

**IMTO – Italian Mission to Oman**

**University of Pisa**

**SUMHURAM**

**PRELIMINARY REPORT**

**November 2007**

**(SUM07B)**



**Sumhuraam Preliminary Report SUM07B**  
**November 2007**

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## **ARCHAEOLOGICAL PRELIMINARY REPORT (SUM07B)**

**November 2007**

The second IMTO's campaign of 2007 (SUM07B), directed by Alessandra Avanzini, started on 3.11.07 and finished on 26.11.07.

The IMTO's activities were focused in different fields, thanks to the participation of scholars of different subjects.

Regarding the city of Sumhuram, the main goals of this campaign concerned the excavation in Area A, Area B and the north-eastern sector of the city walls together with works of restoration and consolidation in Area A.

The excavations were conducted by dr. Alexia Pavan, dr. Michele degli Esposti, dr. Said al Mashani, dr. Milena Cucchiara, dr. Lisa Antonelli, dr. Angela Crestani. Dr. Said al Mashani was also responsible of the management of all the working operations in Sumhuram. Dr. A. Massa was the responsible of the topographic survey. Dr. F. Matteini was the responsible for the archaeological documentation.

The consolidation and restoration of the ancient masonry structures, under the direction of prof. M. Sassu (Department of Structural Engineering, University of Pisa), were conducted on the field by dr. eng. M. Andreini.

From 27.10.07 to 2.11.07 arch. S. Bizzarri has worked in Khor Rori in order to protect the ancient inscriptions placed in the gate complex and to elaborate a plan for the covering of the well inside the Monumental Building.

From 10.11.07 to 20.11.07 dr. P. Pallecchi and dr. G. Giachi from Archaeological Superintendence of Tuscany, Florence, have collected samples of stone vessels, Indian pottery, mudbricks and ceramic shards with internal coating of organic material in order to examine them from an archaeometric point of view.

Dr. M. degli Esposti has carried out a sampling campaign on all the available metallic small finds from Sumhuram, in order to choose the most suitable of them for analytical investigation about their physical and chemical properties.

Dr. A. Pavan has processed the pottery found during the two last campaigns and has provided a selection of "Indian" ceramic.

From 27.10.07 to 1.11.07 Dr. Axelle Rougeulle surveyed Inqitat Mirbat and Inqitat Taqah collecting surface ceramic material in order to complete her report about Islamic pottery coming from these sites.

The work of IMTO has been possible thanks to the collaboration of the Office of the Adviser of His Majesty the Sultan for Cultural Affairs in Muscat and in Salalah. In particular, we would like to thank Ghanem al Shanfari, Said al Mashani and all the Museum's team for their helpfulness.

Salalah, 28.11.2007

## Area A (trench supervisor M. degli Esposti)

New investigations concerned the area immediately south of the Monumental Building's wall M17, nearby room A85, unearthed during SUM06B campaign and possibly belonging to a new building (squares h/i-9/10 – fig. 1). A new room, A108, has been partially brought to light, only in its upper part dating back to a late arrangement of the area (fig. 5). The room is delimited by wall M17, wall M192, partially unearthed during previous campaigns, and newly found walls M237 and M241. Since excavations were interrupted after removing only the upper part of the archaeological record, not connected with the first stages of room A108 existence, the outlines of the stratigraphical situation will be described, prior to some remarks on the different building phases of room A108 and of adjacent unnamed structures as they can be reconstructed so far.

### *Stratigraphical situation and main finds*

The top of archaeological record was constituted by US21, a massive heap resulting from the landslide of the upper part of wall M17. US21 consisted in brown, non homogeneously greyish loose loam, incorporating a noticeable amount of roughly dressed limestone blocks and more regular sandstone slabs, usually smaller than the formers. The occurrence rate of these slabs on the total number of limestone blocks seems to be higher than what is visible on the standing M17 face: this could indicate that the upper part of this wall had a different layout than the surviving portion, or that they belonged to the internal filling of the wall. They could even belong to the upper parts of walls M192, M237 and M242, which delimitate room A108 and underwent different construction operations, one of which could have involved the use of a different kind of stones than the one constituting the lower and older part of these walls. From the crumbling of the walls comes also a great quantity of mortar flakes, beside some medium size *wadi* pebbles. Pottery shards are scantily represented in the layer, as do bone splinters and shells.

The aspect of this very thick layer seems to indicate that it is not the result of a single collapsing event, but rather of different phases of M17 disintegration. In fact, over a lower level rich in stone blocks, which could be attributed to an initial collapsing of the wall's top, stands a more earthy level incorporating a minor quantity of blocks. Upon this, lays the upper part of US21, again characterized by a great amount of large stone blocks. Another hypothesis would be that the lower stones concentration came from room A108 decaying, and only the upper one from M17. The fact that the intermediate level of US21 is richer in finds could indicate a short (?) period of squatter occupation following the first moments of city structures' decaying.

US21 has been removed in a wider area than the one occupied by room108, in order to leave no dangerous slope near the excavated area and to make future investigations shorter.

At the bottom of US21 stands US21floor, a thin hard packed layer, made up of greyish loam mixed with some medium and small size stones, again sandstone and limestone, disposed in a chaotic way. This floor, most probably not defining a real living floor but resulting in its compactness from the high weights it supported, directly covers the surviving top stone rows of walls M192 and M237. The collapse of the upper parts of these walls, with the landslide of their earthy fillings, generated another very compact accumulation of loam and stones, that have been considered as one with US21floor. Over wall M192, in its northern part where it leans on M17, the remnants of US22, localized during SUM06B campaign, have not been identified.

Many finds have been retrieved from US21, among which stand 6 coins (Co437-440, Co442-3), one shell bead (Sh304) and one shell pendent (Sh301), one incised shell (Sh299), one fragment of a glass vessel (G107), one polisher (S1156), one bronze clamp (MB495), one complete bronze needle (MB497), one bronze boss (MB488) and other fragmentary bronze objects (MB486, MB489, MB491-2, MB 494, MB498-9).

In the southern part of room A108, US21 floor directly covered the continuation of US203, partially excavated during SUM06B campaign. US 203, a garbage mound thrown initially inside a pit dug in US22 partially removing it and finally overwhelming the pit's dimensions, directly covers the top of walls M192 and M194 and exceeds current campaign excavation limit both southward and westward. It is quite inhomogeneous, containing a noticeable amount of ashes and charcoal (pulverised) in the southern part and lots of bones and fish bones in the northern. It directly covers the southern part of wall M192, as well as M194, M241 and M242.

From US203 came a steatite block portion, artificially flattened on one side, that could be the first retrieved trace of a local processing of this material, possibly purchased as semi-raw (big blocks import for local vessel manufacture). Other finds consists in one glass vessel fragment (G105), one stone vessel fragment (S1157), one fragmentary folded bronze plaque (MB93) and one lid obtained reshaping a ceramic fragment (CI17).

In the northern part of the excavated area the situation pointed out is more complicated, and ground lenses with different compositions have been identified between US21 floor and US203.

The northern portion of this garbage heap is covered by US241, a quite loose reddish-brown soil clearly distinguishable from surrounding layers, incorporating a low quantity of archaeological materials and revealing a slightly wider grain size than both the upper US21 and US240.

This latter consists in a loose greyish loam layer, with medium size stones included in it, recognized under US21 floor in the north-eastern part of the investigated area, between walls M192, M237 and the great wall M17. It strongly resembles US21, being separated from it by the presence of US21 floor, and differing from it by the lowest rate of mortar chips and stones occurrence. Actually, it includes a different kind of mortar scales, more thick and almost always showing a plain smoothened surface and a regular coarse back, which could indicate their belonging to a floor rather than to a wall. The fact that some such plaster portions were retrieved, showing an angular sloping shape, could point to the existence of a room that had been provided with impermeable floor and walls.

Only one bone bead (B54) came from US241, while US240 gave one glass vessel fragment (G106), one stone vessel fragment (S1158), two whetstones (S1149 and S1164), and a quite well preserved incense burner (S1162).

US240 and US241 are both covered by US21 floor, with US240 overlapping US241. Under them, a greyish-brown layer of loose loam, US243, occupies the northern part of the investigated area, and covers the top surviving part of a new wall, M242, which runs parallel to M17 and seems to be connectable with the late phase wall M195 found and removed in SUM06B campaign. The southern portion of US243 lies under US203.

Wall M242 delimitates southward the extension of US243 floor, a compact, hard-packed greyish soil that probably constituted the occupation level of room A108 during a late building phase, when the room extension was more reduced than the original one.

On the other side of wall M242, US203 had partially removed and currently covers US206, a reddish-brown loose loam layer, some 20 cm. thick in its eastern part but slightly raising westward. US206 is characterized by the scanty quantity of materials found inside it, something that seems to strengthen the idea that it was an artificially laid down soil meant to raise walking levels in a late building phase. It obliterates the upper part of the original entrance to room A108, located between M241 eastern end and M192-M193 corner, and serves as foundation ground for wall M194 and M243. It covers wall M241 (fig. 3).

Excavations have been suspended leaving the most uniform situation possible (figg. 2, 5). US206 has been removed, between walls M194, M242, M243, almost reaching the starting level of wall M242 (fig. 4), where a new layer could be properly distinguished with further excavations (final depth is 20 cm under wall M194 foundation). North of wall M242, the floor US243 has been left *in situ*, with its northern part near wall M17 broken through by US240, which probably represents the outcome of an initial decaying of the surrounding structures and can be chronologically linked to

the great collapse represented by US21. The western face of wall M237 has been unearthed in its top surviving portion, just to allow a clear view of its profile; on this side of the wall a crumble layer very similar to US21 seems to go deeper than on the opposite, and US21 floor has not been identified; nonetheless, the presence of US203 induce to name the unexcavated layer with a new number.

#### *Some remarks on room A108 constructional evolution*

As far as excavation works have been carried out, some phases of the interested structures' life have been cleared out, while some others can be hypothesized by analogy with what room A85's excavation brought to light and need verification with future investigations.

The original structure of room A108 was constituted by walls M237 and M241, defining a trapezoidal space with walls M17 and M192; M237 in fact doesn't run parallel to the wall dividing A108 from A85, but slants slightly toward it. M241 is tied to M237 and forms a corner with it; the original entrance to the room was located between the eastern end of M241 and the western face of M192, with M241 aligned with M193. This room was 1.68 m. large in its northern portion near M17, and 1.53 m large on the entrance side; length was about 4 meters.

Wall M237 reaches a height of 30.36 m. on the sea level at the conjunction with M17, while in its southern part it is only preserved up to 30.04 m.; in the corner with M241 it is 29.80 m. height, corresponding to the average preserved height of the short west-east oriented wall.

The other walls unearthed during current campaign belong to later phases; a deep debris layer is supposed to have filled A108 nearly up to US243 level, as happened with US209 in room A85.

Above these rubble pack was almost surely laid down one (or more) soil in order to supply a regular basis for the new building phase, that anyway exploited to a certain extent the upper parts of ancient walls. US206 represents one of these soils, and could possibly extent even under US243 floor.

The first rearrangement of room A108 is represented by wall M242, running parallel to wall M17 and delimitating what seems to be identified with the living floor of this phase, that's to say US243 floor. The building level of wall M242 has not been reached, but it is likely that it corresponds with the level reached removing US206. Wall M242 results much more disintegrated if compared with walls of the ancient phase, due to the poor consistency or its foundation, probably made up of one sole layer of stones, and its average preserved height is around 29.60 m. on the sea level. The severe collapse it underwent is probably the reason why no entrance to the room is identifiable for this building phase.

Summarizing, the second constructional phase of room A108 was represented by an almost rectangular room, shorter than the original one (now only 3.10 meters long), defined by walls M237 and M192, probably partially rebuilt in their upper part, by wall M17 and by wall M242, which should have hosted the room entrance. This room was provided with a well structured floor, whose preserved height is 29.60 m. on the sea level.

Outside this room, the walking ground had been raised to almost reach the inside floor level, obliterating the remnants of wall M241 by laying down US206.

This latter soil was the building basis for the poorly preserved wall M194 and for the crumbling structure M243, possibly representing the walling up of a passage originally left open between M237/M241 corner and M194. The upper height of M243 is currently 29.97 m. on the sea level. The presence of a large sandstone slab (0.68 x 0.35 m.; height in its middle point 29.56 m. on the sea level) at the bottom of the scanty remains of this structure could be referable to an original threshold (fig. 4), even though the anatomy of the room to which it could have given access is not determinable at the actual stage of the works. One possibility could be that the passage corresponding with M243 lead into a kind of corridor/antechamber delimited by wall M194 on the one side and walls M242 and M195 on the other; towards which rooms A108 and A85 opened in their late phase. A corridor closed on the northern side by walls M241 and M193 would indeed be

too narrow, with a width of just 0.76 m., letting us to confirm that M194 raising took place when the older walls had already been buried.

The slab currently lies on the bias, some 10 cm deeper in its southern end than its northern, but its original level corresponded to M194 base (fig. 4).

However, while the reconstruction of the different building phases of room A108 is quite worthy of credit, for what concerns the adjacent spaces located north of it, nothing more than more or less weak hypothesis can be drawn, at least until excavation have widened both westward and southward.

## **Restoration works and archaeological implications**

Due to the severe damages caused by the heavy rains of June, priorities for the interventions to be carried out in Area A have shifted from further archaeological investigation to walls consolidation and restoration. Here only the outlines of the rebuilding works will be reported, since an accurate description can be found in the technical report. For what concerns photographic documentation, the same principle will be followed, and only archaeologically relevant pictures will be referred to.

### *Building BA6*

Works began in the residential building BA6, specifically in its south-western wing, the one occupied by rooms A64a and A65a and, in a later phase, by the so called “small premises”.

Prior to proper restoration, consisting in the rebuilding of the walls collapsed last June, is been the search for solid bases to allow the walls’ raising. For that purpose, even the lower rows of stones still *in situ*, but not enough strongly tied to the damaged wall structure, have been removed. Stones have been left apart, in order to reuse them in their almost original position.

### *BA6, rooms A64a and A65a*

This operation took place, at first, concerning walls M127 and M230. The latter has been named with a new number given the not clear situation of this area as resulting from previous report: it corresponds most probably with M173, mentioned in SUM05B preliminary report.

From the removal of M230’s leaning out stones and from the cleaning of the loose loam between them, came a fragmentary amphorae handle (SUM07B, M230,1). Other small ceramic fragments have been unearthed while digging in search of a good row of stones from which the rebuilding of the wall could safely start. In the case of walls M127 and M230 this operation actually consisted in removing just a few centimetres of loose sandy loam, considered as part of US192 floor, corresponding to the floor of rooms A64a and A65a (see SUM05B p. report). A few pottery fragments have been retrieved during this phase of the work.

The collapsing of wall M230 allowed the sight of M127 northern face and supplied an explanation to the building of the former. In fact, M127 showed an almost collapsing structure, and M230 turned out to have a limited length, non entirely covering M127 but just acting as a support to its north-western portion, the collapsing one (fig. 6). Thus the original construction of wall M230 has to be regarded as a consolidation work. This situation reflects an analogue relationship existing between M126 and M125 (fig. 7), the latter being a consolidation structure raised to prevent the former from collapsing.

After the works on M127 and M230 have been carried out, the south-western end of wall M101, possibly defining the original corner of at least one building phase of the room A65a, has been taken into account. Even in its case, preliminary works only implied shallow digging to bring to

light a good row of stones, and no find came out. A bronze fragment, possibly belonging to the decoration of a plaque (MB 482), was retrieved amidst the ancient mortar joining the wall.

For what concerns the opposite side of A64a and A65a, the walls standing in front of M101 had been initially defined with three numbers, corresponding to three structures. New investigations actually showed that this interpretation needs rethinking. In fact, as a first matter, the wall named M170 is just part of wall M148 (fig. 8) and one of these numbers should be reassigned or, better, erased. (M170 is finally been considered as a whole with M148 and only the latter has been described in the wall index sheet). Wall M148 thus run from the point where M128 leans to him, to the point where a walled up door is clearly visible, previously considered as part of M170. This architectural features has now been given the number of M231 (fig. 9), leaning on M230 on one side and to M148 on the opposite.

Furthermore, wall M126 seems not to be running further than the point in which the short wall M149 (representing the walling up of a previous passage or the rebuilding of a collapsed portion of the wall) leans on it.

The search for a good starting point for the rebuilding of M148 gave no satisfactory result: the wall appears to have undergone severe collapsing episodes, one of which seems prior to the reorganization of the area with the building of the small premises. A small and not deep sounding was conducted nearby M148, reaching the point where US192floor probably ends, and a new layer seems to stand, characterized by a more compact brownish soil (at a depth of 15-20 cm, relating to US192floor surviving upper level) (fig. 10). This layer has been given no name, due to the reduced extension of the sounding that supplies no certainty on this identification. Its correspondence with US194, identified thanks to a deep sounding in the south-western corner of room A65a during SUM05B campaign is at the moment not sure.

Bearing in mind that many operation have taken place upon US192floor, involving the carrying (and actually throwing) of heavy loads (namely stone blocks), it cannot be dismissed the possibility that the looseness of the upper part of the loam removed during the new sounding only resulted different from the lower part just as a consequence of the abovementioned operations, actually belonging to the same US192floor.

Apart from these considerations which will need verification with new and wide area excavation, what appeared to be sure is that no northwest-southeast oriented wall was originally connecting the remains of M183 and the side of M148, prior to the “late complex” building phase. Beside, wall M148 revealed to have been tied to another wall, whose remains lay now underground, running northwest-southeast and defining a corner with M148, and that can be identified with M147.

Wall M148 has been anyway cleaned from the crumble due to the June’s rains, and during this operation a few pottery fragments came to light, among which a fragmentary base of a straw temper storage vessel; a bronze fish hook (MB 481) has been retrieved too.

Other works concerned the quite long wall M144, closing corridor A60 on its southern side and dividing it from rooms A56 and A65a. This wall showed a landslide in correspondence with the joining with wall M128 and with wall M124. Wall M128 was previously considered as tied to M124, with M144 leaning on the corner between the former two; new investigation on this point actually lead to the conclusion that the south-eastern portion of wall M124 (south of the entrance of room A56) should be considered as a whole with M144, with M128 tied to it.

The same wall M144 underwent a small collapsing episode near the stair that, from corridor A60 level, leads to room A64a. Here, a short segment of the wall appears to have been built using mudbricks instead of stones. These bricks lay upon two lower rows of stone; this could indicate that mudbricks where utilized to repair an ancient collapse or to wall up a passage, in this case characterized by a raising step. The possibility that the preserved one was actually the original structure of the wall should not be discarded.



### *BA6, other rooms*

Cleaning from excess loam probably carried by the heavy winds and rains occurred during last June has been carried out in rooms A56 and A63.

### *Building BA2/BA3*

Two walls belonging to this residential building crumbled due to June's rains. The building was lying in a very poor state and it's been completely cleaned by removing fallen stones and loose loam coming from the walls' filling.

Thin wall M53, dividing room A27 from room A28, with a width corresponding to that of two stones (it is a two faces wall with almost no filling), had lost its northern face and part of its south-eastern end. The wall has not been rebuilt but it has been set free from crumble stones and loose earth.

Otherwise, wall M56, delimiting the stair that leads from A28 level to A31, has been rebuilt using both its original stones and other good ones chosen from other points of the site. In search of a good base to start from, a little sounding has been excavated flanking the wall; no find came to light, but small bone fragments stand to testify that virgin soil have not been reached, or at least that the digging of a thin foundation trench could be hypothesised. This confirms what had already been found during SUM05B campaign, when a deep sounding was carried out along wall M57, in street A45. Here, two layers have been recognized, underlying the wall: a sort of foundation filling set upon mother bedrock, composed of limestone chips, and an upper brown compact loam layer (UU.SS. 168 and 165), a situation that seems to coincide with the one exposed with the sounding in room A28.

### *Building BA4*

The most impressive collapse concerning this building occurred in room A33, where the wide wall A63 fell down. Its structure was built using both irregular stone blocks and mudbricks, whose clay widely buried the floor level of the room after collapsing. Due to the demanding work that its rebuilding would have required, impossible to be carried out during current campaign, the wall has been left in its current situation, and the room cleaned from earth and stones. Few fragments of ceramic and bones came from the crumbled wall's filling.

### **Area B** (Trench supervisors: A. Pavan, S. al Mashani, M. Cucchiara)

About area B, the goals of the present campaign were the completion of excavations in rooms A73 and A74, partially dug in SUM05B and SUM06A (fig. 11), and the clarification of the situation northern to room A73 in the area comprised between the path for the tourists and the northern portion of the storage bins (fig. 12).

### *Street A74*

In street A74 we started to remove the strata western from wall M176 where during the previous excavations was left a baulk of 50 cm circa. The layer, named US232, was brownish in colour and medium compact in consistence. It's equal to US181, excavated in SUM05B: the top part (0.30-

0.35 cm *circa*) consists in very soft light brown loess mixed with medium and large stones; the lower part (0.20-0.15 cm *circa*) is more compact and slightly greyish in colour.

In addition to a scarce quantity of pottery shards, a number of animal bones and marine shells, the followings objects have been found: a crucible (G104), a ceramic lid (C114), fragments of bronze objects (MB479 and MB480), a fragment of iron nail (MI30), a fragment of stone vessel (S1120) and some iron slags, one of them plano-convex in section.

We reached US232floor (=US181floor) at an elevation of 28.72, discovering a row of stones constituting wall M238, which is the northern wall of the new room A105, delimited in the southern part by wall M169 and in the eastern part by wall M176. Actually it's not clear in which way the room was closed towards west (fig. 13).

If in the southern part of A74 we decided to stop at the level of US232floor (=US181floor) in order to draw the new room A105 of which the lower part of US232 (=US181) constituted the pavement, in the northern part we went down removing also US197, a layer consisting of very hardly packed dark brown loam mixed with stones and pebbles (see also report SUM06A), reaching US197floor at point 28.24. Quite a large amount of animal bones have been found in the layer, together with few marine shells, pottery shards and some charcoal samples. Towards wall M165, US197 covered two steps built on the top of US199 (see report SUM06A for the description of the layer). The upper row has a total length of 1.5 m and it's made of four stones (elevation 28.69); the lower one is long 1.2 m and it's made of three stones (elevation 28.45). It seems that this simple staircase led to the entrance located in the wall M165 and connected the room A73 and the street A74.

As well as during the previous campaigns no small finds have been registered from the layer US197.

### *Room A73*

Just the eastern half of room A73 was excavated during excavations of SUM05B so in this campaign we decided to dig the western part.

At the beginning we started removing the layer of dumps, named US233, washed down during the copious rains fall down during the last months reaching the pavement in the eastern side, US190 floor put in light during SUM05B. US233 covered in fact the fireplace with furnace discovered in the previous campaigns and the rows of stones constituting wall M166, on the northern side of the room.

After the cleaning of US190 floor in the eastern part of the room, we went on with the excavations of the western part removing US180, consisting in light brown sandy loam mixed with medium and small size stones, few animal bones and marine shells and a quantity of pottery shards.

A fragment of stone vessel (S1119) and a fragment of bronze rod (MB500) have been found in the layer.

As expected, the same situation brought to light in SUM05B was confirmed during these excavations also in the western part of the room: below US180 was individuated US190, a layer consisting, on the upper part, in light brown sandy loam mixed with large stones, animal bones, marine shells, pottery shards and a quantity of iron slags (total weight of the slags: 1.100 kg).

Quite a large number of small finds has been discovered in US190: a complete incense burner with reddish colour on the exterior (S1128) (see object index card), a stone bead (S1129), a complete stone mortar (S1123) and a fragment of another one (S1131), two shell beads (Sh298 and Sh300), a bronze plaque (MB483), a fragment of bronze nail (MB484), a fragment of stone vessel (MB485), a worked bone (B51) and a fragmentary pendant (D25) in coral, for the first time attested on the site.

In the western part of the room A73, at the same elevation of the fireplace with furnace discovered in SUM05B (elevation 28.24), on US190floor, reached at point 28.21, was identified another installation which was probably connected with some kind of productive activity (fig. 14).

The installation, placed in the western half of the room is roughly oval in shape and it's made from 30 irregular stones of medium size. It measures 1.95x1.06 m. *circa* and it's built, in its southern extremity, close to wall M165.

The presence of a large number of slags found during SUM05B and SUM07B excavations seems to confirm the productive character of room A73 at least on the first phase of occupation.

### *Room A106*

In parallel with the investigations in A73 we started the cleaning of the area, corresponding to square n12, placed northern from A73 where rows of aligned stones were clearly visible on the ground.

The new ambient put in light, named A106, was delimited from wall M234 on the eastern side, M236 on the northern side and M235 in the western side (fig. 15).

The removal of 20 cm of surface gave evidence of animal bones, pottery shards and marine shells.

Below the top soil we recognized a new layer, US235, quite similar for consistence and character of findings to the surface.

US235 has an average thickness of 1 meter *circa* and it consists of soft brown loess mixed with collapsed stones, animal bones, marine shells and pottery shards. Towards the lower part of the layer we recognized lenses with a big amount of fish-bones. The following small finds have been discovered in the layer: three fragments of stone vessels (S1121, S1122, S1124), a clay lid (C115), a clay spindle whorl (C116), a stone polisher (S1125) and a fragment of whetstone (S1126).

Below US235 we individuated US236, a garbage heap according to the huge quantity of organic materials (above all fish-bones but also mammals' bones), ashy lenses and large amount of charcoals. The average thickness of US236 is 60 cm *circa*. Among the numerous pottery shards (many of them present traces of repairing made in antiquity) it's was found a small table jar (US236,4), archaeologically complete (see pottery index card). It was hand-made with a medium compact paste rich of grit temper and white inclusions (calcium carbonate). It's interpretable as a local product.

The following objects have been found in US236: two shell pendants (Sh302 and Sh303), a bone bead (B52), four fragments of stone vessels (S1127, S1133, S1136, S1137), a bronze folded stick interpretable as part of a key (MB487), a stone pestle (S1140) and a coin (Co435).

US 236 was in strict relation with US237, consisting of a fireplace and the pavement on which it was placed on, reached at point 29.47. The average thickness of the layer is 40 cm *circa*. The floor is preserved just in the north-eastern side of the room, the western part was occupied by the fireplace, roughly circular in shape (elevation 29.37) while the southern part had been broken from collapsed stones, left *in situ*. The fireplace was partially delimited by stones of medium and small size, roughly worked and the filling was dark brown/greyish loam mixed with ashes and charcoals. The pavement is made of packed earth.

A fragment of bronze clamp, probably used to repair stone vessels (MB490) and a stone handle in shape of ram's head (S1163) (see object index card) have been found in the layer together with animal bones, marine shells and shards of pottery scattered on the floor and around the fireplace.

### *Room A107*

With the aim of rendering more clear the architectural lay-out of the storage quarter, during this campaign we decide to enlarge the cleaning of the area towards north-east, going on with excavations in square n12, northern from wall M166.

Here a new room, A107, delimited in the northern side by wall M239, in the eastern side by wall M215, in the southern side by wall M165 and in the western side by wall M234, was individuated (fig. 16). Wall M234 is quite different from the other above-mentioned walls (made from irregular stones of different size) and does not present relations neither with wall M239, nor with wall M166.

It means that M234 (as well as A106) belongs to the last occupational phase of the area and it was built later than the other structures.

The top surface covering A107 consisted in soft soil with stones of medium-big sizes collapsed from the surrounding walls. Besides pottery shards, marine shells and animal bones a nice stone vessel handle has been found (S1142).

Below the surface we individuated US239 and a new wall, M239, parallel to M166, with orientation east-west.

US239 is a rather compact layer, brownish in colour with quite a large number of stones of medium size (above all sandstone blocks) and broken mudbricks. Some animal bones (above all whale bones), marine shells and few fragments of pottery have been found here.

Despite of the scarcity of evidences, in US239 was found a very interesting piece: a mortar in limestone of big dimensions with an inscription carved (S1150) on the top, near the rim (see object index card).

Below US239, at point 30.45, we recognized US244 a reddish hard layer made of soil and broken mudbricks which covered completely the space delimited by walls M166, M215, M239 and M234. Just near wall M234, in the western part of A107, the situation was less clear because of the consistence of the soil which is softer and without mud-bricks. We interpreted it as an interface between US238 localized in the "corridor" in correspondence with A106 and US239, localized in correspondence with A107.

US244, completely sterile and interpretable as a levelling layer, covers the wall M244, exposed just for the top row of stones. The walls leans on M239 and the excavated measures are 3.60x0.60x0.15: it seems dividing in two parts room A107.

Northern from rooms A106 and A107 another ambient was individuated, a kind of "corridor", delimited from wall M245 in the northern side, M215 in the eastern side and M239 and M236 in the southern side (fig. 17).

Below the top surface different kinds of accumulations have been individuated: in the western part we recognized US238 and US242, in the eastern side US239 which characterized both the "corridor", both room A107 and an accumulation of stones probably collapsed from wall M215 and placed above all near the wall.

US238 is a garbage heap, with a large quantity of organic remains and pottery shards, many of them with traces of repairing. Ashy lenses and charcoal samples have been discovered. The consistence is soft, the colour reddish. The following small finds have been discovered: two fragments of stone vessels (S1146, S1147), beads in shell (Sh305) and bone (B56, B57), two pestles (S1143, S1151), a probably bone pawn (B55), a whetstone (S1144), two loom weights (S1152, S1153), a bone awl (B53), a mortar (S1154), a stone spindle whorl (S1155), a bronze complete needle (MB496) and a coin (Co441).

Two fragments of Orange Fine Painted Ware have been found in the layer (see pottery index card).

Below US238 was instead recognized US242, a more compact layer with less organic material, small charcoal remains, animal bones, marine shells and pottery shards.

The following small findings have been discovered: two fragments of glass vessels (G108 and G109), two *Chlamys Townsendi* probably used as oil lamps (Sh307 and Sh308), two fragments of stone vessels (S1160 and S1161), a bronze hook (MB503), a shell spindle-whorl (Sh309), a fragment of bronze plaque (MB501), a fragment of bronze object (MB502), a pestle (S1166) and a coin (Co444).

The eastern part of the corridor was instead covered by US239, and near wall M215 is visible a large amount of collapsed stones which represents the upper part of the layer, probably fall down from wall M215.

According the plan of Albright it seems possible to recognize the two rooms A73 and A107 as part of the building IX B6 (1982, 34). However the topographic position of the building in the plan

drawn by AFSM is erroneous since the place where the building is positioned is actually occupied by the northern portion of the storage-rooms.

### **North-eastern corner of the city: Structure A103 and Room A104**

(Trench supervisor: A. Pavan)

#### *Structure A103*

During the first week of excavations the work in the north-eastern corner of the city, started during the previous campaign SUM07A (fig. 18), was finished.

The destruction level US227, constituted by the collapsed walls and the internal filling of structure A103, which made not readable the architectural lay-out of the eastern part of A103, was completely removed showing a complex more articulated than the one published in the report of F. P. Albright (1982: pl. 4, fig. 5) (fig. 19).

Parallel to the internal recess cleaned in SUM07A and unearthed by AFSM, measuring 0.92x4.20 m. (elevation 26.89), during this campaign a second room, rectangular in plan and measuring 1.55x3.10 m, was discovered (elevation 26.63). The two corridors were separated by a wall with a width of 0.87 m, made of stones irregular in dimension and shape. As well as the recess cleaned in SUM07A, also the room excavated during this campaign was found completely empty except for the stones collapsed from the top of the structure and from the partition wall.

As supposed in SUM07A the function of both these empty spaces could be related with the lightening and the stability of the structure.

According to the description made by Albright (1982: 39), the structure A103, measuring 5.35x4.50, named by AFSM M22/M23, was divided in two long rooms by an internal wall. In the western one two other compartments have been originally recognized: the northern, almost rectangular and the southern, less defined in shape; the eastern one was in a very bad state of preservation.

Albright thought that the structure was not contemporary to the city wall and neither built in the same time since, according to his speculations, the eastern half was built against the western one.

Both the parts have been defined roughly hollow: the southern compartment was found completely empty, the northern one held bones, probably human, disturbed and broken.

Albright argued that the compartments could be the foundations of a vault-tomb, made for a high-rank person, even if he added that they could belong to a later deposition, placed in a room built for another purpose.

While it's possible to find a correspondence between the compartment quoted by Albright and the blind corridor cleaned during SUM07A, the eastern compartment brought to light in SUM07B is not recognizable in the plan drawn by the Americans.

In spite of the prosecution of the excavations and the definition of the architectural lay-out of the structure, it was not possible to clarify the absolute chronology of A103.

The lack of finds does not allows us to make hypotheses in this direction even if the construction techniques and the usage of huge monoliths seem proper of the ancient phase of construction.

The base of A103 is made of huge monoliths with dimensions very similar to those of wall M132 in A62: they measure 54x58x55, 55x47x52, 100x50x55, 38x45x41, 105x50x50, 67x52x50, 90x53x50. The second row is constituted by three stones of huge dimensions measuring 123x46x48, 103x40x45, 134x37x46.

The collapsed blocks placed at the feet of tower are two monoliths measuring 115x56x36 and 130x48x30.

For sure, as already noticed in SUM07A, A103 was not built at the same time as A102 since the western wall of A103 just leans on the eastern wall of A102 and it's not tied to it. The difference

between the two structures is however visible also in the masonry: while A102 is made of well-dressed stones of medium-big size, uniformly with the other portions of the city-wall, the northern face of A103 is made from rectangular blocks.

#### *Room A104*

Beside the structure A103 a new room, probably already visible during AFSM excavations but not in the plan of Albright, was excavated.

The room, named A104, is rectangular in plan and measures 2.75x5.20. It's delimited on the northern side by wall M246 (southern wall of structure A103), on the western side by wall M227 (eastern wall of tower A102), on the eastern side by wall M229 and on the southern side by wall M228.

Wall M246 just leans on M227, as well as M228, while M229 is tied to M229 demonstrating that room A104 was a later addition which utilized walls of the previous structures A102 and A103.

Room A104 was excavated for 1 m. *circa*, removing the top layer (surface) and after US234, an accumulation which fills completely the ambient.

US234 is brownish in colour and rather soft in consistence. It's constituted by dressed stones of medium-big size collapsed from walls M246, M227, M229 and M228, placed on the upper part of the layer, earth and a large amount of stones of small size which in many cases have the shape of flakes in the lower part.

On the top marine shells and few bones have been discovered which seem to be related with a modern consumption.

Just one pottery shard has been found in the accumulation.

Circa 50 cm below the surface some charcoal samples and fragments of probably burnt seeds have been found but, belonging to a later phase, they are not interesting for dating.

At the point 28.02 we decided to stop the excavations cleaning the eastern side of A103 and A104 from the dumps accumulated during the excavation work and before. The internal face of wall M229 was, besides, very badly preserved so it was impossible to dig inside without the consolidation of the masonry.



Fig. 1: Area A before SUM07B excavations



Fig. 2: Area A with Room A108 after SUM07B excavations





Fig. 3: Area A during excavation, US206 (in section, and in the middle of the picture) partially covers M241, reaching M194 ground level



Fig. 4: Area A, M243 laying on a possible threshold, upon US206 still *in situ* on this side of the structure





Fig. 5: Area A, Room A108 and nearby walls after excavations



Fig. 6: Area A, wall M127 after rebuilding and wall M230 under construction: the almost collapsing north-western part of M127 is visible, supplying an explanation for M230 raising



Fig. 7: Area A, wall M125 (right) leaning on wall M126 to prevent its collapse



Fig. 8: Area A, the severely damaged structure of wall M148 seen from the east; only the southern end (previously defined as part of M170) and the northern corner with M147 are well visible





Fig. 9: Area A, wall M231 (previously defined as part of wall M170), seen from the east



Fig. 10: Area A, the shallow sounding conducted near wall M148: stones coming from a collapsing event prior to the “late complex” phase are clearly visible under US192 floor level



Fig. 11: Area B before excavations



Fig. 12: Area B after excavations





Fig. 13: Area B, Street A74 and Room A105



Fig. 14: Area B, Room A73 with furnace and annexed installation





Fig. 15: Area B, Room A106 with the fireplace



Fig. 16: Area B, Room A107 divided by wall M244



Fig. 17: Area B, the “corridor” between wall M239 and wall M245



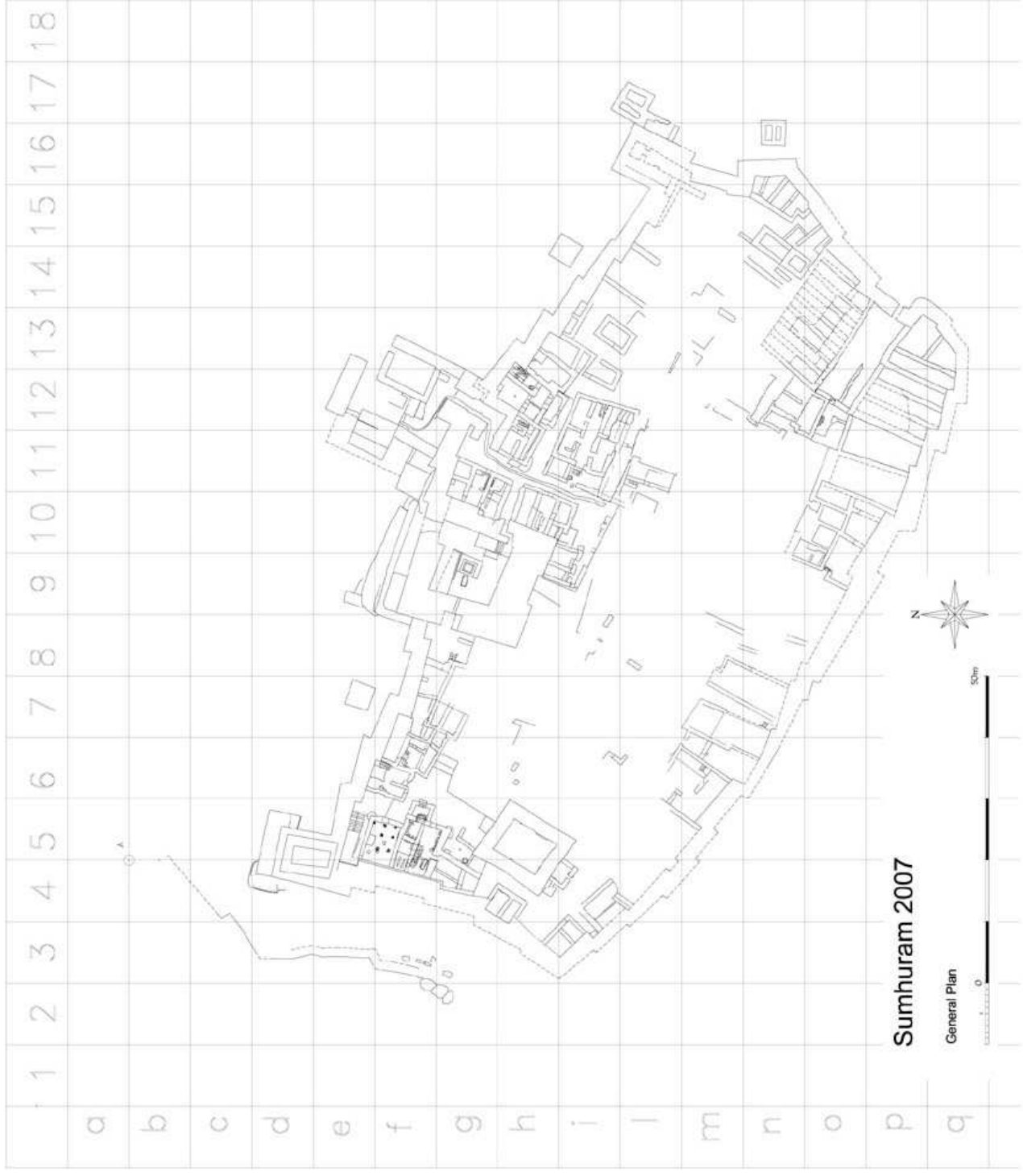
Fig. 18: Area B, Structure A103, before excavations





Fig. 18: Area B, Structure A103, after excavations

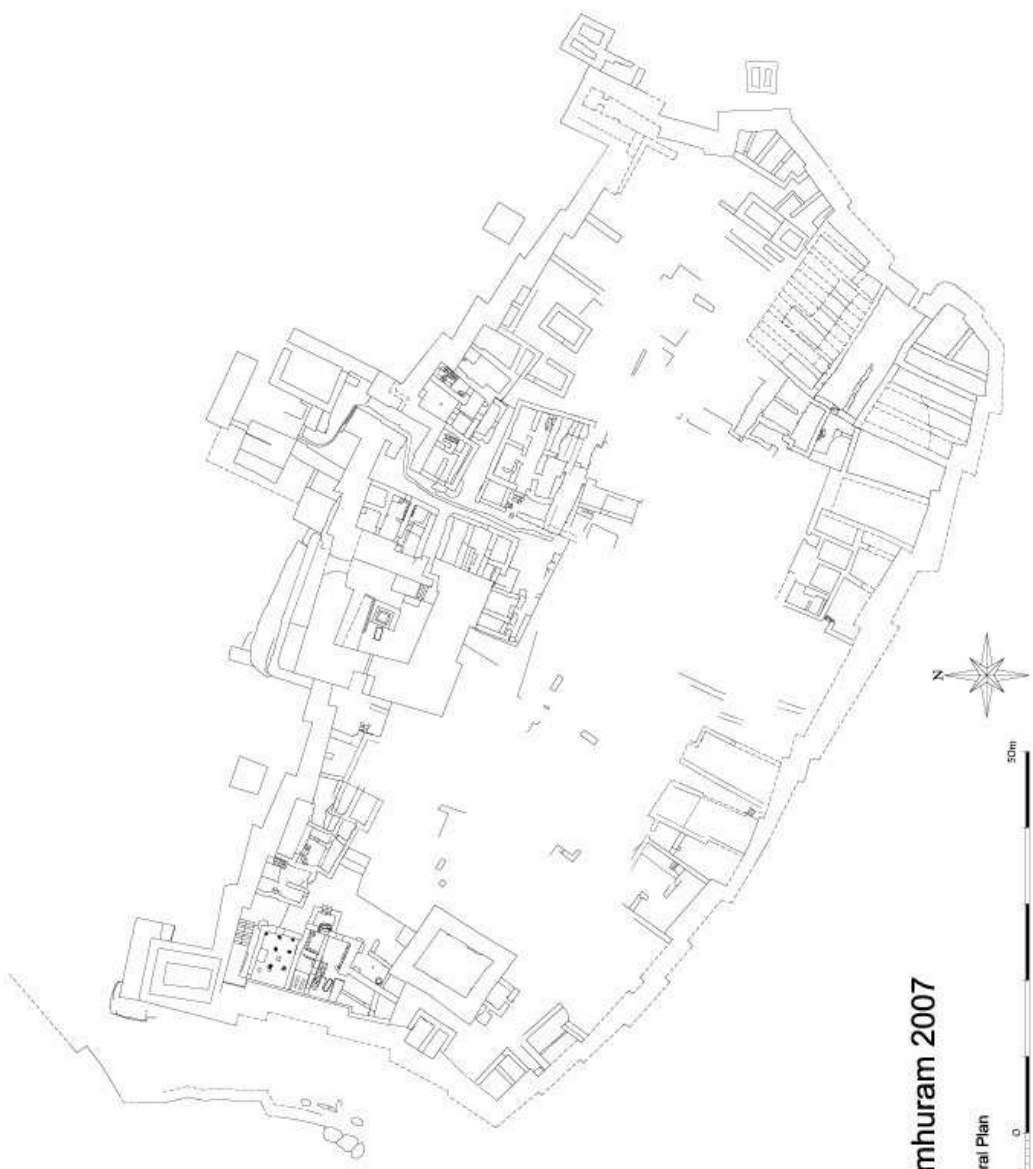




Sumhuram 2007

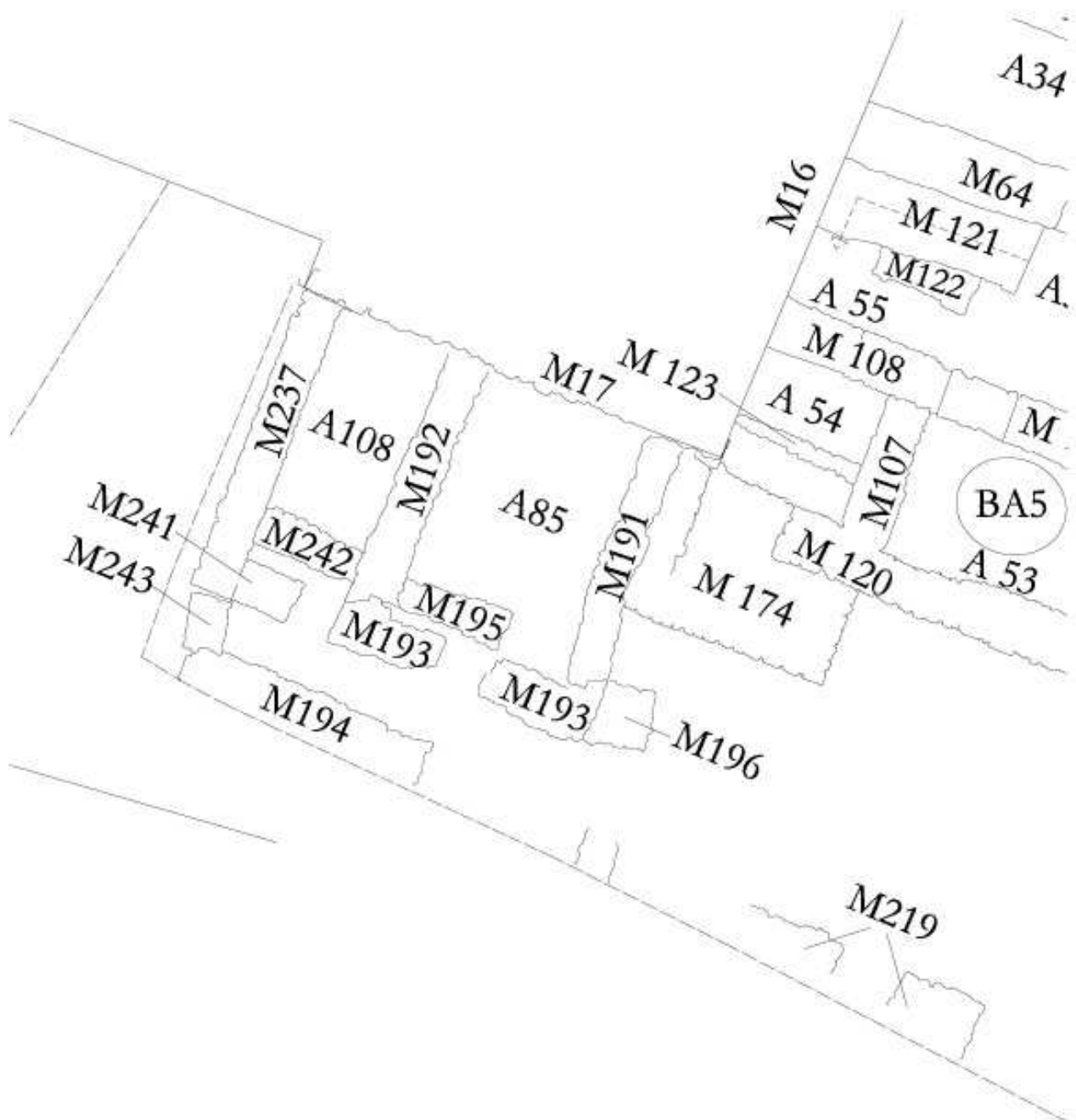
General Plan





# Sumhuram 2007

General Plan

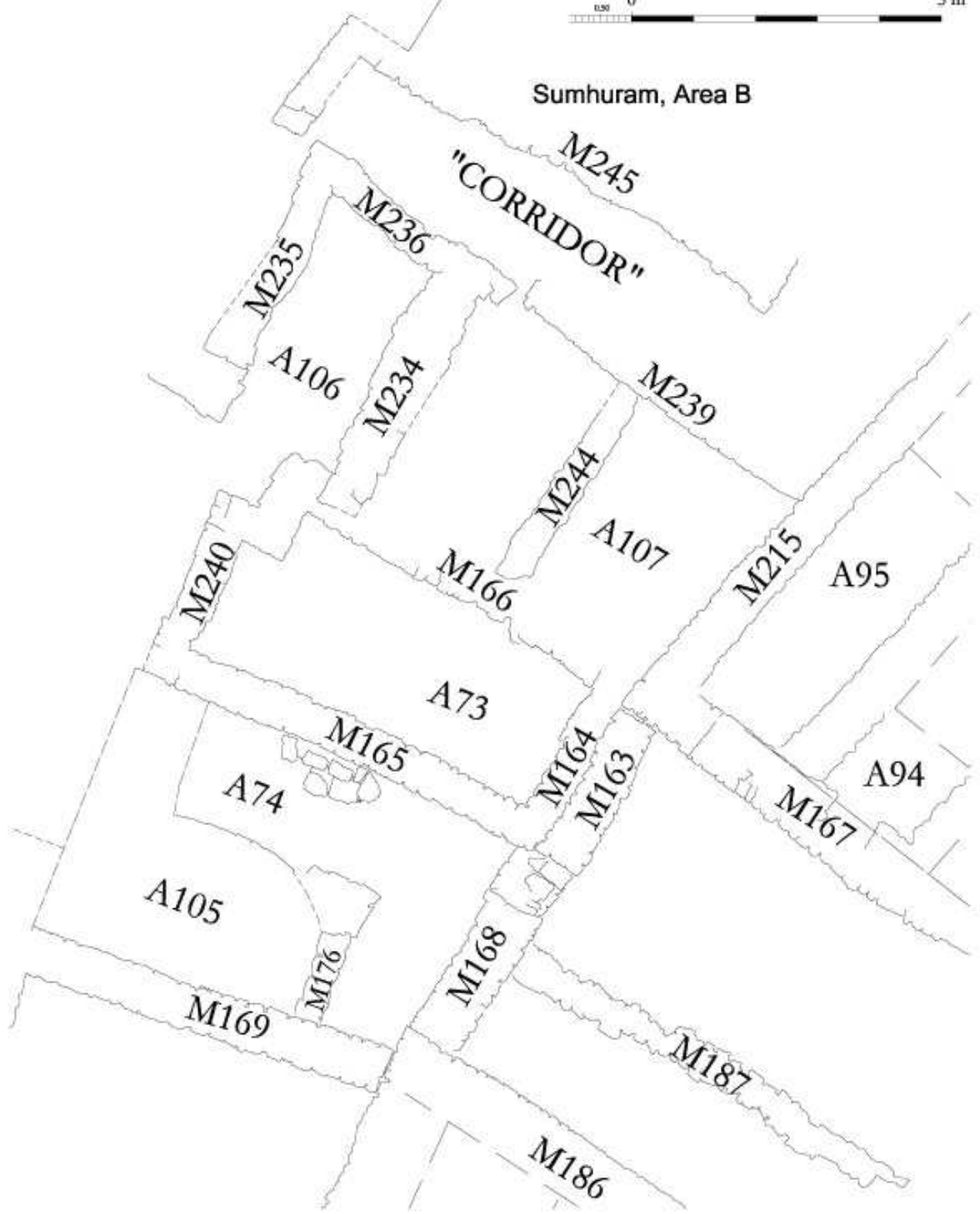


Sumhuram, Area A





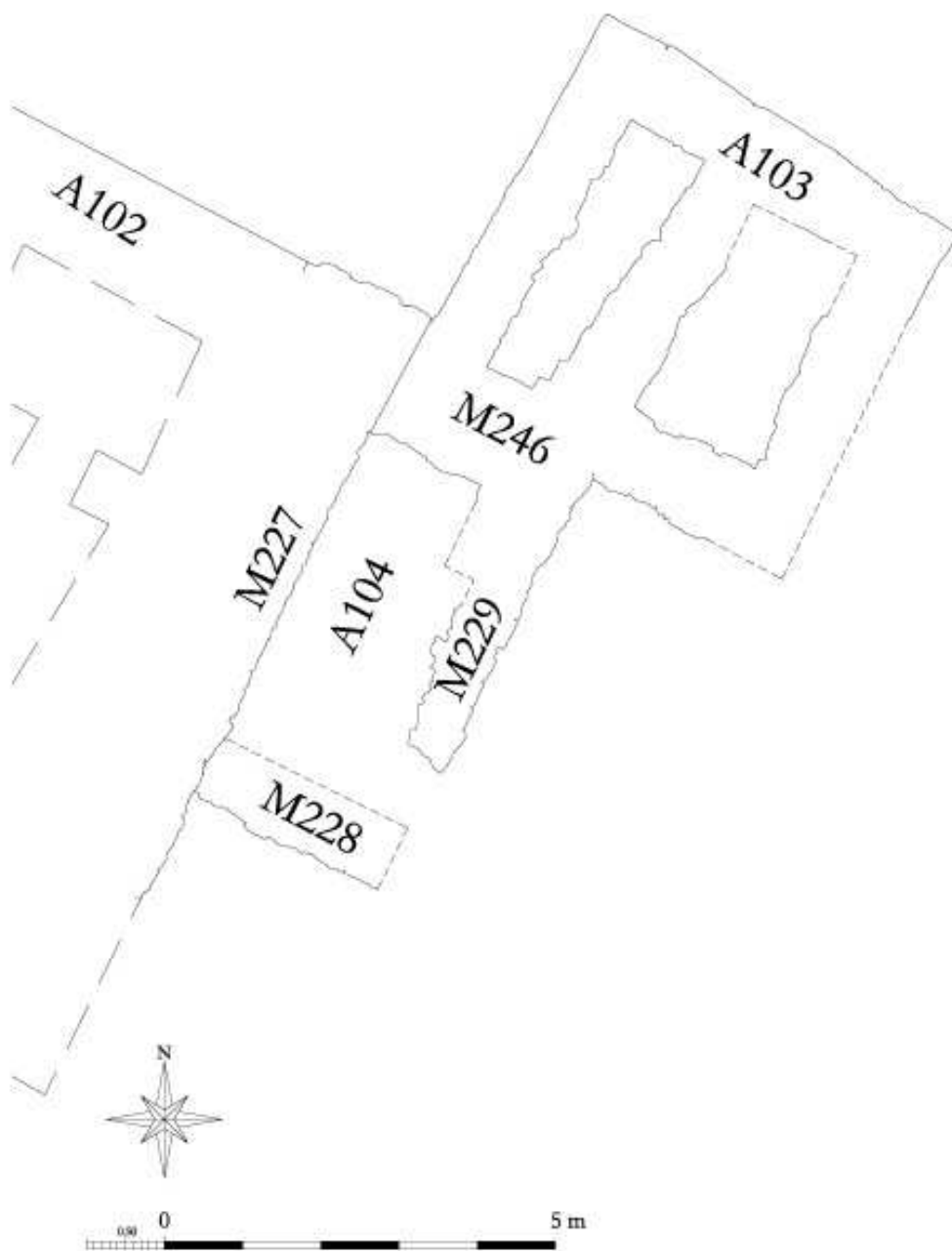
Sumhuram, Area B





### Sumhuram, Area B






Sumhuram, North eastern corner of the city  
Structure A103 and room A104




Sumhura, North eastern corner of the city  
Structure A103 and room A104




## Khor Rori Object Index Card

|  |  |  |                                       |
|--|--|--|---------------------------------------|
| <b>Registration Nr.</b><br>SUM07B<br>US190,27<br>S1128   |  |  |                                       |
| <b>Provenance</b><br>Area B, A73   |  |  |                                       |
| <b>Drawing code Nr.</b>  |  |  |                                       |
| <b>Definition</b><br>Incense burner  | <b>State of preservation</b><br>Good   | <b>Measures</b><br>l.<br>w. 8.6<br>h. 18<br>th. 8.2<br>diam. | <b>Shape</b><br>Parallelepiped-shaped |
| <b>Material</b><br>Limestone   | <b>Preserved part</b><br>Complete  |  | <b>Section</b><br>Rectangular         |
| <b>Description</b><br><br><p>Regular parallelepiped shaped incense burner without legs. The object shows an incised linear decoration covering probably its four lateral sides. Criss-cross patterns of extremely thin engraved lines are well visible on three sides but only very faint traces of them remain on one side. The entire surface shows traces of orange-reddish colour. The upper face is refined by a squared recess for the burning of the resins but no traces of burnt are visible inside.</p> <p>Comparisons: SUM00B, S100 (similar for shape and decoration but with legs).</p> |  |  |                                       |
| <b>Responsible</b><br>F. Matteini  |  | <b>Date</b><br>11/11/07                                      |                                       |


## Khor Rori Object Index Card

|  |  |  |                |
|--|--|--|----------------|
| <b>Registration Nr.</b><br>SUM07B<br>US239,2<br>S1150  |  |  |                |
| <b>Provenance</b><br>Area B, A107  |  |  |                |
| <b>Drawing code Nr.</b>  |  |  |                |
| <b>Definition</b><br>Mortar  | <b>State of preservation</b><br>Good   | <b>Measures</b><br>l.<br>w.<br>h. 39<br>th. 3.7 rim<br>diam. 36<br>diam. 25 (base) | <b>Shape</b>   |
| <b>Material</b><br>Limestone   | <b>Preserved part</b><br>Almost complete   |  | <b>Section</b> |
| <b>Description</b><br><br><p>Tall cylindrical shaped mortar almost completely preserved. Only a portion of wall is missing. The base and the rim are flat, slightly rounded on their external face. Many splintering on the external surface. In the base is visible a central hole, probably due to a long use, closed with a small pebble. The internal surface around the hole is in fact very smoothed.</p> <p>Five ancient South Arabian letters are incised below the rim and it's possible to read:<br/> <math>s^2ms^l \text{ } ^l</math></p><br><br><p>Type I (Report 2)</p> <p>Comparisons: S413 (SUM02A)</p> |  |  |                |
| <b>Responsible</b><br>F. Matteini  |  | <b>Date</b><br>20/11/07  |                |


### Khor Rori Object Index Card

|   |  |   |                         |
|---|--|---|-------------------------|
| <b>Registration Nr.</b><br>SUM07B<br>US240,4<br>S1162   |  |   |                         |
| <b>Provenance</b><br>Area A, h-i 9  |  |   |                         |
| <b>Drawing code Nr.</b>   |  |   |                         |
| <b>Definition</b><br>Incense burner   | <b>State of preservation</b><br>Good   | <b>Measures</b><br>l. 8.5<br>w. 7.9<br>h. 7<br>th.<br>diam. | <b>Shape</b><br>Squared |
| <b>Material</b><br>Limestone  | <b>Preserved part</b><br>Complete  |   | <b>Section</b>          |
| <b>Description</b><br><br><p>Almost squared incense burner on four squared legs (2x2x0.6) placed exactly at its corners. The flat rim, with a rectangular cross section, defines a deep internal recess (deep 2.1) with visible traces of burnt. The lateral faces are straight and completely decorated with a pattern of criss-cross incised lines. No traces of reddish–orange colour are visible on the external faces.</p> <p>Thickness of rim: 0.9</p><br><br><p>Type II.1 (Report 2)</p><br><p>Comparison with S486 (cat. 16 Report 2)</p> |  |   |                         |
| <b>Responsible</b><br>F. Matteini   |  | <b>Date</b><br>24/11/2007                                   |                         |


## Khor Rori Object Index Card

|  |  |   |                          |
|--|--|---|--------------------------|
| <b>Registration Nr.</b><br>SUM07B<br>US237,2<br>S1163  |  |   |                          |
| <b>Provenance</b><br>Area B, A106  |  |   |                          |
| <b>Drawing code Nr.</b>  |  |   |                          |
| <b>Definition</b><br>Handle  | <b>State of preservation</b><br>Fair   | <b>Measures</b><br>l. 8.4<br>w.<br>h.<br>th.<br>diam. 3.4 | <b>Shape</b><br>Circular |
| <b>Material</b><br>Limestone   | <b>Preserved part</b><br>Not complete  |   | <b>Section</b>           |
| <b>Description</b><br><br><p>Circular handle in form of ram's head. All the details of ram's head are carefully incised: the oblong eyes and the long curved eyebrows, the ears, the rectangular shaped nose and the mouth. Two large circular horns start from the middle of the head and run together till the sides of the mouth. The object is broken at one extremity and shows small chippings spread on the whole surface. One side of the ram's head is badly preserved because of the corrosion of the stone.</p> |  |   |                          |
| <b>Responsible</b><br>F. Matteini  |  | <b>Date</b><br>24/11/07                                   |                          |


### Khor Rori Object Index Card

|   |  |   |                |
|---|--|---|----------------|
| <b>Registration Nr.</b><br>SUM07B<br>US21,102<br>Sh299  |  |   |                |
| <b>Provenance</b><br>Area A   |  |   |                |
| <b>Drawing code Nr.</b>   |  |   |                |
| <b>Definition</b><br>Lid  | <b>State of preservation</b><br>Fair   | <b>Measures</b><br>l. 2 (max)<br>w. 5.5<br>h.<br>th. 0.3<br>diam. 9 | <b>Shape</b>   |
| <b>Material</b><br><i>Lambis truncate sebae</i> shell   | <b>Preserved part</b><br>Fragment  |   | <b>Section</b> |
| <b>Description</b><br><br><p>Fragment of a circular object (a lid according to comparisons with Sh1, Sh174, Sh183) probably made from a <i>Lambis truncate sebae</i> shell. The entire upper surface shows a thin incised decoration composed by two concentric and superimposed stripes with different and continuous motifs. Each register is separated from the other by a thin incised line. From the external edge the first stripe (h. 1) shows a row of triangles realized by champlevé technique. The second one is decorated by two overlapping wave lines. Two holes, piercing the shell in all its thickness, are visible above the wave lines. The external and internal surfaces are carefully smoothed and shiny.</p> |  |   |                |
| <b>Responsible</b><br>F. Matteini   |  | <b>Date</b><br>11/11/07   |                |

### Khor Rori Pottery Index Card

|   |  |  |   |
|---|--|--|---|
| <b>Index Nr.</b><br>SUM07B<br>US238,2-3   |  |  |   |
| <b>Provenance</b><br>Area B<br>Square n12   |  |  |   |
| <b>Photo</b><br>x   |  |  |   |
| <b>Drawing code</b><br>Nr.  |  |  |   |
| <b>Category</b><br>Table vessel   |  |  |   |
| <b>Shape</b><br>Close vessel  | <b>Type</b><br>Jar   | <b>Preserved part</b><br>Fr. of rim and part of body   | <b>State of preservation</b>            |
| <b>Measures. Cm</b><br>Diam. 8<br>Th. 0.5   | <b>Color inter. Surface</b><br>Reddish Yellow<br>5YR 6/8                           | <b>Color ext. surface</b><br>Reddish Yellow<br>5YR 6/8 | <b>Color section</b><br>Reddish         |
| <b>Characteristic of paste</b><br>Compact   | <b>Inclusions</b><br>Few small white and dark inclusions                           |  | <b>Method manufacture</b><br>Wheel made |
| <b>Surface treatment (ext.)</b><br>Burnishing   | <b>Surface type (ext.)</b><br>Slip   |  | <b>Decoration (ext.)</b><br>X           |
| <b>Surface treatment (int.)</b><br>Burnishing   | <b>Surface type (int.)</b><br>Slip   |  | <b>Decoration (int.)</b>                |
| <b>Description/observations</b><br><br><p>The shards are decorated with horizontal lines, dots and spiral motifs. The smaller one presents a small hole (0.2cm) for repairing. They belong to the type Orange Fine Painted Ware, already attested in Sumhuran by the shard SUM06A, US195,31.</p> <p>For comparisons see also E. Haerinck, Internalisation and Business in Southeast Arabia during the Late 1<sup>st</sup> century A.D.: Archaeological Evidence from ed-Dur (Umm al-Qaiwan, U.A.E), London 2003, 204-205, fig. 9.</p> |  |  |   |
| <b>Date</b><br>22/11/2007   |  | <b>Responsible</b><br>A. Pavan                         |   |

### Khor Rori Pottery Index Card

|  |  |   |  |
|--|--|---|--|
| <b>Index Nr.</b><br>SUM07B<br>US236,4  |  |   |  |
| <b>Provenance</b><br>Area B<br>Room A106   |  |   |  |
| <b>Photo</b><br>x  |  |   |  |
| <b>Drawing code</b><br>Nr.   |  |   |  |
| <b>Category</b><br>Table vessel  |  |   |  |
| <b>Shape</b><br>Close vessel   | <b>Type</b><br>Small jar   | <b>Preserved part</b><br>Archaeologically complete      | <b>State of preservation</b>           |
| <b>Measures. Cm</b><br>Diam. base 6<br>H. 11.5; Th. 0.5  | <b>Color inter. Surface</b><br>Very pale brown<br>10YR7/4                          | <b>Color ext. surface</b><br>Very pale brown<br>10YR7/4 | <b>Color section</b><br>Brownish       |
| <b>Characteristic of paste</b><br>Medium Compact   | <b>Inclusions</b><br>Grit temper, red and white (calcium carbonate) inclusions     |   | <b>Method manufacture</b><br>Hand-made |
| <b>Surface treatment (ext.)</b>  |  | <b>Surface type (ext.)</b><br>Thin wash                 | <b>Decoration (ext.)</b>               |
| <b>Surface treatment (int.)</b>  |  | <b>Surface type (int.)</b>                              | <b>Decoration (int.)</b>               |
| <b>Description/observations</b><br><br>The jar was found broken in two parts; part of the rim is missing.<br>The manufacturing method and the characteristic of the ware let us to suggest a local production. |  |   |  |
| <b>Date</b><br>22/11/2007  |  | <b>Responsible</b><br>A. Pavan                          |  |



## Notes on pottery

(dr. Alexia Pavan, IMTO, University of Pisa)

During SUM07B all the fragments of pottery found in SUM07A and SUM07B have been processed. Among them it's important to notice the presence of a pottery slag.

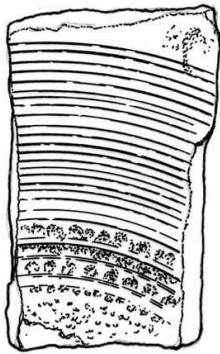
The fragment (SUM07A, US220,4) is the first sample of this kind found in Sumhuran and it's interesting since it's the only marker indicating the possible existence of a pottery production on the site.



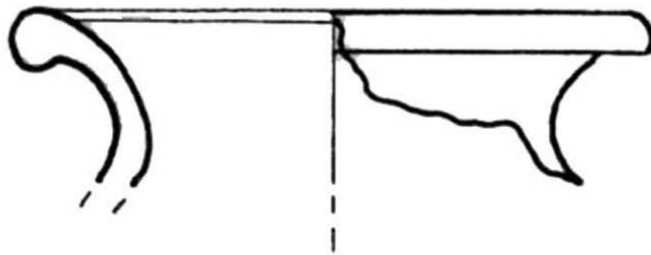
SUM07A, US220,4

By the way a selection of pottery shards belonging to the family of the “Indian pottery” has been done in order to analyze the ware according to archaeometric issues and the different typologies according comparisons with materials found in Indian sites (i.e. Kamrej, Gujarat).

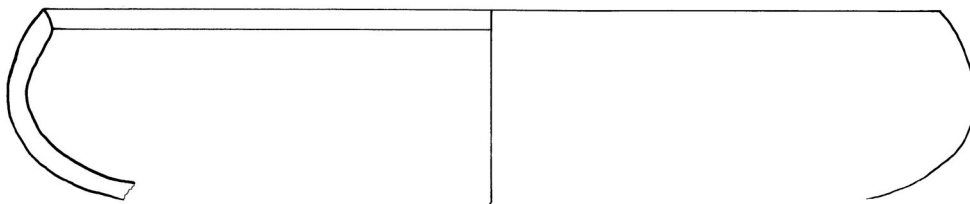
The following categories have been individuated: Rouletted Ware, Red Polished Ware, Black and Red Polished Ware and two different types of kitchen ware.



Rouletted Ware (US148,3)

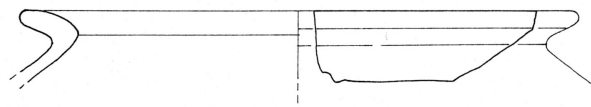


Red Polished Ware (US77,9)

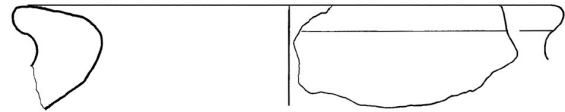


Black and Red Polished Ware (US146,1)





Cooking pots in Indian Style (US125,25)



Sponge ware (US54,51)

Thanks to the presence of Dr. Axelle Rougelle we proceeded with a general survey of the pottery found on Inqitat during the past campaigns. Some of the shards are in fact not Islamic and seems to be suitable inserted in a chronological framework contemporary to Sumhuran.

This observation let us to reconsider the possibility to conduct new researches on the site, especially in the area of the northern perimetral wall and near the entrance to the city.

## Archaeometric analyses:

### Ancient metallurgy at Sumhuram: new sampling for an analytical study

(Dr. Michele Degli Esposti, University of Bologna)

#### *Objects*

During the last seasons of work, a few specimens of metallic objects had already been subjected to sampling, mostly consisting in sawing small bits from fragmentary artefacts or in getting the whole find in those cases in which its “artistic” value was not noticeable, thus allowing its use for analytical investigation of physical and chemical properties.

These samples unfortunately turned out to be in extremely bad conditions for what concerns the preservation of sound metal, even in their inner parts, so that only a few of them will be suitable for analytical characterization.

Hence, the necessity to carry on a new sampling campaign, screening all the available metallic small finds, in order to determine which of them most probably still bears at least a small portion of the original alloy. Again, the availability of the objects underwent the evaluation of their extrinsic artistic value, along with the frequency of their retrieval on the dig and whether they had already been published. In fact, regarding published objects<sup>1</sup>, the sampling involved the cutting of the object, aiming to obtain a fragment that will be used both for metallographic observation after polishing (at first by means of Optical Microscopy, then of Scanning Electron Microscopy with Energy-Dispersive Spectroscopy) and possibly for wet chemical analysis (Flame Atomic Absorption Spectrometry) after drilling the polished sample.

When its shape, its very good preservation, that fact that the object was unpublished, or other restricting conditions occurred, sampling consisted in single drillings on each object, in order to reach sound metal at their core. Powder coming from corrosion products incrustations has been left aside at the greater possible extent.

The findings sampled are listed in the following table:

| Object | US | Campaign | Definition                   | Published in | Drilling |
|--------|----|----------|------------------------------|--------------|----------|
| MB 5   | 5  | 00A      | Fragment                     | KR1 cat.114  | drilling |
| MB 8   | 12 | 99       | Vessel fragment?             | KR1 cat.110  |          |
| MB 9   | 12 | 99       | Mirror                       | KR1 cat.113  |          |
| MB 18  | 16 | 00A      | vessel rim fragment          | KR1 cat.116  |          |
| MB 13  | 21 | 00A      | Mirror                       | KR2 cat.748  | drilling |
| MB 29  | 21 | 01A      | Nail                         | KR2 cat.649  |          |
| MB 327 | 21 | 04B      | Fragment                     | \\           |          |
| MB 54  | 21 | 01A      | Plaque                       | KR2 cat. 773 |          |
| MB 157 | 22 | 03A      | Clamp                        | KR2 cat.680  |          |
| MB 280 | 22 | 04A      | round stick fragment         | KR2 cat.663  |          |
| MB 19  | 24 | 00A      | big flat ring fragment       | KR1 cat.118  | drilling |
| MB 249 | 29 | 04A      | Rect. section stick fragment | KR2 cat.661  |          |
| MB 398 | 39 | 06A      | Fragment                     | \\           |          |
| MB 43  | 71 | 01A      | Mirror                       | KR2 cat.814  |          |
| MB 94  | 80 | 03A      | Bracelet                     | KR2 cat.825  |          |
| MB 34  | 86 | 01A      | pointed stick                | KR2 cat.707  |          |
| MB 35  | 86 | 01A      | Nail                         | KR2 cat. 728 |          |
| MB 42  | 90 | 01A      | nail/rivet?                  | \\           |          |

<sup>1</sup> See Avanzini A. (ed.), *Khor Rori Report 1*, (=Arabia Antica Series, 1), Roma, 2002 and Avanzini A. (ed.), *Khor Rori Report 2*, (=Arabia Antica Series, 6), Roma, in press.

|        |     |     |                               |              |          |
|--------|-----|-----|-------------------------------|--------------|----------|
| MB 40  | 93  | 01A | folded plaque                 | KR2 cat.802  |          |
| MB 56  | 93  | 01A | plaque fragment               | KR2 cat.804  |          |
| MB 49  | 98  | 01A | plaque fragment               | KR2 cat.833  |          |
| MB 393 | 106 | 06A | mirror                        | \\           |          |
| MB 66  | 108 | 02A | Cylindrical rivet/clamp       | KR2 cat.678  |          |
| MB 67  | 108 | 02A | vessel base?                  | KR2 cat.857  |          |
| MB 70  | 108 | 02A | incense burner's foot         | KR2 cat.860  | drilling |
| MB 73b | 108 | 02A | square section rod (awl)      | KR2 cat.606  |          |
| MB 73a | 108 | 02A | square section rod (chisel)   | KR2 cat.607  |          |
| MB 312 | 114 | 04A | fragm. round stick            | KR2 cat. 665 |          |
| MB 106 | 116 | 03A | clamp                         | KR2 cat.733  | drilling |
| MB 123 | 120 | 03A | clamp                         | KR2 cat.736  | drilling |
| MB 126 | 120 | 03A | clamp                         | KR2 cat.738  | drilling |
| MB 131 | 120 | 03A | clamp (key?)                  | KR2 cat.739  |          |
| MB 133 | 120 | 03A | clamp                         | KR2 cat.740  |          |
| MB 139 | 121 | 03A | rod                           | KR2 cat.708  |          |
| MB 189 | 130 | 03A | Rhombic section rod           | \\           |          |
| MB 324 | 152 | 04B | fragment                      | \\           | drilling |
| MB 334 | 152 | 04B | fragment                      | \\           | drilling |
| MB 394 | 152 | 06A | fragment                      | \\           |          |
| MB 399 | 155 | 04B | vessel element (spout? foot?) | \\           |          |
| MI 89  | 157 | 05A | iron rod                      | \\           | drilling |
| MB 362 | 162 | 05A | rod                           | \\           | drilling |
| MB 371 | 184 | 05B | fragment                      | \\           |          |
| MB 383 | 187 | 05A | fragment                      | \\           | drilling |
| MB 344 | M1  | 05A | nail                          | \\           | drilling |
| MB 177 | M70 | 03A | rect. section rod fragment    | KR2 cat.659  |          |

### Coins

A different category of objects is represented by coins, a lot of which had been unearthed during the different campaigns of excavation in Sumhuram. A few of these have already been analysed by scholars from the University of Florence<sup>2</sup>, but in order to afford their work with more reliability, new samples would be necessary. Thus, a bunch of coins have been selected during current campaign, trying to choose at least one specimen from each type<sup>3</sup> when possible.

A total of 15 coins has been chosen, 12 of which will be analysed by following the same procedures already used for the other coins; the remaining three will be studied by means of SEM-EDS, performed on the side of the coin, at the Department of Electrochemical Science of the University of Bologna.

Chosen coins are the following (Type definition and catalogue number refers to A. Sedov in *Khor Rori. Report 2*):

#### Series head/owl , type 1.1

\*Co 163 = cat. 1

#### Series head/owl , type 1.2

<sup>2</sup> Chiarantini L., Benvenuti M., Costagliola P., Avanzini A., *Preliminary investigation of pre-Islamic metallurgical slags from Sumhuram, Dhofar region (Oman)*, poster presented at Archaeometallurgy in Europe 2007, 2<sup>nd</sup> international conference, Grado-Aquileia, 16-18 June 2007.

<sup>3</sup> Types definition follows A. V. Sedov, *The coins from Sumhuram: the 2001A-2004A seasons*, in Avanzini A. (ed.), *Khor Rori Report 2*, Roma, in press.

\*Co 78 = cat. 3

**Series head/owl , type 1.1 or 1.2 (not determined)**

\*Co 79 = cat. 23

Co 103 = cat. 25

**Series radiated head/winged caduceus, type 3.0**

Co 106 = cat. 39

Co 107 = cat. 40

Series head/eagle, type 4.0

Co 92 = cat. 75

Co 82 = cat. 102

Series radiated head/bull, type 5.3

Co 122 = cat. 150

Co 76 = cat. 157

**Series s<sup>2</sup>qr/bull's head, type 10.0**

Co 100 = cat. 174

Co 90 = cat. 179

Series with two head. Coinage of 'Amdān Bayān Yuhaqbiḍ

Co 207 = cat. 185

**Series with bucranium**

Co 147 = cat. 191

Co 217 = cat. 198

\*indicates the coins designated for SEM-EDS analysis

*Slags*

Aside from manufactured objects, the study project concerning with Sumhuran's ancient metallurgy, deals with slags, in order to get more information on different stages of the productive chain. In this concern, a noticeable number of iron slags have been chosen coming from different stratigraphic units, as reported in the following table:

| Campaign | Area   | Square, building, room, (or square) | US     |
|----------|--------|-------------------------------------|--------|
| SUM 03B  | Area A | Trench A13                          | US 92  |
| SUM 05B  | Area A | i 10                                | US 191 |
| SUM 04A  | Area A | i 11                                | US 22  |
| SUM 02A  | Area A | BA4 A32                             | US 113 |
| SUM 03A  | Area A | BA4 A40                             | US 124 |
| SUM 04B  | Area E | e 5                                 | US 152 |
| SUM 05B  | Area A | i 10                                | US 191 |
| SUM 04A  | Area F |                                     | US 80  |
| SUM 05B  | Area F | f7 / g7                             | US 187 |
| SUM 05B  | Area A | BA6 A65a                            | US 185 |
| SUM 03A  | Area F | North of BF3 - Street A29           | US 56  |
| SUM 01A  | Area A | BA3                                 | US 79  |
| SUM 01A  | Area A | h 11                                | US 22  |
| SUM 05B  | Area A | BA6 A56                             | US 21  |
| SUM 06A  | Area F | Sq. A20 (g7)                        | US80   |

|         |        |              |        |
|---------|--------|--------------|--------|
| SUM 00B | Area A | A17          | US 50  |
| SUM 03A |        | North of BF3 | US 80  |
| SUM 03A | Area A | BA4 A36      | US 124 |
| SUM 04A | Area A | BA5          | US 151 |
| SUM 01A | Area A | A22          | US 86  |
| SUM 01A | Area A | b 11 A13     | US 93  |
| SUM 05B | Area F |              | US 162 |

The fragments coming from Area F, US 162, much possibly should not be regarded at as a slag, but should actually belong to a broken ceramic strainer whose greenish colour could be due to long time burial adjacent to a bronze object.

### Archaeometric analyses:

#### Report on characterization of pottery and its coating, stone vessels and their content, shell-lamps and burning fuel residue

(Dr. Gianna Giachi<sup>4</sup> & Dr. Pasquino Pallecchi<sup>5</sup>, Archaeological Superintendence of Tuscany, Florence, Italy)

#### *Ceramic and stone materials*

During the excavation of Sumhram a lot of ceramic and stone items were found. The archaeometric analyses of these findings, compared to the historical context, result of fundamental importance in order to understand the ancient technology and know what kind of raw materials were utilized for their realization. Moreover, the collected data can be useful in establishing trade routes to the town. With this aim, preliminary investigations were carried out in the past year (see Preliminary Report 2006). But, the material collected since 2006 supplied incomplete results. In order to improve the previous work, in the present year the sampling of stone vessels, of Indian pottery and of mudbricks was completed.

#### *Samples of stone vessels:*

| Progr. N. | Description  | Content |
|-----------|--|---------|
|           |  |         |
| 1         | SUM06A Area E d-e/5-6 US154                          |         |
| 2         | SUM06A Area E f 7-8 US 144 outside city wall M134    |         |
| 3         | SUM06A Area E f 7-8 US 144 outside city wall M134    |         |
| 5         | SUM06A Area E f 7-8 US 144,19 outside city wall M134 |         |
| 6         | SUM06A Area E f 7-8 US 144,18 outside city wall M134 |         |
| 9         | SUM99 US1 S8/6                                       |         |
| 10        | SUM04A US 147,4 S727                                 |         |
| 11        | SUM06A US144,14 S953                                 |         |
| 15        | SUM06A US172,10 S936 with US196,3 S939               |         |
| 16        | SUM06A US172,9 S935                                  |         |
| 17        | SUM05B US180,8 S909                                  |         |
| 20        | SUM05B US186,13 S904                                 |         |
| 22        | SUM05B US190,15 S906                                 |         |
| 27        | SUM05B 178,2 S886                                    |         |
| 28        | SUM03A US 120,22 S491                                | yes     |
| 29        | SUM03B US 132 BF3 A41                                | yes     |
| 30        | SUM04A F Room A42 g4                                 |         |
| 31        | SUM 04 Surface                                       |         |
| 35        | SUM00B US54,21 S136                                  | yes     |
| 36        | SUM00A US 5,22 S913 S41                              | yes     |
| 38        | Vessel with handle, Report 2                         | yes     |
| 39        | SUM03A US 120,31 S521                                | yes     |
| 40        | SUM03B US 144,2c S680c                               | yes     |
| 41        | SUM03B US123,19 S682                                 | yes     |
| 42        | SUM03A US124,15 S519a                                |         |

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<sup>4</sup> Chemist

<sup>5</sup> Geologist

|    |                               |     |
|----|-------------------------------|-----|
| 43 | SUM01A US56 S268              |     |
| 44 | SUM01A US93,26 S256d          |     |
| 45 | SUM03B US 92,25 S660          |     |
| 46 | SUM01A S256a US93             |     |
| 47 | SUM04A US 22,101 S704         |     |
| 48 | SUM03A US132 S594             |     |
| 49 | SUM03A BF3 US231 S517         |     |
| 50 | SUM02A US120 S501             | yes |
| 51 | <i>See image</i>              | yes |
| 52 | SUM03A US120,34 S531          | yes |
| 55 | SUM01A US77,4 S154            |     |
| 56 | SUM01A US93,26 S256           |     |
| 57 | SUM03A US58, 16 S613          |     |
| 58 | SUM04A US111,24 S723          | yes |
| 59 | SUM01A g/h 11 (A8) US29,5 S51 |     |
| 60 | SUM03B US93,42 S679           | yes |
| 61 | SUM 04A b/a5 US151 S722       | yes |
| 62 | SUM01A US94,20 S260           |     |

### *Samples of Indian shards*

*SUM03B, US93,42; SUM03A, US22,62; SUM03A, sponge ware no number; SUM04A, US54,51; SUM03A, US54,33; SUM05B, US174,55; SUM05B, US174,8; SUM03A, US125,40; SUM05B, US174,14; SUM03B, US142,1; SUM06A, US153,5; SUM03A, US125,35; SUM03A, US111,3; SUM04A, US45,52; SUM03A, US125,25; SUM05B, US174,6; SUM05B, US162,5; SUM04A, US80,53; SUM04A, US54,53; SUM02A, US110,2; SUM05B, US174,15; SUM05B, US162,7; SUM05B, US174,5; SUM05B, US159,5; SUM05B, US174,27; SUM03A, US58,22; SUM03A, US22,76*



Indian shards, sample US165,1



Indian shard, sample US 174,15

### *Samples of mudbricks*



Sumhuram, wall M194

### ***Contents***

In the last years the characterization of the organic materials in archaeological context has become more and more important in order to define the habits of the ancient societies <sup>6,7,8</sup>. The knowledge of the diet, the artistic or handicraft techniques and the medicine recipes has resulted useful both to

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<sup>6</sup> Pollard A. M., Heron C., *Archaeological Chemistry*, RCS Paperbacks, Royal Society of Chemistry, Cambridge, 1996, 239-264.

<sup>7</sup> Mills J.S., White R., *The Organic Chemistry Of Museum Objects*, II Ed., Butterworths-Heinemann, London, 1994.

<sup>8</sup> Serpico M., White R., *In Ancient Egyptian Materials and Technology*, Nicholson P. and Shaw I., Eds.; Cambridge University Press, Cambridge, 2000.



establish the several aspects of the daily life of the ancient people and, in some cases, to recognize the provenance of the findings and detect the commercial routes.

Chemical analyses help in distinguishing the main classes of the organic substances of vegetable or animal origin: proteins, polysaccharides, lipids, resins and its derivatives as pitch and tar, bitumen and so on. All these substances are the components of the utilized raw materials which could be also undergone to specific treatments and/or mixed together to satisfy the moment requirements. The chemical characterization allows not only establishing the nature but also the treatment and the degradation suffered by the same substances.

With the aim to characterize the organic materials associated to the findings coming from the Sumhuram excavation, some samples of organic residues pertaining to the internal coating of pottery and to the burning fuel of shell-lamps were taken. Moreover, other samples from some stone vessels were collected, in order to verify the composition of the internal deposits.

The collected samples are reported in the following list.

*Samples of the internal coating of straw temper:*

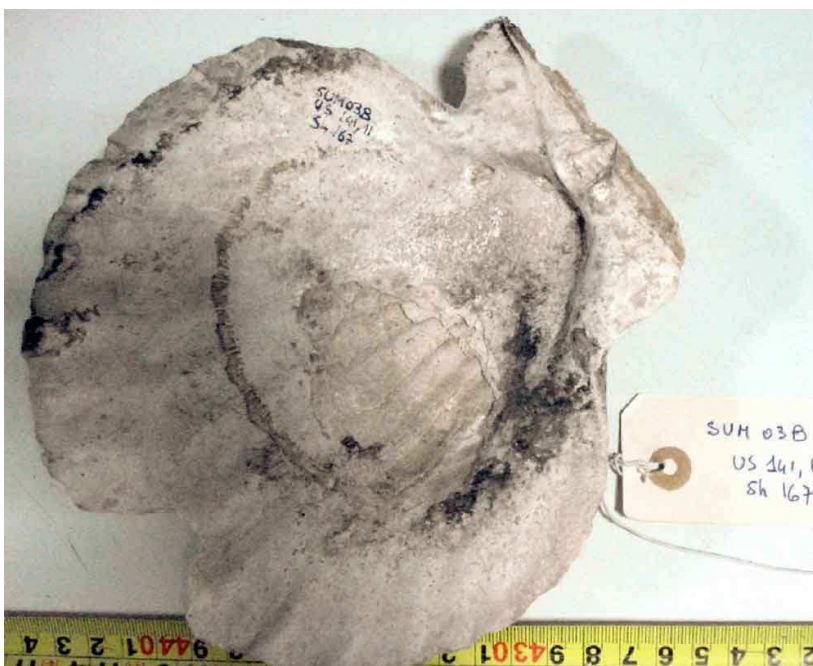
|    |   |        |          |
|----|---|--------|----------|
| 1  | _ | SUM01A | US84,17  |
| 2  | _ | SUM01A | US84,43  |
| 3  | _ | SUM03A | US56,18  |
| 4  | _ | SUM03A | US80,20  |
| 5  | _ | SUM03A | US126,1  |
| 6  | _ | SUM03A | US126,2  |
| 7  | _ | SUM03A | US135,17 |
| 8  |   | SUM03B | US84,60  |
| 9  |   | SUM03B | US93,19  |
| 10 | _ | SUM03B | US142,3  |
| 11 | _ | SUM03B | US 143,2 |
| 12 | _ | SUM04A | US127,11 |
| 13 | _ | SUM04B | US29,58  |
| 14 | _ | SUM04B | US29,63  |
| 15 | _ | SUM04B | US152,17 |
| 16 | _ | SUM05A | US154,4  |
| 17 | _ | SUM05B | US159,2  |
| 18 | _ | SUM05B | US171,1  |
| 19 | _ | SUM05B | US181,1  |
| 20 | _ | SUM06B | US92,37  |
| 21 | _ | SUM06A | US172,6  |
| 22 | _ | SUM06A | US195,13 |
| 23 | _ | SUM06B | US195,40 |
| 24 | _ | SUM06B | US195,44 |
| 25 | _ | SUM06B | US198,12 |
| 26 | _ | SUM07A | US215,65 |



Internal coating of SUM06A US195,13 vessel

*Samples of the burning fuel of shell-lamps:*

|   |   |        |          |        |
|---|---|--------|----------|--------|
| 1 | _ | SUM03B | US141,11 | Sh 167 |
| 2 | _ | SUM03B | US142,17 | Sh 172 |
| 3 | _ | SUM04A | US22,80  | Sh 175 |
| 4 | _ | SUM04A | US22,81  | Sh 176 |



The shell-lamp SUM03B US141,11 with the traces of the original burning fuel

*Samples of the content of stone vessels:*



|     |   |                              |                 |          |          |    |
|-----|---|------------------------------|-----------------|----------|----------|----|
| 1   | — | SUM00B                       | internal        | US54,21  | S136     | 35 |
| 1 b | — |                              | on the fracture | US54,21  | S136     | 35 |
| 2   | — | SUM02A                       |                 | US120    | S501     | 50 |
| 3   | — | SUM03A                       |                 | US93,42  | S679     | 60 |
| 4   | — | SUM03A                       |                 | US120,22 | S491 A39 | 28 |
| 5   | — | SUM03A                       | internal        | US120,31 | S521     | 39 |
| 5b  | — |                              | external        | US120,31 | S521     | 39 |
| 6   | — | SUM03A                       |                 | US631    | S126     | 54 |
| 7   | — | SUM03B                       |                 | US132    | BF3 A41  | 29 |
| 8   | — | SUM03B                       | internal        | US144,2c | S680c    | 40 |
| 8b  | — |                              | edge            | US144,2c | S680c    | 40 |
| 9   | — | SUM03B                       | internal        | US123,19 | S682     | 41 |
| 9b  | — |                              | edge            | US123,19 | S682     | 41 |
| 10  | — | SUM03A                       |                 | US120,31 | S521     | 35 |
| 11  | — | SUM04                        |                 | US148    | S714     | 37 |
| 12  | — | Vessel with handle, Report 2 |                 |          |          | 38 |
| 13  | — | <i>see image</i>             |                 |          |          | 51 |
| 14  | — |                              |                 | US111,24 | S723     | 58 |
| 14b | — |                              |                 | US111,24 | S723     | 58 |
| 15  | — |                              |                 | US151,8  | S722     | 61 |

## **TECHNICAL REPORT n.2/2007**

### **Structural activities on the archaeological site of Khor Rori, Salalah (OMAN)**

(Prof. Mauro Sassu, coordinator, Marco Andreini, Department of Structural Engineering, University of Pisa)

#### **PREFACE**

In relation to the archaeological campaign hold by the Italian Mission to Oman in the site of Khor Rori from November the 3<sup>rd</sup> to the 15<sup>th</sup>, managed by Prof. Alessandra Avanzini of the Department of Historical Sciences of Ancient History of Pisa University, structural restoration interventions were programmed on collapsing masonry walls, with the aim to achieve a satisfactory level of safety, to permit further studies and to consolidate the walls collapsed during the rains. The programmed restoration interventions mainly consisted in:

- restoration of eastern side of wall M6;
- restoration of south-eastern parts of walls M127 and M230;
- restoration of southern part of wall M101;
- restoration of wall M128 and northern part of wall M144;
- restoration of wall M56;
- dismantling of collapsed part of wall M63.

Restorations have been done following the same proceedings of the past campaigns, according to the UNESCO issues.

## **1. GENERAL DESCRIPTION OF THE INTERVENTION**

### **1.1. DISMANTLING AND RECONSTRUCTION OF EASTERN SIDE OF WALL M6**

M6 is the western side of the main entrance (A4) and it has a North-South orientation. The length is 7.6 m, on the eastern side, and 3.4 m, on the northern side; the height varies along its borders, reaching a maximum of 2.7 m. The eastern side of the wall was almost all collapsed and the fallen stones lay in front of it, blocking the entrance.

The programmed intervention involves static, historical and aesthetical aspects, since it is aimed to put the wall in safety conditions, besides to endow it with a pleasant appearance, consistent with the other masonry structures in the site. To attain this purpose, a first phase is prescribed, in which the damaged parts of the wall must be dismantled, while the integer ones will remain unmodified. As this operation has been fulfilled, the wall has been rebuilt. The reached level constitutes an authentic estimation of the minimal height the wall featured in the past, using the collapsed stones in front of it, and thereby represents an attainable level in terms of archaeological correctness. Prior to the wall rebuilding, a narrow geo-textile strip will be applied on the upper face of the old stones on the external surface, to remark the separation between the unmodified ancient masonry and the new part introduced with the present restoration.

For this reason the intervention program was characterized by the following aspects:

- rebuilding the masonry structure according the hypothetical original order;
- preserving the original aspect of the wall, according the UNESCO issues;
- denoting the rebuilding phases by way of a geo-textile layer between the unimpaired wall and the reassembled part.

To realize the upper closure of the wall, some stones have been put in an irregular arrangement and linked together with mortar (so called “beautification”), with both the aesthetical purpose of making the wall looking similar to the others in the site and the technical purpose of making the wall waterproof.

## **1.2. RECONSTRUCTION OF SOUTH-EASTERN PARTS OF WALLS M127 AND M230**

The south-eastern parts of M127 and M230 are in the south-eastern side of the BA6. The former has a length of 3.3 m, a thickness of 0.75 m and a height of 1.6 m from the excavated horizontal layer on Room A65a, while the latter has a length of 2.25 m and a height of 1.6 m from the same layer.

The analysis of the masonry structures revealed that M127 is more ancient than M230 which represents a more recent supporting element, so we moved rebuilding the collapsed parts of the two walls to make both observable from a hypothetical observer located in the BA6. In fact, after restoration, the rebuilt south-eastern part of M230 leaves the reconstructed side of M127 visible.

The collapsed south-eastern part of wall M230 is quite narrow: originally it consisted just in a single parament which supported filling material like irregular stones of medium size and various types of earth. The skill was made of roughly squared stones joined together with ancient mortar layers.

For these reasons the methodology and the intervention program was characterized by the same aspects of M6 restoration.

## **1.3. DISMANTLING AND RECONSTRUCTION OF SOUTHERN PART OF WALL M101**

The southern part of wall M101 is located on the eastern side of the BA6. The length is approximately 2.3 m and the height 1.6 m from the excavated horizontal layer on Room A65a. No intervention was made on the corner between this wall and M127. Just the western parament has been rebuilt for the reason that the eastern one was unknown because situated in an unexcavated area. Therefore the methodology and the intervention program was characterized by the same aspects of M127 restoration.

## **1.4. DISMANTLING AND RECONSTRUCTION OF WALL M128 AND NORTHERN PART OF M144**

M128 and M144 are located on the south-eastern part of the BA6. They separate the Room A60 from the Rooms A65a and A56. The length of M128 is 1.9 m, the height is 1.3 m from the excavated horizontal layer on Room A65a and the thickness is 0.70 m while M144 has a length of 5 m, a height which varies along its borders, reaching a maximum of 2.80 m from the excavated horizontal layer on Room A60 and a thickness of approximately 0.60 m.

The walls are quite narrow: the southern skill of M144 and its northern one are divided by a thin filling of irregular stones of medium size, earth and mud-bricks while the paraments of M128 are separate by a filling of stones of small size. These masonry structures are made of roughly squared stones joined together with residuals of ancient mortar. Just the northern parament of M144, which overlooks on Room A60, was collapsed in two zones: one near the ancient staircase and one in correspondence of the intersection of M124, M128 and M144 vertical average plane.

The intervention program was characterized by the same aspects of M127 restoration.

## **1.5. DISMANTLING AND RECONSTRUCTION OF WALL M56**

M56 is located on the south-eastern side of the BA3. The length is 1.4 m, the height is 1.3 m from the excavated horizontal layer on Room A28 and the thickness is approximately 0.60 m.

The wall is quite narrow: it was made of irregular and squared sand stone blocks which formed a frontal parament and, orthogonally at this, two lateral skills. The stone blocks were joined by natural earth layers. All this wall was collapsed, therefore we began to rebuild from its foundation level.

The intervention program was characterized by the same aspects of M127 restoration.

## **1.6. DISMANTLING OF COLLAPSED PART OF WALL M63**

M63 is located on the north-eastern side of the BA4 and represents a masonry structure for supporting the loads of the staircase in the Room A33. The length is 1.0 m and the width is approximately 1.10 m.

The wall was made of irregular and squared sand stone blocks and mud-bricks which formed a frontal parament and, orthogonally at this, two lateral skills. The blocks were joined by natural earth layers. This entire wall was collapsed; therefore we began to dismantle until its foundation level.

## **2. WORKS ACCOUNT**

### **2.1. RESTORATION OF EASTERN SIDE OF WALL M6**

#### **2.1.1. Dismantling phase**

The restoration works on wall M6 began on November the 4<sup>th</sup> with the dismantling operations of the damaged parts of the wall itself. The stones and the earth forming the wall body were heaped nearby, in the outlook of a following usage during the wall reconstruction. No stone was removed from those parts of the wall featuring structural integrity and a proper masonry arrangement.

#### **2.1.2. Used materials**

As in the past campaigns, walls have been rebuilt using local stones and a particular mortar mixture.

- *Mortar mixture.* The mortar mixture has been determined by making some tests with different proportions of colour and lime in order to obtain the right colour. The chosen mixture has been essentially determined by observing the outcomes of the mixtures previously employed in the site of Khor Rori. On the base of such assessments, it has been decided to give up the cement component and neither to employ natural earth withdrew from the ground, according to the UNESCO issues. This because many mixtures containing those elements showed in the past sensible colour variations, reasonably as a consequence of chemical reactions which led to formation of mineral salts. In this aim, artificial brownish sand, produced crushing local stones, was selected; and the 1:4 mix proportion was regarded as the most suitable in this case. After these tests, the natural colours proportion has been set to: 1 part of yellow, 0,5 part brown, 20 parts of lime. So the standard mixture was made with four buckets of sand and one bucket of the previous mix of lime and colours.
- *Stones arrangement.* The masonry units were withdrawn partially from the ones resulting from the dismantling phase, and partially by the other heaps present in the site.
- *Surface refinement.* After rebuilding the wall for a certain length, the external surface was adjusted filling carefully the leaks between the stones with mortar, and then, as soon as the mortar had became enough consistent, smoothing the joints with soft brushes. Finally, the stones external faces have been cleaned with sponges and clear water.

#### **2.1.3. Wall reconstruction**

On November the 5<sup>th</sup>, after completing the trial session, the rebuilding operations on wall M6 were started. They concerned the following issues:

- *external sides.* Beginning from the structures remained essentially undamaged over the centuries; they have been rebuilt according to the same procedure, elaborated through the walls restoration in the previous campaigns. A film of geo-textile has been posed in the first mortar joint to separate the new rebuilt part of the wall from the old one. At the end 9 lines of stones have been rebuilt in the both sides.
- *internal region.* The wall body was rebuilt using stones and layer of mortar. The lime percentage was fixed to 1:20.
- *upper closure.* It was realized arranging stone irregularly, to reproduce the appearance shown by the tops of the other walls. The gaps between stones were filled with the same

kind of mortar used for the external sides, and afterwards they were likewise refined, using the described technique.

## **2.2. RESTORATION OF SOUTH-EASTERN PARTS OF WALLS M127 AND M230**

### **2.2.1 Dismantling phase**

The restoration works on walls M127 and M230 began on November the 4<sup>th</sup> with the dismantling operations of the damaged parts of the wall itself. The loose stones and the earth forming the wall body were also in this case accumulated in order to use them during the wall reconstruction. The purpose to keep, as much as possible, the original masonry was respected and no blocks were removed from those parts of the wall featuring structural integrity and a proper arrangement.

For M127 the work was concentrated just on the skill visible from Area A, since the other one was still unknown. The dismantling of M127 and M230 followed the same procedure used for eastern side of M6.

### **2.2.2. Walls reconstruction**

The rebuilding operations on walls M127 and M230 concerned the following issues:

- *external sides*. According the general issues of the restoration and conservation of archaeological sites just the necessary operations were carried on. The integrations on the original masonry were realized using the materials accumulated *in situ* during the previous campaigns. A film of geo-textile has been posed in the first mortar joint to individuate the rebuilding phase.
- *internal region*. The wall body was rebuilt using stones and layer of mortar. The lime percentage was fixed to 1:20.
- *upper closure*. It was realized arranging stone irregularly, to reproduce the appearance shown by an incomplete archaeological excavation. The gaps between stones were filled with the same kind of earth found in the original internal region.

## **2.3. RESTORATION OF SOUTHERN PART OF WALL M101**

### **2.3.1 Dismantling phase**

The restoration works on wall M101 began on November the 8<sup>th</sup> with the dismantling operations of the damaged parts of the wall itself. This phase followed the same procedure used for eastern side of M6.

### **2.3.2 Walls reconstruction**

The rebuilding operations on wall M101 concerned the issues seen for M127 and M131.

## **2.4. RESTORATION OF WALL M128 AND NORTHERN PART OF WALL M144**

### **2.4.1 Dismantling phase**

The restoration works on walls M128 and M144 began on November the 10<sup>th</sup> with the dismantling operations of the damaged parts of the wall itself. This phase followed the same procedure used for eastern side of M6.

### **2.4.2 Walls reconstruction**

The rebuilding operations on walls M128 and M144 concerned the issues seen for M6.

## **2.4. RESTORATION OF WALL M56**

### **2.4.1 Dismantling phase**

The restoration works on wall M56 began on November the 8<sup>th</sup> with the dismantling operations of the damaged parts of the wall itself. This phase followed the same procedure used for eastern side of M6.

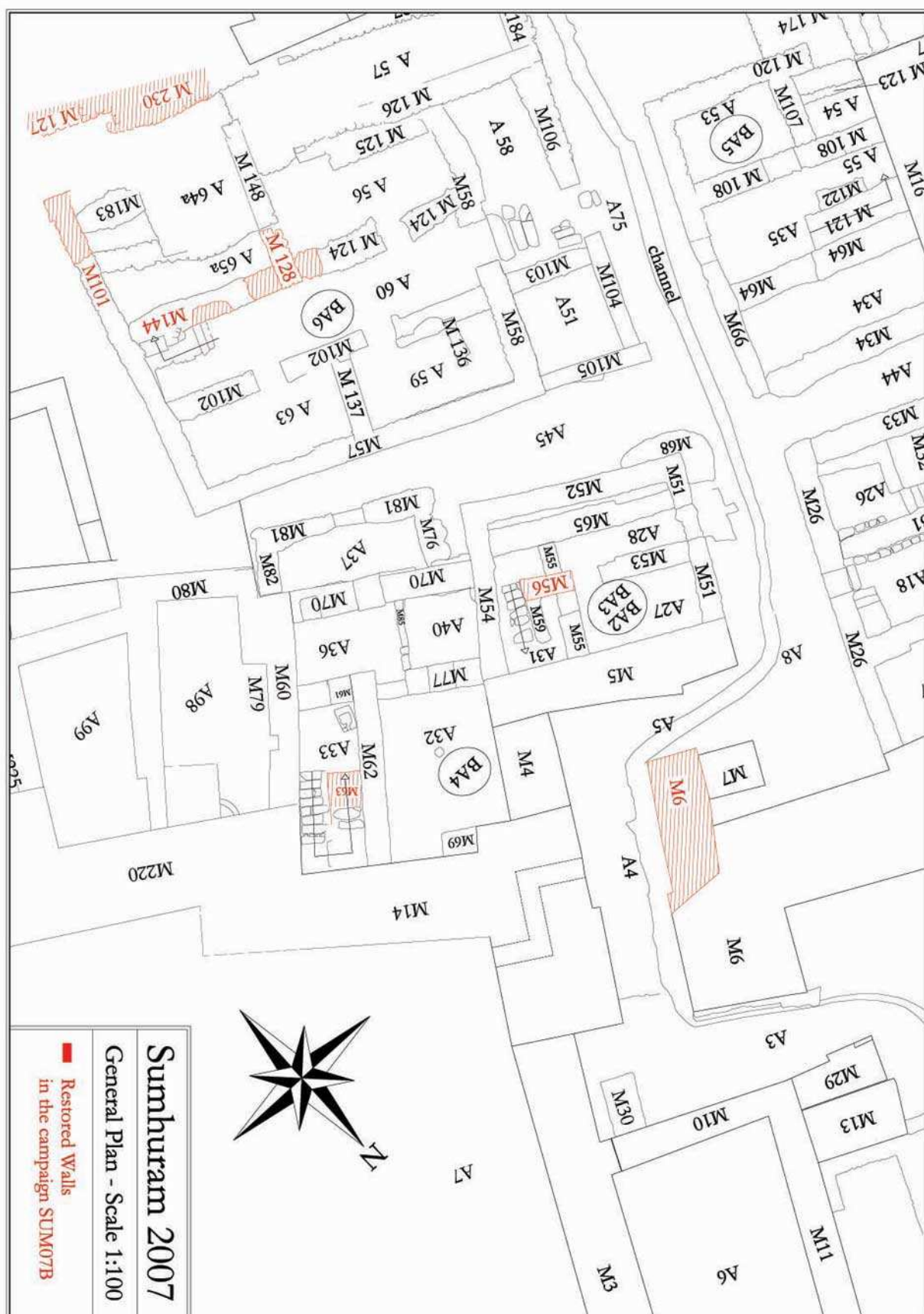
### **2.4.2 Walls reconstruction**

The rebuilding operations on wall M56 concerned the issues seen for M6.

## **2.4. DISMANTLING OF COLLAPSED PART OF WALL M63**

The dismantling of wall M63 began on November the 10<sup>th</sup>. The stones and the earth forming the wall body were heaped nearby: no stone was removed from those parts of the wall featuring structural integrity and a proper masonry arrangement.







Eastern side of wall M6 before restoration





Eastern side of wall M6 after restoration



South-eastern parts of walls M127 and M230 before the rains



South-eastern part of wall M127 after the rains and before restoration





South-eastern parts of walls M127 and M230 after the rains and before restoration



South-eastern part of walls M127 and M230 after restoration



South-eastern parts of walls M127 and M230 after restoration





Southern part of wall M101 before the rains



Southern part of wall M101 after the rains and before restoration



Southern part of wall M101 after restoration





Wall M128 and northern part of wall M144 before the rains



Wall M128 and northern part of wall M144 after the rains and before restoration



Wall M128 and northern part of wall M144 after restoration





Wall M56 before the rains



Wall M56 after the rains and before restoration





Wall M56 after restoration



Wall M56 after restoration



Wall M63 before the rains





Wall M63 after the rains and before dismantling of collapsed part





Wall M63 after dismantling of collapsed part