

THE 2004 GIS STUDIES ON TRANSPORTATION

By Scott Branting



"These feet were made for walking"

Figure 23. Inscription in old Phrygian from the Monumental Entrance to the Palace Complex. (03dpjv5407)

Transportation Studies

Modern city planners make extensive use of transportation simulation computer programs when adding new streets or modifying existing ones. By simulating virtual traffic moving through the network of streets they can predict the effects of changes to that network before construction is begun.

Over the past two years these same computer simulation programs were applied to a reconstruction of the ancient street network at Kerkenes Dağ, an Iron Age city where inscriptions in old Phrygian (Fig. 23 illustrating piece 03TR11U04stn04) were first discovered in 2003. By simulating virtual pedestrian traffic moving along these ancient streets, the street network (Fig. 24) was organized and analyzed in a coherent fashion to determine how it functioned during the occupation of the city.

These simulations revealed which of the streets were main streets that carried heavy traffic loads of people and animals and which streets were small back streets and alleys that saw very little traffic (Fig. 25). These results can be directly related to how the ancient population may have made use of particular areas, compounds, or buildings within the city (Fig. 26).

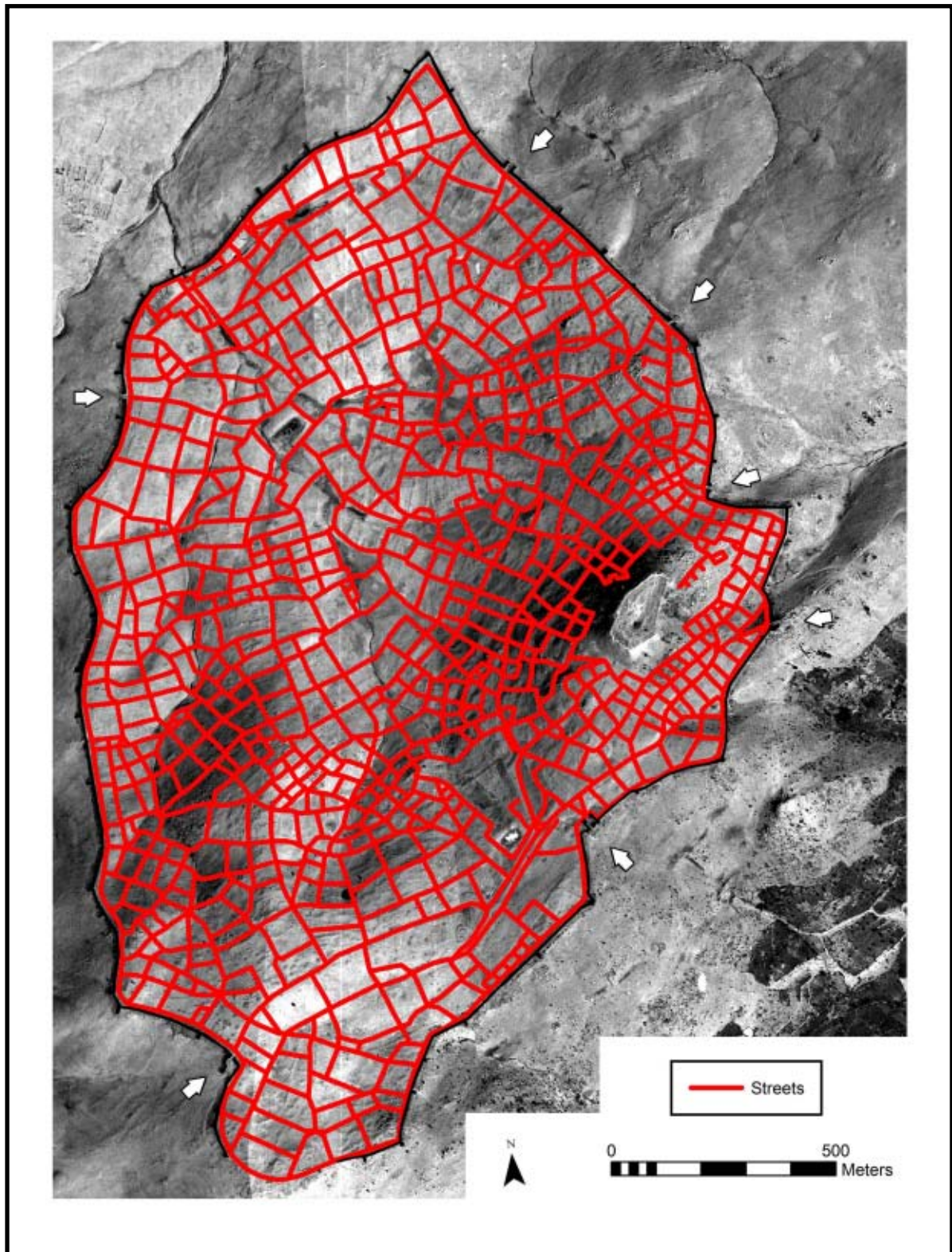


Figure 24. Reconstructed street network at Kerkenes Dağ.

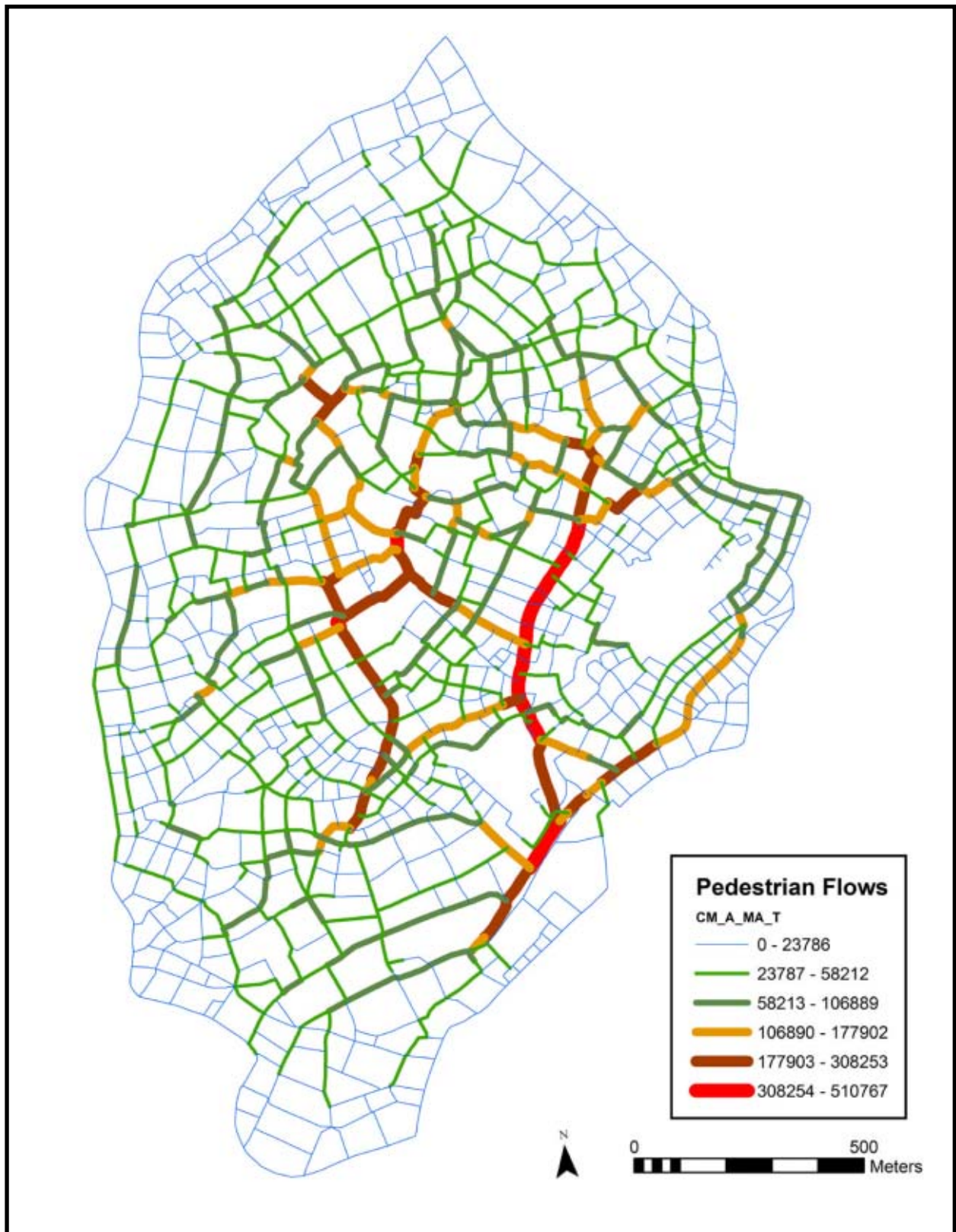


Figure 25. Results of simulated pedestrian transportation in the ancient city.

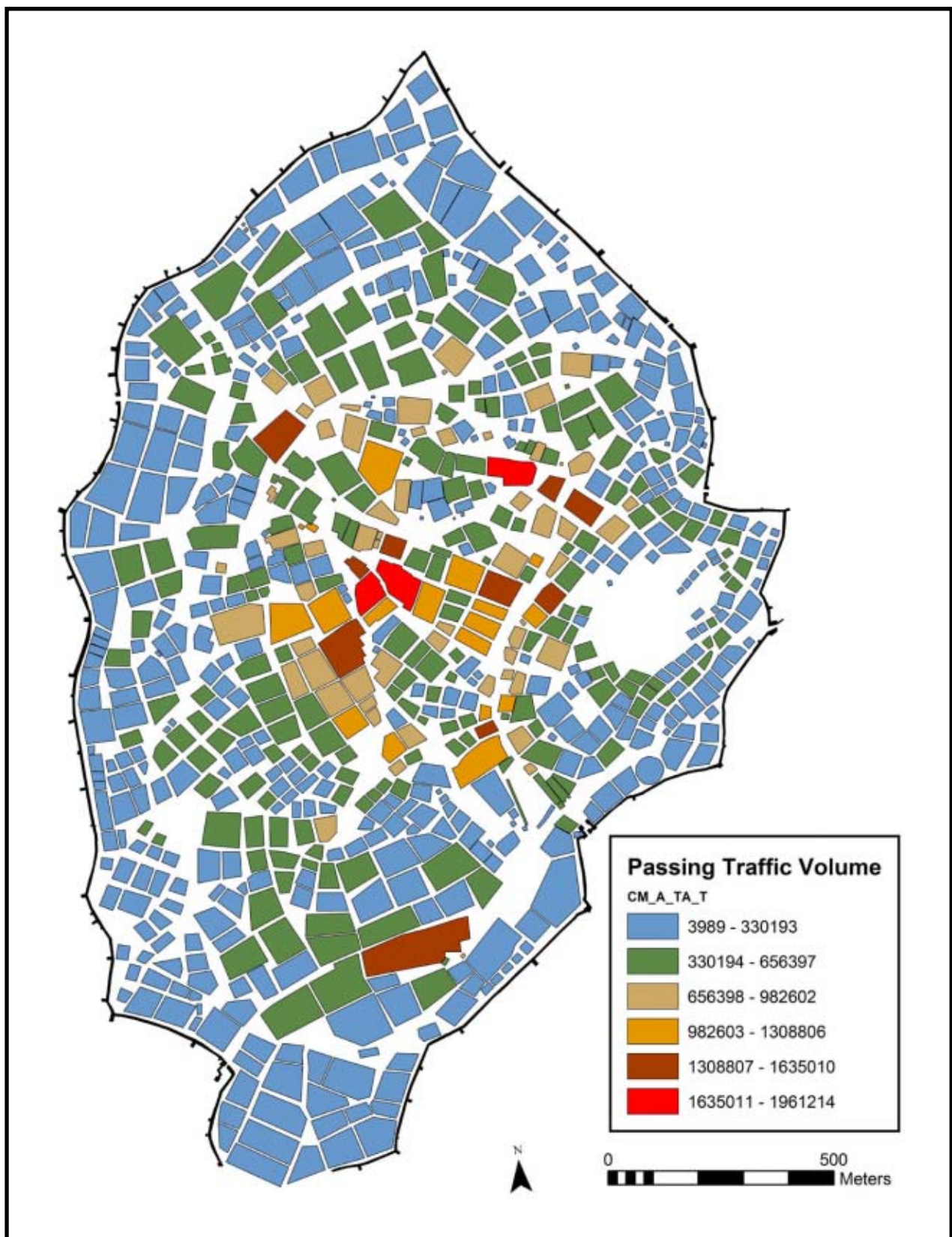


Figure 26. Relating simulation results to the different urban blocks.

The 2004 Transportation Trenches (TT23, TT24, TT25)

In order to check the map of ancient streets and to calibrate the results of the computer transportation simulations, three test trenches (TT) were excavated during the 2004 season. Each trench was laid out to completely cover the area between two different urban blocks where it was hypothesized that a street had existed (Fig. 27). Test trench TT23 was located so as to come down upon the full width of a street that the computer simulations predicted would have low amounts of traffic. Test trench TT24 was positioned to encompass the full width of a street with a middle range amount of simulated traffic. Test trench TT25 was cut through the street in the ancient city with the highest amount of simulated traffic volumes.

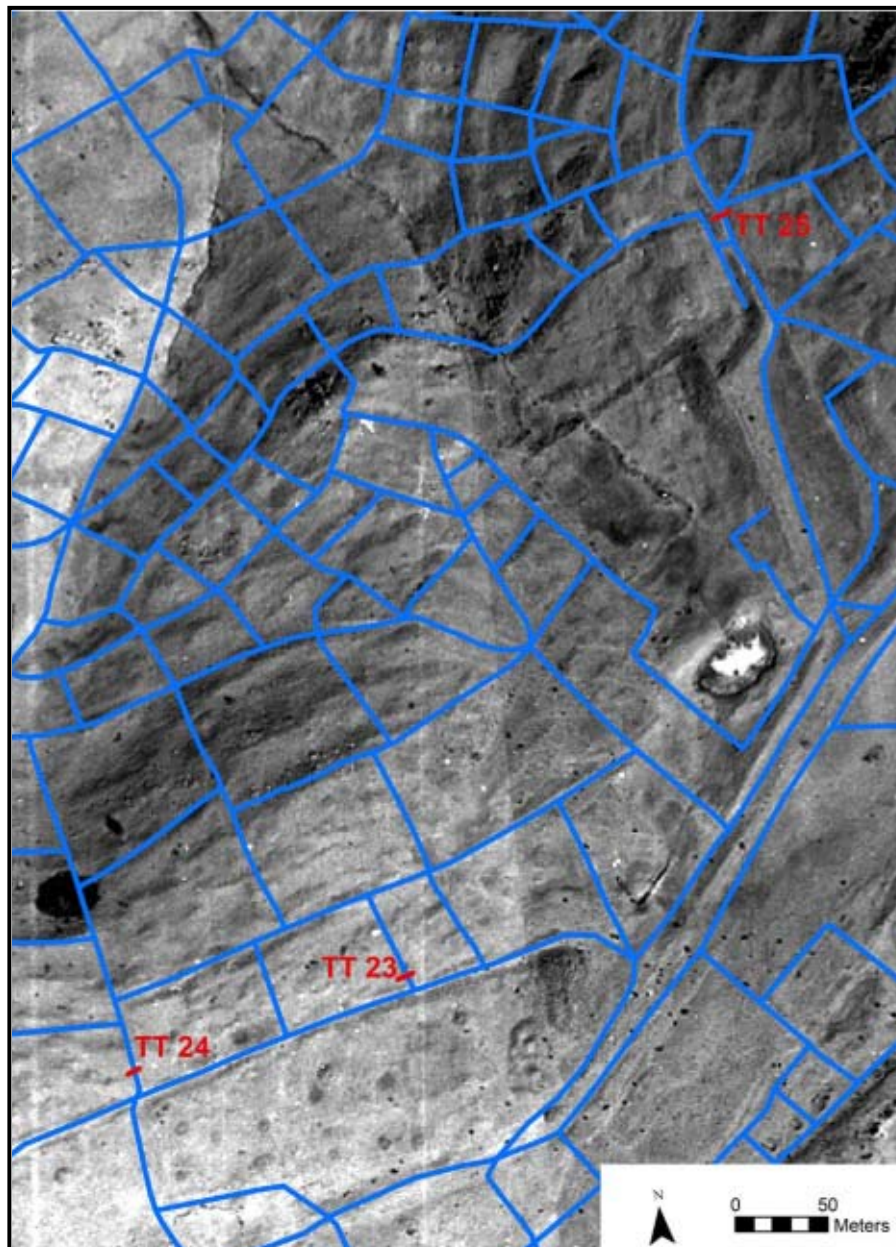


Figure 27. Location of 2004 transportation test trenches.

In each trench any evidence for an actual street surface was recorded and micromorphology samples were taken from the surface of the street and just below it (Fig. 28). These micromorphology samples are being sent to Dr. Charles French at Cambridge University in England for further analysis to quantify the amount of compression on the surface generated as the result of the numerous feet and hooves that once walked upon these streets. Such analysis will allow the results of the transportation computer simulations to be calibrated and tested. Finally, once excavation and recording were finished each narrow test trench was filled in to the modern ground surface.



Figure 28. Taking a micromorphology sample from an ancient street. (04dpjv2133)

Test Trench TT23

Excavation within this 10.3 by 1m test trench revealed the outside walls of two different urban blocks, a small portion of the interior of each urban block, and the exterior surface between them (Fig. 29). The two urban block walls were preserved for three to four courses up to the modern ground surface. As with all the walls in these test trenches they were constructed of unshaped granite stones dry-laid upon the natural matrix of eroded granitic bedrock with larger stones laid at each face. Within the two urban blocks there was no evidence for stone paving, a feature that has been commonly found within excavations of urban blocks elsewhere in the city. This absence can be explained in the easternmost of the two urban blocks by the presence of a small secondary wall built almost up to the main urban block wall. This secondary wall, preserved to only two courses of stone is likely the outer wall of a structure or installation within this particular urban block. Few sherds were found within the limited exposures of the interiors of the two urban blocks.



Figure 29. Test trench TT23. (04dpca0204)

Between the two urban blocks a roughly level brown sandy surface was encountered at a depth of *c.* 0.5m (Fig. 30). It covered an area extending outward for *c.* 3.5m from just in front of the easternmost urban block wall. It extended downwards between 4 and 18cm where it ended directly on the sloping layer of eroded bedrock. This “street” surface was comprised of numerous thin layers of sand with evidence of feathering from the action of water during its deposition. A few pieces of pottery and several pieces of animal bone were found on and occasionally embedded within the layers of this surface, but no evidence for trampling of the material was seen. A good amount of animal burrowing activity was noted throughout this sandy layer. The material between the street surface and the modern ground level is largely erosional wash and the collapse of the two urban block walls as can be clearly seen in the section. The collapse of the eastern urban block wall, in fact, appears to have aided in the preservation of the street surface beneath it. To the west of the street surface the westernmost 1.70m of the area between the two urban blocks was covered by numerous pieces of animal bone and a few pottery sherds dumped on top of the natural eroded bedrock (Fig. 31). This accumulation increased in depth as it neared face of the western urban block wall. It likely represents the dumping of kitchen waste by the ancient inhabitants of the city up against the urban block wall alongside the street, a practice with good parallels in both ancient and modern times. The bone from this context has been sent to Dr. Evangelia Ioannidou at METU for species identification and further analysis.



Figure 30. Ancient street in test trench TT23. (04dpca0216)



Figure 31. Area of occupational dump alongside street in test trench TT23. (04dpca0224)

Test Trench TT24

Excavation within this 8.5 by 1m test trench again revealed the outer walls of two urban blocks as well as a street between them (Fig. 32). The quantity of pottery recovered from the trench was higher than in TT23, and included many more incised or painted sherds (Fig. 33). As with TT23 the urban block walls were preserved for two to three courses, up to the level of the modern ground surface. Unlike the previous test trench these walls lacked two clear faces. Instead the inside face of both urban block walls, the side facing into the respective block, was either collapsed down, as in the eastern urban block wall, or had apparently never existed, as in the western urban block wall. Indeed, the western wall might have served a dual purpose, as a terrace wall retaining leveling fill inside the urban block as well as enclosing it. The base of the westernmost wall was built on a *c.* 10 to 50cm deep layer filled with scattered occupational debris rather than on the underlying natural eroded bedrock. This is significant and could reflect different phases in the construction of the urban block walls within the city or at least a later rebuilding of an existing wall. No evidence was found in the limited exposures within either urban block for paved surfaces.



Figure 32. Test trench TT24 looking east. (04dpca0261)



Figure 33. Pottery from test trench TT24. (04dpca0337)

Between these two walls the same sort of brown sandy “street” surface was encountered (Fig. 34). However, here the surface very gently sloped down to the east from a level area against the west wall, following the contours of the ground rather than being roughly level all the way across. The street surface extended all the way across the area between the two walls. It was thicker here than in TT23, extending down between 14 and 34cm to the sloping layer of natural eroded bedrock. Yet it was buried at a similar depth (c. 50 to 60cm) from the modern ground surface, beneath erosional wash and the collapse of the upper courses of the urban block walls. Once again a fair amount of animal burrowing activity was noted in the sandy street layer.



Figure 34. Ancient street in test trench TT24. (04dpca0259)

Test Trench TT25

Excavation within this 11.5 by 1m test trench across the main city street revealed the outer wall of a single urban block and a second wall with traces of a street running between (Fig. 35). The quantity of pottery recovered from the trench was higher than in TT23 and nearly on par with that from TT24. Like TT24 it included several incised or painted sherds. The easternmost wall within the trench, the outer wall of an urban block higher on the Kale slopes, was preserved to a height of only one and a half courses at a level equal to the modern ground surface. Given the slope of the urban block above, this wall must have originally served in some capacity to retain the soil and perhaps leveling fill underlying the structures in that block. No evidence was found for paving within the extremely small exposure of the inside of the urban block beyond. The western wall within the trench is quite different. It is apparently not a part of any urban block, but rather it seems to divide the main street from a secondary street running parallel to it at a lower elevation. It also quite clearly was used to retain the road surface and leveling fill to the west of it.



Figure 35. Test trench TT25 looking southwest. The scale in the trench is 0.5m. (04dpjv2117)

Between these two walls ran the ancient street (Fig. 36). The traces of it are more difficult to see than in TT23 and TT24 owing to the mass of wall collapse and erosion that have impacted its preservation. At a depth of *c.* 60 cm, preserved under the eastward tumble of the western wall, was a small thin section of a street surface, similar in composition to those seen in TT23 and TT24. It lay directly on top of a leveling fill that can be seen stretching between fingers of bedrock in the trench for over 6m. The street surface by contrast can only be seen following the top of this leveling fill for *c.* 42cm, though it probably once continued all the way across. On top of the street, there is a layer of occupational debris, perhaps deposited by erosion from the urban block above or perhaps as dump accumulation to the side of the street as was seen in TT23.



Figure 36. Ancient street in test trench TT25. (04dpca0322)

Results

The transportation test trenches excavated in 2004 have revealed several important pieces of information. Firstly, we now know that well preserved portions of unpaved streets exist under the modern ground surface at Kerkenes Dağ. Secondly, we now know a great deal more about the structure and composition of these streets. Thirdly, we know that on at least some of these streets we can expect to find in situ deposits of refuse from adjacent urban blocks. Fourthly, we have seen the first evidence that some of the urban block walls may have been later additions or reconstructions. And fifthly, we know that the practice of paving streets with stone pavement, such as was found in the palace gate area, is not the normal practice for street surfacing within the city. Rather a great number of the streets were likely unpaved streets. Further information about these streets will be gained when the results of the micromorphological analysis is complete. However, already an enormous amount of information has been gained from these three test trenches concerning how the street network was designed and used within this ancient city.