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WATER DISTRIBUTION IN PELUSIUM - A SHORT NOTE ON A LARGER PROBLEM

Krzysztof Jakubiak
Institute of Archaeology
University of Warsaw

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The city of Pelusium (the modern Tell Farama), located at the mouth of the Pelusiac branch of the Nile, doubtlessly belonged to the most important seashore cities in the eastern Mediterranean. The site, very significant from a historical point of view, is unfortunately still very little known from its archaeological remains. So far the several archaeological expeditions which conducted the fieldworks there were not able to excavate the most important buildings of the large city that Pelusium originally was. The purpose of the text below is an attempt to show how the water distribution system was used by the citizens of Pelusium. The present knowledge has given us an opportunity to take a closer look at that matter.

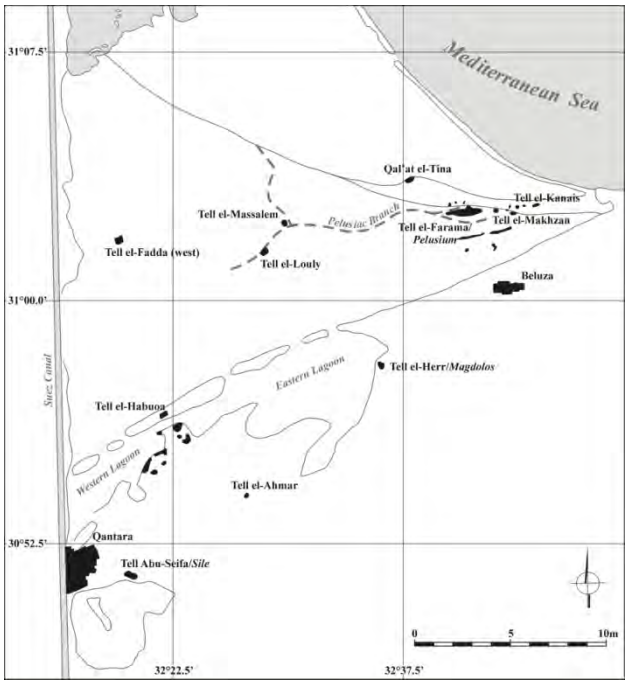

Fig. 1 Pelusium: Site locality

Pelusium, a city that developed along an island, was, according to Herodotus, founded by pharaoh Psamtik I who settled people here from Caria and Jonia. Since that time the city constantly developed and flourished until the Arab conquest of Egypt. After that event Pelusium was slowly abandoned.

Since the excavation strategy mainly focused on unearthing the most important monuments, any elements associated with water distribution and its usage by the Pelusium citizens were not the main aim of the excavators. However, several constructions were unearthed during the researches that were strictly associated with water usage and distribution in the city area. The truth is that no human society and no city are able to function without fresh water sources. Consequently, even the smallest settlement needed to have at least a simple but effective system of water administration. If for the smallest settlement water was one of the essential supplies for its functioning, then the same was even truer for much bigger municipal structures. Pelusium is a good example of a city whose functioning was disorganizedly associated with water.

The basic and most essential question is how the Pelusians replenished their water for daily life and for economic purposes. The answer to that problem seems to be very simple, considering the fact that the city was flourishing on an island in the middle of the Pelusiac branch of the Nile. In other words, fresh water was drawn and distributed directly from the river, and more sophisticated systems such as aqueducts were not necessary in Pelusium. However, the distribution of water in the city itself was a separate problem. Let us focus on the area west from the so-called Great Theatre in Pelusium, where a Polish-Egyptian expedition was recently conducting excavations. There, in the centre of the ancient city, was located a complex of large cisterns collecting huge amounts of water needed for Pelusium's functioning.

Fig. 2 Pelusium, Tell Farama: the water cistern in the central part of the city

This municipal construction undoubtedly played a key role in the water distribution system. That is why the monumental structure was built not only in the centre of the city, but also in the centre of the island, and not without reason. Unfortunately the eastern part of the complex is badly damaged, but still the ruins are the most characteristic and monumental in the Tell Farama landscape. The cistern was originally rectangular in layout, which most probably covered the area of at least two *insulae*. In recent years the structure was partially investigated by a Swiss expedition (DELAHAYE, 2005, 299-305). Thanks to their fieldwork results, it is possible to draw a preliminary plan of that important building. Further research will bring a better understanding of the whole layout of the cistern complex and more precise dating for the structure. According to present knowledge, this hydrological construction was functioning during the 4th and 5th centuries C.E. We should remember, however, that the pottery evidence discovered during preliminary excavations dated the latest phase of the construction back to the 2nd century C.E. If these traces are accurate, the cistern building may be associated with the earlier urban planning development that took place over that time. Most probably this centrally situated cistern distributed water for several important public buildings functioning in the city. The public structures which certainly needed a lot of water were constructed nearby. One of those buildings was erected to the north-west of the cisterns: the so-called northern bathhouse, which was functioning there (ABD EL-MAQSOUD, 1984-5, 3-8).

Fig. 3 Pelusium, Tell Farama: the so-called Northern Bathhouse, a view from the south-east

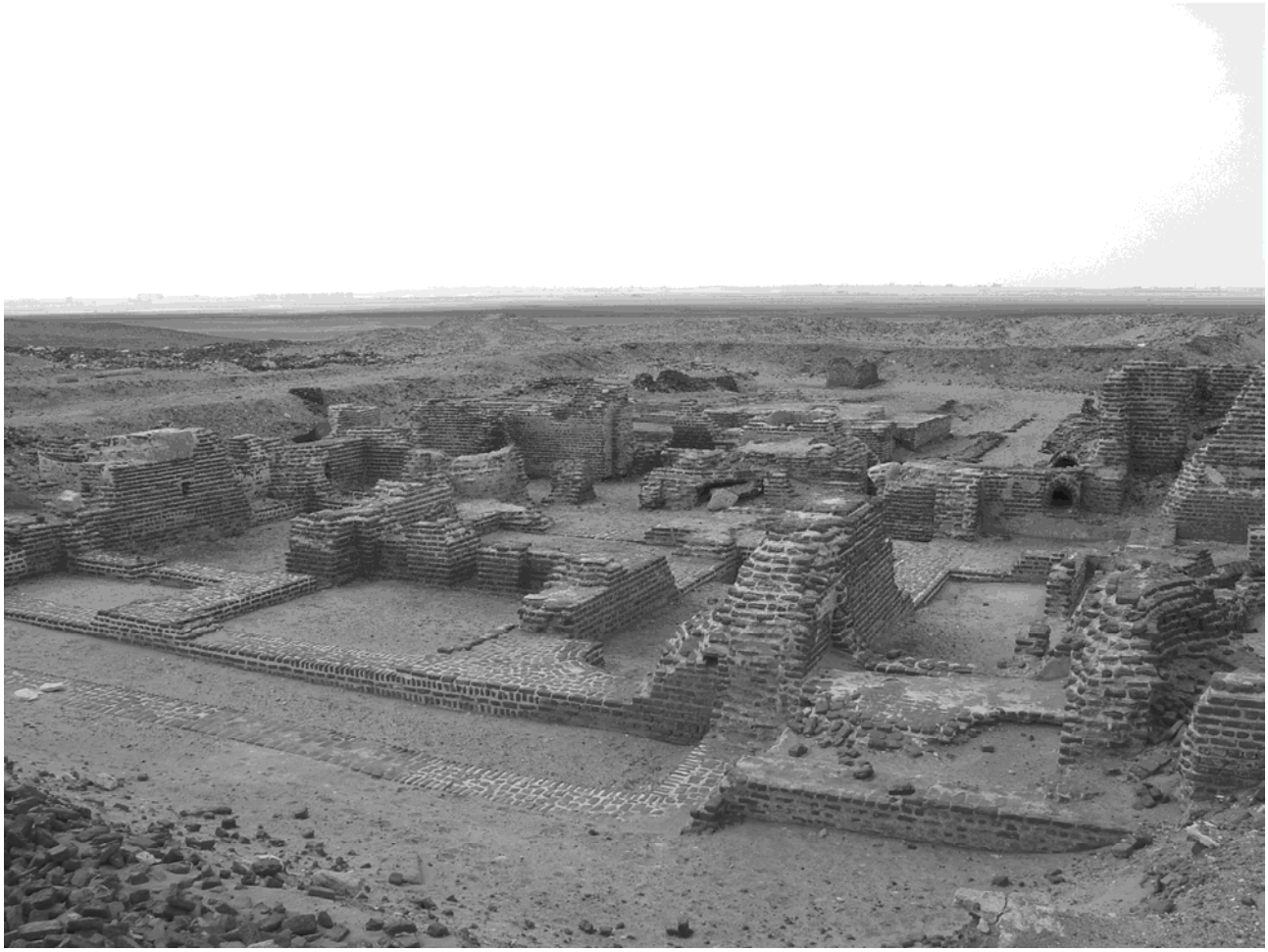

Fig. 4 Pelusium, Tell Farama: the so-called Southern Bathhouse, a view from the north-east

This building was constructed between the Late Roman fortress and the banks of the Nile, where it can be assumed that landing piers were built. The bathhouse situated here most probably used water drawn directly from the Nile. The distance to the river was never farther than 50-60 metres. A debatable question is how the water was drawn from the river. Supposedly a *saqieh* system was in use here, as the most effective and popular in Ancient Egypt. There may also have been a special well functioning next to the bathhouse.

On the opposite side of the city, south of the Late Roman fortress, a much larger bathhouse was partially unearthed. According to the excavators this thermal complex was called the Southern Bathhouse. The building is characterized by a relatively complicated structure (BONNET, CARREZ-MARATRAY, ABD EL-SAMIE et al., 2006, 371-84; BONNET, CARREZ-MARATRAY, ABD EL-SAMIE, et al., 2007, 247-60.) Besides elements typical for baths to function, such as water pipes, stoves, hot air canals and basins, numerous chambers used for different purposes were discovered.

From the point of view of urban planning, the place was originally occupied by a *gimnasion*. When this disappeared in the city landscape, the space was used for the bathhouse construction (CARREZ-MARATRAY, 2006, 385-9.)[1]

The baths, constructed most probably in the 3rd or at the beginning of the 4th century C.E., certainly used large amounts of water daily. That is why this building that was so important for public life was erected close to the southern limits of the ancient city, just near the river course which overflowed the whole of Pelusium. Here also the *saqieh* method of drawing water directly from the Nile could have been used. The excavations are far from final answers and no such construction has been discovered so far. Also essential for the functioning not only of the bath complexes but also for ordinary structures in the whole city fabric was the Pelusium sewage system. Of course the baths were essential foci for the citizens who took special care of their daily hygiene and social life, but removing the dirt and effluents were also important tasks for the city.

Fragments of that kind of structure were excavated by the Polish-Egyptian expedition working in the area of the Great Theatre in Pelusium (A. AL-TABA'I, M. ABDAL-MAQSOUD, P. GROSSMANN, 2003, 271-83; GAWLIKOWSKI, 2004, 67-72; JAKUBIAK, 2003, 2004, 73-5; JAKUBIAK, 2005, 61-8; MAŚLAK, 2005, 69-71; JAKUBIAK, 2006, 125-35).

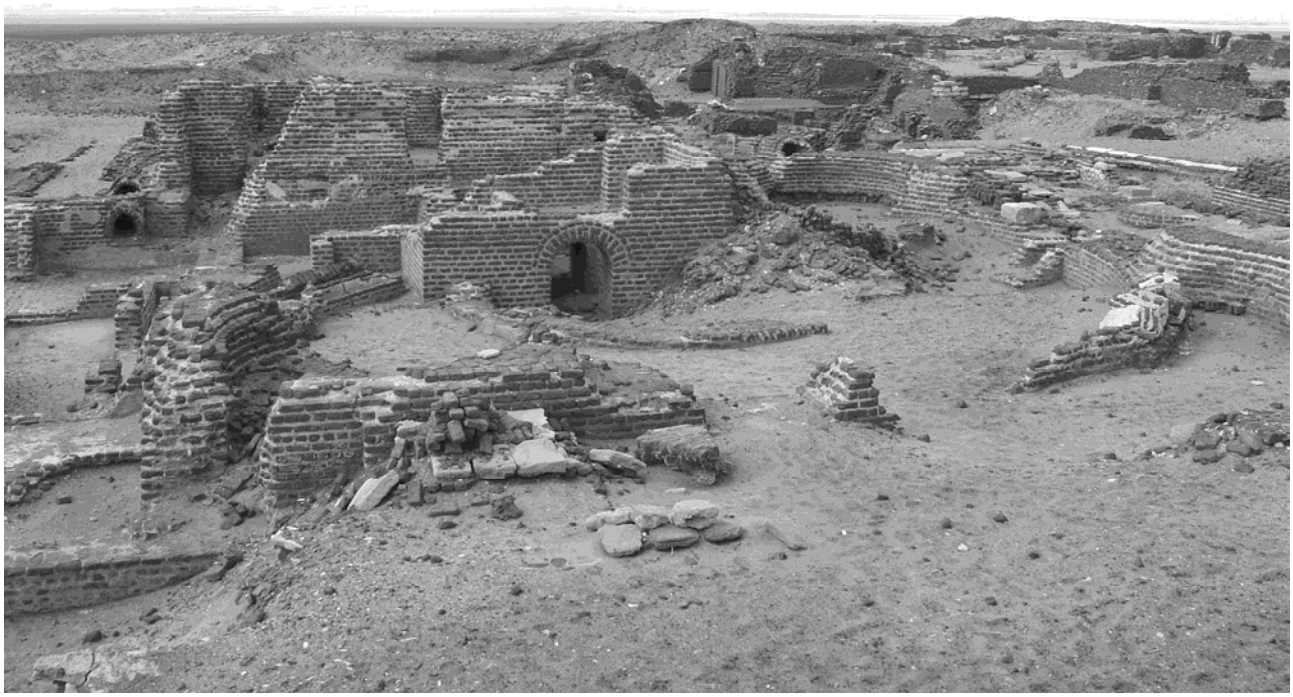

Fig.5 Pelusium, Tell Farama: the so-called Southern Bathhouse, the western part of the building

Directly east of the theatre building, part of a Hellenistic sewage system was unearthed. This, probably the oldest sewerage discovered till now in Pelusium, was constructed of red brick bounded in clay mortar. The sewage canal was built on a foundation of brown clay, identified as a Hellenistic rubbish dump. Inside the canal some pottery fragments were found which supported the proposal of dating it to the Hellenistic period. The most significant fact is that the system was out of order, or its functioning was over by the time the theatre was constructed. This monumental structure almost totally cut off and blocked the older sewerage. In other words, the older Hellenistic city infrastructure was almost completely devastated and forgotten. The building remains which were unearthed east of the theatre, just near the sewage system, were most probably also from Hellenistic times. Among the damaged remnants it was possible to recognize that this monumental building was undoubtedly connected with the above-mentioned main drain. The building had its own canalization system, and the dirty water was channelled away from the building directly to the sewerage. The size of the building and the hydrological solution used here indicate that this construction could have been of public use and probably one of many others in this part of the ancient city. The buildings were erected along the flagstone paved street which had its own drainage system transporting liquid waste, most probably directly to the Pelusiac branch of the Nile.

Fig.6 Pelusium, Tell Farama: the sewage canal situated east of the Great Theatre

To the north of the northern façade of the theatre, a fragment of another drainage system was discovered (JAKUBIAK, 2006, 128-9). Here the sewage system was constructed of red brick and bounded in clay and lime mortars. The technique of construction was different in this case.

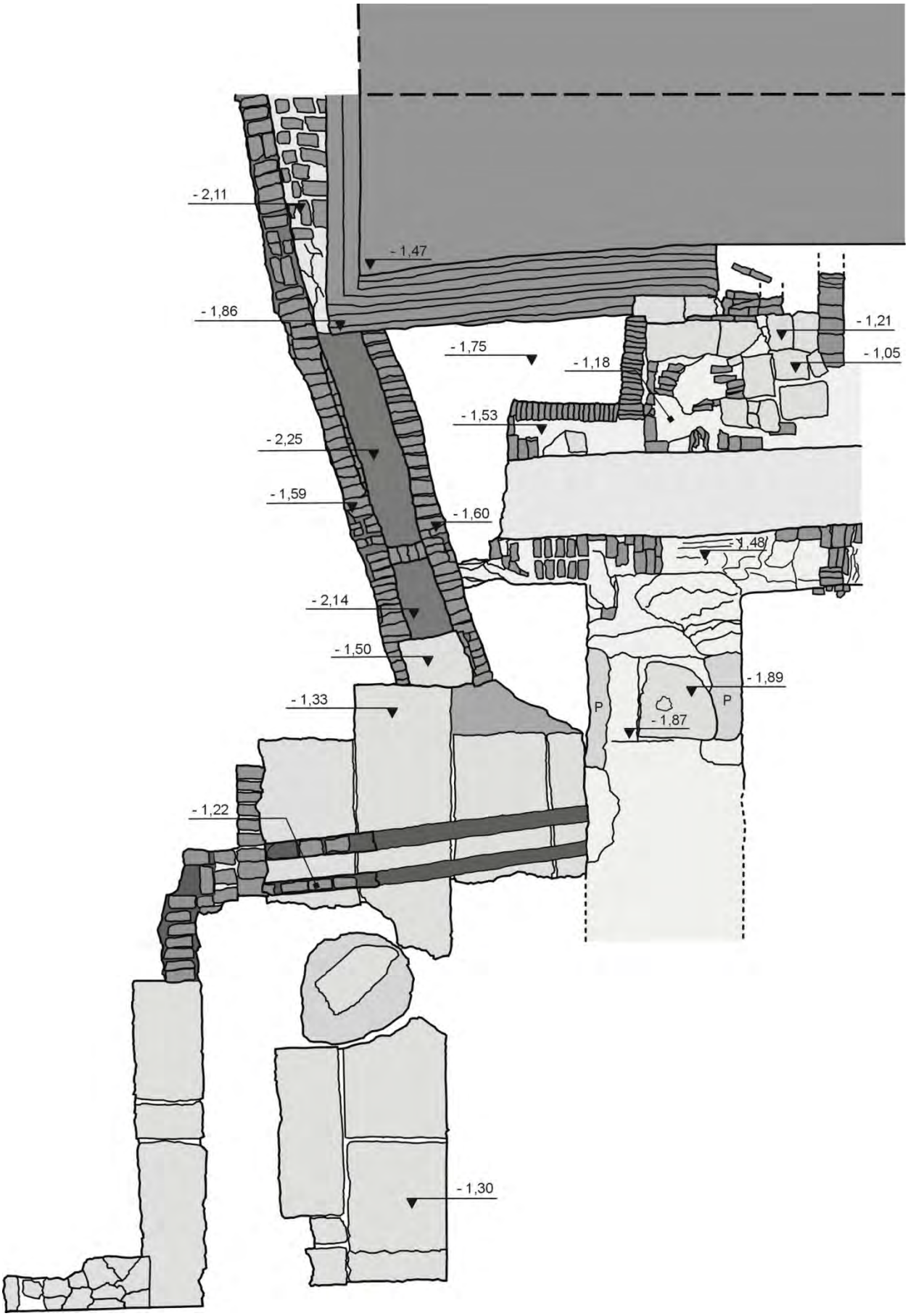

Fig. 7 Pelusium, Tell Farama: sewage canal, east of the Great Theatre

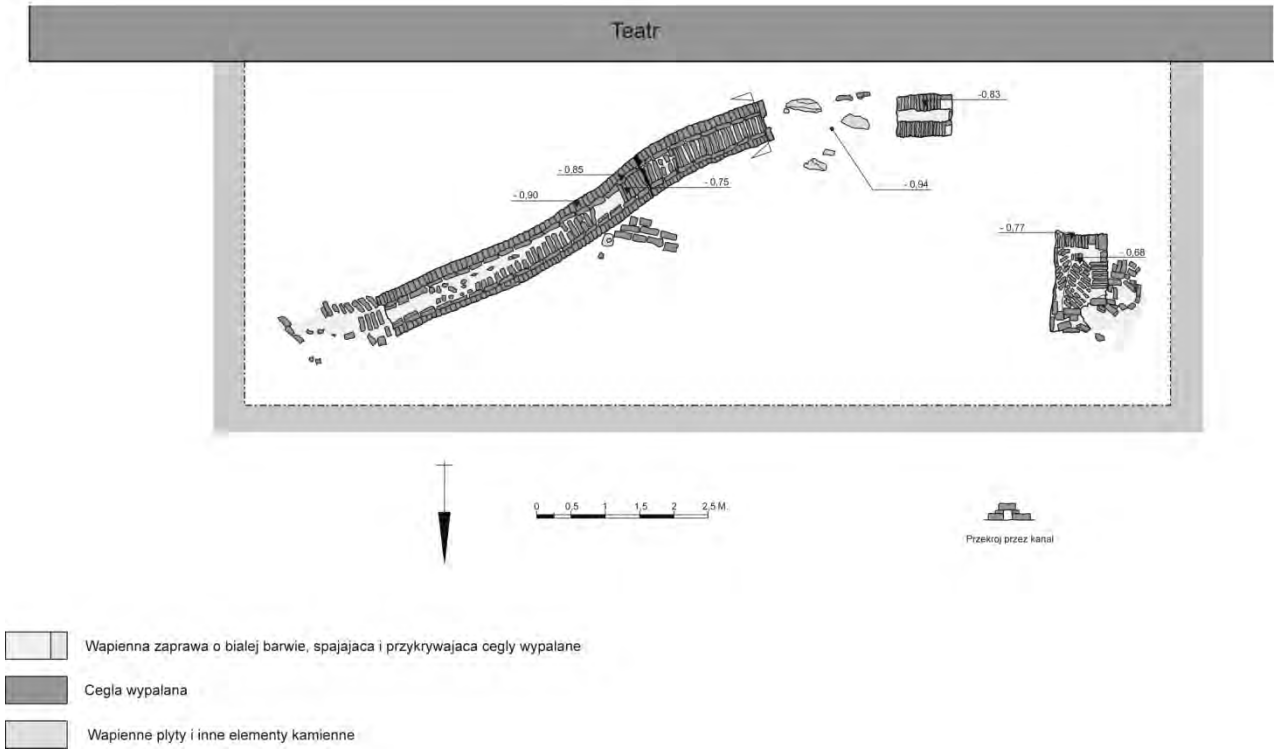

Fig.8 Pelusium, Tell Farama: A sewage canal north of the Great Theatre

The drain was much smaller and covered not with lime flagstones but with red bricks. The canal did not run along the straight line but formed a structure similar to the shape of an S. The whole construction was placed under the street which was running in an east-west direction along the theatre façade. Originally the street was covered with flagstones. In some places traces of eroded lime flagstones were recognized on the surface. Red bricks covering the drain remained until the present day in the city pavements, in the form of red lines. Red, clearly visible bricks had an additional function: they made the drain easy to recognize and easy to open when cleaning was necessary. This system was functioning during the Roman period and corresponds to the building of the theatre. This partly excavated and fragmentarily recognized drain was without doubt a small section of a much larger city sewage system constructed anew in Pelusium during the Roman period. The changes were most probably involved by rebuilding the *insulae* arrangement. At the same time, the older Hellenistic infrastructure was gradually replaced as not being effective enough for the flourishing city of the 2nd or 3rd centuries C.E.

The last evidence of a water distribution system in the theatre area was excavated inside the building. After the theatre had been abandoned, a supposedly quick devastation process started, as we can assume observing the unearthed pulpitium area (GAWLIKOWSKI, 2004, 67-72; K. JAKUBIAK, 2004, 73-5; JAKUBIAK, 2005, 61-8).

The devastation was very systematic and affected the whole theatre building. The material from this monumental structure was reused in other Late Roman buildings constructed in Pelusium. The theatre was certainly furnished with many stone elements, like flagstones, wall decorations, seats in the auditorium and many others.

Fig. 9. Pelusium, Tell Farama: the Great Theatre, the technical canal in the *pulpitium* area

Some of them were probably incorporated in new structures. However, we should remember that marble and limestone could have been very easily melted into lime in special kilns. For this process water was also necessary. A canal discovered in the area of the *pulpitium*

was probably constructed for that purpose. This suggestion can be supported by the character of the construction: the drain was mainly built from reused material. Even some Hellenistic architectonic decorative elements were used for covering the drain. Moreover the pottery discovered during the excavations supports our suspicions that the devastation process was intensified in the 5th and 6th centuries C.E.

In the central part of Pelusium, south-east from the theatre, a partially excavated area can be observed; another sewage system was unearthed there by the Egyptian archaeologists. Besides the canals, the so-called southern street with remains of dwelling architecture was discovered there (JAKUBIAK, 2010, 65-74). Unfortunately the results have remained unpublished, so that little can be said about the buildings apart from the fact that they were attached to the sewage system. Moreover, a so-called 'pipeline' is connected to a relatively large red brick building, on the upper floor of which a water collector was originally functioning. If the observations are correct, the structures provided water for the buildings in that part of the city. The method for water distribution used here was based on gravity – the natural pressure of water lifted to the first floor. The system let water flow under relatively high pressure at a long distance from the 'water tower'. Most probably the whole construction was built up in the Late Roman period.

Other fragments of a water canal or a water pipeline were discovered in the western part of the city behind the hippodrome (ABD AL-MAQSOUD, TABA'I, GROSSMANN, 2001, 17-20). By contrast to the systems mentioned above, serving the dwellings and public areas of Pelusium, the canal discovered here functioned in the industrial zone of the ancient city. The hippodrome which was located on the city outskirts was constructed in Late Antiquity, probably in the 4th or 5th century CE, and the industrial area of Pelusium needs to be dated to the same period. The water for manufacturing purposes was drawn directly from the river, but the exact method of drawing it is unfortunately not known. Excavations in this part of the city were conducted on a limited scale, so our knowledge about the industrial zone is rather small.

Most probably one of the products manufactured there was *garum*, a type of fermented fish sauce. Water was a crucial element in the *garum* production process. In the bordering area, traces of metallurgical workshops were also discovered.

Fig. 10 Pelusium, Tell Farama: the Great Theatre, a view of the industrial canals

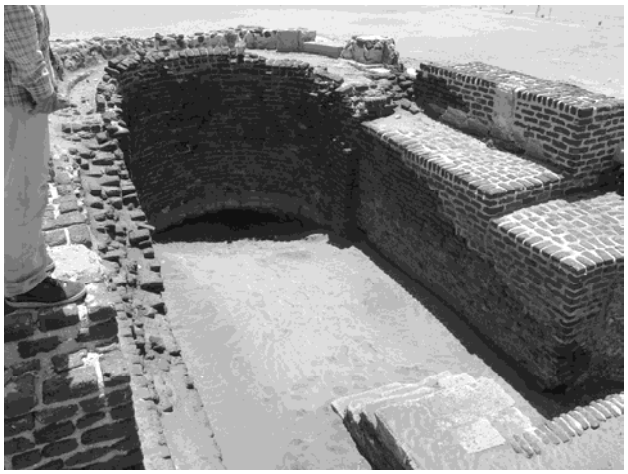

Fig. 11 Pelusium, Tell Maqsan: the Baptistry, a view from the west

In the western part of Pelusium is also located the so-called 'church with an atrium'. Here in the ruins situated west of the Late Roman fortress a very large baptistry was brought to light (EL-TAHER, GROSSMANN, 1997, 255-62; GROSSMANN, HAFIZ, 2001, 109-16.). The baptistry had been built up with a cross-shaped layout and placed in the north-western part of the church. Water is obviously necessary to the Christian baptism ceremony, so the system of providing water was a subject of great importance in the church. Yet there are no traces of canals or pipelines surviving in the building. Most probably water was transported to the church directly from the Nile, possibly by donkeys or other animals. This would have been easy since the river course was situated no farther than 100–120 metres north of the church.

Fig. 12 Pelusium, Tell Maqsan: water cistern with a *saqieh* construction

In the eastern part of Pelusium, on the Tell Maqsan, another monumental building with (so far) the best preserved water system was excavated. It is probably the largest, or the second largest church complex in the city. A huge baptistry was discovered inside (ABD EL-SAMIE, CARREZ-MARATREY, 1998, 127-32; BONNET, ABD EL-SAMIE, 2000, 67-96; BONNET, ABD EL-SAMIE, 2003, 75-93; BONNET, ABD EL-SAMIE et al., 2005, 281-91). The construction was situated in the south-eastern part of the sacral complex. It is rectangular in layout with an apse on the narrower side placed in the eastern part of the construction. An entrance for the catechumens was situated in the southern elevation of the church complex and led directly to the baptistry. This baptistry is one of the biggest ever discovered in northern Egypt. Consequently a huge quantity of water was necessary to fill it up. Besides the baptistry there were additional constructions discovered nearby that required large amounts of water: the convent and the latrine installation located near the main entrance to the sacred complex. This is supposedly the reason why, a few dozen metres to the west of the church, a big cistern was constructed (BONNET, ABD EL-SAMIE, et al., 2005, 281-91). The cistern was able to hold water not only for the church complex's daily functioning but also served the pilgrims who frequently visited this place.

It is worth noting that the cistern is the only construction of this kind fully excavated in the whole of Pelusium. Fieldwork confirmed that the water transported to the cisterns was drawn from a well or from the Nile, using a very effective lifted water *saqieh* system. This ancient method of water distribution is well known in the Near East, even in present times.

The examples presented above show that our knowledge of water distribution and sewage systems is very fragmentary and disordered. To date no correlated project focusing on that very important problem of how the city functioned has been conducted. However, the results of a few years of fieldwork led by several international and Egyptian expeditions are quite interesting, considering the fact that the excavations were conducted only in several parts of this large city. Some important conclusions appeared on the subject of the Pelusium sewage system. First, it seems very possible that all the water used in the city was drawn from the Nile. That observation is quite obvious, since Pelusium was developed on an island. Moreover, other sources of fresh water were probably too far to connect them with the city by an aqueduct system. The water from the Nile was drawn and used directly from the river for technical and industrial purposes only. In other cases, when water was destined for consumption (everyday use by the Pelusium citizens) or for baths, it was necessary to collect it in large water tanks.

At least two large cistern buildings were recognized in the urban space of Pelusium. These structures not only collected fresh water for any kind of use, but what seems to be the most important reason for their construction was that the water inside got cleaned in the most natural way. Water taken directly from the Nile was muddy and dull, but when it was left in the cistern all the dirt, mud and other heavy sediment accumulated at the bottom of the basin. After several days or weeks the water was clear, cool and ready to use. The cisterns' location in the middle of the city could also be very helpful in case of fire.

Fig. 13 Pelusium: the water cisterns in Tell Maqsan

So far we do not know whether or how the cisterns were connected to the important buildings in Pelusium, such as the bathhouses or the church from Tell Maqsan. We can only speculate that, considering the functions of the above mentioned buildings, such a system could exist. Unfortunately no clear evidence can be given right now to support this supposition.

The other question is how the sewage canals functioned in the city itself. The only two fragments of sewage systems discovered in Pelusium date from the Hellenistic and Roman periods. Since both fragments were unearthed in the central part of the city, we can assume that the sewers were constructed as a municipal investment and covered a large area of Pelusium. The canals were constructed under the network of streets, which proves that they were designed as part of the overall urban planning. Thanks to the observations of the stratigraphical positioning and correlations between both investments, we can also notice that the oldest city sewage system had become ineffective in Roman times when Pelusium was larger and flourishing. Rebuilding the drainage canal network probably happened in parallel to the major rearrangement of the city centre. The theatre, some new streets and divisions of the *insulae* were erected in this part of the city, together with a new drainage system. The Roman canals network was in use until the central part of the city had been abandoned, which is dated to the time shortly before Chosroes II's invasion of Egypt in 619 CE. The deserted houses were destroyed and probably used as a source for building materials for the Late Roman camp construction which had been erected to the west of the theatre remains (ABD EL-MAQSOUD, 1984-5, 3-8; ABD EL-MAQSOUD, CARREZ-MARATRAY, 1988, 97-103; ABD EL-MAQSOUD, EL-TABA'I, GROSSMANN, 1994, 95-103; ABD AL-MAQSOUD, TABA'I, GROSSMANN, 2001, 17-20).

To summarize: the main city sewage system in Pelusium was functioning from Hellenistic times until the beginning of the 7th century CE. Of course, the system did not remain unchanged during that time. It must have been restored, cleaned and enlarged several times. The proper functioning of the canal network was very important for Pelusium, a city located on muddy and boggy terrain. The drains served to remove not only liquid waste but also extra water which penetrated the lowermost parts of buildings. However, the only trace of canal rearrangement that can be observed in archeological layers is the one mentioned just above.

To conclude: the water management system in Pelusium can be divided into three groups. The first is the

installations providing water for industrial and technical purposes. These types of constructions were unearthed in the western part of the city and inside the abandoned theatre area. The second category is the municipal investments – all the hydraulic and hydrotechnical structures, such as city canals and pipelines. As was mentioned above, we don't know much about these constructions.

The last category of water city infrastructure is the large water cisterns which supplied fresh water to the citizens of Pelusium for their everyday needs and for the public baths. The Late Roman or Early Byzantine water cistern situated near the church in Tell Maqsan served as a freshwater distributor for this Christian cultural complex.

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Notes:

[1] Moreover, our attention should also be directed to another inscription found in the northern part of Pelusium which mentioned the partially preserved names of Pelusium's gymnasiarches. For details, see ŁAJTAR, 2007, 203-6.