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Going against the flow

Wells, cisterns and water in ancient Greece

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ABSTRACT

Despite the prevalent picture of the water supply in the ancient world as being dominated by fountains and aqueducts, the large number of excavated wells and cisterns show that these were the primary water sources for most individuals. Yet, little research has been done on their construction, function and use. This prompted the organization of the workshop *Going against the flow. Wells, cisterns and water in ancient Greece*, held at the Swedish Institute at Athens on 28–29 September 2017, and subsequent publication of the contributions in this volume. The ten papers presented here offer new evidence as well as a wide range of new perspectives on the use and function of wells and cisterns in ancient Greece. Considering the ubiquity of these installations in every type of setting during antiquity, from pan-Hellenic sanctuaries and civic centres to domestic workshops and remote farmhouses, it is hoped that the breadth of interest among the authors will allow other scholars to advance their own work further, illuminating new and exciting aspects of life in ancient Greece.

Keywords: wells, cisterns, water supply, ancient Greece, archaeology, climate, sanctuaries

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Cover illustration: section of typical ancient Greek cistern, by Patrik Klingborg
Dust jacket: Photograph by Pavlos Karvonis. The rights of the depicted monuments belong to the Hellenic Ministry of Culture and Sports (Law 3028/2002). Delos falls under the responsibility of the Ephorate of Antiquities of Cyclades, Hellenic Ministry of Culture and Sports

PAVLOS KARVONIS

4. The water supply in the Late Hellenistic houses of Delos

Abstract

This paper addresses the issue of water supply in the houses of Delos during the Late Hellenistic period. The small size of the island and the limited rainfall allow the formation of only seasonal streams. The only natural water resource of the island was the underground water. Consequently, the inhabitants of Delos used wells, cisterns and infiltration wells to secure the water supply. Wells are more numerous than cisterns and infiltration wells are rare. All of these installations are usually found in the courtyard of the house, but they can also be found in other locations, which generally indicates that they were kept there after a rearrangement of the house. The shape and size of these installations vary according to the nature of the ground in which they were dug, the needs of the house and the means at the disposal of its owners. The distribution of water supply installations in the houses is generally equal in the different neighbourhoods of the city, even if not all houses had their own water resource. The inhabitants of the houses of Delos seem to have used the limited natural resources of the island to secure the water that was necessary to a household.

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Introduction

Delos is widely known for its Sanctuary of Apollo and for its large Hellenistic city (for the island's location, see map in *Chapter 1*, *Fig. 3*). The island was inhabited from the prehistoric period to the 7th century AD, but the vast majority of the visible remains belong to the Hellenistic city. More than a hundred houses, together with numerous shops, workshops, commercial and associative buildings have come to light, and one of the most frequent questions of modern visitors to the island, especially during the summer, is how its inhabitants secured their water supply. This chapter aims to present the water resources of the island, which depend on its climate and geology, and the way Delians exploited them to meet their needs for drinking water.

The climate of Delos and its water resources

The climate of Delos is semi-arid and has not changed since antiquity.[1] Rainfall is limited, with an average of 300 to 400 mm of rain annually. In the wettest years it could reach 750 mm, while in the driest ones it could drop as low as 150 mm.[2] Rain usually falls between October and March, while the summer is almost completely dry.

[1] Bruneau & Ducat 2010, 30.
[2] Desruelles *et al*. 2003, 257.

The limited rainfall and the small size of the island, with a surface of 3.60 km^2, do not favour the formation of permanent streams and limit the size of the aquifers. There are some seasonal streams, following the shortest way to the sea, to the east or to the west. The most important is the Inopos, the sources of which are located on the lower slopes of Mount Cynthos where the flat ground makes water concentration possible. It flows to the north and then turns west. Before the construction of a dam in the Classical period, it reached the Agora of the Competaliasts.[3] Although it was called deep and with a good flow in the ancient sources, its flow was irregular and its outflow was weak.[4]

To the north of the Sanctuary of Apollo was the circular "sacred lake", formed in a natural cavity in the ground.[5] The lake was drained in 1925 for public health reasons.[6] The lake probably belonged to the Sanctuary of Leto.[7] According to inscriptions, there were fish in it which sold for 60 drachmas apiece, a very high price.[8]

With practically no watercourses or springs, Delos' main water resource was groundwater. The rain filled the aquifers in the granite rock, as well as natural cavities of variable size in the rocky countryside. The level of the water table varied greatly according to altitude.[9]

Water supply for the Late Hellenistic population of Delos

The residents and visitors of Late Hellenistic Delos relied upon public, associative and private installations for water. This paper will discuss the installations found in the private houses of Delos, but it is necessary to briefly present the public and associative ones so that one can be fully aware of the available resources.

Water was a very important element for the cult as well as for the function of sanctuaries, and was present in both Greek and foreign sanctuaries. The Greek sanctuaries on Delos were exclusively equipped with wells. The small ones, like the Artemision, had only one well, while the Sanctuary of Apollo had many wells, some of which were very large.[10] The oriental sanctuaries had wells, cisterns and in one case an underground chamber giving access to a well.[11]

A large well, where water was accessible by a stairway, was found under the Prytaneion. It dates to the 7th or 6th century BC.[12] Around 500 BC the Minoa Krene was built; a well, covered with a roof supported by columns.[13] In 400 BC the Athenians built a dam to retain the water of the Inopos.[14] In the Hellenistic period the dam underwent modifications and a platform with a stairway was built to give access to the water. When the theatre was built, a large water source (1,160 m^3), known as *La Citerne du Théâtre*, was constructed and the water falling on the *koilon* was channelled into it.[15] The "cistern" was in fact an infiltration well, as it tapped groundwater. During the same period, the valley of the sanctuary was equipped with two networks of running water.[16] We do not know where the water came from, but the water resources of Delos are inadequate for a continuous function of these networks. We there-

[3] Fincker & Moretti 2007, 188; Bruneau & Ducat 2010, 295.
[4] Callim. *Hymn* 2, 263; Desruelles *et al*. 2003, 254-255; Bruneau & Ducat 2010, 30, 295.
[5] Hdt. 2.170.
[6] Bruneau & Ducat 2010, 242.
[7] Bruneau & Ducat 2010, 242.
[8] *IG* XI, 2, 161, line 36.
[9] Desruelles *et al*. 2003, 258.
[10] Moretti 2012, 415; *Délos* 46, 89.
[11] Roussel 1915–1916, 20, 36–45; Bruneau 1970, 459–461, 490–491; 1982, 491; *Délos* 35, 89, 156; Siard 1998, 471–477; 2007, 417–447; Bruneau & Ducat 2010, 274, 289–291, 294, 298, 301.
[12] Étienne & Farnoux 1988, 746–752.
[13] *Délos* 5, 103–109; Bruneau & Ducat 2010, 207.
[14] Fincker & Moretti 2007, 215, 218–225, 228; Bruneau & Ducat 2010, 295.
[15] *Délos* 42, 141–154; Bruneau & Ducat 2010, 320–321.
[16] Moretti & Fincker 2011, 160–163.

Fig. 1. House III J of the Theatre Quarter. Well located in courtyard e. Photograph: Pavlos Karvonis.

fore conclude that they were used only when needed.

Water resources found in associative buildings resemble those found in private buildings in both typology and construction technique. They only differ in size and number, since associative buildings tend to have larger and more numerous installations, much like the large houses. This is the case of the Agora of the Italians, where three wells were dug in the courtyard, or of the Club House of the Poseidoniasts of Berytos, where a large cistern was found.[17]

Water in the Late Hellenistic houses of Delos

In the Late Hellenistic houses brought to light on Delos three different types of water sources are found: wells, cisterns, and mixed reservoirs or infiltration wells. The distinction between these installations is made by the way water was collected. Wells attained groundwater and cisterns were used to store rainwater from the roof. Infiltration wells combined the two ways of capturing water: they collected rainwater and attained groundwater.

WELLS

Wells are the most common installations, because of their small size and lower construction cost compared to cisterns.[18] They are usually found in the centre of the courtyard or *impluvium* (*Fig. 1*), when the house has a peristyle. Wells are also found in less expected places, such as living rooms (room j of House IV of the Theatre Quarter), at the foot of a wall (room a

[17] *Délos* 6, 87–89; *Délos* 19, 39.

[18] *Délos* 8, 324.

Fig. 2. House I of the Insula of the Jewels. Well located in courtyard B. Photograph: Pavlos Karvonis.

Fig. 3. House II A of the Stadium Quarter. Well located in courtyard d. Photograph: Pavlos Karvonis.

of House III M of the Theatre Quarter) or of a staircase (house to the south of the Agora of the Delians), under the stylobate (House of the Trident) or under the portico of the peristyle (House IV B of the Theatre Quarter). In most of these cases, the unusual location of the well can be explained by the fact that an already existing well was incorporated into a house that was built at a later date (room AJ in the House of the Tritons in the Skardhana Quarter, room i of House III I of the Theatre Quarter).[19] In the case of room AJ, it is clear from the traces of the ropes on the rim of the well kerb that the wall was built later than the well. On an island where water was scarce, the inconvenience caused by the presence of the well was less important than water supply and so the wells were kept at their original location.

The construction of wells depends on the nature of the ground into which they were dug. Those that were cut into the rock were sometimes irregular and their shafts were formed by the rock itself. Some wells, such as the one found in courtyard k of House II B of the Theatre Quarter, are so irregular that they may have been dug into a natural cavity in the rocky ground.[20] Wells partly or entirely dug into soil had stone-built shafts (*Fig. 2*) for the part dug in the soil. Most of the wells had stone-built shafts. Their plan was usually square or circular, but can sometimes be ellipsoidal or triangular. Wells with stone-built shafts sometimes had small steps allowing descent into the well for its cleaning (House of the Dolphins).[21]

Some wells also collected rainwater, as indicated by the presence of terracotta or lead water

[19] *Délos* 8, 326; *Délos* 27, 98.

[20] *Délos* 8, 327.
[21] *Délos* 8, 327.

Fig. 4. House of the Hill in the Skardhana Quarter. Cistern located under the courtyard. Photograph: Pavlos Karvonis.

pipes.[22] This was by no means their main water source, but rather an auxiliary one, in an effort not to waste any rainwater.

The well of House II A of the Stadium Quarter (*Fig. 3*) is unique: it is the largest well found in a private house, 6.15 m deep and 3.75 m in diameter.[23] It has the shape of a truncated cone. It has walls built of stone and is covered with gneiss slabs, set on three poros arches. The well was accessible by a stairway that did not serve to facilitate the drawing of water, since there is also a well kerb. Its presence is related to a religious activity as the house is considered to be the residence of a Jewish family and the well was used for ritual bathing.[24] The only similar well was discovered in the nearby Synagogue. The well of the House of the Diadoumenos is also unusual: it is rectangular and very large (length 4.57 m, width 1.35 m, depth 6.10 m). Its walls are covered with hydraulic plaster, which means that water arrived only from the unlined bottom.[25]

CISTERNS

Cisterns can also be found in large numbers in the Late Hellenistic houses of Delos. They were usually dug under the courtyard (*Fig. 4*). In rare

[22] *Délos* 8, 328; *Délos* 27, 41, 98.
[23] Plassart 1916, 240.
[24] Bruneau 1970, 490–491; 1982, 491, 499; Bruneau & Ducat 2010, 274.
[25] *Délos* 8, 430.

Fig. 5. House of Dionysos in the Theatre Quarter. Supply channel for the cistern. Photograph: Pavlos Karvonis.

cases, they occupy a room of the house (Houses III D, III R and VI F of the Theatre Quarter). These cisterns, just like the wells, presumably existed there before the construction of the room and were retained as a valuable water supply.[26] Cisterns collected rainwater only from the roof, never from other waterproof surfaces, such as the courtyard.[27] The supply pipes could either enter directly into the cistern or bring water to a supply channel (*Fig. 5*), which was covered and coated with hydraulic plaster. The end of these channels was sometimes fitted with a lead filter to prevent solid material from entering the cistern.[28] The supply pipes were placed in a corner of the courtyard or in the middle of a wall. They could also be fitted to a courtyard column. The form and the material of supply pipes varied considerably. Some were simple recesses in the wall, coated with hydraulic plaster and sometimes with a lead sheet. This type of recess can be identified by the presence of square holes on each side. The holes correspond to a missing piece of wood, to which the lead sheet was fixed with nails. The recesses with no square holes were simply coated with hydraulic plaster. Some were semicircular, which means that they housed a lead or terracotta pipe. Circular pipes were usually fastened to the wall or to a column by means of metal brackets. The only traces still visible are the little holes for the nails in the shafts of the columns or the nails themselves in the walls.[29]

Clearing installations are rare. A sediment basin can be found in the House of the Diadoumenos as well as in the *Magasin à la baignoire*. In the House of the Diadoumenos, the water coming from the roof was directed in a small basin, where solid materials could settle, and then led to the cistern through a supply channel.[30] A lead pipe brought water to the bottom of the cistern, so that the water on the upper level would remain undisturbed. In the House of the Dolphins, the clearing system was fitted to the cistern itself. Water was drawn from a shaft, closed on all four sides and communicating with the rest of the cistern through an opening, 1.50 m from the bottom. The bottom

[26] *Délos* 8, 331.
[27] The only known exception is the small cistern of room b of the House of the Dolphins, which collected the water of the *impluvium*. *Délos* 8, 408.
[28] *Délos* 8, 343–344.
[29] *Délos* 8, 341–344.
[30] *Délos* 8, 340, 344, 430.

Fig. 6. House III R of the Theatre Quarter. Cistern located under courtyard c. The stone beams supporting the cistern's roof can be seen in the upper part of the photograph. On the right hand side, the beams are placed on stone consoles. Photograph: Pavlos Karvonis.

of the cistern served as a settling basin and the water entering the shaft was pure.[31]

Cisterns usually have a rectangular plan, but there also is an L-shaped cistern[32] and some irregular cisterns, a result of the nature of the ground into which they were dug. Cisterns, just like wells, can be cut into the rock. There are also cisterns partly cut into the rock and partly dug through soil layers. But the vast majority of cisterns are dug into soil and have stone walls, made of granite or gneiss.[33] The joints are lined with hydraulic mortar and the walls are coated with hydraulic plaster. The bottom is also coated with hydraulic plaster and the junction of the walls and the bottom can have a quarter-round moulding as additional isolation. When the rock is not covered by a masonry wall, it is almost always coated with hydraulic plaster.

Cisterns could be cleaned just like wells. When the opening was located close to a wall, the addition of a shaft, formed by the side-walls of the cistern, with hand- and footholds allowed access. In a house to the west of the Aphrodision, a hole pierced in a slab of the covering of the cistern permitted one to lift it and access the cistern for cleaning.

Cisterns were always covered in order to preserve the quality of the water stored in them and to limit its evaporation. Their average depth was 3 m, but the cistern of the Hostelry was 8.30 m deep. The roofs of the cisterns, which constituted the floor paving of the room where the cistern was located, were made of gneiss slabs, sometimes covered with a mosaic. These slabs were supported by stone or wooden beams, or by arches. Beams were set into sockets in the upper part of the walls of the cistern. The arches were built in the side walls of the cisterns. Stone beams (*Figs. 6*) were used only for relatively narrow cisterns, usually no more than 4 m wide. The stone beams of the L-shaped cistern of House III R of the Theatre Quarter are set in the wall but they are also supported by stone consoles. On the east side, the rock is cut so as to form corbelling in order to reduce the width of the cistern.[34] In the House of Hermes, the roof of the reservoir is supported partly by stone beams and partly by rock-cut corbelling.[35] Wooden beams were frequently used, especially

[31] *Délos* 8, 340.
[32] *Maison III R du Quartier du Théâtre*. *Délos* 8, 334.
[33] *Délos* 8, 331; Bruneau & Ducat 2010, 246.
[34] *Délos* 8, 334.
[35] Delorme 1953, 456.

Fig. 7. Shop θ of the Stadium Quarter, cistern. The cistern is partly dug into the rock, coated with hydraulic plaster, visible on the right hand side. Its roof is supported by stone-built arches, equally coated with hydraulic plaster. Photograph: Pavlos Karvonis.

for cisterns of medium width. The ends of the beams, and sometimes even the entire beams, were covered with lead sheets in order to protect the wood against humidity.[36] The stone arches (*Fig. 7*) were the most common support of the roof. In cisterns exceeding 5 m in width only stone arches were used. The arches were made of poros, coated with hydraulic plaster. In the House of the Diadoumenos the arches were set on pilasters, a rather unsuccessful solution, since they have all collapsed. The cistern of the House of Dionysos was divided into two compartments by a partition wall, intended to give additional support to the roof, which not only remained intact, but was strong enough to carry the crane used for the modern restoration of the columns of the peristyle. The two cisterns of House II B of the Theatre Quarter were the only ones in Delos that were covered with a barrel vault.

Some cisterns had draining devices. In some cases, such as the cistern of the Hostelry and the cistern of shop θ of the Stadium Quarter, the excess water drained into the ground. In House III D of the Theatre Quarter, the end of the pipe was found 0.40 m under the bottom of the cistern.[37] Elsewhere, e.g. in the House of the Comedians, for instance, the excess water was redirected to a nearby well. The draining devices of the cisterns of the Hostelry and of House III D can no longer be seen. We can therefore assume that others have existed and are now lost.

MIXED RESERVOIRS OR INFILTRATION WELLS

Infiltration wells, also called mixed reservoirs, are less common. Only five have been identified: in the House of the Masks, the House of Hermes, the House of the Tritons, House III H of the Theatre Quarter, and in the Club House of the Poseidoniasts of Berytos (*Fig. 8*). Their form is that of the cisterns and this is why most of them have been published as such, but the lower part of the walls and the bottom are not coated with hydraulic plaster, so that the water of the aquifer could penetrate into the reservoir.[38] Rainwater collected on the roof was sent

[36] Plassart 1916, 221; *Délos* 8, 334–335.

[37] *Délos* 8, 344.

[38] This is the case of House III H of the Theatre Quarter and of the Club House of the Poseidoniasts of Berytos, but the walls of the infiltration wells of the Insula of the House of the Masks and of the House of the Tritons were not coated with hydraulic plaster.

Fig. 8. The Club House of the Poseidoniasts of Berytos in the Skardhana Quarter. The mixed reservoir located in courtyard F. Photograph: Pavlos Karvonis.

Fig. 9. The House of the Trident in the Theatre Quarter. Drawing mechanism of the cistern. Photograph: Pavlos Karvonis.

to the reservoirs by means of water channels and supply pipes. In the House of Hermes, the reservoir reaches the water table and received the water of the hill on which the house was built, through a small aqueduct. A niche, decorated with the statue of a nymph, was built in the back wall of the courtyard, at the point where the water of the hill seeped in the water channel.[39] The reservoir of the House of the Masks probably belonged to all the inhabitants of the insula.[40] It is located outside the nearby houses and collected water from all the surrounding residences. A narrow corridor gave access to the water. The reservoir was not covered because of its large dimensions (11.30 × 12.80 m).

Drawing mechanisms

In all three types of hydraulic installations, water was drawn through a narrow opening (*Fig. 9*), usually mounted by a well kerb, which could be fitted with a cover and a drawing mechanism.[41] In some cases a marble frame with a pulley was set over the well kerb.[42] In the House of the Diadoumenos, a lead basin, 57 cm in diameter and 20 cm deep, was set in the bottom of the cistern, under the drawing hole. It may have been intended to absorb the shock of the water collecting vessels as they reached the bottom.[43]

[39] Delorme 1953, 456.
[40] Chamonard 1933, 148–149.
[41] *Délos* 8, 346–351; *Délos* 18, 93–96.
[42] *Délos* 8, 350–351.
[43] *Délos* 8, 430.

Efficiency

The efficiency of the water supply system of the Late Hellenistic houses of Delos depended on rainfall. The water level in the wells varied considerably from one year to another and also within the same year, depending on the season. In the houses that had both wells and cisterns, we can assume that during the winter, when wells were full, Delians relied mostly on them and tried to keep their cisterns as full as possible for the dry season.

During the summer, when the wells had little or no water, the inhabitants turned to the cisterns, where water could be stored for longer periods.[44] The capacity of the cisterns has not been systematically calculated and it is a rather difficult task to undertake at a site-wide level, because they are often irregular and therefore should be fully excavated and free of debris to be accurately measured. Nevertheless, some have been measured and provided the following capacity numbers: 300 m^3 for the cistern of the Hostelry, the largest known in Delos, 190 m^3 for the House of Dionysos, 155 m^3 for the House of the Trident and 120 m^3 for the House of the Diadoumenos. The mixed reservoir of the Club House of the Poseidoniasts of Berytos and the cistern of the Granite Monument have respective volumes of 210 m^3 and 200 m^3. The infiltration well of the theatre, which was a public installation, has a total capacity of 1,150 m^3.

How much of this volume was actually filled with water depended on rainfall. The size of cisterns was proportional to the size of the roofs of the houses, and thus to the volume of the water collected. Assuming that approximately 90% of all rainfall was collected, some cisterns were under-calibrated, when compared to others. This means that, in an average year, some cisterns would never fill up completely, while others would be full. If we take the rainfall of an average year into account, the cistern of the House of the Trident, with a roof surface of 350 m^2, would collect 107 m^3 of water. The House of Dionysos, with a roof surface of 500 m^2, would collect 153 m^3 of water. The cisterns in both of these houses would then be close to full. The Hostelry on the other hand, with a roof surface of 1,140 m^2 collected 693 m^3 of water, which is more than double the volume of its cistern and this is probably the reason why it had been fitted with a draining device. The traces of carbonate concretions that can be seen on the walls of the cisterns and mixed reservoirs indicate that in reality they were rarely filled up with water.[45] In the infiltration well of the theatre, the height of the concretions corresponds to a volume of approximately 800 m^3.

As a general rule, the domestic hydraulic installations provided the water that was necessary to a household. Of course, during dry years the situation must have been difficult. Such a year is probably reflected in a graffito on a wall of the House of the Lake, where a slave, originating from Magnesia on the Meander, invokes the river god Meander to send rain to Delos.[46]

Distribution of water supply installations in the city

Water supply installations are found in large numbers in the Late Hellenistic houses of Delos. Wells were more numerous than cisterns, while infiltration wells seem to have been rare. In general, the type and the number of water supply installations depended on the importance of the house to which they belonged. Large houses usually had a well and a cistern, since their owners could afford the expenses for both these installations that allowed them to capture both the water of the aquifers and

[44] Desruelles *et al*. 2003, 261.

[45] *Délos* 42, 143.

[46] *Délos* 8, 422–423.

Fig. 10. Plan of the Theatre Quarter with the houses possessing their own water resource in light blue. Bruneau & Ducat 1983, plan VI.

rain-water. In this case, we suppose that the water of the cistern was kept as backup for the dry season. Some houses had two installations of the same type. This can be explained by the rearrangement of a house. This is the case of the House of Cleopatra and of House II B of the Theatre Quarter, both enlarged at the expense of neighbouring houses. In both cases, their inhabitants chose to keep the water supply installations that existed in the annexed houses.

The distribution of water supply installations (*Fig. 10*) is more or less equal in the neighbourhoods of the city of Delos. Nevertheless, the upper part of the Theatre Quarter seems to be better equipped than the lower part, which is mostly occupied by commercial installations. In the Skardhana and Stadium quarters, the distribution of water supply installations is more balanced and, in most cases, their type and number depend on the importance of the house.

In spite of the large number of water supply installations discovered in Delos, all houses were not equipped with them, although we have to bear in mind that some components, such as lead pipes, could have disappeared without leaving traces.[47] The inhabitants of the island could find water in the few public installations. The most important ones are the Minoa Krene, the infiltration well of the theatre and the Inopos dam. The ones belonging to the Sanctuary of Apollo and to the other sanctuaries of the island, if used for water supply, must have played a secondary role in everyday life. Another possibility for those who did not have their own water supply was to look for water

[47] *Délos* 8, 324; Alabe 1988, 773.

from their neighbours' houses, as we learn in Plutarch's *Solon*, where it is mentioned that a person not having water could fill a hydria containing six conges, or a little less than 20 litres, twice a day from his neighbour's house.[48]

The use of water

Water collected in the installations described above was used for drinking as well as for all other purposes, such as cooking, cleaning and washing. When craftsmen, such as sculptors or coroplasts, were working in their houses, it was this same water that they used. Finally, water was used for cult rituals. The House of the Dolphins is the only one where a distinction was made between drinking water and water used for household purposes. The house had two cisterns. The one that was located in the service rooms was fed from the *impluvium*. Since water from *impluvia* was usually not collected, Joseph Chamonard drew the conclusion that in this case the water was used for household purposes. The water in the main cistern, on the other hand, was used for drinking.[49]

The quality of water

Since water was used for drinking, it is only natural to examine the risks of pollution, which were increased in two ways during the dry season. The first one, of anthropogenic origin, is organic and the second one is caused by salt. Delos possessed a highly developed sewage system, which evacuated waste water. But sewers were not waterproof and needed water to function properly, and soiled water probably stagnated during the summer and could infiltrate and contaminate the aquifers. Delians were conscious of the problem and tried not to cross water supply channels and sewers. When this was inevitable, sewers passed under the water supply channels. The risk of salinity on the other hand, was rather low, despite Delos being an island. The average level of salinity measured at the lowest elevation point of the Theatre Quarter, close to the sea, is two per thousand.[50] At the highest elevation point of the same district, the average level of salinity measured is one per thousand. As the sea level was lower in antiquity, the contamination by salt water was probably weaker. Therefore, the only cause for an increase in saltwater concentration levels during antiquity would have been human overexploitation, something which no longer happens.

Conclusion

A large number of private hydraulic installations were used to supply Late Hellenistic Delians with water. These installations belonged to three different types: wells to collect water from the aquifers, cisterns to collect and store rainwater, and infiltration wells, where the two ways of collecting water were combined. The choice for the construction of these installations was made according to the nature of the ground and the means at the disposal of their builders. The construction technique of these installations is the same everywhere. The distribution of domestic installations for water supply is more or less evenly spread across all the neighbourhoods of the city of Delos and it seems as though the inhabitants of the island managed their water supply with care and usually did not lack for it.

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[48] Plut. *Vit. Sol*. 23; *Délos* 8, 324–325.
[49] *Délos* 8, 408.
[50] Desruelles *et al*. 2003, 261.

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