead of providing distributive access, the properties tend to be organized with limited linear access. Essentially even controlled eisodos properties are dead-end spaces, and in most cases their controlling properties have a limited connectivity of 2: one connection to the street, and the other to the deeper controlled property itself. Even property C92 (see again figure 6.9), which controls two deeper properties and thus has a connectivity of 3, does not create any truly integrated system of movement that provides access through private property and back to the public streets.

In contrast to routes that are meant to provide access to and between properties for social purposes, there are also some routes that create through-access, local routes and "shortcuts" that exist in addition to the public street system. For area KAC, the street system of the C layer forms 8 complete rings (as extant during Michigan's excavation). However, once routes that contain access through private properties are included, the number of total rings is raised to 41 (Figure 6.10). Because the total number of spaces in each system of analysis is so different, these numbers cannot be directly compared, however the value of "relative ringyness" (see Space Syntax Appendix for calculation) corrects for this and shows how large the difference really is: the street system alone is only .235 compared to the street and property route value of .339.

Fig 6.10. Left: the street system of KAC's C layer. Right: properties that create potential "rings" with the street system are included. (See also Appendix A for larger illustration).

Of course, not all of these rings are equally as useful: instead of providing shorter routes than the public street system, many of the property routes are in fact longer, both in metric

distance and in threshold depth. In terms of metric distance, a corner "shortcut" through a single property may indeed provide a shorter-path alternative to the street route, by allowing for travel along an angle instead of the relatively perpendicular streets (figure 6.11). However, in terms of syntactical distance, or "threshold depth", there is no significant benefit: the street route has a depth of 1 compared to the property route's value of 2 . In fact, the supposed "shortcut" through private property is actually drastically longer than the street route, once all the separate convex spaces are considered instead of viewing the property itself as a single spatial unit. This more complex view is essential for understanding the way an actual agent might use the route: it adds not only to the quantitative complexity of the system, but to the way an agent would travel through such a space, navigating through multiple thresholds into separate spaces, any of which might be physically blocked, difficult to fit through, or in use by actual inhabitants that would provide an obstacle (physical or cultural, if the space is considered private) to through-access by an outsider.



Public Street Route	Private Route (simple)	Private Route (convex spaces)
Length (metric) = 26.41	Length (metric) = 18.17	Length (metric) = 22.96
Threshold Depth = 1	Threshold Depth = 2	Threshold Depth = 4

Fig 6.11. At left, the basic public route between two intersection streets is shown. In the middle, the basic "shortcut" route from one street to another, considering each property as a single space. To the right, the same route once all spaces are divided according to the rules of convexity.

When the lengths of these alternate routes are compared, both in metric length and syntactic length of "threshold depth", many of the rings are shown to provide no significant benefit over the corresponding all-public street access. Interestingly, the vast majority of these routes correspond with those that go through the interior spaces of private houses. This suggests that they probably were not used as through-access; more likely, their "ringyness" is an unintended feature. In contrast, most significant access routes were exterior, through courtyard spaces rather than through the house itself. These strategies preserve the privacy of the household, creating no need for outsiders to intrude on areas of daily activity at all.

Figure 6.12. Property areas for KAC level C are color-coded according to their basic connectivity. Dead end properties that connect directly to the street (and nothing else) are left uncolored.

While many of the shorter routes may have been accidental and not actually used as pathways, some of the longer routes (see figure 6.12, properties colored red) certainly had the potential to provide real access that may have competed, at least in usefulness, with the public street system. One of the longest is between properties C26, C28, and C36, all of which have direct street access but together provide though-access from street CS18 to CS23. This creates a significant shortcut as the rest of block IV has irregular borders and is non-ringy in terms of street access. The entire private route creates a pathway that is shorter by at least 32 meters compared to the roundabout way (and see figure 6.13).

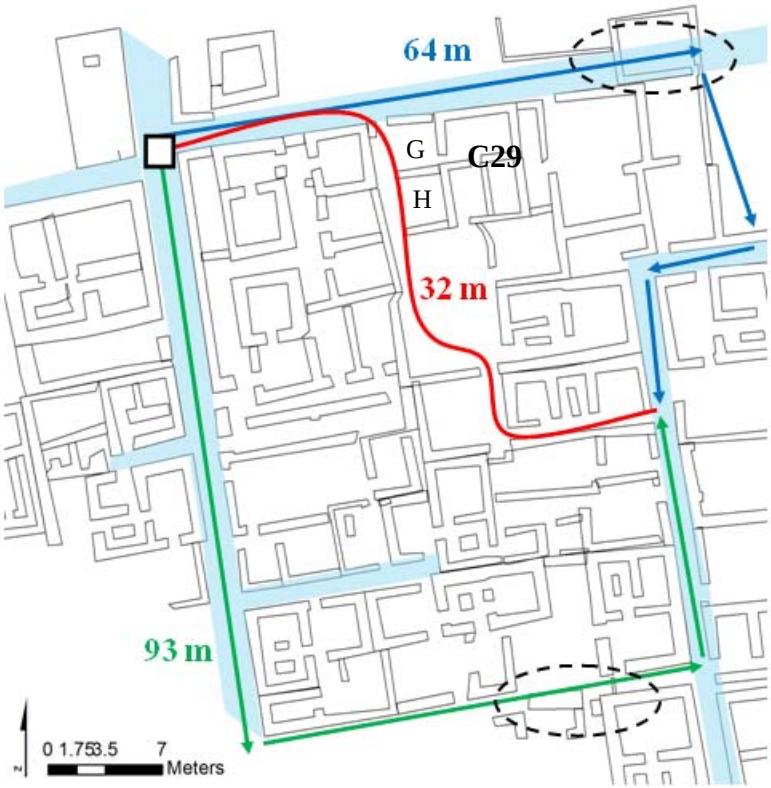


Figure 6.13. Cutting across private property (in red) may have been a common solution to avoiding the long routes of the public streets that did not always provide complete access around a block. Note that both the blue and green routes above were blocked by later construction (shown with dashed line), creating even longer detour routes.

It is still essential that such routes be emphasized as under private jurisdiction rather than part of the civic structure guaranteed to the entire public. In fact, the route depicted above in figure 6.13 passed through C26G and H, at least one of which rooms was roofed and therefore technically "interior" domestic space. Even if it did not, the path still travels through three private properties, suggesting that any agent travelling its full length would require permission from all three owners. Its use was therefore likely extremely restricted, potentially to only extended family or members of the involved households, or other extremely close neighbors. It was probably not used by the general public.

Property C86 has what is perhaps the most significant private route in all of central Karanis (KAC). It preserves the line of street CS105 so that it effectively meets with CS210, despite technically crossing private property. This route was first formed during the early C layer's northern expansion, probably around the turn of the first century C.E. (see also chapter four, p. 149 and following), and remained in effect through both the C and B layers.

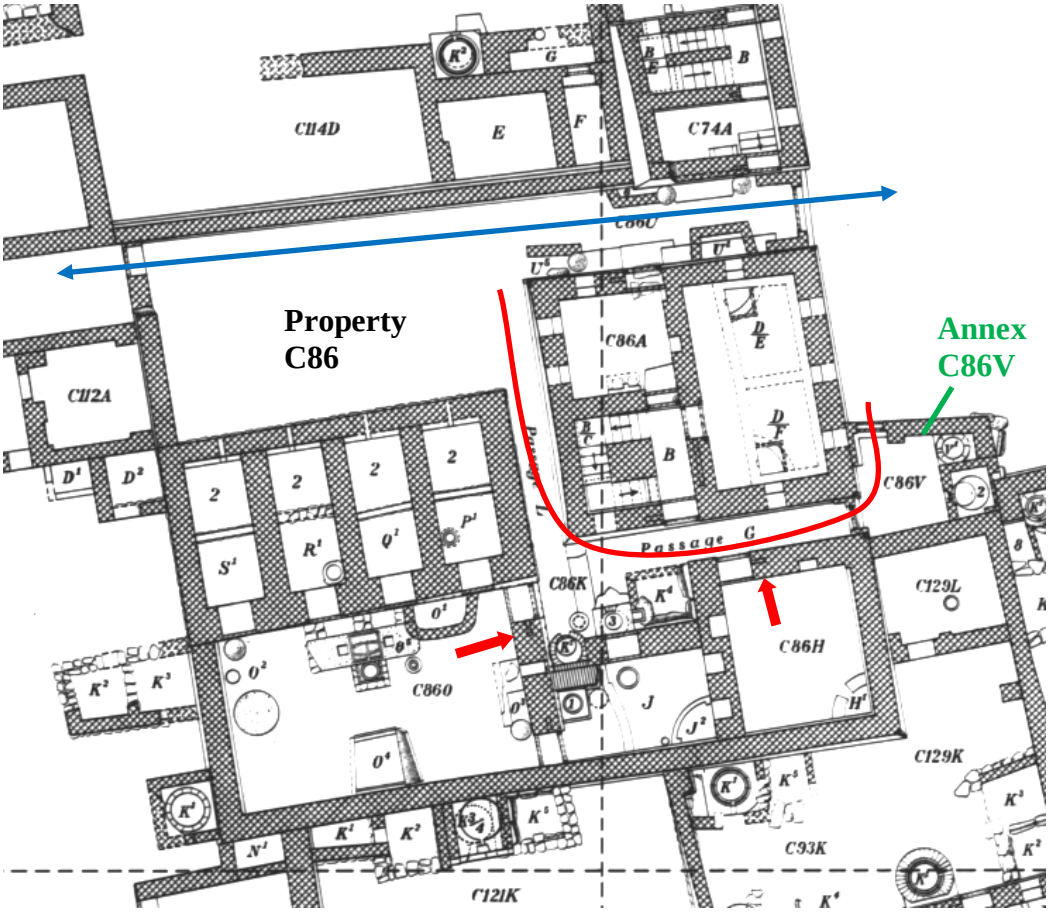


Figure 6.14. Property C86 during the C layer. The major route between CS105 and CS210 runs east-west at the north of the property, and is shown in blue; another more "private" passageway through the property is indicated in red. This passes through the annex space C86V. The activity areas of the southern courtyards are each defined by further enclosure walls, the doorways to which could be bolted shut (see the red arrows for where bolt-holes are indicated within the structure of the walls).

The route through property C86 (figure 6.14) was technically private, but there appear to be few attempts to limit access to it. Theoretically, the western boundary of the property could have been larger: the opening is only .88 meters, a mere 40 % of the 2.17 meter opening that could be possible. By the B layer this interface could have been made as wide as 5.75 meters, as the adjacent western property had fallen into disuse and become an open area. While the size of these doorways seems intentionally limited compared to their full potential, there is no real indication that they were ever truly designed as obstacles or barriers to traffic. There is evidence of threshold beams on each of the interfaces with the street, but as explained in Chapter 4, that is

not necessarily an attempt to restrict access by creating an obstacle, but rather an attempt to mitigate changes in surface levels by creating a reinforced edge rather than allowing for a crumbling slope. No proof of doors was discovered, let alone door bolts or other measures that could be used to physically obstruct through-traffic.

Inside the perimeter walls of C86, the organization of the property further suggests that through-traffic was expected: the northern part of the property has the characteristics of a street rather than a private courtyard. It is bare of ovens, storage bins, and even secluded from access to such features, compared to the rest of the well-appointed courtyard spaces which not only include ovens and storage bins built of mudbrick, but millstones and an olive press, as well as four large stone-built storage bins that resemble formal granary structures. However all of these features are very separate and syntactically distanced from the potential "street" space to the north. In fact, the property is designed around narrow passageways that further isolate the household activity areas, each of which is well-defined by enclosure walls with narrow entryways. These not only included doors, but could be bolted as well. Clearly, these areas were not available to the public. Thus, the entire property is designed to protect the privacy of the household as well as secure their resources from outside interference, while still allowing for fairly broad public through-access along the northern route.

The endurance of route CS105 suggests that even while private, it remained an essential pathway not only for the neighborhood, but also for the entire settlement. By the time a late extension of property B211 blocked it at the end, probably towards the end of the late second century C.E., the only remaining attested east-west route across the center of Karanis and the eastern area was a winding route through the south of town; Karanis had ceased to be composed

of separate blocks and instead had become a single long wall of structures 151 meters from north to south.

Figure 6.15. KAC in the B layer. The original blocks are no longer defined by street space (see also Appendix B for B layer map of color-coded blocks), as through-access is severely limited (streets are shown in blue, with areas of physical blockings indicated in black); by the end of the B layer of occupation, the only route from the western edge to the eastern side of KAC is the route shown with red arrows.

Change over time in neighborhood organization

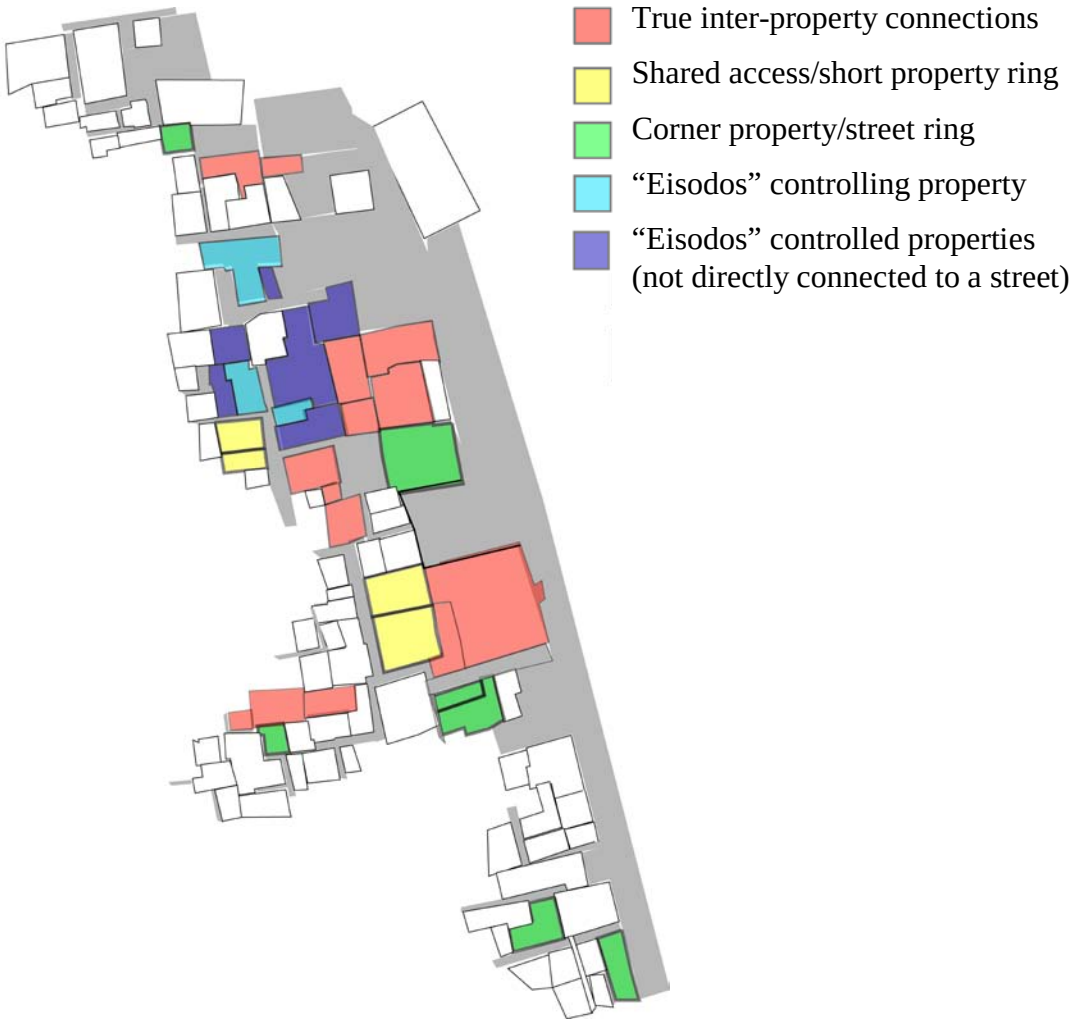


Fig. 6.16. Map of inter-property relationships in the KAC B layer (compare to figure 6.12). Note that in the central area, where through-access was severely limited by street blockings, inter-property access routes (in yellow and red) exist as significant clusters. Properties that may have preserved through-access for short distances between connected streets are in green.

Compared to the fairly ringy nature of the C layer, the B layer system was reduced, both in the street organization as well as private property routes. Most of the original streets were blocked along part of their length, and traffic rings declined: street "relative ringiness" was at .235 during the C layer; by the B layer it was down to .111. Including the potential for using private access, relative ringiness in the B layer was only .175, down from .339 in the C layer.

This suggests that over time, the spatial integration of Karanis neighborhoods decreased, creating more linear and non-distributive routes (see figure 6.17). This also meant that the distance between any two points became longer, with properties becoming deeper from the street and isolated from the public system. However, in terms of social interaction, this likely increased the importance of local relationships: private property like C86 and the long path through block IV may have served as important access-ways when the streets failed to provide direct routes.

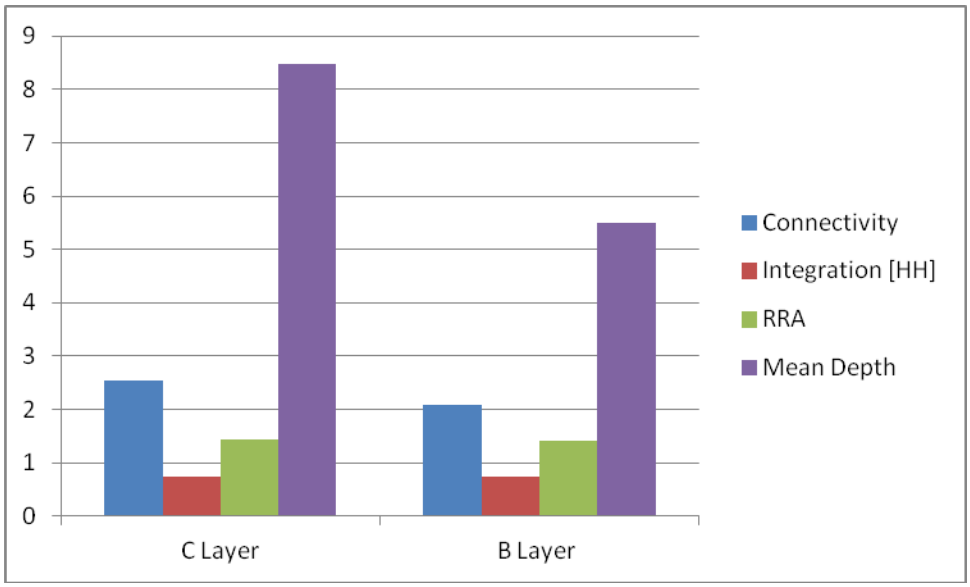


Figure 6.17. Comparison of average space syntax values for the KAC systems in the C and B Layers. Connectivity decreased significantly by the B layer, with the number of ringy accessways between properties becoming blocked. Mean Depth appears to have decreased as well, which could potentially indicate that the B Layer was more accessible and "close" in terms of syntactical distance, but the value also likely reflects the decrease in overall number of spaces between the C and B layers.

However, these routes would never have provided the full range of access that the original street system did, simply because they were not part of the civic system and therefore not open to use by the entire public. They were certainly unsuitable to large industrial or economic traffic: beasts of burden or wagons carrying grain to and from the *thesauroi* would not have cut through a private yard, simply because most of the interfaces between private property

and street were less than a meter wide. It would also have been disruptive for private courtyard space, which in most cases was designed for household production activities, especially grain preparation, which as discussed required protection from wind and invading windblown sand.

Inhabitants would have relied on the permission of their neighbors to use such space, certainly for access to courtyards for long-term occupation, but even for more transient use as potential through-routes. As this permission was likely only extended to known individuals or households, neighborly relations must have become very important. This was likely facilitated by the low integration of the streets: a less ringy, distributive system creates a local "domain of the inhabitants" (Grahame 2000:56) and therefore limits the number of "strangers" who would be using the routes for broad through-access across the settlement. As a result, neighbors may have grown "closer" together socially as the street system created more explicitly-defined systems of access.

Conclusion

Although we cannot necessarily reconstruct all levels of social agreement (or conflict), space syntax analysis does allow us to distinguish some of the general strategies by which space was negotiated, and to determine what some of the underlying social motivations may have been. It seems clear that any given space has two types of potential "use": one of occupation for the performance of activities and potential extended social interaction, and one of transitional movement, connecting two or more other spaces. The latter, although less suitable for long-term social interaction, could nonetheless provide potential "occasions" in which agents might meet briefly and interact for short durations of time. In chapter 5 this was shown to manifest itself as a

distinction between convex living spaces, for extended occupancy and social activities, and the shorter duration of use that occurs in transitional spaces such as stairways and other narrow passages. The same can be distinguished at the level of neighborhood analysis: some spaces are likely used for occupation and long-term use (as in the sharing of adjacent courtyard properties), but others were transitional routes and used mostly for through-access.

Even if a great many people were allowed to use such spaces, private properties were always under the jurisdiction of the owners or inhabitants, and therefore access to and between them was always restricted. Whether given informally, as by a general standing invitation, or even assured with a contractual agreement, an outsider would need permission to use private property, and such privileges were probably limited to close acquaintances and specific need rather than extended to the general public. The sharing of privately-owned space allowed for use of equipment for threshing, grinding flour, or baking bread, but this too was by invitation rather than granted to the general public. Even when through-access was possible, private property never provided a significant system of access because permission of the owner/inhabitant was still required.

In fact, all use of private property by non-inhabitants must be considered a privilege rather than a right, as the complex legal standing of the eisodos contracts has demonstrated. In contrast, use of the public street system and associated civic buildings and spaces would have been available to all. Other Greco-Roman towns preserve the remains of marketplaces, council houses, colonnaded streets, and even theaters and racetracks at which the general public could socialize (Davoli 1998, 2011; Bagnall and Rathbone 2004). Because the center of Karanis was destroyed in the early twentieth century (see Chapters 2, 4), there is no solid evidence for such formal structures; however, even if they cannot be proven to have existed, the general system of

street and "open area" spaces would have served as areas of casual and potentially unplanned interaction and socialization, the "occasions" described in chapter five (and see Grahame 2000:56). The open areas of layer B may also have taken on a broader public function, serving as informal meeting areas comparable to plazas and public squares.

Not only does the potential for encounters or "occasions" (Grahame 2000:56) increase in public areas, but so does the pool of potential agents. Public interactions were harder to control, as individuals of different socio-cultural backgrounds could come into direct contact, each having the right to occupy that public space. Streets were certainly prone to heavier traffic than the private routes, which no doubt led to increased probability of obstacles and annoyances along the route. These might include anything from heavy traffic, ensuing clouds of dust, or even a potential unexpected run-in with another person. Not all interactions were good, and the opportunity for conflict was always present.

The social life of Karanis neighborhoods would have been close, but not necessarily comfortable. Legal documents as well as architectural strategies for separation and access-control prove that interpersonal conflict did happen, and that it often revolved around property rights. However the various strategies outlined above demonstrate that there were many strategies for negotiating these conflicts, from the firm establishment of property boundaries and the erection of enclosure walls, to the existence of inter-property routes that could easily be created or blocked up over time to reflect changes in social relationships. The multiple approaches towards spatial as well as social negotiation show the great ability of Karanis society to adapt to changing circumstances, especially at the local neighborhood level where interpersonal (and inter-household) relationships were so important.

Chapter 7. Conclusion

This study examines the syntactical organization of access throughout ancient Karanis, incorporating both global and highly localized analysis of space in order to identity how the spatial (and therefore social) order was organized and adapted over time. Such organization can be maintained by either civic rule and official order, or by social consensus and pressures to conform to socio-cultural group standards. The architecture of ancient Karanis demonstrates that instead of remaining separate or even conflicting organizational forces, there was in fact a high degree of overlap between the two systems: the broad civic order was essential for instituting large-scale cohesive spatial order, but this authority was balanced by more localized social maintenance and interpersonal negotiations. Both were in fact essential components for, and both served to maintain and/or adapt, the spatial system of access as needed.

In describing past studies of ancient architecture and spatial organization for related socio-cultural groups, we can assess the theories and methods by which architectural remains have been and might continue to be studied and analyzed as evidence of such social organization. Traditionally, investigations of ancient spatial environments have assumed a strict binary division between private and public space, each of which was associated with different standards of permissible social behaviors, as indicated in chapter two. However, that review of literature concluded that many past studies have been misdirected in their assumptions that there was a single definitive code of acceptable practices for any social group: instead of a persisting culture-historical type, the actual expression of group values is continually evolving, based on constant negotiation between the individual and the group. As a result, access to space is itself negotiative of identity, as it allows for social interactions between members of different social

groups. The organization of relative access is therefore often highly dependent on socio-cultural standards of behavior as well as the nature of the specific space where social interaction occurs: in some cultures it is perfectly acceptable for an unmarried girl to entertain a female guest in her own bedroom, but even the male members of her immediate family might be forbidden from that space. Nor is the specific identity of any individual easily categorized based on a single binary description: rather than discussing "inhabitants" versus "strangers" of any given domestic structure, one must consider the different social implications of categories such as visitors, guests, friends, family, neighbors, acquaintances, or even unwelcome intruders. For all social situations, the degree of acceptable behavior varies depending on both the social identity of those involved and the social nature of the spatial location.

Space syntax analysis creates a method for examining spatial organization as quantitative and therefore comparable gradations of value, based on relative contextual location and the mathematic probability that any space or route between spaces will be used. When combined with additional sources of culturally-specific information about the potential reasons for socio-spatial organization, ancient architectural remains can be examined as evidence of complex degrees of social interaction as well as general socio-cultural standards of social organization. This in turn makes it possible to compare results between spaces and across different networks of spaces. It also creates a specific language and mathematical spatial context for describing the relative position of observational attributes for any architectural structure, so that they can be analyzed with respect to their original spatial context and not only according to their general presence or absence within a given structure.

Due to the uneven nature of the site's preservation and modern archaeological excavation, we cannot easily reconstruct all the minutiae of the Karanis' ancient spatial system

with regards to temporal development, nor can we easily rediscover the exact spatial boundaries of the ancient town districts (*amphoda*). However, examination of the structural remains is possible, from the global system of settlement space, to the more local areas of neighborhoods and blocks of private property, and to the organization of individual domestic properties and the houses themselves. By considering the syntactical system of organizing such spaces along with the relative location of individual architectural attributes, a great deal can be learned about the spatial and social organization of the Greco-Roman Fayum town.

Settlement order: the extent of civic planning versus localized social consensus

The global system created by a complete settlement is important for examining broad concepts of spatial organization. It is clear that Karanis was intentionally planned, and that the civic authority was greatly invested in the initial creation of Karanis' spatial system, and oversaw the original layout of the town (as well as its subsequent expansion) according to a pre-planned spatial order. As demonstrated in chapter four, evidence of this is visible in the regularity of the original street layout, which provided not only a complex system of public access throughout the site but also gave consistent orientation to all adjacent constructions of private property. While not the complete formal rectilinear grid of other Greek and Roman settlements, Karanis streets were planned and built to provide highly distributive access through the creation of multiple traffic "rings", which increased the opportunity for choice in selecting routes for access throughout the site. This not only diffused the potential for traffic congestion along major roads, but increased opportunity for access across the entire site: the many options allowed agents to select the shortest possible path between any two points, and the low mean depth for the street system indicates that many direct, short routes were possible.

Just as the high degree of choice among settlement-wide access routes reduced mean depth within the settlement, the traffic rings among individual town blocks reduced the distances between points within a local neighborhood. This created local neighborhood levels of shared spatial experience and social cohesion: and these interpersonal relationships in turn were essential components of local spatial management: while the civic order may have instituted some of these local spatial systems, there was not necessarily a high level of involvement and investment of resources beyond initial construction. As a result, it fell to local-level and sometimes even personal decisions to enact necessary change.

Social consensus as an effective strategy for spatial organization

It is important to remember that, just like more formal centralized administrative programs, organization via social rules of consent is a legitimate way of maintaining spatial order—even if it is not a particularly well-recognized one. Local-level social strategies of maintenance often exhibit greater variation and experimentation, so the results lack the uniformity or recognizable hallmarks of standardized civic plans. In Karanis, these changes slowly altered the original street system, so that pathways were not as long and straight as before, and eventually the majority of old routes was blocked by newer construction.

This does not mean that there were no rules in place to check these actions: while the integration of the street system did decrease, leading to fewer choices of traffic rings and alternate routes, the general connectivity and effectiveness of the public street system was still maintained: access on both the local and global level was still very possible. Because the local choices proved effective in mitigating spatial organization without causing any additional social conflict, the official town management was probably satisfied and chose not to interfere, even if

some of the strategies may have been 'technically' illegal, as they often intruded onto public property. The construction of stone steps and especially windbreak walls around private entryways actually extended into public street space, creating potential obstacles to free traffic. However, there were apparently no steps to dismantle such constructions or prevent them from being built in the first place; in fact, the strategy was so effective that it was commonplace not only for private domestic properties, but even for large economic facilities include large semi-public granaries. In short, local residents were not actively prohibited from taking matters into their own hands and engaging in local-level social and practical problem solving—they may well have been encouraged to do so.

Organization of the Karanis house and social implications for their households

Of course, as Karanis fell under the official administration of Roman law, this gave property owners the rights to construct or remodel buildings however they wished, operating only under limited restrictions designed to secure public safety. This meant that, compared to fear of official civic reprisal, it was far more important for the average property owner to consider actions that might infringe property rights of others: they were more likely to pursue legal action. As a result, many strategies for construction and adaptation of private properties emphasized autonomy and independence rather than a heavy degree of reliance on the cooperation of neighbors. Perimeter walls were ubiquitous and served as a way of making the exact limits of private spatial authority perfectly clear, uncontestable and especially unencroachable by the construction of others. While chapter five demonstrates that some of these outer enclosures could be built of multiple wall units, so they were shared between adjacent

neighbors, the structure of the house itself was absolutely free-standing: it never relied on the support of a neighboring structure.

The tower house was by far the most common structure type for all Karanis properties: the ubiquity of these multi-story structures proved they were considered particularly well-adapted to the social needs of the ancient inhabitants. Though the overall floor-plan was small (an average of only 45 meters square), this strategy maximized the size of the remaining property space, allowing for the inclusion of exterior courtyard space for even the smallest of plots. It also created a strong structural base for the support of upper stories, and provided the main strategy by which Karanis houses were expanded over time: as additional stories could be added on easily as the need arose, the tower house type allowed for adjustment to changing spatial and social needs. This could include expansion to fit a growing number of occupants per household, but also allowed for adaptation to rising levels of ground levels outside the house. As courtyard and street surfaces rose, so did the houses, by converting lower levels to subsurface basement rooms, and moving a story up.

Despite the important role of upper stories in organizing daily life inside the Karanis houses, uneven preservation and publication of the original excavation evidence has necessarily limited other studies to using evidence of only ground-floor domestic spaces. With no more than three convex spaces in the average floor-plan, access was often interpreted as a simple linear transition from public to private space, but even these distinctions were fairly negligible: the "deepest" and most private space was still no more than 2 thresholds from the exterior.

When the dataset is expanded to include additional stories, a far more complex organizational system becomes apparent. The inclusion of upper- and lower-level rooms does little to change depth values within the average house: for almost all cases, even rooms upstairs

remain no more than three or four doorways from the exterior of the house. However, measurements of both control and connectivity experience huge changes once these additional floor spaces are considered. The most dramatic change is consistently focused on the central stairway structure: this is not only the single point of access to upper and lower stories, but it connects *directly* to each room on these levels. The connectivity of the central stairway is responsible for creating the very shallow configuration of the whole house, which is in turn indicated by lower relative asymmetry values. For nearly every relevant syntactical value, the results indicate that the stairway is the standard central distributional hub of access for the Karanis tower house.

The spatial organization thus suggests that social organization within the average Karanis house was defined by close interaction. There was no separate systems of access within the house that could be used to restrict interaction between different social groups: from the head of the house to the servants and slaves, all would have used the same passageway and come into direct contact on a daily basis. Opportunity for mutual monitoring of location as well as behavior was high: it was likely that everyone was equally aware of what the other inhabitants in the house were doing at any given time.

However, that is not to say the Karanis house had no privacy: even if they are not isolated or deep within a structure, rooms can be also considered private if they can be occupied by either an individual or a group with a low chance of interruption by other parties from outside the room. With the exception of the front room of the house and the subsequent stairway passage, nearly every room within a Karanis house has a connectivity value of 1. This means that they have only a single door providing access in and out (and in nearly all examples this connection is to the stairway). Thus these rooms are dead-ends within the access system, which

means that they cannot be used to travel through space to another part of the house. Social activities within such rooms are therefore unlikely to be interrupted by casual traffic; the only people who approach and enter them do so with the intention of occupying them instead of passing through.

A comparison of architectural attributes to the syntactical values of each room shows a consistent relationship between highly convex rooms and low connectivity: spaces that have extremely low connectivity and provide no possibility for through-movement tend to be highly convex, meaning their width-to-length ratio is low. Convex spaces are therefore fat rather than oblong, and allow for a high degree of circulation within a single space. Nearly all the dead-end, non-interruptive rooms of Karanis houses are very convex. In contrast, the stairway passages of Karanis houses were consistently built to much more restrictive dimensions, being narrow and oblong. This low convexity means it is difficult to maneuver freely within these spaces, and they tend to be easily blocked by the presence of even a few individuals.

While low convexity is a common attribute of transitional spaces like hallways, it is in fact a markedly different spatial strategy than has been observed in other houses of the Roman period. As explained in chapter two, the standard *domus* is more regularly thought of as being designed as a series of large convex spaces directly connected along a wide visual axis, thus providing broad transitional access as well as high circulation per individual room. The result created the impression of large continuous space, and was a means of communicating to visitors the wealth, power, and social importance of the inhabitants who lived in such impressive spaces. In contrast, the Karanis houses have no views between rooms at all, nor do they have direct connection between living spaces: anyone wishing to enter the house deeper than the front room must squeeze through a narrow stairway.

This might suggest that, compared to the relatively equal access between household occupants, visitors to the Karanis house were restricted in their movements, that the front room alone was used for entertaining visitors and the rest of the structure was the domain of the inhabitants. However, front rooms consistently lack evidence that they were in any way locations of social display: they were consistently equal to or smaller than their "deeper" ground floor counterparts. In addition, it has been demonstrated that for instances of preserved decorative features, the overwhelming majority were located in secondary rooms rather than the front spaces. If decorations, including wall paintings and elaborate architectural wall shrines, were to have any relative value as indicators of social status, they must have been accessible to view by visitors to the house: this indicates that visitors were not only allowed entry to private houses in general, but allowed fairly deep access to interior spaces. Apparently, guests in Karanis were expected to squeeze through cramped passageways less than a meter wide in order to reach their destinations for even fancy dinner parties or other formal social occasions within the private house. However the near-ubiquity of this pattern proves that it was perfectly acceptable: there is no evidence of tower houses with alternate floor-plans or attempts to reorganize rooms according to a less restrictive system.

Inter-property relationships and the social motivations for shared access

Like the interior rooms of houses, courtyards were designed as fairly convex areas, as befits their use as activity areas for daily household tasks, especially bread making. The convexity allowed for the position of installations such as ovens and small semi-permanent obstacles (millstones) without too much obstruction of traffic, presumably so circulation throughout the space would not be impeded by these activities. In contrast to the essential role of

passageways in connecting convex spaces of the house interior, narrow areas with low convexity are notably rare for private exterior spaces. Instead, courtyard activity spaces were frequently directly connected to each other, with no intermediate passageway. The relative size of access interface points was also significantly high: instead of narrow doorways (as are common to house interiors), access between discrete courtyard spaces was often much wider, sometimes lacking any indication of a threshold or physical boundary-marker at all. This may indicate that there was no strong concept of courtyard spaces as discrete areas, but they perhaps were all considered part of a single courtyard complex.

In addition to scalar attributes such as convexity and the size of access-points, the syntactical analysis confirms that courtyards were highly social spaces, not only for the inhabitants, but even for visitors from outside the immediate household: while some private properties were only accessible from the street via the house itself, other properties had additional access points, including direct courtyard routes to the courtyard areas from the street, or even between separate adjacent properties. This creates the potential for outsiders to access and use private courtyard property in a variety of ways.

There is also is a high association between the existence of inter-property access and the presence of associated ovens, mills, and other food-processing equipment, suggesting that the most frequent reason for sharing courtyard access was to provide access to specialized equipment not found on other properties. The sharing of workspace was likely highly beneficial to both the property owner and any permitted guests: not only could they share the burden of physical labor and even the cost of production by pooling resources, but they could use the time for social interaction, creating strong interpersonal relationships and reaffirming their identities as part of a larger social community. But these neighborly agreements were not necessarily long-

lasting: permission to access private property could be revoked at any time. Small changes in access between Karanis properties—the blocking of old shared doorways, especially—suggests that such agreements were often tenuous. As in modern life, not all neighbors were equally generous with their property, and not everyone in Karanis was equally interested in being an active part of a local cooperative community.

However, as is discussed in Chapter six, the social organization of Karanis was important in maintaining social order to the point that pressures from the community had significant influence over the decisions of the individual, even with respect to private property. Unlike the sharing of a courtyard for extensive occupation and use of the facilities, sometimes neighbors were effectively forced to share the use of their private properties as access routes to other areas. If the first property was physically controlling another so that there was no other possible pathway for access, the legal property rights of the two parties were directly in conflict: one could not fully control one's own property without restricting the right of the other to do the same. In such circumstances access across a neighbor's land was considered almost a real legal right, but certainly was widely considered a right in the court of public opinion. Many documents preserve examples of contracts outlining the exact nature of such access agreements, suggesting that such negotiations were not always friendly but required more official forms of settling conflict. This is exemplified in papyrological evidence of special permissions and servitudes on property, including rights of *eisodos kai exodos*, rights of entry and exiting through another's private property. These serve as proof that such permissions were rarely taken for granted, and once given, every effort was made to make them permanent, and even somewhat enforceable under law.

Physical proof of such arrangements is hard to identify in the extant remains of Karanis—

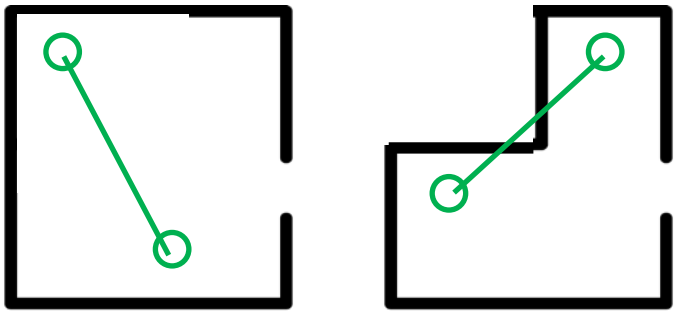
examples that appear to be separate adjacent properties united by shared access may in fact have been part of the same extended property and shared by a single household. However, analysis of connectivity values among Karanis blocks demonstrates how severely the official street system diminished over time: instead of multiple choices of access between any two locations, by the late levels of Karanis occupation, most systems of access had been reduced to a few major routes across town, supplemented by a secondary network of non-direct interconnected access-ways along narrow, winding streets.

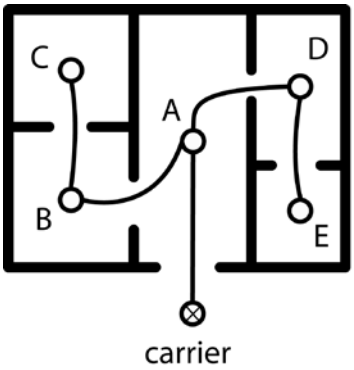
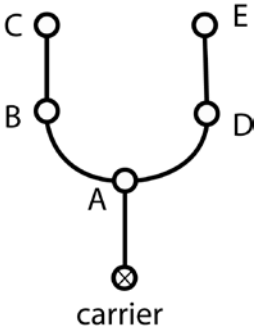
But instead of isolating the inhabitants of Karanis from each other, this decrease in choice of routes along public streets likely increased their dependence on cooperation and access to alternative routes through private property. Knowledge of those special "shortcuts" and back roads would have relied on both familiarity with local layout as well as familiarity with the local owners and inhabitants—after all, as long as such routes crossed private land, their use was a special privilege rather than a public right. Nevertheless, when the low number of remaining public routes was combined with potential paths though private property, the result is a much more extensive system of access that resembles the high connectivity, integration, and distribution of traffic rings created by the original street system. This proves just how effective local social systems could be at adapting changing spatial environments.

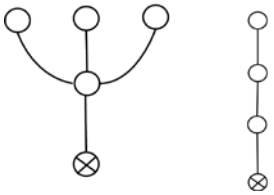
While change over time in the Karanis spatial networks has been described as transforming persistently towards social and economic disorder and decline, it is important to emphasize that this pattern was not developing contemporaneously across all areas of Karanis. Instead, it was symptomatic for each individual area that had a long history of continual occupation. Changes due to new construction as well as the surface debris that caused streets to rise resulted in the complex palimpsests of local neighborhood access, but this does not meant

that the original plan was a failure, nor did the civic organizational mechanisms cease to exist. In fact, while central Karanis (KAC) was at its most complex and circuitous stage of development, contemporary construction in the eastern and western suburbs (KAE and KAW) prove that the town's administration continued to develop new areas of habitation according to the original plan that was used since Karanis' foundation: broad streets were regularly spaced and oriented, highly connected to provide multiple rings of access and increased choice of path between any two locations. Considering that the original plan had not been replaced or even notably improved upon for centuries, it is unlikely that anyone considered it to be a failure. Instead, it was part of the complex system that balanced civic oversight and relative uniformity of public spatial organization with the more variable and inventive aspect of small-scale social interaction that enacted change for local neighbors and private properties. The results, as preserved in the structural remains of ancient Karanis, demonstrate the huge adaptivity of the ancient town and its inhabitants to encompass and even embrace change.

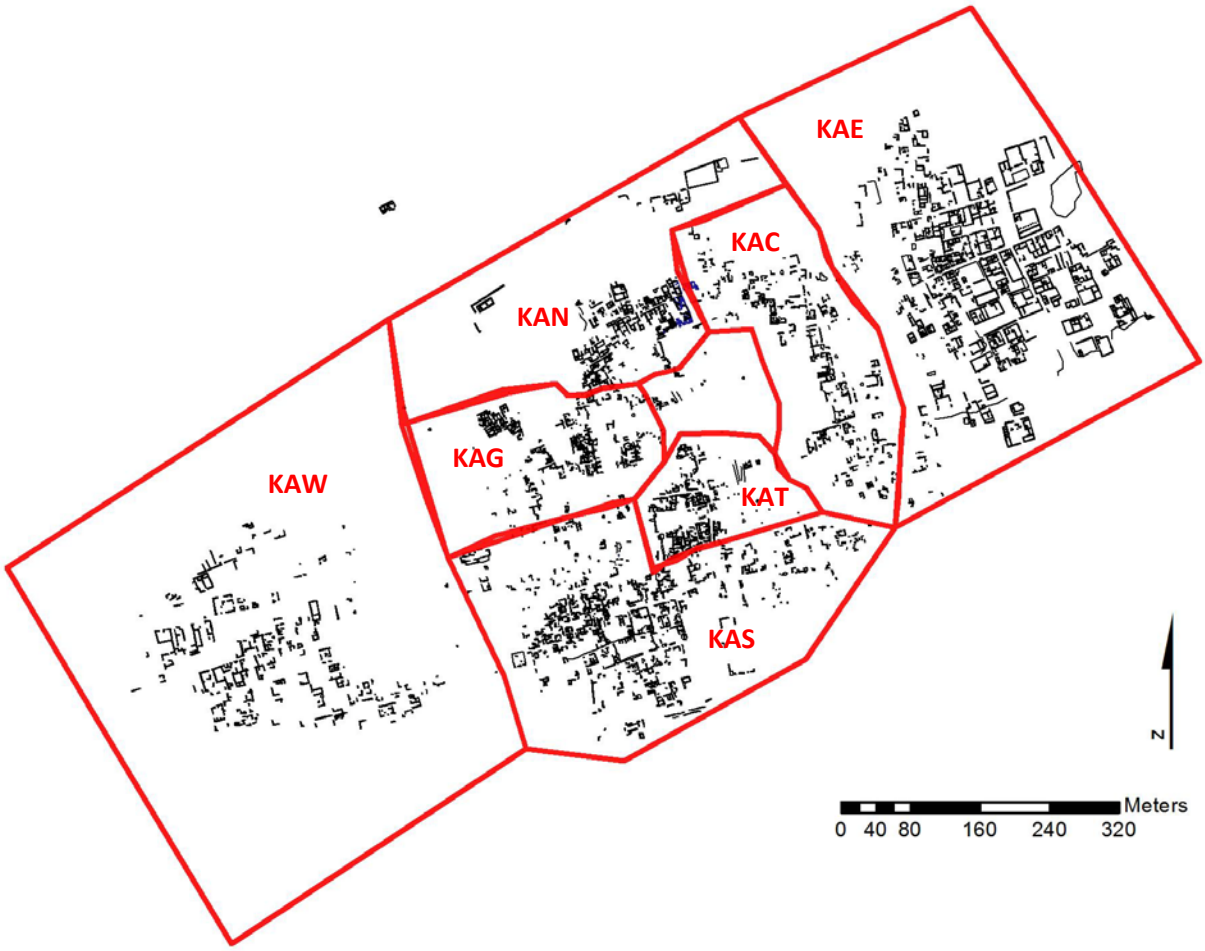
Appendix A: Glossary of Space Syntax Terminology and Formulae

Scalar Concerns	
	Convex space: Basic unit of space syntax analysis, not equal to the architectural designation of "room", but partially defined by the position of the walls. For a convex space, any two points within that space can be joined by a line segment that is totally contained within the spatial boundaries. If the line passes over the wall/boundary at any point, the space is concave and must be divided into separate convex spaces.  **Convex** **Concave**
	Convexity A ratio of length versus width of rooms, ranging between 0 and 1. A high convexity value indicates a wide space, approaching a square. A low convexity is an oblong, narrow space. These values often reflect room use, with low convexity suitable for storage or transitional traffic, and highly convex spaces more suitable for activity and circulation of occupants.

Access Analysis	
	Justified Access Map Redrawing the system map from the point of view of one space (usually the carrier, or nearest space exterior to the structure), with the rest arranged in standardized tiers from this point. This allows for easy calculation of threshold depth.  **Basic (architectural) Access Map**  **Justified Access Map**
Depth Values	
	Threshold Depth (also known as **Step Depth**) The number of boundaries that must be crossed to reach a given space from a starting location. Value should be an integer of 1 or higher, and according to the shortest path available. Step depth is often used to calculate depth of interior spaces with respect to the outside of a structure (with the outside space serving as "carrier").
	Mean Depth How deep a given space is compared to the rest of the spaces in the building. A high mean depth suggests a space is comparatively inaccessible and potentially private compared to a more accessible, shallow space that is well-connected to the structure's access system. $MD = Rd_k/(k - 1)$ Rd_k is the sum of the depth values for each space k is the total number of spaces for the entire configuration (see Fisher 2009:441) For this study, Mean Depth is calculated automoatically by the Depthmap program

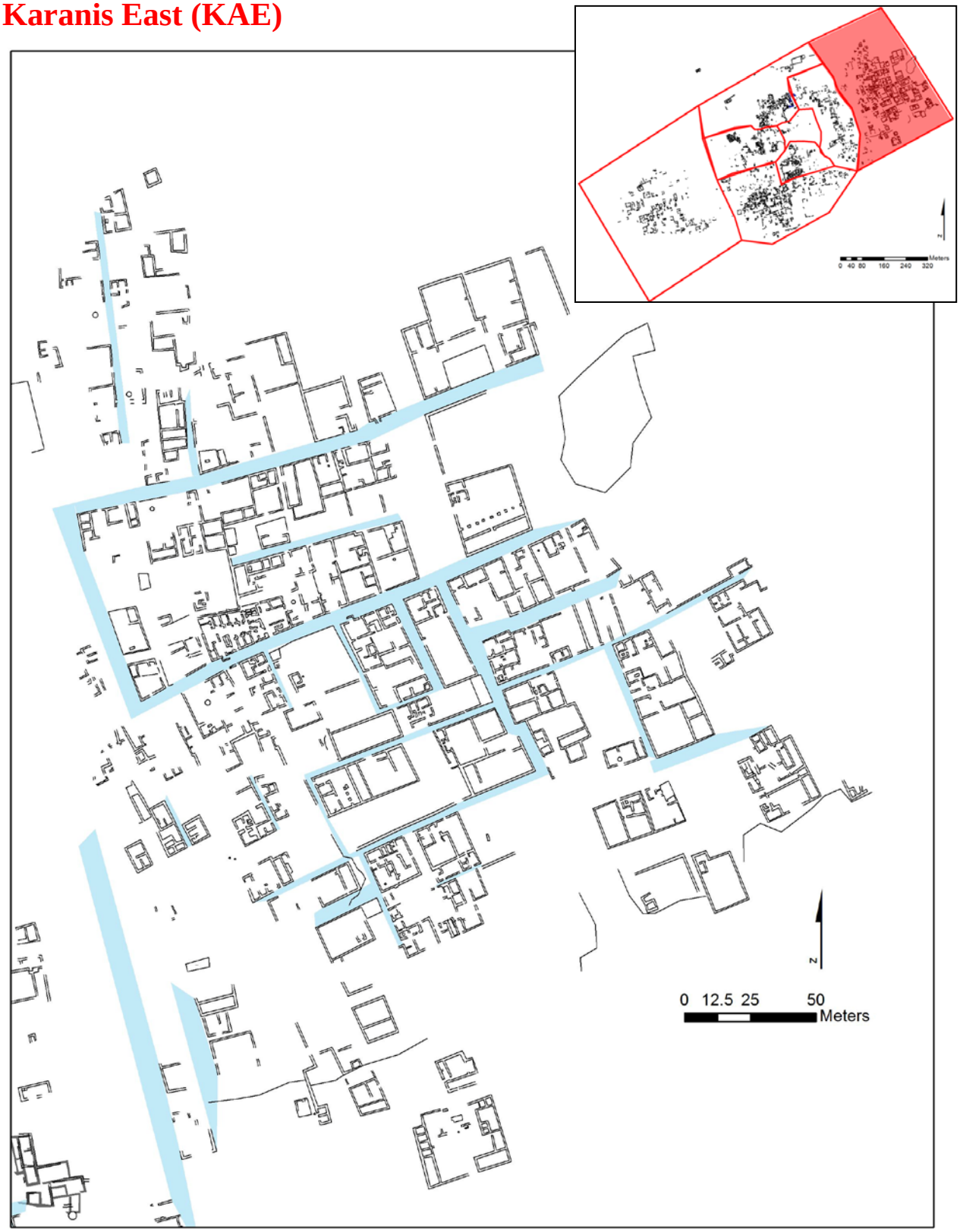
Integration Values	
	Integration, according to the Hillier and Hanson definition (1985): The number of thresholds necessary for any given space to cross to reach all other spaces within the system (shortest paths). Low value indicates good accessibility, high indicates more isolated, non-accessible space. In this study, integration values are calculated with Depthmap.
	Asymmetry: A symmetrical access plan includes many shallow configurations, wherein most spaces are relatively close and well-connected to each other at similar depths. Therefore an asymmetrical space or system has a greater range of depths: some spaces will be shallow and close to each other, but others are more isolated down long, linear paths.  **Symmetrical** **Asymmetrical**
	Relative Asymmetry: RA = 2(MD - 1)/(k- 2) MD is the "Mean Depth" value (see above) Where k is the number of convex spaces in the spatial system Results are in the 0-infinity range. High value=less accessible.
	Real Relative Asymmetry: This value takes into account the whole complexity of the system . (In Depthmap a high RRA equals low ringiness and low integration). A space with few ringy connections will have a lower, better score than a space with many non-ringy connections. RRA=RA/D Where k is the total number of convex spaces in the spatial system and D is the D-value of k. A configuration's D-value is a constant related to the total number of rooms in a configuration, and must be referenced from a chart in Hiller and Hanson 1984 (Table 3).

Appendix B: Maps of Karanis



General survey map of extant Karanis architecture, recorded in 2007-2012 by H. Barnard, here seen with overlay indicating “areas” as designated by the current UCLA/RUG/UoA Fayum Project.

Karanis East (KAE)



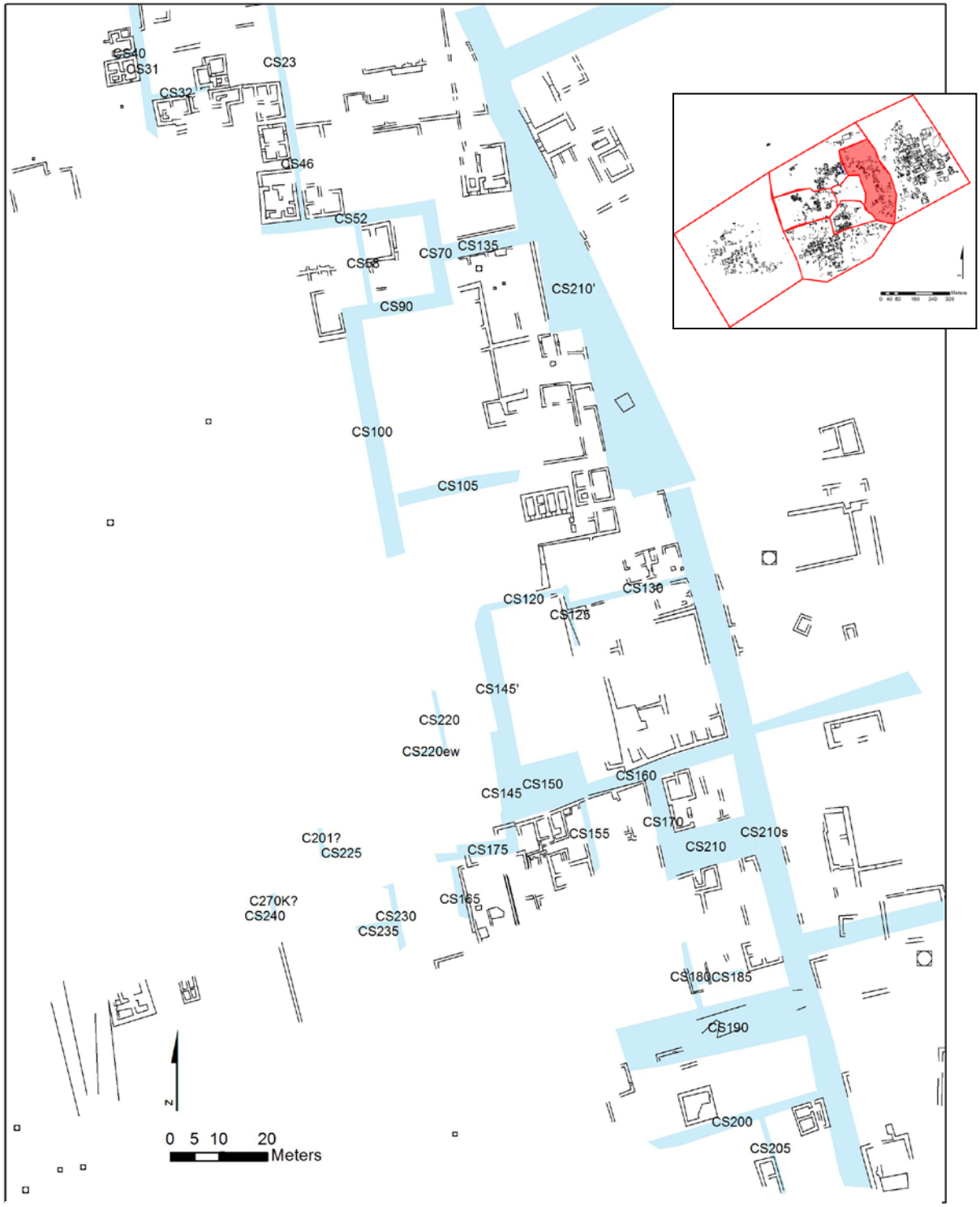
Karanis West (KAW)

Karanis South (KAS)

Karanis “Area G” (KAG)

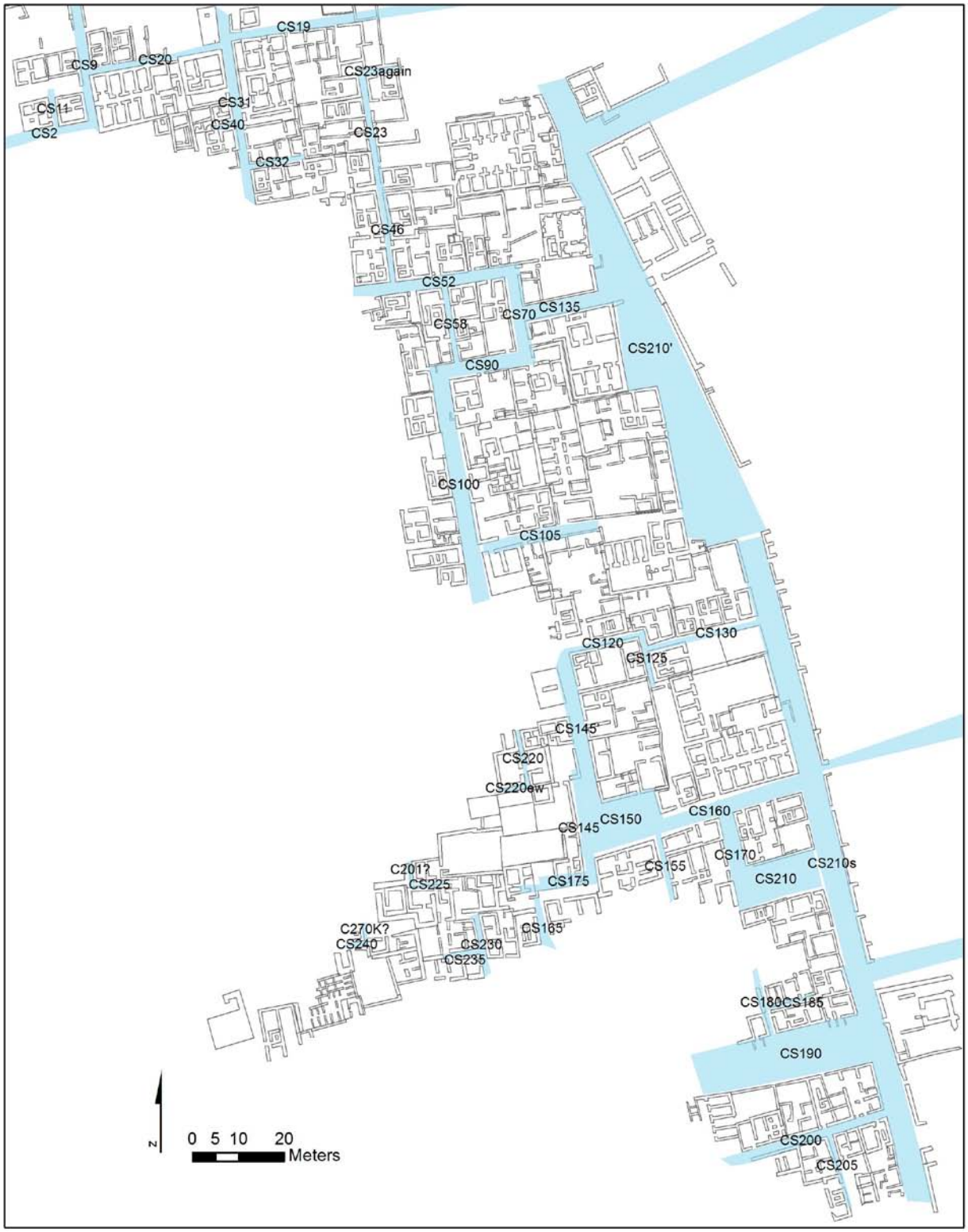
Karanis North (KAN)

Karanis Center (KAC)

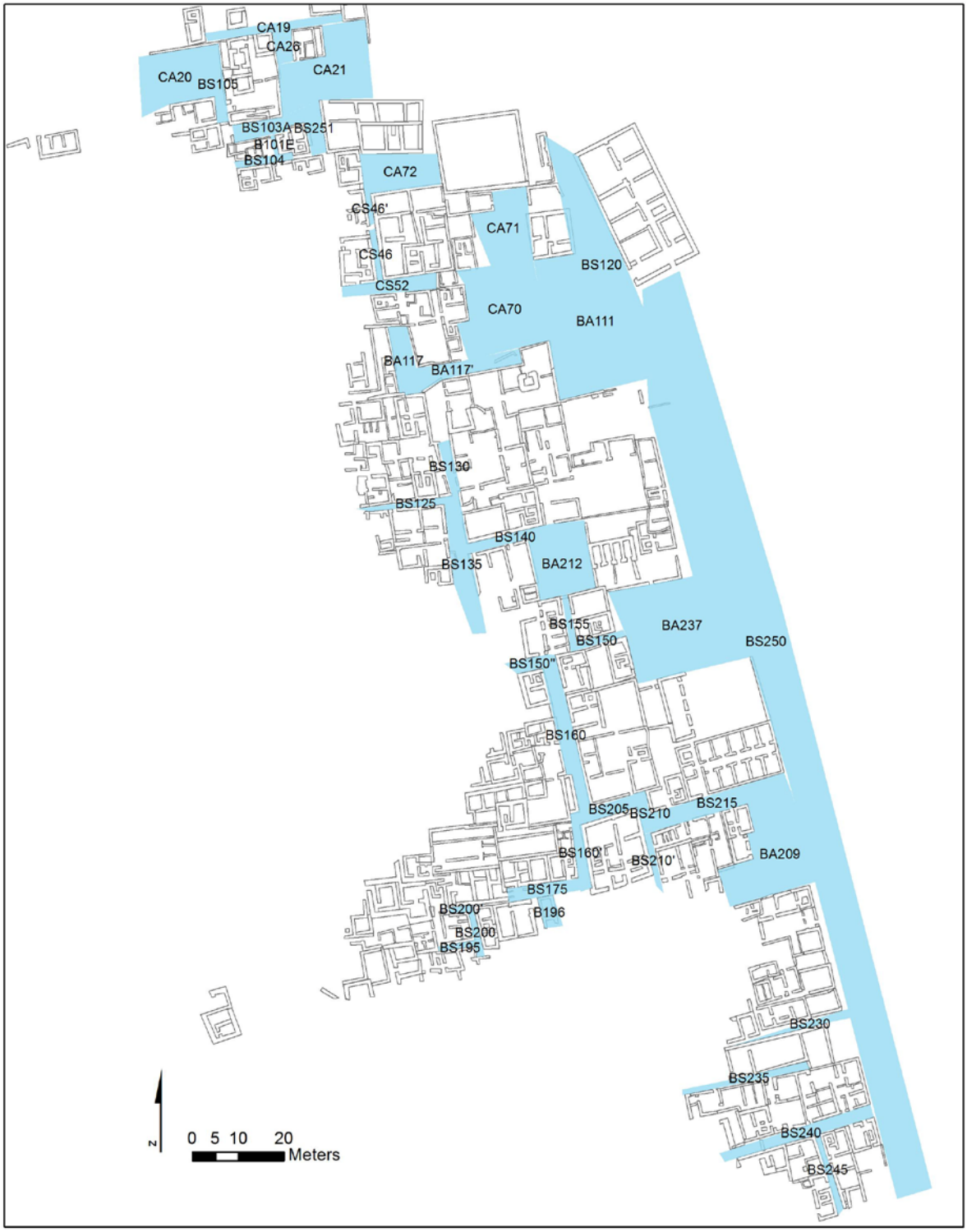


KAC architecture as recorded in 2007-2012 survey. Position of the original C layer streets superimposed in blue.

C Layer of KAC (streets shown in blue)

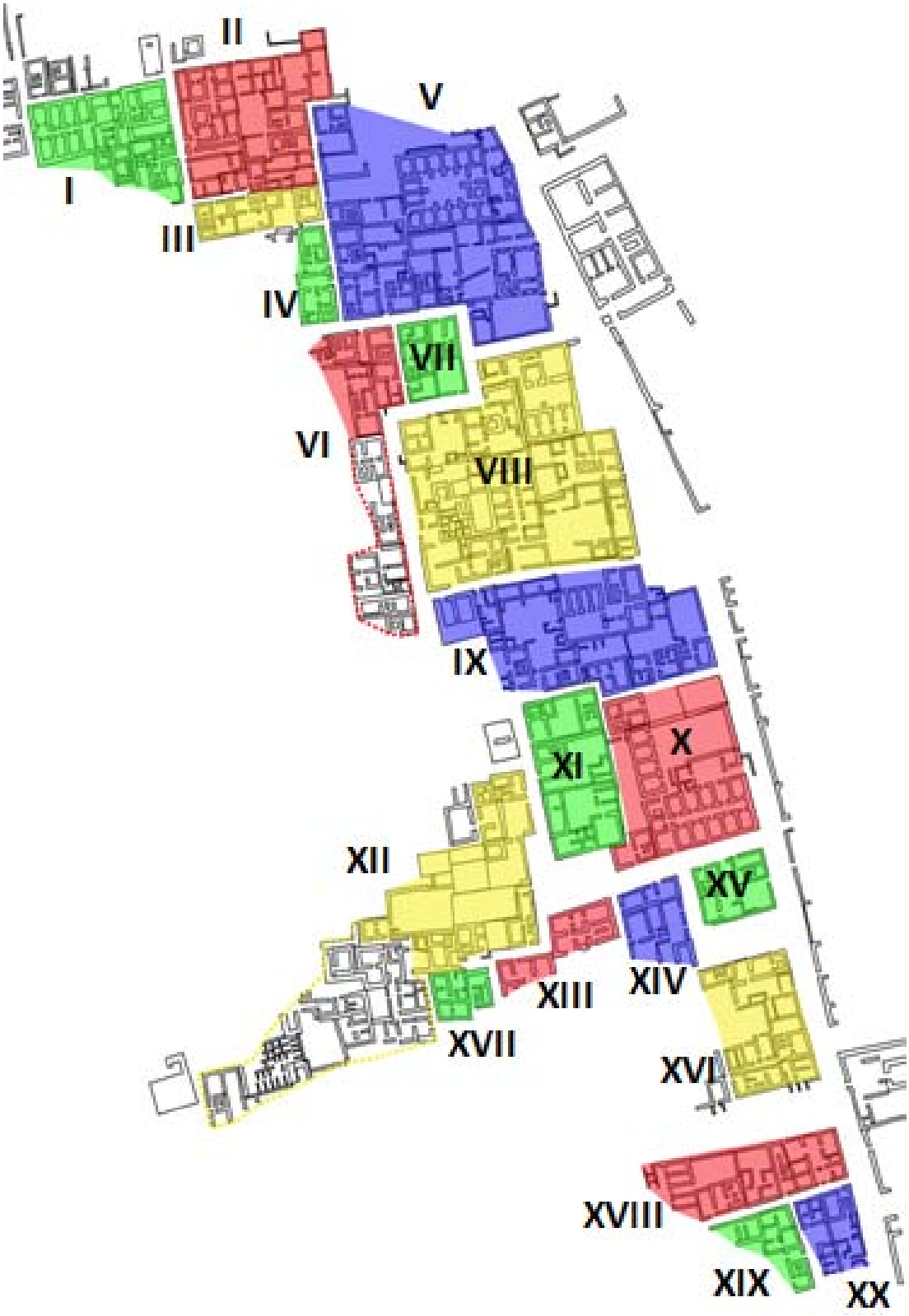


B Layer of KAC (streets shown in blue)

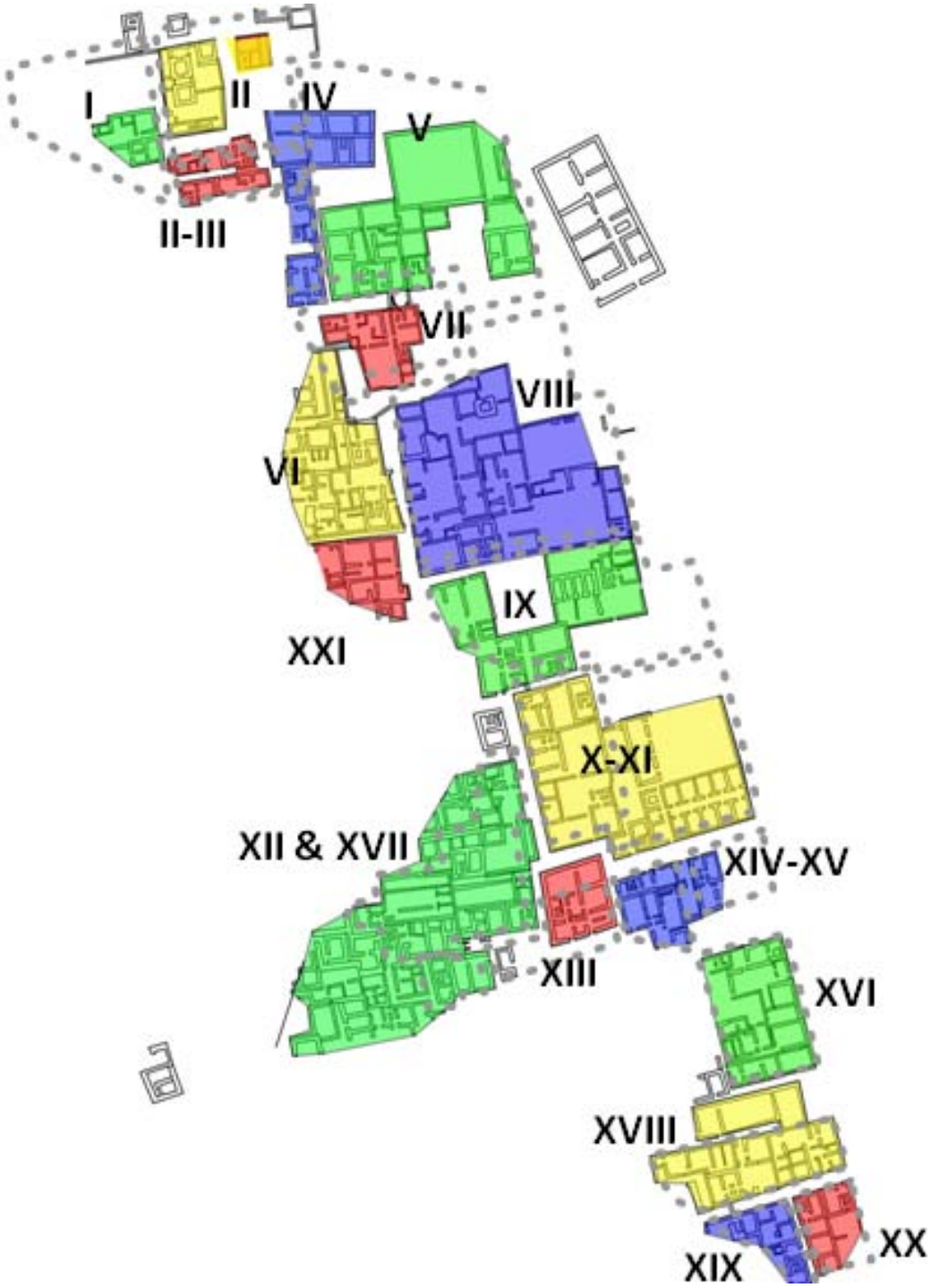


A layer of KAC

C Layer blocks (KAC)

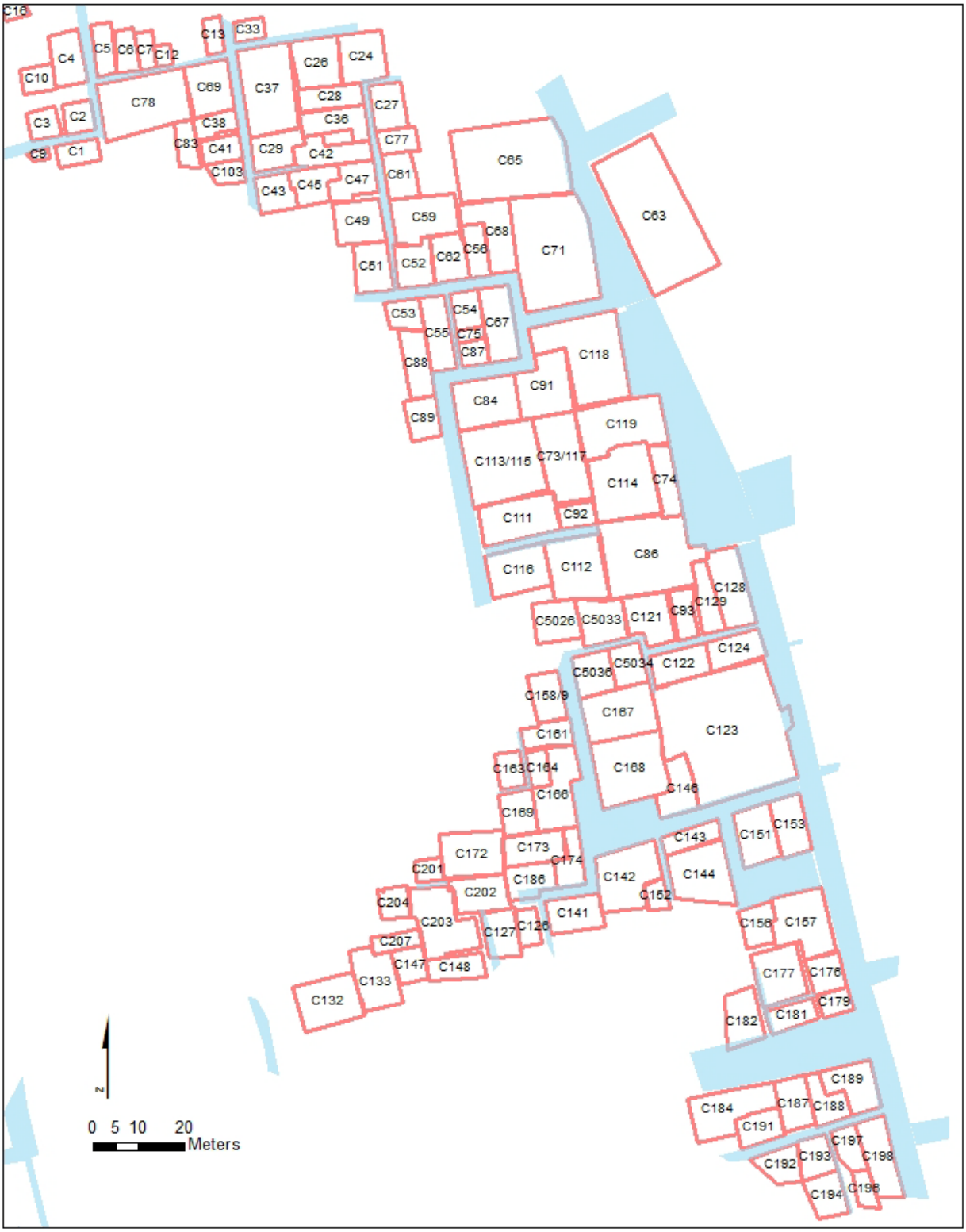


B Layer Blocks (KAC)

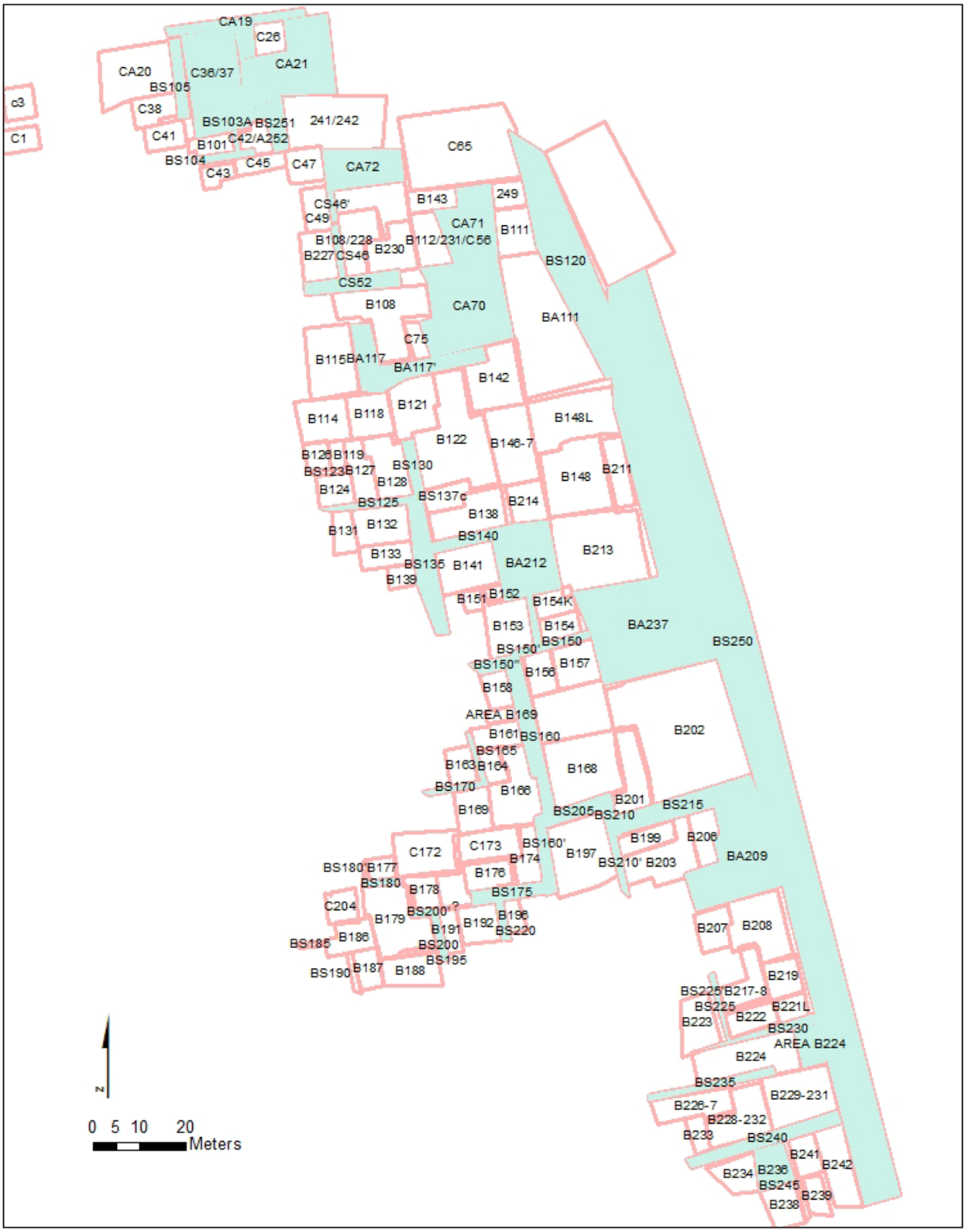


This image shows different colors than the corresponding map of Layer C, to reflect the new property groupings in the B layer. Labels reflect the old C designations but are "combined" according to the B layer relationships; outlines of C layer blocks in GREY dashed line.

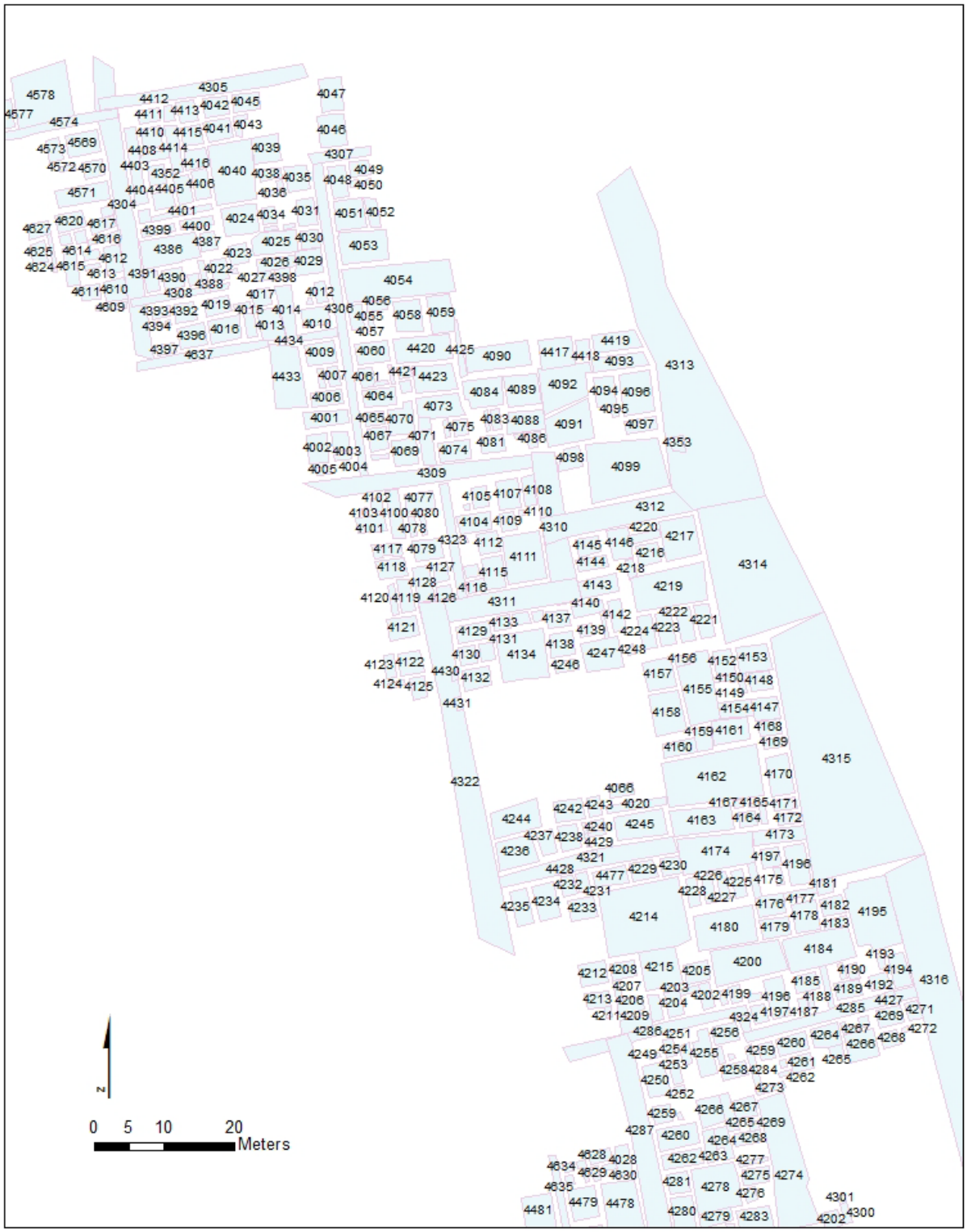
Properties of the C Layer (KAC)

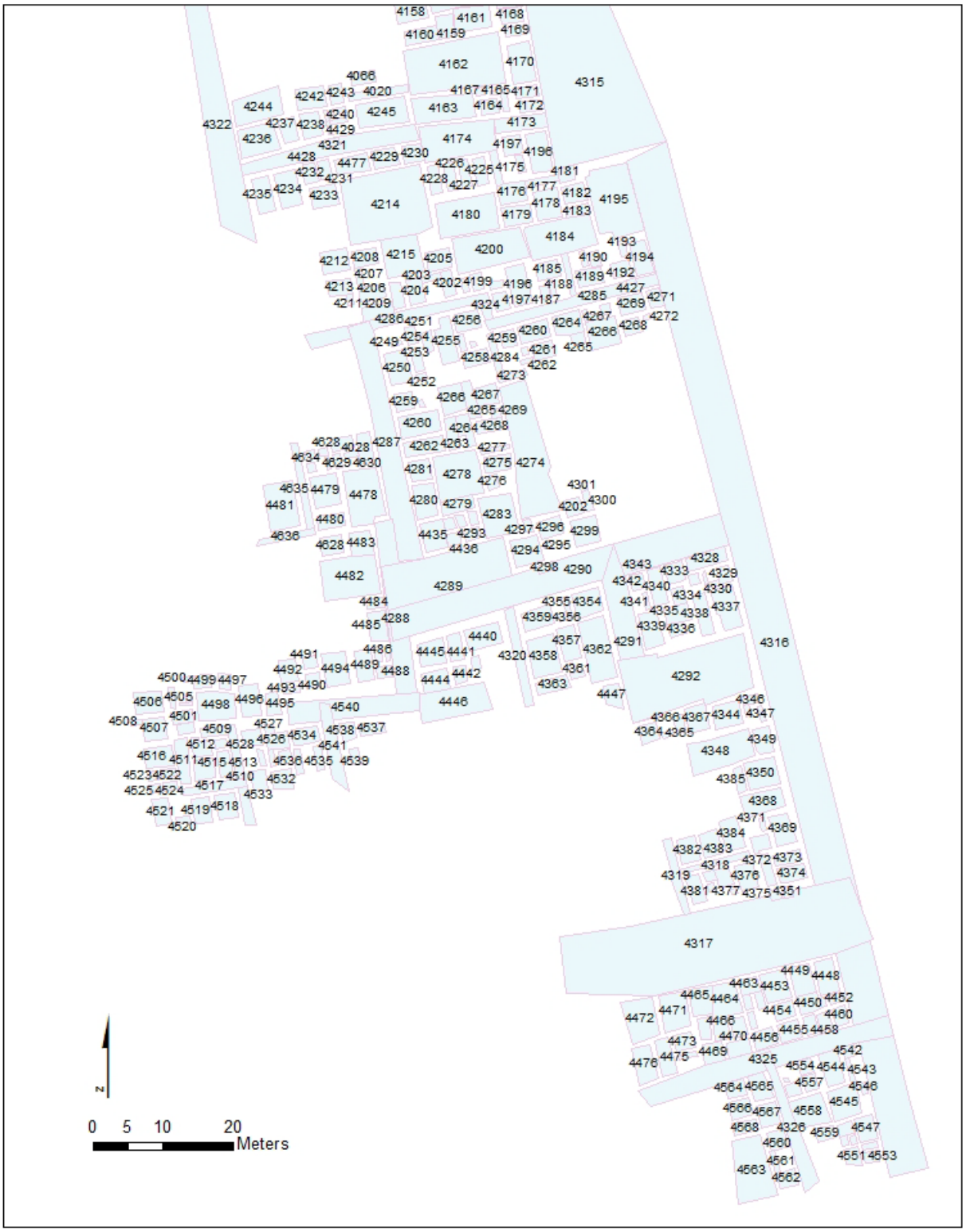


Properties of the B Layer (KAC)

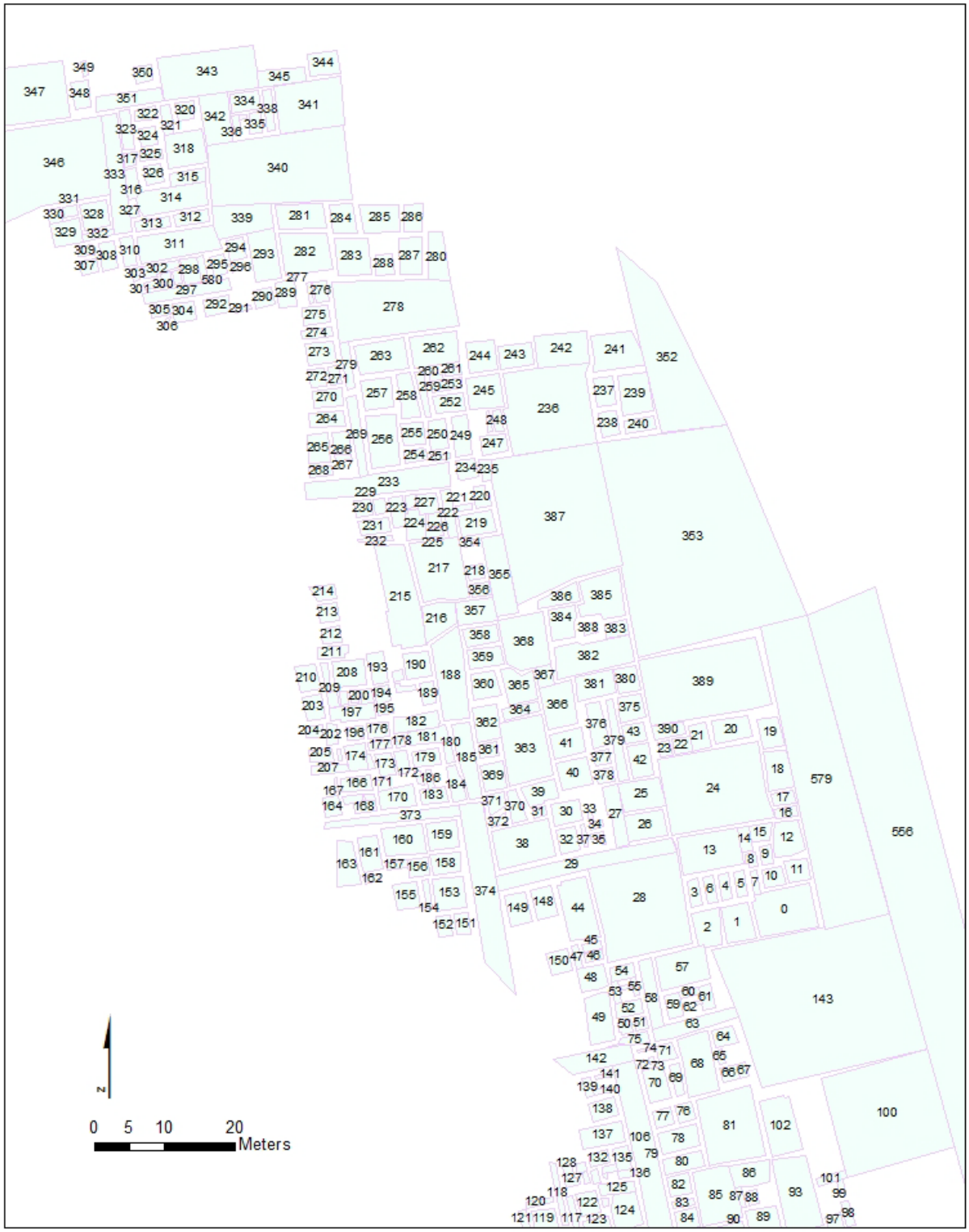


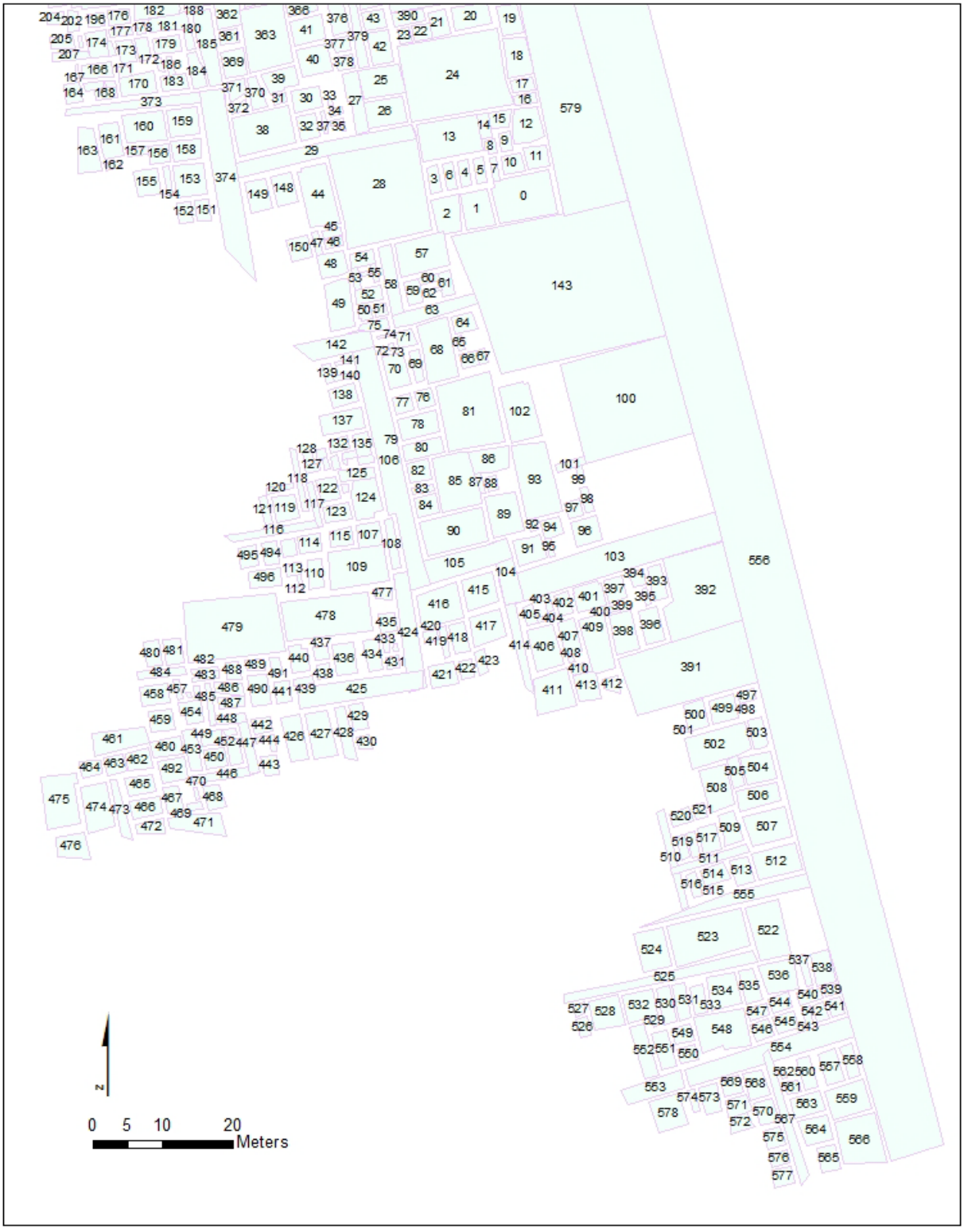
Spaces of the C Layer



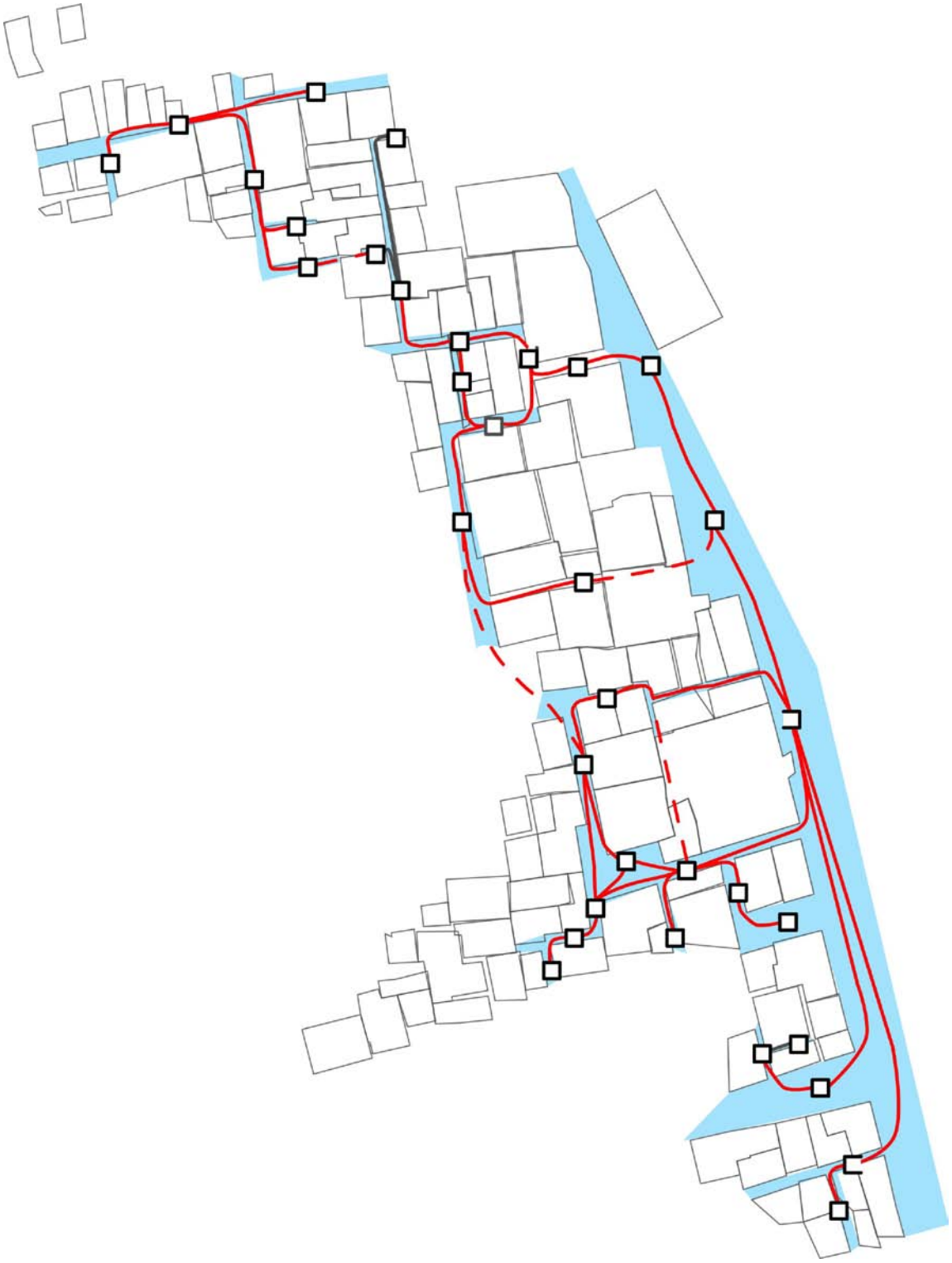

N
0 5 10 20
Meters

Spaces of the B Layer

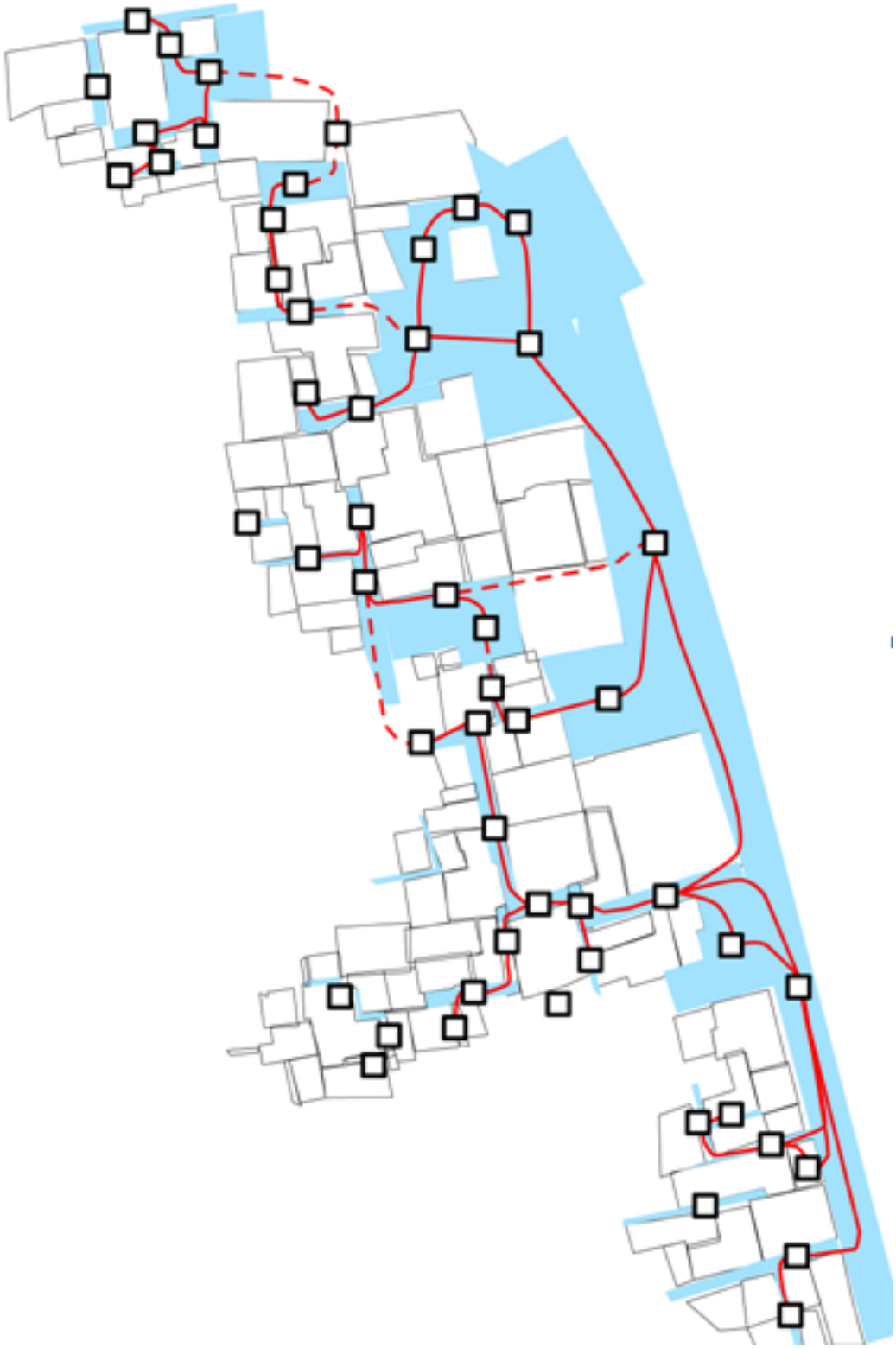



N
0 5 10 20
Meters

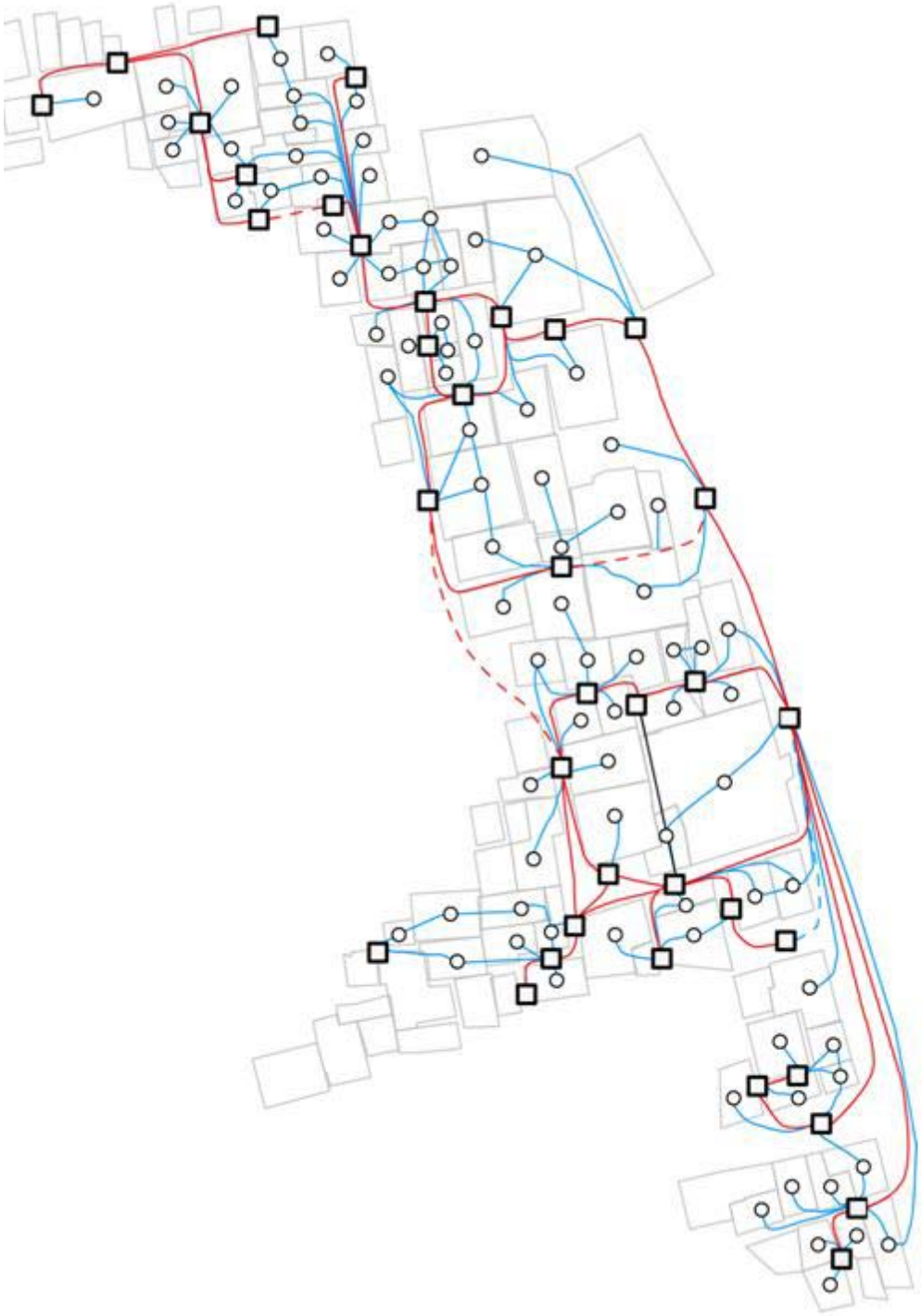
Street Access in the C Layer



Street Access in the B Layer



Property Access in the C Layer



Red lines show street connections, blue lines show connections from street to property, or between two properties. (Connections between individual convex spaces of properties are only available in Depthmap database.)

Property Access in the B Layer

Red lines show street connections, blue lines show connections from street to property, or between two properties. (Connections between individual convex spaces of properties are only available in Depthmap database.)

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