



# **POMPEII SUSTAINABLE PRESERVATION PROJECT**

**Documentation of the funerary monuments  
14\_EN and 07\_ES**

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## 1. Documentation of the funerary monument 14\_EN

### 1.1. Introduction

In September 2014 PSPP, started its first preliminary campaign in Pompeii. The necropolis of Porta Nocera including its extension at the west end (sometimes called Fondo Pacifico) should be photographed, materials and damages documented to estimate the risks for the ancient monuments and to evaluate further investigations. It was a collaboration of different conservators, archaeologists, students for conservations and photographers.

After a first impression of the total necropolis of Porta Nocera, two funerary monuments were chosen for a detailed documentation with mappings of all present damages. This detailed documentation should clarify the total amount of necessary emergency investigation to preserve the present state.

### 1.2. Description of the monument 14\_EN

The funerary monument 14\_EN was chosen because it is situated in a row (04\_EN, 06\_EN, 10\_EN and 12\_EN) of rather similar funerary monuments (Figure 1). All five monuments have the similar kind of construction technique (opus incertum and opus testaceum) and materials (lava and brick) with several plaster renders. The orientation of this line of monuments are comparable, the representative and partly more sophisticated designed wall to the road is their south wall. Their erecting dates<sup>1</sup> are in between the Augustan period (ca. 14 BC – 27 AD) and the Julio-Claudian Period (ca. 27 BC / 14 AD – 54 AD). All five monuments have been excavated between 1954 – 1956.<sup>2</sup> Therefore these five monuments have a rather similar “history” together. Observed damages of 14\_EN could also be found similar at the monuments 04\_EN, 06\_EN and 12\_EN.



Figure 1: Funerary Monuments 04\_EN, 06\_EN, 10\_EN and 12\_EN.

<sup>1</sup> D'AMBROSIO ANTONIO, 1983.

<sup>2</sup> ANDRINGA VAN, WILIAM, 2013.

### 1.2.1. Graffiti

The funerary monument 14\_EN has been described by D'AMBROSIO<sup>3</sup>. The documentation of D'AMBROSIO is the starting point of this documentation. Only observed addition should be named here. One of the additions are the ancient graffiti, which are mainly along the base of the south wall. They have been described by DELLA CORTE<sup>4</sup>, but so far only one drawing (Figure 2) of one graffito exists. It shows a fight of two gladiators at position 2 (Figure 112). With the drawing of DELLA CORTE, it is possible to compare the situation of graffiti from 1958 with its present state (November 2014). As Figure 2 and Figure 3 shows only 40% of the incisions are still visible.



Figure 2: Drawing of the graffito at position 2 of DELLA CORTE, 1958, p.152 No. 382. Incisions which are still visible are green marked.

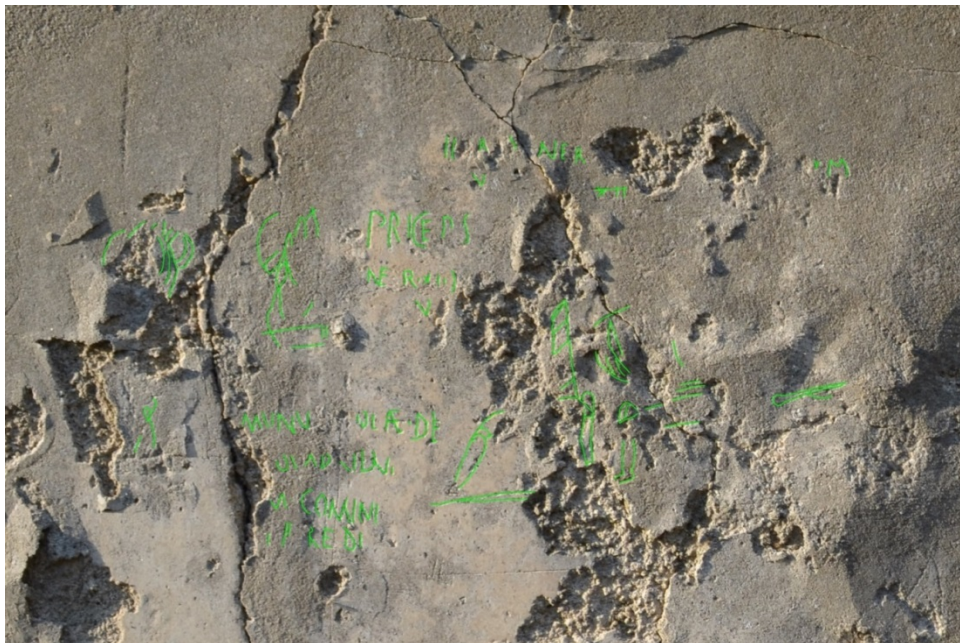


Figure 3: Picture of the graffito at position 2. Green marked are incisions which are still visible.





<sup>3</sup> D'AMBROSIO ANTONIO, 1983.

<sup>4</sup> DELLA CORTE M., 1958, p. 142, No. 337-340, p. 151 No. 380-384.



The other graffiti at the south wall are only described, but not drawn in 1958. It was much harder to find existing pieces of them nowadays. In addition to the already described graffiti at position 2, graffiti could be found at position 1, position 3, position 4 and position 5 (Figure 4). To document the graffiti, pictures were taken and the position marked (Table 1). To see the fine lines of the incisions strong, ranking light was needed. Together with the pictures and in front of the monument, it was possible to redraw the fine lines of incisions (Figure 112 – Figure 115).

Table 1 Listed picture numbers and positions of graffiti.

Position	Picture number	Subsequent treatment
 Position 1	14_EN_S_GRA_DSC_0142	
	14_EN_S_GRA_DSC_3372	14_EN_S_GRA_DSC_3372,drawing
	14_EN_S_GRA_DSC_3373	
	14_EN_S_GRA_DSC_3374	14_EN_S_GRA_DSC_3374_drawing 14_EN_S_GRA_DSC_3374_drawing,map
	14_EN_S_GRA_DSC_6569	
 Position 2 and 3	14_EN_S_GRA_DSC_0138	14_EN_S_GRA_DSC_0138,drawing 14_EN_S_GRA_DSC_0138,drawing,map
	14_EN_S_GRA_DSC_0139	
	14_EN_S_GRA_DSC_0143	
	14_EN_S_GRA_DSC_6443	
	14_EN_S_GRA_DSC_6444	
	14_EN_S_GRA_DSC_0138	14_EN_S_GRA_DSC_0138,drawing 14_EN_S_GRA_DSC_0138,drawing,map
 Position 4	14_EN_S_GRA_DSC_6445	
	14_EN_S_GRA_DSC_0140	14_EN_S_GRA_DSC_0140_drawing 14_EN_S_GRA_DSC_0140_drawing,map
	14_EN_S_GRA_DSC_3375	
	14_EN_S_GRA_DSC_3376	
	14_EN_S_GRA_DSC_6570	
	14_EN_S_GRA_DSC_6571	
 Position 5	14_EN_S_GRA_DSC_0144	
	14_EN_S_GRA_DSC_0141	14_EN_S_GRA_DSC_0141_drawing 14_EN_S_GRA_DSC_0141_drawing,map
	14_EN_S_GRA_DSC_0145	
	14_EN_S_GRA_DSC_3377	
	14_EN_S_GRA_DSC_3378	
	14_EN_S_GRA_DSC_6572	
	14_EN_S_GRA_DSC0005	
	14_EN_S_GRA_DSC0006	

### 1.3. Previous interventions

#### 1.3.1. Reconstructions

The reconstruction of masonry is clear visible even though it imitates the original construction technique of the monument. The condition of the reconstruction material lava and brick is not as eroded as the ancient ones.

Maps Figure 116 – Figure 119 show the amount of reconstruction, which is in average 13,5 % percent of the total amount (Table 2).

Table 2: Listed amount of reconstruction and preserved surfaces.

<b>14_EN</b>					
	<b>14_EN_S</b>	<b>14_EN_N</b>	<b>14_EN_E (estimated)</b>	<b>14_EN_W (estimated)</b>	<b>total</b>
Reconstruction [m <sup>2</sup> ]	1,79 m <sup>2</sup>	3,30 m <sup>2</sup>	1,98 m <sup>2</sup>	1,5 m <sup>2</sup>	<b>8,57 m<sup>2</sup></b>
Reconstruction [%]	Ca. 13 %	Ca. 18 %	Ca. 12 %	Ca. 11 %	<b>Average 13,5%</b>
Total amount of surface [m <sup>2</sup> ]	13,62 m <sup>2</sup>	18,11 m <sup>2</sup>	15,6 m <sup>2</sup>	13,6 m <sup>2</sup>	<b>60,93 m<sup>2</sup></b>
Preserved original plaster Surfaces [m <sup>2</sup> ]	9,75 m <sup>2</sup>	6,8 m <sup>2</sup>	3,3 m <sup>2</sup>	7,9 m <sup>2</sup>	<b>27,75 m<sup>2</sup></b>

#### 1.3.2. Modern roofing's

Funerary monument 14\_EN has no protecting roof. In the map of the whole Necropolis, it is mapped as “modern waterproofing of original structure”.

The reconstruction of masonry gives not only more stabilization to the ancient structure, but is also used to give some kind of water impermeability. On top of the reconstructed masonry, there are different layers of cement, bitumen and “cocciopesto” to give water impermeability (Figure 4). Even though the top of funerary monument was hardly visible, it supposed to have such kind of water impermeability. 14\_EN has also a rain drain visible at the north wall half up the reconstructed wall.

The small distance of monument 14\_EN to the neighboured monument 12\_EN is covered with graphite panels.



Figure 4: “modern waterproofing of original structure” at funerary monument 25\_OS. Visible are layers of cement over an reconstructed masonry. Over the cement a layer of bitum and on top “cocciopesto”.

### 1.3.3. Fillings and protection of edges

Cracks and edges have been protected in former conservation interventions and maintenance work. But new cracks have appeared and some of the fillings and protection of the edges has to be renewed (see conservation master plan).

Two possible different filling materials could be observed at the walls. One, which seemed to be very hard but having a rather good connection to the original surfaces, and the other, which has a very smooth surface, a rather dark gray color and a bad connection to the original surface. The first described filling material is a hard mortar maybe containing cement (Figure 120 – Figure 121). The other described filling mortar could presumably contain plasticizer (Figure 120 – Figure 121). The filling mortar presumably containing plasticizer is very tense and the filling material itself has a lot of fine cracks. The connection to the original material is badly bonded and the filling material scales off. Therefore, most of these fillings have to be renewed.

The same kind of material as described above has been found at the protection of the edges.



Figure 5: filling with hard mortar (cement?).



Figure 6: fillings mortar contains presumably plasticizer.



### 1.3.4. Consolidations

There are some brown and black discolored areas, unequally diversified over the walls of 14\_EN, which could result of former consolidation materials residues.

The brown discoloration was found in missing parts of preparatory layers (Figure 7) and the black discoloration in missing parts of Intonaco (Figure 8).



Figure 7: brown discoloration in missing parts of preparatory layers (red arrow).



Figure 8: black discoloration in missing parts of Intonaco (red arrow).

### 1.4. Mapping of damages

For a better understanding of the amount of damages and the resulting condition of the monument, maps of all four walls of 14\_EN were made (Table 3). Based on these maps, a rough first emergency intervention plan was made.

The walls 14\_EN\_S and 14\_EN\_N were mapped with Metigo Map, a program developed for mappings in conservation work. This program gives a precise amount of the analyzed surfaces, which simplifies an estimation of the damaged area. The walls 14\_EN\_W and 14\_EN\_E could not be mapped with Metigo Map because of technical reasons. These maps were manual mapped. Therefore, the amount of the affected areas is just an estimation done by the executive conservator. These estimated amounts are marked in the maps.

Table 3: List of all carried out maps of 14\_EN. All maps, which were taken into account for the conservation plan are red marked.

Original technique of construction	
graffiti	
Previous Intervention	
reconstruction	
fillings with hard mortar (cement?) / malta cementitia	
fillings, mortar contains presumably plasticizer	
protection of the edges with hard mortar (cement?) / malta cementitia	
protection of the edges, mortar contains presumably plasticizer	
Damages	
Damage of Masonry	
cracks in masonry (attention: no cracks in masonry, therefore no maps!)	X
eroded brick (round flushed out)	X
eroded lava (round flushed out)	X
missing mortar	X

powdering mortar	X
presumably powdering mortar	X
scaling (exfoliating) brick	X
scaling (exfoliating) lava	X
<b>Damages of Plaster</b>	
Cracks staying at the surface	X
Deep Cracks (presumably reaching through all plaster layers)	X
Delamination (detachment) from structure	X
Delamination (detachment) Intonaco from preparatory layers	X
Delamination (detachment) preparatory layers from each other's	X
Intonaco flaking	X
Intonaco powdering	X
Intonaco scaling	X
Preparatory layers flaking	X
Preparatory layers powdering	X
Preparatory layers scaling	X
<b>Collapsing areas</b>	
Loose plaster fragments, collapsing	
Lacunae, collapsing	
Loose stones, brick and architectural elements	
<b>Necessary Conservation actions</b>	
Protection of the edges	X
<b>Biological Overgrowth</b>	
microbiological overgrowth	
mosses	
plants	

## 1.5. Emergency interventions

As emergency interventions and for the maintenance of layers of 14\_EN following interventions are suggested.

- Plaster fragments:

It is important to collect all plaster fragments, which are lying around the monument. This would prevent them from being accidentally smashed under the feeds of visitor and from being totally destroyed by rain and weathering. A later replacement on the original wall could be possible in certain cases.

- Masonry:

Missing mortar (Figure 138 – Figure 141) between the bricks and lava should be refilled (e.g. with lime/sand mortar). The estimated amount is listed at Table 4.

The powdering mortar, eroded brick and eroded lava should be consolidated (e.g. brushing, spraying, Ethyl Silicate).

- Plaster:

The “detached layers from structure”, “detached preparatory layers from each other's” and “detached Intonaco from preparatory layers” (Figure 122 – Figure 129) should be consolidated (e.g. injections of hydraulic mortar).



Flaking and scaling layers (Figure 134 – Figure 137) should be consolidated by e.g. microinjections (e.g. hydraulic mortar) and micro-fillings (e.g. very fine lime/sand mortar). Powdering layers should be consolidated (e.g. brushing and spraying).

Table 4: Listed amount of affected areas

<b>14_EN</b>					
	<b>14_EN_S</b>	<b>14_EN_N</b>	<b>14_EN_E (estimated)</b>	<b>14_EN_W (estimated)</b>	<b>total</b>
<b>PLASTER</b>					
delamination (detachment) from structure	9,46 m <sup>2</sup>	5,66 m <sup>2</sup>	3,3 m <sup>2</sup>	7,9 m <sup>2</sup>	<b>26,32 m<sup>2</sup></b>
delamination (detachment) preparatory layers from each other's	1,75 m <sup>2</sup>	1,02 m <sup>2</sup>	0,6 m <sup>2</sup>	2,0 m <sup>2</sup>	<b>5,37 m<sup>2</sup></b>
delamination (detachment) Intonaco from preparatory layers	3,54 m <sup>2</sup>	1,32 m <sup>2</sup>	3,1 m <sup>2</sup>	5,9 m <sup>2</sup>	<b>13, 86 m<sup>2</sup></b>
flaking and scaling layers	2,4 m <sup>2</sup>	0,68 m <sup>2</sup>	0,6 m <sup>2</sup>	6,0 m <sup>2</sup>	<b>9,63 m<sup>2</sup></b>
Preparatory layers powdering + Intonaco powdering	0,3 m <sup>2</sup>	0,13 m <sup>2</sup>	0,26 m <sup>2</sup>	0,80 m <sup>2</sup>	<b>1,49 m<sup>2</sup></b>
protection of the edges	17,95 m	15,24 m	3,5 m	16,0 m	<b>52,7 m</b>
Deep Cracks (presumably reaching through all plaster layers)	11,22 m	11,4 m	5,5 m	11,3 m	<b>39,42 m</b>
<b>MASONRY</b>					
missing mortar	0,18 m <sup>2</sup>	1,63 m <sup>2</sup>	1,2 m <sup>2</sup>	0,05 m <sup>2</sup>	<b>3,06 m<sup>2</sup></b>
powdering mortar + presumably powdering mortar	0,16 m <sup>2</sup>	1,71 m <sup>2</sup>	1,1 m <sup>2</sup>	1,3 m <sup>2</sup>	<b>4,27 m<sup>2</sup></b>
eroded brick (round flushed out)	0,24 m <sup>2</sup>	0,52 m <sup>2</sup>	0,48 m <sup>2</sup>	0,0 m <sup>2</sup>	<b>1,23 m<sup>2</sup></b>
eroded lava (round flushed out)	0,05 m <sup>2</sup>	0,42 m <sup>2</sup>	0,4 m <sup>2</sup>	0,0 m <sup>2</sup>	<b>0,87 m<sup>2</sup></b>

## 1.6. Conclusion

The documentation of damages shows no cracks which could cause static problems at the masonry of 14\_EN. The plaster layers are in a rather bad condition. The plaster shows a wide spread amount of different kind of damages (scaling, flaking, detachment etc.). The detachment of the whole plaster layers from structure is one of the server problems. Many of these plaster pieces seem just to be kept in place by the previous edge protection. As maps (Figure 150 – Figure 151) show, there are plaster areas, which have rather no attachment to their substrate and could fall off any time (Figure 10). To conserve these parts emergency intervention has to be done.

At the base of the south wall, the intonaco is affected by scaling. Especially the graffiti bear losses from scaling intonaco (Figure 9).

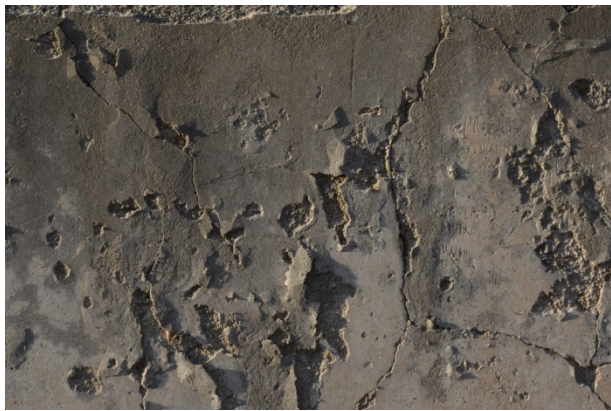


Figure 9: Scaling intonaco close to one graffito at position 2.



Figure 10: collapsing lacunae at 14\_EN\_S.

The documentation of the actual condition (November 2014) of funerary monument 14\_EN gives an impression of the present state of this monument. New accruing damages and losses could be monitored.

The documented conditions (November 2014) should be compared with historic pictures of all sites of this monument (Table 5). This could detect the damage development over the decades. Subsequently, the previous done conservation interventions and possible impact of the used conservation material could be evaluated.

The detected damages and problems at 14\_EN are in most instances representative for the whole necropolis of Porta Nocera. The development of a unified “document sheet”, which records and evaluates the conditions of every single monument at the necropolis of Porta Nocera would be useful. Also a glossary to use an uniform terminology should be produced.

Table 5: Comparison of historic drawing and pictures of 14\_EN\_S.

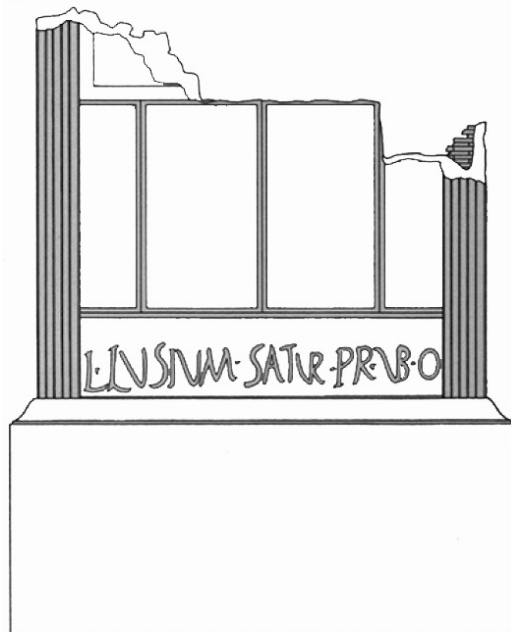


Figure 11: drawing of 14\_EN\_S after excavation in October 1954 (D'AMBROSIO, 1983, P. 39).



Figure 12: picture of 14\_EN\_S in the year 1972 (Deutsches Archaeologisches Institut).



Figure 13: 14\_EN\_S December 2004 (pompeiiinpictures).



Figure 14: 14\_EN\_S May 2006 (pompeiiinpictures).





Figure 15: 14\_EN\_S in the year 2009 (Stefania Giudice (SAPES))



Figure 16: 14\_EN\_S October 2014.

## 2. Documentation of the funerary monument 07\_ES

### 2.1. Description of the monument 07\_ES

07\_ES is as well as 14\_EN described by D'AMBROSIO<sup>5</sup>. 07\_ES is a funerary monument with a chamber. To enter the chamber, you have to climb down three steps, because the chamber is around 1,60 m deep under the surrounding ground level. In the chamber, the plaster is painted with different colored lines and architectural elements. The precinct has an enclosure with a wall. To enter the precinct, it is necessary to climb over the north wall. Three great stone blocks are included in the wall to have an easier access.

The chamber of 07\_ES is rather damp, which causes a wide spread intense biological overgrowth at the walls. This is why 07\_ES was chosen to do climate measurements. It is possible that funerary monument 02\_EN has comparable problems for its painted plaster as 07\_ES because 02\_EN has as well a chamber which is half under surrounding ground.

#### 2.1.1. Paintings and former colors

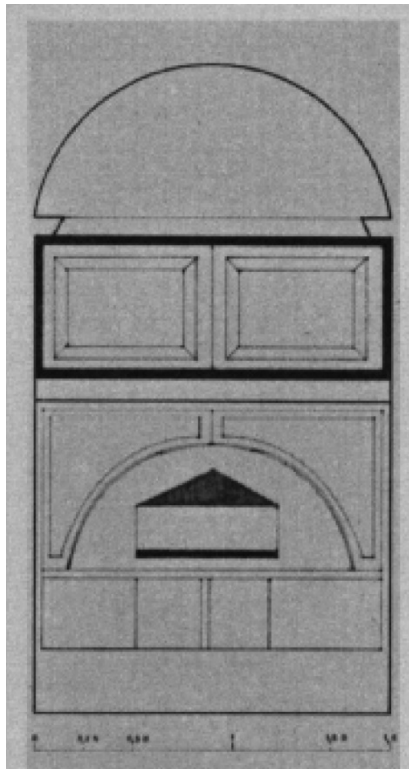


Figure 17: drawing of DELLA CORTE of 07\_ES\_S\_I from 1958. The double line (see red arrow) could no longer be detected.

The paintings and former colors of the south wall of the chamber has been drawn 1958 by DELLA CORTE<sup>6</sup> (Figure 19). To understand the painted decoration of the other walls, which are quite similar but not exactly the same, the still existing lines were documented (Figure 157 – Figure 160).

Detail pictures and microscope pictures of the different colors were taken, described and listed in tables (Table 6 – Table 10).

As Figure 159 shows, a double line emphasizing the middle of the base of the southern wall as it was drawn by DELLA CORTE (Figure 19), could no longer be detected.

<sup>5</sup> D'AMBROSIO ANTONIO, 1983.

<sup>6</sup> DELLA CORTE M., 1958, p. 389 – 390.

Table 6: description and position of red color

**Red color:**

- strong red color
- fine lines along the niche (forming nearly a triangle)
- small line above first cornice
- big red lines framing the plaster square between the two cornice
- fine lines at the aedicula shaped painting at the back wall of the niche of 14\_EN\_S\_I

photographs: 07\_ES\_S\_OT\_DSC\_3314, 07\_ES\_S\_OT\_DSC\_3315,  
07\_ES\_S\_OT\_DSC\_3316, 07\_ES\_S\_OT\_DSC\_3322

microphotographs: 07\_ES\_S\_I\_Micro\_PICT0178, 07\_ES\_S\_I\_Micro\_PICT0179



Figure 18: red color (picture number: 07\_ES\_S\_OT\_DSC\_3315).

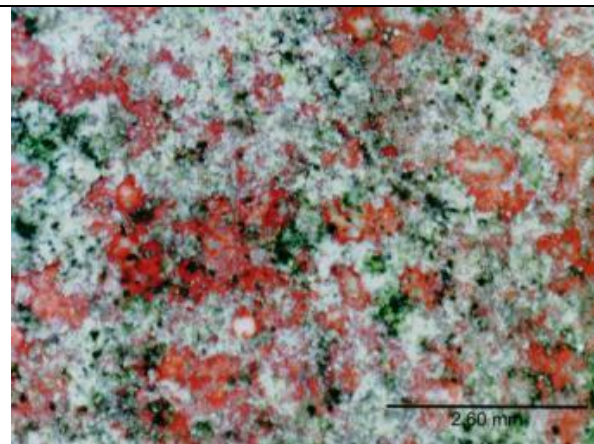


Figure 19: microscope picture of red color (picture number: 07\_ES\_S\_I\_Micro\_PICT0178).

Table 7: description and position of ochre color

**Ochre color:**

- yellow ochre color, at some parts a little bit reddish
- fine lines at the painted impression of coffering between the two cornices

photographs: 07\_ES\_S\_OT\_DSC\_3314, 07\_ES\_S\_OT\_DSC\_3315,  
07\_ES\_S\_OT\_DSC\_3316

microphotographs: 07\_ES\_S\_I\_Micro\_PICT0170



Figure 20: ochre color (picture number: 07\_ES\_S\_OT\_DSC\_3314).

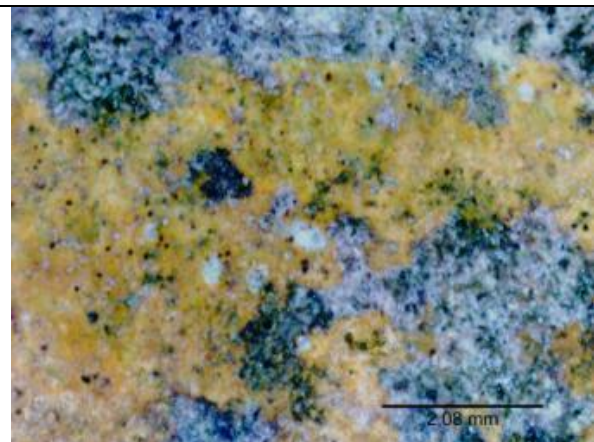


Figure 21: microscope picture of ochre color (picture number: 07\_ES\_S\_I\_Micro\_PICT0170).



Table 8: description and position of red ochre color

**Red ochre color:**

- red ochre color, at some places more red and at other more orange
- big lines framing the niches

photographs: 07\_ES\_E\_OT\_DSC\_3318

microphotographs: 07\_ES\_E\_I\_Micro\_PICT0181



Figure 22: red ochre color (picture number: 07\_ES\_E\_OT\_DSC\_3318).

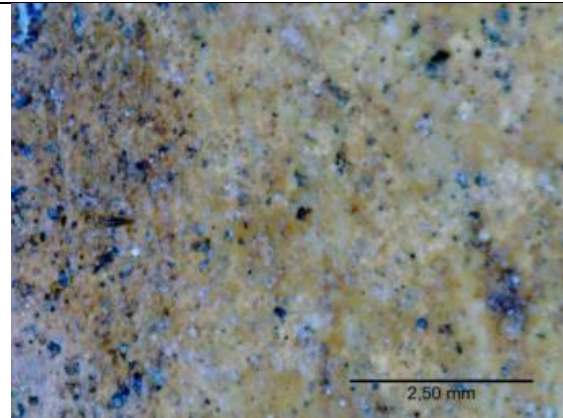


Figure 23: red ochre color microscope picture (picture number: 07\_ES\_E\_I\_Micro\_PICT0181).

Table 9: description and position of green color

**Green color:**

- green colour with a slightly bluish hue
- fine lines framing the niche and plaster aerea under the lowest cornice
- bigger lines leading over the corners of the upper cornice in the vault and framing the vault
- aedicular shaped painting at the back wall of niche of 14\_ES\_S\_I

photographs: 07\_ES\_E\_OT\_DSC\_3319, 07\_ES\_E\_OT\_DSC\_3320, 07\_ES\_S\_OT\_DSC\_3322

microphotograph: 07\_ES\_E\_I\_Micro\_PICT0183, 07\_ES\_E\_I\_Micro\_PICT0184



Figure 24: green color (picture number: 07\_ES\_E\_OT\_DSC\_3319).

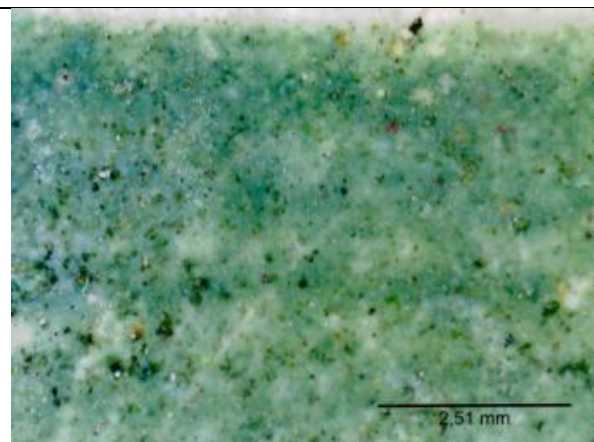


Figure 25: microscope picture of green color (picture number: 07\_ES\_E\_I\_Micro\_PICT0184).



Table 10: description and position of bluish black color

**Bluish black:**

- dark bluish black color
- fine lines being the contour of the pictured coffering

photograph: 07\_ES\_S\_OT\_DSC\_3314, 07\_ES\_S\_OT\_DSC\_3316,  
07\_ES\_E\_I\_BO\_DSC\_3142

microphotograph: 07\_ES\_S\_I\_Micro\_PICT01865, 07\_ES\_S\_I\_Micro\_PICT0186



Figure 26: bluish black color (picture number: 07\_ES\_S\_OT\_DSC\_3314).

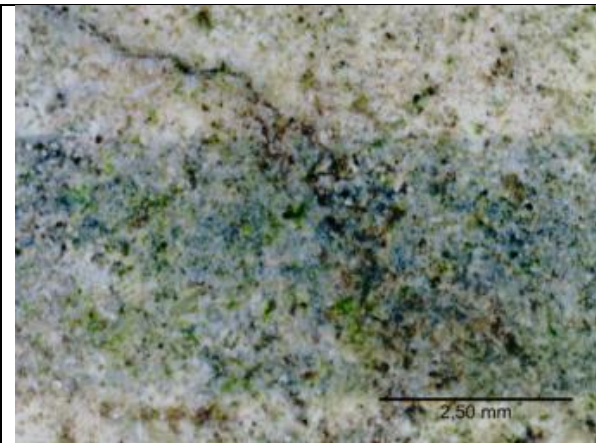


Figure 27: microscope picture of bluish black color (picture number: 07\_ES\_S\_I\_Micro\_PICT0186).

### 2.1.2. Preserved original plaster fragments at the outer walls

D'AMBROSIO<sup>7</sup> described original plaster fragments at external walls of 07\_ES. But the exact position and amount of original plaster fragments was not named. Therefore the original plaster fragments were documented and mapped in the present state of November 2014 (Figure 163 – Figure 165).

## 2.2. Previous interventions

### 2.2.1. Reconstruction

As you can see on Figure 166 – Figure 170, especially the ceiling of the chamber has been reconstructed and the west corner of the northern external wall.

D'AMBROSIO wrote that 07\_ES was found with a broken hole in the ceiling. This hole was made by former tomb raiders which looted this funerary monument.

Nowadays, there is a big block of masonry in the enclosure of 07\_ES. This could be the collapsed original corner of the northern wall, which is nowadays reconstructed (Figure 167).

### 2.2.2. Modern roofing's

07\_ES has no protecting roof but a reconstructed roof. At the east corner of southern wall, original roofing is preserved. The water impermeability was gained by a layer of cement, bitumen and "cocciopesto" (Figure 28). At some parts, new "cocciopesto" layers are mounted over the original ones (Figure 29).

<sup>7</sup> D'AMBROSIO ANTONIO, 1983.

The vaulted ceiling of the chamber of funerary monument 07\_ES has a squarish opening (Figure 30). This opening was reconstructed by historic indication.



Figure 28: reconstructed roof with layers of cement, bitumen and “cocciopesto”.



Figure 29: Fragments of original “cocciopesto” layers under a mounted reconstruction of “cocciopesto” roofing.



Figure 30: squarish opening at the vaulted ceiling.

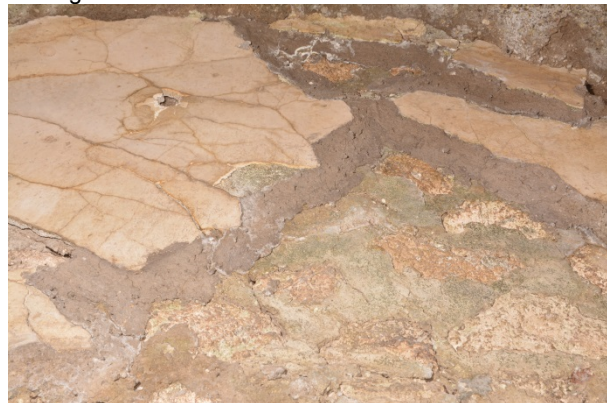


Figure 31: edge protection at 07\_ES\_N\_I.

### **2.2.3. Consolidations**

In the chamber a few fillings and edge protection (Figure 31) was used (Figure 171 – Figure 174). Obviously, they are all done with the same material at the same time. A division of different kind of edge protection and fillings was not possible (as done at 14\_EN).

## 2.3. Mappings of damages

Most maps are handmade. Only a few have been afterwards transferred to Metigo Map so far. It was tried to apply the same categories, which were done for 14\_EN at the funerary monument 07\_ES. But slightly changes were necessary resulting from deviating problems for each single monument (Table 11).

Table 11: Listed preformed mappings of 07\_ES

Original technique of construction
Paintings and former colors
Original plaster fragments at the outer walls (attention: not at 07_ES_W_E, therefore no map!)
Previous Intervention
reconstruction
fillings
protection of the edges
Inner walls
Damage of Masonry
cracks in masonry (attention: only at the ceiling, therefore only one map!)
missing mortar (attention: only at the ceiling, therefore only one map!)
Outer walls
Damage of Masonry
cracks in masonry
loose stones, brick and architectural elements
missing mortar
Chamber
Damages of Plaster
Cracks staying at the surface
Deep Cracks (presumably reaching through all plaster layers)
Delamination (detachment) from structure
Delamination (detachment) Intonaco from preparatory layers
Delamination (detachment) preparatory layers from each other's
Intonaco salt weathering
Intonaco scaling
Preparatory layers scaling
Preparatory layers salt weathering
Chamber
Collapsing areas
Loose plaster fragments, collapsing
Lacunae, collapsing
Loose stones, brick and architectural elements
Chamber
Biological Overgrowth
Red algae
Green-brown algae

Lime green bakteria?/algae?
Intense green algae
Green moss
Reddish brown moss
White turquoise lichens
Black fungi
Turquoise fungi
<b>Outer walls</b>
<b>Biological Overgrowth</b>
moss
plants
lichens

### **2.3.1. Biological overgrowth**

The chamber of 07\_ES is very damp and dark. Through the squarish opening at the ceiling rain water can run over the walls. Therefore biological overgrowth has grown all over the walls. Sometimes the biological overgrowth is so thick that is not possible to see through it and to spot if plaster or masonry is lying underneath.

The following tables (Table 12 – Table 15) describe the present biological overgrowth and divide them in possible categories (Table 11). After this division a mapping of the biological overgrowth could be done (Figure 209 – Figure 219).



Table 12: description and position of biological overgrowth of 07\_ES\_W\_I

**07\_ES\_W\_I**

**Lichens:**

White turquoise color. Apparently could it be lichens. It grows in small groups, laminar over the hole area until a high of 1,6 m up to a high of 1,7 m over the masonry.  
Notably strong overgrowth at the dado up to the lower edge of niche. It overgrows plaster as well as masonry.

photographs: 07\_ES\_W\_I\_BO\_DSC\_3147

microphotographs: 07\_ES\_W\_I\_Micro\_PICT\_0002; 07\_ES\_W\_I\_Micro\_PICT0005;  
07\_ES\_W\_I\_Micro\_PICT0006; 07\_ES\_W\_I\_Micro\_PICT0008



Figure 32: white turquoise lichens (picture number: 07\_ES\_W\_I\_BO\_DSC\_3147).

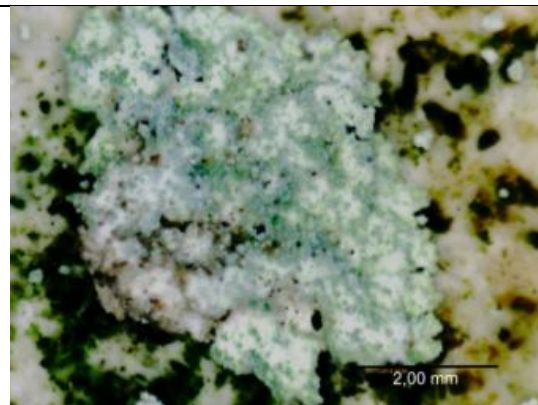


Figure 33: microscope picture of a white lichen (picture number: 07\_ES\_W\_I\_Micro\_PICT\_0008).

**Mosses:**

intens green color. It overgrows predomently masonry until a high of about 2 meters as well as over plaster visible at south-west-corner of the niche (**Fehler! Verweisquelle konnte nicht gefunden werden.**). The reason for this selectiv overgrowth of mosses in the niche might be a ideal condition of humidity and sunlight.

Recognisable is a preffered groth im cracks and plaster lossages (07\_ES\_W\_I\_BO\_DSC\_3149).

photographs: 07\_ES\_W\_I\_BO\_DSC\_3149; 07\_ES\_W\_I\_BO\_DSC\_3150

microphotographs: 07\_ES\_W\_I\_Micro\_PICT0004



Figure 34: green moss (picture number: 07\_ES\_W\_I\_BO\_DSC\_3250).



Figure 35: microscope picture of green moss (picture number: 07\_ES\_W\_I\_Micro\_PICT0004).

### Mooses:

reddish brown little "cushion" of moos. Very sporadic at the west side of the western innern wall.

photographs: 07\_ES\_W\_I\_BO\_DSC\_3153

microphotographs: 07\_ES\_W\_I\_Micro\_PICT0007



Figure 36: reddish brown moss (picture number: 07\_ES\_W\_I\_BO\_DSC\_3153).

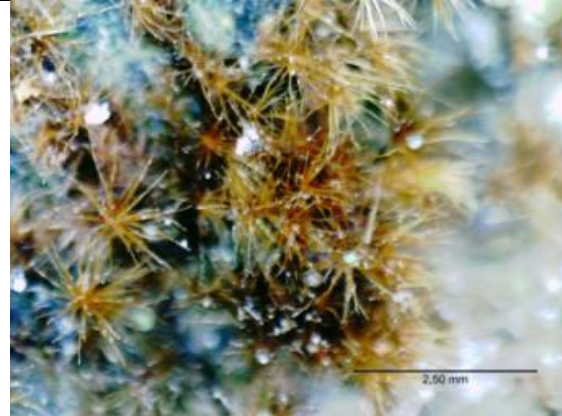


Figure 37: microscope picture of reddish brown moss (picture number: 07\_ES\_W\_I\_Micro\_PICT0007).

### Algae:

Possible a green-brown colored algae. It ranges over the total plaster with a less extend at the south corner of the west wall (**Fehler! Verweisquelle konnte nicht gefunden werden.**). Notably strong overgrowth at transition of masonry to plaster northern part of the west wall in a high of 1,7 m (07\_ES\_W\_I\_BO\_DSC\_3157).

photographs: 07\_ES\_W\_I\_BO\_DSC\_3155; 07\_ES\_W\_I\_BO\_DSC\_3157

microphotographs: 07\_ES\_W\_I\_Micro\_PICT0012; in transition of masonry to plaster: 07\_ES\_W\_I\_Micro\_PICT0014, 07\_ES\_W\_I\_Micro\_PICT0015, 07\_ES\_W\_I\_Micro\_PICT0016



Figure 38: green-brown algae (picture number: 07\_ES\_W\_I\_BO\_DSC\_3155).

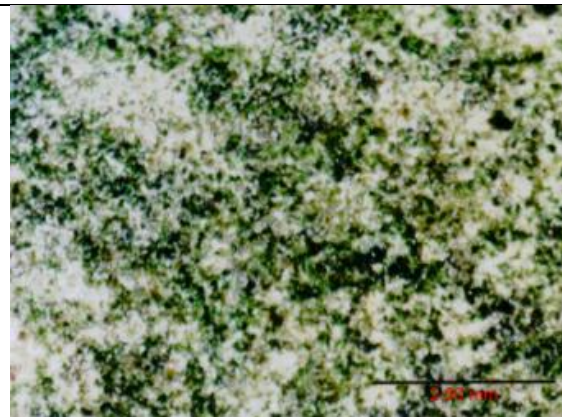


Figure 39: microscope picture of green-brown algae (picture number: 07\_ES\_W\_I\_Micro\_PICT0012).



**Algae:**

Potentially a red brown algae. Grows centered at the lower edge of the niche with an extend of ca. 35 x 20 cm.

photographs: 07\_ES\_W\_I\_BO\_DSC\_3158

microphotographs: 07\_ES\_W\_I\_Micro\_PICT0017, 07\_ES\_W\_I\_Micro\_PICT0020



Figure 40: red-brown algae (picture number: 07\_ES\_W\_I\_BO\_DSC\_3158).

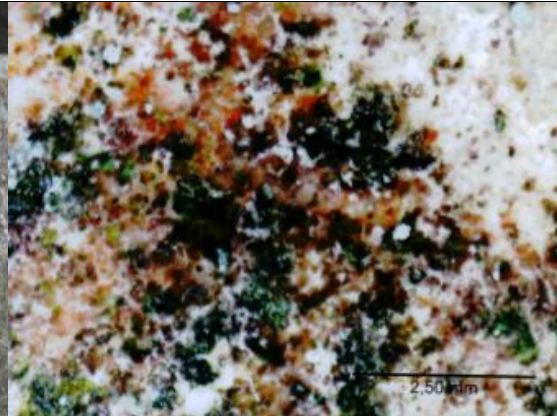


Figure 41: microscope picture of red brown algae (picture number: 07\_ES\_W\_I\_Micro\_PICT0017)

**Algae:**

Grave overgrowth of green and red algae? at the south west corner of the western wall up to a height of 1,6 m. Developing clusters in cracks and gaps of plaster (could be as well something else?).

photographs: 07\_ES\_W\_I\_BO\_DSC\_3159; 07\_ES\_W\_I\_BO\_DSC\_3160

microscope pictures: 07\_ES\_W\_I\_Micro\_PICT0024, 07\_ES\_W\_I\_Micro\_PICT0025; clusters in gaps: 07\_ES\_W\_I\_Micro\_PICT0022



Figure 42: green and red algae (picture number: 07\_ES\_W\_I\_BO\_DSC\_3159).

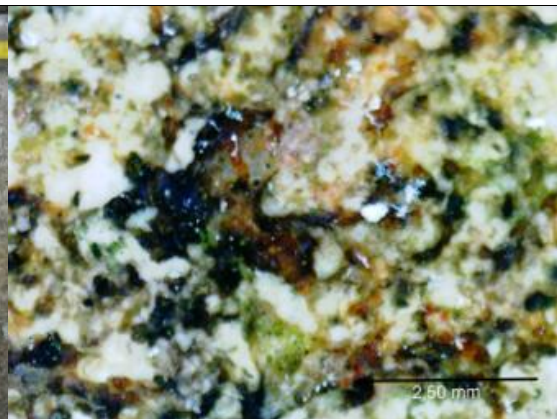


Figure 43: microscope picture of green and brown algae (picture number: 07\_ES\_W\_I\_Micro\_PICT0024).



### Algae:

At the breaking edge of the cornice is an intense green infestation to be found.  
photographs: 07\_ES\_W\_I\_BO\_DSC\_3173



Figure 44: intense green infestation (picture number: 07\_ES\_W\_I\_BO\_DSC\_3173).

no microscope picture

### Algae/Moss/Bacteria???:

red-brown colored infestation. It grows in fluffy clusters as well in cracks as well on the plaster. Notably strong growth in a crack. Detected was it in the north west corner of the niche of the western wall.

photographs: 07\_ES\_W\_I\_BO\_DSC\_3160

microphotographs: 07\_ES\_W\_I\_Micro\_PICT0037, 07\_ES\_W\_I\_Micro\_PICT0038



Figure 45: algae/moss/bacteria??? (picture number: 07\_ES\_W\_I\_BO\_DSC\_3166).

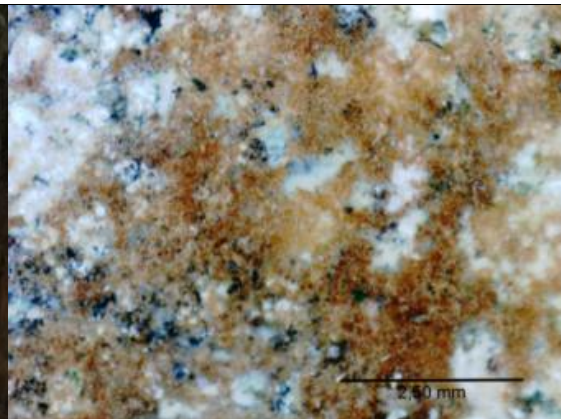


Figure 46: microscope picture of algae/moss/bacteria??? (picture number: 07\_ES\_W\_I\_Micro\_PICT0038)

**Funghi:**

Possible funghi. White-turquoise color. It grows laminar at the bottom of the dado until a height of 40 cm. It's appearance is fluffy and feathery. Most likely is the same funghi to be found in the vault of the niche with a strong development in the south corner of the niche (07\_ES\_W\_I\_BO\_DSC\_3163 and 3164).

photographs: 07\_ES\_W\_I\_BO\_DSC\_3161; 07\_ES\_W\_I\_BO\_DSC\_3162;

07\_ES\_W\_I\_BO\_DSC\_3163; 07\_ES\_W\_I\_DSC\_3164

microphotographs: 07\_ES\_W\_I\_Micro\_PICT0026, 07\_ES\_W\_I\_Micro\_PICT0027,

07\_ES\_W\_I\_Micro\_PICT0029, 07\_ES\_W\_I\_Micro\_PICT0030,

07\_ES\_W\_I\_Micro\_PICT0032; under the vault of the niche: 07\_ES\_W\_I\_Micro\_PICT0033,

07\_ES\_W\_I\_Micro\_PICT0034

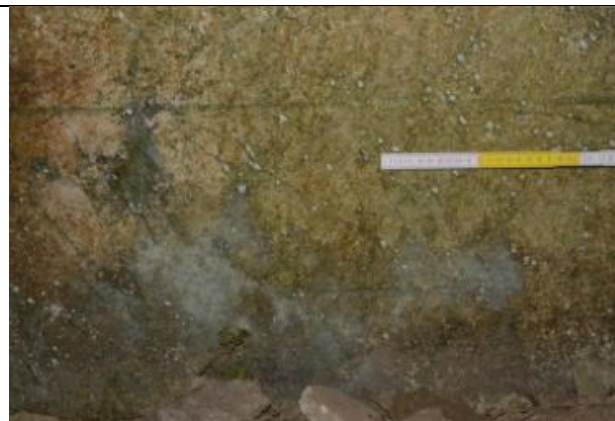


Figure 47: white turquoise fungi (picture number: 07\_ES\_W\_I\_BO\_DSC\_3161).

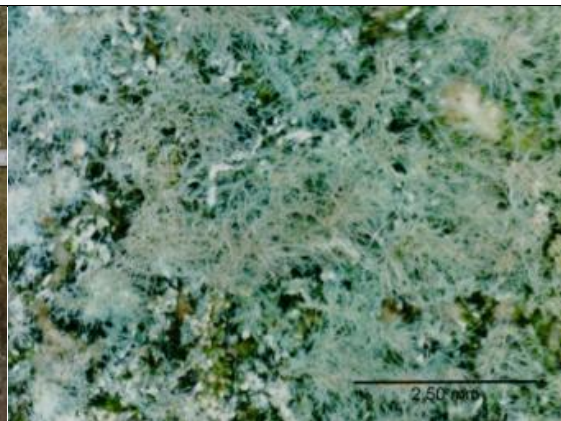


Figure 48: microscope picture white turquoise fungi (picture number: 07\_ES\_W\_I\_Micro\_PICT0030).

**Funghi:**

Apparently a mould formation, which has the color grey up to black. It is found on the lower edge of the niche and it grows laminar on plaster and masonry.

photographs: 07\_ES\_W\_I\_BO\_DSC\_3166; 07\_ES\_W\_I\_BO\_DSC\_3168

microphotographs: 07\_ES\_W\_I\_Micro\_PICT0046



Figure 49: black fungi (picture number: 07\_ES\_W\_I\_BO\_DSC\_3168).

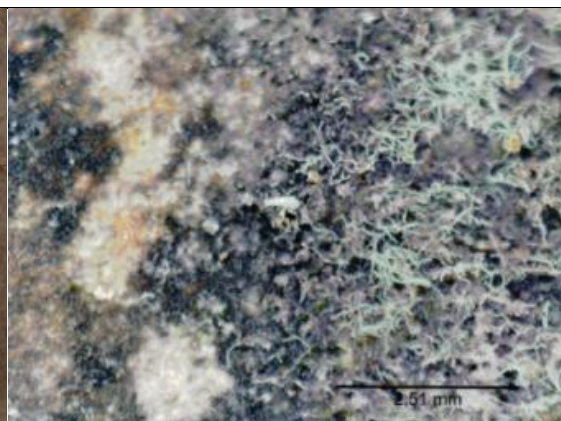


Figure 50: microscope picture of black fungi (picture number: 07\_ES\_W\_I\_Micro\_PICT0046).



### Fungi:

Above cornice growing on masonry is turquoise mould. The growing starts at a height of 2,15 m up to a height of 2,81 m. Apparently the plaster is not infested by the growing.

photographs: 07\_ES\_W\_I\_BO\_DSC\_3174

microphotographs: 07\_ES\_W\_I\_Micro\_PICT0040, 07\_ES\_W\_I\_Micro\_PICT0042



Figure 51: turquoise fungi (picture number: 07\_ES\_W\_I\_BO\_DSC\_3174).

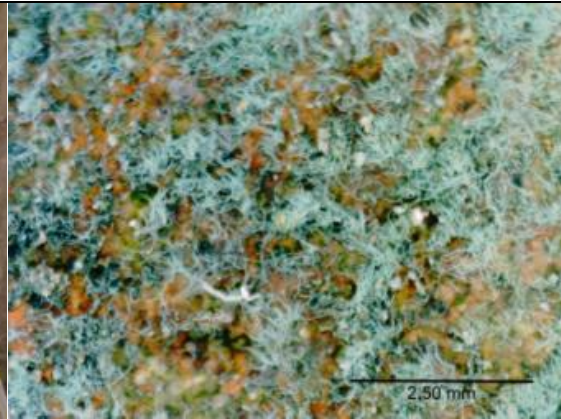


Figure 52: microscope picture of turquoise fungi (picture number: 07\_ES\_W\_I\_Micro\_PICT0040).

### Fungi/Salt?:

two oval shaped spots of the size of ca. 15 x 25 cm, located at the niche back wall, which could be mould (07\_ES\_W\_I\_BO\_DSC\_3168). To be found as well at the north west corner of the niche (07\_ES\_W\_I\_BO\_DSC\_3169). The appearance is like a fluffy cluster with a well-defined shape.

photographs: 07\_ES\_W\_I\_BO\_DSC\_3168; 07\_ES\_W\_I\_BO\_DSC\_3169

microphotographs: 07\_ES\_W\_I\_Micro\_PICT0050, 07\_ES\_W\_I\_Micro\_PICT0052, 07\_ES\_W\_I\_Micro\_PICT0053 (ranking light)



Figure 53: 07\_ES\_W\_I\_BO\_DSC\_3168

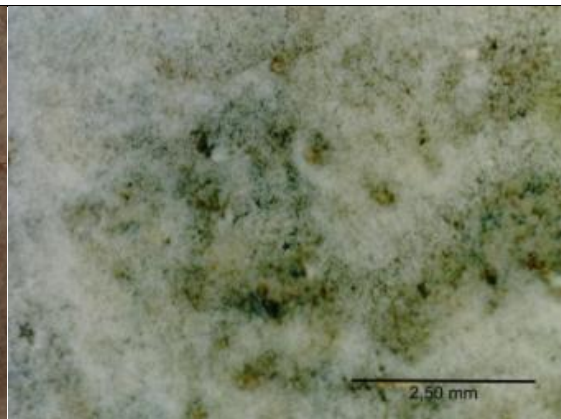


Figure 54: 07\_ES\_W\_I\_Micro\_PICT0050

**Plants:**

Growing of Plants in the niche, especially in the south west corner of the niche (sunlight). It is growing on the horizontal bottom of the niche as well at the vertical vault. It reaches a height up to 4 cm.

photographs: 07\_ES\_W\_I\_BO\_DSC\_3171



Figure 55: 07\_ES\_W\_I\_BO\_DSC\_3171

no microscope picture

Table 13: description and position of biological overgrowth at 07\_ES\_S\_I

**07\_ES\_S\_I**

**Lichens:**

- turquoise, round shaped lichens
- south-west corner (sunlight) until a height of 1,45 m, pointed
- particular strong infestation at the dado up to lower edge of the niche
- slight growth at the bottom of the niche
- growing on plaster and masonry

photographs: 07\_ES\_W\_I\_BO\_DSC\_3178, 07\_ES\_W\_I\_BO\_DSC\_3179

microphotographs: 07\_ES\_S\_I\_Micro\_PICT0151, 07\_ES\_S\_I\_Micro\_PICT0152



Figure 56: 07\_ES\_W\_I\_BO\_DSC\_3179

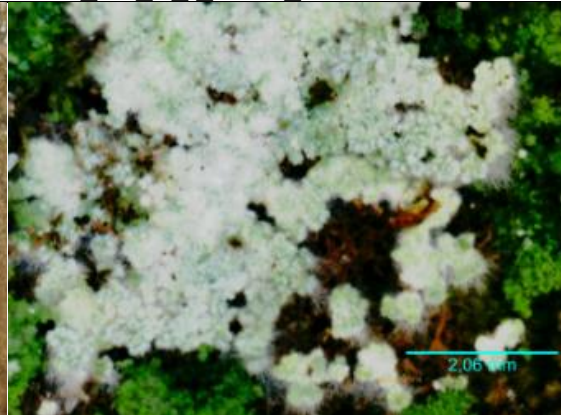


Figure 57: 07\_ES\_S\_I\_Micro\_PICT0152

**Mosses**

- intense green, growing in laminar "cushions"
- growing in both corners south-east and south-west of the southern wall, overall width ca. 1,00 m from both corners
- eastern bottom of the niche
- particular strong infestation on masonry, sporadic on plaster

photographs: 07\_ES\_S\_I\_BO\_DSC\_3181, 07\_ES\_S\_I\_BO\_DSC\_3182

microphotographs: 07\_ES\_S\_I\_Micro\_PICT0153



Figure 58: 07\_ES\_S\_I\_BO\_DSC\_3181

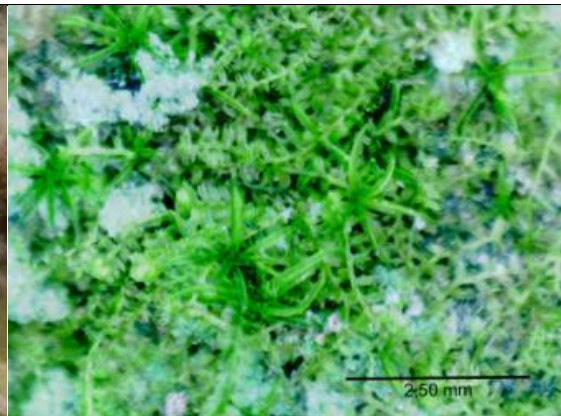


Figure 59: 07\_ES\_S\_I\_Micro\_PICT0153



### Fungi:

- white-turquoise mildew
- at the dado, south-west corner, size 29 x 9 cm (07\_ES\_S\_I\_BO\_DSC\_3183) 156, 157
- at the dado, south-east corner, size 26 x 36 cm (07\_ES\_S\_I\_BO\_DSC\_3184) 159, 160
- south-east corner of the niche, size 10 x 15 cm (07\_ES\_S\_I\_BO\_DSC\_3185) 162
- south-west corner of the niche, size 28 x 10 cm (07\_ES\_S\_I\_BO\_DSC\_3187) 163

photographs: 07\_ES\_S\_I\_BO\_DSC\_3183, 07\_ES\_S\_I\_BO\_DSC\_3184,  
07\_ES\_S\_I\_BO\_DSC\_3185, 07\_ES\_S\_I\_BO\_DSC\_3187

microphotographs: 07\_ES\_S\_I\_Micro\_PICT0156, 07\_ES\_S\_I\_Micro\_PICT0157,  
07\_ES\_S\_I\_Micro\_PICT0159, 07\_ES\_S\_I\_Micro\_PICT0160,  
07\_ES\_S\_I\_Micro\_PICT0162, 07\_ES\_S\_I\_Micro\_PICT0163



Figure 60: 07\_ES\_S\_I\_BO\_DSC\_3187

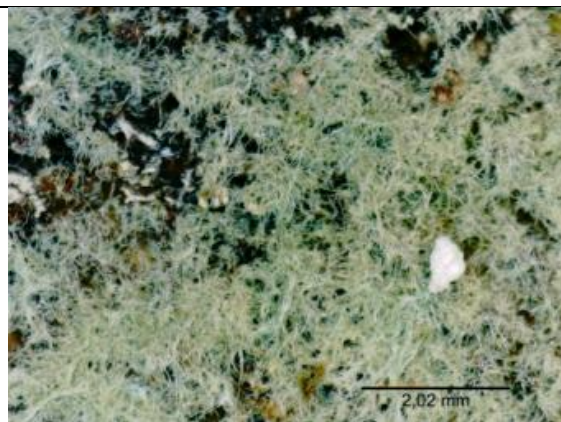


Figure 61: 07\_ES\_S\_I\_Micro\_PICT0156

### Algae:

- reddish brown algae
- growing overall of the dado, up to a height of 1,4 m and a width of 1,10 m (07\_ES\_S\_I\_BO\_DSC\_3193)
- particular strong at the dado south-west corner (07\_ES\_S\_I\_BO\_DSC\_3188)
- growing on plaster as well as on masonry

photographs: 07\_ES\_S\_I\_BO\_DSC\_3188, 07\_ES\_S\_I\_BO\_DSC\_3193

microphotographs: 07\_ES\_S\_I\_Micro\_PICT0164



Figure 62: 07\_ES\_S\_I\_BO\_DSC\_3188

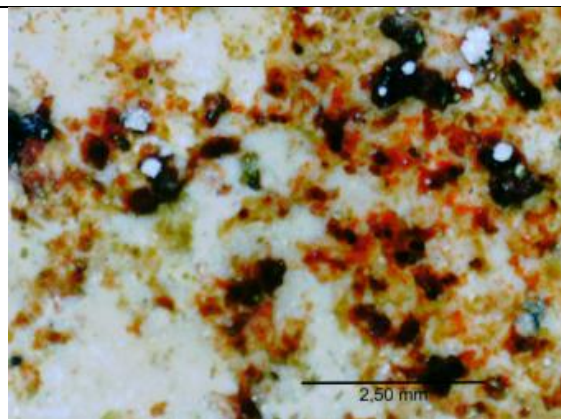


Figure 63: 07\_ES\_S\_I\_Micro\_PICT0164

**Algae:**

- lime green Algae/fungi
- centered over the top of niche (07\_ES\_S\_I\_BO\_DSC\_3197)
- on top of the vault of the niche
- in the middle of the niche centered at the back wall (07\_ES\_S\_I\_BO\_DSC\_3200)
- at the bottom of the niche and growing over the lower edge of the niche (07\_ES\_S\_I\_BO\_DSC\_3199)

photographs: 07\_ES\_S\_I\_BO\_DSC\_3197, 07\_ES\_S\_I\_BO\_DSC\_3199,  
07\_ES\_S\_I\_BO\_DSC\_3200

microphotographs: 07\_ES\_S\_I\_Micro\_PICT0167, 07\_ES\_S\_I\_Micro\_PICT0168



Figure 64: 07\_ES\_S\_I\_BO\_DSC\_3197)

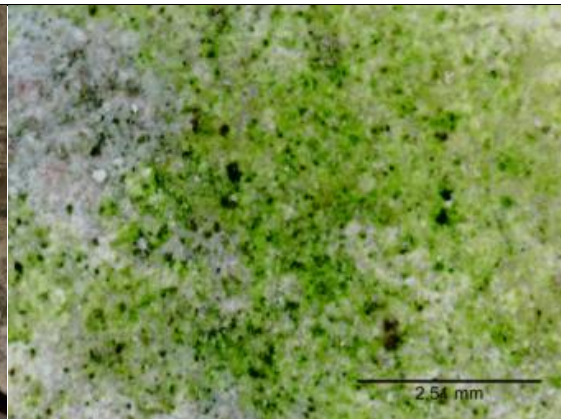


Figure 65: 07\_ES\_S\_I\_Micro\_PICT0167

**Algae:**

- green, brown laminar algae
- building dark clusters at gaps and cracks
- south-east corner at the dado (07\_ES\_S\_I\_BO\_DSC\_3193)
- south-east corner at the niche (07\_ES\_S\_I\_BO\_DSC\_3194)
- south-west corner at the niche (07\_ES\_S\_I\_BO\_DSC\_3195)

photographs: 07\_ES\_S\_I\_BO\_DSC\_3193, 07\_ES\_S\_I\_BO\_DSC\_3194,  
07\_ES\_S\_I\_BO\_DSC\_3195

microphotographs: 07\_ES\_S\_I\_Micro\_PICT0169, 07\_ES\_S\_I\_Micro\_PICT0172



Figure 66: 07\_ES\_S\_I\_BO\_DSC\_3194

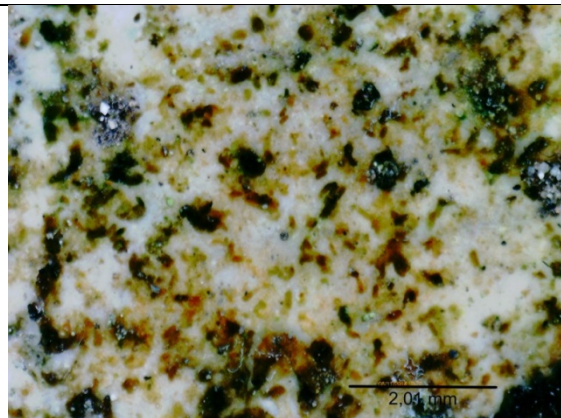


Figure 67: 07\_ES\_S\_I\_Micro\_PICT0169



### Algae:

- green, dark brown algae, grows laminar all over the area
- small dark groups ca. 35 cm centered above the niche (07\_ES\_S\_I\_BO\_DSC\_3201, 07\_ES\_S\_I\_BO\_DSC\_3202)
- east of the niche (07\_ES\_S\_I\_BO\_DSC\_3205)
- over all plaster above the cornice (07\_ES\_S\_I\_BO\_DSC\_3207)

photographs: 07\_ES\_S\_I\_BO\_DSC\_3201, 07\_ES\_S\_I\_BO\_DSC\_3202, 07\_ES\_S\_I\_BO\_DSC\_3205, 07\_ES\_S\_I\_BO\_DSC\_3207

microphotographs:



Figure 68: 07\_ES\_S\_I\_BO\_DSC\_3202

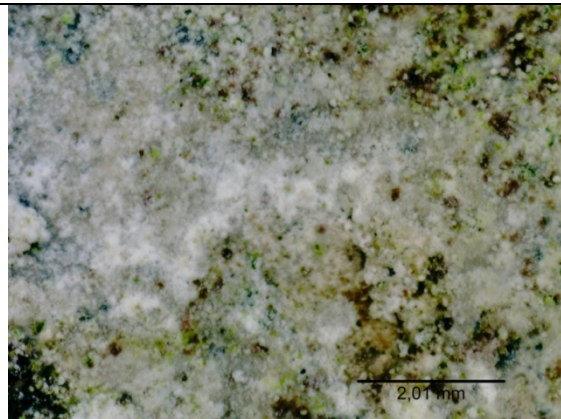


Figure 69: 07\_ES\_S\_I\_Micro\_PICT0177

### Mould?/Salt?:

- selective white mould, round shaped
- centered at the lower edge of the niche (07\_ES\_S\_I\_BO\_DSC\_3208)
- centered at the back wall of the niche (07\_ES\_S\_I\_BO\_DSC\_3209)
- eastern part of the niche, vault and bottom (07\_ES\_S\_I\_BO\_DSC\_3210)
- centered over above the niche (07\_ES\_S\_I\_BO\_DSC\_3211)



Figure 70: 07\_ES\_S\_I\_BO\_DSC\_3209



Table 14: description and position of biological overgrowth of 07\_ES\_E\_I

**07\_ES\_E\_I**

**Algae:**

- greenish brown algae, growing laminar
- all over the dado up to a height of 1,6 m
- building dark clusters in gaps and cracks
- growing on plaster and masonry

photographs: 07\_ES\_E\_I\_BO\_DSC\_3221, 07\_ES\_E\_I\_BO\_DSC\_3223

microphotographs: 07\_ES\_E\_I\_Micro\_PICT0065, 07\_ES\_E\_I\_Micro\_PICT0066,  
07\_ES\_E\_I\_Micro\_PICT0069, 07\_ES\_E\_I\_Micro\_PICT0070,  
07\_ES\_E\_I\_Micro\_PICT0071, 07\_ES\_E\_I\_Micro\_PICT0076



Figure 71: 07\_ES\_E\_I\_BO\_DSC\_3221

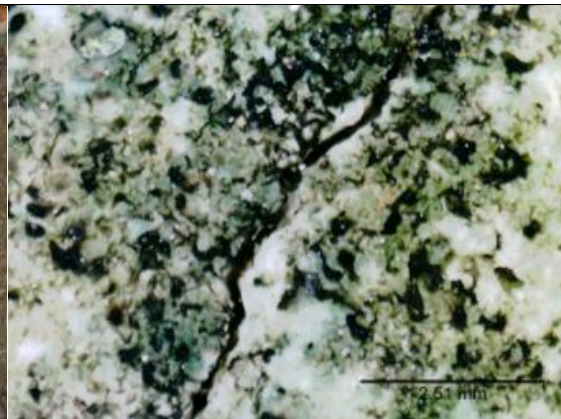


Figure 72: 07\_ES\_E\_I\_Micro\_PICT0066

**Algae:**

- greenish black algae, forming clusters
- east-north corner, besides the niche (07\_ES\_E\_I\_BO\_DSC\_3226)
- possibly the same like above but in a intense variation

photographs: 07\_ES\_E\_I\_BO\_DSC\_3226

microphotographs: 07\_ES\_E\_I\_Micro\_PICT0078



Figure 73: 07\_ES\_E\_I\_BO\_DSC\_3226

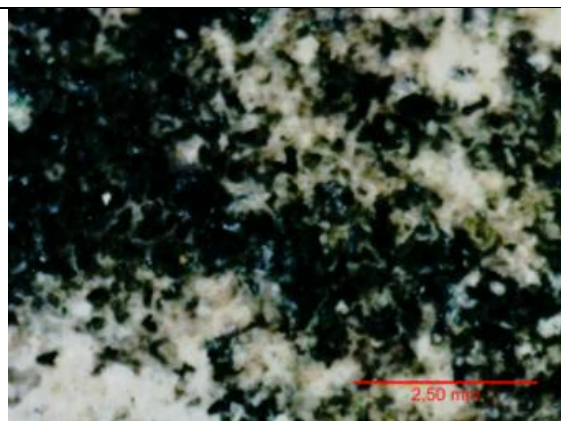


Figure 74: 07\_ES\_E\_I\_Micro\_PICT0078

**Algae:**

- brownish red, laminar slight infestation
- mixes with a greenish brown algae
- predominant on plaster
- south-east corner of the eastern wall, size ca. 20 x 20 cm  
(07\_ES\_E\_I\_BO\_DSC\_3227, 07\_ES\_E\_I\_BO\_DSC\_3229)

photographs: 07\_ES\_E\_I\_BO\_DSC\_3227, 07\_ES\_E\_I\_BO\_DSC\_3229

microphotograph: 07\_ES\_E\_I\_Micro\_PICT0080



Figure 75: 07\_ES\_E\_I\_BO\_DSC\_3229

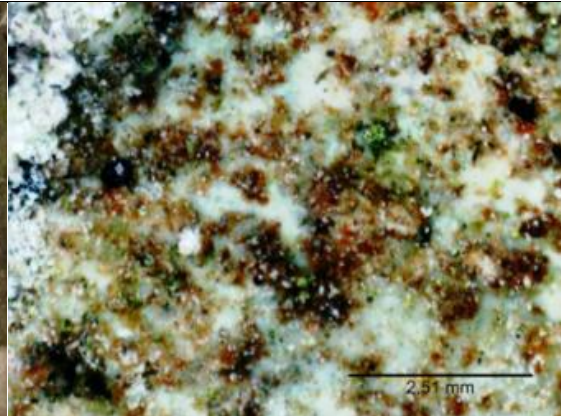


Figure 76: 07\_ES\_E\_I\_Micro\_PICT0080

**Mosses:**

- green, growing in fluffy clusters
- at the dado at the south-east corner of the eastern wall, size ca. 20 x 20 cm (sunlight) (07\_ES\_S\_I\_BO\_DSC\_3232)
- predominant growing over the masonry and plaster lossages

photographs: 07\_ES\_S\_I\_BO\_DSC\_3232

microphotographs: 07\_ES\_E\_I\_Micro\_PICT0084, 07\_ES\_E\_I\_Micro\_PICT0085



Figure 77: 07\_ES\_S\_I\_BO\_DSC\_3232

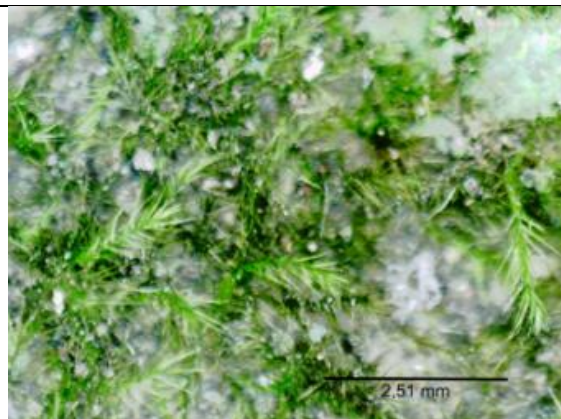


Figure 78: 07\_ES\_E\_I\_Micro\_PICT0084



**Fungi:**

- turquoise laminar mould
- following the south-east corner of the eastern wall (07\_ES\_S\_I\_BO\_DSC\_3233, 07\_ES\_S\_I\_BO\_DSC\_3235)
- infestation of the niche: south-east corner, vault and eastern deepening for sacrificial vessel (07\_ES\_S\_I\_BO\_DSC\_3236, 07\_ES\_S\_I\_BO\_DSC\_3239)
- growing here and there together with mosses

photographs: 07\_ES\_S\_I\_BO\_DSC\_3233; 07\_ES\_S\_I\_BO\_DSC\_3235;

07\_ES\_S\_I\_BO\_DSC\_3236, 07\_ES\_S\_I\_BO\_DSC\_3239)

microphotographs: 07\_ES\_E\_I\_Micro\_PICT0089, 07\_ES\_E\_I\_Micro\_PICT0091



Figure 79: 07\_ES\_S\_I\_BO\_DSC\_3236

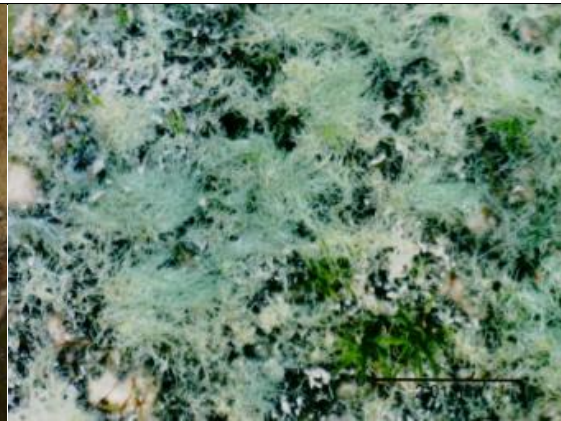


Figure 80: 07\_ES\_E\_I\_Micro\_PICT0089

**Algae:**

- grayish green algae
- back wall of the niche, particular the south-east corner of the niche (07\_ES\_S\_I\_BO\_DSC\_3240)
- particular strong infestation on the fillings of previous restoration but also growing on ancient plaster around the fillings (07\_ES\_S\_I\_BO\_DSC\_3242)

photographs: 07\_ES\_S\_I\_BO\_DSC\_3240, 07\_ES\_S\_I\_BO\_DSC\_3242

microphotographs: 07\_ES\_E\_I\_Micro\_PICT0092, 07\_ES\_E\_I\_Micro\_PICT0094



Figure 81: 07\_ES\_S\_I\_BO\_DSC\_3242

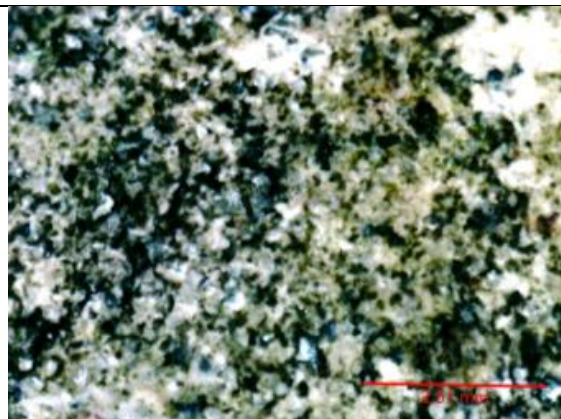


Figure 82: 07\_ES\_E\_I\_Micro\_PICT0092

**Algae:**

- greenish brown algae
- very intense at the south-east corner of the niche (07\_ES\_S\_I\_BO\_DSC\_3236)
- at the southern lower edge of the niche (07\_ES\_S\_I\_BO\_DSC\_3227)

photographs: 07\_ES\_S\_I\_BO\_DSC\_3227, 07\_ES\_S\_I\_BO\_DSC\_3236

microphotographs: 07\_ES\_E\_I\_Micro\_PICT0092, 07\_ES\_E\_I\_Micro\_PICT0094



Figure 83: 07\_ES\_S\_I\_BO\_DSC\_3227

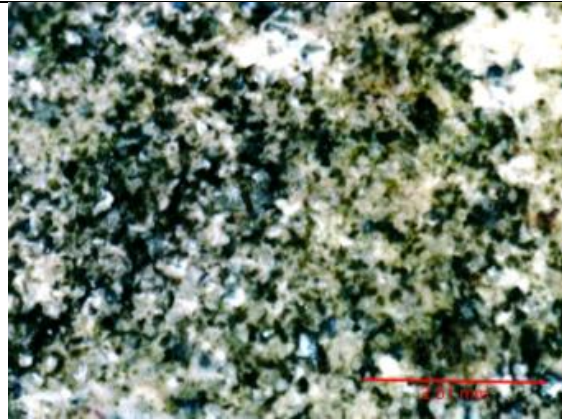


Figure 84: 07\_ES\_E\_I\_Micro\_PICT0092

**Algae/Bakteria/Fungi???:**

- reddish algae
- vault of niche, particular north-east corner (where nearly no light reaches the algae), (07\_ES\_E\_I\_BO\_DSC\_3245)
- it seems to grow in combination with turquoise mould

photographs: 07\_ES\_E\_I\_BO\_DSC\_3245

microphotographs: 07\_ES\_E\_I\_Micro\_PICT0098



Figure 85: 07\_ES\_E\_I\_BO\_DSC\_3245

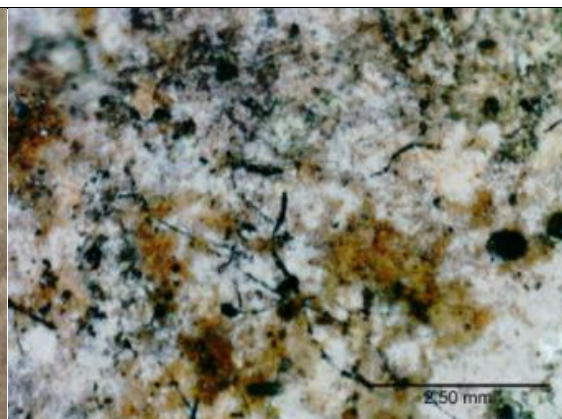


Figure 86: 07\_ES\_E\_I\_Micro\_PICT0098



#### Agae/Salt?:

- shaped like a rosette, size Ø ca. 8 - 10 cm, color: black and white
- predominant north-east part of the eastern wall above niche, at a height 1,05 m up to 1,55 m, (07\_ES\_E\_I\_BO\_DSC\_3246)
- sporadic at the south-east part of the eastern wall, at a height 1,10 m up to 1,29 m, width ca. 0,42 m, here white colored (07\_ES\_E\_I\_BO\_DSC\_3249)
- could be a combination of salt efflorescence and growing of algae

photographs: 07\_ES\_E\_I\_BO\_DSC\_3246, 07\_ES\_E\_I\_BO\_DSC\_3248,  
07\_ES\_E\_I\_BO\_DSC\_3249

microphotographs: 07\_ES\_E\_I\_Micro\_PICT0100, 07\_ES\_E\_I\_Micro\_PICT0102



Figure 87: 07\_ES\_E\_I\_BO\_DSC\_3248

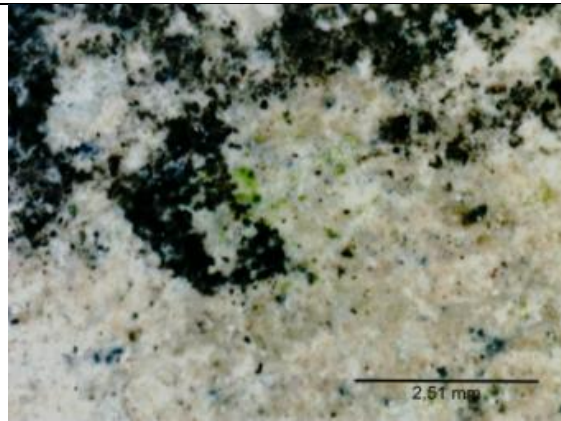


Figure 88: 07\_ES\_E\_I\_Micro\_PICT0102

#### Algae/Incrustation of dirt???:

- brown green algae
- over the total plaster, above height of 1,68 m (former cornice), (07\_ES\_E\_I\_BO\_DSC\_3252)

photographs: 07\_ES\_E\_I\_BO\_DSC\_3252

microphotographs: 07\_ES\_E\_I\_Micro\_PICT0110



Figure 89: 07\_ES\_E\_I\_BO\_DSC\_3252

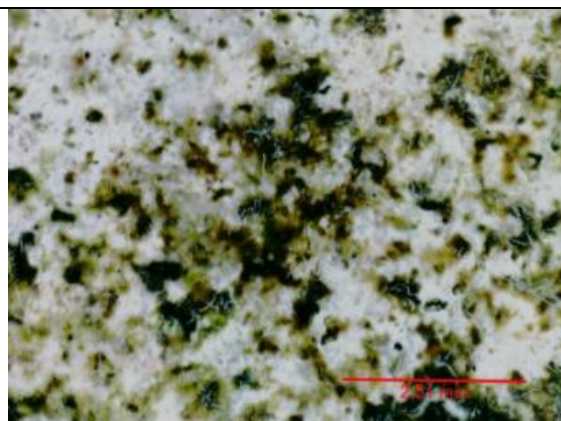


Figure 90: 07\_ES\_E\_I\_Micro\_PICT0110

**Algae:**

- green, black Algae
- grows in cluster along plaster losses and cracks
- centered underneath the hole in the vault, size 20 - 15 cm

photographs: 07\_ES\_E\_I\_BO\_DSC\_3254

microphotographs: 07\_ES\_E\_I\_Micro\_PICT0107



Figure 91: 07\_ES\_E\_I\_BO\_DSC\_3254

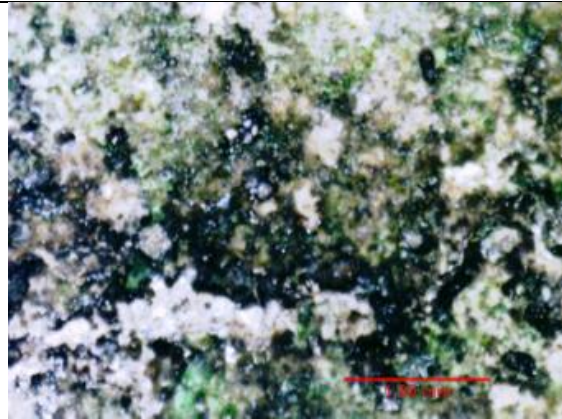


Figure 92: 07\_ES\_E\_I\_Micro\_PICT0107

**Algae:**

- intense green algae
- centered underneath the hole in the vault (07\_ES\_E\_I\_BO\_DSC\_3256)

photographs: 07\_ES\_E\_I\_BO\_DSC\_3256

microphotographs: 07\_ES\_E\_I\_Micro\_PICT0105



Figure 93: 07\_ES\_E\_I\_BO\_DSC\_3256

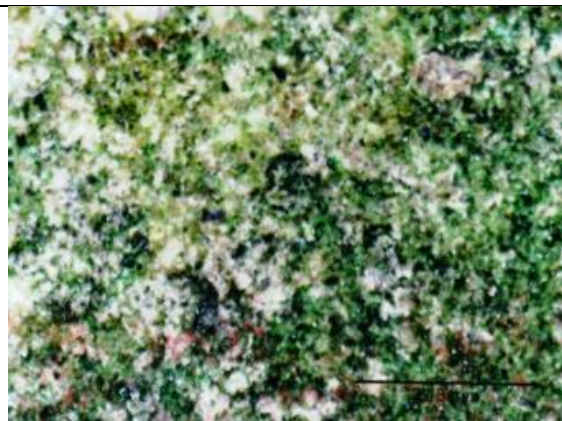


Figure 94: 07\_ES\_E\_I\_Micro\_PICT0105



Table 15: description and position of biological overgrowth of 07\_ES\_N\_I

**07\_ES\_N\_I**

**Fungi:**

- intense turquoise fluffy infestation
- northern wall with almost no light
- from the bottom up to a height of 1,40 m, over the total width of 93 cm, growing over masonry and over the rest of masonry preparation plaster, (07\_ES\_N\_I\_DSC\_3258)
- over the rest of the plaster fragments at the dado, size 20 x 15 cm (07\_ES\_N\_I\_DSC\_3261)
- over the steps of the entrance

photographs: 07\_ES\_N\_I\_BO\_DSC\_3258, 07\_ES\_N\_I\_BO\_DSC\_3261,  
07\_ES\_N\_I\_BO\_DSC\_3262

microphotographs: 07\_ES\_N\_I\_Micro\_PICT0115; 07\_ES\_N\_I\_Micro\_PICT0118



Figure 95: 07\_ES\_N\_I\_BO\_DSC\_3262

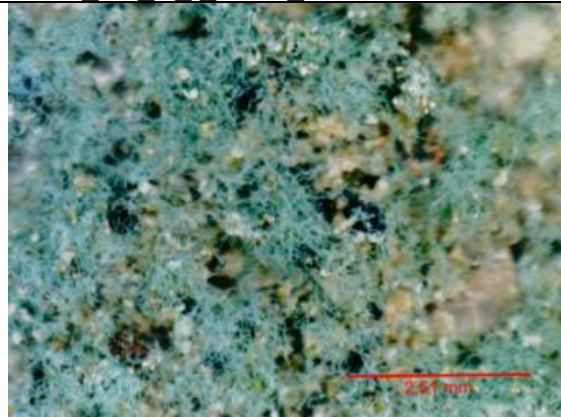


Figure 96: 07\_ES\_N\_I\_Micro\_PICT0115

**Algae:**

- greenish black algae
- grows on the plaster fragment at the bottom of the wall, masonry at the areas around seems not to be infested, size 90 x 70 cm, following the edges of the plaster fragment (07\_ES\_N\_I\_BO\_DSC\_3264, 07\_ES\_N\_I\_BO\_DSC\_3266)

photographs: 07\_ES\_N\_I\_BO\_DSC\_3264, 07\_ES\_N\_I\_BO\_DSC\_3266

microphotographs: 07\_ES\_N\_I\_Micro\_PICT0121, 07\_ES\_N\_I\_Micro\_PICT0122



Figure 97: 07\_ES\_N\_I\_BO\_DSC\_3266

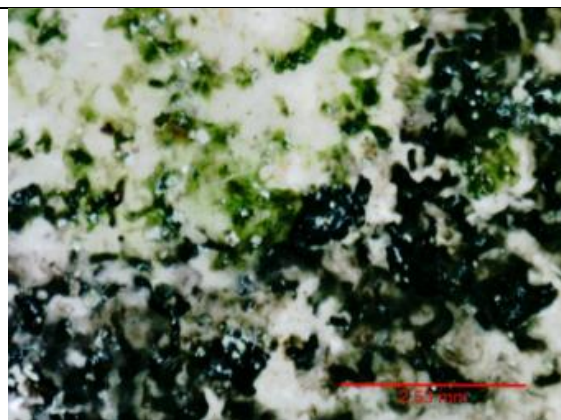


Figure 98: 07\_ES\_N\_I\_Micro\_PICT0122



**Bakteria/Algae/Fungi?:**

- lime green
- growing over the plaster next to the door and on the reveal (sunlight),  
(07\_ES\_N\_I\_BO\_DSC\_3268)

photographs: 07\_ES\_N\_I\_BO\_DSC\_3268

microphotographs: 07\_ES\_N\_I\_Micro\_PICT0123, 07\_ES\_N\_I\_Micro\_PICT0124



Figure 99: 07\_ES\_N\_I\_BO\_DSC\_3268

Figure 100: 07\_ES\_N\_I\_Micro\_PICT0123

**Algae:**

- black, green, brown
- growing on the plaster fragment next to the door

photographs: 07\_ES\_N\_I\_BO\_DSC\_3268, 07\_ES\_N\_I\_BO\_DSC\_3274,  
07\_ES\_N\_I\_BO\_DSC\_3276

microphotographs: 07\_ES\_N\_I\_Micro\_PICT0127



Figure 101: 07\_ES\_N\_I\_BO\_DSC\_3268

Figure 102: 07\_ES\_N\_I\_Micro\_PICT0127

**Algae:**

- green, brown algae
- the turquoise mould crosses over to this green algae at a height of 1,30 m and reaches up to 2,20 m

photographs: 07\_ES\_N\_I\_BO\_DSC\_3269

microphotographs: 07\_ES\_N\_I\_Micro\_PICT0132

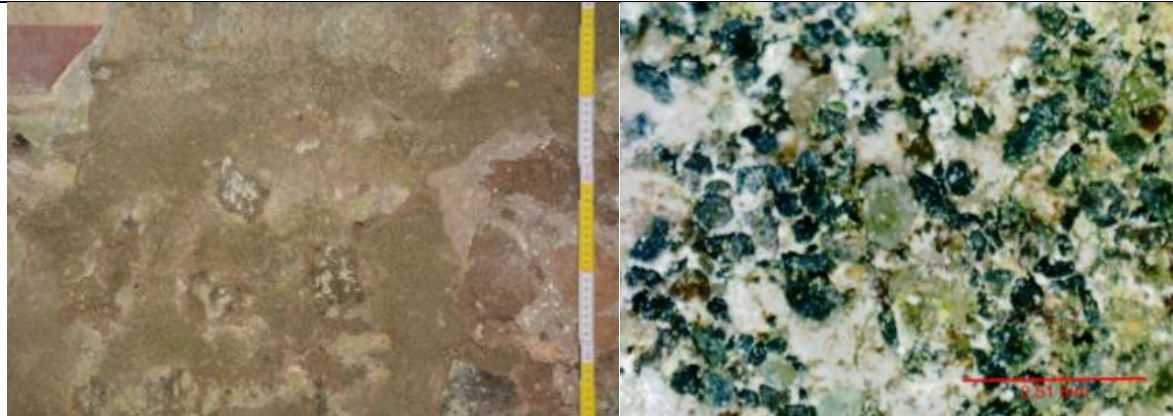


Figure 103: 07\_ES\_N\_I\_BO\_DSC\_3269

Figure 104: 07\_ES\_N\_I\_Micro\_PICT0132

**Algae:**

- grayish green algae, presumably combined with a lot of dirt
- between the former two cornices on the plaster and on masonry, getting slightly grey in height

photographs:

microphotographs: 07\_ES\_N\_I\_Micro\_PICT0133, 07\_ES\_N\_I\_Micro\_PICT0136 (grayish)



Figure 105: 07\_ES\_N\_I\_BO\_DSC\_3278

Figure 106: 07\_ES\_N\_I\_Micro\_PICT0133



**Algae/Bacteria/Fungi:**

- red orange infestation, looking powdery
- grows at the reveal (needs sunlight?)

photographs: 07\_ES\_N\_I\_BO\_DSC\_3280, 07\_ES\_N\_I\_BO\_DSC\_3281,  
07\_ES\_N\_I\_BO\_DSC\_3283

microphotographs: 07\_ES\_N\_I\_Micro\_PICT0139, 07\_ES\_N\_I\_Micro\_PICT0140



Figure 107: 07\_ES\_N\_I\_BO\_DSC\_3283

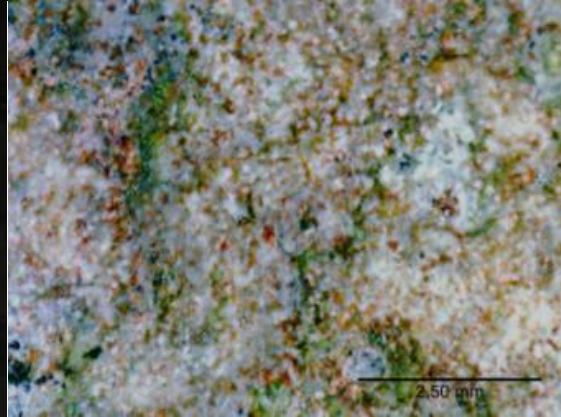


Figure 108: 07\_ES\_N\_I\_Micro\_PICT0140

**Bacteris?:**

- flamy red infestation, maybe kind of corrosion (minium?/core iron)
- growing in the crack of the beam and over the masonry above the beam at the entrance (needing much light?)

photographs: 07\_ES\_N\_BO\_DSC\_3284, 07\_ES\_N\_BO\_DSC\_3285,  
07\_ES\_N\_BO\_DSC\_3286

microphotographs: 07\_ES\_N\_Micro\_PICT0141, 07\_ES\_N\_Micro\_PICT0143



Figure 109: 07\_ES\_N\_BO\_DSC\_3285

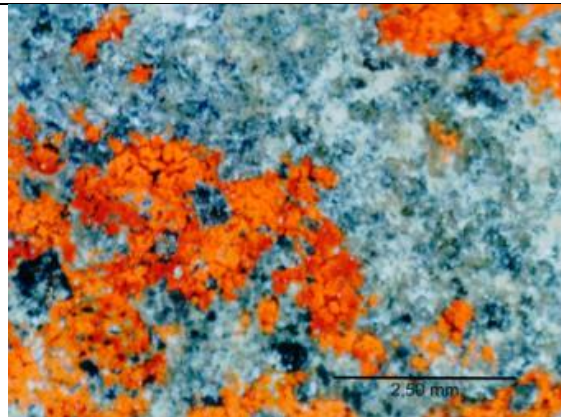


Figure 110: 07\_ES\_N\_Micro\_PICT0143



## 2.4. Conclusion

One of the mayor problems of 07\_ES is the high humidity in the chamber. This is an ideal condition for biological overgrowth, moss, lichens, algae and fungi growth at the walls.

Water running marks and salt efflorescence are visible. This shows an additional moisture income by rain water, which is obviously reaching the monument. The water, running into the chamber is caused by the squarish opening in the ceiling and deep cracks in the modern roof. Without a functional roof a water impermeability is no longer for certain.

A deep crack goes through the architrave of the door (07\_EN\_N). It should be checked if this is a static problem.

## 3. Bibliography

D'AMBROSIO ANTONIO, DE CARO STEFANO: *Un impegno per Pompei, fotopiano e documentazione della necropoli di Porta Nocera*, Rozzano 1983

DELLA CORTE M.: *NSc*, 1958, p. 142, No. 337-340, p. 151 No. 380-384

ANDRINGA VAN, WILIAM; ET AL.: *Mourir à Pompéi, Fouille D'Un Quartier Funéraire de la Nécropole Romaine de Porta Nocera*; Rom 2013

<http://pompeiiinpictures.com/pompeiiinpictures/Tombs/tombs%20nocen%20p3.htm>; date 10.02.2015.

## 4. Photo documentation

### TERMINOLOGY OF PICTURES:

funerary monument\_orientation\_description\_picture number camera

e.g. 14\_EN\_S\_OT\_DSC\_6419

14\_EN = funerary monument; S = South (orientation); OT = Original Technique (description); DSC\_6419 = picture number camera

Abbreviations of descriptions	
BO	Biological Overgrowth
DAM	Damage
GRA	Graffiti
MI	Mobil Items
Micro	Microscope pictures
MR	Modern Roofing
MW	Modern Water Collector
OT	Original Technique
OW	Original Water Collecting System

## POMPEII SUSTAINABLE PRESERVATION PROJECT

**Topic:** Documentation of Funerary Monument 14\_EN and 07\_ES

Christina Elsässer B.A.

PI	Previous Interventions
TM	Tool Marks
WP	Working Pictures

## **5. Appendix**

### **5.1. Mappings 14\_EN**



### 5.1.1. Graffiti

## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S

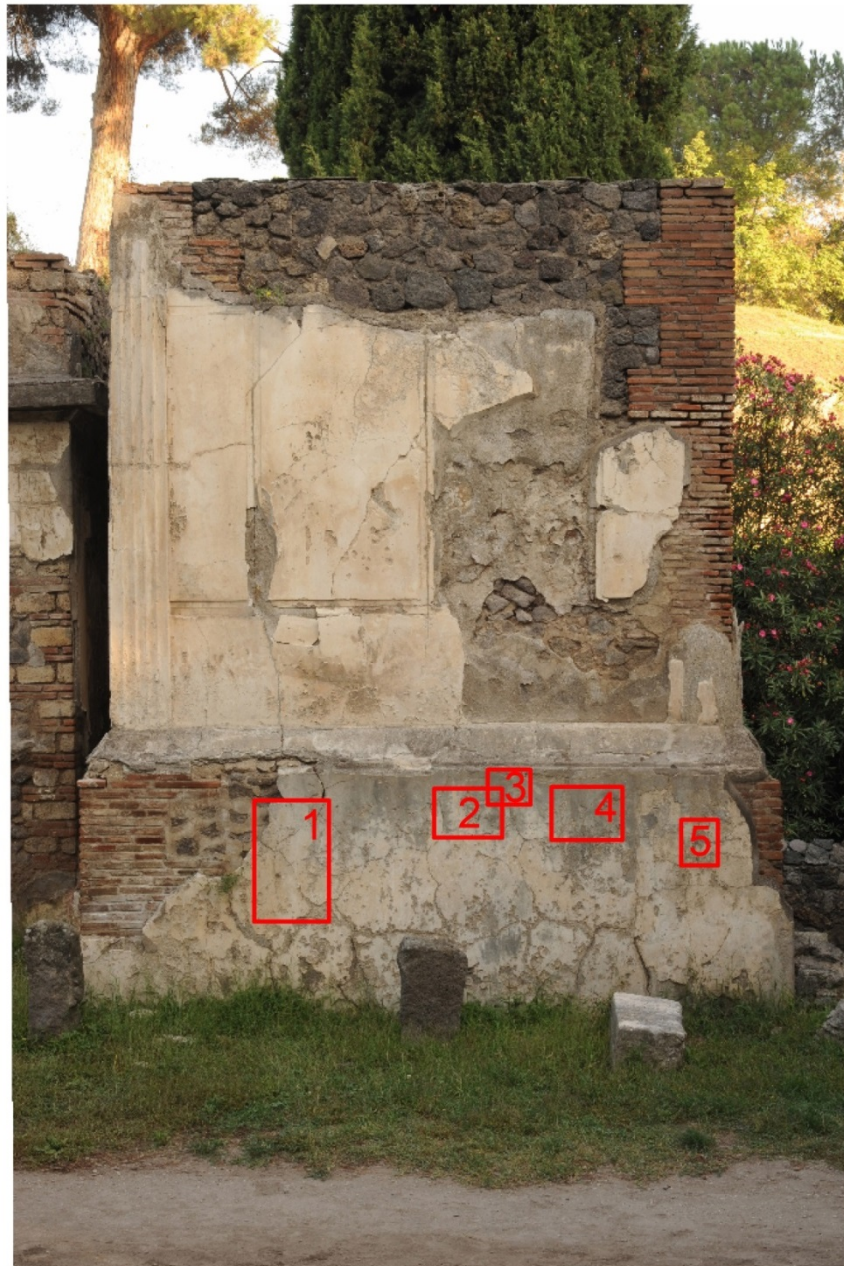
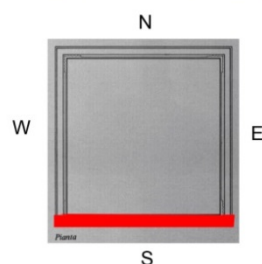
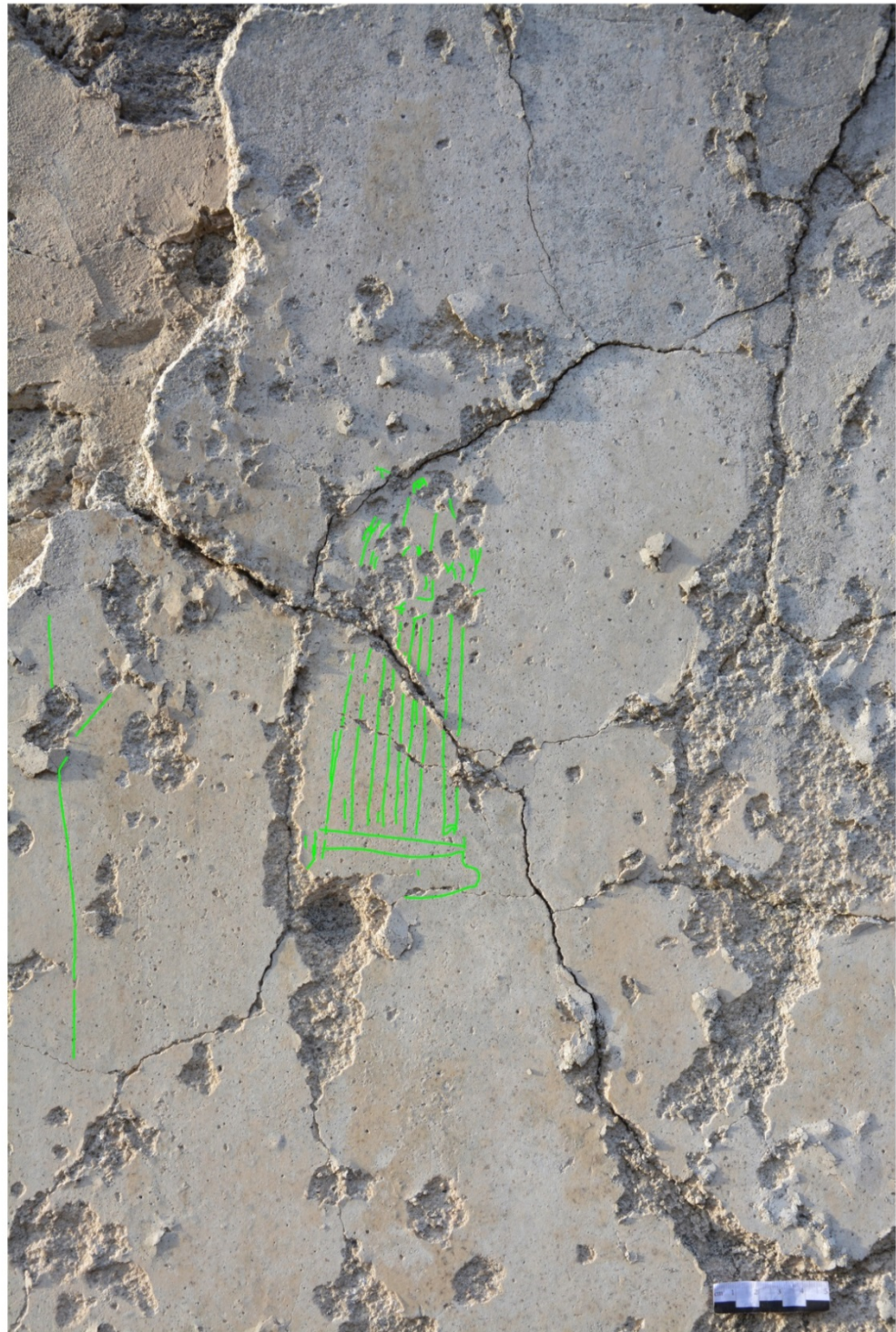


Figure 111: Map of position of graffiti.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S



### LEGEND OF MAPPING

| incision of graffito

(see pictures:

14\_EN\_S\_GRA\_DSC\_3374\_drawing

14\_EN\_S\_GRA\_DSC\_3374)

Figure 112: Map of incision of graffito at position 1.



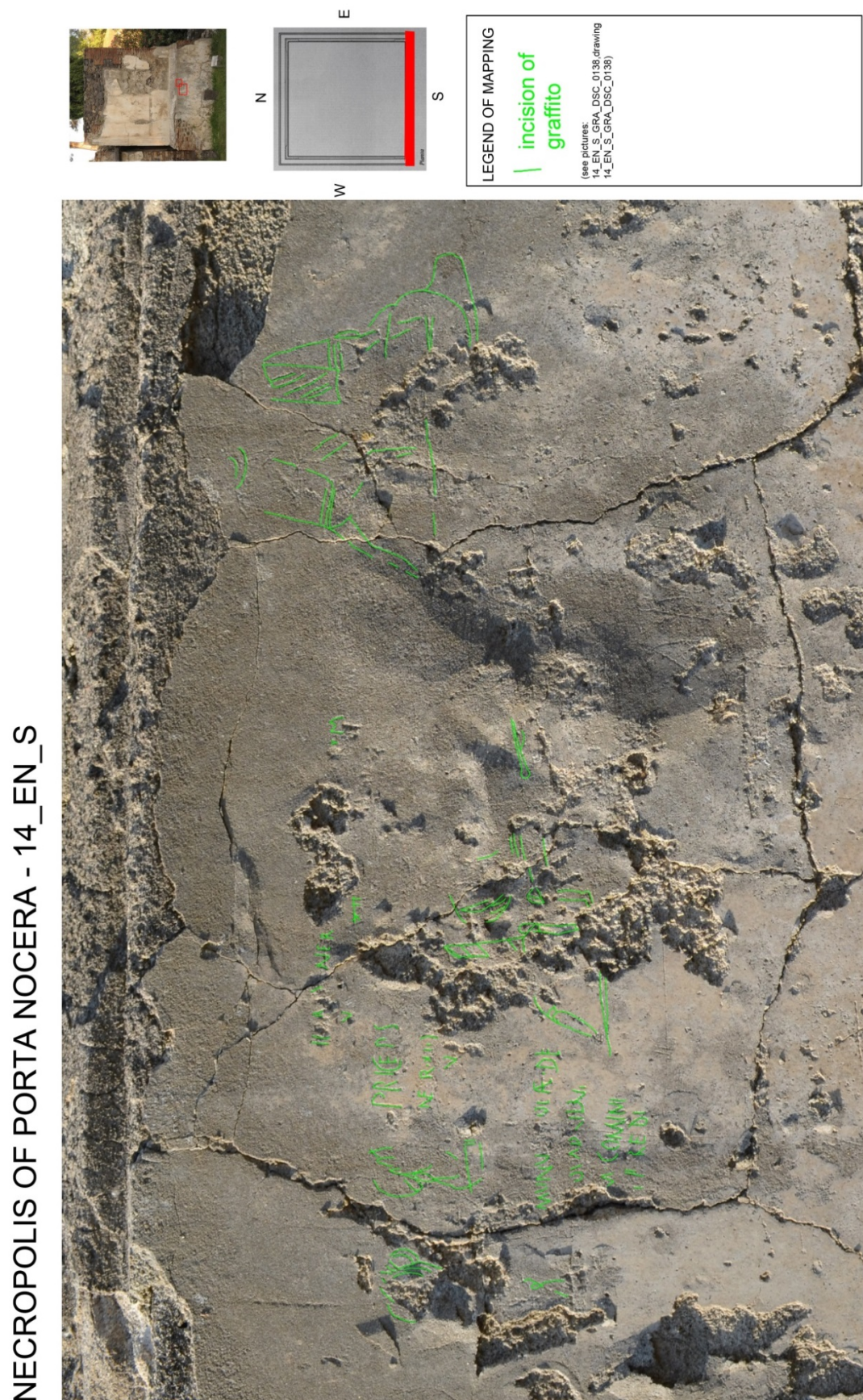
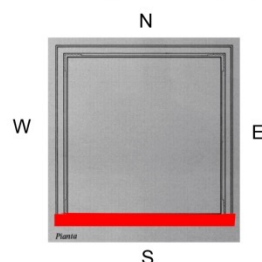
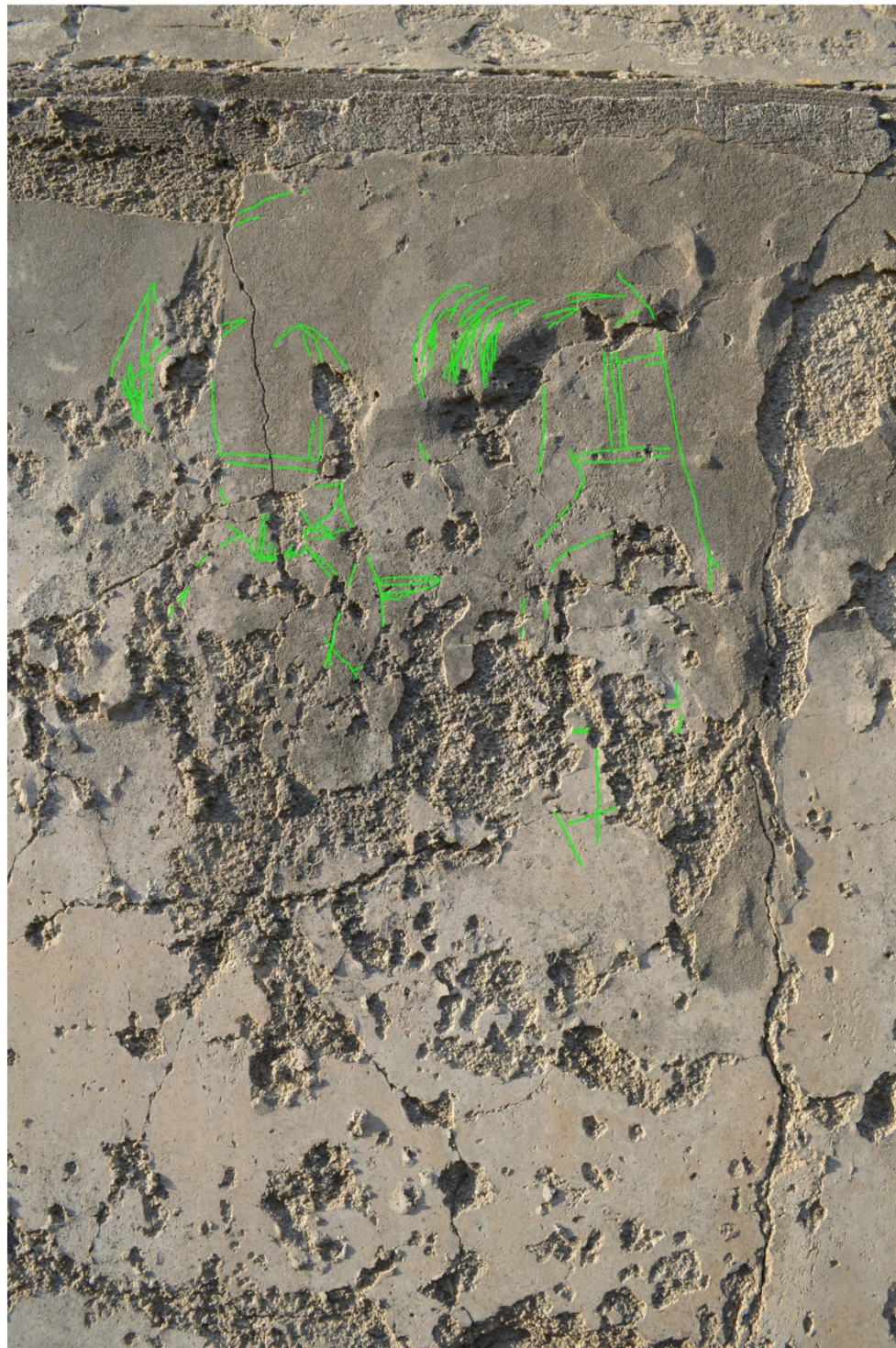


Figure 113: Map of incision of graffito at position 2 and 3.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S



### LEGEND OF MAPPING

| incision of graffito

(see pictures:

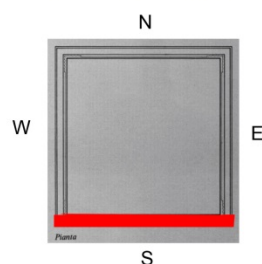
14\_EN\_S\_GRA\_DSC\_0140\_drawing

14\_EN\_S\_GRA\_DSC\_0140)

Figure 114: Map of incision of graffito at position 4.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S



### LEGEND OF MAPPING

| incision of graffito

(see pictures:

14\_EN\_S\_GRA\_DSC\_0141\_drawing

14\_EN\_S\_GRA\_DSC\_0141)

Figure 115: Map of incision of graffito at position 5.



### 5.1.2. Previous interventions

## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S

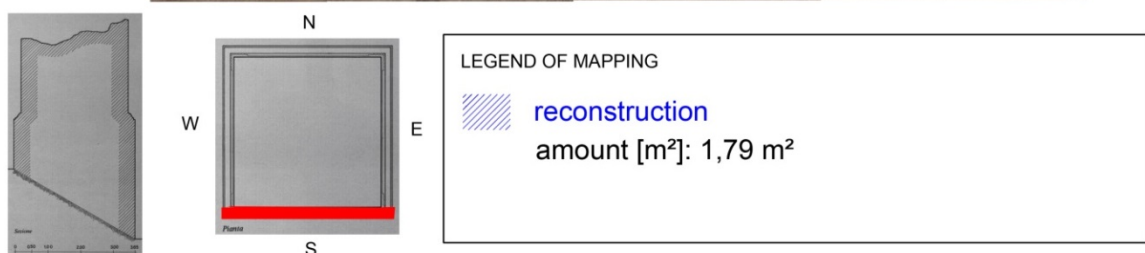
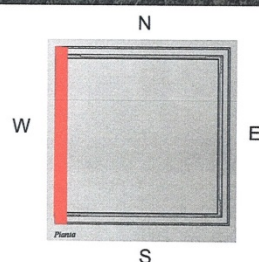


Figure 116: map of reconstruction of 14\_EN\_S.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_W



### LEGEND OF MAPPING

 RECONSTRUCTION

ESTIMATED AMOUNT [m<sup>2</sup>]: 1,5 m<sup>2</sup>

Figure 117: map of reconstruction of 14\_EN\_W.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N

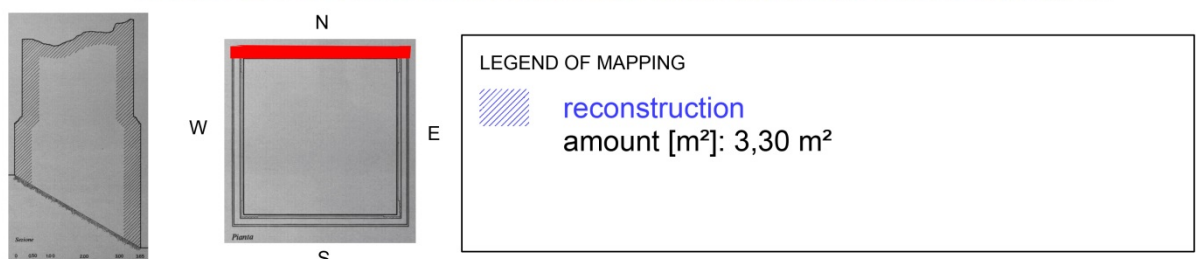
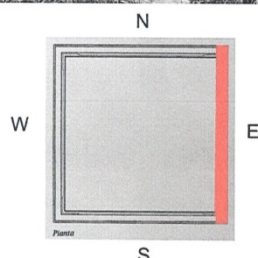
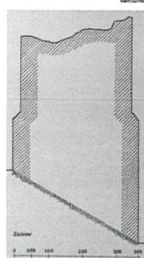


Figure 118: map of reconstruction of 14\_EN\_N.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_E



### LEGEND OF MAPPING

 RECONSTRUCTION

ESTIMATED AMOUNT [m<sup>2</sup>]: 1,98 m<sup>2</sup>

Figure 119: map reconstruction of 14\_EN\_E.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S

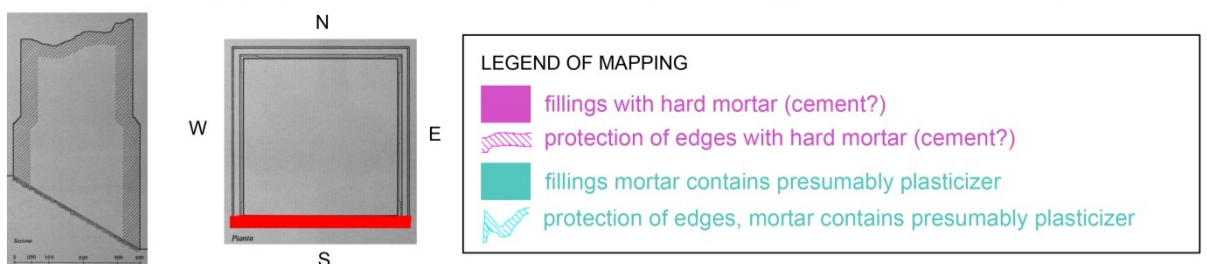


Figure 120: map of fillings and protections of edges at 14\_EN\_S.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N

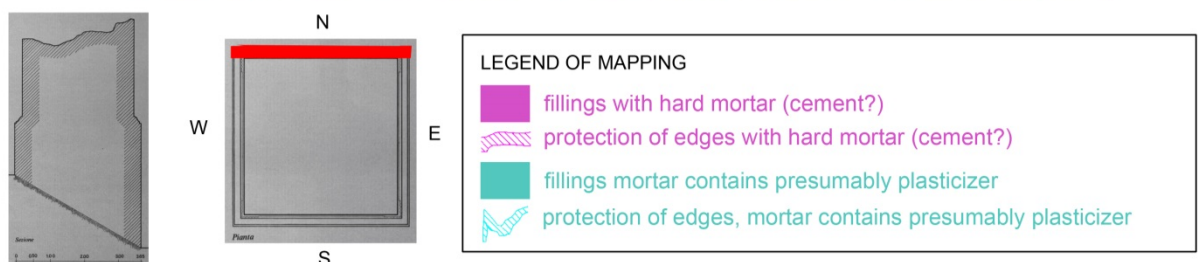


Figure 121: map of fillings and protections of edges at 14\_EN\_N.



### 5.1.3. Damages

## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S

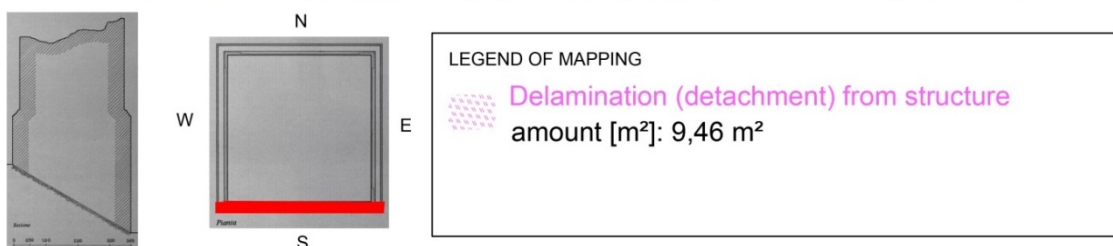
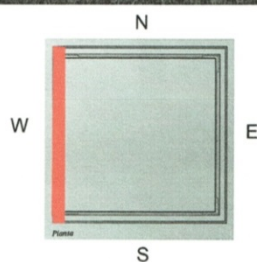


Figure 122: map 14\_EN\_S delamination (detachment) from structure.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_W



### LEGEND OF MAPPING

MAPPINGS FOR THE CONSERVATION MASTERPLAN

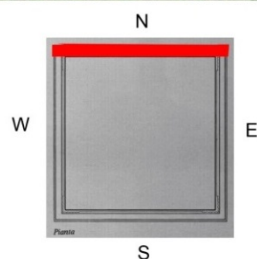
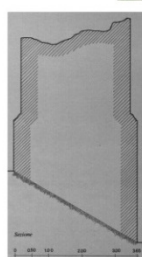
 DELAMINATION (DETACHMENT) FROM STRUCTURE

ESTIMATED AMOUNT [m<sup>2</sup>]: 7,9 m<sup>2</sup>

Figure 123: map 14\_EN\_W delamination (detachment) from structure.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N



### LEGEND OF MAPPING



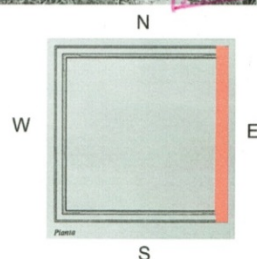
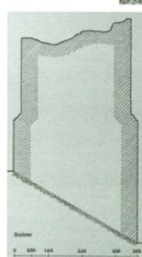
delamination (detachment) from structure

amount [m<sup>2</sup>]: 5,66 m<sup>2</sup>

Figure 124: map 14\_EN\_N delamination (detachment) from structure.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_E



### LEGEND OF MAPPING

MAPPINGS FOR THE CONSERVATION MASTERPLAN

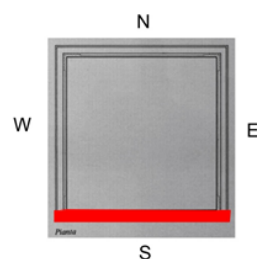
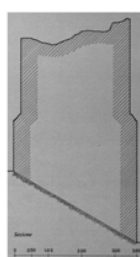
 DELAMINATION (DETACHMENT) FROM STRUCTURE

ESTIMATED AMOUNT [m<sup>2</sup>]: 3,3 m<sup>2</sup>

Figure 125: map 14\_EN\_E delamination (detachment) from structure.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S



### LEGEND OF MAPPING


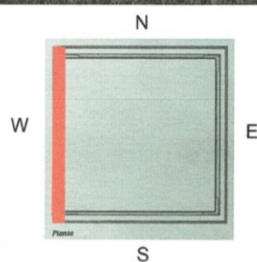
 Delamination (detachment) preparatory layers from each others  
amount [m<sup>2</sup>]: 1,75 m<sup>2</sup>

Figure 126: map 14\_EN\_S delamination (detachment) preparatory layers from each other's.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_W



### LEGEND OF MAPPING

MAPPINGS FOR THE CONSERVATION MASTERPLAN

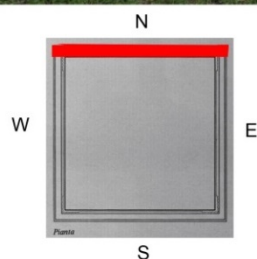
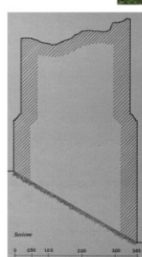
 DELAMINATION (DETACHMENT) PREPARATORY LAYERS FROM EACH OTHER

ESTIMATED AMOUNT [m<sup>2</sup>]: 2,0 m<sup>2</sup>

Figure 127: map 14\_EN\_W delamination (detachment) preparatory layers from each other's.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N



### LEGEND OF MAPPING

 delamination (detachment) preparatory layers from each other

amount [m<sup>2</sup>]: 1,02 m<sup>2</sup>

Figure 128: map 14\_EN\_N delamination (detachment) preparatory layers from each other's.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_E

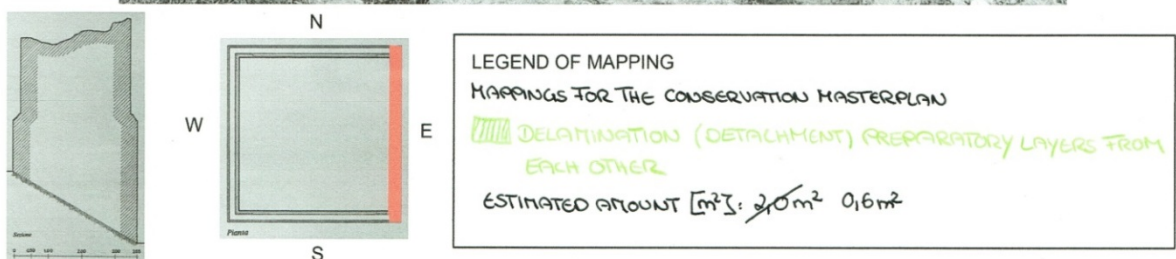
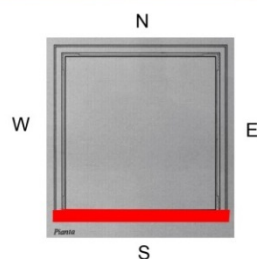
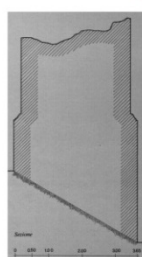


Figure 129: map 14\_EN\_E delamination (detachment) preparatory layers from each other's.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S



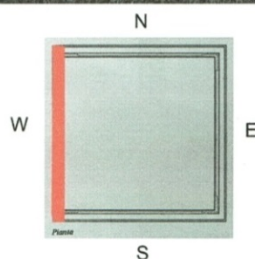
### LEGEND OF MAPPING

 Delamination (detachment) Intonaco from preparatory layers amount [m<sup>2</sup>]: 3,54 m<sup>2</sup>

Figure 130: map 14\_EN\_S delamination (detachment) Intonaco from preparatory layers.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_W



LEGEND OF MAPPING  
MAPPINGS FOR THE CONSERVATIONS MASTERPLAN  
DELAMINATION INTONACO  
ESTIMATED AMOUNT [m<sup>2</sup>]: 5,9 m<sup>2</sup>

Figure 131 map 14\_EN\_W delamination (detachment) Intonaco from preparatory layers.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N

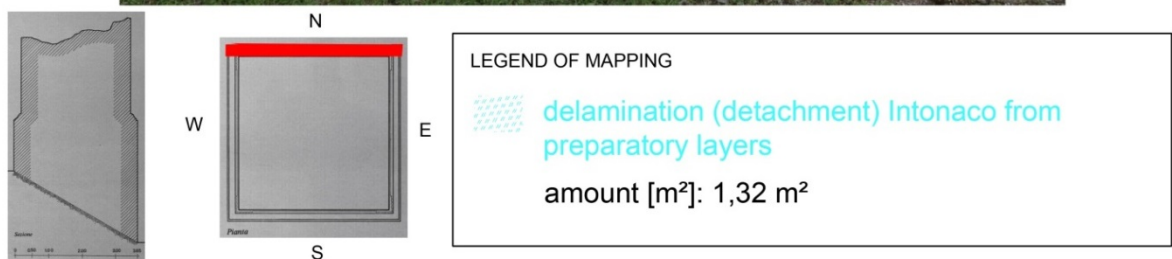
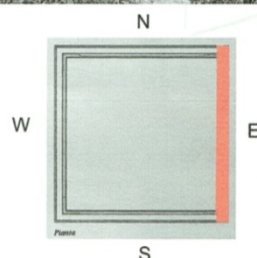
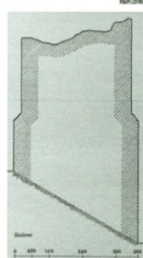


Figure 132: map 14\_EN\_N delamination (detachment) Intonaco from preparatory layers.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_E

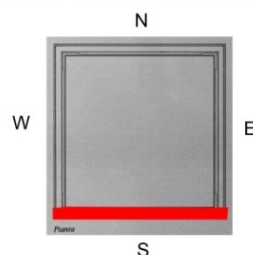
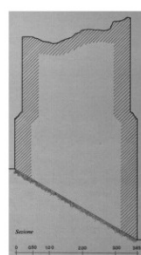


LEGEND OF MAPPING  
MAPPINGS FOR THE CONSERVATION MASTER PLAN  
/// DELAMINATION INTONACO  
ESTIMATED AMOUNT [m<sup>2</sup>]: 3,1m<sup>2</sup>

Figure 133: map 14\_EN\_E delamination (detachment) Intonaco from preparatory layers.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S



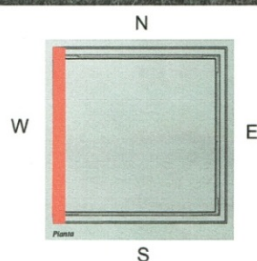
### LEGEND OF MAPPING

- Preparatory layers scaling amount [m<sup>2</sup>]: 0,08 m<sup>2</sup>
- ▨ Intonaco scaling amount [m<sup>2</sup>]: 0,82 m<sup>2</sup>
- Preparatory layers flaking amount [m<sup>2</sup>]: 1,07 m<sup>2</sup>
- ▨ Intonaco flaking amount [m<sup>2</sup>]: 0,43 m<sup>2</sup>

Figure 134: map 14\_EN\_S preparatory layers scaling, Intonaco scaling, preparatory layers flaking and Intonaco flaking.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_W

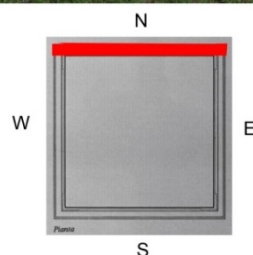
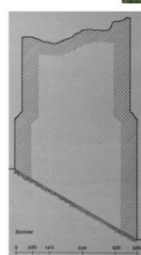


LEGEND OF MAPPING  
MAPPINGS FOR THE CONSERVATION MASTER PLAN  
/// SCALING AND FLAKING OF THE PLASTER  
ESTIMATED AMOUNT [m<sup>2</sup>]: 6,0 m<sup>2</sup>

Figure 135: map 14\_EN\_W scaling and flaking of plaster.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N



### LEGEND OF MAPPING

	Preparatory layers scaling	amount [m <sup>2</sup> ]: 0,67 m <sup>2</sup>
	Intonaco scaling	amount [m <sup>2</sup> ]: 0,0093 m <sup>2</sup>
	Preparatory layers flaking	amount [m <sup>2</sup> ]: 0,0 m <sup>2</sup>
	Intonaco flaking	amount [m <sup>2</sup> ]: 0,0 m <sup>2</sup>

Figure 136: map 14\_EN\_N preparatory layers scaling, Intonaco scaling, preparatory layers flaking and Intonaco flaking.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_E

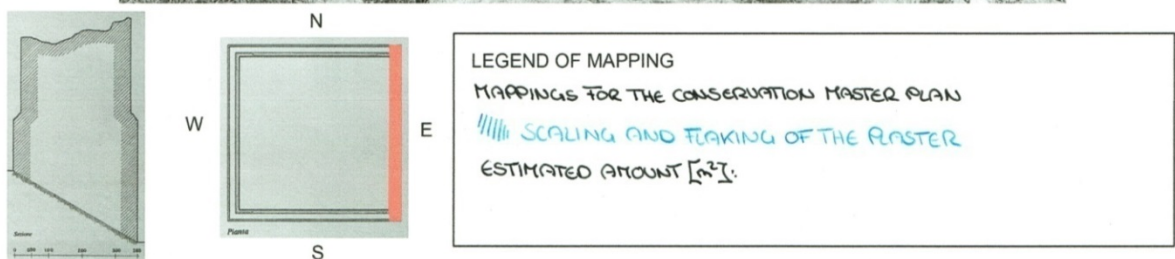
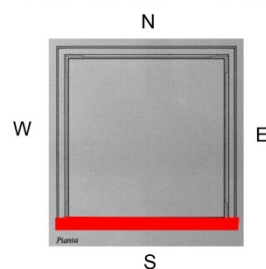
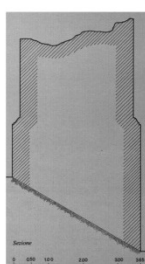



Figure 137: map 14\_EN\_E scaling and flaking of plaster.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S



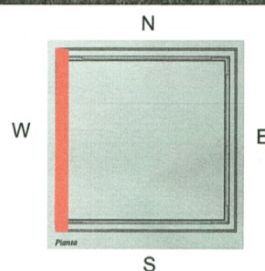
### LEGEND OF MAPPING

 Preparatory layers powdering  
amount [m<sup>2</sup>]: 0,18 m<sup>2</sup>

 Intonaco powdering amount [m<sup>2</sup>]: 0,12 m<sup>2</sup>



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_W



### LEGEND OF MAPPING

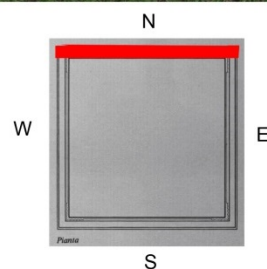
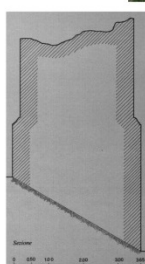
MAPPINGS FOR THE CONSERVATION MASTER PLAN

////// PREPARATORY LAYERS POWDERING


ESTIMATED AMOUNT [m<sup>2</sup>]: 0,80 m<sup>2</sup>



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N



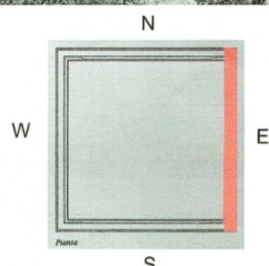
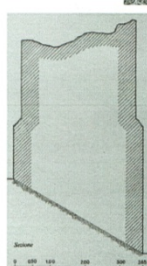
### LEGEND OF MAPPING

 Preparatory layers powdering  
amount [m<sup>2</sup>]: 0,13 m<sup>2</sup>

 Intonaco powdering amount [m<sup>2</sup>]: 0,0 m<sup>2</sup>



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_E



### LEGEND OF MAPPING

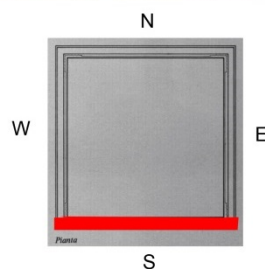
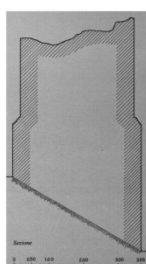
MAPPINGS FOR THE CONSERVATION MASTER PLAN

/// PREPARATORY LAYERS POWDERING

ESTIMATED AMOUNT [m²]:



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S



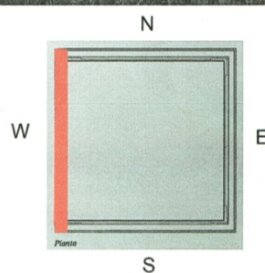
### LEGEND OF MAPPING

( Deep Cracks (presumably reaching through all plaster layers) amount [m]: 11,22 m

✂ Cracks staying at the surface amount [m]: 45,46 m



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_W



### LEGEND OF MAPPING

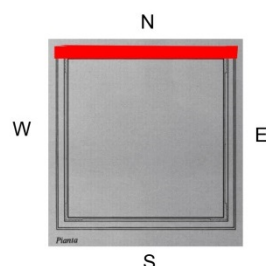
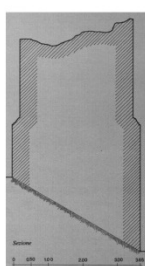
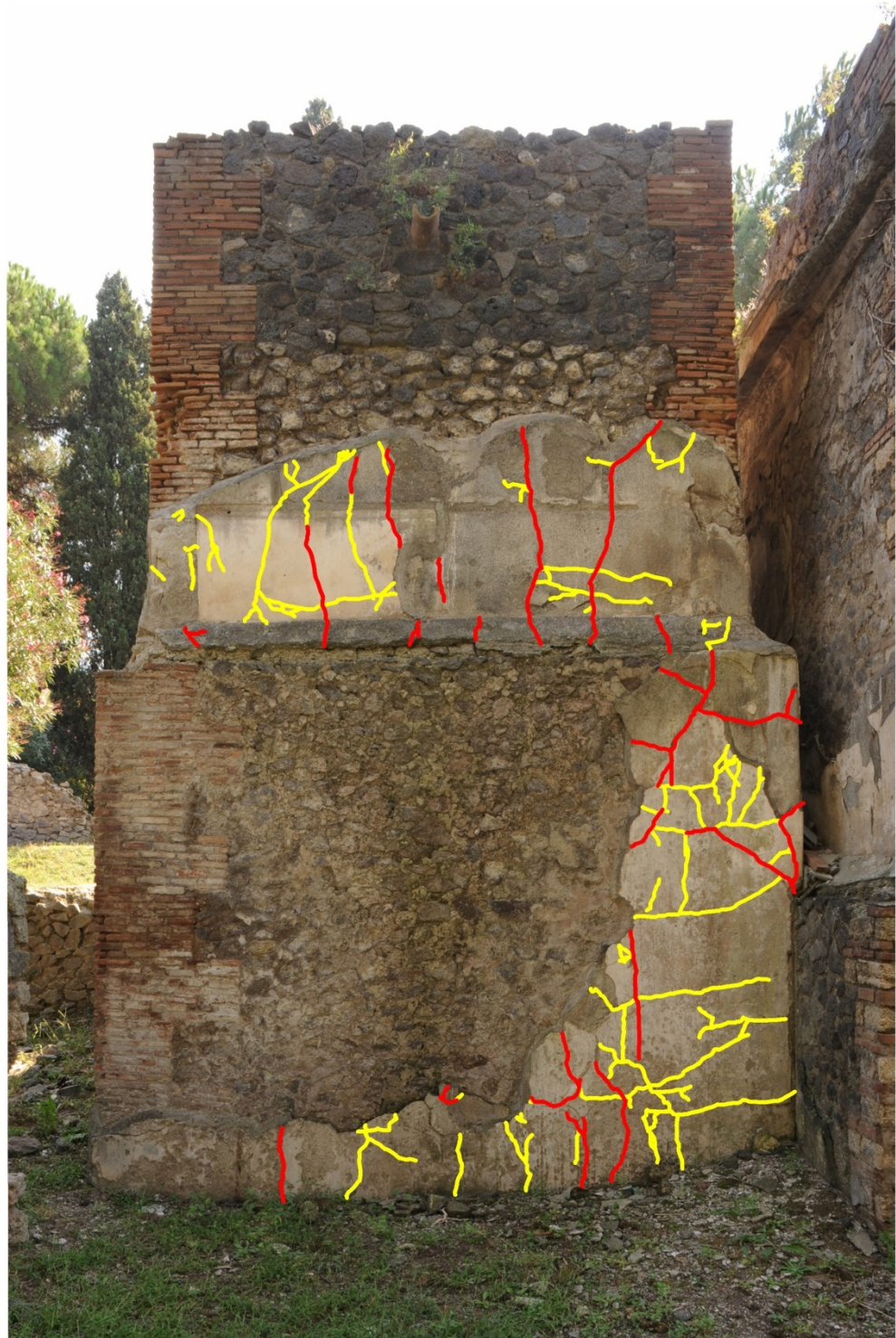
MAPPINGS FOR THE CONSERVATION MASTER PLAN

— CRACKS

ESTIMATED AMOUNT [m]: 11,30 m



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N

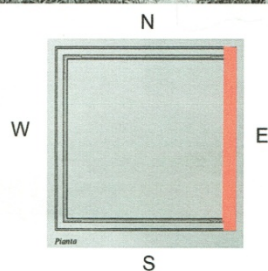
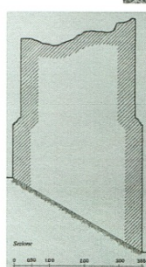


### LEGEND OF MAPPING

- | Deep Cracks (presumably reaching through all plaster layers) amount [m]: 11,4 m
- | Cracks staying at the surface amount [m]: 20,45 m



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_E



### LEGEND OF MAPPING

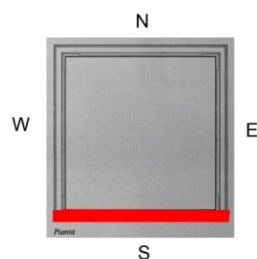
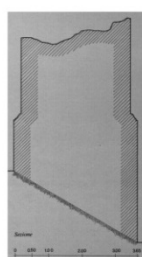
MAPPINGS FOR THE CONSERVATION MASTER PLAN

— CRACKS

ESTIMATED AMOUNT [m]: 5,5m



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S



### LEGEND OF MAPPING

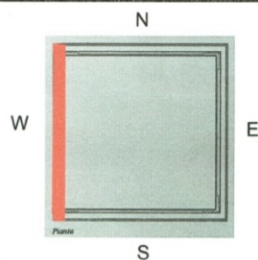


missing mortar amount [m<sup>2</sup>]: 0,18 m<sup>2</sup>

Figure 138: Map 14\_EN\_S of missing mortar.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_W



### LEGEND OF MAPPING

MAPPINGS FOR THE CONSERVATION MASTER PLAN

MISSING MORTAR

ESTIMATED AMOUNT [m<sup>2</sup>]: 0,05 m<sup>2</sup>

Figure 139: map 14\_EN\_W of missing mortar.



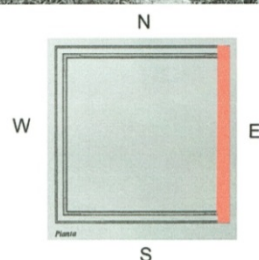
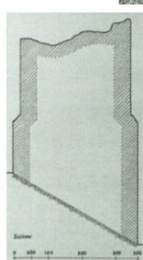
## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N



Figure 140: map 14\_EN\_N of missing mortar.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_E



### LEGEND OF MAPPING

#### MAPPINGS FOR THE CONSERVATION MASTER PLAN

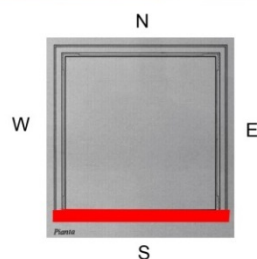
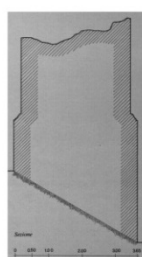
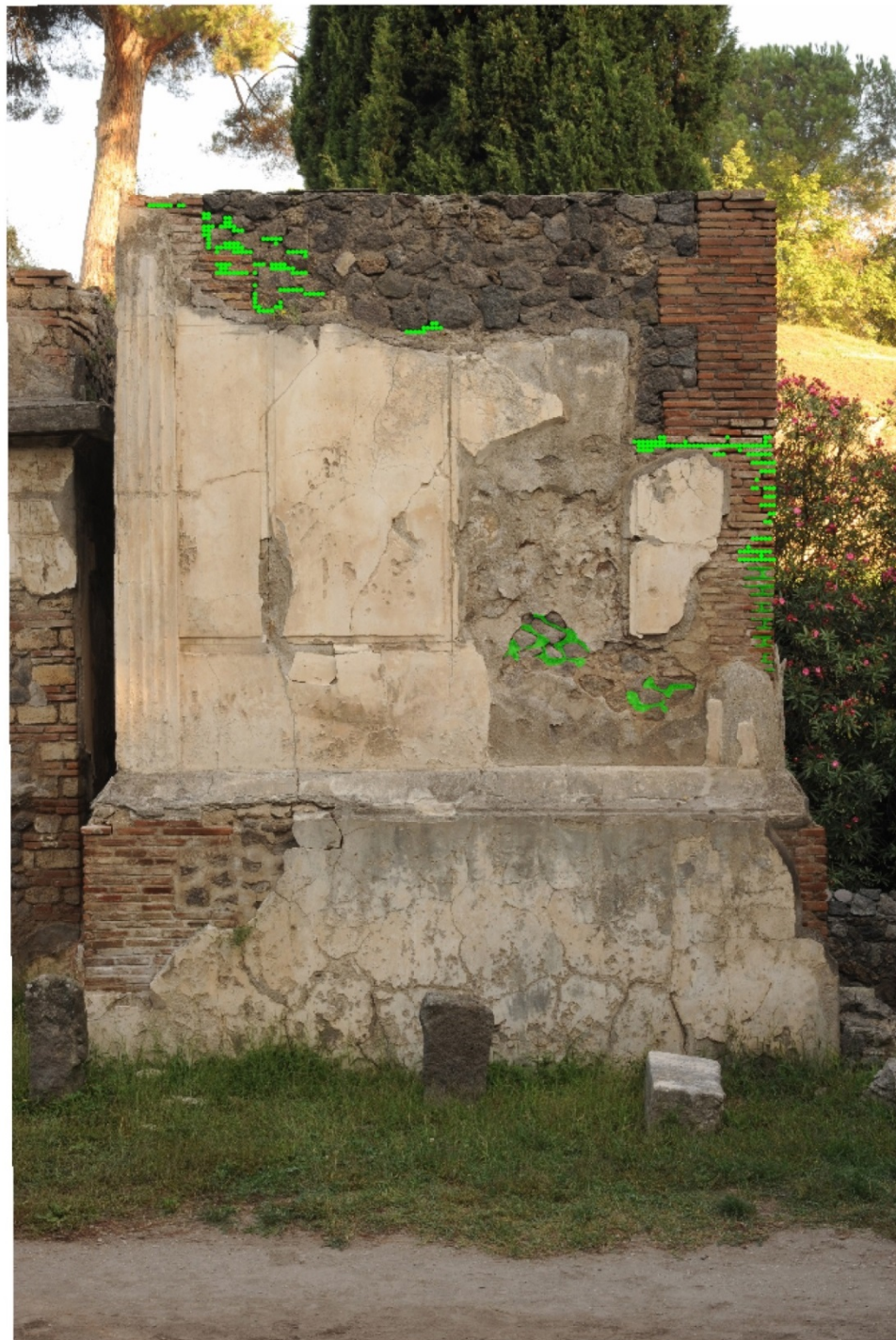
 MISSING MORTAR

ESTIMATED AMOUNT [m<sup>2</sup>]: 1,2 m<sup>2</sup>

Figure 141: map 14\_EN\_E of missing mortar.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S



### LEGEND OF MAPPING



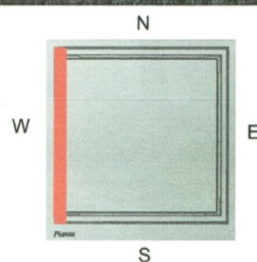
-  powdering mortar amount [m<sup>2</sup>]: 0,06 m<sup>2</sup>
-  presumably powdering mortar amount [m<sup>2</sup>]: 0,1 m<sup>2</sup>

Figure 142: map 14\_EN\_S of powdering and presumably powdering mortar.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_W



### LEGEND OF MAPPING

MAPPINGS FOR THE CONSERVATION MASTER PLAN

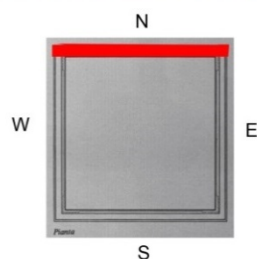
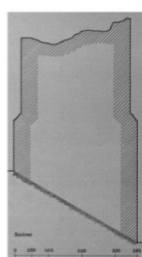
POWDERING MORTAR + PRESUMABLY POWDERING MORTAR

ESTIMATED AMOUNT [m<sup>2</sup>]: 1,30 m<sup>2</sup>

Figure 143: map 14\_EN\_W of powdering and presumably powdering mortar.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N



### LEGEND OF MAPPING

 powdering mortar amount [m<sup>2</sup>]: 0,16 m<sup>2</sup>


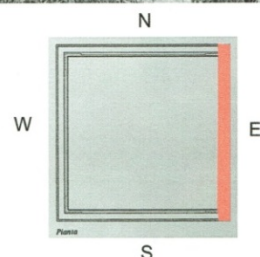
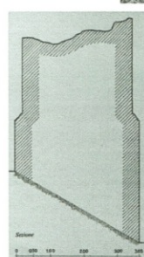
 presumably powdering mortar  
amount [m<sup>2</sup>]: 1,55 m<sup>2</sup>

Figure 144: map 14\_EN\_N of powdering and presumably powdering mortar.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_E



### LEGEND OF MAPPING

#### MAPPINGS FOR THE CONSERVATION MASTER PLAN

POWDERING MORTAR + PRESUMABLY POWDERING MORTAR

ESTIMATED AMOUNT [ $m^2$ ]: 1,1  $m^2$

Figure 145: map 14\_EN\_E of powdering and presumably powdering mortar.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S

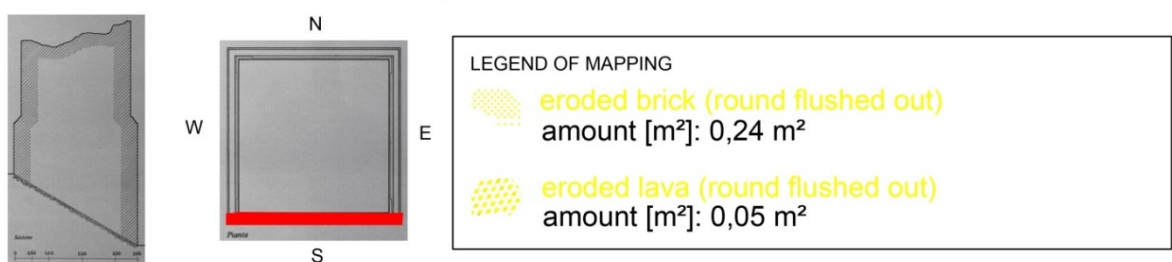
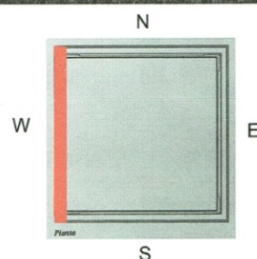


Figure 146: map 14\_EN\_S of eroded (round flushed out) brick and lava.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_W



### LEGEND OF MAPPING

#### MAPPINGS FOR THE CONSERVATION MASTER PLAN

ERODED BRICK (ROUND FLUSHED OUT)

ESTIMATED AMOUNT ERODED BRICK [m<sup>2</sup>]: 0,0 m<sup>2</sup> (see reconstruction)

ERODED LAVA (ROUND FLUSHED OUT)

ESTIMATED AMOUNT ERODED LAVA [m<sup>2</sup>]: 0,0 m<sup>2</sup> (see reconstruction)

Figure 147: map 14\_EN\_W of eroded (round flushed out) brick and lava.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N

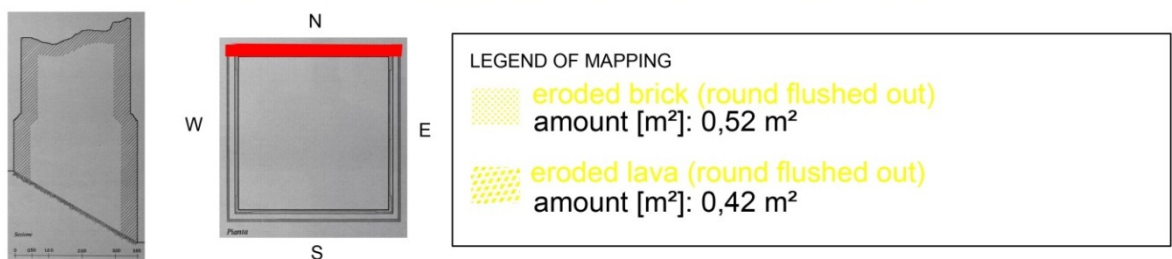
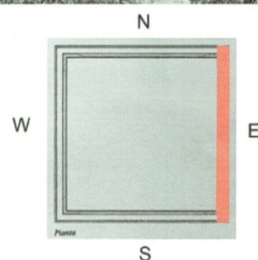
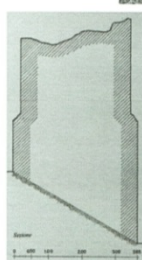


Figure 148: map 14\_EN\_N of eroded (round flushed out) brick and lava.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_E



### LEGEND OF MAPPING

#### MAPPINGS FOR THE CONSERVATION MASTER PLAN

ERODED BRICK (ROUND FLUSHED OUT)

ESTIMATED AMOUNT ERODED BRICK [m<sup>2</sup>]: 0,48 m<sup>2</sup>

ERODED LAVA (ROUND FLUSHED OUT)

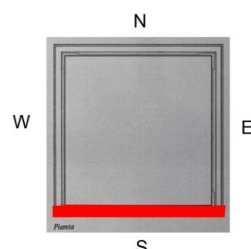
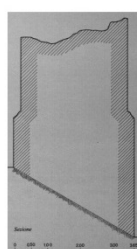
ESTIMATED AMOUNT ERODED LAVA [m<sup>2</sup>]: 0,70 m<sup>2</sup>

Figure 149: map 14\_EN\_E of eroded (round flushed out) brick and lava.



#### 5.1.4. Collapsing areas

### NECROPOLIS OF PORTA NOCERA - 14\_EN\_S



#### LEGEND OF MAPPING




-  lacunae, collapsing
-  loose plaster fragments, collapsng
-  loose stones, brick and architectural elements

Figure 150: map 14\_EN\_S of collapsing areas.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N

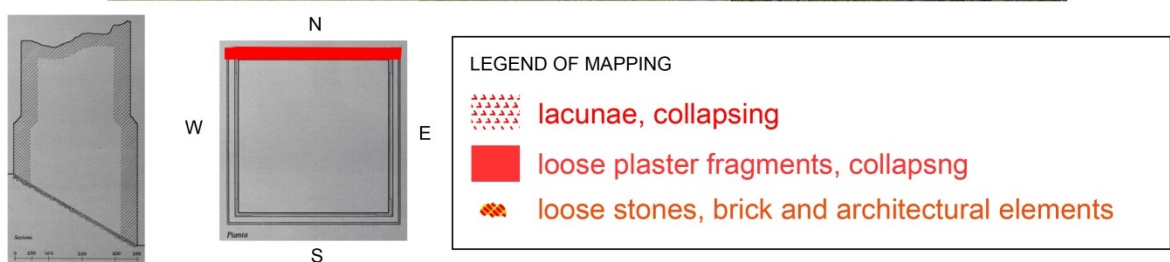
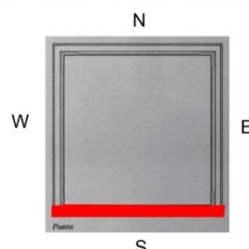
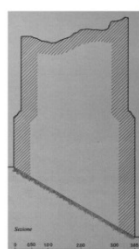
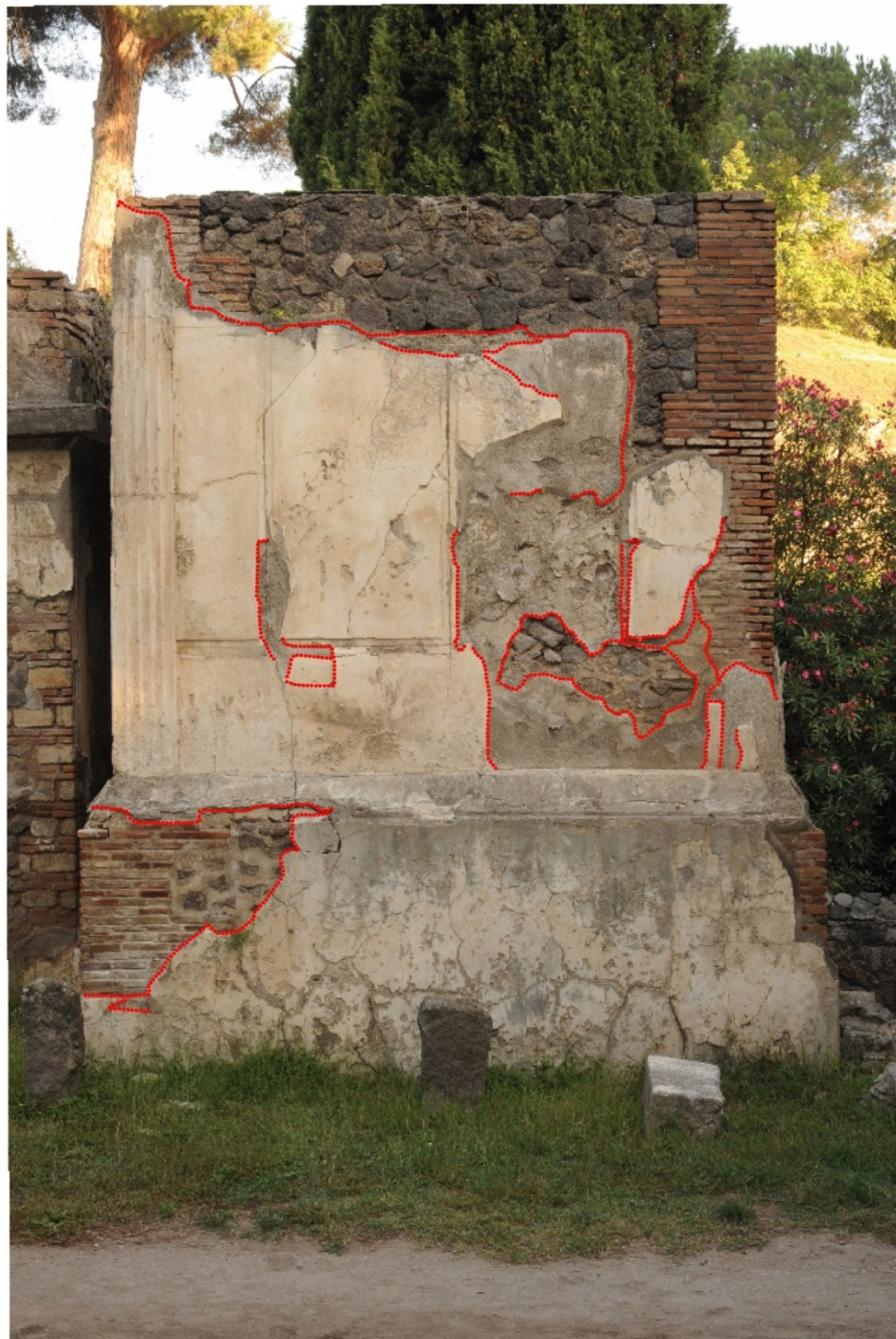


Figure 151: map 14\_EN\_N of collapsing areas.



### 5.1.5. Necessary Conservation actions

## NECROPOLIS OF PORTA NOCERA - 14\_EN\_S



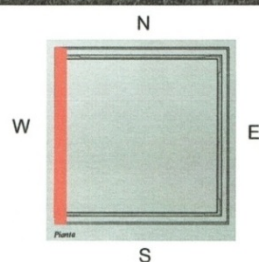
#### LEGEND OF MAPPING

--- Protection of the edges amount [m]: 17,95 m

Figure 152: map 14\_EN\_S of protection of the edges necessary for stabilization.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_W



LEGEND OF MAPPING  
MAPPINGS FOR THE CONSERVATION MASTER PLAN  
— PROTECTION OF THE EDGES  
ESTIMATED AMOUNT [m]: 16,0 m

Figure 153: map 14\_EN\_W of protection of the edges necessary for stabilization.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N

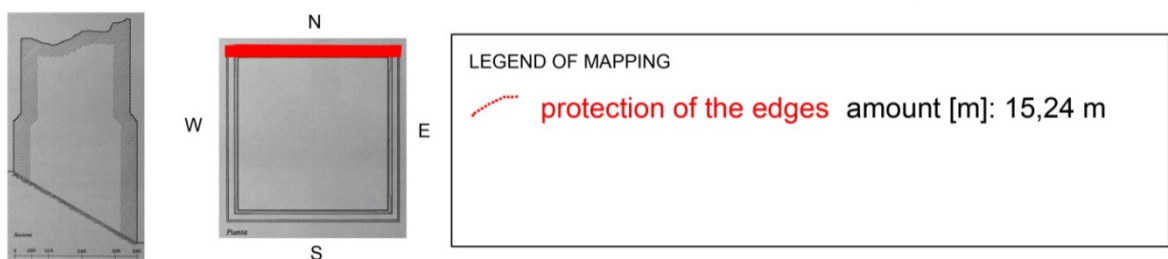
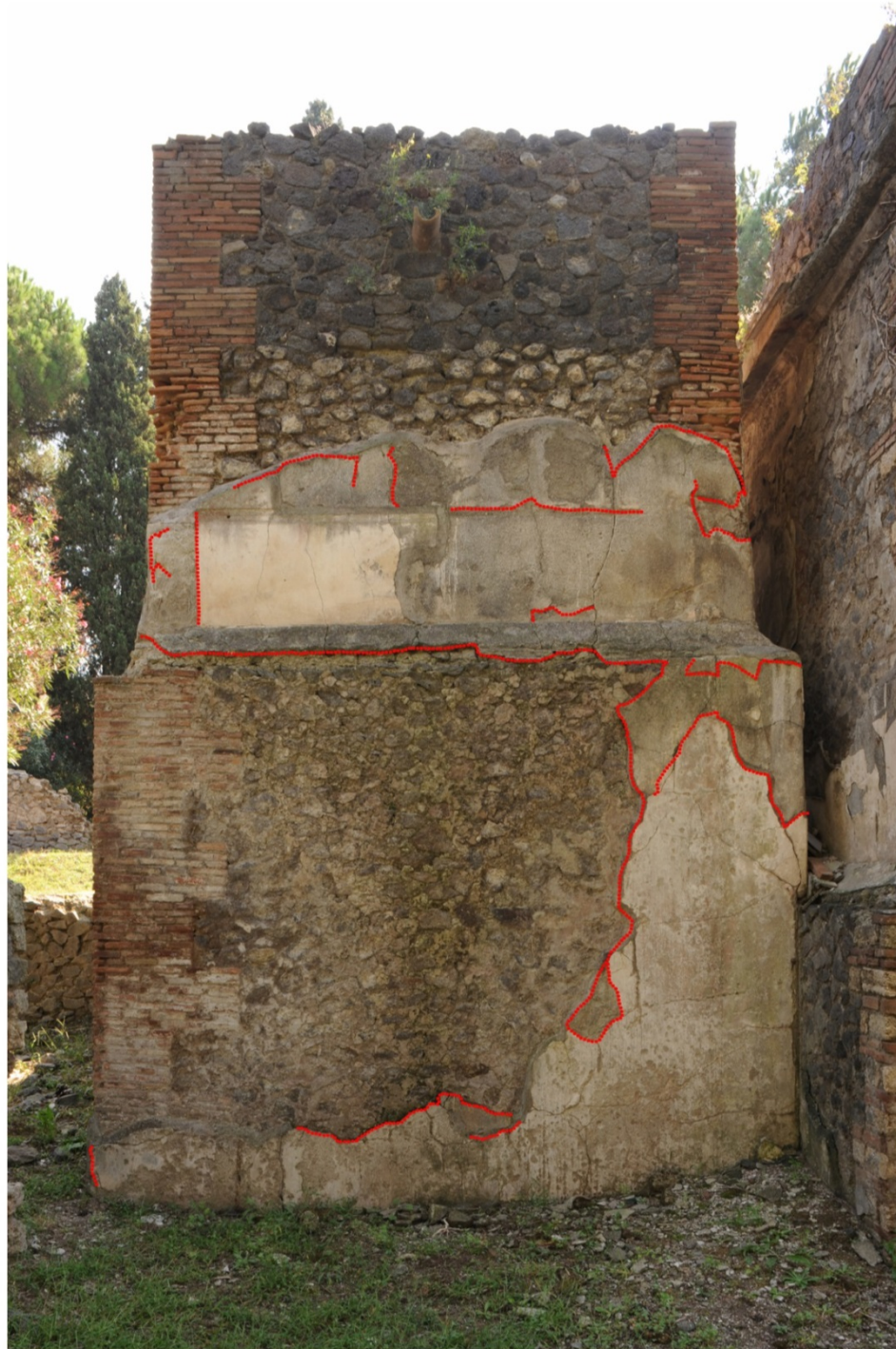


Figure 154: map 14\_EN\_N of protection of the edges necessary for stabilization.



## NECROPOLIS OF PORTA NOCERA - 14\_EN\_E

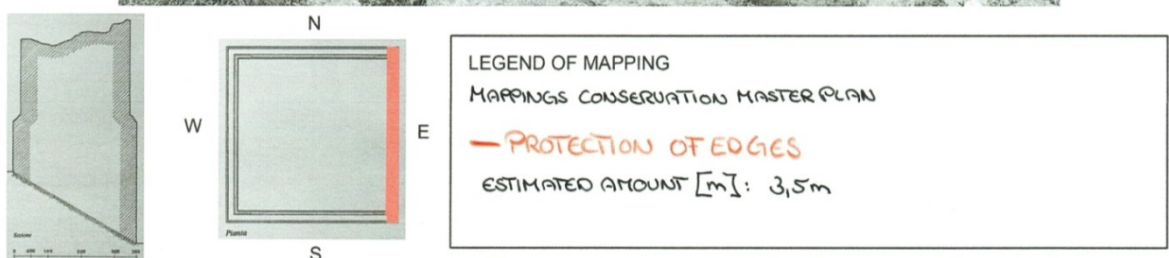


Figure 155: map 14\_EN\_E of protection of the edges necessary for stabilization.



### 5.1.6. Biological Overgrowth

## NECROPOLIS OF PORTA NOCERA - 14\_EN\_N

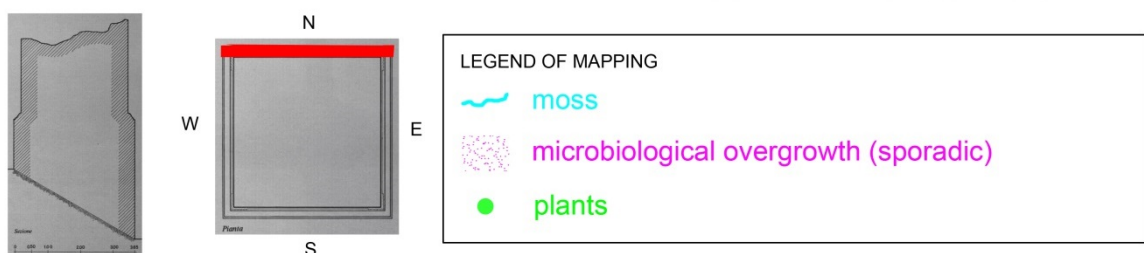
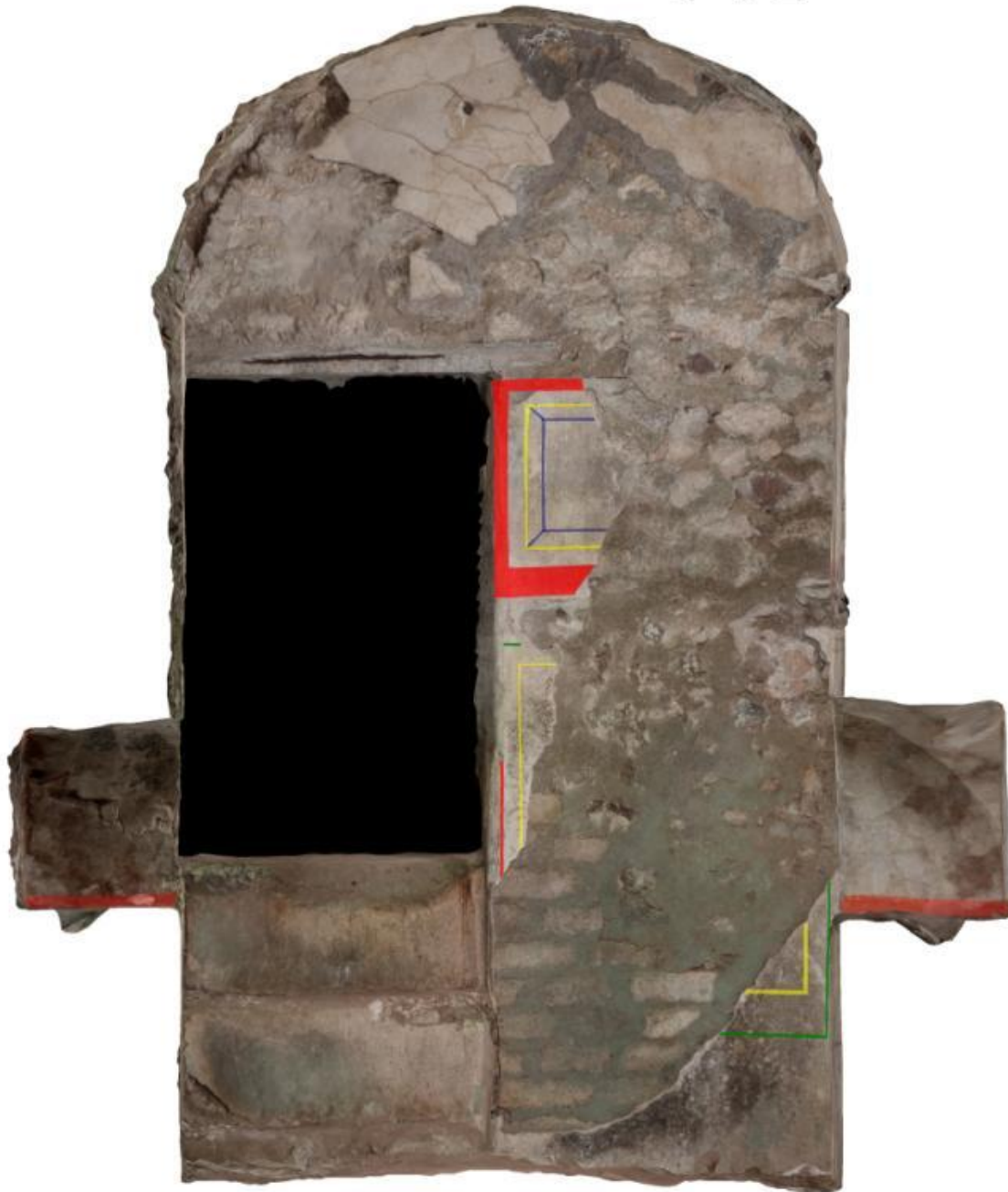


Figure 156: map 14\_EN\_N of biological overgrowth.

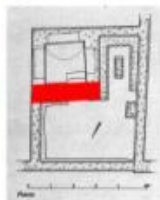
## 5.2. Mappings 07\_ES

### 5.2.1. Paint and former colors

#### NECROPOLIS OF PORTA NOCERA - 07\_ES\_N\_I



Picture kindly recieved from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



#### LEGEND OF MAPPING

- red colour
- ochre colour
- ochre red colour
- green colour

- bluish black colour

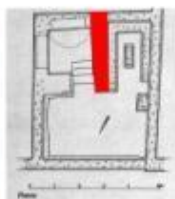
Figure 157: map 07\_ES\_N\_I of paint and former colors.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_W\_I



Picture kindly recieved from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



### LEGEND OF MAPPING

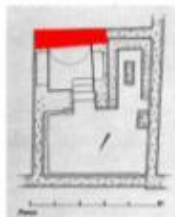
<span style="color: red;">■</span>	red colour	<span style="color: blue;">■</span>	bluish black colour
<span style="color: yellow;">■</span>	ochre colour		
<span style="color: brown;">■</span>	ochre red colour		
<span style="color: green;">■</span>	green colour		

Figure 158: map 07\_ES\_W\_I of paint and former colors.

## NECROPOLIS OF PORTA NOCERA - 07\_ES\_S\_I



Picture kindly recieved from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



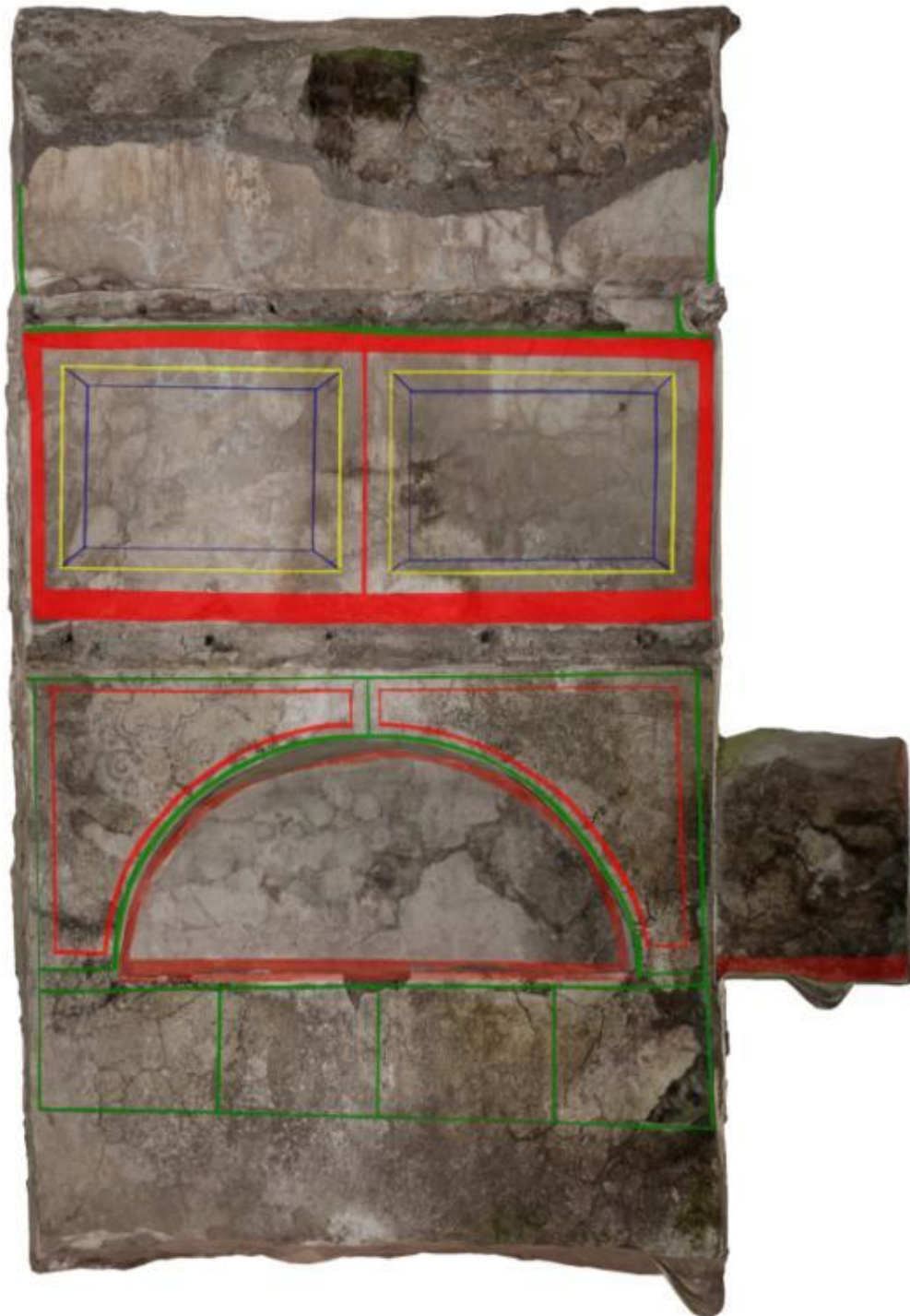
### LEGEND OF MAPPING

<span style="color: red;">■</span> red colour	<span style="color: blue;">■</span> bluish black colour
<span style="color: yellow;">■</span> ochre colour	
<span style="color: brown;">■</span> ochre red colour	
<span style="color: green;">■</span> green colour	

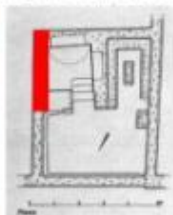
Figure 159: map 07\_ES\_S\_I of paint and former color.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_E\_I



Picture kindly recieved from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone

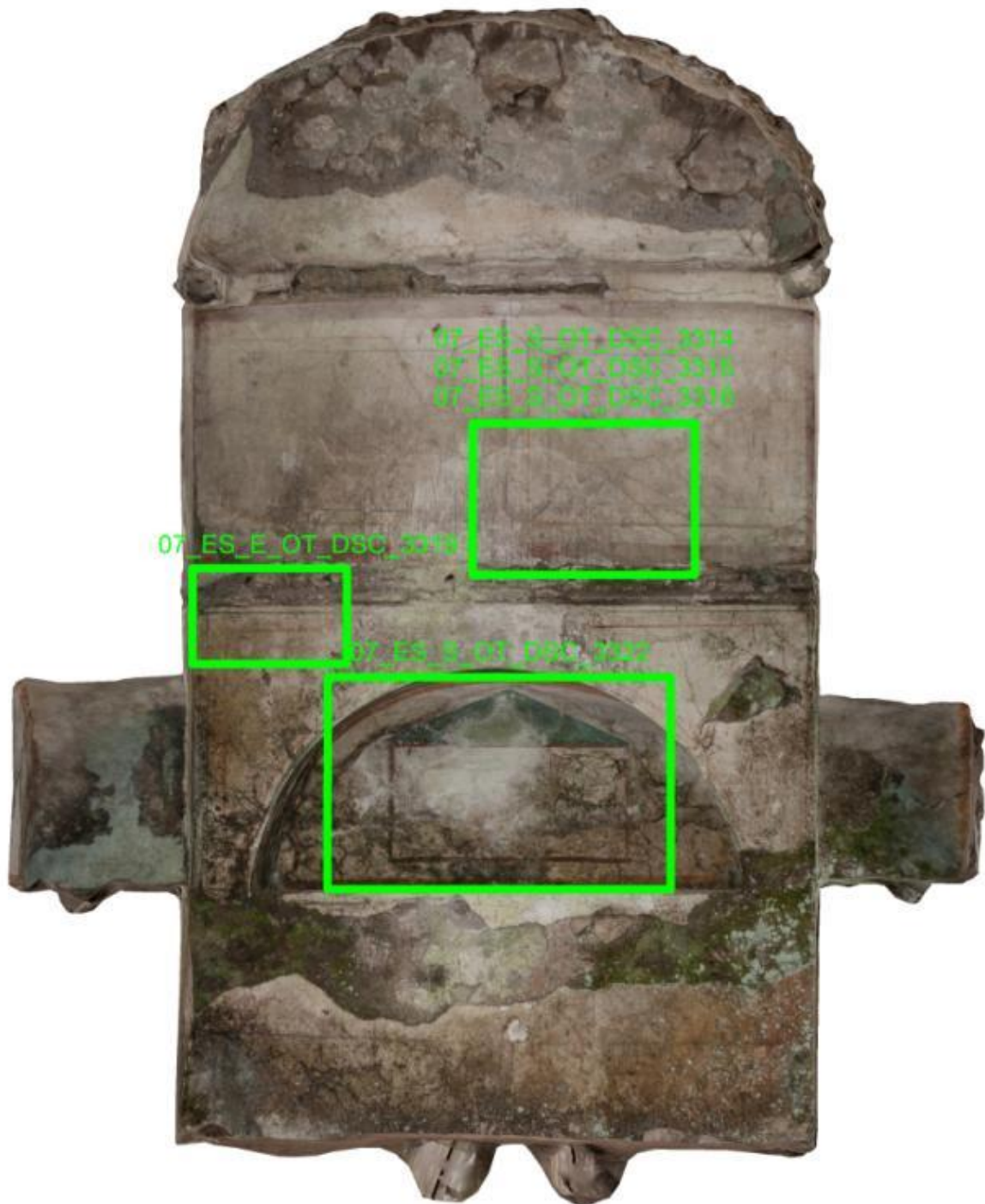


### LEGEND OF MAPPING

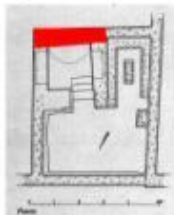
<span style="color: red;">■</span>	red colour	<span style="color: blue;">■</span>	bluish black colour
<span style="color: yellow;">■</span>	ochre colour		
<span style="color: brown;">■</span>	ochre red colour		
<span style="color: green;">■</span>	green colour		

Figure 160: map 07\_ES\_E\_I of paint and former colors.

## NECROPOLIS OF PORTA NOCERA - 07\_ES\_S\_I



Picture kindly recieved from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



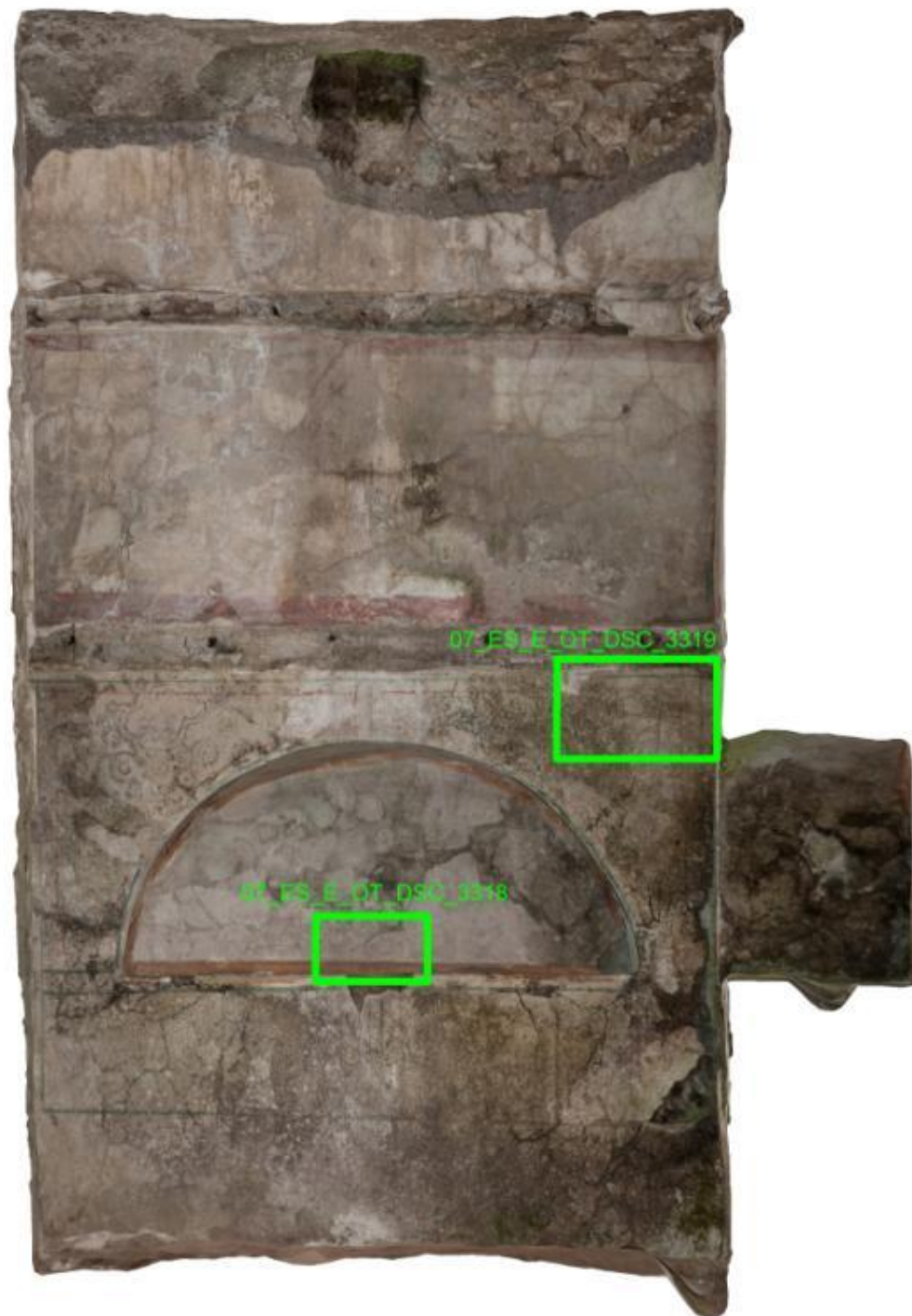
### LEGEND OF MAPPING

  detail picture and picture numbers

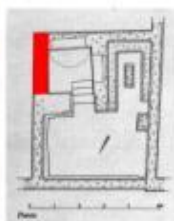
Figure 161: map 07\_ES\_S\_I of detail picture and picture number.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_E\_I



Picture kindly recieved from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone

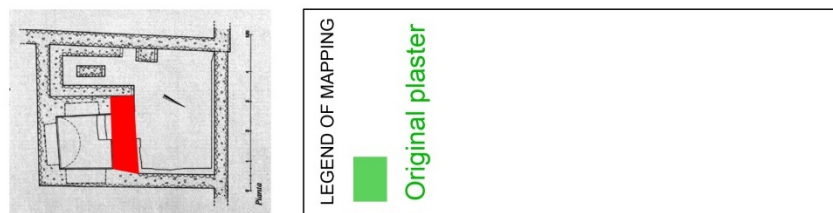


### LEGEND OF MAPPING

detail pictures with picture number

Figure 162: map 07\_ES\_E\_I of detail pictures with picture number.

## 5.2.2. Preserved original plaster fragments at the outer walls



07\_ES\_N



Figure 163: map 07\_ES\_N\_E of preserved original plaster fragments.





07\_ES\_E



Figure 164: map 07\_ES\_E\_E of preserved original plaster fragments.



07\_ES\_S



Figure 165: map 07\_ES\_S\_E of preserved original plaster fragments.



### 5.3. Previous intervention

#### 5.3.1. Reconstruction

#### NECROPOLIS OF PORTA NOCERA - 07\_ES\_T\_I

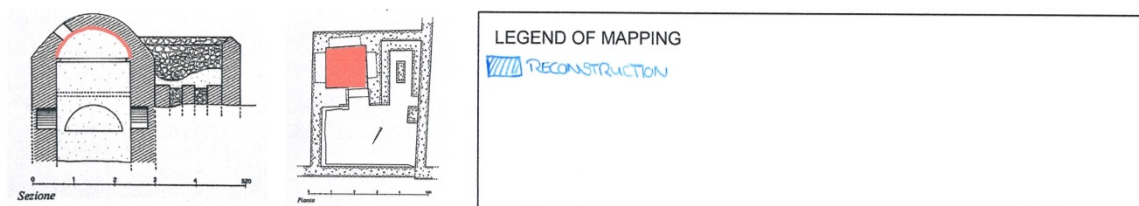
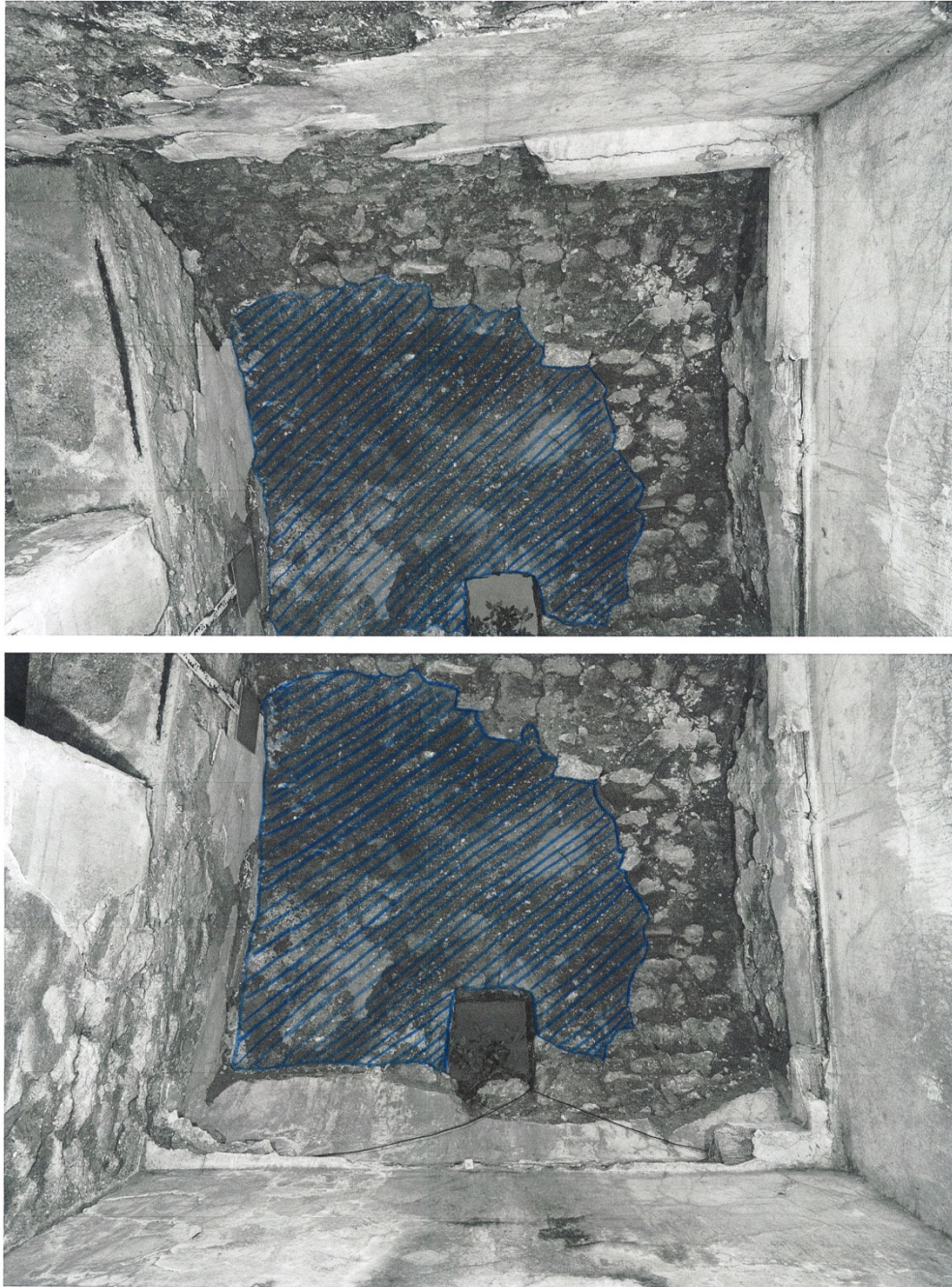


Figure 166: map 07\_ES\_T\_I of reconstruction.



07\_ES\_N

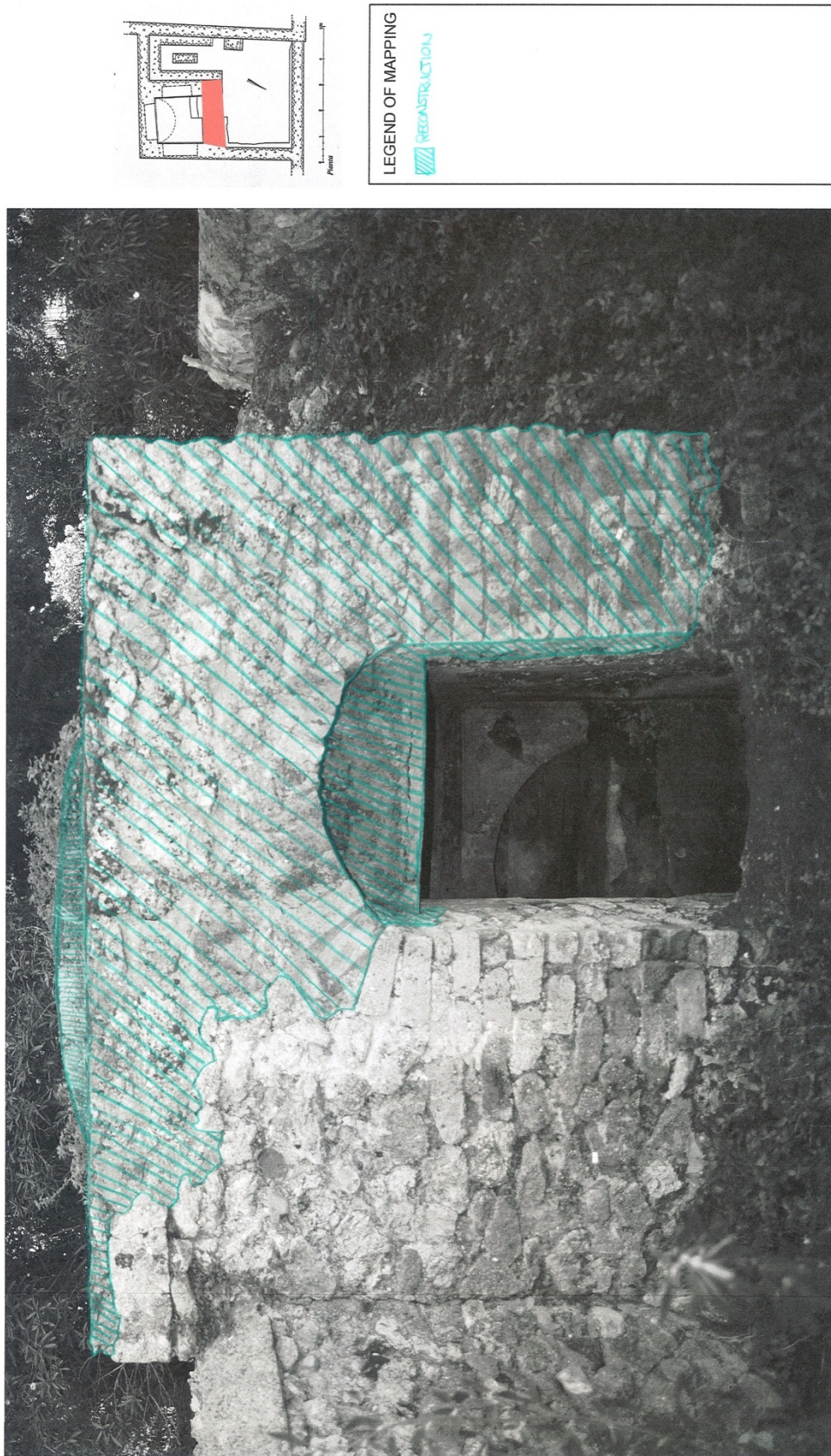


Figure 167: map 07\_ES\_N\_E of reconstruction.





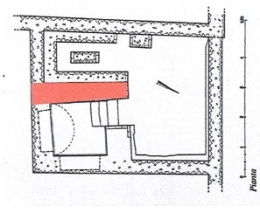
Figure 168: map 07\_ES\_E\_E of reconstruction.





Figure 169: map 07\_ES\_S\_E of reconstruction.





LEGEND OF MAPPING

RECONSTRUCTION



07\_ES\_W

Figure 170: map 07\_ES\_W\_E of reconstruction.

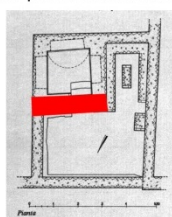


### 5.3.2. Fillings and protection of edges

## NECROPOLIS OF PORTA NOCERA - 07\_ES\_N\_I



Picture kindly recieved from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



#### LEGEND OF MAPPING

-  protection of edges
-  fillings

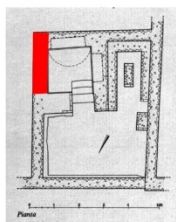
Figure 171: map 07\_ES\_N\_I of fillings and protection of edges.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_E\_I



Picture kindly received from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone

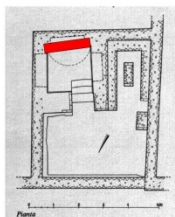


### LEGEND OF MAPPING

-  protection of edges
-  fillings

Figure 172: map 07\_ES\_E\_I of fillings and protection of edges.

## NECROPOLIS OF PORTA NOCERA - 07\_ES\_S\_I



### LEGEND OF MAPPING

- protection of edges
- fillings

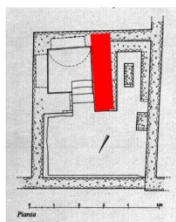
Figure 173: map 07\_ES\_S\_I of fillings and protection of edges.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_W\_I



Picture kindly received from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



### LEGEND OF MAPPING



-  protection of edges
-  fillings

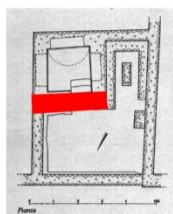
Figure 174: map 07\_ES\_E\_I of fillings and protection of edges.

### 5.3.3. Damages

## NECROPOLIS OF PORTA NOCERA - 07\_ES\_N\_I



Picture kindly recieved from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



#### LEGEND OF MAPPING

 delamination (detachment)  
from structure

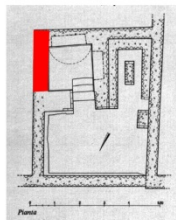
Figure 175: map 07\_ES\_N\_I of delamination (detachment) from structure.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_E\_I



Picture kindly received from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



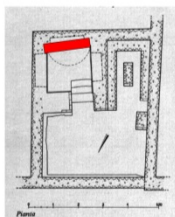
### LEGEND OF MAPPING

 delamination (detachment)  
from structure

Figure 176: map 07\_ES\_E\_I of delamination (detachment) from structure.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_S\_I



### LEGEND OF MAPPING

 delamination (detachment)  
from structure

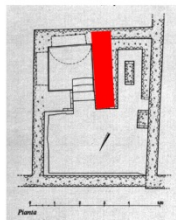
Figure 177: map 07\_ES\_S\_I of delamination (detachment) from structure.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_W\_I



Picture kindly received from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone

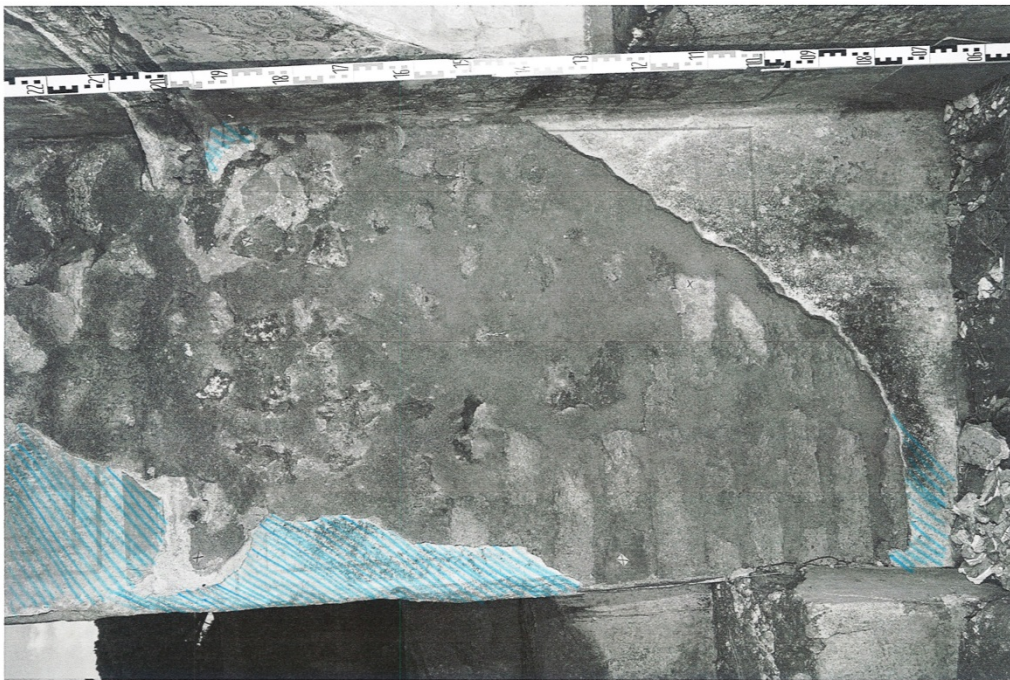
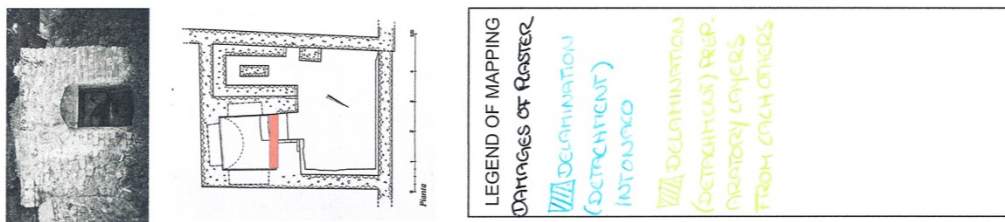


### LEGEND OF MAPPING

 delamination (detachment)  
from structure

Figure 178: map 07\_ES\_W\_I of delamination (detachment) from structure.





07\_ES\_N\_I

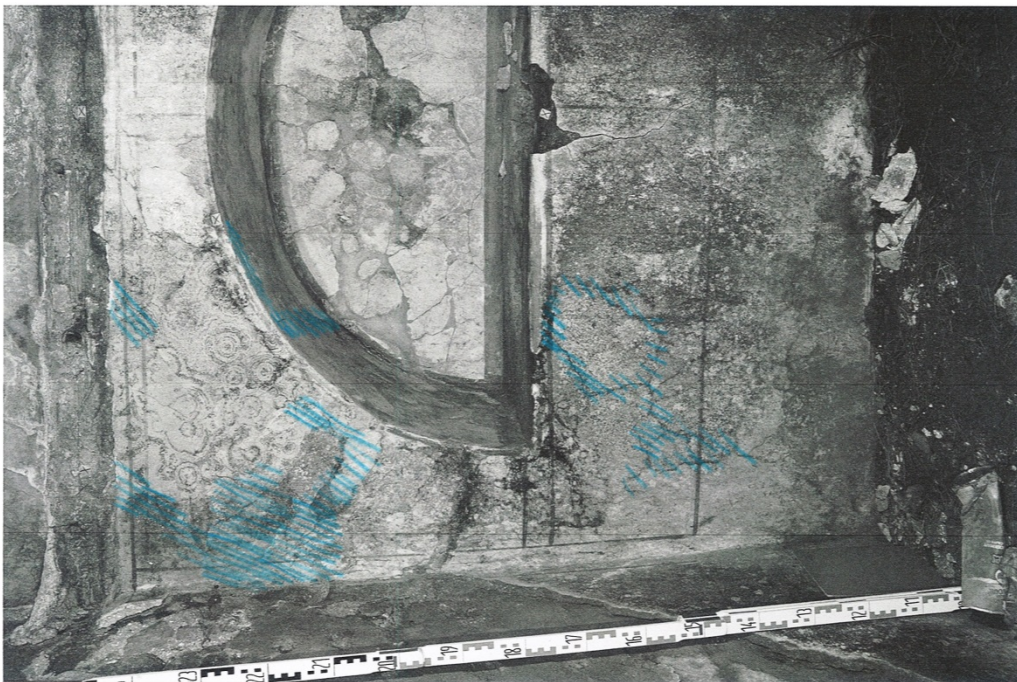
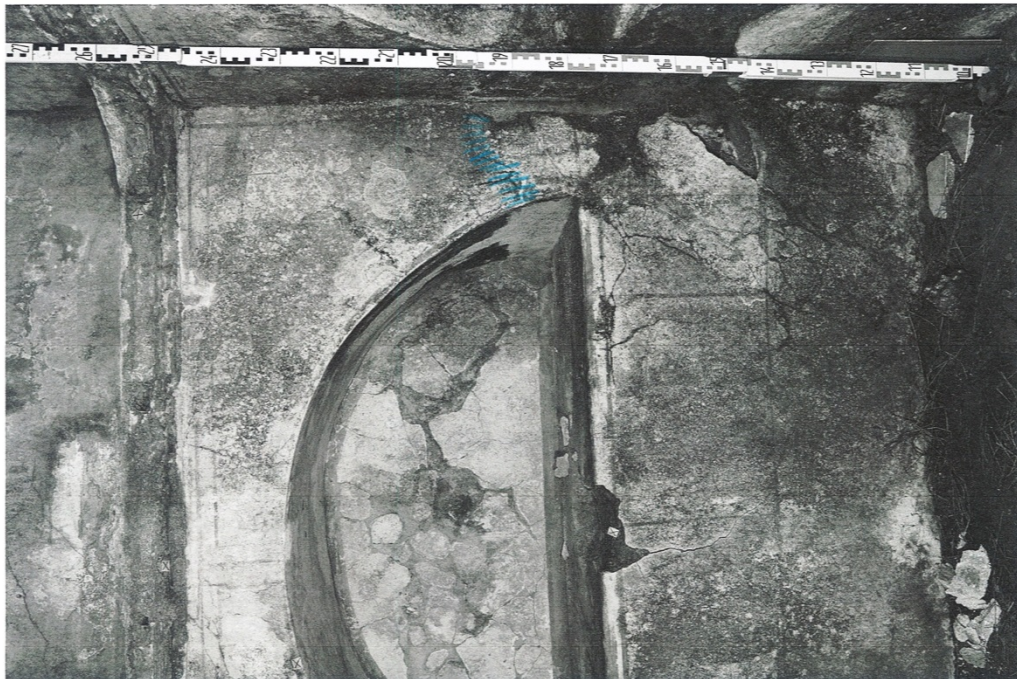
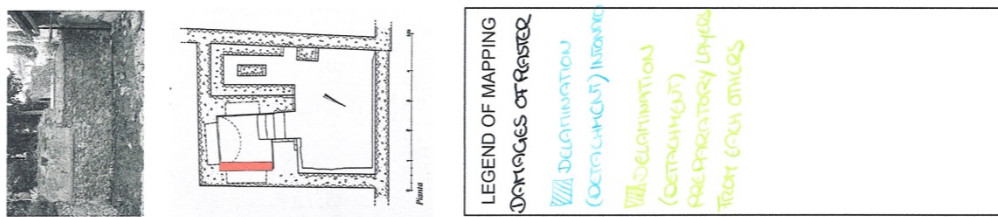
Figure 179: map 07\_ES\_N\_I\_1 of delamination (detachment) Intonaco from preparatory layers (blue) and delamination (detachment) preparatory layers from each other's (green).





Figure 180: map 07\_ES\_N\_I\_2 of delamination (detachment) Intonaco from preparatory layers (blue) and delamination (detachment) preparatory layers from each other's (green).

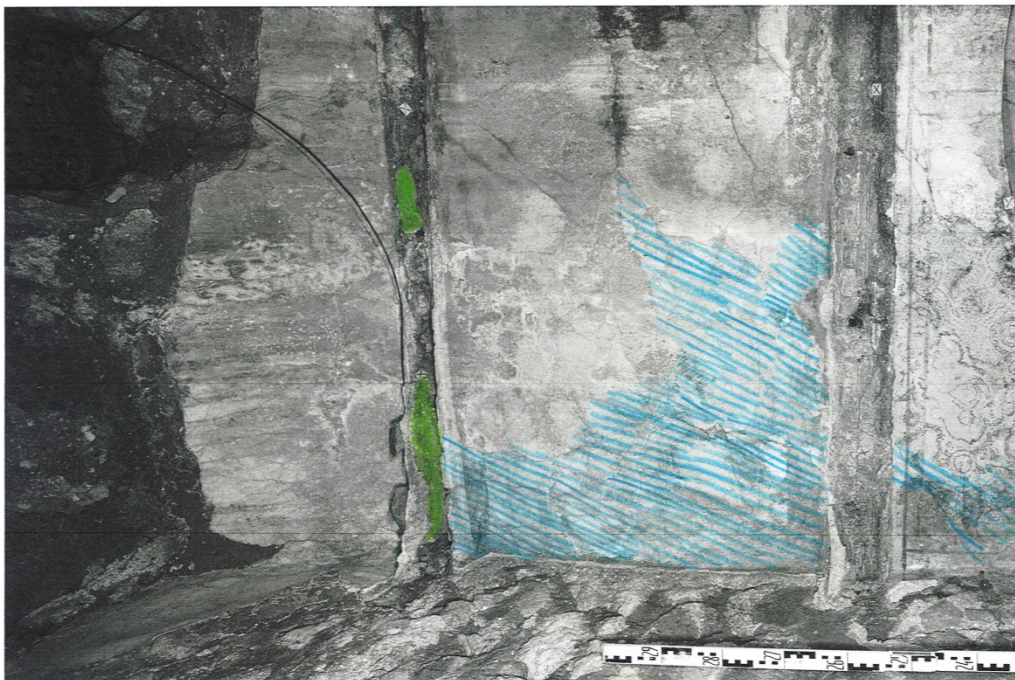
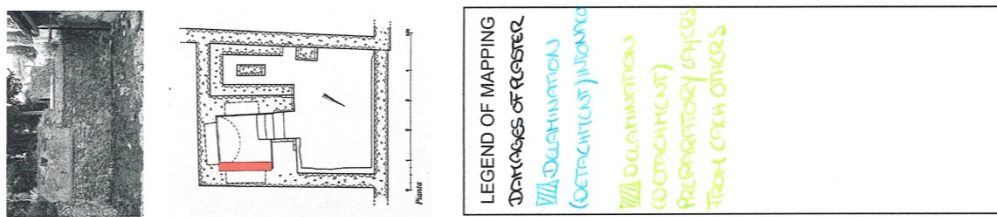




07\_ES\_E\_I

Figure 181: map 07\_ES\_E\_I\_1 of delamination (detachment) Intonaco from preparatory layers (blue) and delamination (detachment) preparatory layers from each other's (green).



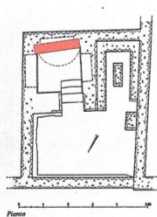


07\_ES\_E\_I

Figure 182: map 07\_ES\_E\_I\_2 of delamination (detachment) Intonaco from preparatory layers (blue) and delamination (detachment) preparatory layers from each other's (green).



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_S\_I



### LEGEND OF MAPPING

#### DAMAGES OF RASTER

DELAMINATION (DETACHMENT) INTONACO

DELAMINATION PREPARATORY LAYERS FROM EACH OTHERS

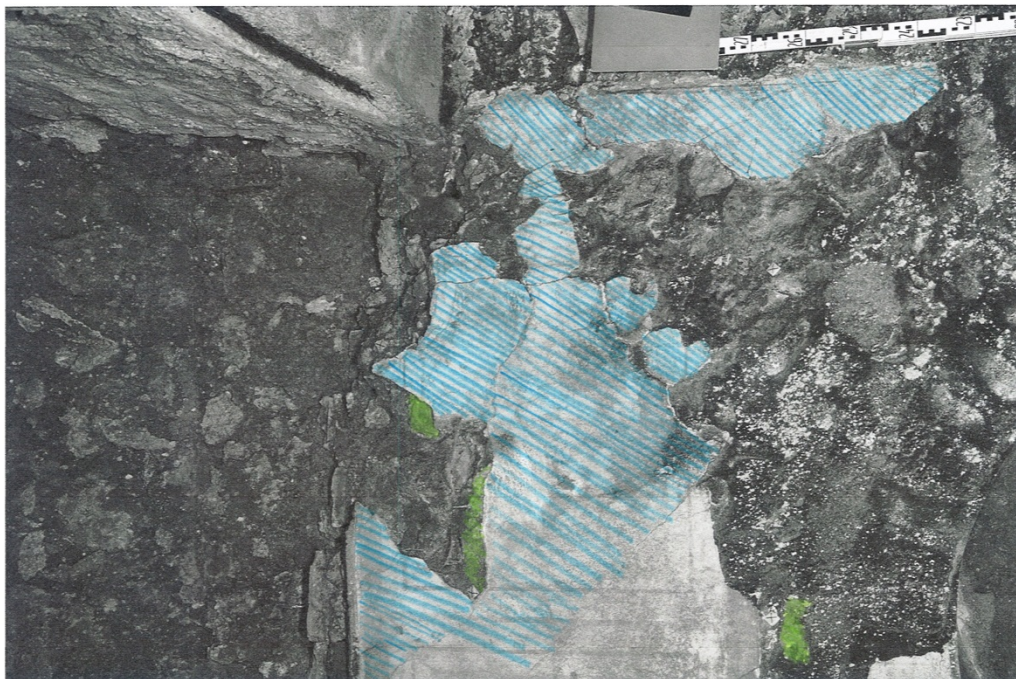
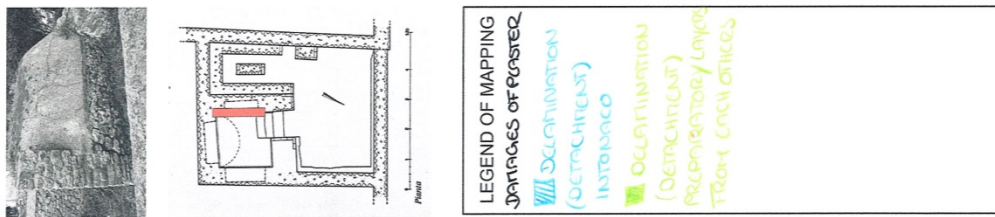
Figure 183: map 07\_ES\_S\_I of delamination (detachment) Intonaco from preparatory layers (blue) and delamination (detachment) preparatory layers from each other's (green).





Figure 184: map 07\_ES\_W\_I\_1 of delamination (detachment) Intonaco from preparatory layers (blue) and delamination (detachment) preparatory layers from each other's (green).





07\_ES\_W\_I

Figure 185: map 07\_ES\_W\_I\_2 of delamination (detachment) Intonaco from preparatory layers (blue) and delamination (detachment) preparatory layers from each other's (green).





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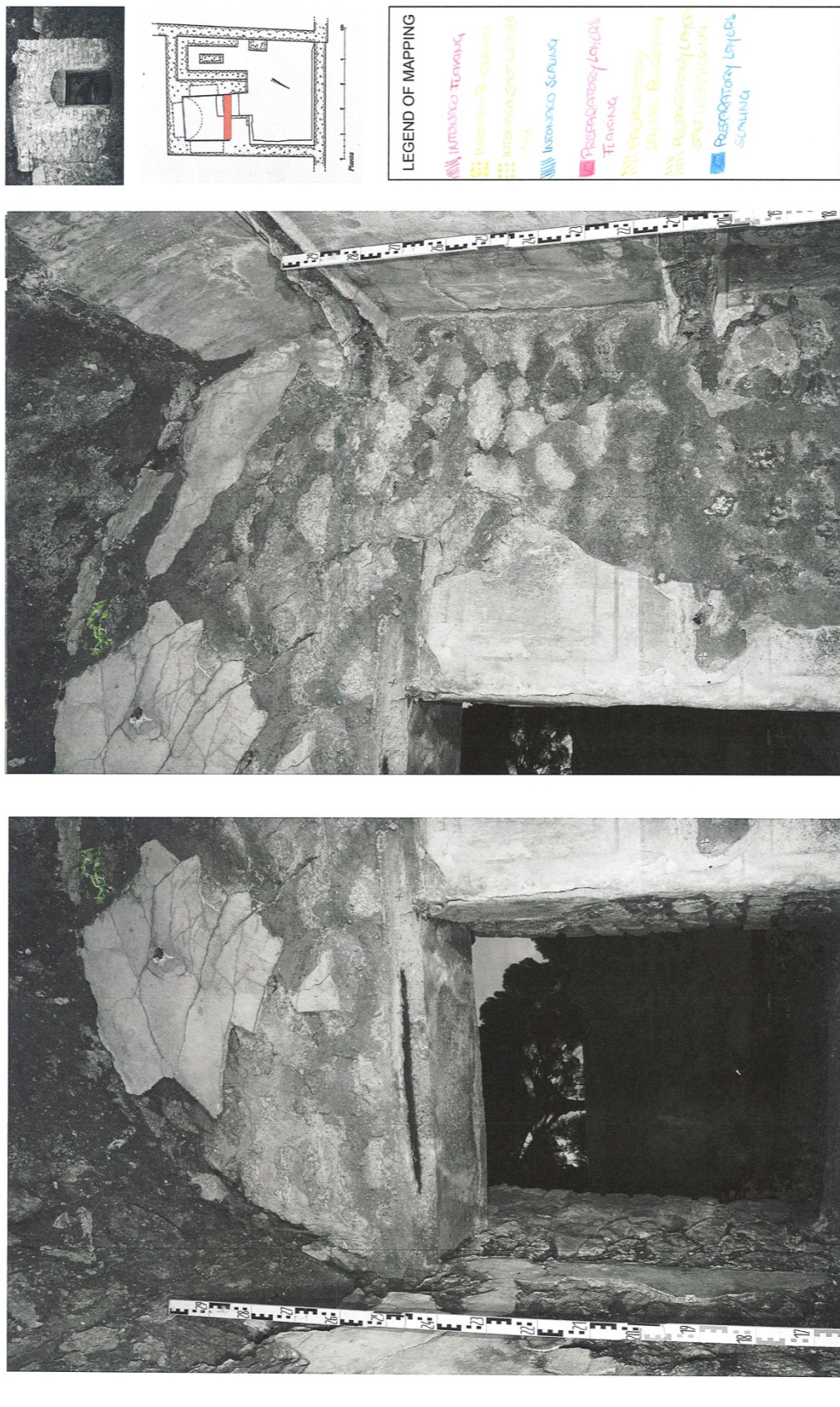


Figure 187: map 07\_ES\_N\_I\_2 of scaling (blue) and salt weathering layers (green).



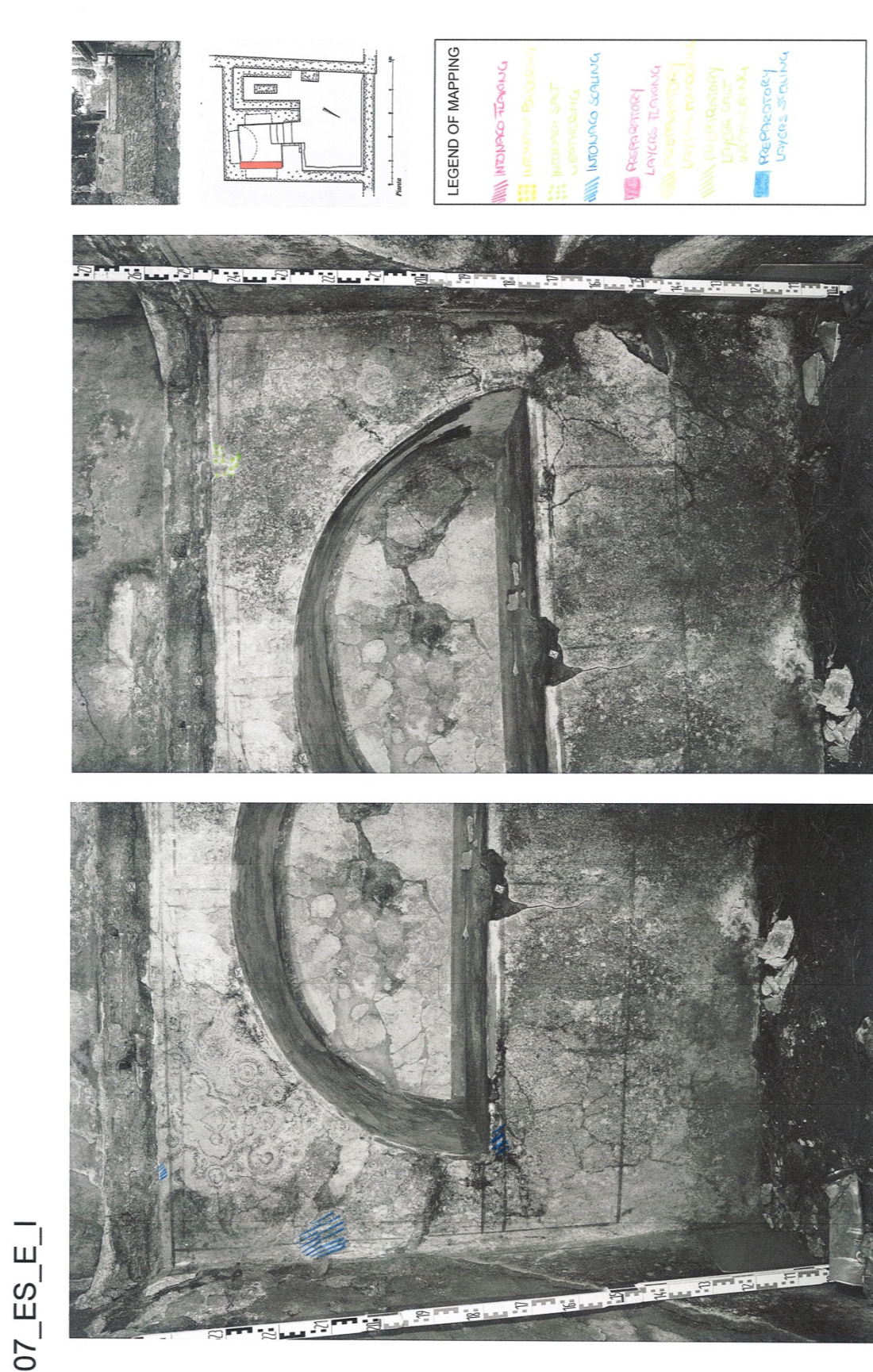
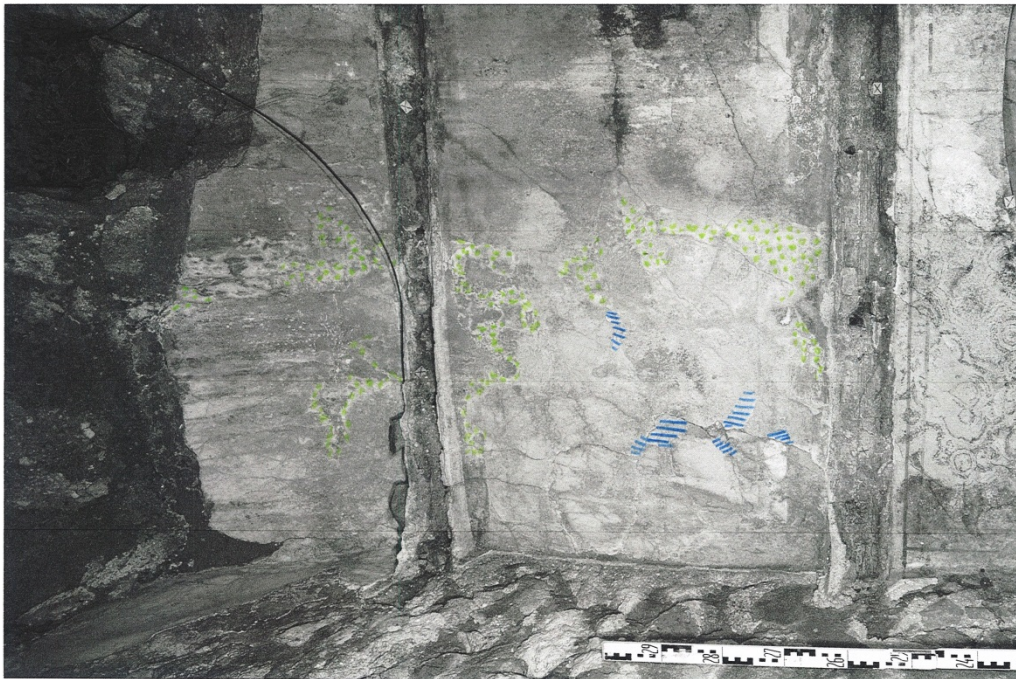
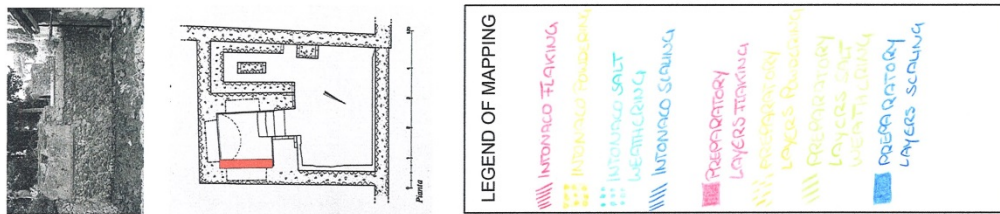


Figure 188: map 07\_ES\_E\_I\_1 of scaling (blue) and salt weathering layers (green).



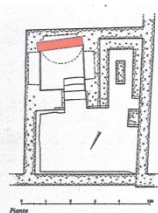


07\_ES\_E1

Figure 189: map 07\_ES\_E\_I\_2 of scaling (blue) and salt weathering layers (green).



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_S\_I



LEGEND OF MAPPING	
//// INTONACO FLAKING	■ PREPARATORY LAYERS FLAKING
■ INTONACO POWDERING	/// PREPARATORY LAYERS POWDERING
■ INTONACO SPALL WEATHERING	/// PREPARATORY LAYERS SALT WEATHERING
/// INTONACO SCALING	■ PREPARATORY LAYERS SCALING

Figure 190: map 07\_ES\_S\_I of scaling (blue) and salt weathering layers (green).



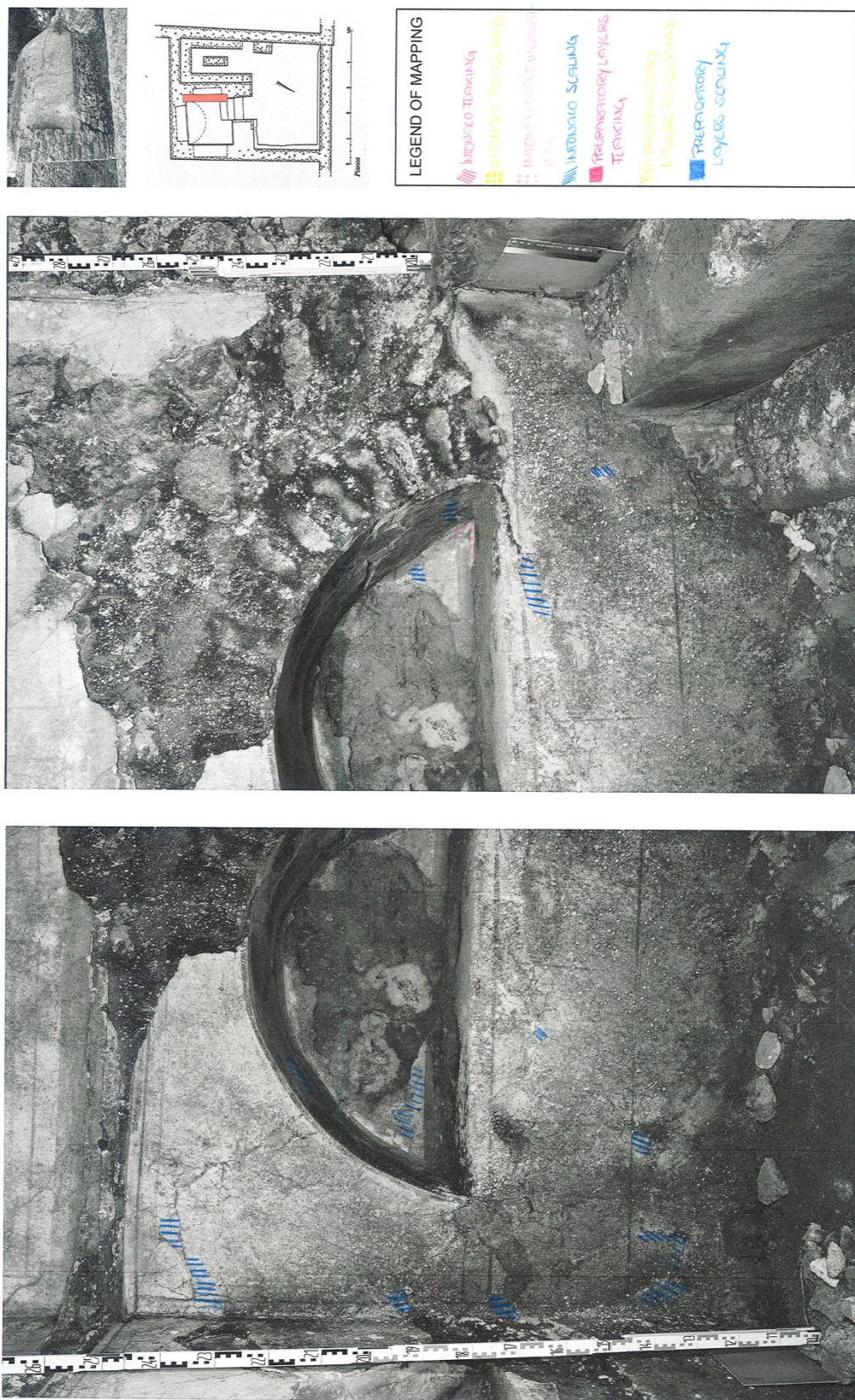
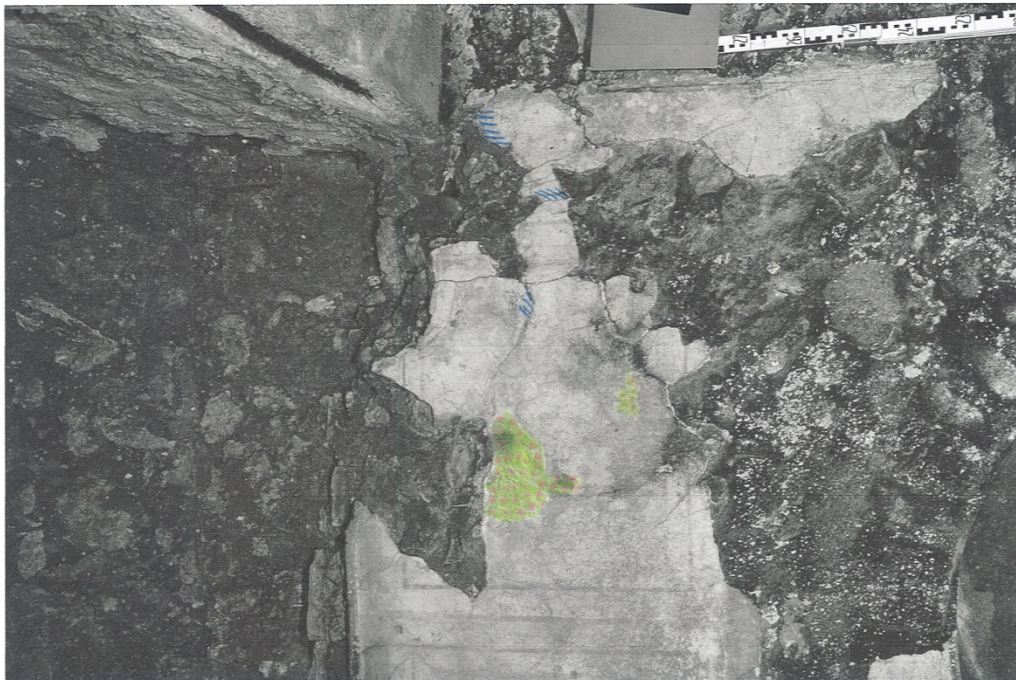
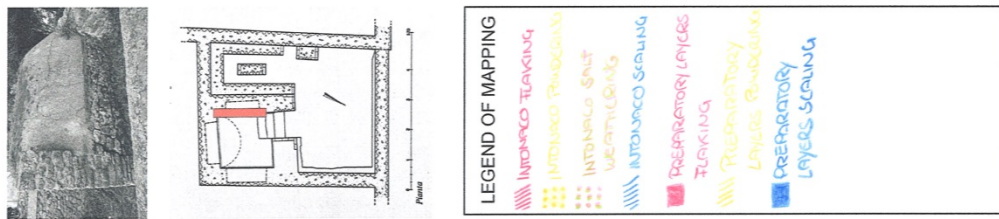


Figure 191: map 07\_ES\_W\_I\_1 of scaling (blue) and salt weathering layers (green).





07\_ES\_W\_I

Figure 192: map 07\_ES\_W\_I\_2 of scaling (blue) and salt weathering layers (green).



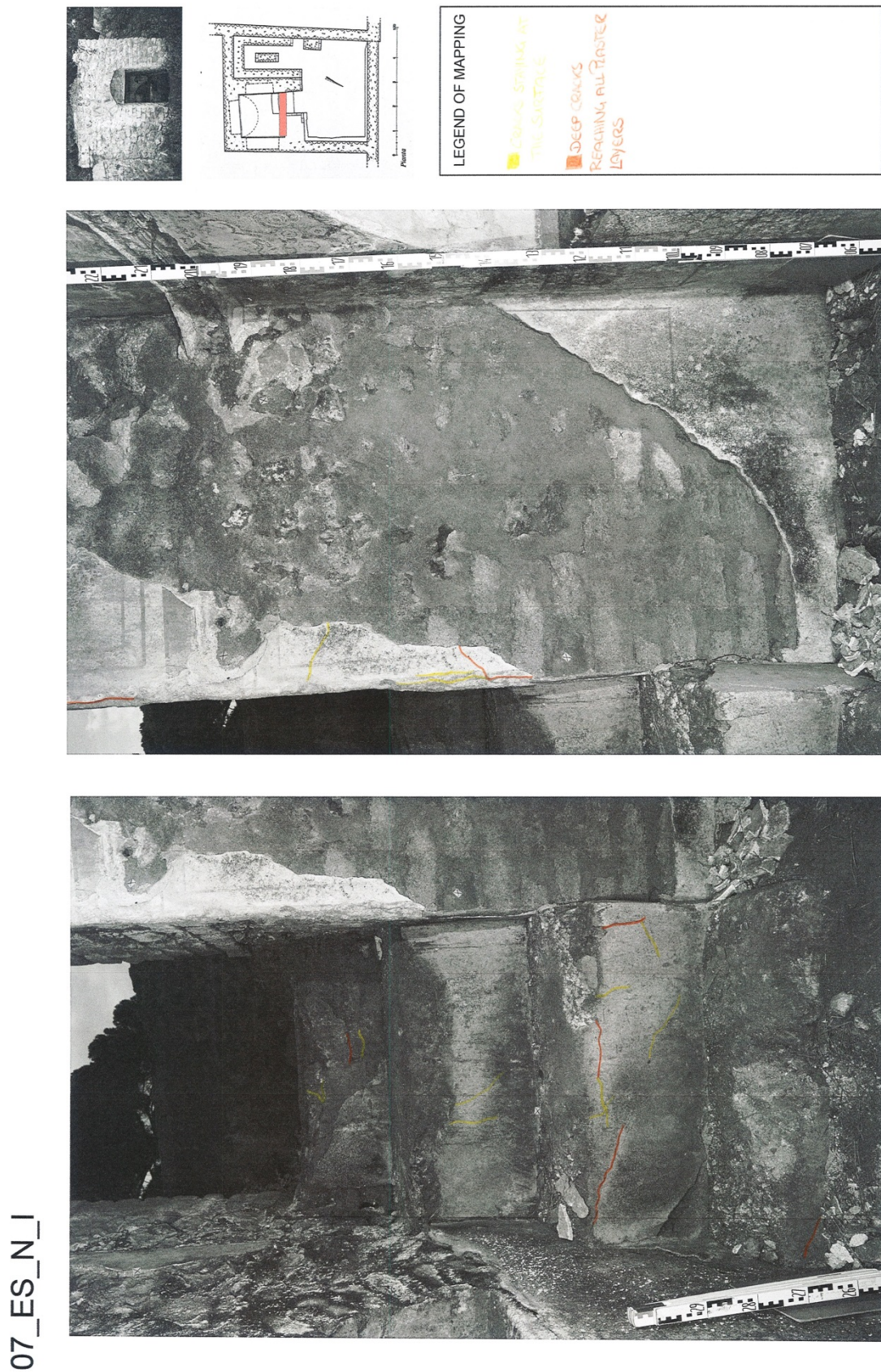


Figure 193: map 07\_ES\_N\_I\_1 of cracks.



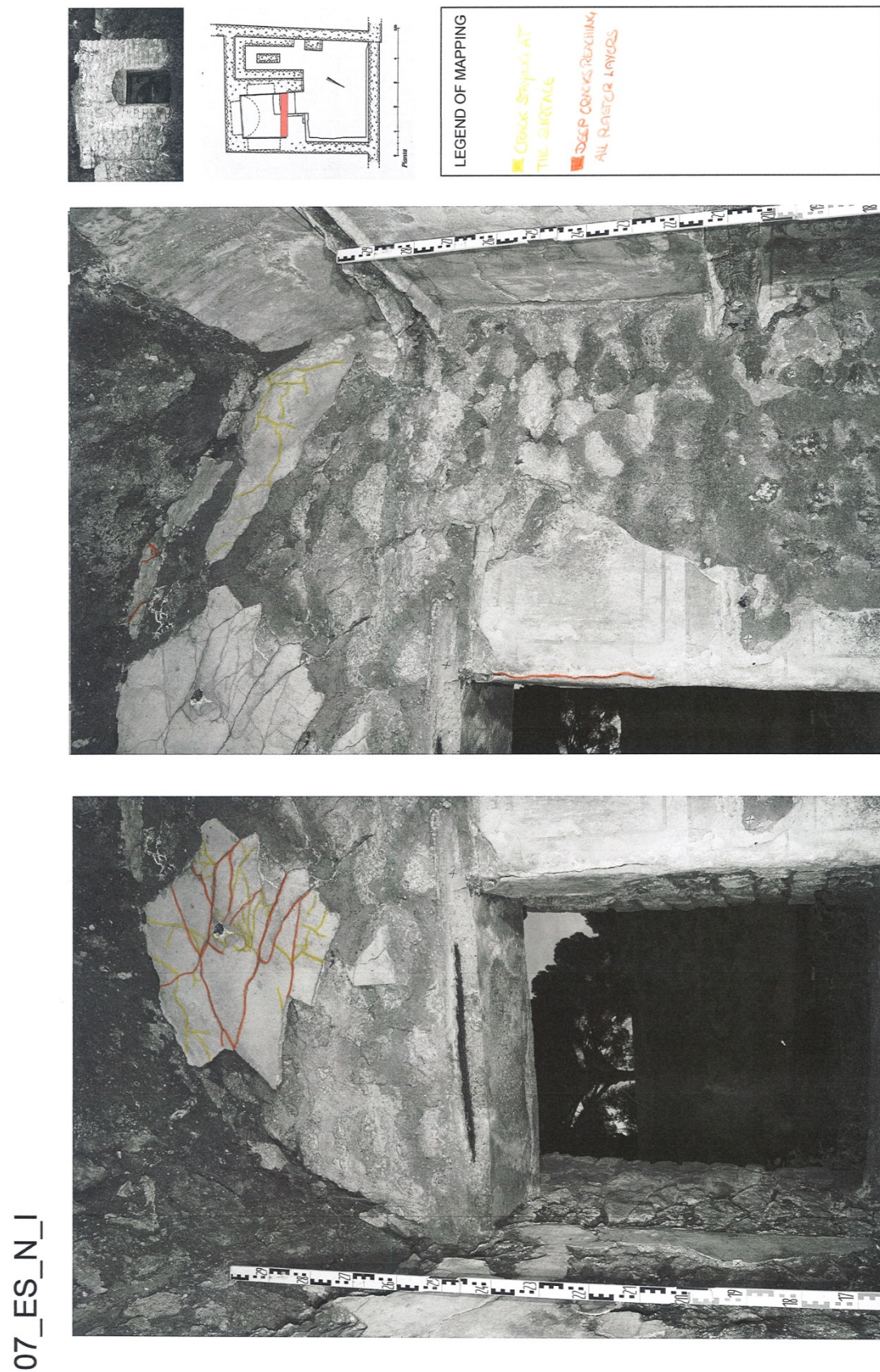


Figure 194: map 07\_ES\_N\_I\_2 of cracks.



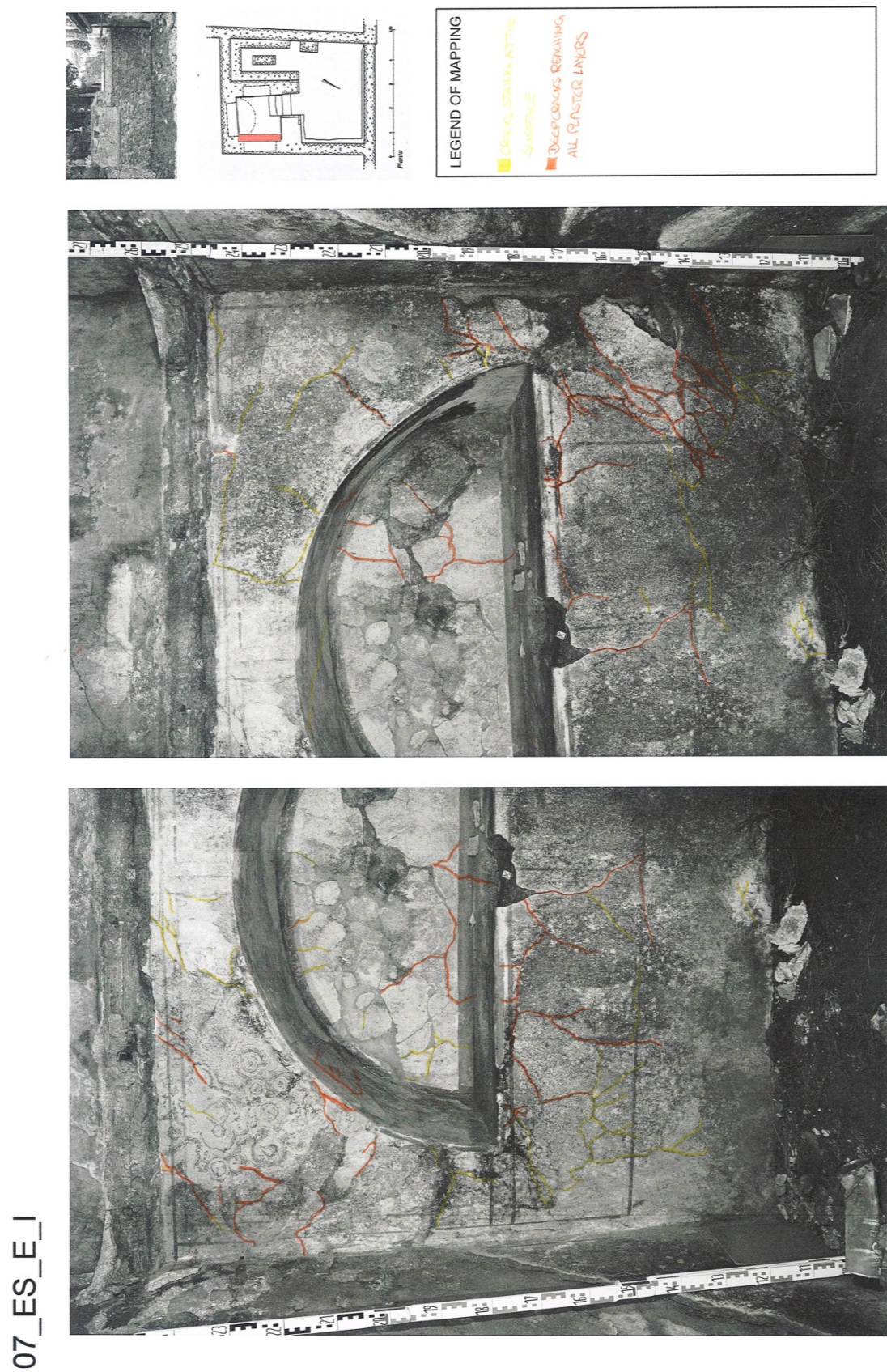


Figure 195: map 07\_ES\_E\_I\_1 of cracks.



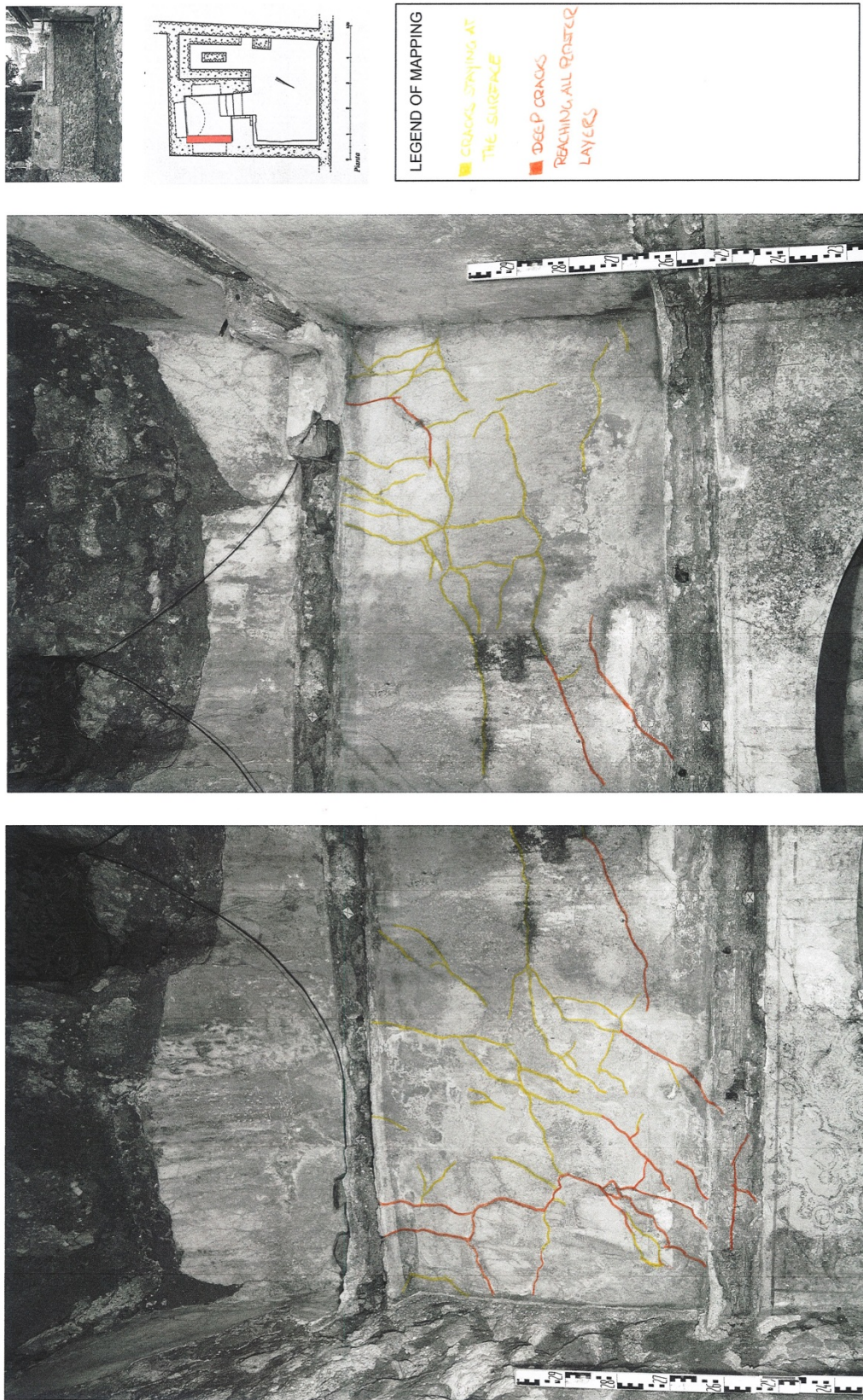
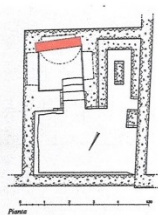


Figure 196: map 07\_ES\_E\_I\_2 of cracks.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_S\_I



### LEGEND OF MAPPING

- CRACKS STAYING AT THE SURFACE
- DEEP CRACKS REACHING ALL PLASTER LAYERS

Figure 197: map 07\_ES\_S\_I of cracks.





Figure 198: map 07\_ES\_W\_I\_1 of cracks.



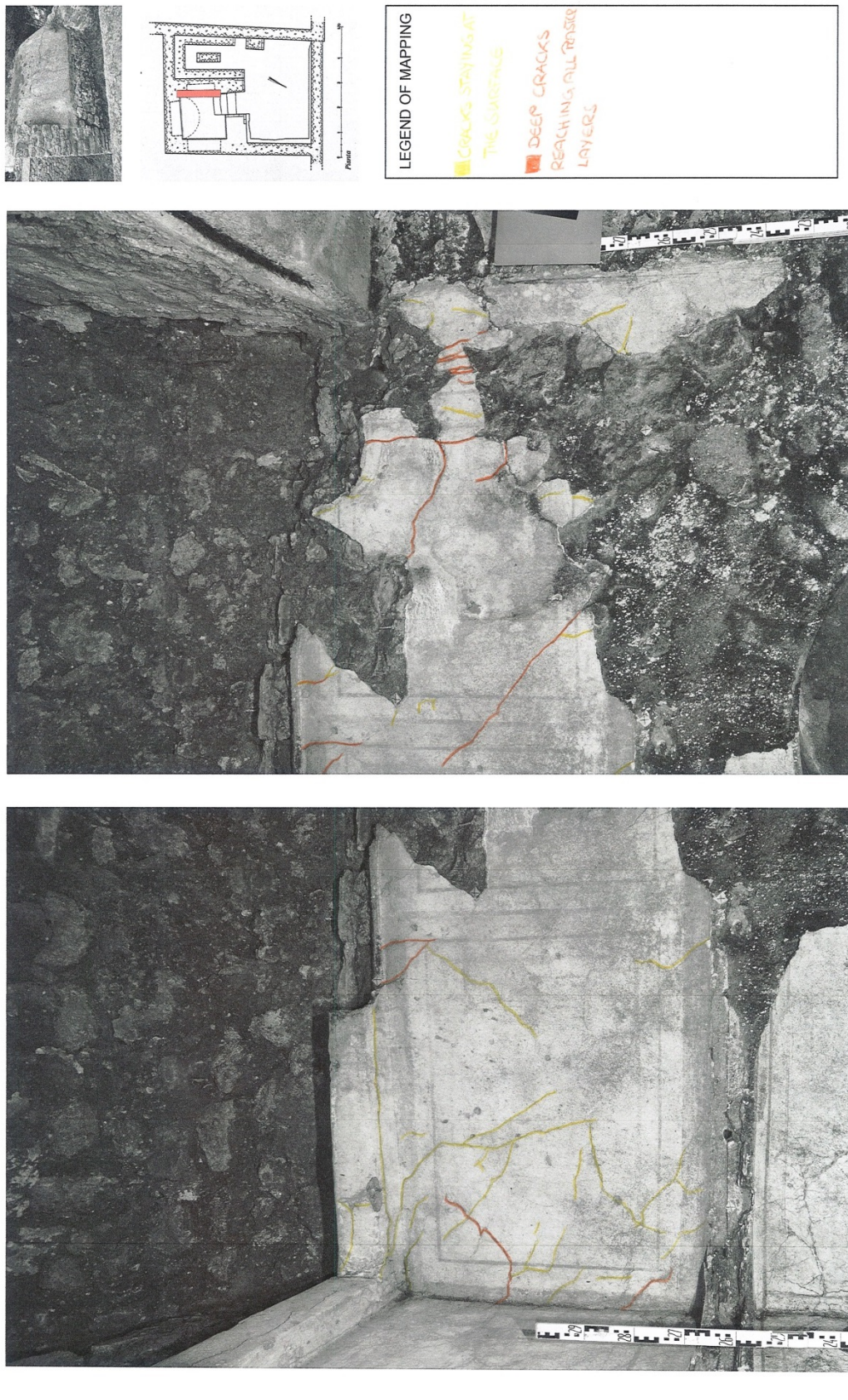
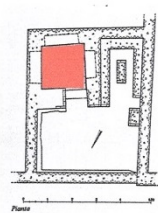
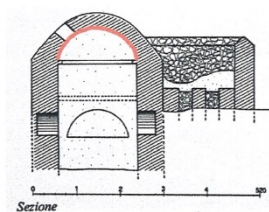
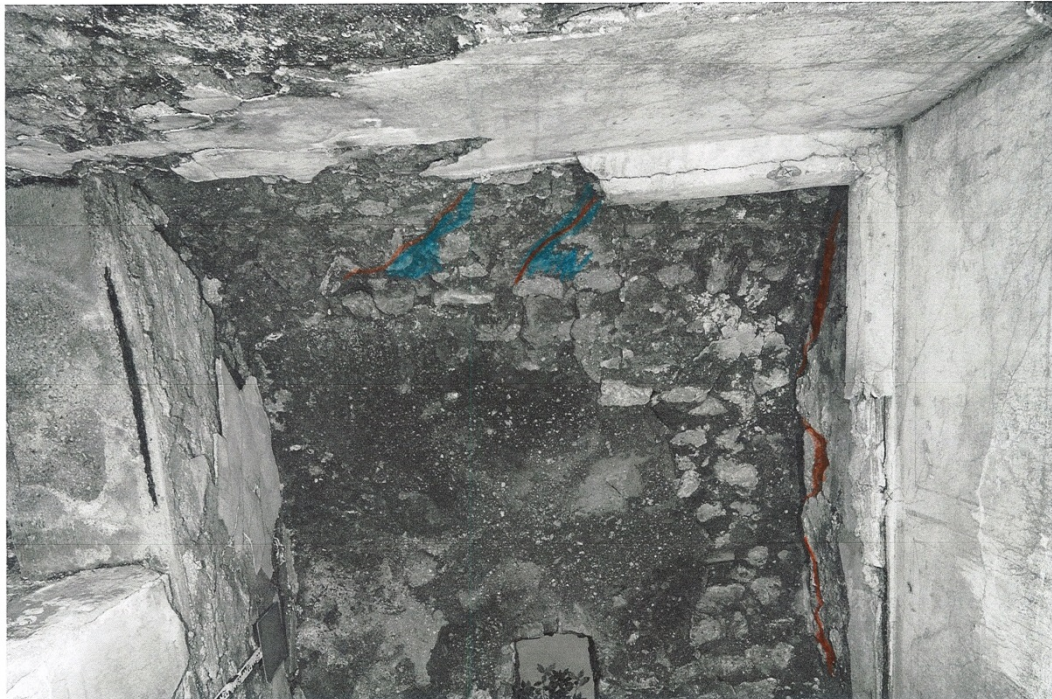


Figure 199: map 07\_ES\_W\_I\_2 of cracks.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_T\_I

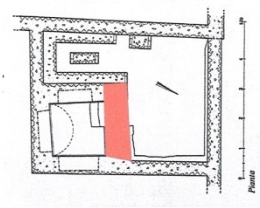


LEGEND OF MAPPING	
DAMAGES OF MASONRY	
— CRACKS	LOOSE STONES (BRICK AND ARCHITECTURAL ELEMENTS)
■ CROCKED (ROUND FLUSHED OUT) STONES	MISSING MORTAR
■ GRANULAR DISINTEGRATION (POWDERING) STONES	POWDERING MORTAR
	SCALING (EXFOLIATING) STONES

Figure 200: map 07\_ES\_T\_I of masonry damages. Missing mortar is mapped blue and cracks in masonry red.



07\_ES\_N



LEGEND OF MAPPING	
DAMAGES OF MASONRY	
—	CRACKS
■	ERASED STONES (ROUND TUSCAN ORDER)
■	CONCRETE DIS-INTEGRATION (RAW-DRYING) STONES
■	LOOSE STONES, BRICK AND MORTAR
■	TEXTURAL DEFECTS
■	MISSING MORTAR
■	POWDERING MORTAR
■	SCALING (EXFOLIATING) STONES

Figure 201: map 07\_ES\_N\_E of masonry damages.



07\_ES\_E

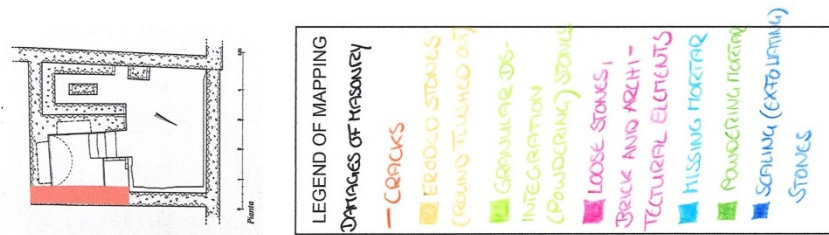


Figure 202: map 07\_ES\_E\_E of masonry damages.





Figure 203: map 07\_ES\_S\_E of masonry damages.





Figure 204: map 07\_ES\_W\_E of masonry damages.

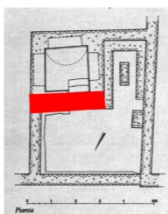


### 5.3.4. Collapsing areas

## NECROPOLIS OF PORTA NOCERA - 07\_ES\_N\_I



Picture kindly received from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



#### LEGEND OF MAPPING




-  lacunae, collapsing
-  loose plaster fragments, collapsing
-  loose stones, brick and architectural elements

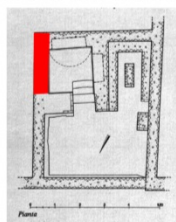
Figure 205: map 07\_ES\_N\_I collapsing areas.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_E\_I



Picture kindly received from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



### LEGEND OF MAPPING

- lacunae, collapsing
- loose plaster fragments, collapsing
- loose stones, brick and architectural elements

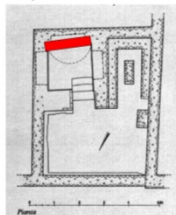
Figure 206: map 07\_ES\_E\_I collapsing areas.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_S\_I



Picture kindly received from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



### LEGEND OF MAPPING

- lacunae, collapsing
- loose plaster fragments, collapsing
- loose stones, brick and architectural elements

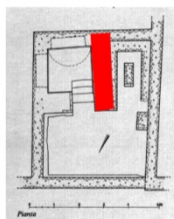
Figure 207: map 07\_ES\_S\_I collapsing areas.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_W\_I



Picture kindly recieved from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



### LEGEND OF MAPPING




-  lacunae, collapsing
-  loose plaster fragments, collapsng
-  loose stones, brick and architectural elements

Figure 208: map 07\_ES\_W\_I collapsing areas.

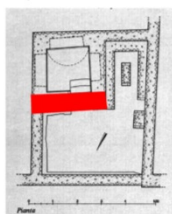


### 5.3.5. Biological Overgrowth

## NECROPOLIS OF PORTA NOCERA - 07\_ES\_N\_I



Picture kindly received from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



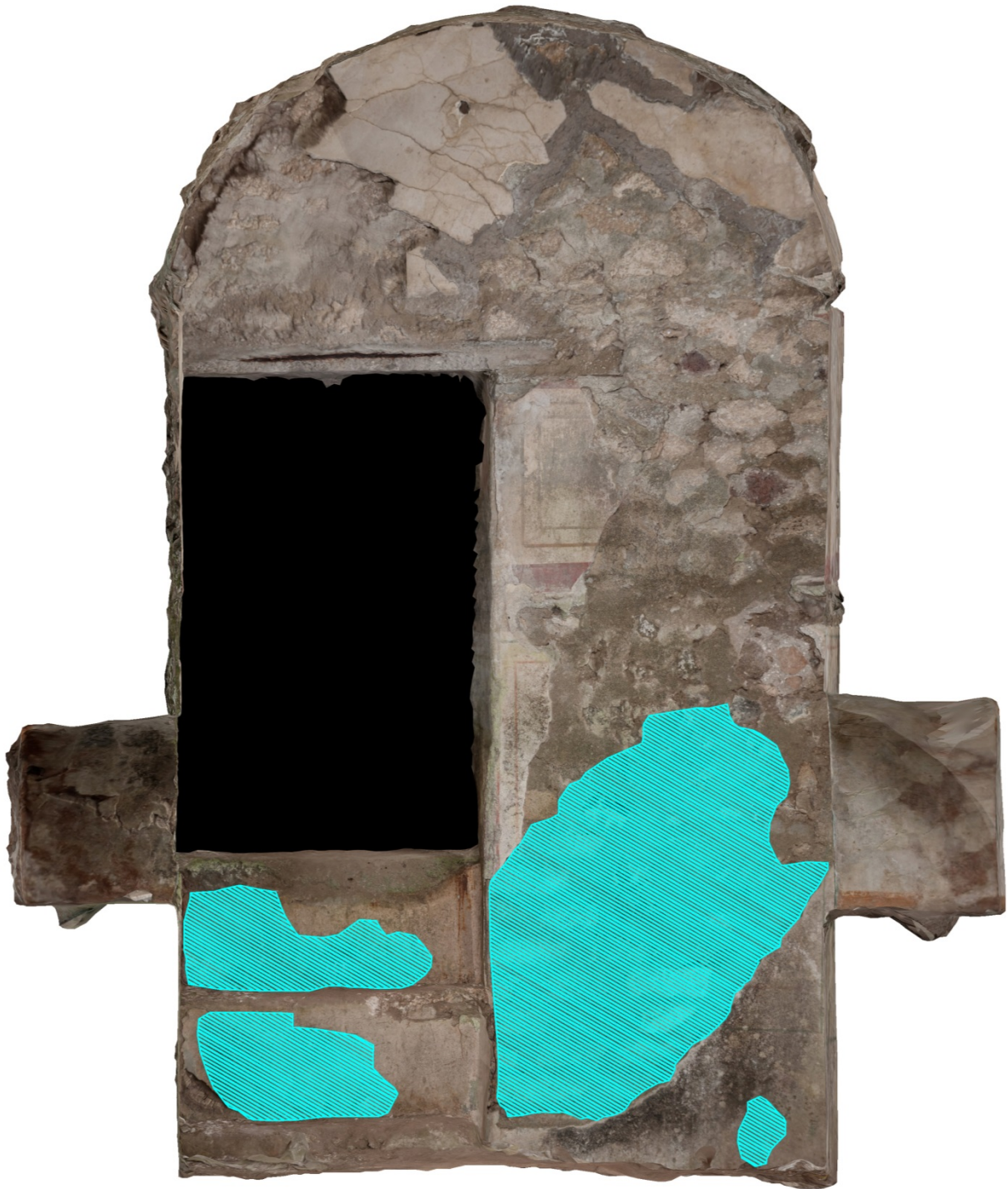
#### LEGEND OF MAPPING

-  green-brown algae
-  red algae

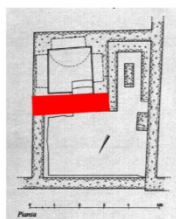
Figure 209: map 07\_ES\_N\_I of possible algae.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_N\_I



Picture kindly recieved from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



### LEGEND OF MAPPING

 turquoise fungi

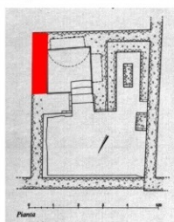
Figure 210: map 07\_ES\_N\_I of possible fungi.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_E\_I



Picture kindly recieved from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



### LEGEND OF MAPPING

	green-brown algae	amount [m <sup>2</sup> ]: 4,32 m <sup>2</sup>
	red algae	amount [m <sup>2</sup> ]: 0,5 m <sup>2</sup>
	lime green bakteria? / algae?	amount [m <sup>2</sup> ]: 0,01 m <sup>2</sup>
	intense green algae	amount [m <sup>2</sup> ]: 0,09 m <sup>2</sup>

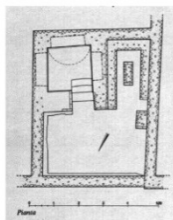
Figure 211: map 07\_ES\_E\_I of possible algae.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_E\_I



Picture kindly received from Ibam (Istituto per i beni archeologici e monumentali), made by Daniele Malfitana, Giovanni Fragalà and Danilo P. Pavone



### LEGEND OF MAPPING



green moss

amount [m<sup>2</sup>]: 0,04 m<sup>2</sup>

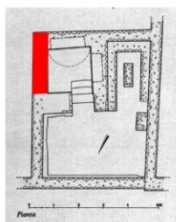
Figure 212: map 07\_ES\_E\_I of moss and lichens.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_E\_I



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### LEGEND OF MAPPING



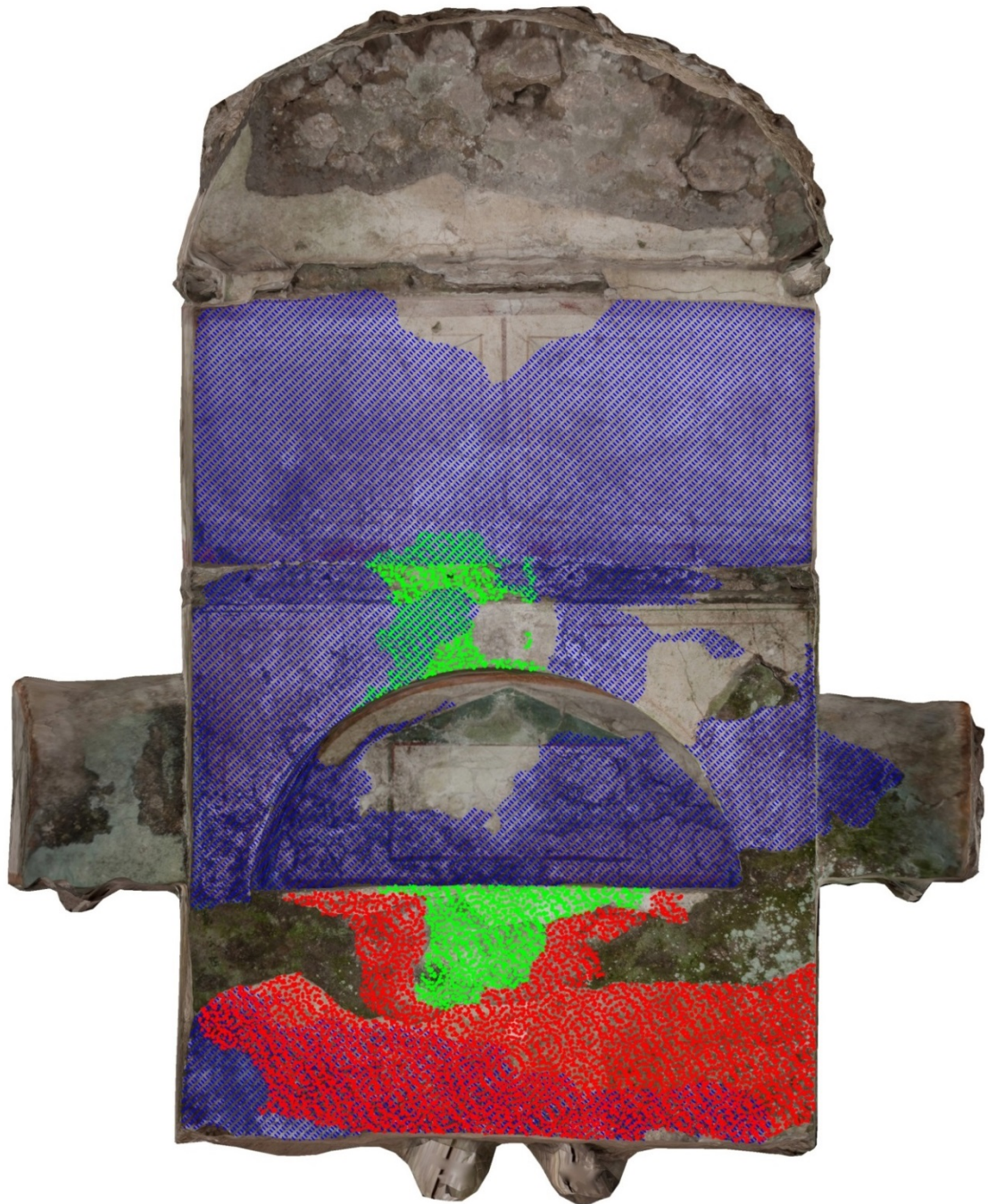
turquoise fungi

amount [m<sup>2</sup>]: 0,05 m<sup>2</sup>

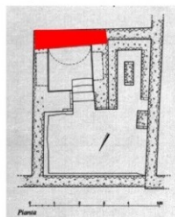
Figure 213: map 07\_ES\_E\_I of possible fungi.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_S\_I



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### LEGEND OF MAPPING

	green-brown algae	amount [m <sup>2</sup> ]: 2,87 m <sup>2</sup>
	red algae	amount [m <sup>2</sup> ]: 0,81 m <sup>2</sup>
	lime green bacteria? / algae?	amount [m <sup>2</sup> ]: 0,27 m <sup>2</sup>

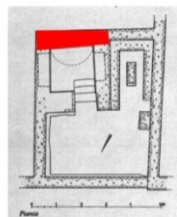
Figure 214: map 07\_ES\_S\_I of possible algae.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_S\_I



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### LEGEND OF MAPPING

	green moss	amount [m <sup>2</sup> ]: 0,37 m <sup>2</sup>
	white turquoise lichens	amount [m <sup>2</sup> ]: 0,52 m <sup>2</sup>

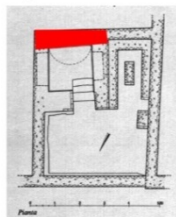
Figure 215: map 07\_ES\_S\_I of moss and lichens.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_S\_I



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### LEGEND OF MAPPING



	black fungi	amount [m <sup>2</sup> ]: 0,19 m <sup>2</sup>
	turquoise fungi	amount [m <sup>2</sup> ]: 0,28 m <sup>2</sup>

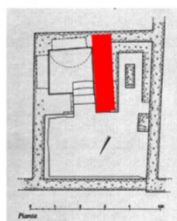
Figure 216: map 07\_ES\_S\_I of possible fungi.




## NECROPOLIS OF PORTA NOCERA - 07\_ES\_W\_I



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### LEGEND OF MAPPING

 green-brown algae

 red algae

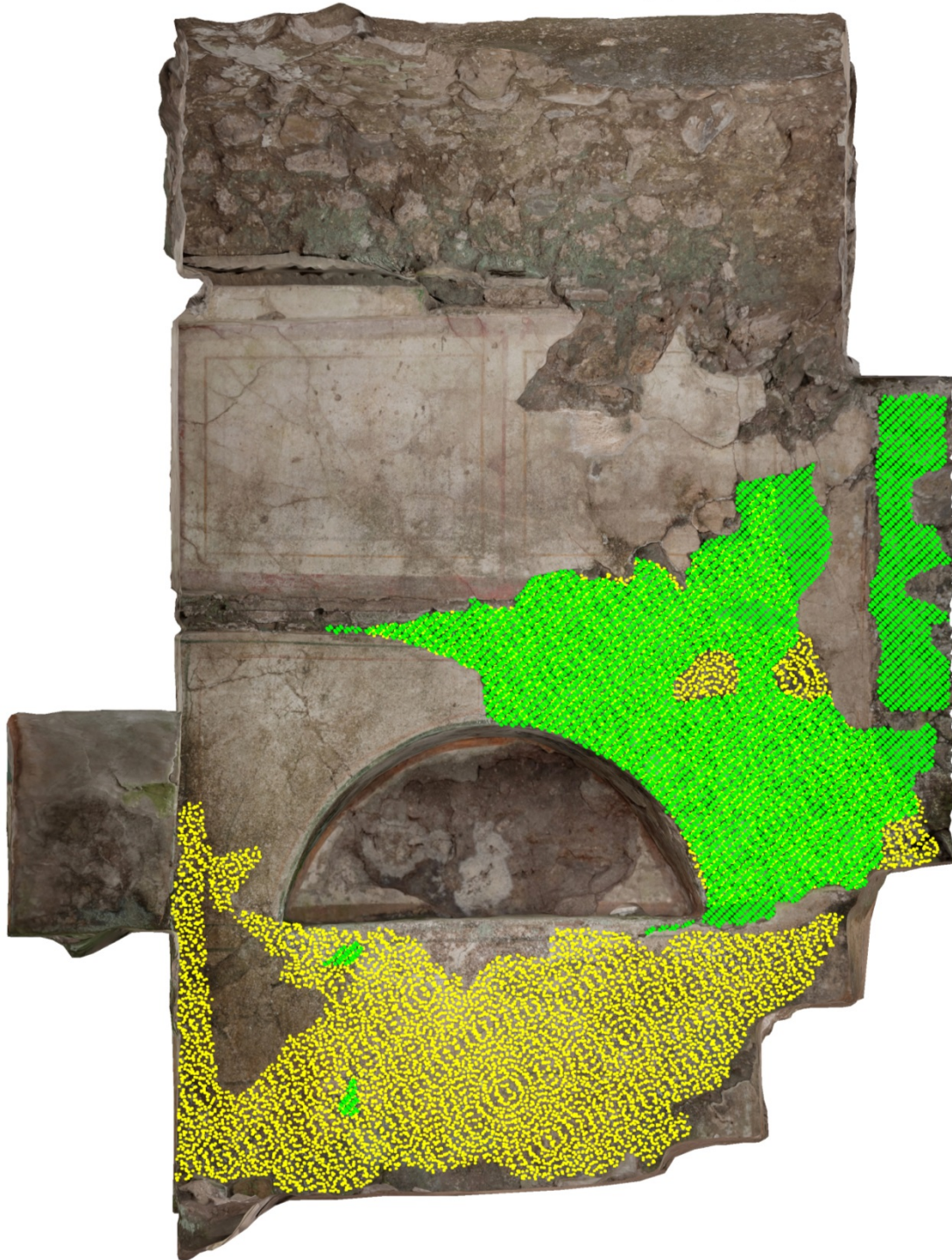
 red-brown alga/moss/bakteria???

 intense green algae

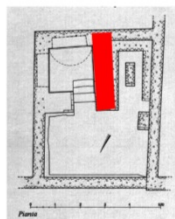
Figure 217: map 07\_ES\_W of possible alga.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_W\_I



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### LEGEND OF MAPPING


-  green moss
-  white turquoise lichens

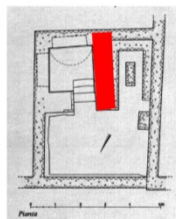
Figure 218: map 07\_ES\_W\_I of moss and lichens.



## NECROPOLIS OF PORTA NOCERA - 07\_ES\_W\_I



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### LEGEND OF MAPPING

-  black fungi
-  white turquoise fungi
-  turquoise fungi

Figure 219: map 07\_ES\_W\_I of possible fungi.



07\_ES\_N



Figure 220: map 07\_ES\_N\_E of biological overgrowth.



07\_ES\_E



Figure 221: map 07\_ES\_E\_E of biological overgrowth.



07\_ES\_S

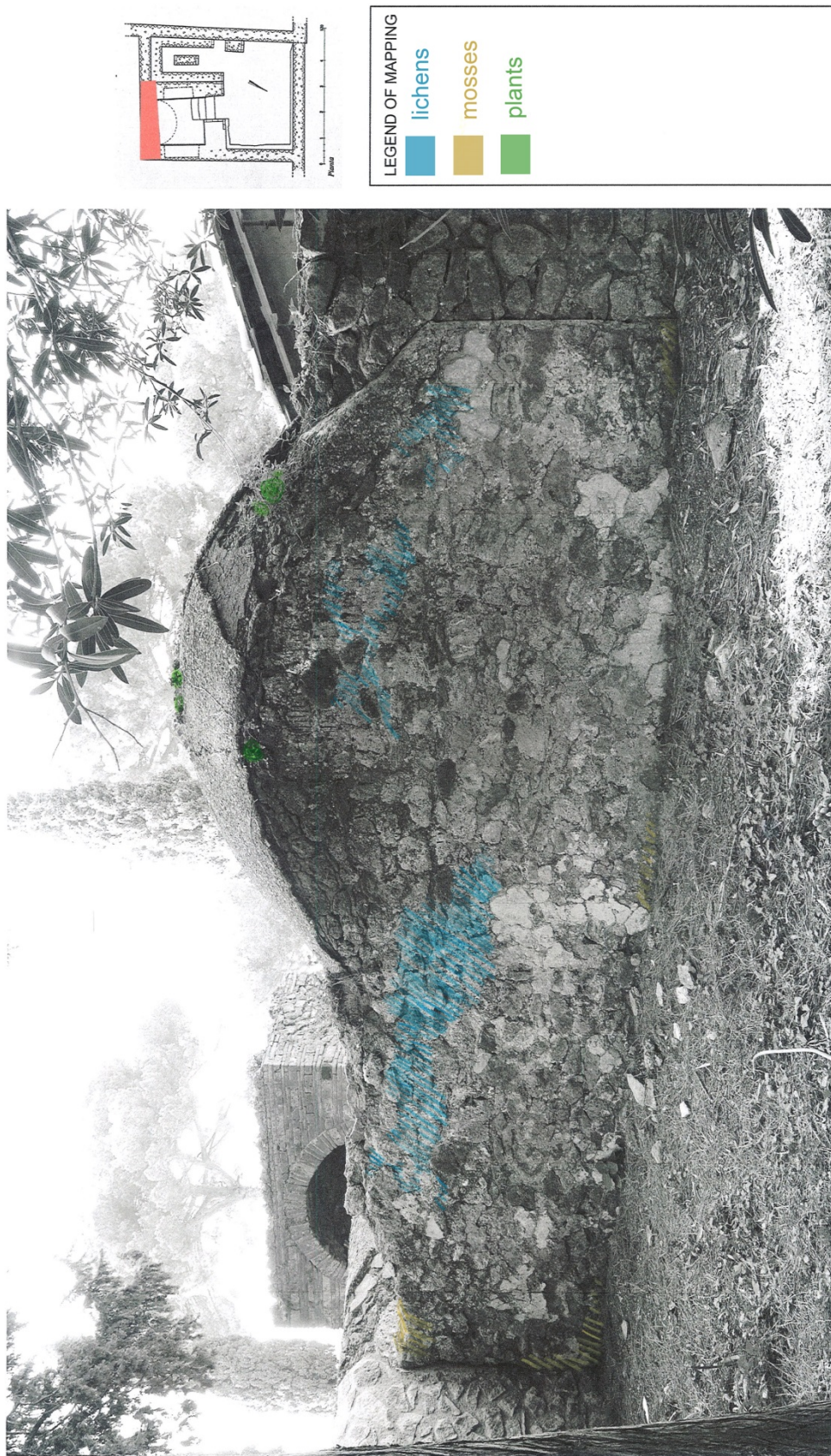


Figure 222: map 07\_ES\_S\_E of biological overgrowth.



07\_ES\_W



Figure 223: map 07\_ES\_W\_E of biological overgrowth.