REPORT 2022

for the Restoration of the Miqvot in the rock-scarp of Mt. Zion

November 11, 2022

CONTENT

1. SUMMARY

The GPIA under the direction of Prof. Dr. Dr. Dr. h.c. Dieter Vieweger started to excavate in the Protestant Cemetery in 2015. The excavation is located on the southern slope of Mt. Zion. Previous excavations revealed three superimposed city walls that included Mt. Zion into the walled city of Jerusalem during the Byzantine Era, the Hasmonean/Herodian period and the Iron Age. The two later walls, which have the same orientation, also contain a gate and a tower.

In between the years of 2015 and 2018 different excavation campaigns have discovered Byzantine level and housings and layers from the medieval and ottoman era. In 2018, the excavation has been widened (green squares in Figure 1).

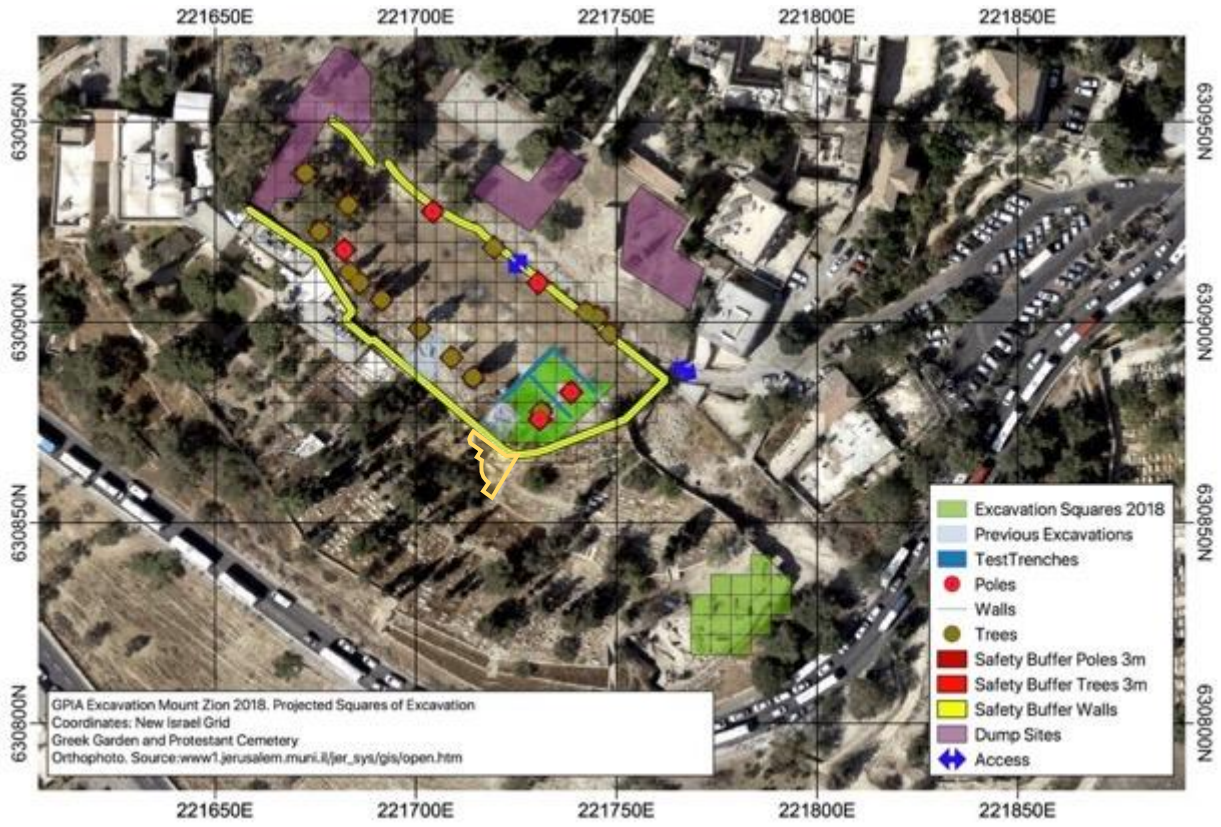


Figure 1: Map of the site and excavation areas of 2018 by the GPIA

Next to the big excavation area on the northern border of the cemetery there is located a Double-Miqveh (orange in Figure 1). The Miqvot are hewn in the bedrock of Mt. Zion and integrated and surrounded by historical walls and components. Some features hint for a dating between the 1st century BC and the 1st century AD.

In 2016 and 2017 an architectural survey and a report about the damage assessment

have taken place. The results are concepts for the preservation and conservation of the Miqvot building. Between 2017 and 2018 a scientific analysis on stones, mortars and historical surfaces was carried out, aimed at a comprehensive restoration concept. Treatment tests in selected areas were conducted. A treatment concept was created based on all gained results. In addition to the investigations concerning the restorative measures, the structural stability has been assessed in February 2019.

Thus, it appears that the state of the building concerning the structural stability in some parts as well as the state of damage on the wall's surfaces and Miqvot vaults are partially critical. Therefore, a restoration of the architectural elements is an indispensable step to make sure the building stays as a contemporary witness for the future.

2. SITE MAP

Figure 2: Map of the site (Protestant Cemetery) and location of the Miqvot (Orthophoto, source: www1.jerusalem.muni.il/jer_sys/gis/open.htm

3. PREVIOUS INVESTIGATIONS

In October 1875, Claude R. Coder reported on Henry Maudsley's excavation in the area of the Miqvot on Mount Zion. According to him, 36 steps gave access to the baths above. The rock-hewn steps led in a south-eastern direction onto a level containing the two Miqvot, which he initially misinterpreted as two cisterns. The vault of one of these baths (the northwestern) was found still intact: „They are cut into the rock, with broad steps, giving six feet of water at the back of each. The first (scil. the western) is roofed with beautiful masonry in a round barrel vault."[1]

Roughly a century after the establishment of the cemetery, Pioneers Frederick Bliss and Archibald Dickie [2] explored the area during the years between 1894 and 1897.

After Bliss and Dickie, it again took a century until the Benedictine monk Bargil Pixner who, motivated by his religious interests, was seeking to find remains of the times of Jesus on Mt. Zion. Based around the two Miqvot, as well as another one nearby (Plot

[1] CONDER 1875, p. 86. CONDER drawed a site map of the sight, in which the Miqvot are illustrated for the first time.
[2] BLISS 1898

29), Pixner theorizes of an Essene settlement on Mt. Zion based on accounts of the Essenes particular sense for purity. Yet, Jewish ritual baths are common throughout many other parts of Jerusalem and thus could hardly be seen as evidence, flawing his theory. Pixner dated the ritual bath to a timeframe between 53 BC until 70 AD.[3]

4. REPORT OF THE SURVEY AND ANALYSIS

4.1. Description of the Miqvot

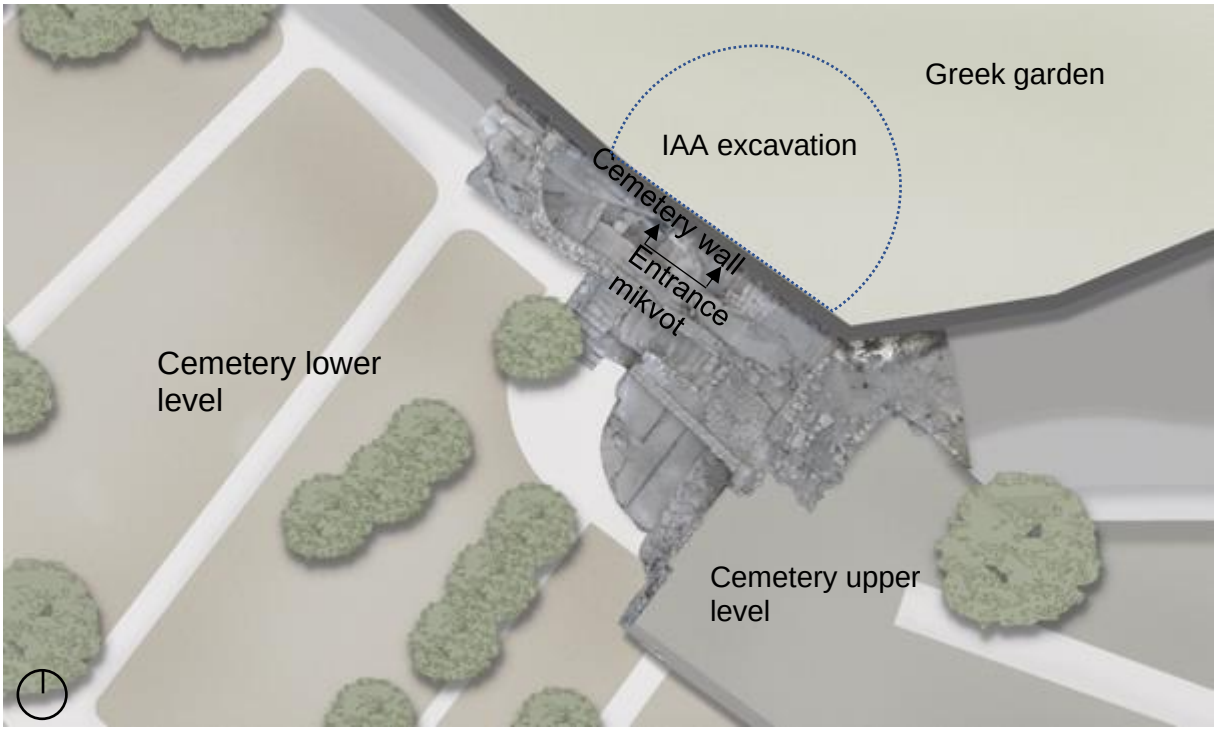


Figure 3: Map of the Miqvot building (THIERRY, 2017)

Two Jewish ritual baths are located on the upper level of the Mt. Zion Cemetery (Figure 3). The whole Miqvot complex is terraced on two different levels whereas the rock slope forms the foundation. Steps on the lower level of the cemetery lead to the upper, three meters higher Miqvot level where the arched entrances to the baths are built in the cemetery wall.

[3] Many Miqvot during this timeframe had seperate steps, to sperate clean from unclean visitors. Die steps, in which a separation was not possible, have been blocked with a symbolic stone hump as it was done in the southeastern Miqveh.

The southeastern bath, called Miqveh, is accessible from a platform via an external staircase. The arch of the entrance was built out of hewn limestones and mortar, set in an arch without mortar and using the adjacent rock as support. The Miqveh measures 4.2 meters in height, from floor to the highest point of the arch, its footprint measures 4 m^2. The vaulted ceiling is, unlike the arched entrance, built from roughly hewn fieldstones (Figure 4). Three stairs and a small platform lead into the bath itself, ending on yet another platform in the bath itself.

The second north-western Miqveh can be accessed via three steps and a platform, hewn into the bedrock. In this Miqveh, the whole depth of the ceiling has been constructed using hewn stones without mortar. Both Miqvot have different layers of plaster on the interior walls and floor.

Figure 4: Entrances to the baths (THIERRY, 2017)

Different walls surround the ritual baths on both levels (Figure 5). They consist of natural limestone masonry constructed with lime mortar.

Three accesses lead to the Miqvot complex. One access conducts from the lower level and rock hewn steps to the upper level. Another access heads from southeastern

direction to the building on the upper level. And the third access is constructed in wall A (Figure 5) and has been sealed with natural stones and finishing cement mortar.

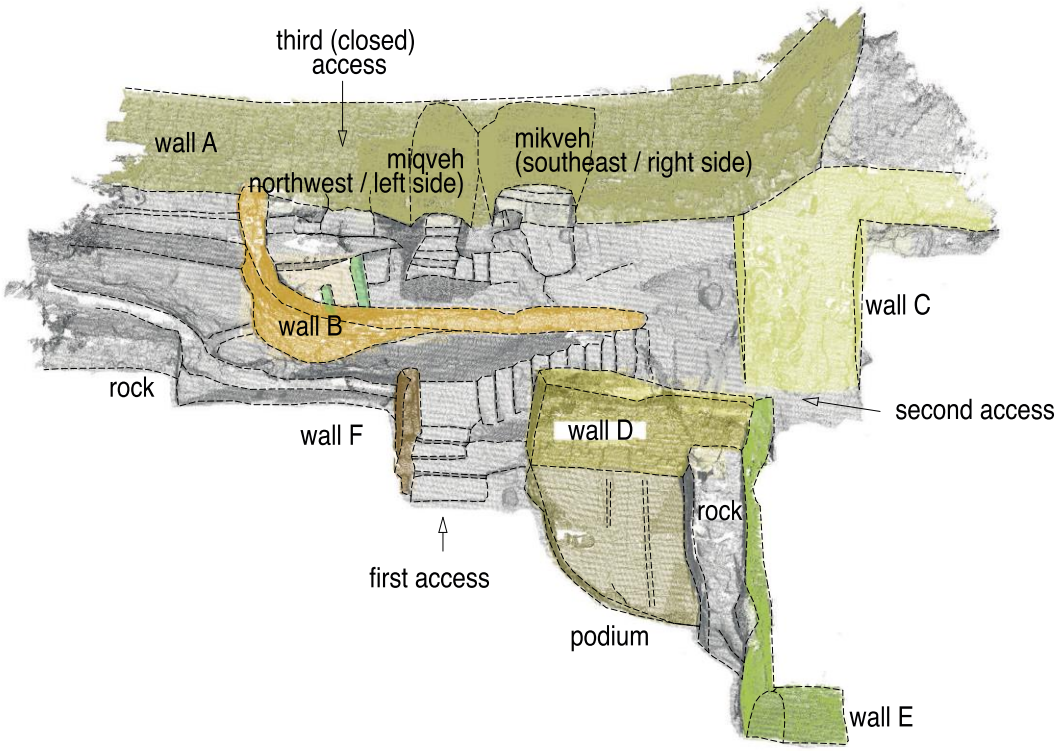


Figure 5: 3D Chart: Explanation of architectural components (THIERRY, 2017)

A cistern has been found under the rock hewn complex of the building. It has two openings, one in the ceiling and one on the side wall (wall D). The walls in the cistern are cut in the bedrock and the roof is partly built with stones.[4]

Different rock hewn channels were once responsible for supplying the baths and cistern with fresh water (Figure 6). On the lower level a rock hewn canal leads in direction of wall F and into the cistern. On the upper level, canals from southeastern direction along the rock slope served as water supply for the baths.

[4] BOAZ LANGFORD 2017

Figure 6: flow of rock-hewn water channels and accesses to the cistern (THIERRY, 2017)

4.2. Structure and material

As described, the bedrock builds the base of the Miqvot level (grey in Figure 5). All walls built around the Miqvot and on the rock are sealed with natural stones and lime mortar (Figure 7).

The stone size varies from square stone blocks (20-25 cm) to very small stones. An analysis of the material is specified in 4.6 Restoration.

Figure 7: Perspective view on the whole Miqvot building, Photo: GPIA

4.3. Historical overview

Historical legend

Parts built between the 1st century BC and the 1st century AD

The base for the oldest phases is the bedrock. It has been formed into a podium on the outside of a small gate (postern). The walls, as well as a massive tower (today, the walls C and E) to the east of the Miqvot, were built on sections of the bedrock.

In the rituals baths, some features hint for a dating between the 1st century BC and the 1st century AD.[5] Both baths have been hewn into the rock with multiple layers of plaster applied to their walls. The basins can be reaches via rock-hewn stair. In the south-eastern bath, the stairs are subdivided to separate cleaned visitors from uncleaned ones. Additionally, the vault of the north-eastern bath, built of hewn stone without mortar, is a technique commonly used during the timeframe mentioned above.

This dating is also supported by measurements, connecting the baths with the Gate of the Essenes. Around 1875 Maudsley was able to observe and photograph the staircase leading up to the platform from which the ritual baths can be entered. Today, most of these steps are covered by the platform built for the cemetery. According to Maudsley's measurements, the first step of the staircase was found at 746,874 m NN (Figure 8). This measurement closely resembles the level of the threshold of the gate of the Essenes – entrance to the city during the times of Herod the Great – with 746,863 m NN [6]. The weathering of the northwestern vaults stones resembles that of the threshold of the postern.

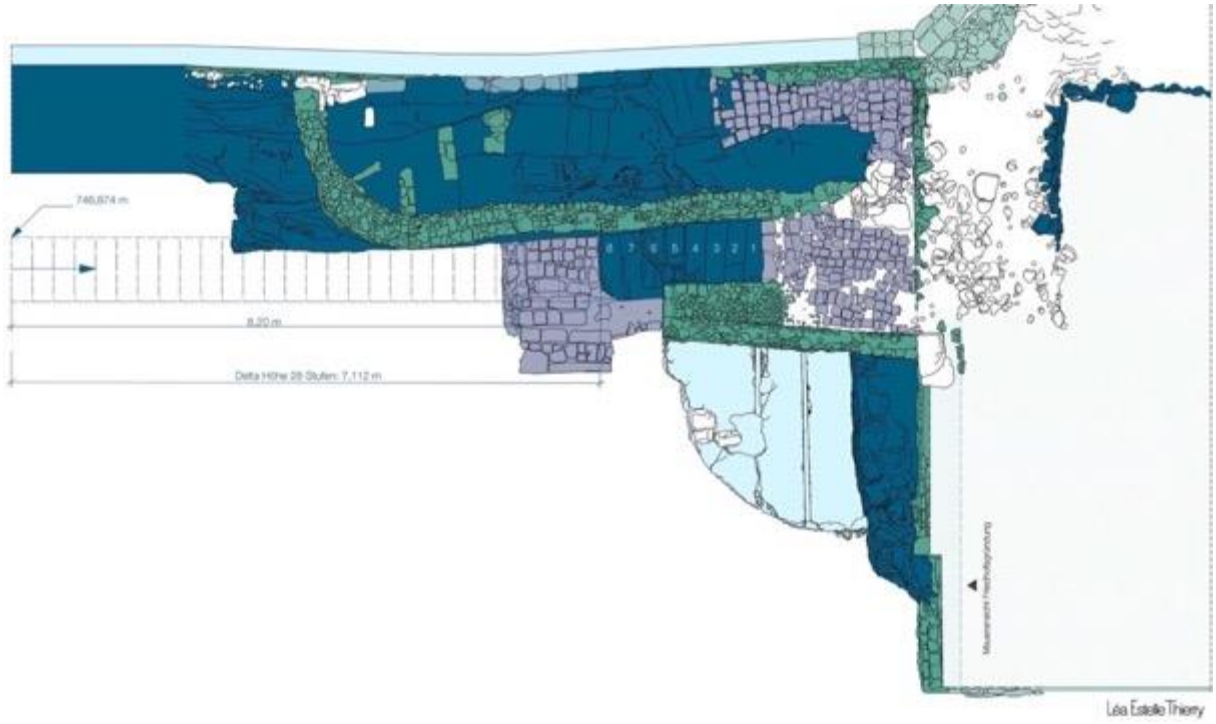


Figure 8: Historical mapping of the ground plan incl. height of first step under cemetery level (THIERRY, 2017)

[5] see MILLER 2015; HEUBERGER 1992 and REICH 1990
[6] measured by Jochen Reinhard, while the excavation campaign on Mt. Zion in 2016

From the establishment of the cemetery to Wilson's photo (1865)

In 1848, Samuel Gobat acquired the plot of land on which today the Bishop-Gobat School and the cemetery are located.[7] With the construction of the cemetery's enclosure, the south-eastern Miqveh must have been rebuilt. Its construction differs from that of its counterpart with its well-built, mortar-less vault. The vault of the south-western bath lines up with the face of the cemetery's enclosure, hewn stones, possibly older, have only been used above the entrance. The remainder of the vault had been constructed in a fashion common during Osman times – using quarry-stone, rubble and mortar.

Wilsons photography from 1865 shows that the wall bordering the upper level containing the Miqvot had already been constructed in dry-wall technique (Figure 9).

Figure 9: left: view on southeastern wall 2017, right: Wilson's photo from 1865 (THIERRY, 2017)

[7] GRÄBE 2014, p. 10

Redesign and enlargement of the cemetery (1904/1905)[8] and modern changes

The slab-pavement of the intermediate landing and the level containing the baths have been lain after 1865, together with the intermediate landing and the new staircase. All walls in which cement was used are to be dated after 1904/05. During the most recent reconstruction of the cemetery at the end of the 20th century, the cistern was covered with a reinforced concrete slab.

4.4. Degree of damage

In 2016 and 2017 an extensive survey of the architectural elements of the building has been done by Estelle Thierry. The objective of the research is a full documentation of the Miqvot: A historical overview, a survey of the state of construction and an analysis of the structural damage because of weathering degree has been carried out. The results are concepts for the preservation and conservation with an emphasis of the construction of the Miqvot building. Two sorts of damage causes have been identified: The decay on the material surface because of weathering and the decay because of critical structural stability as a result of weathering.

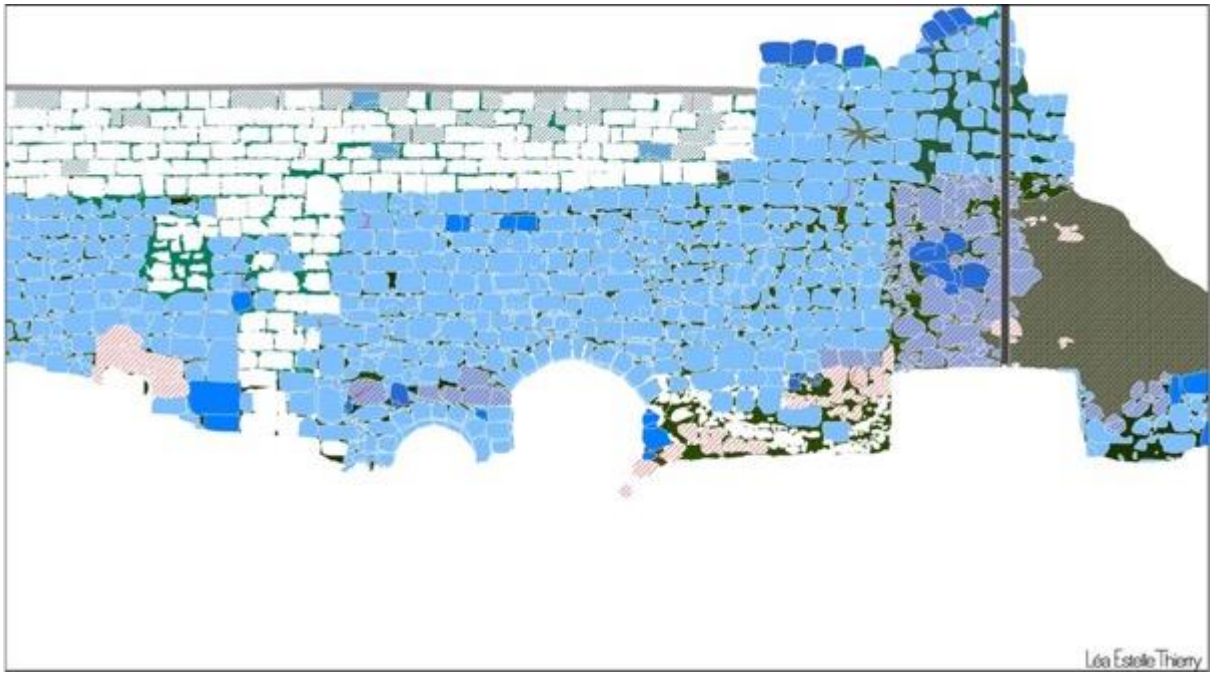


Figure 10: mapping of damage degrees, (THIERRY, 2017)

[8] described in MEHNERT 1971

The following critical states on the building have been identified:[9]

Ground stability and loss of material

The stone tiles on the ground as well as the lime mortar are loose, some parts are fully broken. The ground near the hole that leads to the cistern needs to be analyzed regarding to structural stability. Also, the stairs up to the Miqvot-level are partially broken. Without restoration, the current status risks to worsen. The ground stability is not guaranteed.

Figure 11: ground around cistern-hole (THIERRY, 2017)

Walls: Loss of material on stone surface

On the stone surfaces of the walls that surround the baths a continuing erosion is visible. The degree and type varies on each wall: It starts with partial detachments, up to fully loss of stone fragments.

Figure 12: Loss of material wall D (THIERRY, 2017)

Walls: Loss of material in joints

The jointing mortar of the walls is sandy and loose. It shows a loss of components. Because of the decay and erosion of the mortar, the stability of the stones and masonry nearby is no longer guaranteed. The use of different mortar, e.g. cement mortar in thick layers of the big cemetery wall A, contributes to the downgrade, also regarding to the aesthetic aspects.

Figure 13: Loss of material in joints (THIERRY, 2017)

[9] THIERRY 2017, p. 56 - 116

Walls: Discoloration & Deposit on stone surface

Crusts and Deposits have been found on the stone surfaces that contribute to the loss of material.

Figure 14: Stone surfaces on wall D (THIERRY, 2017)

Walls: Biological colonization on stone surfaces and in joints

Different biological colonization has been found on the walls. Snails, as well as different plants (mostly Ailanthus), roots and algae and moos downgrade the stone surface. Because of that, the loss of material risks to worsen.

Figure 15: biological colonization in joints, here snails (THIERRY, 2017)

Miqvot: Loss of material:

Partially loss of the different plastering mortars in the baths as well as detached dark areas have been identified.

Figure 16: northwestern mikveh: salt crusts, dark areas (THIERRY, 2017)

Miqvot: Discoloration and deposit:

Salt crusts and moist areas as well as undefined dark areas on the walls.

Vault northwestern/left Miqveh:

The masonry of the ceiling is defined as stable structure after a static analysis. The ceiling in the back of the bath had a big hole and missing parts of stones and the structure above. It was highly important to measure the dimension of the cavity, fill the missing part with mortar and close the masonry, so the vault guarantees a stability its entire length.

Figure 18: Ceiling of southeastern Miqveh (THIERRY, 2017)

Vault southeastern/right Miqveh:

The masonry of the ceiling is defined as stable structure after a static analysis. There are different loose fragments. An analysis of the structure behind was recommended. Small injections of hollows and the restoration of the material will stable the existing shape.

Risks of structural stability

Besides the Miqvot ceilings, there are areas on the building where the loss of material causes a risk of crack and deformation. Metal installations like screws and covers corrode and damage the material around. The defect in the southwestern front view of wall D risks to weaken and deform the wall further.

The concrete platform on the cemetery level in front of wall D has no static stability according to professional assessment. The analysis classifies the platform as in need of renovation.

4.5. Architectural survey

The undertaken survey by Estelle Thierry in 2016 and 2017 serves as base for all following measures. Planning material, CAD-drawings, ground plans, elevations, sections and models have been prepared. Line drawings are attached.

4.6. Restoration analysis

4.6.1. Results of examinations

In 2017 and 2018 Theo Schubert wrote his Master's Thesis on scientific analysis concerning the conservation and restoration of the building under the supervision of Prof. Dr. Jeannine Meinhardt[10]. In this context mortar samples have been taken for microscopic examination. Based on all results of his investigations, test areas regarding joints, renders, groundings, cleaning and salt reduction have been placed.

[10] Prof. Dr. Jeannine Meinhardt is Professor for Conservation and Restoration of Stone at the University of Applied Science in Potsdam, Germany.

Besides that, different examinations concerning the moist in the baths as well as a salt-crusts analysis have been done. With the results of the examinations a concept of measures has been prepared.

The following examinations have been carried out in 2017 / 2018:

- Classification of damage types on stone surfaces, joints and plasters
- Identification of different plaster layers in the baths
- Identification of jointing mortar of the walls
- Analysis to the salt crusts and moist in the baths
- Detection of the detached areas in the baths
- with the results, tested areas have been restored
- different cleaning measures were tested

The notable results concerning the building components in the first restoration campaign of 2019 are listed below.
Before the tested areas on the walls have been prepared, the results of the following analysis methods were determined:

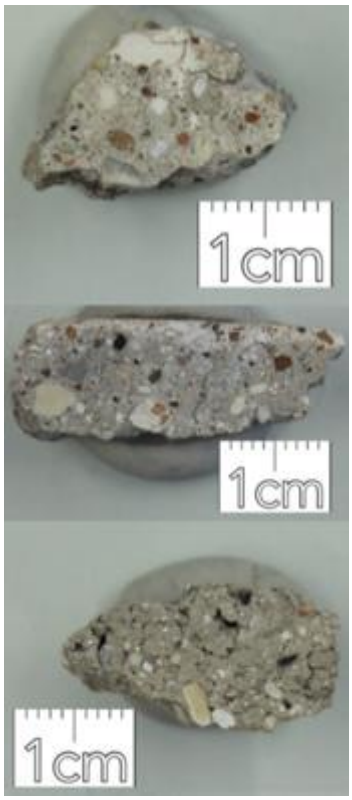


Figure 19: Jointing mortar probes for microscopic examination (SCHUBERT, 2018)

From capillary water uptake[11] and ultrasonic examinations[12] no noteworthy results that affect the restoration measures have been evaluated. Microscopic examinations of the stones surfaces prove no problematic contaminations or risks of damage.[13]
The laboratory examinations of the jointing mortar show the following results (Figure 19).[14] Because of similar structure of the jointing mortars around the building, the results are summarized:[15]

[11] The masonry (stones) show a low grade (0,17 kg/m²√h), SCHUBERT 2018, p. 41

[12] The analysis proves the structural stability analysis: intact stones show a higher ultrasonic velocity in comparison with damaged stones. SCHUBERT 2018, p. 43

[13] Dirty stone surfaces with tesa-stripe-test: Under the microscope microbial colonization was found. The dirt on the stones is classified as not damaging. SCHUBERT 2018, p. 49

[14] Seven different samples were taken. SCHUBERT(Anhang/attachements) 2018, p. 112

[15] SCHUBERT 2018, p. 45

- aggregates: always white, black limestones
- mostly added: quartz and ceramic
- rarely: plant coal found
- lime: varies from light grey, grey up to ochre – beige

The grading curve of the mortar is:[16]

- 3/4 to 4/5 crushed lime stone with
- 1/5 to 1/4 ceramic additives and
- dark dried soil (1 – 0,063 mm)

4.6.2. Tested Areas

In January 2018, tested areas have been made, in order to obtain finally best quality for the restorative measures. Therefore, the repairing mortar has been mixed in accordance to the existing material and to the results of the investigations.[17] In February 2019, one year after the test applications, the areas have been inspected. It turned out that the biological infestations reduced to 90%. The mortars are stable and the edges are adhering (Figure 20). The cleaning method and the recipe is assessed as suitable for the restoration of the walls.[18]

21.01.2018 before measure

21.01.2018 joints cleaned

[16] SCHUBERT 2018, p. 63
[17] The tested areas shown concern the first restoration campaign 2019. The tested areas in the baths and on other walls concern the second campaign. Therefore, they are not listed in the application for 2019.
[18] The measures and mixture are specified in **Fehler! Verweisquelle konnte nicht gefunden werden. Fehler! Verweisquelle konnte nicht gefunden werden.**

23.01.2018 refilled joints/restored area 26.02.2019 restored area after one year

Figure 20: tested area on wall A from January 2018 until February 2019 (SCHUBERT, 2018)

4.7. Static analysis

In February 2019 a static analysis of the walls and the vaults for both Miqvot were carried out by the Construction Engineer Dipl. Eng. D. Schwengler. He is very experienced with the restoration of historical monuments and archaeological sites.
Thus, a static report identifies the most critical parts on the building in need of restoration as soon as possible to decrease the risk of further damage.

The critical parts in need of restoration and static measures:

- Exploration of the ground above the Miqvot ceilings; especially the hole in the northwestern Miqveh with suitable measuring methods to dimension the structure, to afterwards
- close the masonry of the ceilings and close the holes and hollows by injection to finally stable the structure. Besides that, the
- Closing the missing parts in the southwestern view of wall D is necessary.

Furthermore, the restoration of all the walls is classified as necessary because of the risk of further loss of historic material and deformation of the structure.[19]

[19] SCHWENGLER 2019

5. CONSERVATION CONCEPT

The focus is the conservation of the building. Therefore, all the work is linked to a minimum of loss of substance. Main goal is to conserve the building in its current shape. This will be realized within three campaigns in the next three years (2019 – 2021):

2019: Exploration, Static Stabilization and Restoration of most critical parts

2021: Restoration, with the focus of the historical surfaces inside the baths and the Miqvot-level

2022: Touristic Exploitation and protective measures for the Miqvot site

6. RESULTS OF FIRST RESTORATION CAMPAIGN 2019

6.1. Stabilization, May 2019

The vaults of the Miqvot have shown loss of material and cavities behind the masonry (northwestern Miqveh) as well as damaged masonry and mortar (southeastern Miqveh). The stabilization (10th-15th May) has served stable parts of the vaults.

Northwestern Miqveh (left):

Planned measure:

Closing the masonry of the vault in accordance to the existing shape with similar materials and fill the cavity above the vault (Figure 22 - Figure 25).

Result:

After taking out loose material, the non-visible joints have been refilled with mortar. The mixture of the formulation is:

- 1 part hydraulic lime (NHL 3,5);
- 3 parts fine crushed limestone

Figure 21: Orthoplan: frontal wall northwestern Miqveh before measure (plan: E. Thierry)

The big and shapeless stones in the area of the hole in the vault, that take part of the stability, have been cut back for 10 centimeters (Figure 22). Afterwards, faced brickwork of approximately 8 - 9 centimeters thickness have been bricked up to close the vault's masonry. Between old structure and new stones mortar has been backfilled to create a contact bridge. Old and new stones are superimposed and the used mortar is not visible from the outside in accordance to the existing structure of the vault. Furthermore, there has been built up a bearing by putting the new stones 20 to 25 centimeters behind the frontal wall's new stones. Also there, stones have been bricked up to close the hole. In this area, mortar has been used in the visible parts in accordance to the existing shape.

The last stone in the highest point of the vault has been positioned without filling mortar and cut in a stepped shape to finally tilt it in between the stones around (Figure 23). Therefore, the stone was removable to guarantee an access to the cavity above for the injection, that has been done in October.

As a result, the vault is reconstructed in its original shape (Figure 24 and Figure 26) and has a structural stability in its entire length.

Figure 22: cut stones of the vault in northwestern Miqveh

Figure 23: last stone in vault cut in a stepped shape in northwestern Miqveh

Figure 24: reconstructed vault in original shape, northwestern Miqveh

Figure 25: reconstructed vault in original shape, northwestern Miqveh (note: mortar in frontal wall not dried)

Dimension of the cavity:

The cavity above the vault has been measured out (Figure 26). It turned out that the earth was very loose and risked to fall. Therefore, a backfilling of the hollow was necessary to put enough pressure on the vault's construction to finalize the guarantee of structural stability.

The hollow had a conical shape. It measured 1,50 meters from the beginning of the masonry up to the highest and tightest point. The width differed from 45 – 55 centimeters and shrunk further upwards. The cavity needed an approximate filling of 0,4 cubic meters.

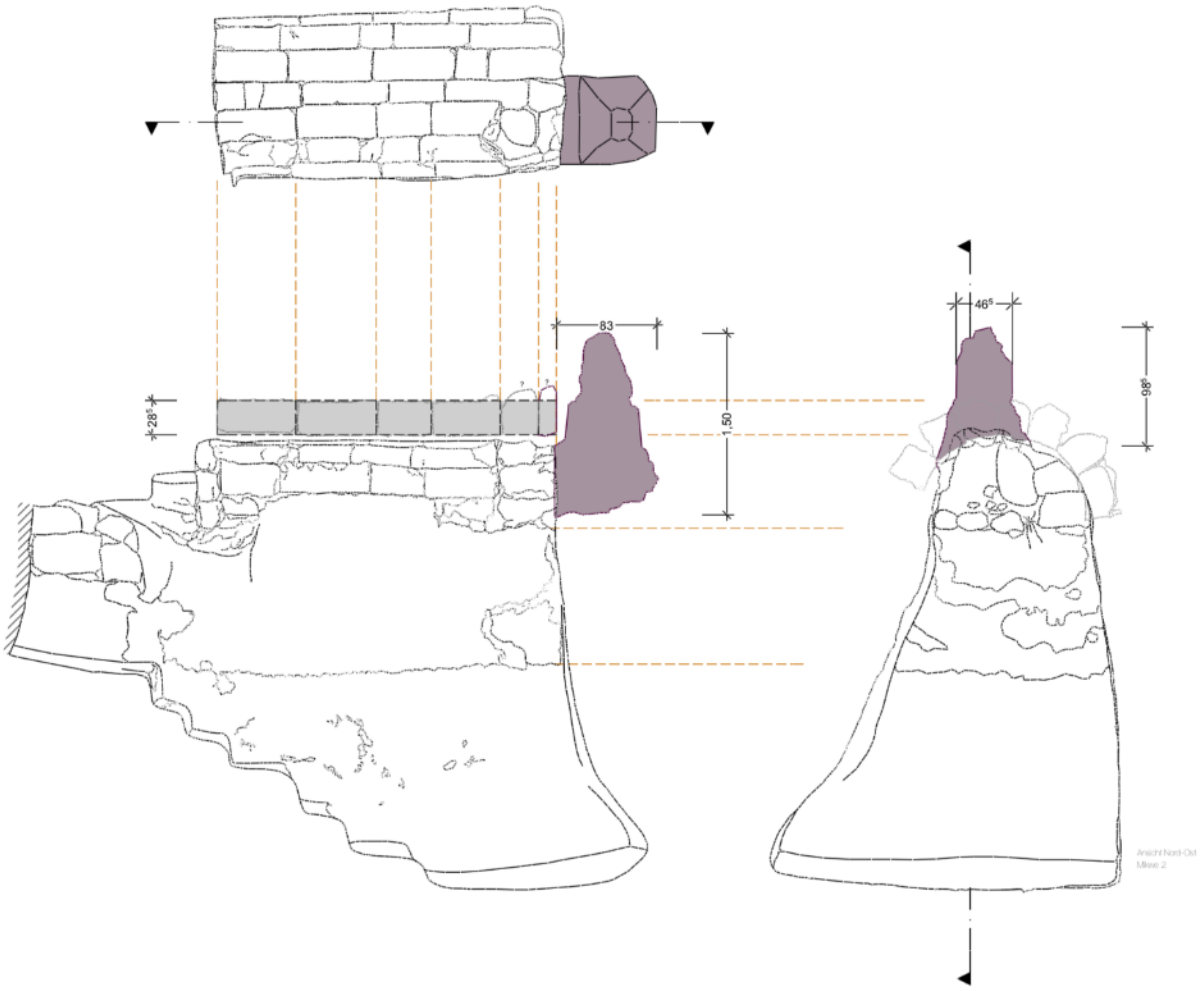


Figure 26: plan of northwestern Miqveh with cavity (note: drawing shows vault before the closing), plan: E. Thierry

6.2. Restoration, October 2019

The main goal of this campaign (01st and 21rd Oct) was the restoration of the building's most important parts. These contain the walls A and D, as well as the northwestern Miqvot vault. The preparation started on 26th September, the working days for the restoration were from 01st until the 21st of October 2019. The measures were conducted by M. Eng. Estelle Thierry.

The restoration has been carried out in accordance to the tested areas that were restored by Theo Schubert in 2018 in agreement with the IAA.

A) Preparation:

After the basic cleaning of the whole building[20], a scaffold has been built up in front of the big cemetery wall (called wall A). The length of the scaffold was 11,0 meters, the height has been bridged with two scaffold levels.

[20] especially the removal of the massive biological growths

Figure 27: Scaffold in front of cemetery wall (wall A), E. Thierry

B) Cleaning:

For wall A four to seven qualified restorers have cleaned the stone surfaces with brushes. For the biological infestations, no herbicides have been used.[21] The cleaning of the joints have been done by scraping out by hand with lancets from dirt and biological growth.

The joints were filled with different mortars (Figure 28).

[21] T. Schubert tested in 2017 different cleaning methods and recommends no use of herbicides because of damage risks.

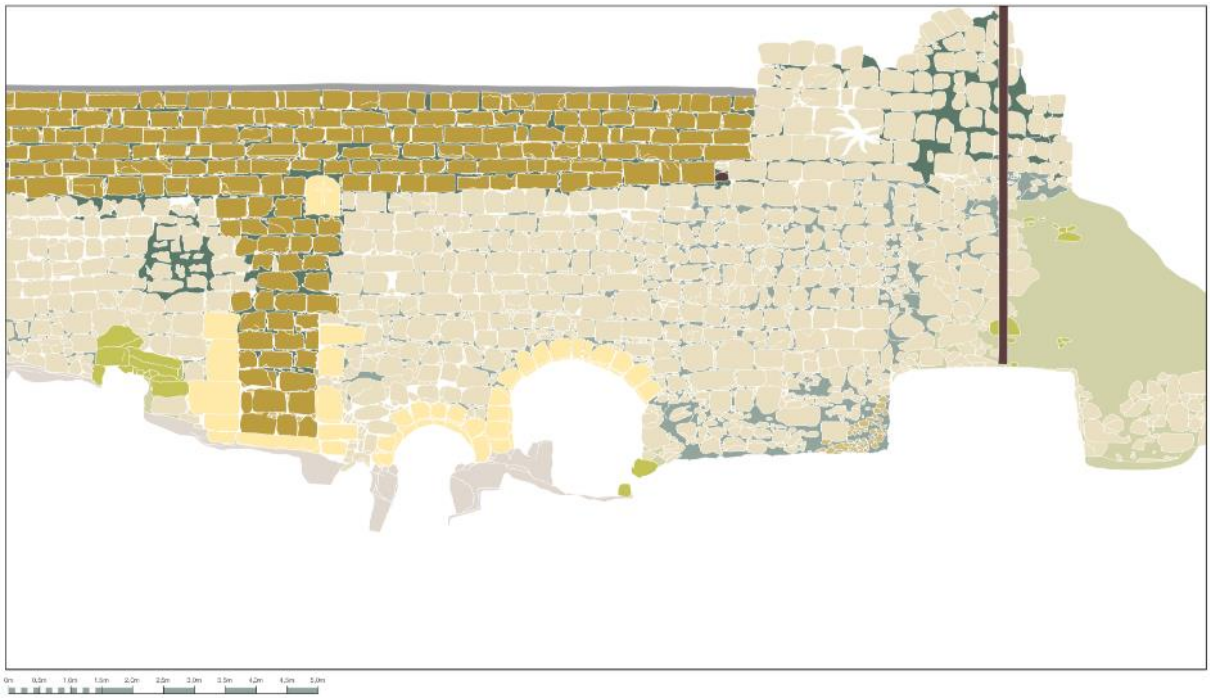


Figure 28: mapping of materials E. Thierry 2016

Cement mortar (most recent)
Lime mortar (original cemetery wall)
Block masonry (most recent)
Quarry masonry (original cemetery wall)
Form stones (ancient stones)

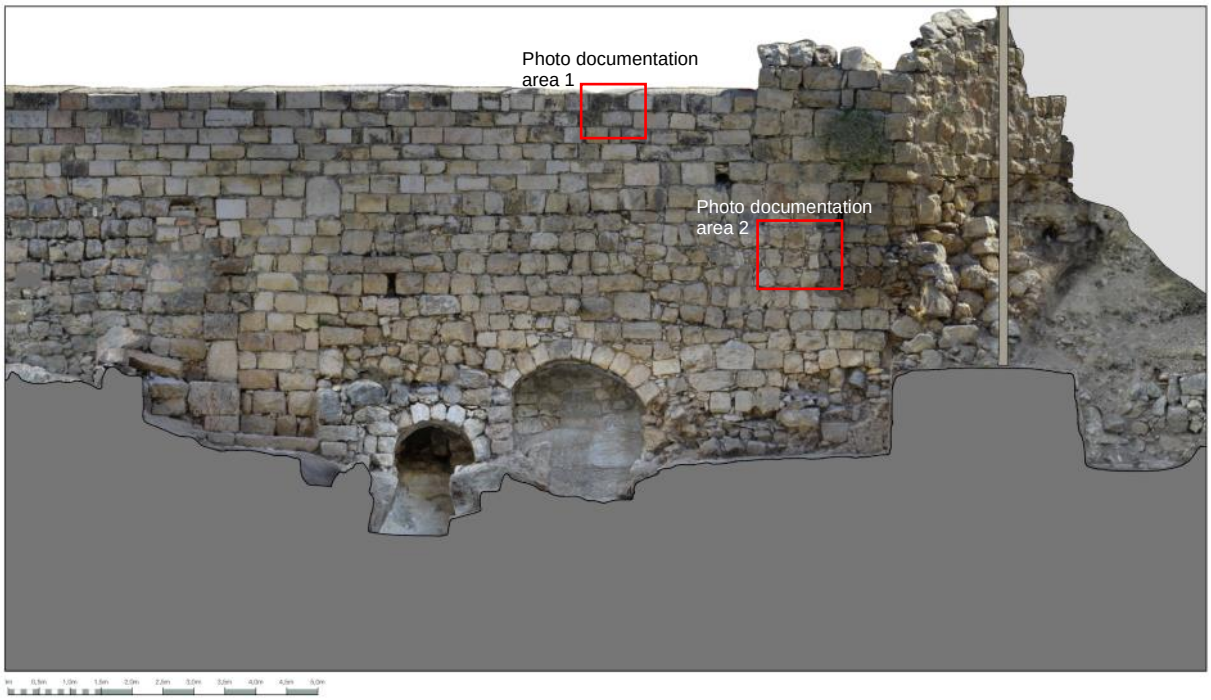


Figure 29: ortho photo, section, view south west on big cemetery wall A, E. Thierry 2016

Cement mortar: The six upper stone layers as well as a vertical stripe of 1,20 m width were filled with cement mortar. There, joint have been scraped out 2-4 cm with steel handles.

Photo documentation area 1:

Figure 30: photo documentation area 1: before measure: joints filled with cement mortar

Figure 31: photo documentation area 1: joints scraped out

Figure 32: photo documentation area 1: joints scraped out, 2-4cm depth

Lime mortar: In the lower part of the wall the filling mortar in the joints contains lime. Loose material, dirt and biological colonization have been scraped out 5-15 cm (in some parts up to 50 cm) with steel handles. Stable lime mortar has been left in the joints and afterwards refilled with same material (mixture listed below). Besides plants, there have also been identified snails in the joints.

Photo documentation area 2:

Figure 33: photo documentation area 2: before measure: joint filled with lime mortar, small stones, dirt, loose material, snails and biological colonization

Figure 34: photo documentation area 2: joints scraped out

Figure 35: photo documentation area 2: joints scraped out, 15cm depth

Figure 36: photo documentation area 2: joints scraped out, 5cm depth

C) Refilling with non-visible mortar:

After the cleaning, broken and missing stones have been replaced and joints refilled manually[22] with mortar. The non-visible mortar has only been used for the refilling of the lime mortar joints (light green and beige in Figure 28).

The mixture of the formulation:

- 1 part hydraulic lime (NHL 3,5);
- 3,5 parts fine crushed limestone (< 2mm)

Photo documentation area 2:

Figure 37: photo documentation area 2: refilling with non-visible mortar

D) Refilling with visible mortar:

The visible jointing mortar, is a mixture with dried and hand sieved soil from the cemetery plot in accordance to the existing shape:

- 1 part hydraulic lime (NHL 3,5);
- 2 parts soil (< 2mm);
- 1,5 parts fine crushed limestone (< 2mm)

[22] The filling has been done with mortar seals.

The refilling of the joint with the finishing mortar (depth 2-4cm) have been done in a manual procedure and at last smoothed with a fine brush. In the five upper stone layers the joints have been filled up only with the visible mortar because the structure was identified as stable (cement mortar).

Photo documentation area 1:

Figure 38: photo documentation area 1: refilling with visible mortar before final smoothing

Figure 39: photo documentation area 1: refilling with visible mortar after final smoothing

Photo documentation area 2:

Figure 40: photo documentation area 2: before measure: joint filled with lime mortar, small stones, dirt, loose material, snails and biological colonization

Figure 41: photo documentation area 2: final result: refilling with visible mortar after final smoothing

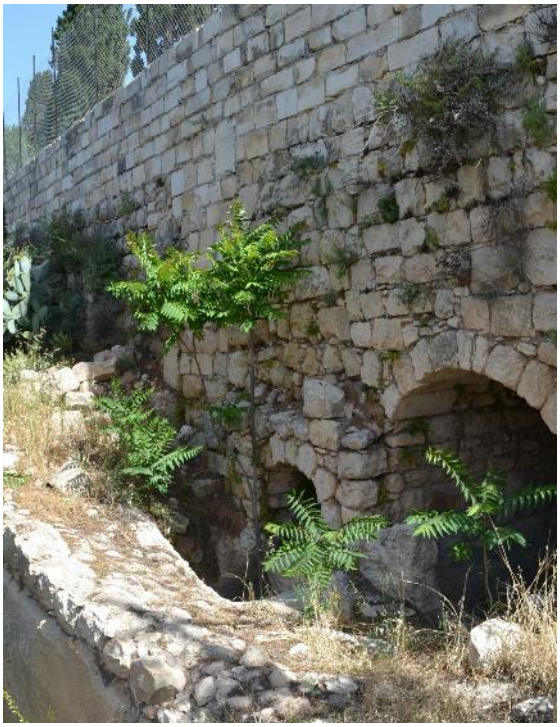


Figure 42: Big cemetery wall A before measure 2016

Figure 43: Big cemetery wall A, final result 2019

Figure 44: photo documentation area 1: before

Figure 45: photo documentation area 1: final result

Figure 46: photo documentation area 2: before

Figure 47: photo documentation area 2: final result

6.2.1. Stabilization of Wall D

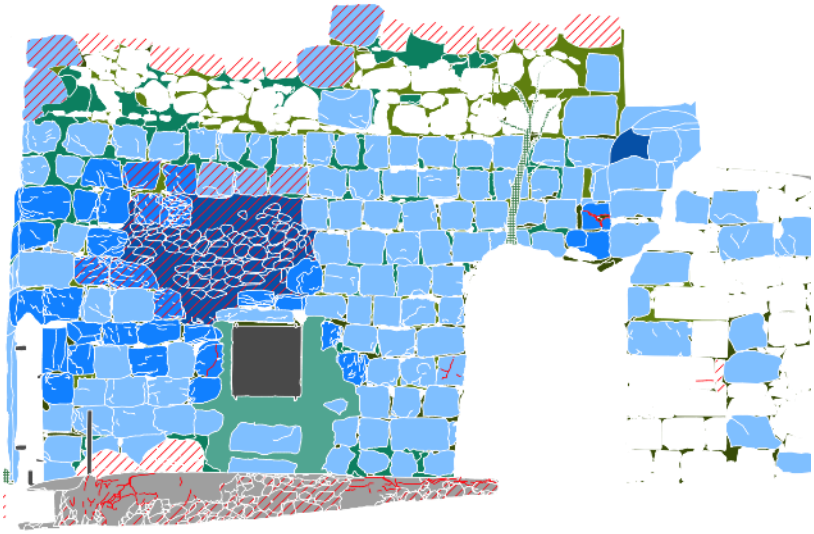


Figure 48: mapping of damage degree (E. Thierry, 2017)

The big missing part in the southeastern front view of wall D caused a risk of crack and deformation (dark blue in Figure 48). Metal installations like screws and covers corrode and damage the material around. The missing part risked to weaken and deform the wall further.

Therefore, closing the missing parts with stones was necessary. Two qualified masons cut stones in the shape of the stones as in the wall. After cleaning and scraping out the loose material, they filled the wall with lime mortar to afterwards close the hole and masonry. The result is shown below:

Figure 49 ortho photo, section, view south west on wall D, before measure (big missing part), E. Thierry 2016

Figure 50: southeastern front of wall D after closing the big missing part, Oct. 2019

6.2.2. Restoration of the northwestern Miqvot vault

Furthermore, the vault of the northwestern Miqveh has been stabilized. The loose keystone was carefully removed. Then the approximately 1.5m deep hole was filled by hand with a mixture of lime mortar and quarry stones. After the hole behind the vault was filled, a small vault of masonry and lime mortar was built over the access hole. Before the keystone was reinstated, the vault was filled with lime mortar. Then the keystone was set into place. The stone was stabilized with a support until the mortar was dry. Finally, the mortar joints of the underside were filled to stabilize the vault completely.

Figure 51: manually filling the hole with lime mortar, 2019

Figure 52: the mortar filled hole, before setting the keystone

Figure 53: Final restored vault of northwestern Miqveh, 2019

7. RESULTS OF SECOND RESTORATION CAMPAIGN 2021

7.1. Restoration and stabilization of the big cemetery wall (Wall A)

The campaign in 2021 included the stabilization of the big cemetery wall in the bottom parts. Therefore, the floor tiles and soil layers had to be removed up until a stable foundation level. After digging up to -80cm, a rock hewn structure had been discovered, where a new masonry could be constructed on.[23] The discoveries found in part are described in chapter 7.9.1.

Figure 54: bottom part of big cemetery wall before measures in 2016

Figure 55: bottom part of big cemetery wall after measures in 2021

Figure 56: entrances to the Miqvot before measures in 2016

Figure 57: entrances to the Miqvot after measures in 2021

[23] The work was conducted in agreement with the GPIA and the IAA.

7.2. Restoration and stabilization of all other walls

On base of the first restoration campaign, the measures included the restoration of walls B and D as well as the ground and the restoration of the plasters in the baths. All masonry has been restored as described in chapter 6.2.

Figure 58: Wall B before measures in 2016: biological colonization, loose mortar and unstable structure, 2016

Figure 59: Wall B after measures in 2021: new mortar fillings make the wall stable and prevent new biological colonization; mural crown rebuilt for better waterdischarge

Figure 60: wall D before measures, 2016

Figure 61: wall D after stabilization measures (2019) and mortar refilling (2021), E. Thierry

7.3. Restoration of plasters in the Miqvot baths[24]

The Miqvot themselves, have been cleaned from dirt and biological infestations and have been desalted. Hollows and missing parts of the wall's mortar have been refilled in some parts.[25] The condition of the plaster in both Miqvots made it necessary to perform emergency treatments. The steps will be explained in the following text.

7.3.1. Cleaning & removal of plants

The Miqvot were first of all cleaned from foliage, soil and waste with hand sweeps. The plants, growing between plaster and stone and in between the stones were removed to prevent further damage of the plaster. Plants which couldn't be removed were cut open poisoned to prevent them from further growing.

Figure 62: Before cleaning

Figure 63: After cleaning and removal of growing plants

[24] The conservation measures have been carried out by Nora Hauptvogel, Mural Restorer, 2021. The documentation for the conservation of the plasters in the baths was written by her.
[25] All the mentioned measures will be done in accordance to the existing shape and as restored in tested areas by T. Schubert in 2018 in agreement with the IAA. Detailed information will be given with the Application for the second campaign.

7.3.2. Removal of salt efflorescence

White salt efflorescence was partially visible on the plaster. Some areas of the plaster are crumbling and / or flaking off due to the repeated salt crystallizations. The visible salt efflorescence was brushed off dry with a brush. Afterwards, the plasters were cleaned wet with distilled water and a brush.

Figure 64: Before removal of salt efflorescence

Figure 65: After removal of salt efflorescence

In some areas are white vails of salt, which couldn't be removed so easily. Therefore, tests were carried out by putting compresses based on cellulose flakes. The tests showed that prolonged exposure to moisture eventually loosened the salt veils. Afterwards they were subsequently removed.

Figure 66: Veils of salt before treatment with a compress

Figure 67: Veils of salt after treatment with a compress

7.3.3. Consolidation

The salt efflorescence caused in many areas attrition of the plaster. To renew the strength of the plaster it was necessary to treat those areas with consolidation material. For this purpose, diluted Ludox PX30 (silica sol diluted in distilled water) was injected in the crumbling areas. Especially the grey osmanic plaster was very unsteady and needed consolidation.

Figure 68: Decay caused by salt before consolidation

Figure 69: After removal of salt and consolidation

7.3.4. Removal of biological growth

Samples were carried out to remove the biological growth on the plaster. A mixture of distilled water and alcohol (95%) was used to clean off the biological growth by means of brushes.

Figure 70: Biological growth on the plaster

Figure 71: Sample of removed biological growth

7.3.5. Injections of hollow plaster

Wide areas of the plaster were hollow. As part of the emergency safety measures, there was only taken care of the open gaps in the plaster. They were not closed until after the cavities had been cleaned and backfilled with a lime based injection mortar:
1 part putty lime
2 parts crushed marble stone (< 0,5 mm)
prepared in 1% cellulose in distilled water.
With this measure all hollow areas have been refilled and stabilized.

Figure 72: Previous condition of loose and hollow pieces of plaster

Figure 73: Condition after injections (white material) and partial pointing (orange mortar)

7.3.6. Consolidation of loose parts of plaster & reapplication of lost plaster pieces

Loose pieces of plaster could be preserved. The main reason for loss of adhesion are plants which grow behind the plaster. Other pieces of plaster were fallen off due to lack of preservation works. The fragments of plaster, which had to be consolidated had to be cleaned of dirt and could be reapplicated by use of injection mortar and pointing mortar.

Figure 74: Loose pieces of plaster which are removed to clean the underground

Figure 75: Reapplicated pieces of plaster

Figure 76: Pieces of plaster which fell off

Figure 77: After reapplication of pieces of plaster

7.3.7. Pointing & Repairing

Theo Schubert experimented in his scientific work[26] in 2018 with repair and pointing mortars for the ancient plaster. His repair mortar is based on natural hydraulic lime as binder and very stable when it's used on the stairs. On the walls, on the other hand, the repair samples have partially lost their adhesion and the adjacent areas also show damage from salt crystallization. The repairs, based on NHL, are probably too dense and hard for salts from the ancient plaster to penetrate them, allowing the salts to crystallize behind them and keep damaging the ancient plaster. Therefore, the decision was made to make a softer mortar based on lime for the repairs and pointing on the wall plasters. The mortar is intended to act like a permanent compress that can absorb the salts from the plaster and thus reduce further damage to the ancient plaster. Those repairing will decay due to the salt and will have to be renewed.

[26] SCHUBERT (2018), Chapter 12

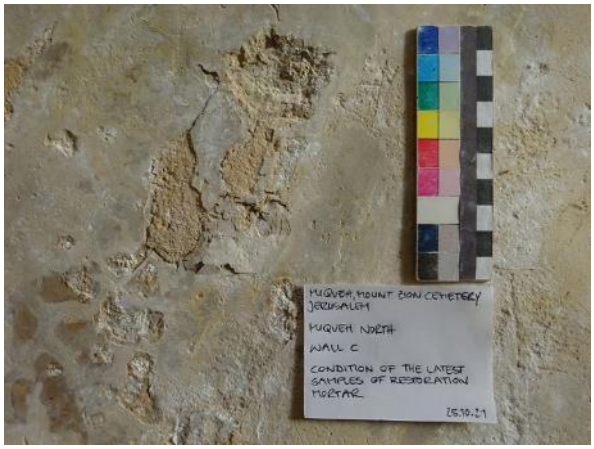


Figure 78: Sample of one of Schuberts repair samples: the repairing lost adhesion and the surrounding has been damaged by salt crystilization

Figure 79: Picture of the new lime based pointing material

The decision was made to modify the recipes for the different kind of plasters, to make the colors match and to avoid too much of distraction of the optical appearance of the ancient plasters.

Figure 80: before measure

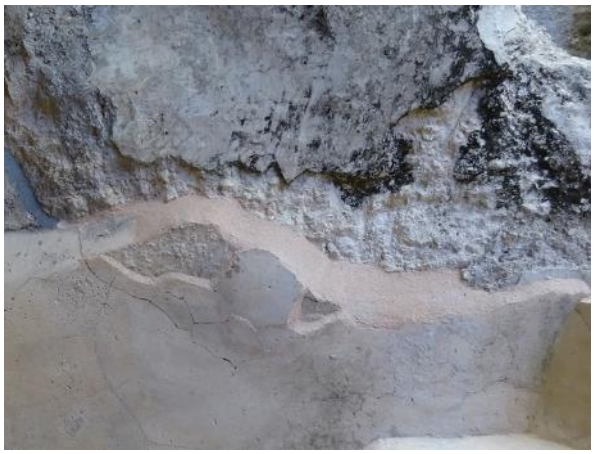


Figure 81: after measure

An orange plaster material, based on lime and clay, was prepared for the orange plaster (Figure 81):

0,5 part putty lime
+ 1 part crushed ceramics (< 0,5 mm)
+ 1 part soil (< 0,5 mm)
+ 3 parts crushed lime stone (< 0,5 mm)
Distilled water

Figure 82: southeastern Miqveh before

Figure 83: southeastern Miqveh after

A beige plaster material, based on lime and clay, was prepared for the first century plaster (Figure 83):

0,5 part putty lime
+ 1 part crushed lime stone (< 0,5 mm)
+ 2 parts soil (< 0,5 mm)
+ 4 parts crushed marble stone (< 0,5 mm)
Distilled water

Figure 84: southeastern Miqveh before

Figure 85: southeastern Miqveh after

A grey plaster material, based on lime, was prepared for the osmanic plaster (still wet on Figure 85):
0,5 part putty lime
+ 1 part crushed lime stone (< 0,5 mm)
+ 1 part crushed marble stone (< 0,5 mm)

+ 2 parts ash

Distilled water

Some of the missing areas in the ancient plaster were repaired with mortar when it was necessary to stabilize the edges of the plaster and / or in areas with a lot of visible salt efflorescence.

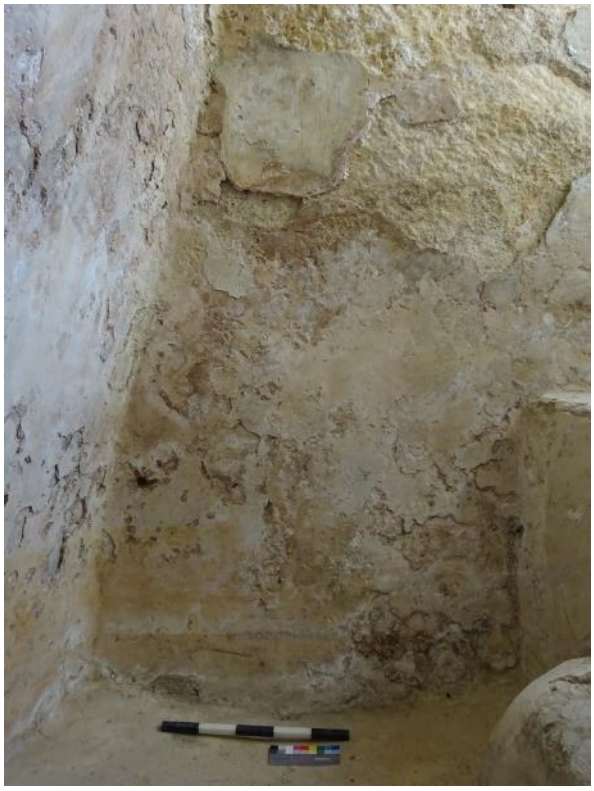


Figure 86: Condition before removal of salt efflorescence and repairing

Figure 87: Condition after removal of salt efflorescence and

The plaster of the steps have large voids. During the restoration campaign, only emergency stabilizations could be carried out. Two types of repair mortar were used for this purpose: a gray mortar, similar to the base layer, for deep voids in the base plaster and an orange mortar for the pointing of the orange plaster. The aim of the emergency repairs was to promote water drainage and to secure endangered areas of the plaster. The measures are temporary until the restoration work can be continued.

Figure 88: Condition of the stairs after dry cleaning

Figure 89: Condition of the stairs after the removal of

A grey repairing mortar was used for the course layer of the plaster (still wet on the picture):

1 part NHL 3,5
1 crushed lime stone (< 0,5 mm)
1 part small stones
2 parts ash
Distilled water

An orange repair mortar, based on NHL, was used as it was developed by Theo Schubert[27] (still wet on the picture):

1 part NHL 3,5
1 part crushed ceramic (< 0,5 mm)
1 part soil (< 0,5 mm)
3 parts crushed lime stone (< 0,5 mm)
Distilled water

[27] SCHUBERT (2018), Chapter 12.2

7.4. Restoration and stabilization of the vault of the southeastern Miqveh

The loose mortar in the ceiling of this Miqveh has been removed gently step by step. It came out, that the stones of the vault's construction have a conic shape. The stones are stably connected with each other. Therefore, a structural stability in the whole vault is given. After scratching out and cleaning the joints from 15 up to 30 centimeters, the refilling has been executed with similar material in accordance to the current ceiling construction. Because of the moisture in the baths especially during the winter months, the formulation of the mortar includes hydrated lime. This lime is especially suitable because of the water permeability; it doesn't block incoming moisture from above the vault but gives space to evaporate after entering and keeps structural stability at the same time. The concrete on the surface, originated from former repair measures and displaying marks from the formwork, remain unaffected. This work has been done by professional stone mason in consultancy with an engineer.

Figure 90: vault after scratching, E. Thierry, 2021

Figure 91: complete restored vault including back wall, 2021

Figure 92: vault before measures, 2016

Figure 93: vault after measures: refilled joints in whole length, 2021

7.5. Ground stabilization

The natural stone tiles have been removed, the area cleaned and analyzed concerning the stability underneath. One unstable spot has been identified and as a result overlapped with a stone, that has a conic shape on two sides and which is tilt between two bearings to give full structural stability.

Figure 94: floor on Miqvot level before measures, 2016

Figure 95: uncovered structure: architravs building the ground structure on Miqvot level, 2021

Figure 96: stone with conic shape beared on the rock so strucutral stability is ensured, 2021

Figure 97: stone tiles in mortar bed; right side: filling non-visible mortar, left side: visible joint mortar, 2021

The stones have been tiled back on the ground with hydraulic lime mortar[28], so the floor builds a stable structure to walk on. Furthermore, the ground has been rebuilt with a gradient to control the water inflow towards the hole to the cistern. All uneven parts of the ground have been covered and rebuilt as a stable and even structure[29] to ensure the stability and decrease the risk of stumbling for future visitors. The mortar has been mixed in accordance to the formulation of the other restored parts, whereas the bedding mortar was mixed as a lean mortar:

Bedding mortar:

- 1 part hydraulic lime (NHL 3,5);
- 6 parts fine crushed limestone (< 2mm)

The **visible joint mortar** was mixed in accordance to the other wall surfaces:

- 1 part hydraulic lime (NHL 3,5);
- 2 parts soil (< 2mm);
- 1,5 parts fine crushed limestone (< 2mm)

[28] Hydraulic lime mortar has been used for the stone tiles. They have been built between 1865 and 1970.

Figure 98: stone tiles before measures, 2016

Figure 99: rebuilt stone tiles with stable underground in mortar bed, 2021

Figure 100: floor and wall C on Miqvot level before measures, 2016

Figure 101: restored floor tiles and wall C after measures, 2021

Figure 102: hole in floor above cistern, unsure structural stability, 2016

Figure 103: hole in floor above cistern, structural stability ensured after construction measures and retiled floor, 2021

7.6. Closing of the second access

To guarantee the access from the cemetery level up to the Miqvot-level and to prevent the entry threw the beaten access or paths on the upper level, the second has been closed in accordance to the existing shape of wall C.

Figure 104: access before measures, 2016

Figure 105: closed access in accordance to the masonry in wall C after measures, 2021

7.7. Conservation of plasters

The discovered plasters described in chapter 7.9.5 near the hole leading to the cistern on Miqvot level has been restored. For protective reasons, the identified plaster has been pointed with a beige lime earth plaster.

7.7.1. Fragment A:

A fragment of plaster was found on the floor of the upper plateau, in front of the stairs. The plaster consists of two layers: the bottom layer is a beige/grey plaster with pieces of ceramic split. The upper layer of plaster is very bright and the surface has been smoothed.

Conservation treatment

Before the execution of the new floor, it was necessary to preserve the fragment of plaster. The fragment has been in the ground for ages and to preserve it furthermore, the decision was made to cover it again with soil thus to restore it to its previous condition. The materials used to stabilize the plaster, before covering it with soil again, were made of the same soil, it was covered with in first place. The plaster was dry cleaned with a brush and afterwards were the edges stabilized with clay mortar. The cracks were filled with injection mortar based on clay and afterwards closed with the same clay mortar. In the end, the surface of the entire fragment was covered with clay plaster. The clay mortar is an entirely reversible treatment, but protects the fragment of plaster while building the new floor.

Figure 106: Detail of the fragment of plaster with its two layers: 01 course layer, 02 upper layer

Figure 107: Previous picture of the piece of plaster

Figure 108: Condition after injections and pointing

Figure 109: Condition after covering the fragment with clay plaster

7.7.2. Fragment B:

The plaster looks similar to “fragment A”. Different to fragment A it will remain exposed to the weather. Therefore a pointing was executed to stabilize the edges of the plaster and to prevent water or dirt from crawling behind the plaster. For the pointing was the same lime/clay based mortar used, which was develop to do the pointing of the first century plaster in the Miqveh.

Figure 110: plaster before measures

Figure 111: plaster after conservation

7.8. Prevention of water inflow and protective rain tarp

A permanent roof has been classified as unnecessary, because the inflow of rainwater can not be avoided relevantly. Besides that, a roof would disturb the architectural view of the building. Instead, a flexible horizontal coverage just in front of the baths entrances with waterproof material has been installed for the duration of the winter months. The tarp is removable and has been installed with a minimum of damage in the original substance of the walls.

Figure 112: protective rain tarp, 2021

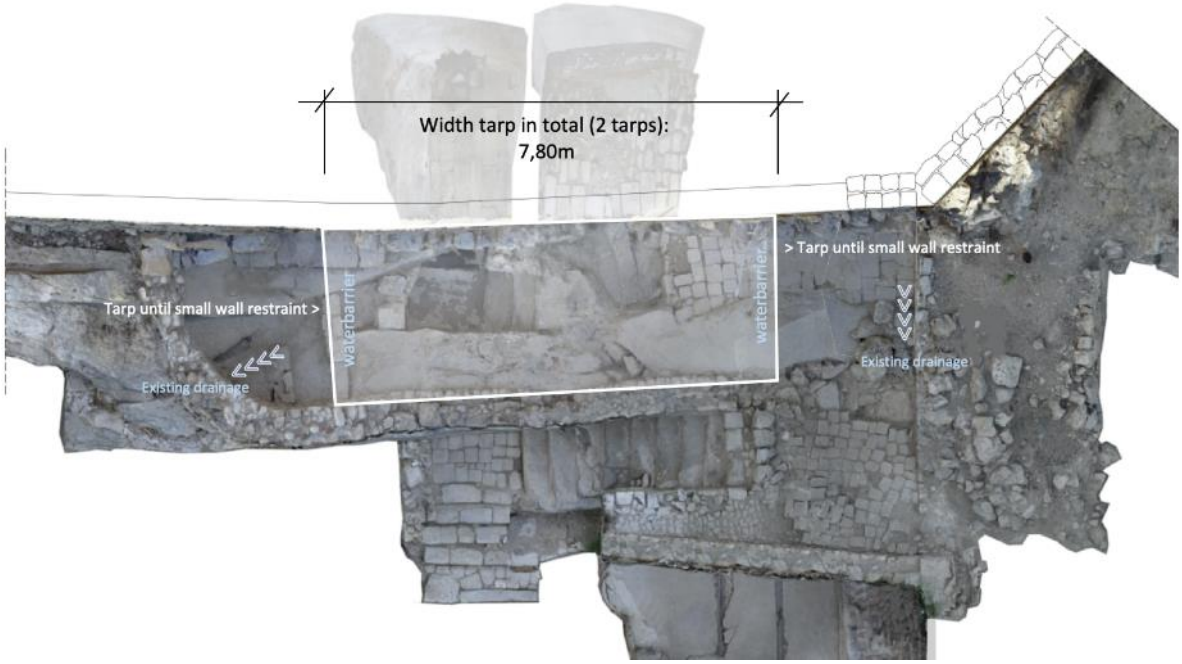


Figure 113: concept for rain tarp in front of baths entrances, E. Thierry 2021

7.9. New discoveries

7.9.1. Original rock hewn ground floor

In the southeastern front of the cemetery wall the floor tiles and substructure has been removed to gain access to the bottom parts of the wall. Therefore, soil has been removed up to -80cm, until a rock hewn structure has been discovered. There have been found traces of ancient mason tools as well as a rock hewn channel, a drainage towards the cistern and a basin overflow. Because of the traces of the mason tools, there is a presumption that the discovered structure belongs to the most ancient parts of the Miqvot complex. The complete explanation of the traces is summarized in an attachment to the report in german language.[30]

Figure 114: rock hewn structure, in some parts covered with soil and tiles (before measures)

Figure 115: direction of rock hewing according to the stone mason traces, 2021

[30] "Steinmetzmässige Bearbeitungsspuren an der Doppelmikweh am Zionsberg in Jerusalem", written by Andreas Mann, stone mason and Lukas Ritter, stone mason master, 2021

7.9.2. Rock hewn water channels

Besides the known rock hewn water channels, there have been discovered more of them:

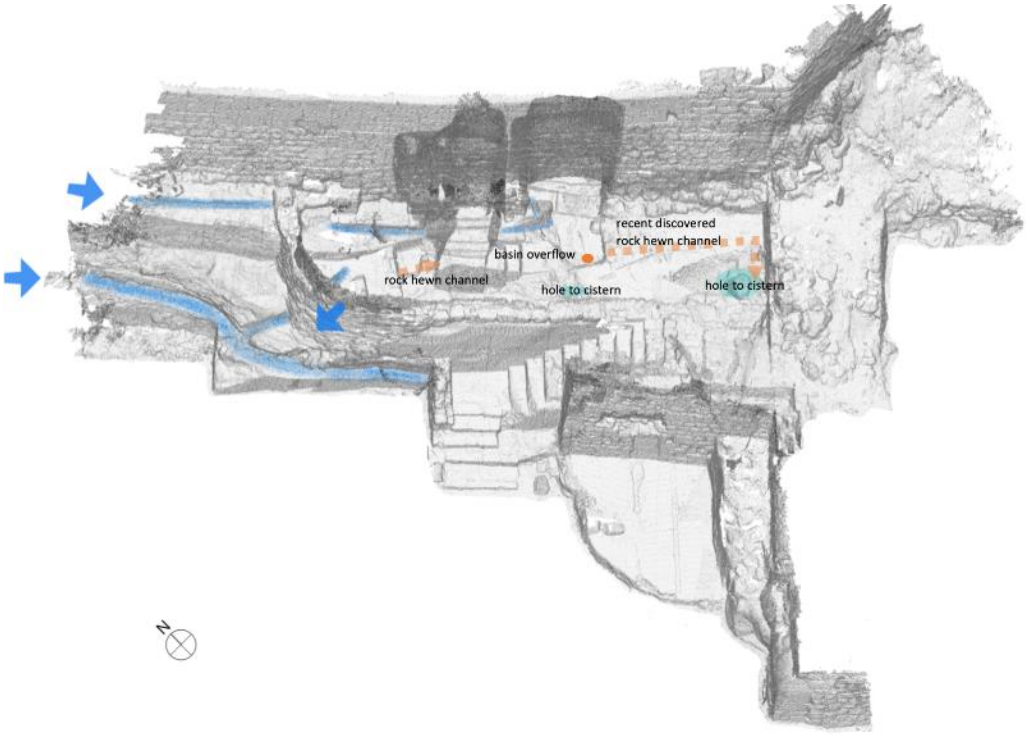


Figure 116: water channels on site; orange: discovered rock hewn channels and basin overflow, E. Thierry 2021

Figure 117: rock hewn water channel guiding from southeastern Miqveh towards the hole (east) to the cistern underneath

Figure 118: rock hewn water channel guiding from west towards northwestern Miqveh

7.9.3. Architravs above cistern

The floor tiles have been removed to uncover the structure underneath it and to analyze the ground stability for future visitors. The rock hewn structure in the cistern is shaped kind of like a vaulted chamber with a hole in the top parts, where several crossbeams or architravs have been installed, to build a stable top cover. Regarding the structure, there is an assumption that the architravs are parts of the most ancient structure of the complex.

7.9.4. Basin overflow

As described in chapter 7.9.2, a basin overflow has been discovered in front of the southeastern Miqveh. The pipe is not functioning anymore. Traces of lime mortar were found. There is a presumption that the basin overflow ends in the cistern below.

Figure 119: possible basin overflow with lime mortar, Thierry 2021

7.9.5. lime plasters

In several parts, a very fine and bright lime plaster has been discovered. Near the hole in the ground floor (east side of the complex), which leads to the cistern, new parts of a thick layer of plaster has been uncovered. Underneath the fine white lime plaster, there was also found a grey lime plaster with chalk additives. The same grey plaster has been discovered in the Miqvot baths, identified as “Ottoman plaster”.[31] Maybe these plasters are the remain of a cupola that covered the hole in the ground.

„Ottoman plaster“:
- grey lime plaster with ceramic puzzolans, crushed lime stone and carbonized and non-carbonized plant fragments
- higher part of amorphous silicatphase
- has been added after ancient plaster
- discovered also on wall D
- often in connection with grey sludge

[31] In the scientific work of Theo Schubert in 2018, there has been identified an “ottoman plaster”. There are several parts with the same plaster (Miqvot baths and visible mortar in wall D)

Figure 120: discovered plasters near hole above cistern; bottom plaster: grey lime plaster with chulk, top plaster: fine lime plaster, 2021

Figure 121: uncovered fine lime plaster under stone tiles on Miqvot-level, 2021

More of the same plaster (fine white lime plaster) was found underneath the stone tiles, covering the architravs. Before rebuilding the ground structure and applying the tiles, the remains of that plaster have been conserved and covered with a Japanese paper[32], so there is no substance loss in case the tiles are being removed again.
In the basin overflow traces of the same plaster (fine white lime plaster) has been discovered (see chapter 7.9.4).

[32] Japanese paper is used in the mural conservation to protect vulnerable plasters and other. It is made from vegetable Kozo fibres and is also called “Kozo paper”. Exact product name: Hiromi Japan Papier - Tengucho Caustic Soda 3 g, handgefertigt (Rolle)

8. MEASURES IN THIRD RESTORATION CAMPAIGN 2022

Some parts were still in need of restoration. Therefore, there has been a continuation of small restoration works in 2022, as well as protective measures and installment of information boards.

8.1. Main access (steps, stone tiles & small wall)

The main access guiding from the cemetery level up to the Miqvot-level has been restored. The tiles were removed; a leveling bed of 15 cm with rammed earth has been applied. Afterwards a mortar bed has been placed:

Bedding mortar:

- 1 part hydraulic lime (NHL 3,5);
- 4 parts fine crushed limestone (< 2mm)

The **visible joint mortar** was mixed in accordance to the other wall surfaces:

- 1 part hydraulic lime (NHL 3,5);
- 2 parts soil (< 2mm);
- 1,5 parts fine crushed limestone (< 2mm)

Figure 122: Staircase after cleaning before measures (2022)

Figure 123: Staircase after restoration (2022)

8.2. Restoration of wall C

The northwestern façade of wall C has been restored in accordance to the other walls.

Figure 124: wall C after cleaning but before restoration measures in 2016

Figure 125: wall C after all measures in 2022

8.3. Protective measures for cistern (coverages)

The access to the cistern in wall D was covered with a provisory board to prevent access inside it. In 2022 a permanent window with metal grids and a lock has been placed so the entrance is permanently protected. Also, there was installed a protection above the hole on the ground floor above the cistern.

Figure 126: access to cistern with provisory coverage, 2021

Figure 127: hole to cistern on Miqvot-level protected with a big stone above, 2021

Figure 128: access to cistern in wall D with sustainable long term coverage, 2022

Figure 129: hole to cistern in Miqvot-level with a sustainable long term coverage, 2022

8.4. Plasters in the baths

The restoration of the ancient plasters started in 2021. Because of the very high damage degree (hollows, salt crusts and big missing parts of different mortars), there has been a continuation of the work in 2022.

Continued salt efflorescence on the walls of both mikvot led to renewed signs of decay on the plaster. The small-scale repairs of the orange plaster from the last campaign had to be mostly renewed already. The repair mortar is intentionally designed to absorb salts from the plasters and decay instead of the historic plaster. The repair mortar must therefore be renewed regularly in order to fulfill its function as a permanent compress.

It was also observed that the biogenic growth had returned and a newly grown plant also had to be removed.

The priority in October 2022 was to restore the steps of both baths. The steps were originally covered with a gray/beige plaster, the so-called first century plaster. This consisted of a very coarse lower plaster and a highly compacted upper plaster. At a later date, this plaster was reworked with a layer of highly compacted orange plaster. Furthermore, there are small partial repairs of voids with the red plaster, which is also partially found on the walls. In 2021, extensive emergency safety measures were already carried out on the steps. In 2022, the filling of the hollow spaces and the securing of small missing fragments was completed.
The undercoat of the first century plaster was partially exposed. This one is relatively soft and at the same time very coarse-grained. Its fragile condition made partial consolidation with silica sol necessary, yet it was not stable enough to leave it exposed. In order to preserve it in situ in the long term, it was provided with a reversible separating layer and plastered over with a soft lime mortar, at the level of the top coat of the first century plaster, thus protecting the flanks of the exposed top coat at the same time. In order to ensure improved water drainage, larger defects in the first century plaster also had to be closed. The fractured edges of the orange plaster were pointed, so that the oldest, underlying plaster remains visible and the flanks of the orange plaster are still supported.

Figure 130: Previous conditon of the steps in miqveh 2, 2021

Figure 131: Condition of the stairs after restoration, 2022

Figure 132: Eposed course layer oft he 1st century plaster

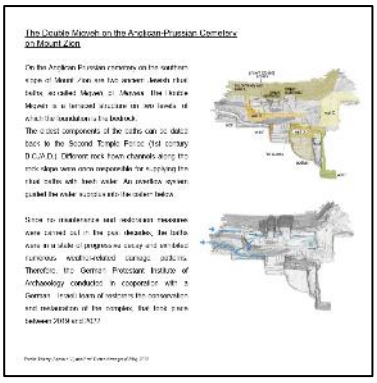
Figure 133: Filled gaps oft he 1st centurs layer by means of a grey repairing mortar and pointing oft he orange mortar

Repairing mortar, based on lime, for the 1st century plaster (Figure 133):
0,5 part putty lime
+ 3 parts crushed marble (> 1 mm)
+ 1 part crushed white lime stone (1 mm)
+ 1 part crushed white lime stone (< 0,5 mm)
+ 3 parts crushed marble (< 0,5 mm)
+ 0,25 part soil (< 0,5 mm)
+ 0,25 part ash (< 0,5 mm)
Distilled water

Pointing material, based on lime and NHL, for the orange plaster (Figure 133):
0,5 part putty lime + about 5% NHL
+ 1 part crushed ceramics (< 0,5 mm)
+ 1 part soil (< 0,5 mm)
+ 3 parts crushed lime stone (< 0,5 mm)
Distilled water

8.5. Information boards for visitors

For future visitors, there will be integrated an information board just right next to the main access in different languages that explains the history of the Miqvot as well as the restoration measures.


The Double Miqveh on the Anglican-Prussian Cemetery on Mount Zion

8.6. Protective measures for guided tours

To prevent further damage by visiting the Miqvot without permission there has been installed a barrier from metal in front of the main access. Also, the access inside the baths is prohibited to preserve the ancient plasters.

Figure 134: concept for metal protections and information board, E. Thierry 2022

9. Summary before measures and after finishing all three campaigns

To gain an overview of the progress that was conducted, the photos below show the state of the complex before measures (2016) and after all restoration and conservation works (2022):

Figure 135: Miqvot overview 2016

Figure 136: Miqvot overview 2022

Figure 137: Miqvot overview 2016

Figure 138: Miqvot overview 2022

Figure 139: view to northeastern miqveh & wall D 2016

Figure 140: view to northeastern miqveh & wall D 2022

Figure 141: Miqvot overview 2016

Figure 142: Miqvot overview 2022

Figure 143: steps on cemetery level 2016

Figure 144: steps on cemetery level 2022

Figure 145: wall B 2016

Figure 146: wall B 2021

Figure 147: entrance to northeastern Miqveh 2016

Figure 148: entrance to northeastern Miqveh 2022

Figure 149: entrance to western miqveh 2016

Figure 150: entrance to western miqveh 2022

Figure 151: view towards steps and wall D 2016

Figure 152: view towards steps and wall D 2022

Figure 153: rock hewn steps towards Miqvot level 2016

Figure 154: rock hewn steps towards Miqvot level 2022

Figure 155: rock hewn steps downwards from Miqvot level 2016

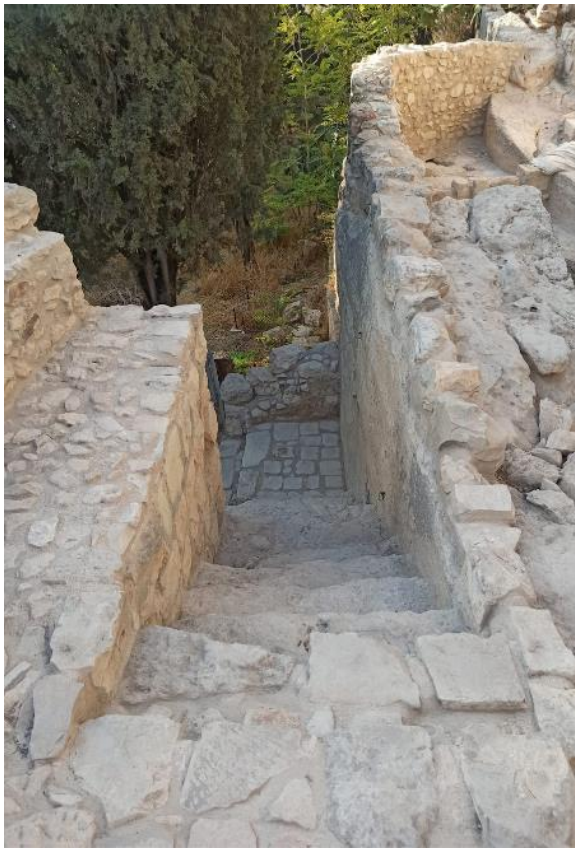


Figure 156: rock hewn steps downwards from Miqvot level 2022

10. Future

To ensure the restored and current state of the Miqvot it is necessary to take care of further topics. Besides the necessity of cleaning the area every year there are further measures to take care of:

10.1. Recommendations for further procedure of plasters in the baths

1. No entering of the Miqvehs (by tourists) due to the preservation of the plaster on the stairs and walls.
2. The Miqvhes should be protected from infiltrating water.
3. Cleaning, removal of growing plants and, if necessary, skimming out of water every year after the rain season/in the spring-time.
4. A repairing mortar needs to be developed to restore the red plaster.

5. The plaster of the two Miqvots contain salts which are harmful to it.[33] In a few areas the plaster was already worn down and was crumbling. The filtration of water and with it the filtration of salts and the mobilization of already existing salts won't be stopped as long as rain enters the Miqvots (especially during the winter time) and as long as moist can leak into the Miqvots from the soil behind them. A closer monitoring of the efflorescence and the damages could show in which areas and to what extent the plasters are endangered by repeated salt crystallization.
6. Dry removal of visible salt efflorescence of the plaster surface every year.
7. Development of a strategy to reduce the salts of plasters on the walls of both baths.
8. Renewal of the repair mortar when it is corroded by salts.
9. Salts are the main cause of damage to the plasters. Even if the infiltration of salts could not be completely prevented, regular salt reduction measures should still be carried out to slow down the decay of the plasters. Controlled treatments with cellulose compresses are suitable for this purpose.
10. In the past was a grey slurry, based on cement, carried out to repair some areas of the plaster. Mainly the osmanic plaster is covered with it. The inflexible slurry is not compatible with the soft osmanic plaster. Tests could be carried out to see if the cement slurry can be removed.

10.2. Further subjects

Water discharge: The possibility of water drainage behind the big cemetery wall A in Greek Garden has to be examined. The current situation shows an uncontrollable inflow of raining water in the ceilings of the Miqvot because of the steep gradient in the Greek Garden in that area. The measure with the least risk of damage would be to add a layer of soil in the lowest point in the Greek garden (above the Miqvot vaults) and to flatten the ground level in that point. In that case, the water would not flow into the deepest point above the Miqvot, but would have a wider field to drain naturally into the ground and evaporate faster. A solution for the water discharge is an indispensable prerequisite to keep the baths in a long-term stability.

Statics: The concrete platform on the cemetery level in front of wall D is after a static analysis classified as unstable and in need of renovation. This area is not under responsibility of the GPIA (instead: cemetery). Static recommendation for a renovation

[33] SCHUBERT (2018), Chapter 7

are described as followed:

variant 1: demolition and rebuild
variant 2: building a new platform above with a self-supporting construction

10.3. Integration of the Miqvot in the archaeological park

The GPIA focusses with its excavations not only on the academic interest of researchers and archaeologists, but on its opening for tourists and a broader public.[34] The aspect of education is one of the fundamental pillars of the institute and therefore plays a very important role in the considerations concerning the future of the site on Mt. Zion: The GPIA plans to create an archaeological park in the Anglican-Prussian Cemetery showing and explaining the city walls and the inner-city settlements (yet to be excavated). In addition to the archaeological finds at the south of the cemetery, the cemetery itself will be included in the archaeological park, too, because it contains not only graves of important archaeologists but also the Miqvot in the northern border. The visitor will not be stopped at the archaeological area, though, but be guided through the cemetery as well. Small hints on created passageways in between the graves will lead him from the archaeological sites, threw the graves to the Miqvot. Also there, signs will serve as teaching elements.

Thus, the visitor of the Protestant cemetery of Jerusalem can experience 3000 years of the history of the city by following the GPIA’s visitors path through the excavation and around the cemetery.

[34] The funding for these plans is already provided. The Deutsches Auswärtiges Amt will support the preservation of the area due to its cultural worth.

5 PERSONALIA

5.1 Academic and Scientific staff of the measures

The archaeologists in charge were Prof. Dieter Vieweger and Jennifer Zimni.

5.2 Conservation

Estelle Thierry M. Eng. Building Preservation, Architect	Scientific research, planning of campaigns and construction management (2019, 2021, 2022)
Christoph Trojok M. Eng. Building Preservation	Project worker (2019, 2021, 2022)
Theo Schubert M.A. Conservator, Stone Mason	Scientific research, project worker (2019)
Alexandra Streich M.A. Conservator	Project worker (2019)
Nora Hauptvogel Dipl. Conservator	Project worker and leader for conservation of plasters in baths (2021, 2022)
Johanna Kaminska M.A. Conservator	Project worker (2019)
Lukas Ritter Stone Mason	Project worker (2021)
Yana Qedem M.A. Conservator	Local project worker (2021, 2022)
Andreas Mann Stone Mason	Project worker (2021)
Ziv Sebban Volunteer	Project worker (2022)
Prof. Dr. Jeannine Meinhardt Conservator	Scientific guidance and project worker (2019)
Katja Schmeikal Dipl. Conservator	Project worker (2019)
Lale von Baudissin B.A. Conservator	Project worker (2021, 2022)
Elisabeth Haar Student of Conservation	Project worker (2022)
Gustav Schulz Mason	Project worker (2019)

5.3 Correspondence with the responsible authorities

Israel Antiquity Authority

contact person: Amit Reem, Evgeny Ivnovsky and Yonathan Tzahor

07th October 2022: Announcement of third restoration campaign 2022

26th October 2022: Visit on sight with Yonathan Tzahor (IAA), Dieter Vieweger (GPIA) and Estelle Thierry + Team

November 2022: Report of Restoration Campaign via Mail

6 FORMALIA

6.1 Dates

Architectural survey: May 2016 – April 2017
Restoration analysis: October 2017 – March 1018
Static analysis: 26th – 28th February 2019
Exploration and Stabilization: 10th – 15th May 2019
1. Restoration campaign: 01st– 21rd October 2019
2. Restoration campaign: 17th October – 25th November 2021
3. Restoration campaign: 16th October – 31st October 2022

6.2 Financial coverage

The GPIA takes care of all the costs concerning the excavation and conservation in the Anglican- Prussian Cemetery. In addition to the own resources of the GPIA third party funds the Auswärtiges Amt covers the costs.

This Report was written by

M. Eng. Estelle Thierry

approved by
Prof. Dr. Dr. Dr. hc. Dieter Vieweger

November 11, 2022

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