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Roman Water Installations in the Vicinity of Pella

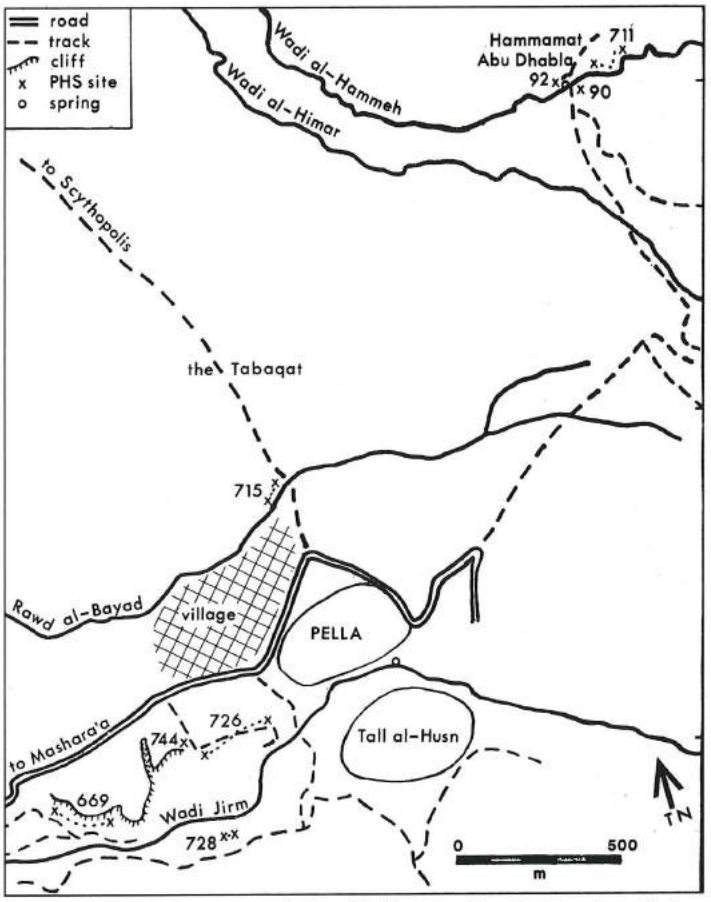
The Pella Hinterland Survey (PHS) was conducted for three seasons in the autumns of 1994-1996, in order to intensively investigate landuse and settlement patterns in the immediate vicinity of Pella, in the eastern foothills of the north Jordan Valley. Whilst evidence from all periods was recorded, the principal analysis is focused on the Roman-Byzantine material. This report is concerned with a number of water installations apparently constructed in the Roman period (first-early fourth century AD), whose remnants were mostly identified and recorded during the 1996 season. All PHS sites mentioned in the text are shown in FIG. 1.[1]

The Water Installations

As Pliny noted in his description of the Decapolis cities in the first century AD, Pella was "rich in water" (*NH* 5.16.74). A number of installations for water distribution were found to the north and west of the site which are not only of interest for understanding the structure and activities of the city in its wider context, but also for the clarification of certain myths or assumptions associated with the site.

The Roman Baths and Aqueduct at Ḥammāmāt Abū Dhabla (Sites 92 and 711)

The present-day hot springs of Ḥammāmāt Abū Dhabla in Wādī al-Ḥammeh, ca. two kms north of Pella, boast a small crude single-roomed bath house, actively used by the local populace. The hot springs of Pella were mentioned in the *Jerusalem Talmud* (6.I.)[2] when a Rabbi Zeira, dated sometime between AD 279-359, was wondering whether he was permitted to go there and use the baths (he was). While the centre of the city contains the remains of a Roman-period bathhouse (Smith and Day 1989), the spring here has a normal temperature and probably hasn't changed since antiquity. Some interpreters have assumed that the hot spring was "near Pella" and would therefore be Ḥammāmāt Abū Dhabla. Robert Smith who worked numerous years at Pella, considered that "the few ruins at the spot are insufficient to represent a famous ancient



1. Map of the immediate vicinity of Pella, showing the location of sites mentioned in the text (based on the topographical map series: Jordan 1:25,000 Sheet 3154 IV NW, al-Mashāri')

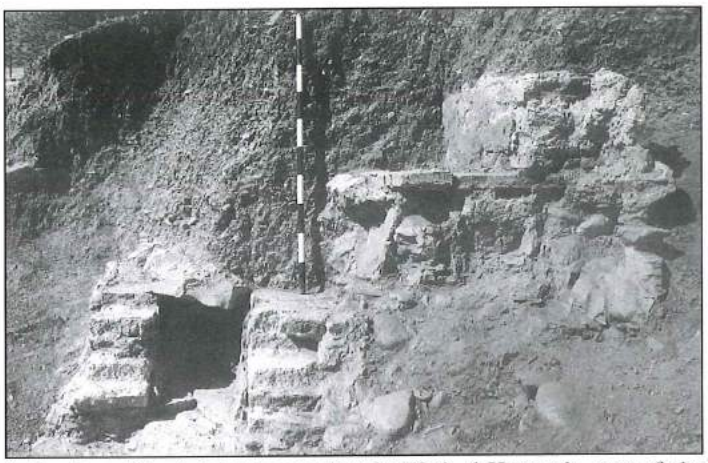
[1] The project was jointly sponsored by the British Institute at Amman for Archaeology and History and the University of Adelaide, Australia with myself and Dr Margaret O'Hea directing. The intrepid 1996 season staff members comprised Mathew Bradley, David Connolly, and James Wright (surveyors), Fiona Baker, Kirsten Drummond, Amy Dumas, Samantha Gibbins, John Meadows, Holly Parton, David Thomas, and Ruth Ward. The aims and methodology of the overall survey are presented in Watson and O'Hea 1996: 63-64.

[2] Cited in Smith 1973: 57.

bath" (Smith 1973: 58). However in 1986 the wādī was severely scoured after heavy winter rains, deepening its course and causing erosion of the banks near the current bathhouse. As a result the bathhouse was pedestalled several metres above the new water table, and the massive walls of a buried building complex were revealed, having originally existed at this newly-exposed lower level. Pottery sherds of the Roman through Byzantine period were noted. Unfortunately, before resources could be martialled to excavate and properly record this complex, local villagers bulldozed the site in an effort to fill in the wādī and raise the water table to its previous level in order for the modern bathhouse to function again. The effort was futile at the time, but the complex was destroyed. The Pella Hinterland Survey (PHS) recorded all the remnants in 1996 as PHS site 92. A wall beneath the present bathhouse (FIG. 2) and a number of upslope peripheral walls were still *in situ*. A related Late Byzantine complex across the natural rock bridge to the south was also recorded (Site 90).

However, examination of the wādī to the east revealed a quite unexpected addition to the bathing installations. A fired-brick aqueduct had been cut into and exposed by a bulldozed road cutting, buried in the thick colluvium of the steep northern hillside. Some clandestine digging had destroyed and further exposed sections of the structure. Approximately 70m in length is patchily visible in the slope, running roughly east-west, although the direction varies as it follows the undulation of the slope profile. The westernmost exposure lies some 100m east of the ancient bathhouse (FIG. 3). The aqueduct is set into the hard-packed pebbled colluvium of the slope, and consists of a square-sectioned channel with an exterior measurement of 0.95m wide by 0.50m high, and the interior 0.22m wide by 0.18m high. The side walls are of low-fired terracotta bricks, four courses high. The exposed side has an outer face of white mortar embedded with rubble stones. The base of the channel comprises a single course of flat terracotta tiles, very well fired, set upon a white mortar bed with rubble and bedrock. The channel was capped with unworked limestone rocks of uneven size. The structure is stepped upwards into the hill on the north side and the resulting shelf is lined with tiles.

2. Modern bathhouse at Ḥammāmāt Abū Dhabla, pedestalled above the wādī floor, with earlier Roman-Byzantine wall exposed beneath it (Site 92). View NE.

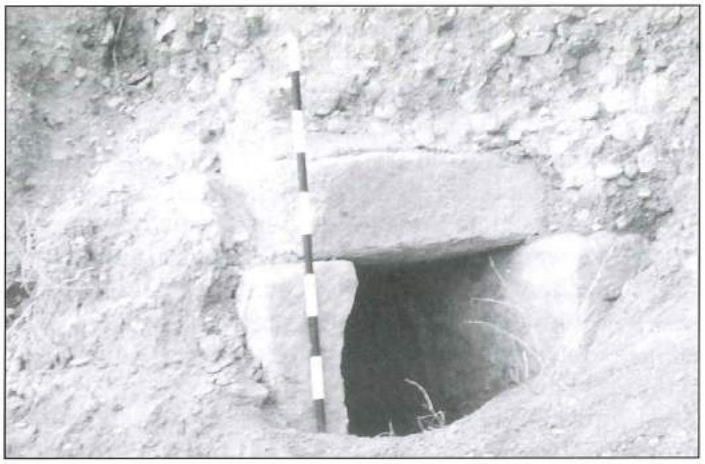


3. Section of buried brick aqueduct in Wādī al-Ḥammeh, east of the bathhouse, looking into the channel at left (Site 711). View NW.

The structure is assumed to be originally Roman in date, by association with the bathhouse. No artefacts were found within it and the pottery in the adjacent colluvium ranged from Roman to Byzantine. The purpose is slightly puzzling as the eastern source of the water channel has not been found, either buried in the considerable slope wash from the north, or destroyed by natural erosion in the wādī. As the spring beside the bathhouse is quite hot (today, ca. 40° Celsius), perhaps it was tapping a cooler and less sulphurous spring to the east, also necessary for the bathing regime and for potable water. In this region dominated by limestone constructions, this is the first fired-brick structure, so often employed in generic Roman architecture, to be found at Pella.

The Rawḍ al-Bayyāḍ Box Drain (Site 715)

The Rawḍ al-Bayyāḍ is a small wādī separating the agricultural *ṭabaqat* (plateau) from the urban limits of the extended city. It flanks the northern side of a small hill which lies just to the north of the main city mound of Pella and which reveals the remains of classical period structures. A subterranean box drain was exposed through erosion on the north bank of this wādī, buried beneath the rich terra rossa soils of the *ṭabaqat* (FIG. 4). The channel is square in section (interior dimensions: 0.55m wide x ca. 0.65m high), with side walls and capstones of finely-fitted limestone ashlar masonry. Three exposures were identified ca. 40m apart, one being exposed in section. The drain was probed but not excavated; however the lower surface seems to be the alluvium within which it is set. There is no evidence of mortar or sealing. Therefore it seems truly to be a drain, allowing for controlled seepage,



4. Section of buried ashlar box drain in the Rawḍ al-Bayyāḍ (Site 715). View SW.

5. Remains of reservoir at the western end of the aqueduct on the northern bank of Wādī Jirm (Site 726). View SSE.

rather than a channel to transport water from a source to a destination. The base of the current wādī is now 3-4m below the drain and to one side of it. In antiquity the drainage level must have been a shallow dip rather than an incised wādī, but nevertheless followed a similar line as today. The need to have regulated drainage of this area rather than allowing uncontrolled runoff is understandable, as this is a natural crossing point to the agricultural plains of the *ṭabaqat* to the north, and the main route approaching the city from Scythopolis / Baysān (remains of which were found on the northern descent from the *ṭabaqat*).

The North Wādī Jirm Aqueduct (Site 726)

This aqueduct runs westwards from the spring head of Wādī Jirm in the centre of the city, along the north bank of the descending wādī, finishing at a reservoir. Roughly 130m of its length is sporadically exposed in eight sections and it is first encountered some 200m southwest of the base of the two talls. The channel is set into the pebbly conglomerate and limestone marl of the bank, with an outer downslope wall of unworked rubble stone set in thick cement mortar. It is lined internally with hard, smooth cement ca. 4cm thick, reaches a truncated depth of 12cm and a width of more than 1.20m. Much of it has been destroyed by a modern road, although erosion, silting and other depredations have degraded it. The large reservoir (FIG. 5) is of the same construction and cut into the conglomerate bedrock. It measures 18.50m x 5.0m, divided into two parts using a large *in situ* boulder which was mortared. It is situated downslope from a large Roman building (Site 744) which it may or may not have served. Pottery from the construction mortar of the aqueduct dates it to the Roman period.

The South Wādī Jirm Aqueduct (Site 728)

The south side of the Wādī Jirm has been well-served by aqueducts. A modern aqueduct, now out of use, runs along the southern terrace above the wādī orchards. Below this, appearing in two sections, is another aqueduct channel which could not be dated but seems to be 20th century by the appearance of the mortar. Some 10m north of this line, lower down, is another long low wall line buried in the colluvium with much decayed mortar associated with it. It leads to a very solidly built multi-roomed structure on the low knoll, dating to the Roman period (FIG. 6). The prevailing remnants of mortar suggest that this too may have been a water channel serving this building.

The Western Wādī Jirm Tunnels (Site 669)

Further westwards on the northern side of the Wādī Jirm ca. 600m from Pella, where the wādī base drops considerably and tall cliffs have formed, lies an enigmatic network of rock-cut subterranean tunnels, water channels and cistern, weaving in and out of the cliff face (FIG. 7). About halfway up the cliff where the angle of slope changes to vertical, is a suite of tunnel entrances, twelve in all, with the highest to the east (L) and the lowest to the west (A). A computer-generated contour map of these tun-

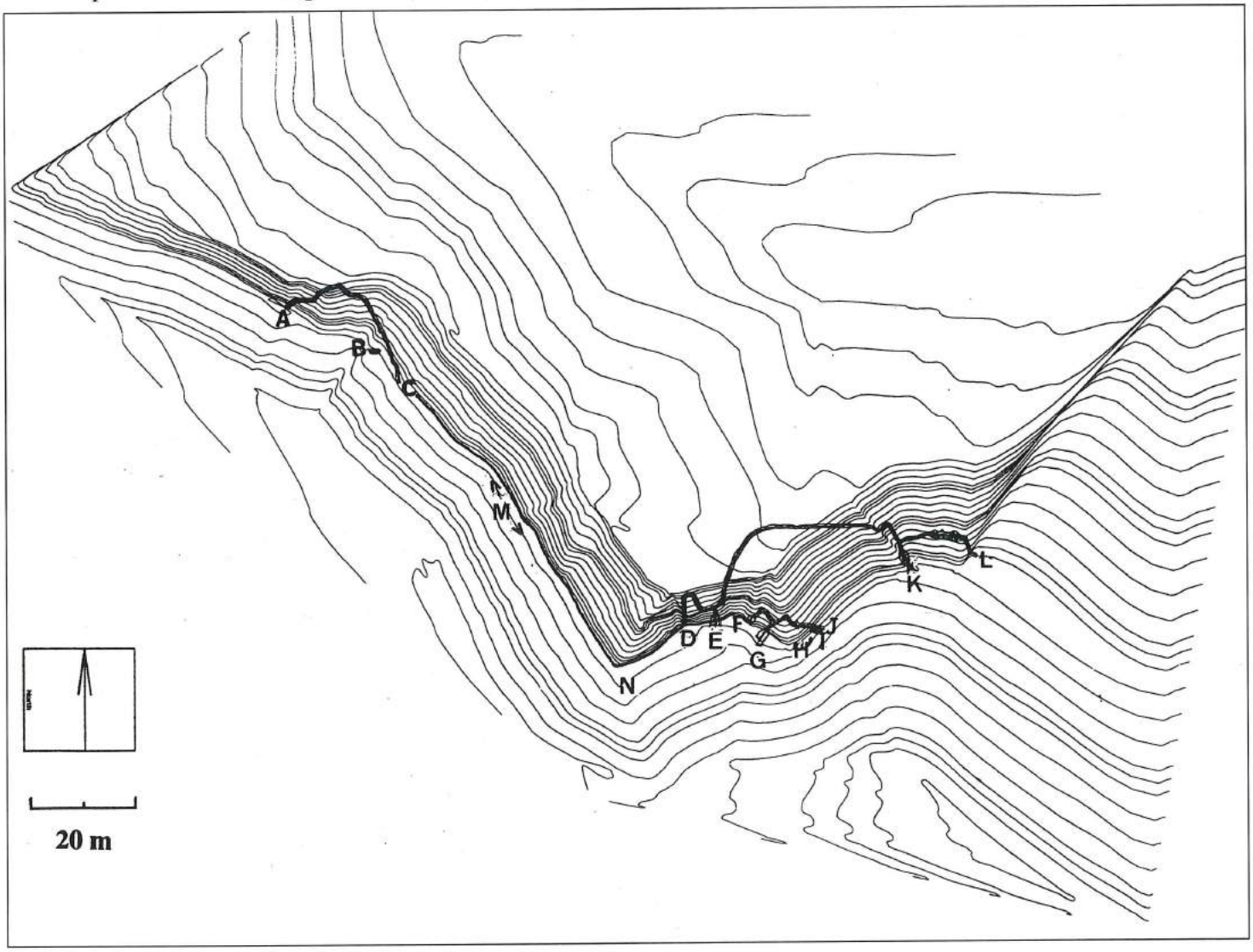
6. View of Roman building remains on the south terrace of Wādī Jirm, with a line of mortared channel leading to it from the east (Site 728). View SE.

7. View of the northern cliffs of the western Wādī Jirm, showing the tunnels of Site 669 located at the junction of the sloping talus with the vertical face. The upper line of caves along the vertical face contains sites 666-668. View NNE.

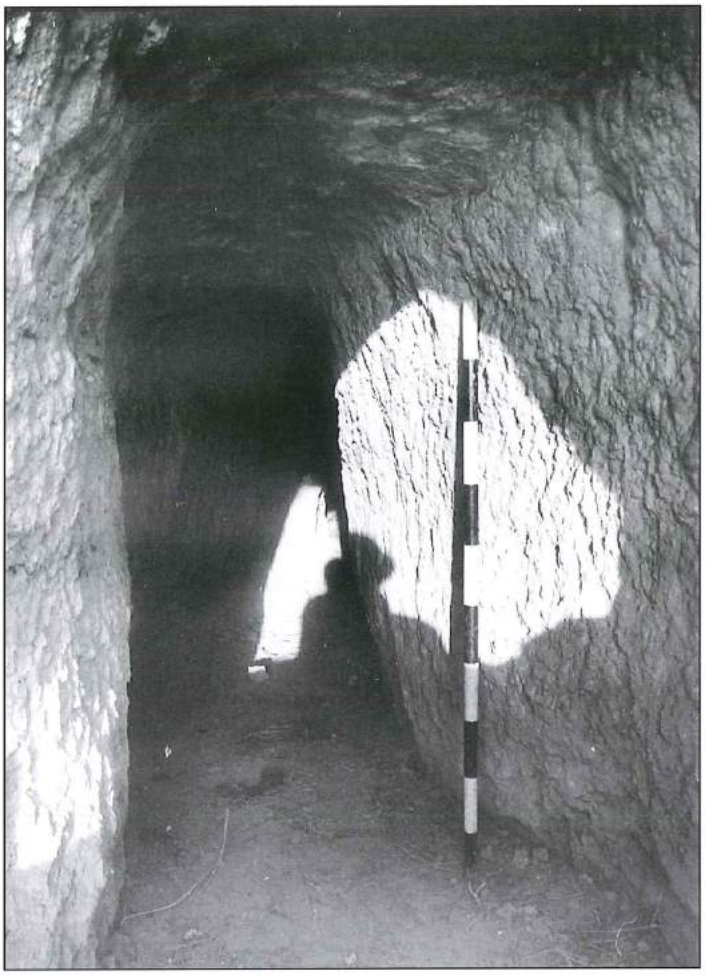
nels is shown in FIG. 8. They are clearly man-made with striated pick marks and lamp niches (FIG. 9), although natural tunnels in the tufaceous limestone were utilized where useful (FIG. 10), as well as caves (FIG. 11).

The bedrock is a combination of areas of tufaceous limestone with characteristic tubular columns and spaces formed by vigorous discharge from fast-flowing springs (FIG. 12), and more compacted limestone, above a gravelly soft conglomerate. Most of the tunnels are heavily silted and we were unable in the given time to fully expose them; much of the exploration and mapping involved crawling through tight and claustrophobic spaces. The tunnel builders left occasional barriers or low walls of uncut bedrock on the floor.

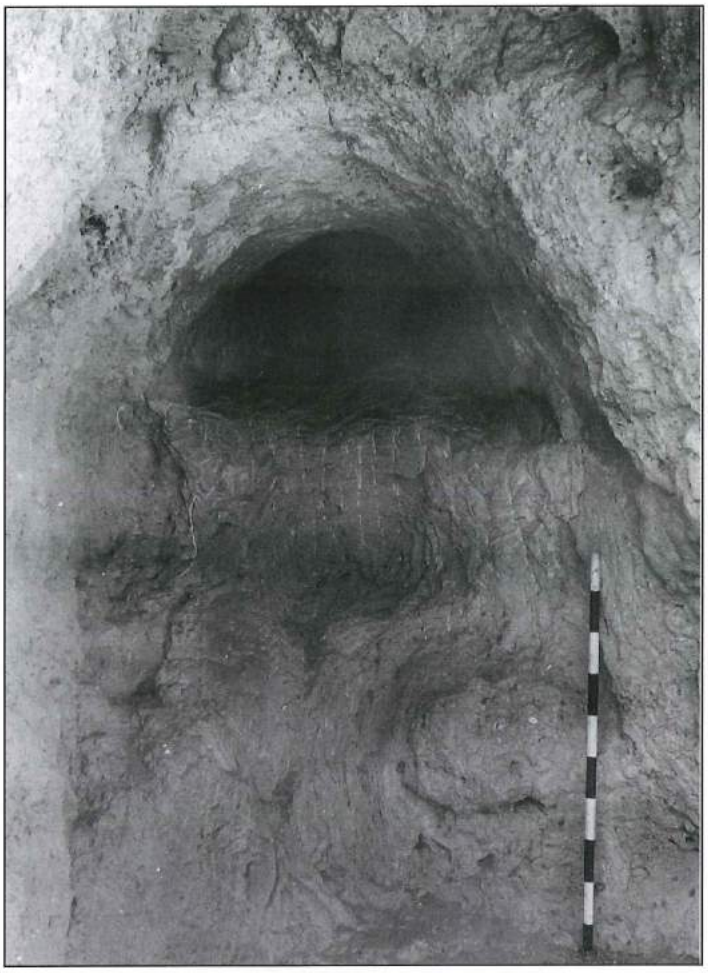
There were also stretches of open channels, identified by layers of *sinter*, a calcine build-up formed by continual fast flowing water (FIG. 13). These exterior channels lack any outer containing wall. Examination of the cliff itself shows it to be extremely friable, with frequent signs of cliff collapse. Taken with the evidence of pick marks in some areas of exposure (FIG. 14), these considerations



8. Computer-generated contour map showing the tunnel system 669 A-L (contours at 2m intervals).



9. Interior view of tunnel 669A, hand-hewn. View NE.



10. Entrance to tunnel 669K, a natural tunnel within the tufaceous limestone, utilized and enlarged by man within. View NNW.

suggest that the exterior channels were once interior tunnels now exposed by subsequent collapse of the cliff face.

On investigating the tunnels which incorporated three entrance caves, we found branch channels cut into the rock, one leading to a cistern whose outer wall was built of rubble stone and mortar (FIG. 15), another connecting to what is now an exterior channel (FIG. 16). Pottery found in the excavations of different areas belongs uniformly to the Roman period, with absolutely no Byzantine sherds at all. It therefore functioned for a limited period only. It is quite clear that the network of tunnels and caves is a water system, but its specific purpose is obscure. The highest and easternmost tunnel (L, FIG. 12) is located a long way above the wādī floor in the tufaceous limestone area where a spring, now dry, had once gushed forth. The barriers in the tunnels may have served to gather sediment and increase the power of the flow. The lower westernmost tunnel at A is in an area of severe cliff collapse and the ultimate destination of this system is thus destroyed. What was its purpose when there was a wādī below, well-supplied with perennial

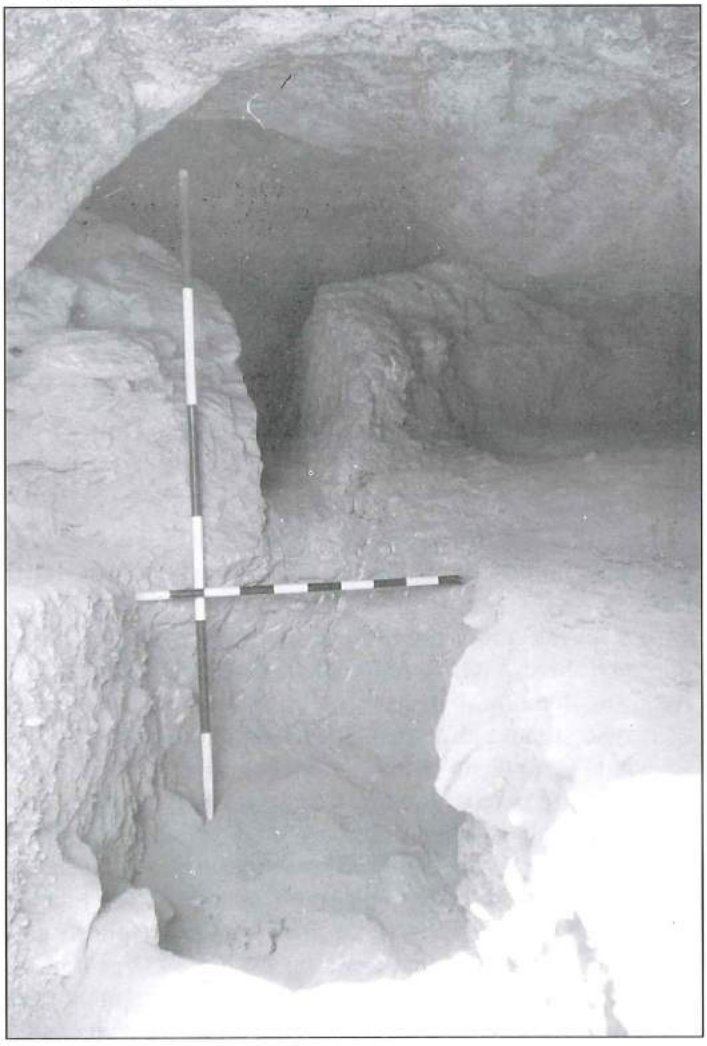
11. Caves 669 E, F, and G (from left). View NE.

flowing water? It represents a massive investment of labour, not lightly undertaken without a gainful purpose. The system is located well beyond the urban limits of the city and therefore cannot be compared to the water systems recently documented at Umm Qays and Abila, where their urban needs had to be transported from afar (Kerner

12. Tunnels 669 K (left) and L (right) within the tufaceous limestone formation. Note the fallen tubular rock downslope from K. View NW.

13. Channel 669 M emerging from tunnel D. View ENE.

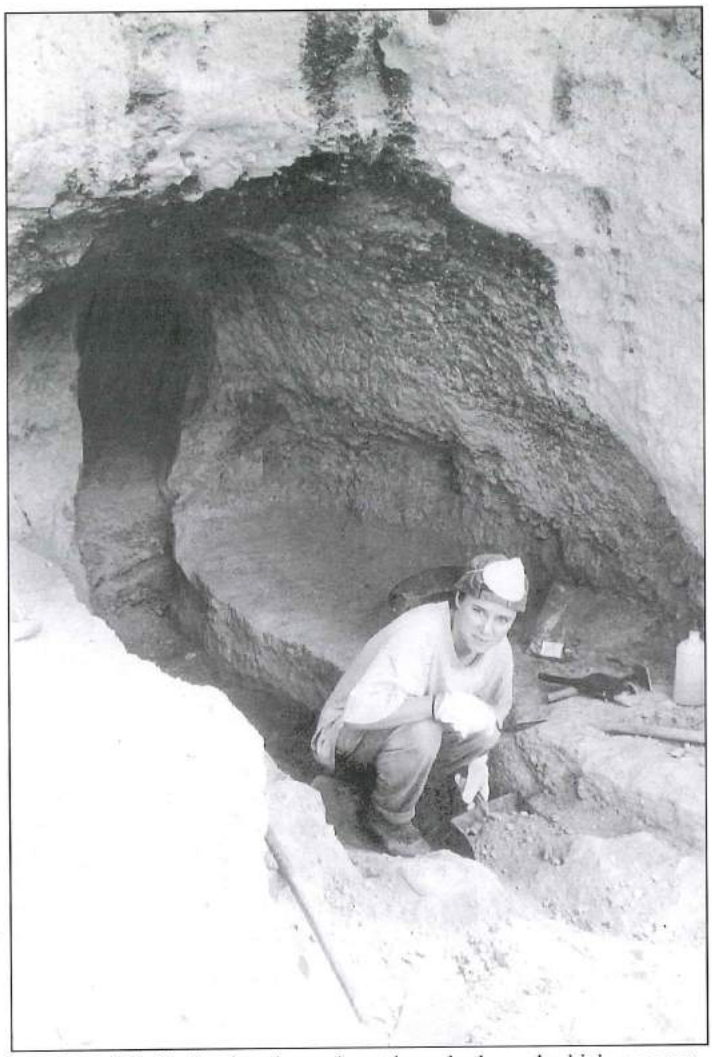
14. Channel 669 M emerging from silted tunnel H, with pick marks visible in the cliff above the metre scale. View NNE.



15. Cave 669 E with a rear tunnel perpendicular to channel leading into a cistern (partially excavated, in centre). View NNW.

1997: 283-287; Mare 1996: 267-269). One might assume a special processing function - agricultural or industrial. Unfortunately there is no further evidence in the landscape, as the forces of nature and man have continued to change and develop the immediate environment.

The identification of the water tunnels however has laid one theory or myth to rest. The tradition is recorded



16. Cave 669 G; clearing the rock-cut branch channel which runs perpendicular to the tunnel behind the rear wall of the cave. View NE.

by the church historian Eusebius (*EH* III.5.3-4) in the early 4th century, that the early Christian Jews of the Jerusalem church fled sometime between 66-68 AD to Pella, seeking refuge from the imminent confrontation of Romans and Jews during the First Jewish Revolt. The 19th century traveller Gottlieb Schumacher visited Pella and found this same suite of caves and tunnels, which he interpreted as habitation caves and escape tunnels for the Jewish Christian refugees, thus also categorizing them as anchorites. His claim was reaffirmed by subsequent visitors such as John Richmond in the 1930s, and the story lived on (Richmond 1934: 20-22). No further physical investigation had been made until the Pella Hinterland Survey of 1996. In fact, habitation caves were found on the survey which would better suit (but not confirm) his hypothesis, but that is beyond the scope of this paper.[3]

Conclusion

The identification of a number of hydrological works associated with Roman Pella enriches our understanding of the infrastructure that contributed to the functioning of a well-organized classical city. The finely made box drain attests to concern for public utilities on the urban fringe. The aqueducts around the city seem to have serviced important structures beyond the city limits. The existence of a renowned bathing complex outside the city, mentioned in early texts, has now been confirmed and clarified. Finally, we have established the hydrological nature of an outlying network of tunnels and caves in the western Wādī Jirm, although the specific purpose of this intriguing system still eludes us.

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[3] An upper line of caves in the cliff face shown in Figure 7, some 10-15 metres above the system of water tunnels, revealed clear evidence of habitation, and in one important instance, of deliberate and sophisticated concealment (Sites 666-668). These particular caves had not been noted by Schumacher, nor by any other researcher. Unfortunately our investigations produced no dateable information that would relate them to the water system below.