IMTO – Italian Mission to Oman

University of Pisa

SUMHURAM

Preliminary Report

February – March 2013 (SUM13A)

PRELIMINARY REPORT (SUM13A)

February – March 2013

The first IMTO's campaign of 2013 (SUM13A), under the direction of prof. A. Avanzini, started on 2nd February and finished on 14th March 2013.

The main goals of the excavations have been focused in area A, eastern part (street A113, room A179), in area A, central part (square l9), and in area B (entrance to building BB2, building BB2 with room A185, square A180, rooms A106 and A178, square A74, new building BB3 with rooms A202 and A203, and area North of building BB3).

The excavations were conducted on the field by prof. Alexander Sedov, dr. Vittoria Buffa, with the collaboration of senior students Giulia Russo, Giulia Buono, Clara Mancarella and Cleto Carbonara.

Arch. Sergio Martelli was responsible for the pottery drawings.

Laura Strolin was responsible for archaeozoological analysis.

Arch. Simona Rossi was responsible of the architectural survey, the CAD digitalization and the updating of the plans of the city.

The restoration activities have been carried out at the city walls (rebuilding and rising up of the wall M129 at the west side, restoration of the wall M287 at the east side, rising up of the wall M477 at the south side), and along the path from the main entry where are located the areas BA1 and BA5.
The restoration of the wall M129 can be considered a huge intervention that involved the dismantling, the reconstruction and the rising up of the wall in order to reach the level of the front wall M130.
The consolidation and restoration of ancient masonry structures has been done by arch. Roberto Onofrio under the coordination of arch. Valter Filatondi.

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 Salalah and in Muscat, in particular Ghanem al Shanfari, Said al Mashani, Ali al Kathiri, Said al Salmi, Hassan al Jabri and all the Museum's team for their kind helpfulness.

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Archaeological Report

Excavation in Area A, squares l9, l-m10, new street A206 (trench supervisor C. Carbonara)

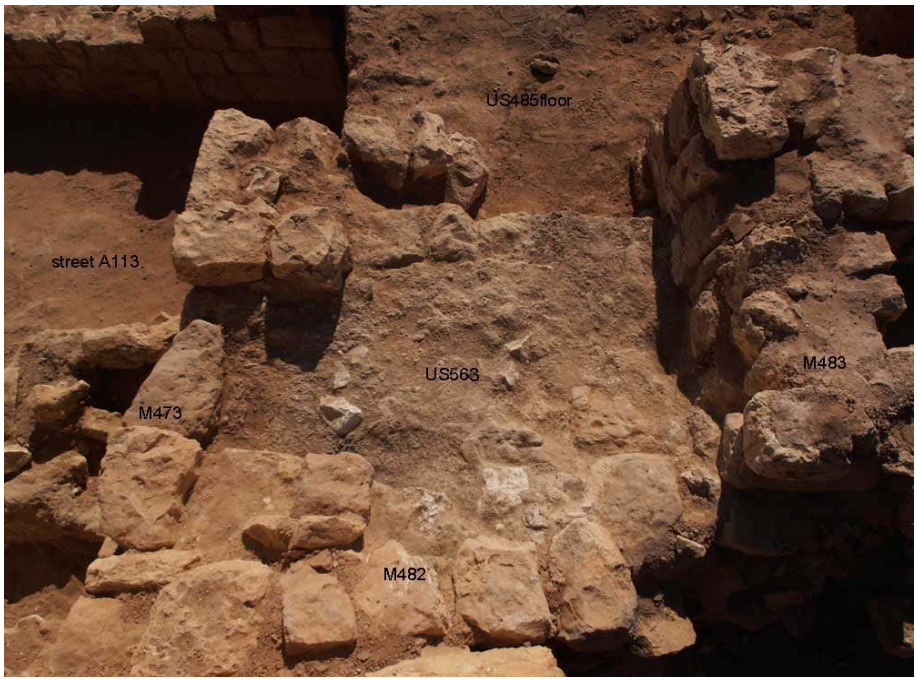
The excavation in Area A, squares l9-lm10, started with the removal of US 480 East of the building BA13. The US 480 is an accumulation layer of earth mixed with stones of medium and small dimensions, with a gray colour and a friable consistence. The layer had a gradient from North to South and a greater thickness on the northern side. The layer was completely removed down to the elevation of 29,95 m, and returned three fragments of storage pottery and several animal bones.
With the removal of US480 the existence of a street (A206), running along the eastern wall M490 of building BA13 and M489 of room A165, was recognizable.
Underneath US480 a new stratigraphic unit, the US 574, was excavated. This is an accumulation layer of earth mixed with stones of big, medium and small dimensions, with a brownish red colour and a quite compact consistence. On the top the stones were very scattered and their number increased in the lower part of the US. Several blocks collapsed probably from walls of BA13, are recognized during the excavation. In the lower part a more compact zone with a large amount of scattered stones of small dimensions along the North side was recognized. In the north-western corner a fireplace with burnt stones small in size was noted. The layer had a gradient from North-West to South-East and was completely excavated down to the elevation of 29,24. US574 corresponds roughly to the US316 in street A156. It is to be noted nevertheless that in A206 no US574floor was recognizable. In US574 two coins (Co794, Co795), and a polisher (S2207) were found.
Underneath US574, the deposit US 579 was excavated. The US 579 (sup. elevation 29,24 m) is an accumulation layer of earth mixed with stones big, medium and small in size, with a brownish gray colour. The layer had a very compact consistence in the northern part, while going toward South, the layers shows a silty composition and a lower compactness. A greater concentration of stones was visible on the West and East sides. A zone dark gray in colour was present in the north-western corner and a burnt area with burnt small stones in the south-eastern corner. Finds in US579 include: fragments of pottery, a large amount of animal bones and some crumbled shells.
US579floor was reached at the elevation of 28,86 m. It consists of earth packed soil that loses compactness in the southern part. On the western side, in correspondence with the door in the eastern wall M490 of BA13 there is a collapse of stones medium and small in size. There are three lined small stones with an irregular shape that may be a threshold.
The floor corresponds to US443floor in street A156.

Area A, before excavation from East

Area A, street A206, after excavation from South, US579floor

Area A, square l12, excavation in room A179 and cleaning of street A113 (trench supervisors: V. Buffa and G. Russo)

The small room A179, delimited from north to south by walls M473, M482, M483, had been shortly excavated during the SUM11A campaign. Here below the superficial layer US458, US471 had been only partly removed. During the present campaign US471 was completely removed. US471 was an accumulation quite loose in consistence, grey-brownish in colour, with many small white inclusions, stones and burnt sandstone. Many bones were found, in conglomerates with earth and white spots (burnt limestone?). The limit with the US563 below was defined by a medium compact accumulation with limestone blocks of medium-large size. A few pottery sherds and two stone tools were found; a soil sample was collected (n. 11). The inferior elevation reached was 29.04 (top US563, left in situ).



Area A, room A179, after excavations

Cleaning of street A113

During the SUM13A campaign the very large limestone blocks left in situ at the end of the previous campaign at the corner formed by street A45 and A113 have been removed.

Street A113, before cleaning

Street A113, after the removal of the blocks, US516floor

Area B (trench supervisor A. Sedov)
During the SUM13A season excavations of the building BB2 and adjacent areas were reactivated. Previously, the ruins of the building BB2 were partially excavated during the seasons SUM11C and SUM12A (see *Preliminary Report SUM11C* and *Preliminary Report SUM12A*).

Square A180 (trench supervisors: A. Sedov, G. Russo)
The wide square, *circa* 5.50x9.90 m in size, is located SW of the building BB2, along its external wall M529. The 'passage', *circa* 2.0 m wide and 2.6 m long, connected squares A180 and A184. From A180 it has a door, *circa* 1.0 m wide, with stone threshold. Very hardly trampled US523floor was traced in the passage at 30.65 point. Excavations during the present season revealed that the door of the 'passage' had an inner step made from three solid limestone blocks, *circa* 12-15 cm high (one block was placed next to the door and two others – along the pylon M548). Very hard and compact greyish deposits continue under US523floor, and they were not separated from the floor with any horizontal level. Round polishing stone was found in the SW corner of the 'passage' (in US523).

It seems that during the last phase of occupation the northern side of the 'passage' as well as the external SW corner of the building BB2 was formed by the late additional wall M522 (southern external 'late' wall of BB2), but originally, when the original southern external wall M529 of BB2 was in function, the width of the 'passage' was *circa* 2.4-2.8 m. It seems also that the pylon M548 was the 'late' addition as well and was built contemporary with the wall M522.Big part of the 'late' additional wall M522 was demolished during the present campaign.

A trench, *circa* 3.0 m wide, was placed in the square A180 along the wall M516 and between the walls M529 and M245 in order to understand the purpose and function of A180 square.
Covered by US523, US567 (sup. Elevation 30.20m) was a rather compact loamy accumulation, brown-reddish in colour, with a quite regular surface, running from SE to NW. In the central portion of the area a grey accumulation, concave in section and elongated in shape was visible, with a large amount of charcoals and ash lenses. This grey accumulation leaned to the mudbrick wall M580 to the north. Along wall M245 to the south-east, the limestone blocks collapsed from the wall were preserved, covering US567 (30.28-30.60m). More than one hundred pottery sherds were collected from US567, mainly storage and table vessels (1 black and grey, 11 amphora and 2 glazed fragments), and three coins were found. While excavating US567 the top

Room A180

of the mudbrick walls M579 and M580 was accidentally removed; while the top of M579 was already visible in US523 (30.10m), the original height of M580 is reconstruct able just from the eastern baulk, while the height preserved in the trench is 29.72m. The accumulation inside the walls (US577), not distinguished at the beginning from US567, was not further excavated (preserved height 29.65m). US567 covered US572 (sup. elevation 29.75m), a loamy accumulation, brownish in colour and rather compact in consistence. Many plaster fragments were found along wall M579 and were collected as sample (n.50). The limit with US576 below was defined by a compact floor (US572floor, 29.61m to the north, 29.66m to the south), preserved just along the eastern baulk (1.88 x 0.36 m), and by a loose soil uncovered in the western portion of the trench (US576). In this portion of the trench a white line defined by burnt and crumbled limestone around 5cm wide was visible, running along the northern portion of wall M516; a soil sample with many burnt limestone was collected while excavating (n.57), even if belonging to US576. Moreover, the top of an alignment made of three limestone well-dressed blocks was uncovered in the central portion of A180, going further down in US576. Along the north-western baulk the top of a new mudbrick wall was uncovered but not numbered (1.20x0.40m, sup. Elevation 29.72m). The inferior elevation of US572 was 29.66 (the floor along the eastern baulk) and 29.57m in the western portion of the trench.

Square A184

The trench running in A184 along the western façade of the building BB2 and along the 'passage' revealed two staircases: one leading to the entrance of the building BB2 and another – leading to the door of the 'passage'. Both staircases had identical constructional features – L-shaped walls (M549 and M575 respectively) protecting the stairs from accumulations on the square (or street?) A184.

Entrance to the passage

The staircase leading to the entrance of the building BB2 had five steps made from solid limestone blocks and a porch in front of the entrance, which horizontal surface was paved with limestone slabs. The second staircase leading to the door of 'passage' had more amorphous character and looked more likely as pavement with two low steps made from limestone and sandstone slabs.

BB2, staircase leading to the main entrance

Building BB2

Excavations of ground floor rooms of the building BB2 were in progress during the SUM13A season.

Room A181 (central corridor). The bulk for section roughly in the centre of the room was removed and the entire room was excavated following US527floor level (point 29.80 in its western part and 29.85-29.90 in the eastern). A step made from solid limestone block was found next to the threshold of the entrance to the room A183. One more step made from square solid limestone block was found against the threshold of the entrance to the room A182. In the middle part of the room, on the US527floor, remains of round stand for big storage jar were found (against the wall M524) and next to it – two whale vertebras standing *in situ*. Almost complete stone mortar was found in US527 (S2084). The stone structure in the NE corner revealed remains of the staircase leading to the top floor of the building: three steps of staircase and its side-wall M576 were discovered.

BB2, room A181, two whale vertebra

BB2, room A181, remains of jar's stand

Room A182. The western part of the room was excavated. It revealed a structure almost symmetrical to its eastern part: a low partition wall M574, made from two vertical rows of flat sandstone slabs, separated a compartment, *circa* 0.9x1.9 m in size. A whale vertebra and a round polishing stone were found standing *in situ* on the US528floor in the central part of the room, next to the wall M574. The cultural deposits in the western part of the room were also denoted as US528, and consisted of limestone blocks mixed with loose dark brown loam, fragments of mud-bricks (upper parts of partition walls?), very little amount of pottery fragments, marine shells and animal bones. Numbers of stone tools (grinding and polishing stones, pestles) were found in the US528 (S2030-S2048).

BB2, room A182 (part), after excavations

Room A183. The eastern part of the room was excavated following the US541floor. Cultural deposits in this part of the room were denoted as US529 (top stratum) and US541 (stratum between US529floor and US541floor). Numbers of stone tools were discovered in both strata (S1995-S2008 and S2054-S2055).

BB2, room A183 (E part), after excavations

Room A185 (trench supervisor: G. Russo) SE part of the room was excavated and we started to remove cultural deposits denoted as US531 down to the floor of the room. US531 covered US 566 (sup. Elevation 30.75m), a rather compact loamy accumulation covering the whole A185. It was brown-greyish in colour, with bones, shells, crumbled mudbricks and medium-large limestone blocks. A large amount of stone tools was found scattered in the US (mainly handstones and polishers and one incense burner); just a few pottery sherds were recovered, belonging to storage and table vessels (no diagnostic sherds). US566 covered US568 and its inferior elevation was 29.85 m ca. The removal of US566 uncovered the top of a one-row mudbrick wall in the eastern portion of the room (29.93m), leaning on M533 to the north and to M529 to the south. A second alignment of stone (small-medium size sandstone and limestone blocks, 29.87m) was covered by US566 in the southern portion of the room, leaning on M523 to the west and to M530 to the east. This alignment was partly covered by the mudbrick row along its SE side; a broken squared limestone basin was set into it. US566 covered also the top of a stool (made from a whale vertebra) in the central portion of room A185.

US568 below was a very loose, grey accumulation with black lenses, ashes, charcoals of medium-large size (collected as samples n. 25, 30, 31), burnt bones and shells. A large amount of stone tools was found (handstones, whetstones, polishers, rubbing stones), along with a few clay and glass beads, soft stone vessel fragments and a small ivory object (I6). 26 pottery sherds were collected (storage and table vessels), among them 5 fragments of amphorae and 2 glazed fragments.

The accumulation was thicker along wall M533 to the north, where the earth was very loose and full of charcoals and burnt shells and bones, while it was less loose along the southern and eastern walls, respectively M529 and M530. US568 was covered to the east by the mudbrick wall and to the south by the stone alignment already visible at the bottom of US566; both of them, mudbrick wall and stone alignment, had just one row of mudbrick/stones. The removal of US568 uncovered a more compact soil, brown-greyish in colour, preserved in the central portion of A185 and in the partitions defined by the mudbrick wall (2.30 x 0.25 m) and the stone alignment (2.83 x 0.24 m). The inferior elevation of US568 was 29.75 m in the central part of the room.

The orientation of US568 (thicker to the north along wall M533 and thinner to the south along wall M529) could suggest that a fireplace was probably set in the north of room A185, close to the steps leading to the corridor A181, but no stones defining a fireplace were recovered. Ashes, charcoals, burnt bones and shells were then probably scattered in the whole room to create a regular surface on which the mudbrick and stone alignments were set in order to define different partitions along the southern and eastern walls of the room (M529 and M530 respectively). The function of these partitions is difficult to determine since no particular findings or changes in the composition of both US568 and US566 were recognized. An interesting feature of room A185 is the whale vertebra used probably as stool and the broken limestone basin reused in the southern stone alignment. The vertebra and the basin were aligned and close to each other, suggesting that they could have been used respectively as stool and worktop; this interpretation is strengthened by the presence of shallow circular depressions on the surface of the limestone basin. Moreover, a large amount of stone tools and an unfinished animal protome (S2162) have been found in the room, suggesting the possibility that some kind of productive activity took place in A185.

BB2, room A185 from E, after the excavations

Room A186. The room remained untouched.

Room A187. Cultural deposits US533 were started to remove down to the floor. Large fragment of stone mortar was found in the entrance of the room.

In general, it seems quite probable that building BB2 and the wall M516 separated the storage quarter from the rest of the city. In this case we can consider the ‘passage’ between BB2 and M516 as the only access on the roof of long storage rooms A89-A95, from where, as we hypothesized, the storages were accessible, at least at the final phase of the city existence. To proof this supposition we need to excavate the squares A180 and A184 completely.

During this campaign, the area to the west of M516 was partly cleaned, removing US540, a loose, brown-reddish accumulation with the blocks collapsed from M516 to the east and M581 to the south. US540 was completely removed along wall M516, revealing a more compact soil with small charcoals and plaster fragments. In the area further to the west US540 was only partly removed, uncovering the collapsed stones of the walls which were left in situ.

Excavation in Area B: square A74, rooms A106, A178, A204 and A205 (Trench supervisor: G. Buono)

During the SUM13A campaign, excavation was carried out in area B, square A74, rooms A106, A178, A204 and A205.

Square A74

The work concentrated in the north-western part of A74 to clarify the connection between the storage area and area B. The excavation started with the removal of most of the modern path and US181 that was the top accumulation of the square A74. It covered M169, M584, M585, M583, M578, M235 and it consisted in very soft light brown loam mixed with mudbricks (+29,445), not many pottery fragments and few bones and marine shells. Inside the layer some iron slags, three coins (Co773, Co774, Co775), a nail (MI199), three crucibles (G181, G182, G183), four fragments of soft-stone vessels (S2049, S2050, S2056, S2058), one spindle-whorl (S2024), an anvil (S2051), two whetstones (S2052, S2053), a loom-weight (S2057) and an oil lamp (Sh461) were found. The floor, reached at an elevation of 29.01, is made of packed loam with white inclusions and was left in situ. During the excavations some new walls were brought to light: the continuation of M160 to the west, the two walls M584 and M585 with an orientation north-south/east-west forming a corner one with the other, and M583 that leans to M578 with orientation north- south (l. 1.1m).

Square A74, before excavation

Square A74, after excavation

Rooms A106, A178

Room A106 was already excavated in SUM07B but work stopped to US237floor that consisted in a fireplace that we decided to remove during this campaign. Under US237, US564 was identified (superior elevation before excavation + 29.41): it is an accumulation made of loam, very compact in consistency and brownish gray in colour, with a large amount of bronze scraps (200 gr of bronze scraps were collected in A178), charcoal, a large amount of vitrified clay fragments, some small sandstones, some iron slags, large crucibles and scarce presence of pottery and bones. Under US564, US181floor was recognized.

The excavation was extended in the north-western part of A178 to understand the connection with A106 and we started with the removal of the superficial wall M236 and the following stratigraphic units:

US235 is an accumulation, placed below US242 , in room A178. Its consistency was loose and it presented a large amount of organic material (above all fish-bones, placed in the upper part of the layer). The following findings were found in the layer: decorated pottery (SUM13A, US235,26), some iron slags, some bronze objects: a fragment of vessel (MB731), a fragment of plaquette (MB733), a ring (MB734), a nail (MB735), together with a crucible (G188), two handstones (S2109, S2110), a rubbing stone (S2113), fragments of two soft-stone vessels (S2111, S2112) and an oil lamp (Sh467).

US235 covered US236. US236 (Sup. elevation 29.77, inf. elevation 29.58) represented a layer where it's clearly possible to recognize a garbage heap. It was compact in consistency, brownish-gray and very rich of organic remains (above all fish-bones) and a great quantity of charcoal and ashy lenses. Two whetstones (S2104, S2105), two oil lamps (Sh465, Sh468), a rivet (MB729) and a fragment of a bronze bracelet (MB730) were discovered in the layer. It covered US237 and US237 floor. US237 was an accumulation with its related floor made by loam medium compact in consistency and brownish gray in colour with a large amount of bronze scraps, charcoal, fragments of vitrified clay, large crucibles and a few pottery remains and bones. The floor (elevation 29.48)

was made of packed earth with white inclusions. In the western part of the pavement there were ash lenses. Near the corner between M235 and M245 three clay molds for bronze inscribed plaquettes were discovered (Cl49, Cl50, Cl51).
US564 presented the same features in both the rooms A106 and A178, but it covered two different floors: US181floor in A106 (the same floor found in A74) and US564floor in A178.
US564floor (elevation 29.34), preserved only in A178, is made of gray packed loam with white inclusions (US546floor 29.341). It is delimited by a row of stones of small size that proceeds from M234 to M235 (E/W orientation) and seems intended to isolate this zone. On the floor there are at least two small fireplaces, circular in shape with a diameter of 0.40 m, one of them near the corner between M235 and M245, and the other one next to the row of stones in the north-western part of A178. In the center of the area there is a small pit, irregular in shape, with a large amount of charcoals and bronze scraps; close to it, a rectangular trace of a bronze plaquette (20x8 cm) is still visible. Finally in the north-eastern part of A178, close to M245, there is a semicircular structure (diameter 50 cm) interpreted as a furnace probably used for the cooking of the molds for bronze inscribed plaquettes. The most internal part of the furnace is made of an accumulation of loam, loose in consistency and gray in colour, with ashes; this part is delimited by a semicircular course of cooked clay (pale yellow in colour) and by a more eastern one, brown in colour and softer in consistency. The layer was not removed.

Room A106, before excavation

Room A106, after excavation, US181floor

Room A178, before excavation

Room A178, after excavation, US564floor

Small finds from room A178, US564

Room A204

The room was delimited by M235 to east, by M581 to the north and by M582 to the south. The excavation started with the removal of US570 that consisted in an accumulation made of loam, not very compact in consistency and light brown in colour with a large amount of stones of small size and small sandstone slabs. The floor, reached at an elevation of 30.39, was made of compact gray loam with white inclusions. On the floor there were two fireplaces, one close to M235 and the second one, on the other side, next to the preserved section (western area of the trench). A coin (Co790), two fragments of stone vessels (S2182, S2183), a rubbing stone (S2181), two stone beads (S2178, S2178), a shell pendent (Sh490), a bronze rivet (MB747), a fragment of glass vessel (G190) and a small stone vessel archaeologically complete (S2177) were found in the layer. Under US570, US573 was identified. US573 was an accumulation made of loam, not very compact in consistency and brownish-gray in colour. The US573floor (elevation 30.17**)** is made of compact gray loam with white inclusions. On the floor there are two fireplaces, left in situ; the biggest one is close to M235 and delimited by two large well dressed stones (80x40x20 cm; the fireplace is filled with brownish loam loose in consistency with some burned bones). A second fireplace is located on the other side, next to the preserved section (western area of the trench), it is smaller than the first one. Two coins (Co789, Co792), some bronze objects (MB752, MB753, MB754), some pottery shards and bones and shells were found in the layer.

Rooms A204 and A205, before excavation

Room A204, after excavation, US573floor

Room A205

Room A205 is situated southern to A204 and it is delimited by M235 to east, by M582 to the north and by M578 to the south. The collapse layer and the related floorUS575 are an accumulation made of loam loose in consistency and brown in colour, and a large amount of large stones fallen from the walls. The floor (elevation 29.47) is made of compact gray loam with white inclusions. It is badly preserved and it is present only near M582. Some pottery shards (one with signs of reparation made in antiquity), bones and shells and iron slags were found in the layer.

Room A205, after excavation, US575floor

Excavation in Area B, squares o10-11, n10-11, new building BB3 (trench supervisor V. Buffa)

The area in question has been partially excavated by the AFSM in 1952-53 (Albright 1982, p. 33-34, fig. 5, VIII, rooms J24 and another room not numbered). Albright describes a four rooms building, west of the storage bins, as having "floors near the present surface level…. and the floor under this floor level are constructed better than those of later date". It is nevertheless impossible to know exactly which room or rooms have been tested by Albright and to which depth.
At the beginning of the IMTO SUM13A campaign walls delimiting two rooms of Albright four rooms building were visible on the surface. IMTO excavation started with the removal of the surface deposit in the NW room (J24), from now room A202.

Area B, before excavation, from North

Room A202
Room A202 measures 3.50 x 4.40 m. It is delimited by the northern wall M571, the eastern wall M572, the southern wall M573 and the western wall M365. A door in wall M572 leads to the eastern room A203. The deposit inside the room has been divide in two layers, according to the lithology. The surface had an elevation of 31.47 m. The very superficial floor mentioned by Albright must have been all removed, because its traces were not found at present.
The deposit in room A202 was excavated at first leaving a bulk for section. After drawing of the section all the room has been excavated.
The superficial layer, US561, consisted of reddish brown loam, incorporating several sandstone stones and several broken mudbricks. No bones, 21 fragments of pottery (14 storage -one black and grey-, 7 table - 3 glazed)- , one glazed bowl and one ovoid storage jar red), and 5 complete whale vertebra were found in the deposit. Finds included: 15 stone tools: whetstones, polishers, pestle, handstones (S2027-2029; SS2167-2172; S2196-2201), one incense burner (S2163), one

unfinished bead (S2202), one shell bead (Sh485), one iron nail (MI211), a bronze bracelet (MB741), 3 coins (Co777, Co778, Co779), oil lamps (Sh460, Sh486), and 2.5 kg of iron slags.
US561floor was marked by some sandstone slabs and some ashes.
The deposit below has been named US569. It consisted in rather loose reddish loam mixed with ashes.
Finds included: 27 stone tools: handstones, rubbing stones, polishers, pestles, mortar, platter, whetstones (S2130-2145; S2173, S2174; S2185-2188; S2205, S2206; S2211, S2213) , several shell, clay, stone beads (S2175, MB762,), a necklace made of beads of different materials (D31), some unfinished (S2195), one coin (Co781), one iron point (MI210), one iron nail (MI209), iron slags 0.5 kg . Only three fragments of Egyptian amphorae, and few other pottery walls – 2 glazed- were recovered.
US569floor was reached at the elevation of 30.30 m. The floor was made of hard packed loam, blackened by exposure to fire. In the corner formed by walls M365 and M573 two vessels stood in situ upside down. The first one , completely reconstructed (US569,2) , a handmade jug, had the mouth was closed with a stone and some fine grey silt. The bottom is missing and the fracture is smoothed. The jug has been reused as a container. The vessel was kept in situ by a lining of hardened reddish clay and on the eastern side by a "wall" of mortar, on the western side by a limestone block. US578 has been named the deposit between the jug and the mortar. In US578 one iron slag has been found. The other vessel (US569,1), an Axumite vessel, is complete and was lying upside down between the first vessel and wall M365.
In front of the two vessels stood three whale vertebrae, slightly rising from the floor ; two of them show signs of having been exposed to fire or to high temperatures on the upper surface. A large squared whetstone with traces of rust lied next to them.
The northern part of the room was occupied by the remains of an installation lying on US569floor: US580 . In the western part the structure is round and it is defined by medium size limestone undressed stones. It is separated from the eastern part by a square, flat stone with the function of a whetstone or anvil, lying south of a small hole filled with loose black soil with some ashes. In the eastern part larger limestone undressed blocks define a oval or rectangular structure that seems to be missing its southern side. Inside the structure (or structures?) US580 a base of hard packed reddish clay was topped by a mixture of loose red and black soil, mixed with ashes and charcoals, small pebbles burned, few burned bones and some stone tools also with traces of fire: a handstone (S2216), a rubbing stone (S2215), and a rectangular "mortar" with blackened upper surface and an iron slag. The stones forming the structure are often blackened by fire or whitened by high fire.

BB3, room A202, vessels US569,1 and US569,2

BB3, room A202, vessel US569,2

BB3, room A202, US569floor, three whale vertebrae in the background, from North

BB3, room A202, in the background US580, from South

Room A203

The room stands West of A202. In Albright publication it is neither mentioned or numbered. It is possible that it has not been excavated.

The room is longer than A202, measuring 3.50 x 7.70 m. It is defined by northern wall M587, western wall M577, southern wall M588. The western wall M572 with its threshold and door is the partition wall between A203 and A202. M588 is probably a wall belonging to a more ancient structure that was used for A203 when BB3 was built, while for room A202 another wall M573 was built against M588, probably because M588 was in bad conditions. M577 has a door connecting the room with the outer eastern space.

The superficial layer , US562, was removed, leaving a bulk in the northern part (for section). It consisted of loose brown loam, incorporating several sandstone slabs fallen from the upper part of the surrounding walls, especially M588. Under the surface, US562 becomes crumbled. The bottom of US562 was reached at the elevation of 30.50. No real floor was present, but the layer underneath marked a difference in color an consistence.

Finds in US562 include: 18 stone tools: handstones, whetstones, grinding slab, mortar, polishers, anvils, a pestle (S2059-2083), 3 shell and clay pendants (Sh469, Cl47, Cl48), one oil lamp (Sh483) , 7 fragments of pottery (one wavy rim bowl). Four whale vertebrae were found in the deposit.

Under US562, US565 underneath was made of crumbled grayish brown loam and ashes, incorporating a quantity of sandstone slabs. No bones and only 6 fragments of pottery were present in US565.

Finds include : 15 stone tools: whetstones, handstones, polishers, anvil (S2087-2094; S2114-2120), one coin (Co776), beads (MB725, Sh463), one unfinished bead (S2069), one gemstone for ring (S2068) pendants (Cl45, Cl46, Sh470, Sh471), two oil lamps (Sh466, Sh484), shells half worked or present as raw material for beads and pendants (Sh72).

US565floor was reached at the elevation of 30.23 m. It was marked by some limestone slabs. On it stood three whale vertebrae and a large whetstone. Some area of fire were present.
Almost half of the room remained unexcavated at the end of the SUM13Acampaign.

BB3, room A203, US565floor, three whale vertebrae in the background, from South

Enlargement of the trench North of BB3, squares o10-11, n10-11

Area B, squares o10-11, n10-11, before excavation, from North

During the SUM13A campaign the trench North of building BB3 has been opened in order to find the stratigraphic relation between BB3 and the rooms excavated to the West – mainly A145 - during past campaigns, and also with A74 – excavated down to US181floor (see G. Buono).
A trench about 8.50 m x 4m, was opened following to the North for 4 m the line of wall M365 and M577. Also this area has been partially excavated by AFSM. Albright describes a "peculiar structure" connected to the North to our room A202 through wall M571. It has not been possible in this campaign to clear completely the structure described by Albright. All the area was interested by massive collapse of blocks, soil and probably also AFSM dumps. North of M587 the collapsed blocks and soil were removed down to the elevation of 29.65 m. All the deposit has been named US571. It consisted of loose reddish brown and brownish soil with limestone blocks, sandstone slabs, few pottery shards and animal bones. US571 has been completely removed. Three coins (Co782, Co796, Co797) , stone tools (S2217, S2218), an iron nail (MI761), a bead and a pendant made of shell (Sh487, Sh488) were found.
The upper inner face of wall M587 was cleared, but the outer face remains to be found. A wall M586 , made of sandstone slabs, is leaning on M587 going in a northern direction. It has an opening 1.50 m wide.
The trench was later widened toward the East to connect it with the trench in A74. It was possible to expose the connection between M577 and M169, the latest set at a lower elevation than M577. Wall M585 continues toward the NW; it is a superficial wall (like probably M586). This latest operation in the area proves that A74 and the area north of BB3 are part of the same open (?) space. In the area North of BB3 , under US571, the layer left in situ will be equal to US181.

Area B, squares o10-11, n10-11, after excavation, from North

Preliminary remarks

As far as relative chronology goes, it is possible – with Albright - to assign the two rooms to a late phase within the life of Sumhuram. The extension of the excavation to the area North of BB3 has proven that at least M577 is a superficial wall set at the elevation of 30.06, only 0.17 m lower than the floor in room A203. The building was constructed using some earlier walls already present, such as M588, M365. It is therefore to be expected that another earlier structure is present under BB3. The two complete jars of room A202 must still be studied, but a date in the first centuries AD is probable. This could be confirmed by the presence of the fragment of wavy rim bowl in room A203.

About the function of two rooms some facts can be high lightened. It seems that A202 and A203 were not part of a residential building, as can be inferred from the absence of pottery and bones. The presence of several stone tools and of the objects recovered (mainly beads and pendants, some unfinished, and raw material for beads and pendants) is an indication that the spaces were used as workshops. The whale vertebrae in situ in the two rooms could have been used as stools or working surfaces.

Moreover on the floor of room A202 (US569floor) the structure US580 can be tentatively interpreted as a furnace for iron smithing, similar to the one discovered, not far away, in room A73 during the SUM06B campaign. The iron slags could have been part of the smithing process, as the large whetstone with rust . In this case the reused jug, lying next to the whale vertebrae could have been used for holding water needed in the smithing process. Analysis of the incrustation on the inner surface of the jug could give an answer.

Object Index Card

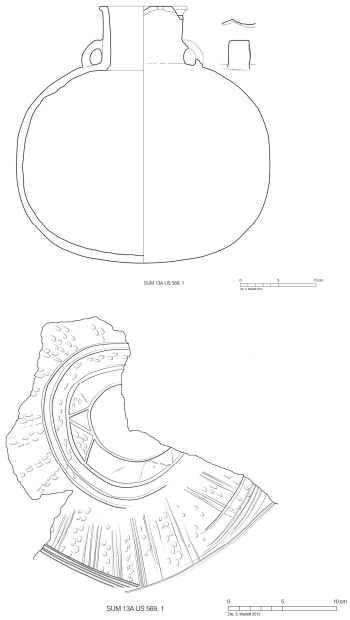
Registration Nr. SUM13A US565,6 S2068	 		
Provenance Area B, O 12, A203			
Drawing code Nr .			
Definition Gemstone	**State of preservation** Good	**Measures** l. 2.6 w. 1.8 h. th. 1.1 diam.	**Shape** Oval
Material Agate	**Preserved part** Complete		**Section** Plano -convex

Description

SUM13A, US565,6, S2068
Complete oval cabochon gemstone for ring, with plano -convex section. The gemstone is made from red and white banded agate. The top is convex, the bottom is flat. Top and lateral surface polished.

Responsible G. R.	**Date** 18.02.13

Khor Rori pottery Index Card

Index Nr. SUM13A US569,1	
Provenance Area B, BB3 A202	
Photo	
Drawing code Nr.	
Category Storage	

Shape	**Type**	**Preserved part**	**State of preservation**
Closed	Jar	Complete	Good

Measures. cm	**Color inter. Surface**	**Color ext. Surface**	**Color section**
	Reddis h Brown 5YR 5/4	Red 10R 5/6	Red

Characteristic of paste	**Inclusions**	**Method manufacture**
Compact	Several tiny black and white mineral inclusions, some larger white	Hand made

Surface treatment (ext.)	**Surface typ e (ext.)**	**Decoration (ext.)**
burnishing	plain	

Surface treatment (int.)	**Surface type (int.)**	**Decoration (int.)**
smoothing	plain	impresso?

Description/observations

The bottom of the internal surface is "decorated" with *impresso* ? circular lines triangles filled wit h oblique lines , radiating lines, alternated with row of pastilles. It could be the result of an object used to shape the bottom?

Date	**Responsible**
07.03.2013	VB

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

a b c d e f g h i j k l m n o p q

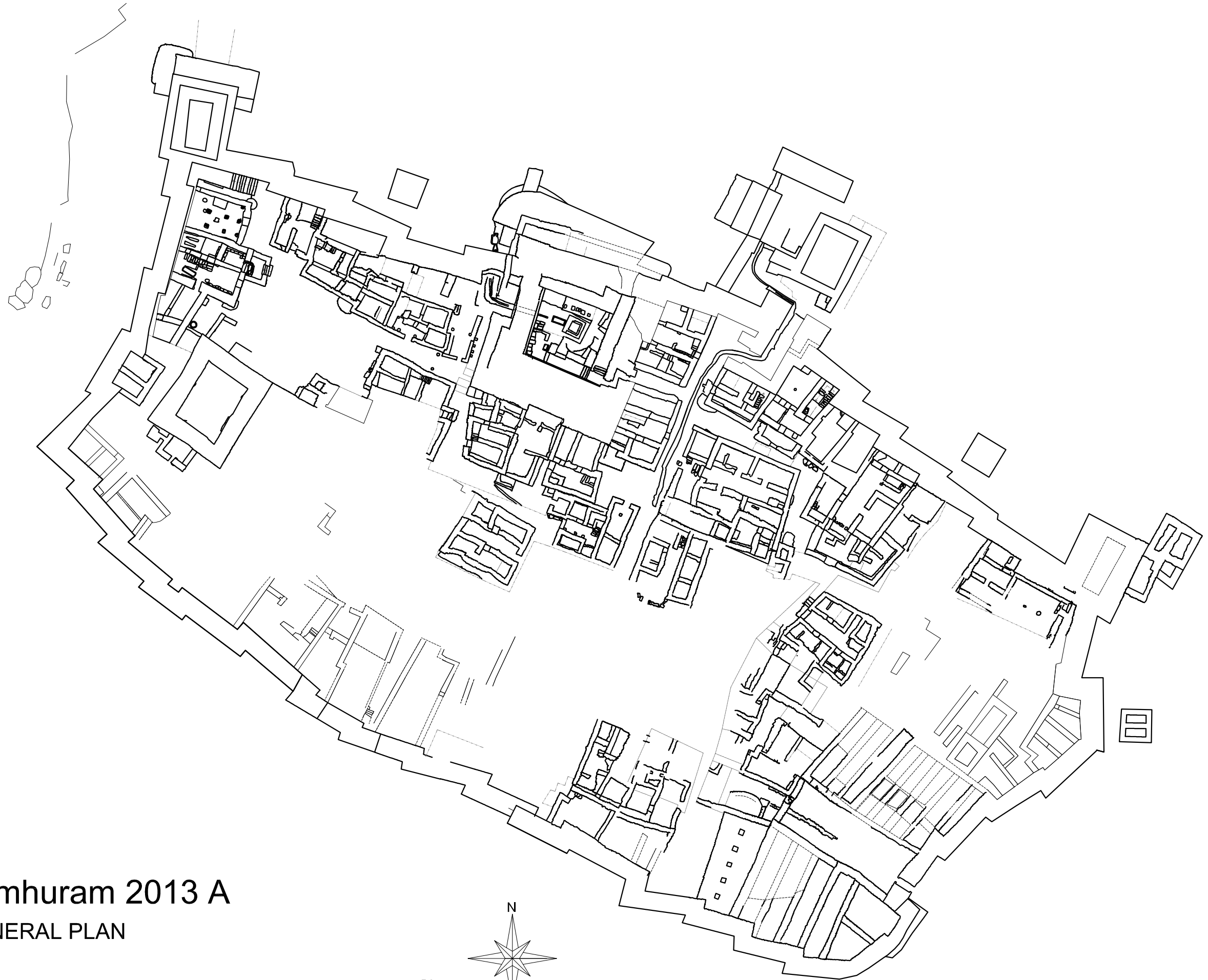
A

Sumhuram 2013 A

GENERAL PLAN

N

5 0 50m

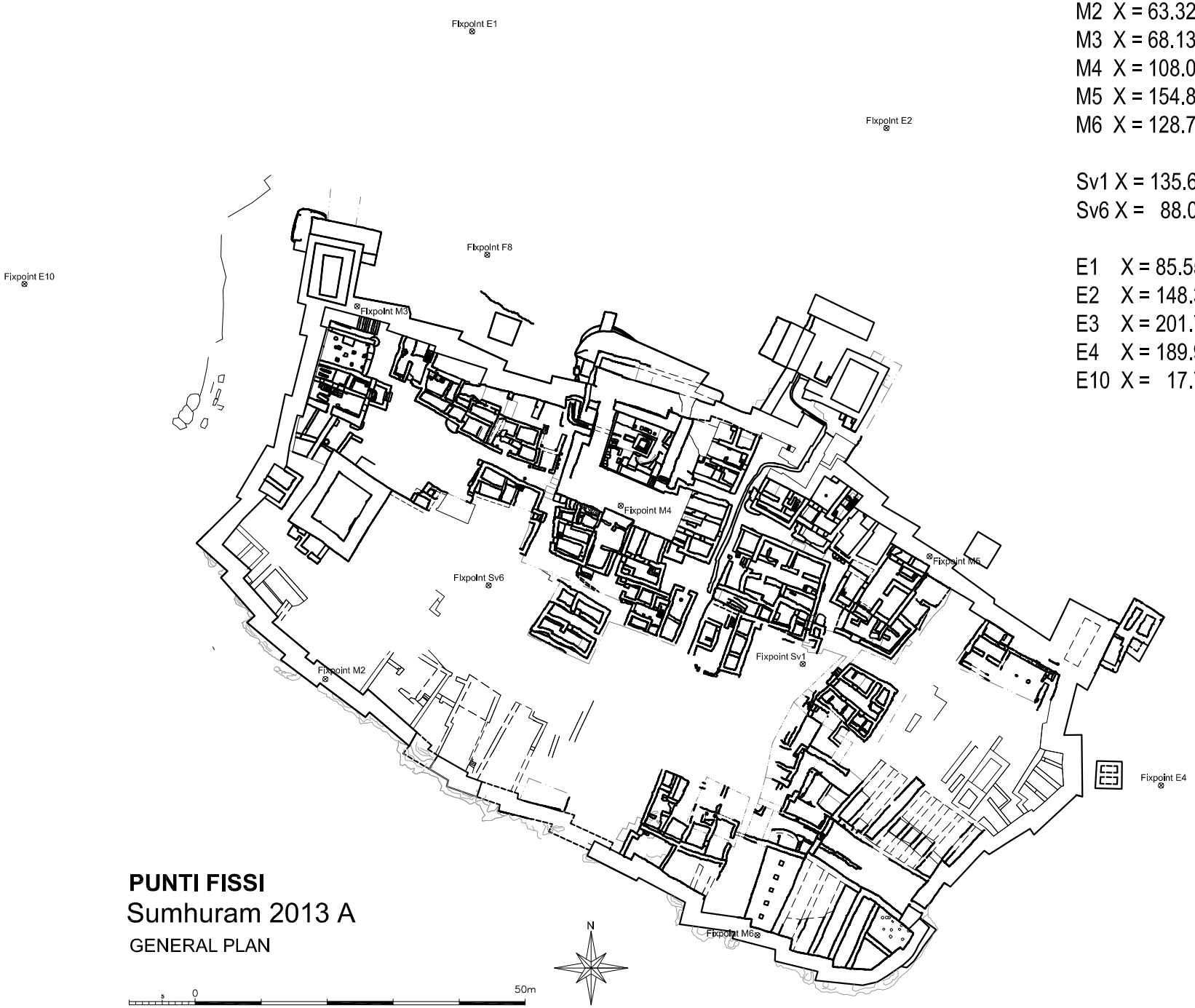


Sumhuram 2013 A

GENERAL PLAN

QUOTA
PUNTO FISSO

M2	X = 63.3220	Y = 124.1880	Z = 29.2150
M3	X = 68.1340	Y = 180.6630	Z = 29.3470
M4	X = 108.0700	Y = 150.4640	Z = 32.5230
M5	X = 154.8560	Y = 142.7840	Z = 31.5440
M6	X = 128.7630	Y = 85.3880	Z = 30.1960
Sv1	X = 135.6390	Y = 126.4780	Z = 31.6110
Sv6	X = 88.0530	Y = 138.3820	Z = 30.4070
E1	X = 85.5530	Y = 222.3211	Z = 21.8310
E2	X = 148.3190	Y = 207.6640	Z = 24.3680
E3	X = 201.7270	Y = 162.7970	Z = 22.7730
E4	X = 189.9160	Y = 108.0670	Z = 26.3480
E10	X = 17.7330	Y = 184.0410	Z = 22.3880



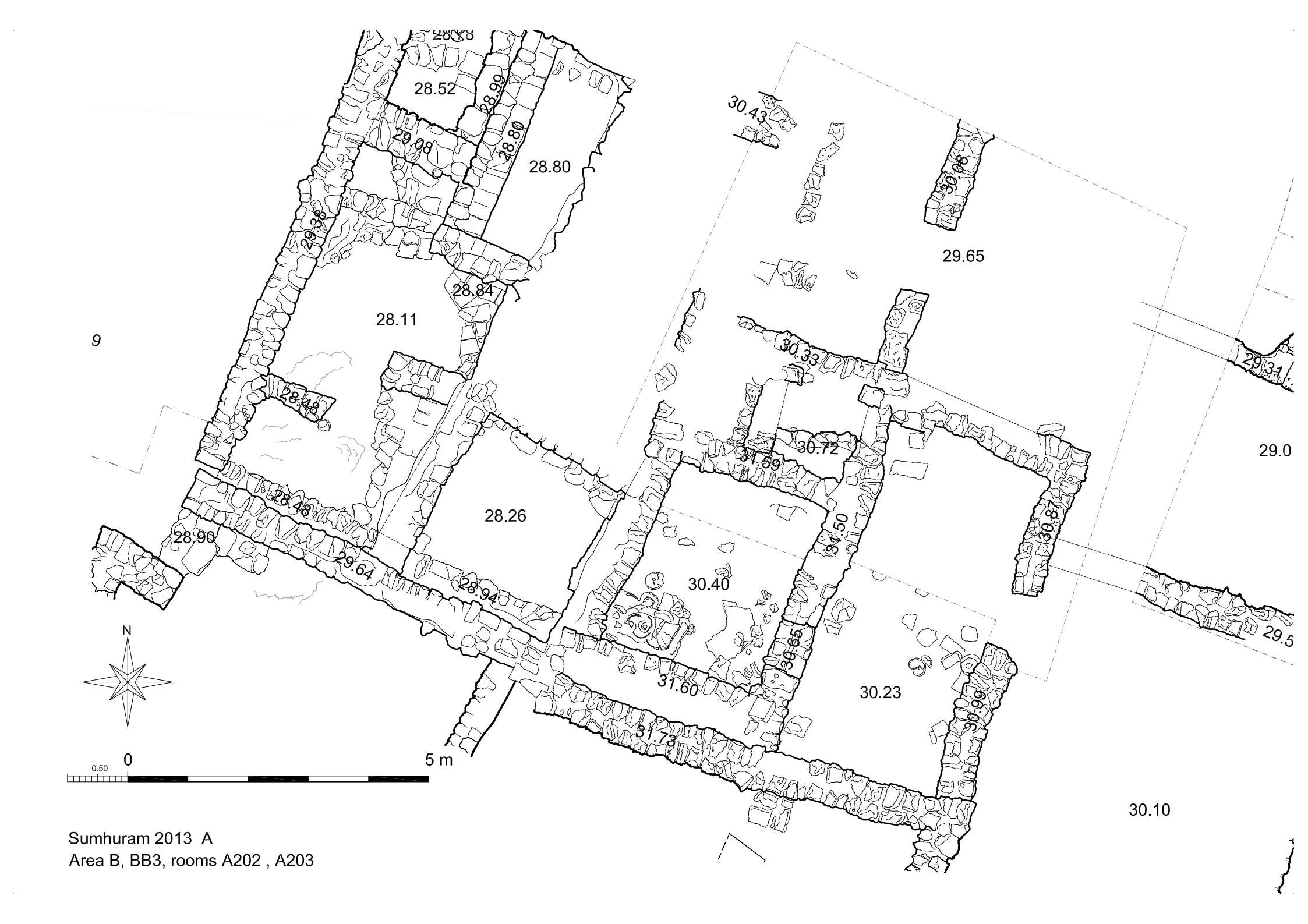
PUNTI FISSI

Sumhuram 2013 A

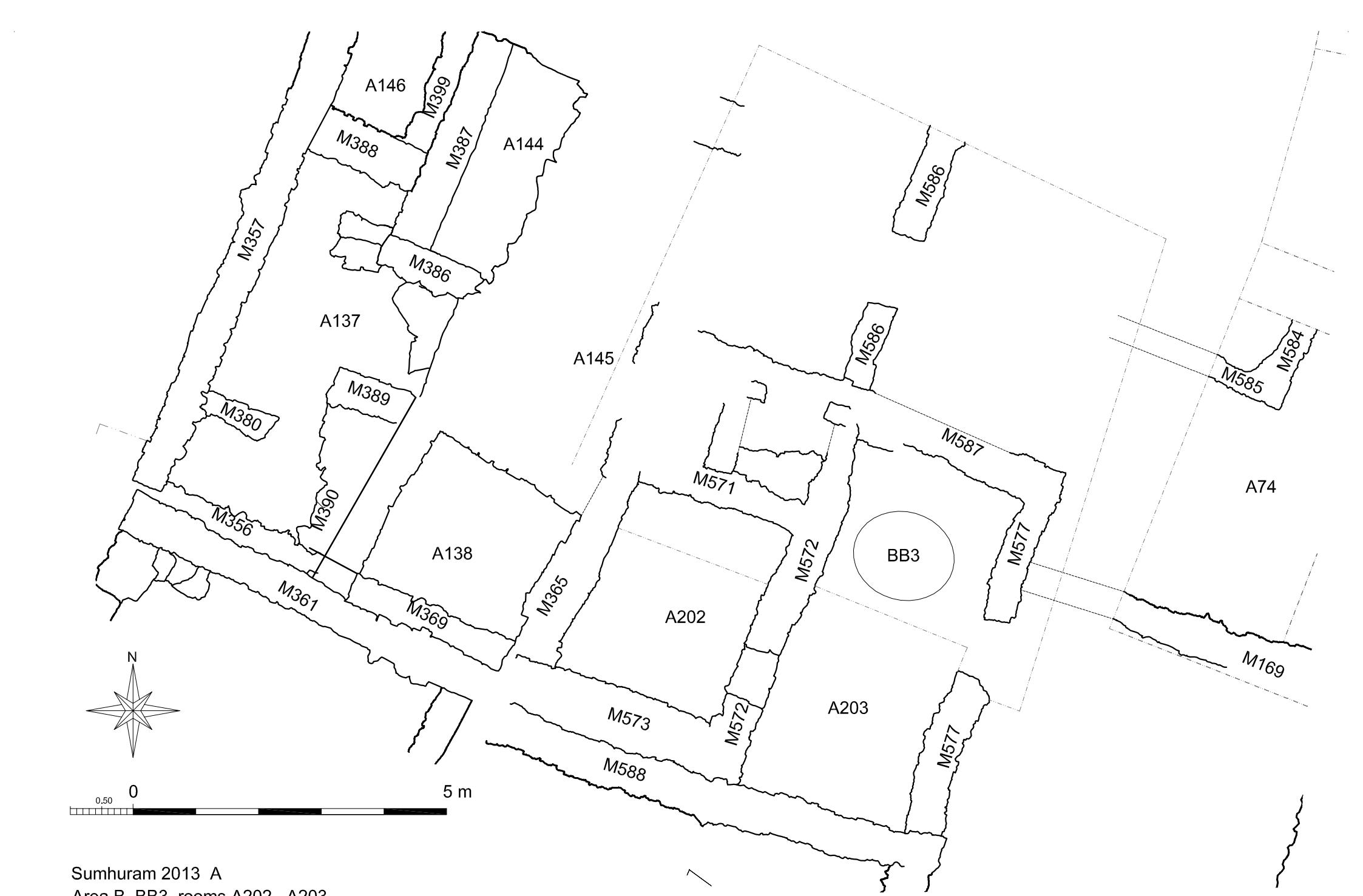
GENERAL PLAN

Sumhuram 2013 A
Area A

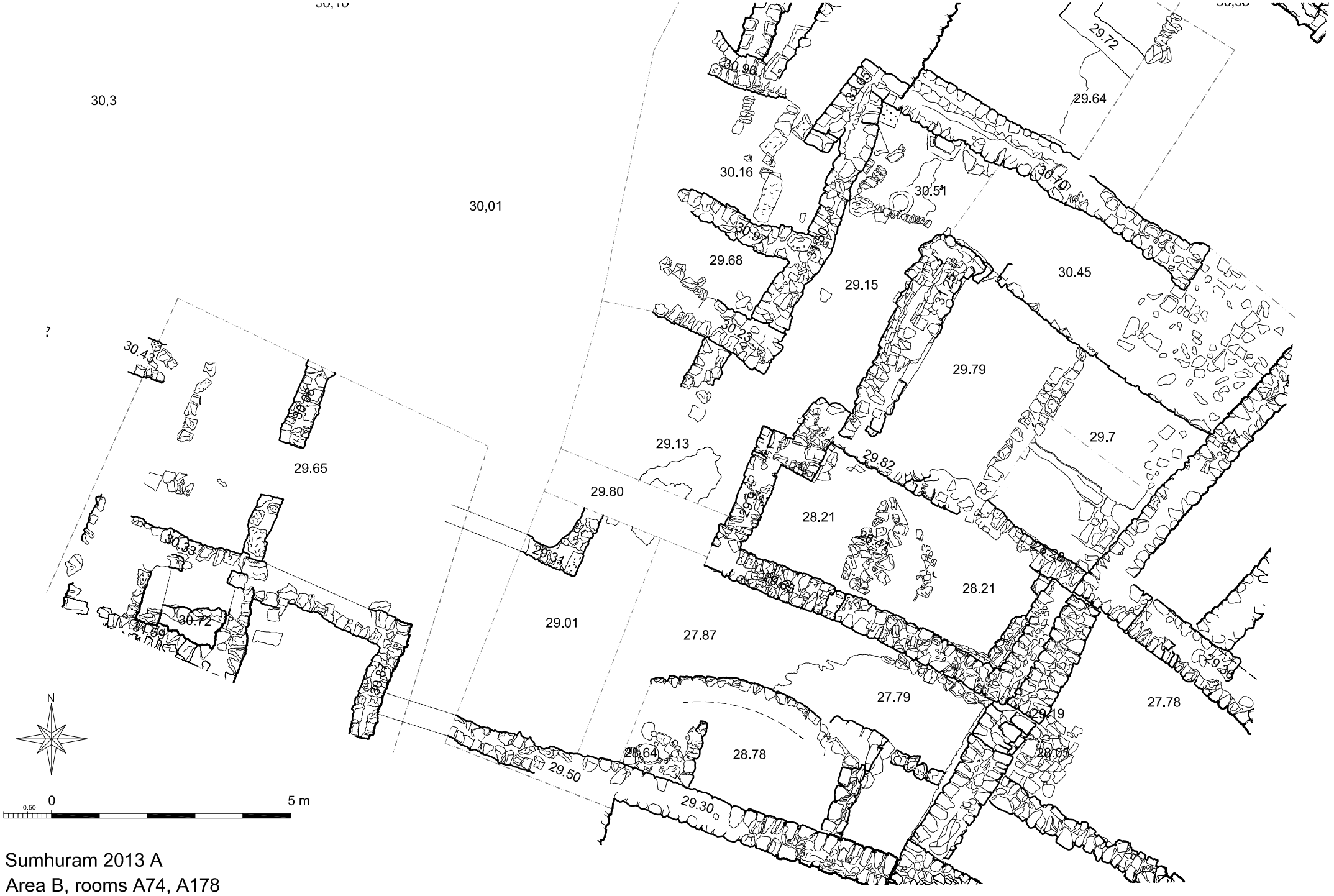
Sumhuram 2013 A
Area A



Sumhuram 2013 A
Area B, BB3, rooms A202 , A203

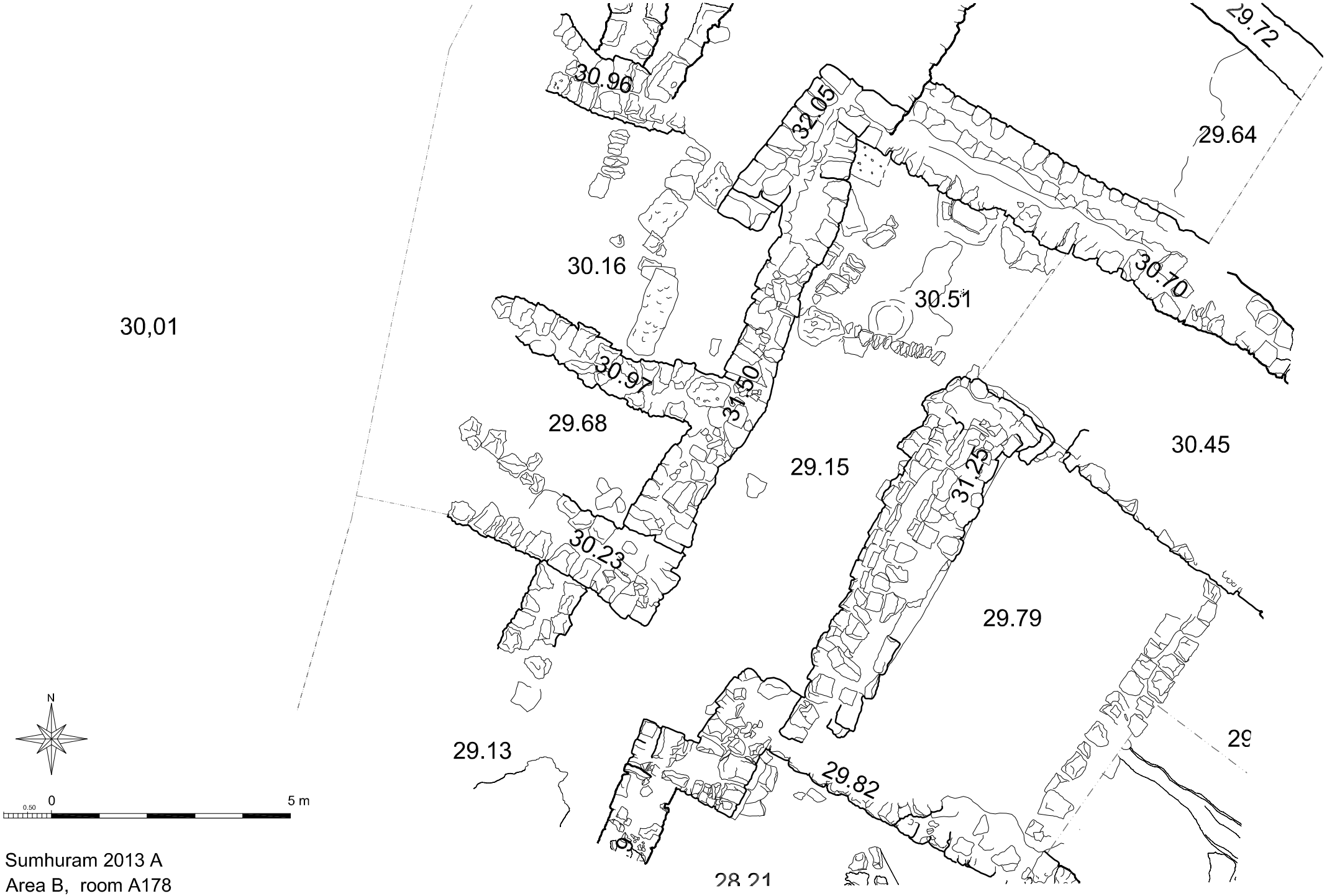


Sumhuram 2013 A
Area B, BB3, rooms A202 , A203

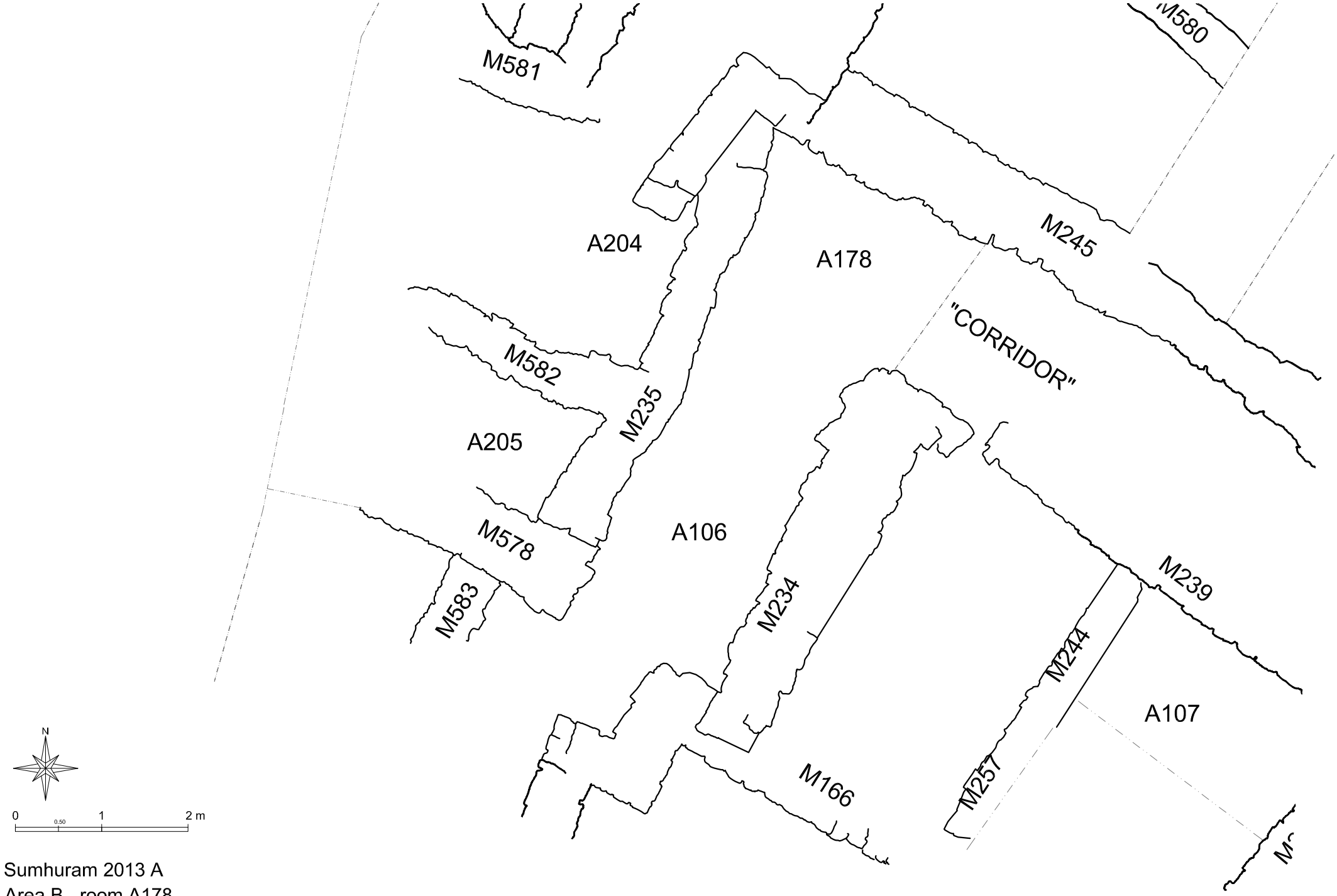


Sumhuram 2013 A
Area B, rooms A74, A178

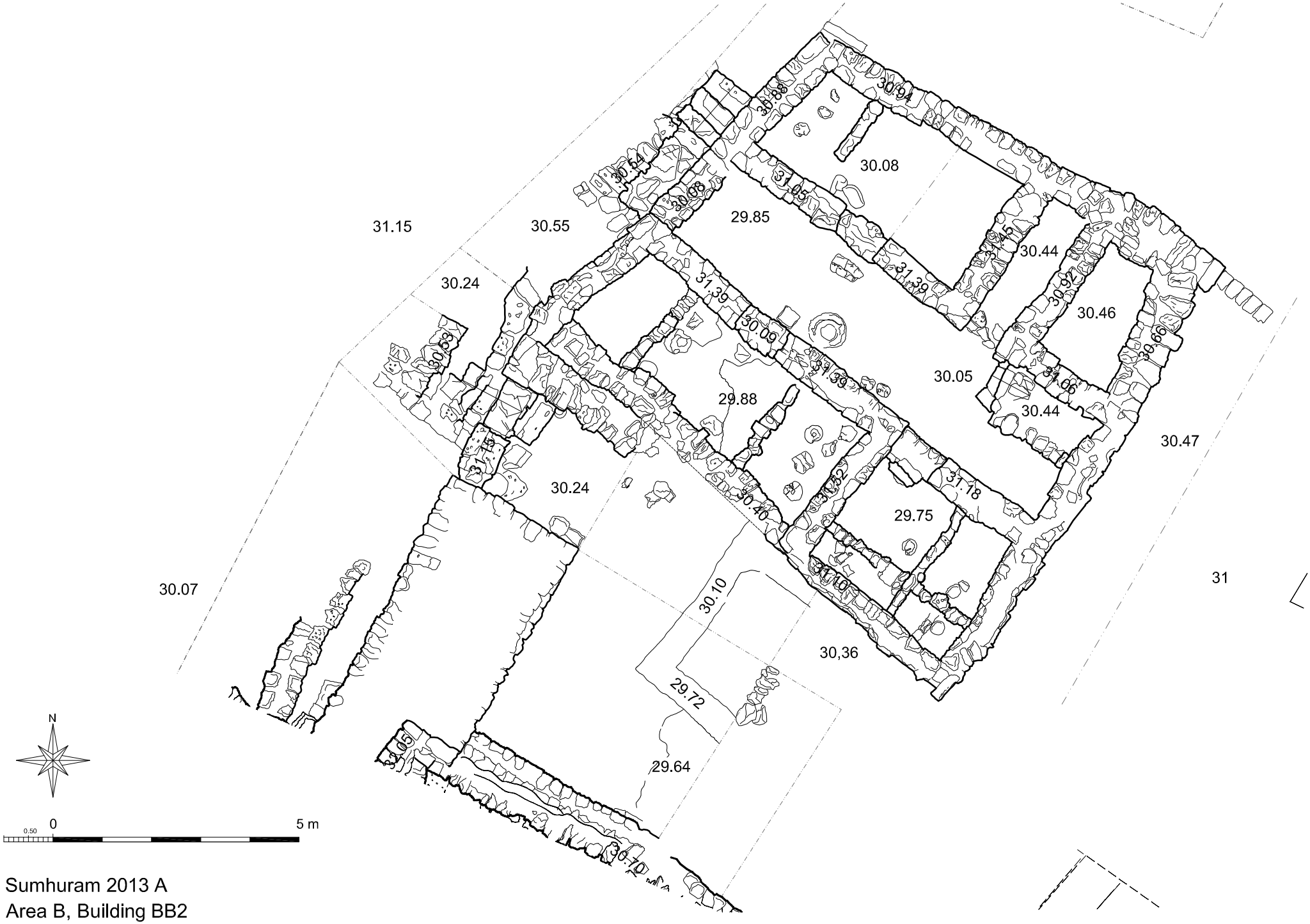
Sumhuram 2013 A
Area B, rooms A74, A178



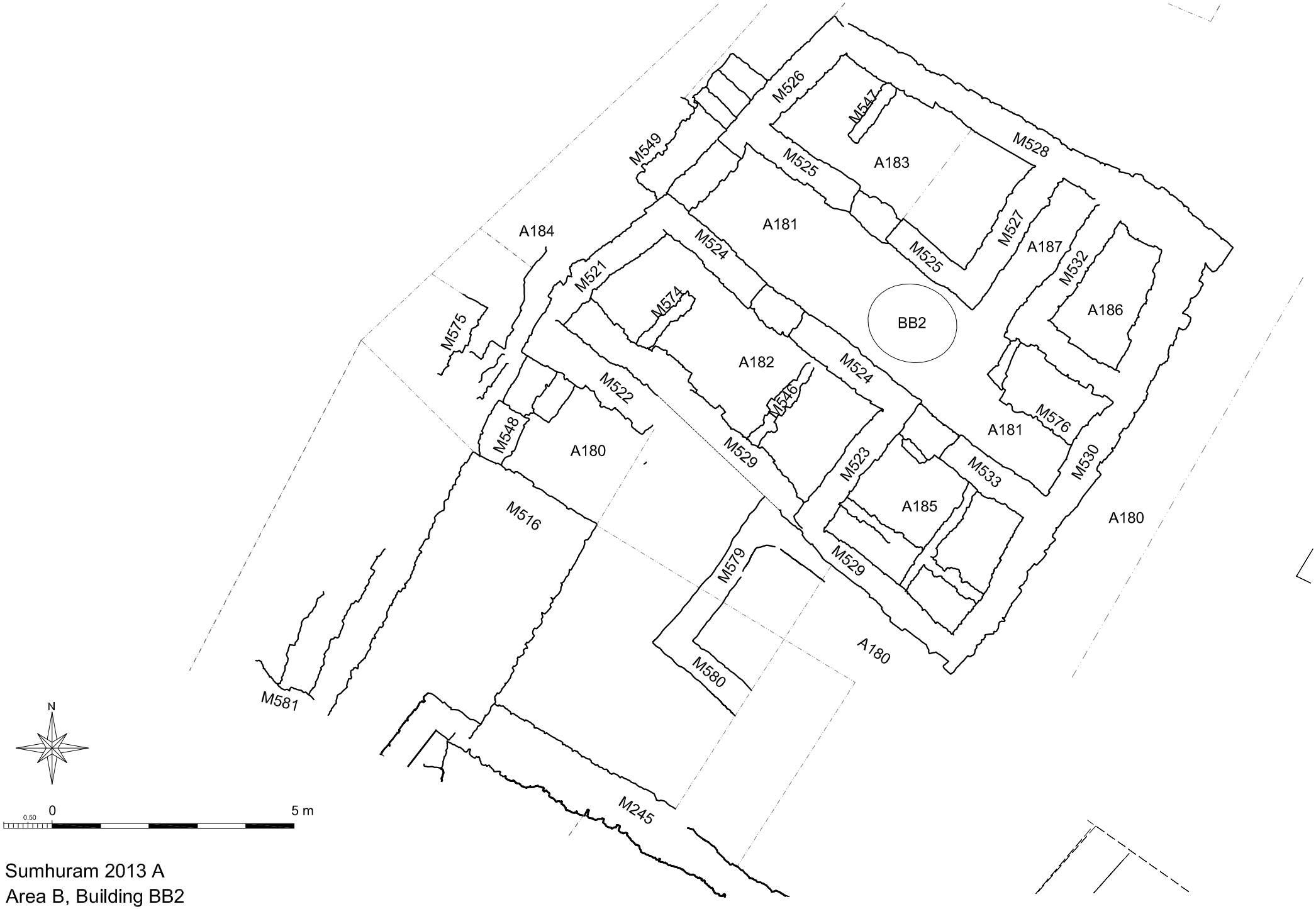
Sumhuram 2013 A
Area B, room A178



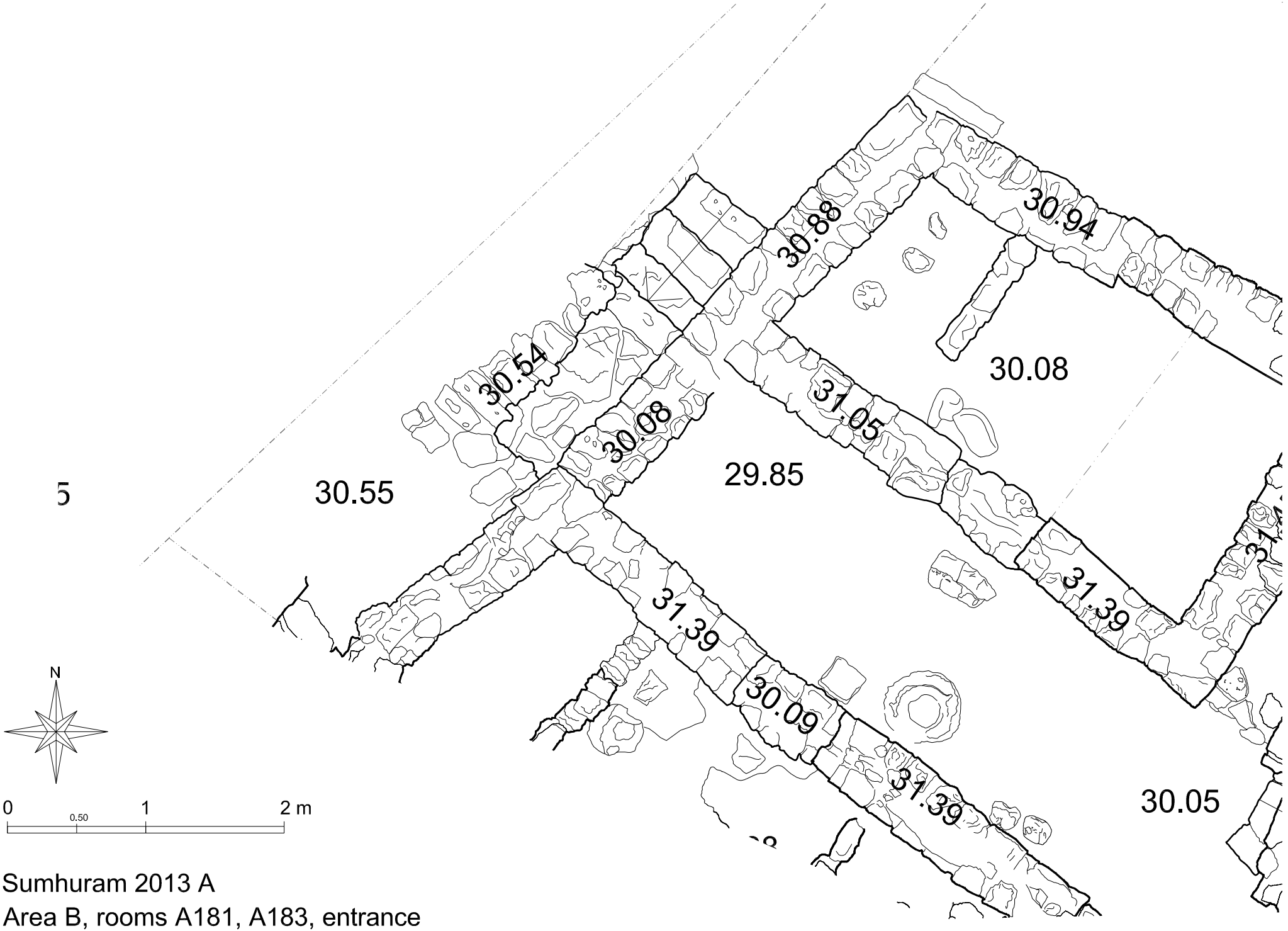
Sumhuram 2013 A
Area B, room A178



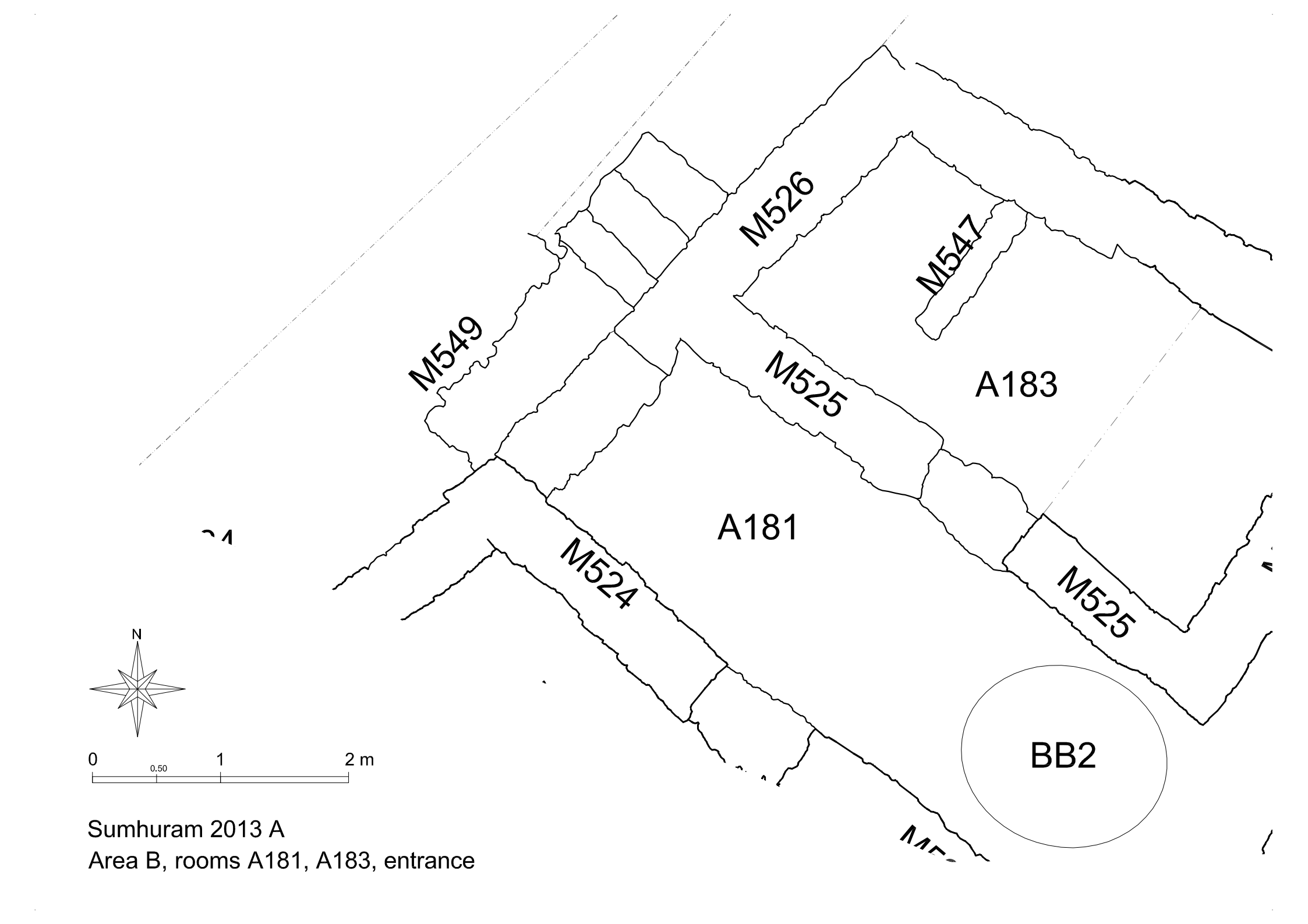
Sumhuram 2013 A
Area B, Building BB2



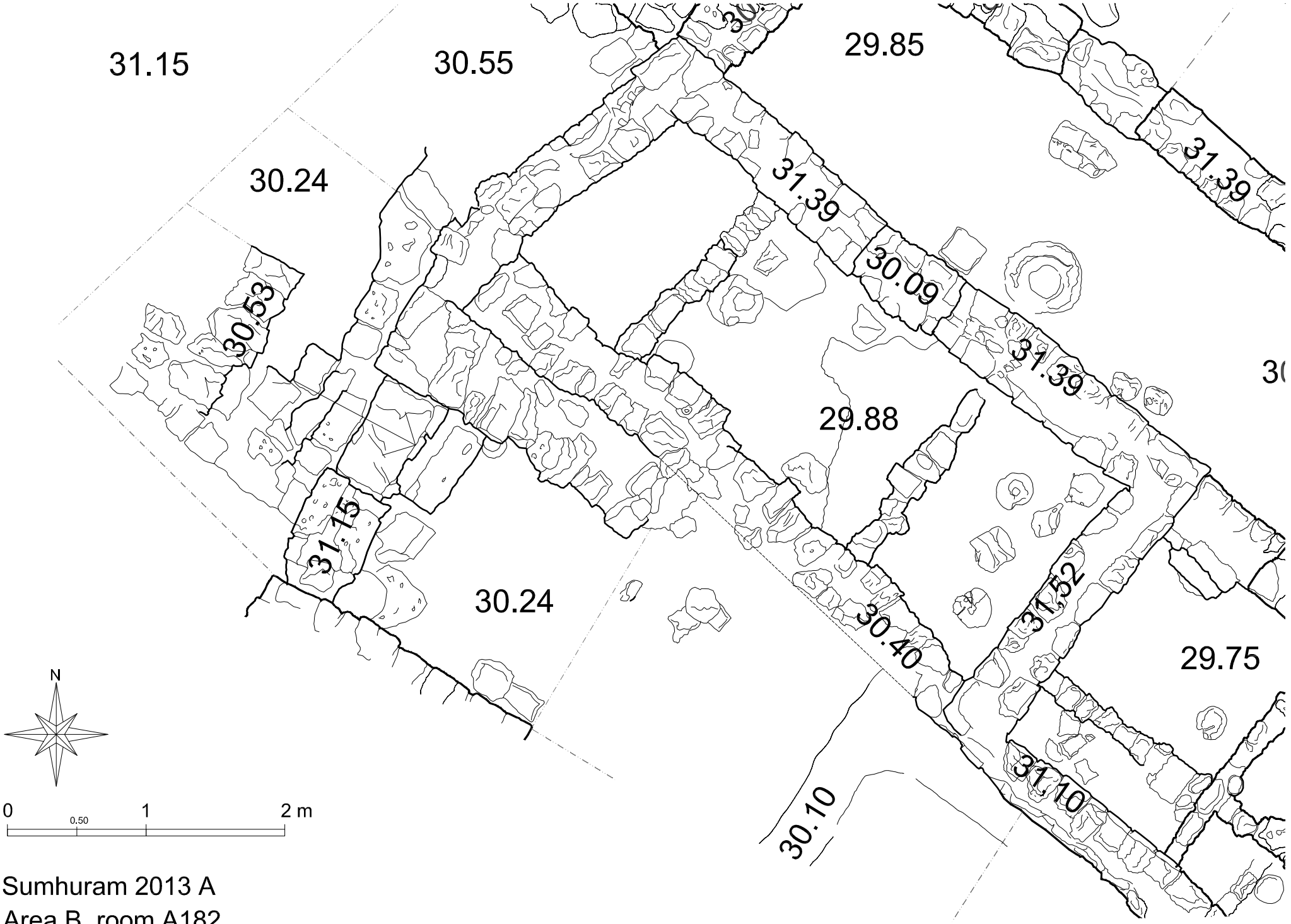
Sumhuram 2013 A
Area B, Building BB2



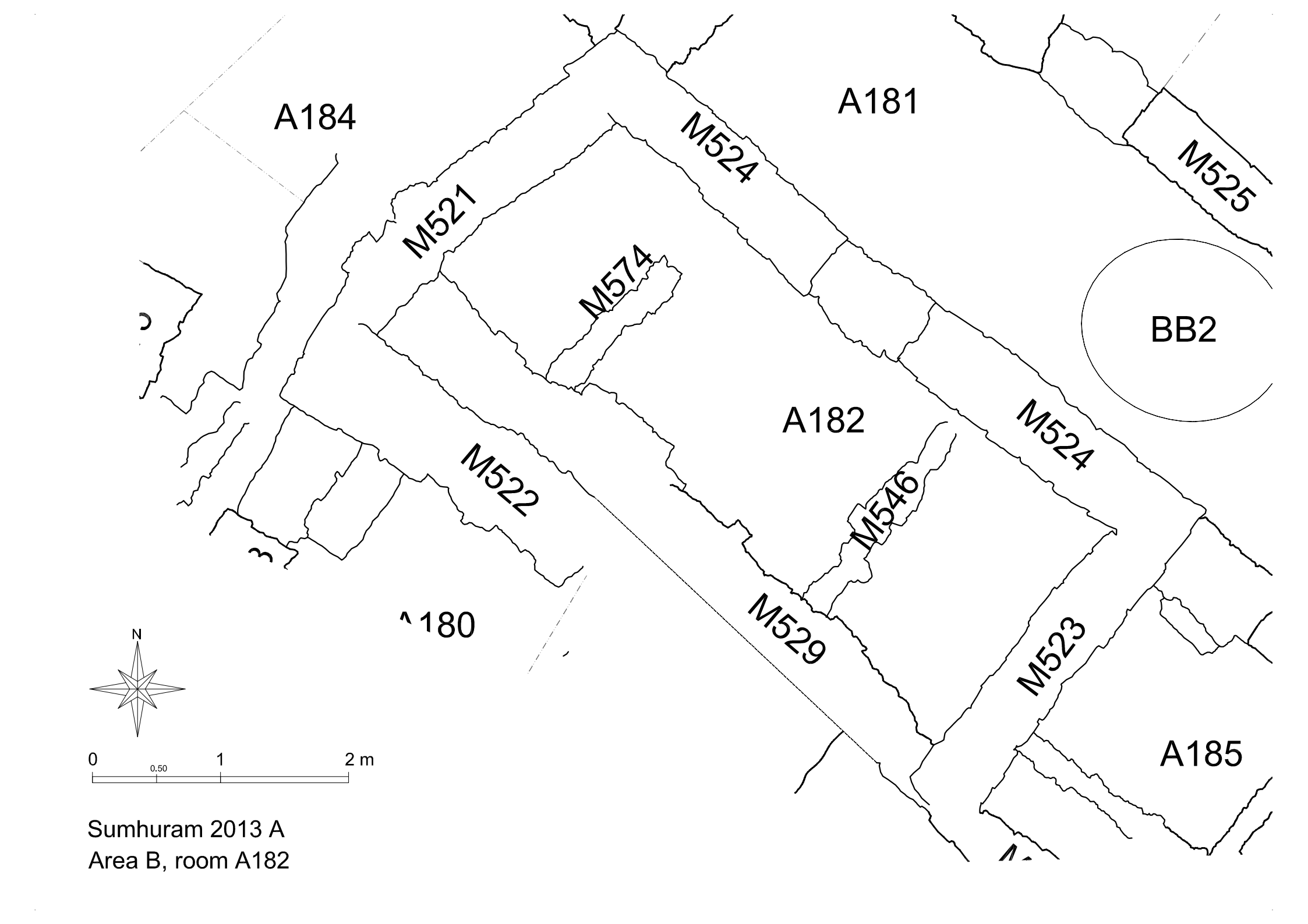
Sumhuram 2013 A
Area B, rooms A181, A183, entrance



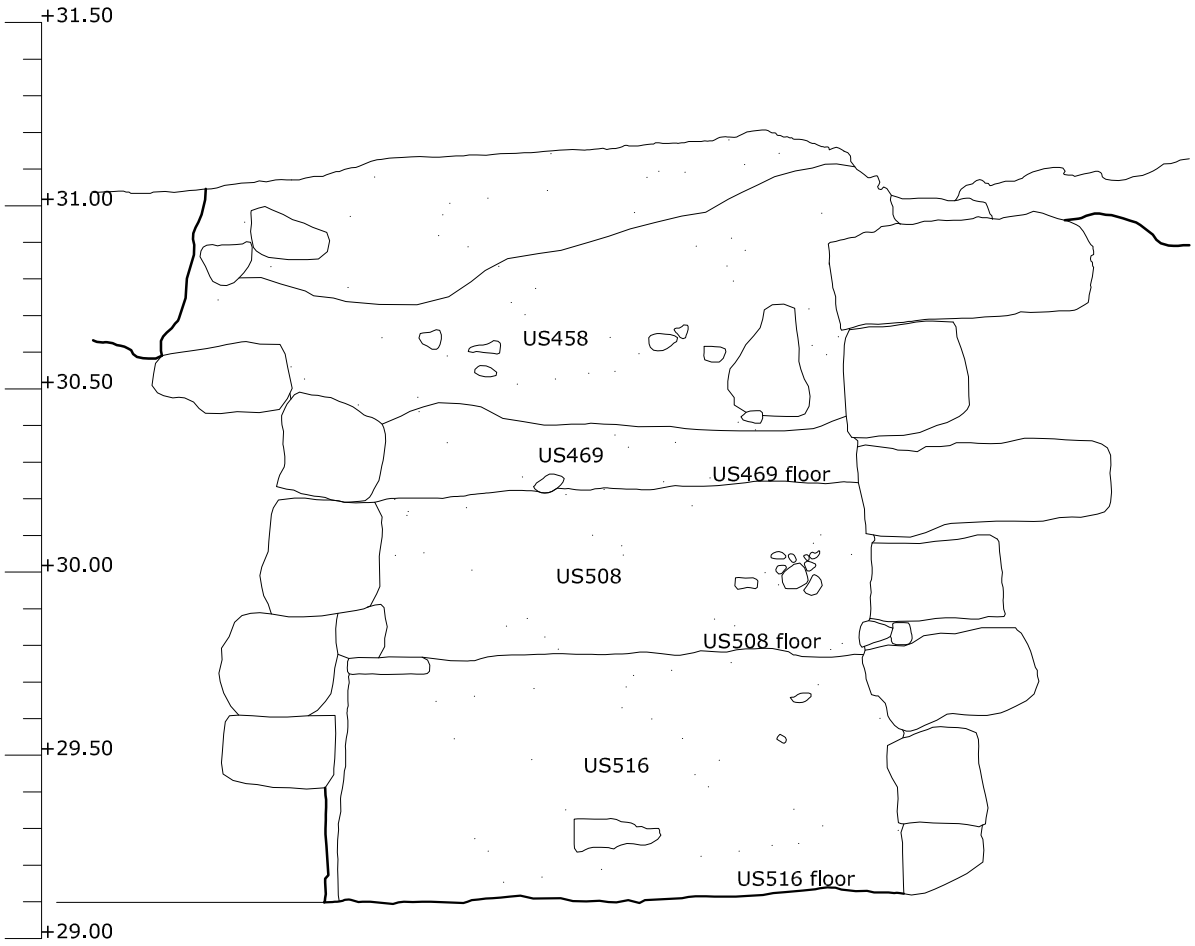
Sumhuram 2013 A
Area B, rooms A181, A183, entrance



Sumhuram 2013 A
Area B, room A182

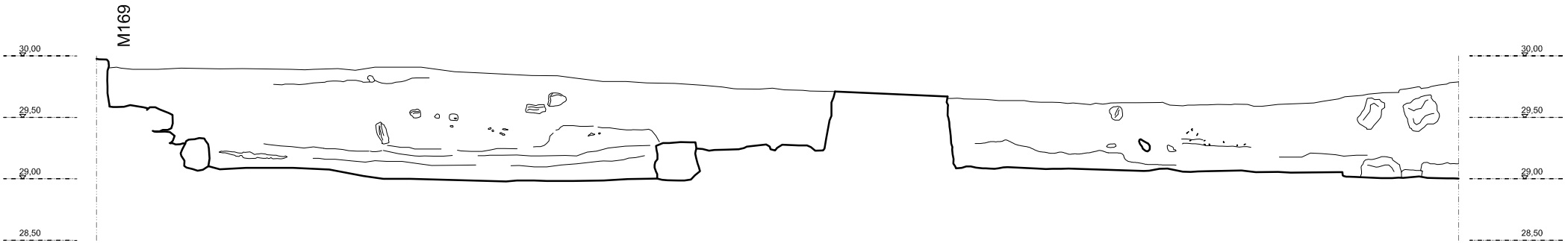


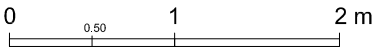
Sumhuram 2013 A
Area B, room A182



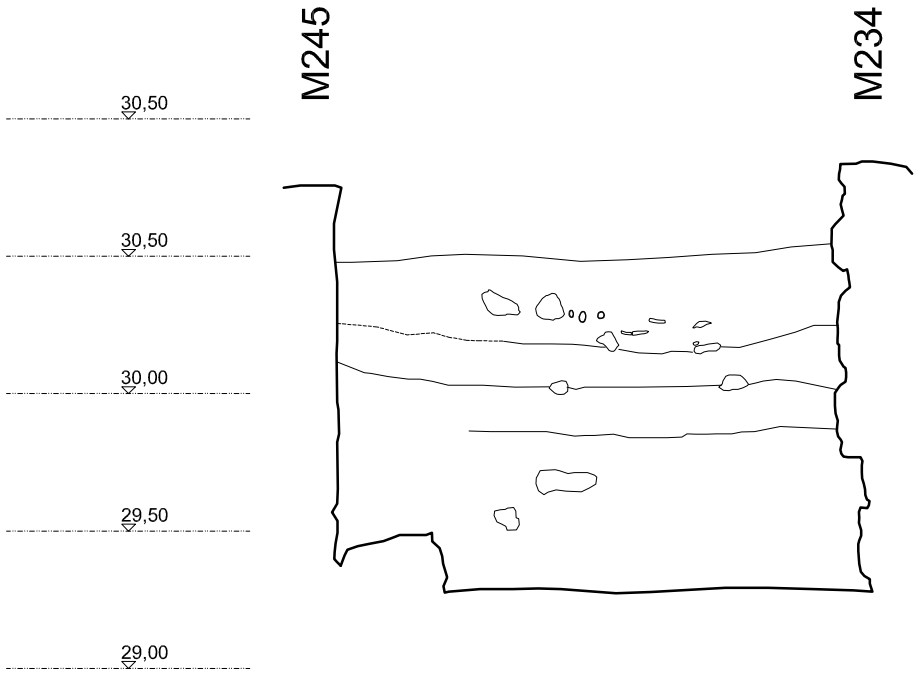
Sumhuram 2012 C

Area A section street A113



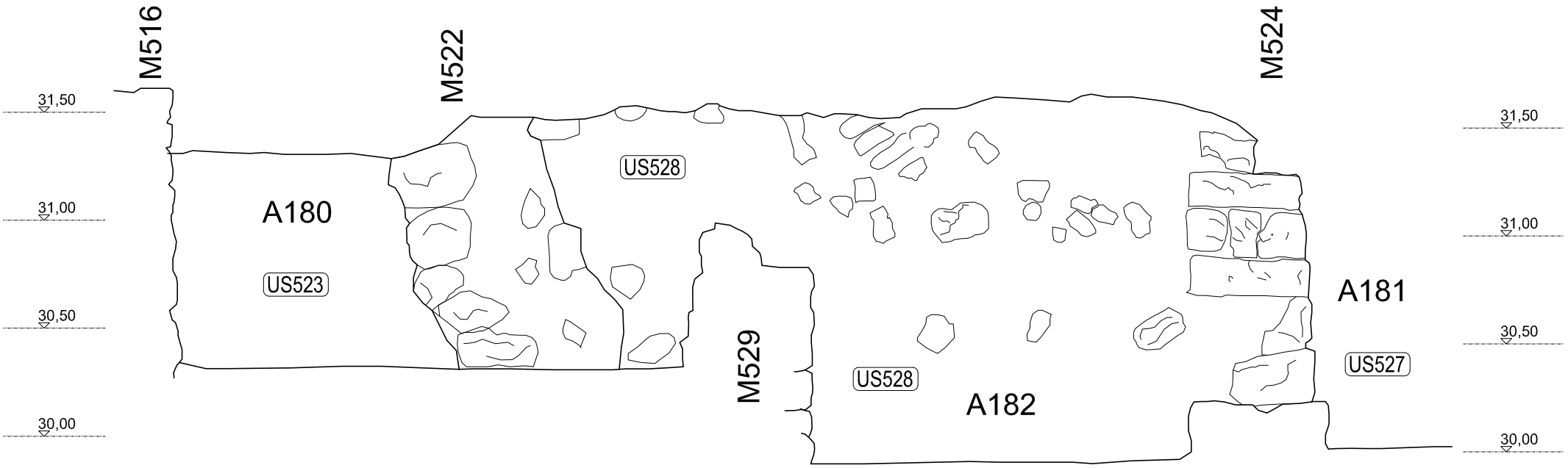


Sumhuram 2013 A
room A74, section



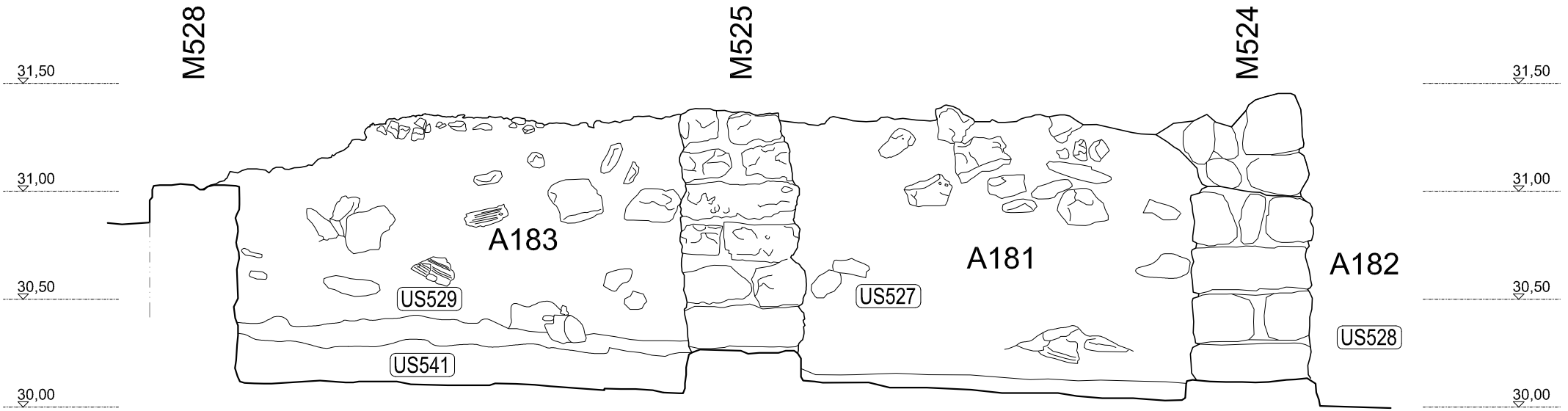
0 0.50 1m

Sumhuram 2013 A
room A178, section



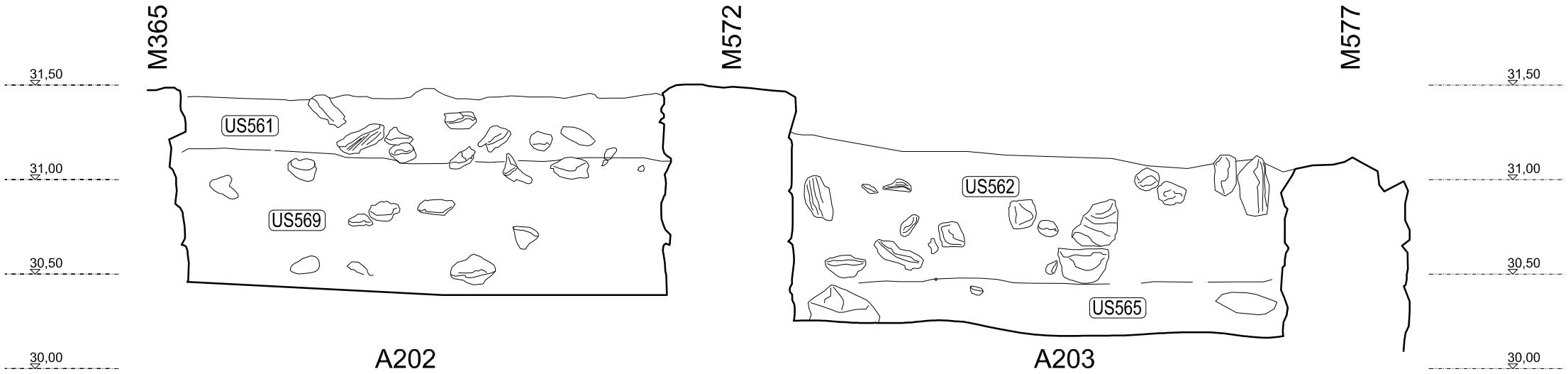
0 1 2 m
0.50

Sumhuram 2013 A
Area B
section in A182



0 0.50 1 2 m

Sumhuram 2013 A
Area B
section in A183, A181



0 0.50 1 2 m

Sumhuram 2013 A
Building BB3 - rooms A202, A203
section

ARCHAEOZOOLOGICAL ANALYSIS

(SUM12C; A196a US 558; A196 US 544; A201 US556; A197 US 560 and 545; A200 US 559 and 555)

Laura Strolin

The osteological remains that are object of this preliminary report come from the excavations carried out during the 2012C campaign in area A/F, in particular in rooms A196, A197, A200, A201 and A196a of building BA13. According to the Preliminary Report of the 2012C campaign, the US taken into account (US 560, 559, 558, 556, 555, 544 and 545) pertain to two distinct phases of the building. The US detected at deeper elevation (US 560, 558 and 559) belong to a stable occupation phase of the building, while the more recent layers (US 556, 555, 544 and 545) have been interpreted by the excavator as the result of a later limited occupation, that occurred after a gap of abandonment of the area. The archaeozoological observations, as it will be shown, lead to the same conclusions above since sensible differences distinguish the more ancient layers from the more recent ones.

The layers selected do not cover the entire building, but only the rooms excavated in 2012C campaign. This fact can be explained with pragmatic reasons: the materials pertained to the same campaign, they were easily accessible in the deposits and the time devoted to the classification was restricted. It is here signalled that the materials from US 555 consisted in fragments of large cetaceans only, but their specific context of retrieval was not documented in detail nor their taxonomic homogeneity; and that the materials from US 545 were not found in the deposits it has been possible to visit, even though the recovery of osteological remains is recorded in the archaeological documentation. Therefore this analysis may be integrated in the future with new data.

Methodological premises

The data collection and following analytical procedures of this second archaeozoological approach to faunistical remains reiterate those applied during the previous analysis carried out in 2012C campaign. The guidelines are here therefore reported again for a better comprehension of the work.

The analysis conducted is a first step of archaeozoological investigation of faunal remains, carried out in Oman during the campaign, still not inserted in any systematic approach to faunal evidence. This factor is here underligned not only because the paucity of comparisons from the same site reduces the potentialities of a study limited to a selection of layers, but also because it motivates the limits of material recoveral. The digging operations indeed have not been carried out in an archaeozoological perspective, causing therefore a sensible loss of information. There is for instance no detailed description available so far of some features related to bone recovery (such as the location and characteristics of fireplaces, as it is indicated in A200 or A196a). The material has been hand-collected on sight, without any sieving or floating procedure. The efficiency of recovery may have biased species diversity through affecting the recovering of bones of small dimensions. It

must be considered that not only fragmented ones, but also bones belonging to small species may have been missed during the fieldwork.

The main archaeozoological studies of the site of Sumhuram are WILKENS 2002 and CARENTI/WILKENS 2008.

The immediate result of the work of classification is a database (Appendix) and some preliminary considerations. The database of the faunal remains includes the identification of the anatomical parts and the determination of the *taxa*, for which we could not refer to a comparison collection but only to the previous studies on the site (WILKENS 2002, CARENTI/WILKENS 2008) and to archaeozoological osteological *atlantes* and specific publications (SCHMID 1972, HILLSON 2005, ADAMS/CRABTREE 2001, HARRISON/BATES 1991, WYNEKEN 2001, MOSSERI-MARLIO 2000, PETERS 1986 and several others). We also compared the material with evidence collected in other areas being explored during the campaign, for having a sort of local comparative set. When the distinction between *capra* and *ovis* was attempted we referred to BOESSNECK 1969, HALSTEAD/COLLINS/ISAAKIDOU 2002, KRATOCHVIL 1969, PAYNE 1985, PRUMMEL/FRISCH 1986, ZEDER/LAPHAM 2010 and ZEDER/PILAAR 2010. When the recovered parts were not diagnostic for sorting the species, the expression *ovis vel capra* was adopted as in the previous studies on Sumhuram, also because it is closer to a realistic definition of the fauna. The database also incudes information about age at death, for which calculations was executed following DENIZ/PAYNE 1982, GRANT 1982, PAYNE 1973 for dental eruption and occlusal surface wear; NODDLE 1974, SCHMID 1972 and WILSON 1978 for the epiphyseal fusion degree (when fusion stage is not mentioned in the observations, it means that the epiphysis was completely fused, with the fusion line totally closed and obscured). Measurements have been taken according to VON DEN DRIESCH 1976 standards as adopted in previous studies of the site. In case of the few burnt fragments, we must take into account a possible shrinkage of the bone. Unfortunately the fragmentation of specimens made this source of information less incisive, and in combination with the lack of comparative elements, has consequences on all what may be inferred by dimensional data (sexing, domestication issues, climate, diet…). We have then included possible observations such as presence of gnawing, butchering or burning marks, nevertheless the taphonomic analysis is limited to a fieldwork observation and has not been carried out with specific optical instruments. Taphonomic observations refer to LYMAN 1994 and REITZ/WING 2008. Broadly, the database is organized per US, per working days[1] and per *taxa*. Regarding the quantifying methods, the species proportions have been estimated following the NISP abundance measuring system and then with the MNI one, calculated following BÖKÖNYI 1970 and CHAPLIN 1971 recommentations. Not only the anatomical frequency of each element but also of size, symmetry, age and preserved portion have been considered, with eventual matches.

Preservation of the assemblage

The analysed sample presented itself in rather bad conditions not only because of its fragmentation but also considering the preservation state of surfaces and bony material.

The high fragilization of the whole assemblage required very careful and delicate cleaning procedures, privileging soft brushing and avoiding the use of water that would have enhanced the weakness of the bones. The fragility of the record must have worsened the destroying impact of digging operations as well: many fractures were indeed recent and several fragments bore pick marks, related to an invasive removal of the layers. Table 1 resumes the proportions of preservation of the analysed archaezoological evidence.

[1] Each working day the unearthed materials were collected in the same bag so we kept the same arbitrary subdivision in view of a possible revision of the materials, that may be more easily located in the deposits.

Preservation of fragments	≤ 5%	≤ 10%	≥ 50%
US 560	36.1 %	23.4 %	13.3 %
US 559	47.9 %	21 %	12.7 %
US 558	39.6 %	13.2 %	27 %
US 556	52.2 %	13 %	17.4 %
US 544	14.6 %	9.8 %	53.6 %

Table 1. Preservation of assemblage.

The low percentage of specimens preserved for more than 50% hampered the taxonomic determination. The same classification system used in previous archaezoological studies[2] has therefore been applied to the fragments whose species could not be discerned with certainty: the fragments have been at first stage classified according to the proportion of their size as belonging to large, medium and small animals. Afterwards, for the secondary analyses, a probability criterion has been applied in consideration of the already recorded species, so that the most realistic correspondence was chosen associating large specimens to cattle and medium ones to *ovis/capra*.

The whole assemblage has suffered a moderate to heavy weathering impact. The surface of bones is opaque and damaged by corrosion and abrasion, often by root etching, in many cases edges are worn out making the trabecular structure visible, a good number of fragments presents flaky and fissured cortical layer, in several cases the original surface is only partially preserved. A reduced portion of the assemblage was better preserved, and therefore well readable. The weathering conditions can be broadly defined following BEHRENSMEYER 1978 preservation stages: the majority of the remains belong to stages 2 and 3, a consistent part corresponds to stage 4, while a reduced portion of the sample corresponds to stage 5 (for instance US 544 and 555, but also several other individual fragments from other layers). The climatic conditions of Dhofar together with the pH of the soil (that heavily demineralized the substance of bones) were relevant abiotic taphic factors of damage and fragmentation. In particular at the expense of juvenile bones, whose number must therefore be amplified in order to obtain a more realistic picture of the animal presence. Trampling too may have been a relevant factor of fragmentation, considering that bones were left on the floor, exposed to foot traffic damage and dispersion.

The features of the osteological assemblage indicate a certain time averaging (medium range), in consideration of the quantity of tooth-marked fragments (see Tables 17-22 and *infra*), of the significant level of their fragmentation (see Table 1), which includes fracture lines consistent with breakage of dry bone, and also of the weathering stages of the remains, boosted by dry climate and soil pH. This assumption has been formulated also by the excavator on the basis of other archaeological criteria[3].

Quantitative analyses

According to the recording method chosen all fragments are icluded in the database following CHAPLIN 1972 indications. A minimalist recording method such as DAVIS 1992 would have been less indicated for a heavily fragmented assemblage and would have drawn a non-realistic picture of the living fauna.

Regarding the quantitative analysis, two systems have been followed, in order to mutually correct and smoothen the unavoidable errors of each method. NISP quantification indeed leads to an over-representation of highly fragmented bones (as more naturally fragile and dimensionally thin bones are and as happens in the majority of the considered remains), while MNI quantification

[2] CARENTI/WILKENS 2008 and our previous Preliminary Report of 2012C campaign.
[3] See Preliminary Report of 2012C campaign.

produces an over-representation of the species scarcely attested in the assemblage (as is the case for malacofauna and avifauna). Using the two methods even highlights possible discrepancies and surely sums the positive characteristics of both. For instance a NISP quantification is a constantly extendable system, which is very useful in the present case since we had the opportunity to analyse only a section of the faunal remains of building BA13. NISP results can be simply added one to the other to enlarge the quantitative picture. On the other side, MNI provides a certain minimum number of living individuals and prevents from re-counting elements belonging to the same individual, since it considers the recurrence of each anatomical part in the skeleton, the age data and the metric information. Both systems are therefore useful to reconstruct the living stock at ancient Sumhuram.

The recorded quantitative data are explicited in Tables 2-6, together with the relative proportion of species. The predominant *taxa* are *ovis aries*, *capra hircus* and *bos taurus*. In particular, if one sums the relative proportions of *ovis vel capra*, *ovis aries*, *capra hircus* and 'undetermined medium' fragments together on one side and *bos taurus* and 'undetermined large' on the other side, the pattern is immediately evident, especially in the NISP quantification, that avoid over-representation of species scarcely present in the sample.

Sea turtle fragments in the sample are present in good proportion. It is difficult and hypothetical to evaluate a MNI for turtles since carapace and plastron bones are hardly associable as pertaining to a same living individual. Variations of thickness on such small fragments are not a key for making a sure assessment.

Fish remains were recorded in lower proportion in comparison with previous archaeozoological studies[4], as well as –but much more remarkably- shell remains. Still, recorded fish reached sizes appraisable from small to large on the basis of the dimension of the vertebrae. Therefore the food coming from fish exploitation was sufficient for considering it a regular part of ancient diet, which is natural in a so strongly and substantially sea-related site. The dimensions and quantity of fish remains allow us to imagine well established and developed habit of fishing and a certain dose of fishing skills.

Shell remains, on the contrary, are scarce in number and include a narrow variety of species (the most represented shell is *oliva bulbosa*). The exploitation of malacofauna has a chronological implication since it is a main feature of more ancient economies and dietary habits. In more recent times, it is likely to imagine that Sumhuram lived a demographic growth, together with the implantation of a more stable economic system. These socio-economic factors may have been the background for a necessary improvement of the supplying system, which may have fostered, together with big fish fishing, the consumption of mammals, which present a higher amount of meat even though they require more intensive breeding or importing undertakings (see *infra*). Diet may have then turned from more subsistence-like sea-based consumptoin habits, to more intensive and efficient meat-based consumption.

Shells have also been collected for purposes other than alimentary: their use as pendents, weights, spindle-whorls, oil lamps or raw material is widespread and attested[5], some of them also made object of trade in antiquity. The present assemblage included a minor quantity and variety of shell remains. The relative proportion of *oliva bulbosa* (a high number of specimens presented, as common in nature[6], the apex pierced, a feature which is proved to have been an incentive for non alimentary exploitation of these shells[7]) and gastropods in general are predominant. Some *olivae* presented also traces of wear on the siphonal canal but not on the apex hole, which was regular.

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[4] Higher proportions of fish remains have been linked, in previous archaeozoological studies (CARENTI/WILKENS 2008, p. 504), to the function of the places of recovery, likely connected with specific industrial or preservation activities. This situation would have produced a different percentage of sea products in comparison with normal household refuse only due to consumption.

[5] See LOMBARDI/BUFFA/PAVAN 2008, pp. 397-404 and Pls. 60-61. See also CARENTI/WILKENS 2008 (pp. 491 and 497). We signal here in particular the fragment of mother-of-pearl recovered in US 559, an aesthetically high valued material.

[6] See REITZ/WING 1999 (p. 126).

[7] See BAR-YOSEF MAYER 2000.

Altough the observations have been done without optic instruments, we cannot by now assume with certainty their secondary use. Two *cypaeidae* too had the body more or less regularly pierced, which could too have propmoted their secondary use[8]. Cowries are resistent to degradation and well recognizable, features that have always made them suitable to cultural uses and therefore bias their distribution in archaeological sites[9]. Some *chlamys townsendi* fragments were also included in the sample, with burning traces that could confirm their widespread use as oil lamps[10] (we did not analyse possible residual substances on their internal surface). The paucity and low variety of shell remains may also be explained by the exportation of certain species of shells, but this consideration too remains uncertain.

The present work does not specifically take into account fish and shell remains, therefore considerations regarding these categories of findings remain hypothetical and general.

US 560 species representation	**Species**	**Relative proportion of species, percentage (NISP)**	**Relative proportion of species, percentage (MNI)**	**NISP**	**MNI**
	ovis vel capra	11.5 %	12.5 %	24 (7 j)	6
	ovis aries	2.4 %	8.3 %	5 (1 j)	4
	capra hircus	5.3 %	8.3 %	11 (3 j)	4
	bos taurus	11.5 %	6.3 %	24 (2 j)	3
	camelus	0 %	0%	0	0
	sea turtle	11 %	4.2 %	23 (1 j)	2
	und medium	13.4 %	6.3 %	28 (1 j)	3
	und large	18.7 %	4.2 %	39	2
	bird	0.9 %	2.1 %	2	1
	cetacea	0 %	0 %	0	0
	fish	16.7 %	10.3 %	35	5
	shell	8.6 %	37.5 %	18	18
	TOT			209	48

Table 2. Quantitative species representation and proportions (US 560).

US 559 species representation	**Species**	**Relative proportion of species, percentage (NISP)**	**Relative proportion of species, percentage (MNI)**	**NISP**	**MNI**
	ovis vel capra	12.7 %	10.7 %	41 (10 j)	8
	ovis aries	0.6 %	2.7 %	2 (2 j)	2
	capra hircus	3.1 %	4 %	10 (1 j	3
	bos taurus	5.3 %	4 %	17 (1 j)	3
	camelus	0.6 %	1.3 %	2	1
	sea turtle	8.4 %	2.7 %	27 (3 j)	2
	und medium	22.4 %	1.3 %	72 (2 j)	1
	und large	15.8 %	1.3 %	51 (2 j)	1
	und	7.5 %	0 %	24	0
	bird	0.3 %	1.3 %	1	1

[8] See for instance LOMBARDI/BUFFA/PAVAN 2008 (p. 403, cat. 930, Pl. 61:3). For a specific treatment of malacofauna previously recovered at Sumhuram, see WILKENS 2002; good literature is also available about Oman shells.
[9] See BAR-YOSEF MAYER 2000.
[10] See for instance LOMBARDI/BUFFA/PAVAN 2008 (Sh85, Sh100, Sh114, Sh113; Pl. 60:1-4). A fragment burned on its internal surface has been recovered in US 558.

	cetacea	1.2 %	1.3 %	4 (4 j)	1
	fish	7.5 %	6.7 %	24	5
	shell	14.6 %	62.7 %	47	47
	TOT			322	75

Table 3. Quantitative species representation and proportions (US 559).

US 558 species representation	**Species**	**Relative proportion of species, percentage (NISP)**	**Relative proportion of species, percentage (MNI)**	**NISP**	**MNI**
	ovis vel capra	18.2%	11.1 %	34 (6 j)	5
	ovis aries	1.1 %	2.2 %	2 (2 j)	1
	capra hircus	4.9 %	8.9 %	9 (7 j)	4
	bos taurus	8.1 %	11.1 %	15 (6 j)	5
	camelus	0 %	0 %	0	0
	sea turtle	10.7 %	2.2 %	20	1
	und medium	8.5 %	4.5 %	16 (1 j)	2
	und large	17 %	2.2 %	32 (1 j)	1
	und	8.1 %	2.2 %	15 (1 j)	1
	bird	0 %	0 %	0	0
	cetacea	0 %	0 %	0	0
	fish	12.7 %	8.9 %	24	4
	shell	10.7 %	44.5 %	20	20
	TOT			188	45

Table 4. Quantitative species representation and proportions (US 558)

US 556 species representation	**Species**	**Relative proportion of species, percentage (NISP)**	**Relative proportion of species, percentage (MNI)**	**NISP**	**MNI**
	ovis vel capra	14 %	8 % (8.3 %)	6 (1 j)	2
	ovis aries	0 %	0 %	0	0
	capra hircus	2.3 %	4 % (0 %)	1	1 (0)
	bos taurus	0 %	0 %	0	0
	camelus	0 %	0 %	0	0
	sea turtle	0 %	0 %	0	0
	und medium	18.6 %	0 %	8	0
	und large	9.3 %	4 % (4.2 %)	4	1
	und	4.6 %	0 %	2	0
	bird	0 %	0 %	0	0
	cetacea	0 %	0 %	0	0
	fish	4.6 %	4 % (4.2 %)	2	1
	shell	46.6 %	80 % (83.3 %)	20	20
	TOT			43	25 (24)

Table 5. Quantitative species representation and proportions (US 556).

US 544 species representation	**Species**	**Relative proportion of species, percentage (NISP)**	**Relative proportion of species, percentage (MNI)**	**NISP**	**MNI**
	ovis vel capra	14.3 %	13.7 %	8 (2 j)	3
	ovis aries	1.8 %	4.5 %	1 (1 j)	1
	capra hircus	0 %	0 %	0	0

	bos taurus	5.4 %	4.5 %	3	1
	camelus	0 %	0 %	0	0
	sea turtle	0 %	0 %	0	0
	und medium	8.9 %	4.5 %	5 (3 j)	1
	und large	1.8 %	0 %	1	0
	rattus	1.8 %	4.5 %	1	1
	cetacea	7.1 %	4.5 %	4	1
	fish	42.8 %	22.9 %	24	5
	shell	16.1 %	40.9 %	9	9
	TOT			56	22

Table 6. Quantitative species representation and proportions (US 544).

Species representation

As already evident from these preliminary considerations, the *taxa* represented with the higher abundance are sheep, goats and cattle. They all were certainly destined to feeding purposes (as the butchery marks prove, see *infra*). Part of the sample presents traces of burning (especially in US 560, 559 and 558, *datum* that seems to confirm an interpretation of these layers as household refuse), some have calcified portions, a mandible fragment from US 559 presented itself in complete carbonization and partial calcification. In addition, the excavator reported the recovering of fireplaces with burnt bones and charcoals, one located in room A200 under wall M562 (US 559), one in room A196a close to wall M567 and another one in the same room in the corner formed by M494 and M567 (US 558). Details about these findings are not reported in the available documentation and it is so far impossible to know what bones were recovered in close proximity of the fireplaces. In particular, room A196a (a unique room/corridor in its more ancient phase) presents interesting characteristics appearently as nodal point of the building. Another interesting room is A197 (US 560), that was an internal space, with low accessibility, reachable only through A200 and that presented for instance some carnivore gnawed bones.

No stress marks were recorded on limb extremities, so we may imagine that animals (cattle in particular) were not intensively used for heavy transport or work as it usually happens in agricultural economies. From an economical point of view, moreover, the predominance of farmyard species is a solid proof to imagine that hunting practices were not a fundamental subsistence strategy at Sumhuram, that based it supply on different incomes.

The distinction between sheep and goat was attempted when the discriminant criteria were preserved. When the conditions made it possible, we noticed a predominance of *capra hircus* bones. Geomorphological and environmental considerations, associated with comparisons with nowadays local fauna, associated with goat's dietary requirements and behavior (goats are stenotopic and grazers), together with their economical utility (goats can be easily herd, fed and produce a good amount of meat and milk), are sound arguments for assuming that, among the undiscernable specimens, a higher number belonged to goats. Sheep and goats were massively used for consumption, their relative proportion (see Tables 2-6) as well as their age at death, as well as their element representation (see Tables 7-16) and the butchery marks found on their bones (see Tables 17-22) fully confirm this pattern.

Osteological parts of *camelidae* were recovered too. Their reduced number[11] perfectly corresponds to their role in human societies: they are mostly and intensively used as work and pack animals, apt to long as well as short-distance transport. Their natural attitude and physical resistance

[11] It is here added that the broad category of large mammals used in the present study may be comprehensive of camel bone fragments as well, because their high level of fragmentation (see *supra* and Table 1) may have preserved non-diagnostic parts.

were exploited in ancient times[12], when they constituded a fundamental means, especially in a trading center located in a dry climate. We need therefore to imagine *camelidae* as a moving population, temporarily based at the site, but itinerant. Their exploitation for feeding may have been a part of their tasks, even though not the main one[13]. The presence of cut marks on a *camelus* phalanx (US 559) seems related to alimentary use (likely when the animal was not useful for work any more), which is still practiced nowadays. In consideration of nowadays local fauna[14] and of archaeological evidence at Sumhuram[15], it is more likely that remains belong to one-humped *camelus dromedarius*.

The absence of *sus scrofa* remains is compatible with environmental, climatic and religious local factors and confirms the results of the previous archaeozoological investigations[16].

We signal here that, due to the bad preservation of the assemblage, which hampered the identification of small fragments, some bones pertaining to gazelles may be counted among the sheep and goat ones. Gazelles are common in this geographical area[17] and have been previously recorded at Sumhuram[18], but in restricted number, indicating their non predominance in the diet. For this reason, their absence may be biased by conditions unrelated to actual ancient faunal representation.

Concerning the indirectly assumed presence of small carnivores, the paragraph about tooth-marked bones gives a realistic picture of the ancient fauna (see *infra*). Archaeologic proofs of their presence had already been recorded in previous campaigns[19].

The presence at Sumhuram of small rodents is undoubtedly attested by the marks left on the recovered material (see the paragraph about tooth marks and Tables 18-22) and by a femur specimen in US544. *Rattus rattus* had already been identified among the osteological remains[20], but its presence had only been inferred in other archaeozoological studies of the site[21]. Their recovery is heavily biased by the dimensions of the living animal and the methods of excavation. Therefore the quantitative representation of this *taxon* does not reflect the actual faunal situation in antiquity. The possible intrusion of rat bones in more ancient layers due to the animal's behaviour and habits has to be considered, nevertheless it is heavily limited by the quantity of traces and the *data* from previous studies. Moreover, the location of the recovered fragment in US544 is consistent with the interpretation of the layer given by the excavator[22].

Sea turtle was present at the site in relevant proportion and of variable ages. Their consumption must have been a common practice since some limb bones present clear butchery marks. Sea turtles belong to local fauna and are unsurprising in a sea-related trading centre. Their bones have been constantly recovered at Sumhuram for alimentary use (their meat was highly prized) but also for practical[23] or symbolic[24] use (some particular cut marks were detected, see paragraph about butchery).

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[12] Pliny, *Naturalis Hist*oria XII, 32; DAVIS 1987 (pp. 166-168, 162-164). See CARENTI/WILKENS 2008 (p. 506).

[13] Secondary uses of *camelidae* can be found in Pliny, *Naturalis Historia* XVIII, 25. See also DAVIS 1987 (pp. 166-168), CARENTI/WILKENS 2008 (p. 506). For the use of camels in weaving see POTTS 1990 8p. 130). For camels in Arabia see HARRISON/BATES 1991.

[14] Not only visible in the area, but also attested in literature, see HARRISON/BATES 1991.

[15] For instance the bronze pendant in shape of dromedary SUM03A US120, 19 MB141 found in BF3, room A39 published in LOMBARDI/BUFFA/PAVAN 2008 (pp. 386-387; cat. 818; pl. 56:10 and 29:6; for comparisons in ancient Arabia see note 130).

[16] See CARENTI/WILKENS 2008, WILKENS 2002 and th Preliminary Report of 2012C campaign.

[17] See HARRISON/BATES 1991 (pp. 193-204).

[18] See CARENTI/WILKENS 2008 (p. 480) and WILKENS 2002.

[19] In the Preliminary Report of 2012C campaign, in WILKENS 2002 and CARENTI/WILKENS 2008.

[20] See CARENTI/WILKENS 2008 (p. 507).

[21] See WILKENS 2002 and the Preliminary Report of 2012C campaign.

[22] See the Preliminary Report of 2012C campaign.

[23] For instance it is possible that traces of burning on sea turtle carapace may be related to fat extraction (see MOSSERI-MARLIO 2000). Turtle leather was appreciated, as well as its keratinous scutes and eggs, which were object of intense trade as raw material (MOSSERI-MARLIO 2000, p. 95).

Small and large cetaceans are attested in the sample. Their osteological remains have been recovered in three distinct layers (two unfused vertebrae of a small cetacean[25] –likely dolphin- in US 559, heavily weathered and burnt fragments of vertebrae in US 544 and many damaged fragments in US 555, a layer devoided of other faunal remains). Cetaceans are attested to have been regularly used not only as meat source (but also as masonry elements, for their greasy products useful for combustion, for cosmetics…), therefore it is not surprising to find a certain set of their remains at Sumhuram[26]. They are still part of the local maritime fauna and one has to imagine that they may be captured locally, butchered close to the sea and then entered at the site already in smaller portions (at least big cetaceans, that could certainly neither fit the dimensions of Sumhuram's narrow gates). The systematic and well organised use of these animals is attested in literature[27]. The burnt vertebrae of US 544 and the badly preserved fragments of US 555 lack of information about their context of retrieval (how were they located? Were they concentrated in one spot or dispersed? Were they already fragmented? Some of them bear clear pick marks and so on) that could provide elements for better understanding. Cetacean vertebrae bear a high amount of grease in their spongy structure[28], a feature that makes them compatible with a use a fuel for combustion[29], besides their already mentioned exploitation for architectonic purposes in a geographical region with scarce wood avoidability.

Avifauna specimens were recorded too, in very small number as already recorded in previous archaeozoological studies of Sumhuram. Bird bones recovery is constantly biased by size-related factors and by their fragility. Nevertheless, very few bones were found, belonging to small birds (*corvidae*?, as in US 559[30]) that may not be linked to dietary needs but that lived fed by urban refuse, especially domestic refuse.

Anatomical part representation

The preservation of the different anatomical part is usually biased by a series of factors, that must be taken into account when facing an archaeological assemblage since it may not reflect directly the living assemblage. First of all, the spongy cancellous structure of epiphyses is less resistent to weathering, trampling, corrosion and temperature variations. Even among epiphyses, less dense ones (for instance distal femur or proximal tibia) will be less represented than robust parts (such as proximal metapodia and distal tibia). Moreover, epiphyses and metaphyses are the parts of the bone that suffer a stronger biologic disturbance due to the selective animal gnawing, that will cause the faster and more likely disappearance from the sample of those portions that have a higher nutritive value. There are also size-related biases to consider: phalanges, astragali and cubic bones in general, although their robust and resistent material consistence, may get lost along

[24] Symbolic use of sea turtle remains is attested at Sumhuram (SUM10C US174 B73 is an example) and are often associated to graves in the area since much more ancient times (see POTTS 1990, p. 130)

[25] Their vertebrae, are easily confused with large mammals ones if very fragmented. Vertebral epiphyses can fuse very late in life (see YOUNG 1981).

[26] For whale bones see CARENTI/WILKENS 2008 (p. 509), WILKENS 2002 (pp. 272-273), LOMBARDI/BUFFA/PAVAN 2008 (p. 397) but also the Preliminary Report of 2013A campaign (maybe as furniture element in room A181 US 527floor; room A182 U528floor; room A185 US568floor). For the use of whale vertebrae for architectural puropses at Sumhuram, see BUFFA/SEDOV 2008 (p. 31). For dolphins see CARENTI/WILKENS 2008 (p. 509).

[27] See WILKENS 2002.

[28] See BRINK 1997.

[29] See MORIN 2010 (p. 217). The combustibility of bone is correlated to its fat content, which is related to its spongy structure. In particular, whale vertebrae have a high percentage of lipid: thoracic ones <10% but lumbar ones have 50% and caudal ones 40% (see HIGGS/LITTLE/GLOVER 2011 p. 11). Other skeletal elements of whales bear too a good amount of fat inside their structure, for instance the skull, the mandible and the maxilla.

[30] Bones belonging to this species had already been found during 2003 campaign, in a building with dwelling function BA4 (CARENTI/WILKENS 2008, p. 494).

time, transported or eaten by scavengers, but also during the excavation (in particular for bones belonging to small animals, that are more difficult to detect at sight).

As the following tables and histograms show, the analysed assemblage includes a wide range of skeletal elements for all the represented species (exception made for birds and cetaceans, since they are both at the extremities of the dimensional scale). For sheep, goats, cattle and sea turtles indeed, we found axial skeleton parts as well as appendicular skeleton ones. In particular, for what concerns the appendicular skeleton, we recorded a higher proportion of meat-bearing limbs in comparison to scarcely yelding metapodia (that still were not absent). The abundance of fore and hindlimbs fits in an alimentary consumption pattern. The reduced number of metapodia confirms this pattern too, since they may have been excluded from the more demanded meaty limbs. Butchery marks confirm this profile.

The abundance of vertebrae, scapulas, pelvis fragments, ribs and cranial elements suggests that animals were entire at the site, they did not enter the city as selected sets of portions. This observation in association with butchery marks (see *infra*) promotes the idea that animals were butchered *in situ* through detachment of heads, evisceration and disjointing of limbs. This profile can be applied to sheep and goats, that even may be herd in the immediate surroundings of the city since their dimensions and requirements are sustainable, likely also to cattle, maybe in different proportions. The food requirements of Sumhuram, closely related to its demographic reality, are part of the demographic issue that is still under debate for this trade centre with so many specific social features.

For what concerns marine fauna, it is likely that sea turtles may be butchered close to the sea, where the first stages of caracass processing operations took place, as it happened to cetaceans. Regarding cetacean remains, vertebrae are the predominant (if not unique) record. To understand this anatomical representation pattern, some considerations can be useful. Cetaceans have as prominent feature a remarkable proportion of fat in their body, a substance that was important and high valued for its multiple uses. Another factor to consider are the butchery procedures applied to the carcass. Moreover, the dimensional factor must not be forgotten, for it has consequences on the possibilities of transport and on the secondary use of skeletal elements. Dolphins are heavy, slippery and difficult to transport, while their meat, hide and precious fat are easy to remove from the carcass[31]. Therefore vertebrae usually occur in processing sites (which is consistent with Sumhuram's economic situation) or if a specific reason makes the cost of transport worth as a result of a motivated choice (for example the secondary use of whale vertebrae in contructions or wider architectonic purposes[32]).

Some studies[33] suggest an estimation of the quantity of meat and fat for each skeletal part, in order to calculate their value in ancient economies. This kind of utility profile is interesting since it draws a correlation between the utility of a specific skeletal portion and its likelihood of transport. The higher the utility index, the higher the likelihood for that bone to be found on a site (which is the case most of all for lumbar and caudal vertebrae[34]) while the useless skeletal parts may be left where the carcass has been first butchered[35]. It is archaeologically relevant to notice that the bones that have a higher index of utility are also those that are more sensible to post depositional degradation and therefore whose archaeological visibility may be more affected. This kind of index can be stikingly predictive for small cetaceans, while it has to be combined with other parametres

[31] See MOSSERI-MARLIO 2000 (p. 95) and SAVELLE/FRIESEN 1996 (p. 719).

[32] This secondary use, as already underligned, is attested at Sumhuram (see *supra*, previous paragraph).

[33] See SAVELLE/FRIESEN 1996.

[34] The estimated meat utility index (%MMUI) is 100% for lumbar vertebrae, 95% for caudal ones, 74% for thoracic ones, 30% for cervical ones, while the index for flippers is 6% for flippers, 22% for scapulae... (see SAVELLE/FRIESEN 1996, p. 719).

[35] In the case of skulls, even if the head contains a good percentage of useful materials, one must consider that fat and edible tongue are easily extracted even without leaving archaeological evidence, while the weight of the skeletal part wouldn't have made its transport cost-effective. This explains why skull fragments should be linked to processing places. to exceptional motivations (see SAVELLE/FRIESEN 1996, p. 720).

when other factors may have inflenced antropic choices -as for dimension and material robustness or availability.

It is indeed interesting to consider what scholars have named the architectural utility index[36]. Shape, resistance, compactness of bones did play a role in some societies, as in Sumhuram. Therefore the advantage of using skeletal parts for this secondary use, calculated through a specific index for each skeletal element, is a useful tool for explaining archaeozoological assemblages. Of course these quantifications must be applied with awareness of the limited reliability of mathematic instruments and of the peculiar specificities of each site, nevertheless they lead to stimulating reflections.

Also fish were represented in many of their parts: skull fragments, vertebrae and a tail bone. Also for big fish we may immagine a first processing in the proximities of the sea. The natural fragility of these remains has an important role in the formation of the archaeological assemblage.

As we have just seen, element representation too fits in a consumption-oriented pattern.

US 560		
	ELEMENT	N.
	teeth	5
	mandibula	7
	cranium	3
	atlas	1
	axis	0
	vertebrae	13
	scapula	16
	humerus	9
	radius	7
	ulna	2
	carpal/tarsal	2
	metacarpus	3
	pelvis	19
	femur	9
	tibia	8
	astragalus	5
	calcaneus	2
	metatarsus	3
	phalanges	1
	carapace + plastron	17

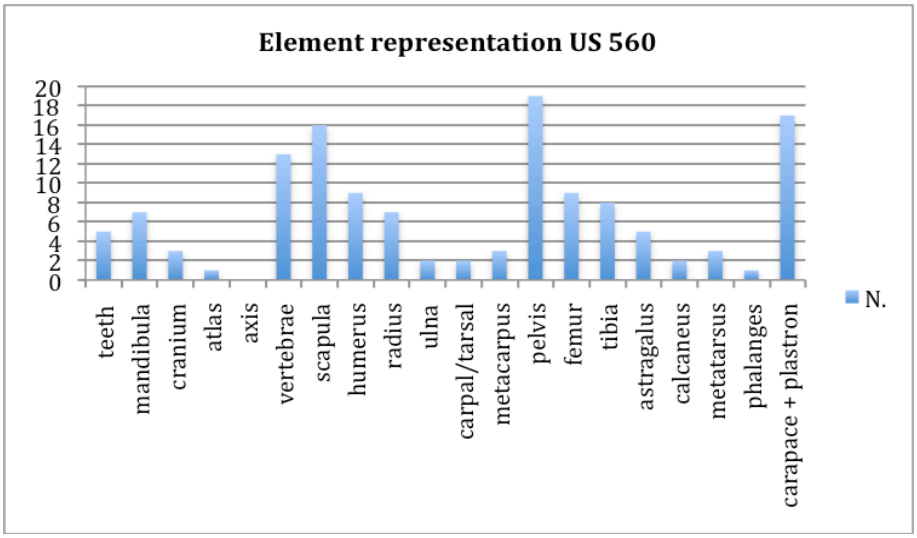

Table 7. Element representation (US 560).

Table 8. Element representation histogram (US 560)

[36] SAVELLE 1997 (in particular pp. 870-873 and table 2).

US 559		
	ELEMENT	N.
	teeth	14
	mandibula	7
	cranium	7
	atlas	3
	axis	0
	vertebrae	31
	scapula	31
	humerus	8
	radius	3
	ulna	3
	carpal/tarsal	1
	metacarpus	3
	pelvis	45
	femur	9
	tibia	4
	astragalus	0
	calcaneus	0
	metatarsus	2
	phalanges	3
	carapace + plastron	17
	horn core	4

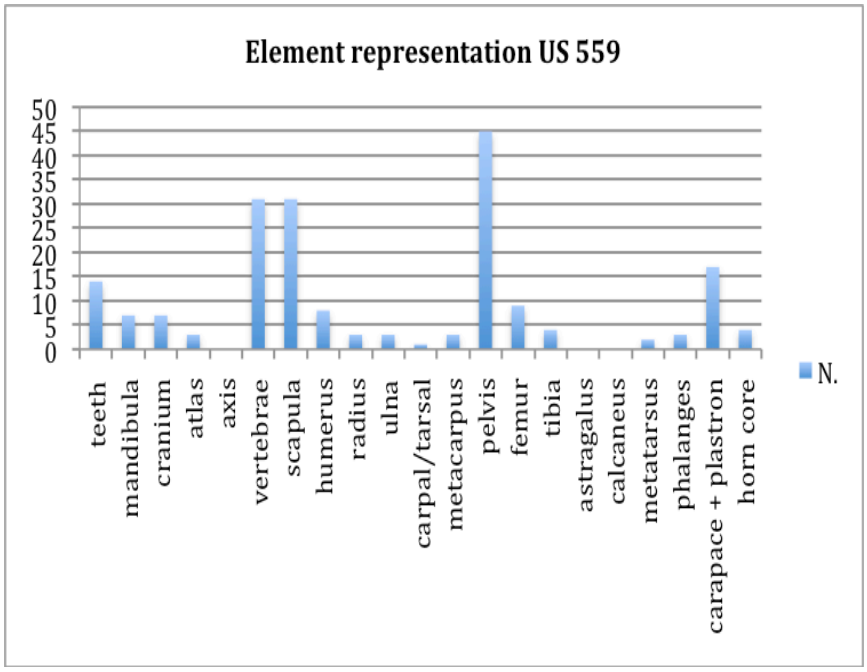

Table 9. Element representation (US 559).
Table 10. Element representation histogram (US 559)

US 558		
	ELEMENT	N.
	teeth	21
	mandibula	10
	cranium	3
	atlas	0
	axis	1
	vertebrae	7
	scapula	6
	humerus	4
	radius	5
	ulna	2
	carpal/tarsal	0
	metacarpus	3
	pelvis	13
	femur	6
	tibia	5
	astragalus	4
	calcaneus	3
	metatarsus	3
	phalanges	2
	carapace + plastron	16

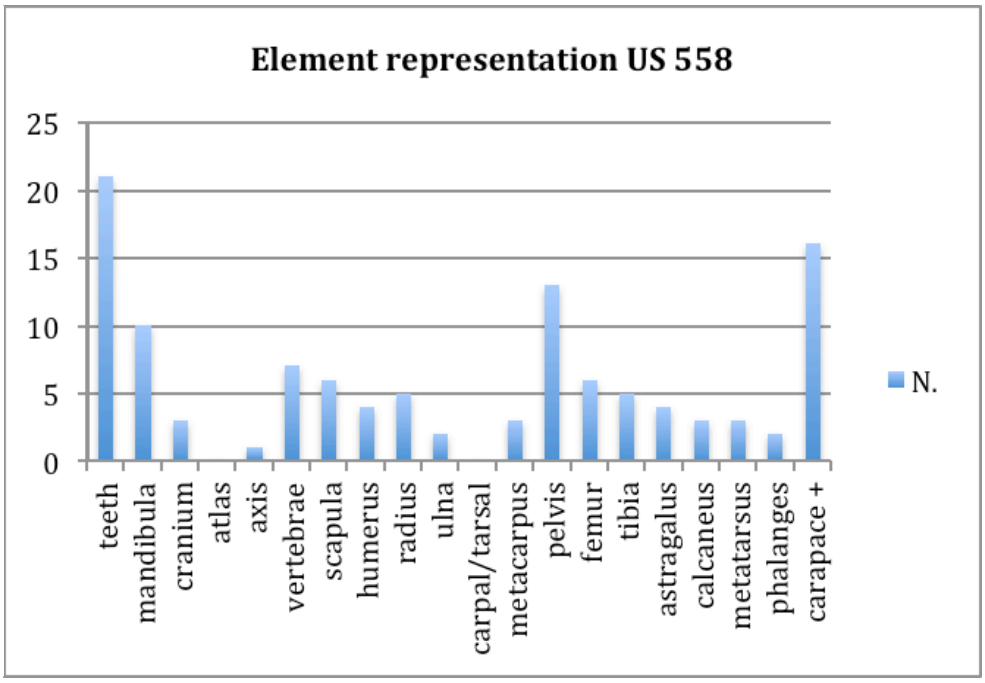

Table 11. Element representation (US 558).
Table 12. Element representation histogram (US 558)

US 556		
	ELEMENT	N.
	teeth	2
	mandibula	0
	cranium	0
	atlas	1
	axis	0
	vertebrae	4
	scapula	2
	humerus	1
	radius	1
	ulna	0
	carpal/tarsal	0
	metacarpus	0
	pelvis	1
	femur	0
	tibia	2
	astragalus	1
	calcaneus	0
	metatarsus	0
	phalanges	0
	carapace + plastron	0

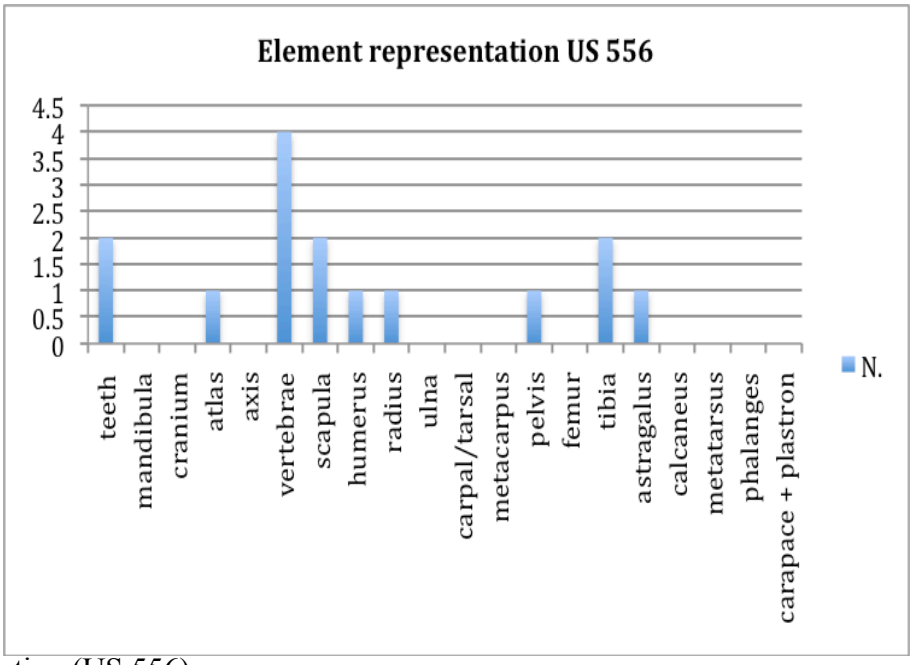

Table 13. Element representation (US 556).
Table 14. Element representation histogram (US 556)

US 544		
	ELEMENT	N.
	teeth	1
	mandibula	0
	cranium	0
	atlas	0
	axis	0
	vertebrae	6
	scapula	0
	humerus	1
	radius	0
	ulna	0
	carpal/tarsal	2
	metacarpus	2
	pelvis	3
	femur	1
	tibia	4
	astragalus	2
	calcaneus	0
	metatarsus	0
	phalanges	0
	carapace + plastron	0

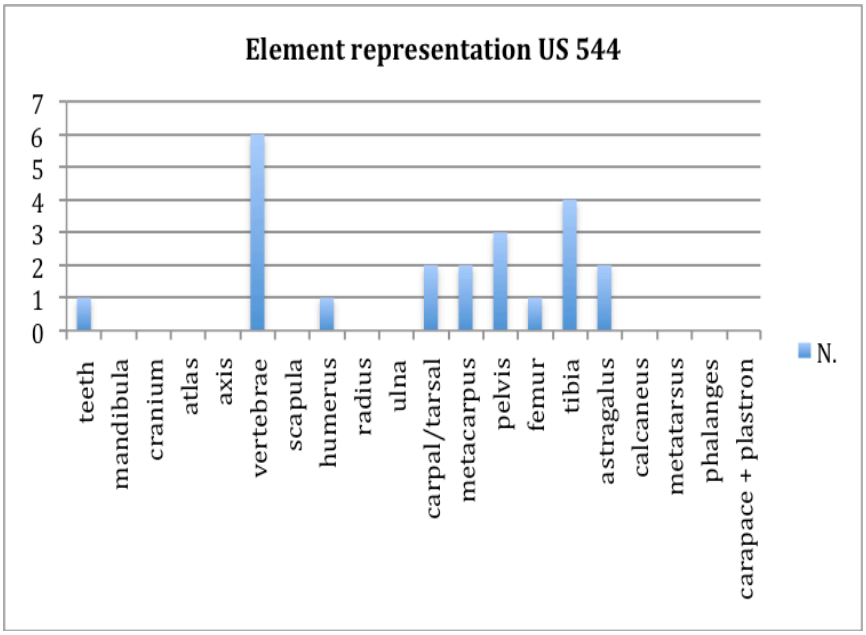

Table 15. Element representation (US 544).
Table 16. Element representation histogram (US 544)

Mortality pattern

The mortality profiles of the sample show an unbalanced pattern: the living population of all *taxa* was mainly constituted of adults and young adults, no senile specimens were recorded in the assemblage. Animals generally had a short lifespan, with of course a certain degree of variability. Such a mortality pattern reflects a management of the living stock based on the consumption of their meat more than on their use for secondary purposes. It is likely that a good portion of the living population (especially sheep and goats as Tables 2-6 indicate) was destined to early

alimentary consumption, while the rest of the stock could be bread for reproduction or transport or milk and wool production.

The presence of bones belonging to animals slaughtered young is a recurrent feature at the site[37]. Mainly sheep and goats, but also cattle, sea turtles and small cetaceans died and were likely consumed young in the analysed area. Moreover, several individuals aged of around 10 months or less at death compose a good percentace of the juvenile and sub-adult population: 14.3% of the young animals of US 560, 25% in US 559, and 17.4% in US 558. Young specimens bearing gnaw and cut marks are attested in all the studied layers, with a similar frequency in the deeper layers.

Generally, juvenile bones, due to their material structure and composition, are highly sensible to every kind of post-depositional taphonomic impact (from abiotic factors to preferential consumption choices). The archaeological evidence therefore, which theorically is already a reduced selection of the actual living assemblage, will derive, in the case of juvenile animal remains, from a more acute disproportion than the disproportion that one can assume in the case of more resistant adult bones. These considerations bring us to infer that the actual quantity of young individuals was much larger than what is archaeologically represented. One can therefore hypothesize a relevant meat consumption from young individuals as a well documented dietary habit. The slaughtering of young animals is consistent with their exploitation for primary alimentary support, and not preminently for their secondary products, which may be the core of economies non based on trade but on agriculture or breeding instead. The mortality profiles are therefore consistent with the commercial vocation of ancient Sumhuram.

Other taphonomic observations:
Butchery marks

Butchery marks have been recorded on a constant percentage of the assemblage (see Table 17) indicating usual practices in meat consumption, in consideration of the low state of preservation of the materials. No specific optical instruments for microscopy could be used during the data collection.

The location of butchery marks (see Tables 18-22) helps understanding meat processing and dietary habits. Carcasses were disarticulated by disjointing the scapula from the humerus and the pelvis from the femur. Limbs were divided in smaller meat portions (cut marks are recorded on proximal radius, proximal ulna, distal humerus, proximal tibia and distal femur in both *ovis/capra* and *bos*, a proximal ulna is also recorded for sea turtle). The head could be detached too by disjointing the atlas (at least in a *bos taurus* specimen of US 559). Ribs and vertebrae bear cut marks too, pointing to fleshing and eviscerating practices, which constitute primary butchering stages. Spinous processes of vertebrae too present cut marks inherent to the division of edible meat portions (US 559 and 556). There is evidence for longitudinal cutting of cattle specimen: a cervical vertebra has been axially divided through a regular smooth cut line. These procedures have comparisons in other sectors of Sumhuram[38] and can therefore be extended to ovicaprids. In the observed assemblage, metapodia too were dismembered from limbs, as cut marks on proximal and distal metaphyses show, as well as the marks on phalanges, astragali, carpal and tarsal bones. The location of cut marks on these particular anatomical elements could also be consistent with skinning activities: cut marks appear also on mandibulae, completing the skinning pattern. Incisions on carpal/tarsal, metapodia and phalanges are visible since these bones are not meat-bearing bones therefore cut marks easily reach the bone. The food utility of each skeletal element influences the location of butchery marks, which will be concentrated on specific *loci* of the bone.

[37] See CARENTI/WILKENS 2008 and the Preliminary Report of 2012C campaign.
[38] See CARENTI/WILKENS 2008.

Butchery marks on sea turtles (US 560 and 559) involve both carapace bones and post-cranial parts: the epiphyses of an ulna and a tibia bear cut marks for dismembring limbs portions, the tibia also bears fleshing signs, indicating a dietary exploitation of the animal.

Cut marks were recorded on a camel phalanx in US 559. Camels did not constitute the primary food source at Sumhuram, nor were primarily used for alimentary purpose. Their main task was to serve as long and short-distance pack animals when alive, then, after death, as source of a good quantity of useful materials (for instance medical substances as witnessed by ancient sources, or as raw material in bone workshops[39]).

Butchery marks are attested also on some juvenile and sub-adult specimens, indicating that they were possibly brought to the site or maybe locally bread mainly for meat consumption purposes. The proportion of juvenile and sub-adult animals may be biased and restricted by the easy loss of their young, porous, non completely calcified bones.

Some of the recorded marks seem to point to a different use of animals. In particular, the case of a smooth transversal clean cut on a *bos taurus* distal tibia metaphysis (US 558) follows a pattern common to bone processing evidence. Bone was an appreciated raw material since it is easy to find and suitable for working due to its resistance but also its facility to carving[40]. Long bones (metapodia in particular) are solid and their curved shape may be exploited for specific categories of objects. The dimension of the animal too, together with the anatomic element's characteristics *per se*, counts: big mammals provide a greater surface or amount of material to exploit[41]. In this case, a bovine tibia would have produced a considerable quantity of compact bone to be manufactured (rectangular tablets, rings, cylinders, rods to turn into a differenciated range of objects). The specimen recovered, which bears no signs of use or polishing or working, would then be a discarded portion, a refuse related to the preliminary processing of bone manufacture. Evidence of manufacturing waste, processed with the same technique of debiting (sawing off the articular extremities ..), is typical in ancient world and recurrent in archaeological sites[42]. Examples have been previously observed at Sumhuram[43].

Moreover, a carapace bone fragment and a hypoplastron one from US559 and US560 show a clean-cut (possibly due to a sawing action), which could specifically refer to the secondary use of the skeleton for artifact production[44]. Carapace bones indeed, due to their particular conformation, could answer different practical needs, as previously attested in Sumhuram's archaeological finds[45].

These observations, derived from the analysis of a circumscribed specimen confirm some previous conclusions and add new data to the animal industry picture.

US	Tooth-marked fr proportions (percentage per species)	Tooth-marked fr proportions (total percentage)	Cut-marked fr proportions (percentage per species)	Cut-marked fr proportions (total percentage)
558	ovis vel capra 18.3%; bos taurus 17%; sea turtle 5%; und 6.7%; fish 4.2%	11.7 %	ovis vel capra 3.3%; bos taurus 8.5%; sea turtle 5%; und 0%; fish 0%	3.7 %
559	ovis vel capra 6.4%;	3.4 %	ovis vel capra 1.6%;	5.9 %

[39] Pliny, *Nat Hist*, XII, 32. See CARENTI/WILKENS 2008.
[40] See MACGREGOR 1985 (pp. 23-29).
[41] See AYALON 2005a (pp. 5-8), MACGREGOR 1985 (cpt. 5).
[42] See AYALON 2005a (pp. 131-144), MACGREGOR 1985 (cpt. 5), BARBIER 1988 (pp. 48-50, fig. 1).
[43] See WILKENS 2002 (pp. 280, 283; pls. 2: 5-6, 3: 1, 6), CARENTI/WILKENS 2008 (p. 488), LOMBARDI/BUFFA/PAVAN 2008 (pp. 397, 399-400; pl. 60: 8-13, cat. 874, 876, 882, 883, 884, 889, 887; pl. 61: 9 cat. 940 SUM10A US86 B4, but also pl. 61: 10-11, cat. 934, 938; pl. 34: 3-6, 19, 27, cat. 881, 886, 888, 924, 923). Other comparisons can be SUM00A US22 B1, SUM03A US55 B16, SUM05B US187 B36-42.
[44] See MOSSERI-MARLIO 2000 (p. 95).
[45] See WILKENS 2002 (p. 273; pl. 1: 2), CARENTI/WILKENS 2008 (p. 509) and from IMTO database SUM05B US186 B39.

	bos taurus 3%; camelus 50%; sea turtle 0%		bos taurus 4.4%; camelus 50%; sea turtle 7.4%	
560	ovis vel capra 28%; bos taurus 17.5%; sea turtle 17.4%	16.2 %	ovis vel capra 13.2%; bos taurus 7.9%; sea turtle 8.7%	7.7 %
556	ovis vel capra 6.7%; bos taurus 25%	4.7 %	ovis vel capra 0%; bos taurus 25%	2.3 %
544	ovis vel capra 35.7%; bos taurus 0%	10.7 %	ovis vel capra 14.3%; bos taurus 25%	5.4 %

Table 17. Tooth and cut-mark frequencies.

Tooth marks

A significant amount of the observed material bears multiple and extended tooth marks, as listed in Tables 17-22. Rodent tooth marks are widely spread on all the evidence, but also a good representation of small carnivore gnawing has been recorded.

The diffusion of gnaw marks is consistent with a period of abandonment of the building, that made scavenging activity possible on non promptly-buried remains. The presence of gnaw marks following the fracture lines of some fragments even of small dimensions (without covering the fracture section) implies that their breakage occurred before the animal scavenging activity, which can therefore be considered post-depositional. At the same time, the presence of animal gnawing evidence implies a certain degree of disturbance of the original assemblage. The active presence of animals indeed produces the displacement of materials from and to other contexts (bones could be taken away for consumption or brought from other places of the city; small bones such as tarsals, carpals and phalanges could have disappeared in the past from the archaeological assemblage due to their transportability and fast edibility). This antique post-depositional disturbance must be taken into account even though it cannot be precisely evaluated.

The distribution of tooth marks on certain preferential *loci* (yielding epiphyses *in primis*) is due to the nutritional coefficient of each skeletal part. Moreover, meaty bones (such as forelimb humeri and radia, or hindlimb femura and tibiae) will be the primary object not only of human but also of animal consumption, in comparison with the less yielding metapodia. This will influence the patterns of element representation (scavengers destroy material eating it, but the consumption of certain parts actually causes their presence) and tooth and cut marking, and can therefore be read in the opposite direction to suggest alimentary and refuse habits. In fact, the presence of tooth marks was recorded on all the anatomical parts (axial bones, all parts of appendicular skeleton) of all the species (including sea turtles, camels and fish) without any specific preference. Carcass parts that have a higher nutritive level (such as femura and humeri) have been left at disposal of scavengers, before the total extraction of edible elements. This means that scavengers had access to all the elements of carcasses (including ribs and vertebrae), in many cases as a secondary access: the combined presence of tooth and cut marks on the same specimen indicates indeed that men and animals exploited the same alimentary resource. This feature also lightens the waste disposal habits, since no specific pits or areas have been identified, the bones were found dispersed in the layers instead, which means that they were left at open incidence of animals but also of trampling and weathering (which undoubtedly enhanced their immediate fragmentation). One may also hypothesize that since the leftovers were still bearing edible elements and since there were no heavy preferential consumption of more nutrient anatomical parts, this could mean that there were enough alimentary resources on the site (or that they arrived at the site in sufficient abundance) so that specific consumption strategies did not need to be carried out. This may also be related to the presence of marine food directly accessible from the site.

Carnivore marks are distinct due to their broad irregular grooves, the presence of pits, scores and punctures, the chewing activity, removal of portions of the bone and the predilection for cancellous spongy epiphyses that leave bone reduced to their shaft (as it occurs for instance to a tibia fragment and some metapodia). The specific concentration of small carnivore tooth marks, with their specific features and location, in the first phase of room A197 (US 560, which is also the US counting the higher percentage of tooth-marked but also cut-marked bones) may be accidental. Still, one could underline that US 560 restituted a small amount of pottery sherds in comparison with the amount of osteological remains, and was located in a room with no access on the exterior (the only way out was through room A200), which may have limited the bone dispersion. But this situation may have other reasons that cannot be cleared at this stage of research yet.

Tooth marks are also a fundamental indirect proof of the presence at Sumhuram of a significant abundance of rodents and a more limited presence of small carnivores (not directly attested in this assemblage, but previously recorded[46]) as part of the faunal living population in ancient times. The presence of rats is also consistent with the commercial nature of the site. Rodents bones are less likely to be recovered in archaeological samples, at least in reason of their size, but had also been recorded during previous studies[47]. Anyway, every archaeozoological analysis undertaken by now has highlighted a recurrent diffusion of rodent tooth marks[48].

The attestation of gnaw marks on a substantial amount of juvenile animal bones (20% of the tooth-marked specimens) may be an index of the higher quantity of individuals slaughtered young than what appears from the recovered data. The preferential chewing of young soft bones usually produces a great diminution of them in archaeological evidence. Their number therefore should be increased to have a more realistic picture of the slaughtering patterns at Sumhuram.

US 560 SPECIES	TOOTH MARKS	CUT MARKS
Ovis vel capra	Scapula mesial (rod)	
		Scapula fossa (3 cuts)
	Radius prox metaph + diaph (rod)	Radius prox metaph (2 cuts)
	Radius dist epiph (rod)	
	Radius dist epiph (rod)	
	Humerus dist epiph (carn + puncture)	
	Humerus dist epiph (rod)	
	Calcaneus diaph + proc art (rod)	
	Metatarsus diaph + epiph on fracture or achewing line (rod) j	
	Lumb vertebra centrum (rod)	
	Scapula tuber (rod)	
	Femur prox epiph (rod + carn) j	
	Tibia dist metaph + diaph (rod) j	
		Humerus dist metaph cond (many cuts)
		Pelvis ilium (many)
	Pelvis ilium (carn score)	
	Humerus dist metaph cond (carn)	Humerus dist cond (3-4 cuts)
	Mandibula (rodents)	
	Tibia dist diaph (rodents)	
	Metapodium dist metaph (rod) j	
		Vertebra thor on ventral centrum j
	Rib prox (rod)	Rib prox below art (3 cuts)
		Rib prox below art (3 cuts)
	Pelvis ischium (rod + carn score)	Pelvis ischium edge (2 cuts)

[46] See CARENTI/WILKENS 2008, WILKENS 2002 and the Preliminary Report of Sumhuram 2012C campaign.
[47] See CARENTI/WILKENS 2008.
[48] See WILKENS 2002, CARENTI/WILKENS 2008, the Preliminary Report of Sumhuram 2012C campaign and this one as well..

Bos taurus	Cranium fr (rodents)	
	Femur dist epiph (carn score)	
		Humerus prox epiph (2 cuts)
	Humerus dist metaph cond (small carn + carn score + rod)	Humerus dist epiph tuberc and cond (cuts and chop marks)
	Metatarsus dist epiph trochlea also mesial (rod + carn on metaph)	
	Radius disp epiph (puncture)	
	Phalanx II on both epiph	Phalanx II epiph ?
	Astragalus (rod + carn)	
		Cubonavicular (3 cuts)
		Tibia prox metaph
	Carpal capitate-trapezoid (rod)	
	Tibia prox metaph (rod) j	
	Femur prx epiph + metaph + fracture or chewing line (carn?)	
	Rib (rod + carn, chewing)	
Sea turtle	Carapace suprapygal edge (rod)	
		Hypoplastron (sawn)
	Peripheral plate bone (rod)	
	Ulna metaph + diaph (rod)	Ulna prox metaph
	Fibula diaph (rod)	
	Tibia diaph (rod + carn chewing portion asported)	

Table 18. Tooth and cut marked remains (US 560)

US 559 SPECIES	**TOOTH MARKS**	**CUT MARKS**
Ovis vel capra		Scapula fossa (4 cuts)
	Rib (rod)	
	Radius dist epiph diaph (rod)	
		Humerus dist (many cuts on tuberc + condyles)
	Metatarsus prox epiph + diaph (rod)	
	Metacarpus dist metaph + diaph (rod)	
	Pelvis acetabulum (rodents)	
	Radius prox diaph + metaph (rodents) j	
	Vertebra fr (rod)	
	Cerv vertebra (rod) j	
Bos taurus		Atlas
	Ulna prox on incisura + art edges (rod)	Ulna prox above incisura semilunaris
		Femur dist metaph (3 thin cuts + 2 large)
	Metacarpus diaph (rod)	
		Lumb vertebra spine (5 cuts)
Camelus	Phalanx II diaph + dist epiph (rod)	Phalanx II prox metaph (3 long cuts)
Sea turtle		Carapace bone art fr (sawn)
		Tibia diaph + dist epiph edge (3-4 cuts)

Table 19. Tooth and cut marked remains (US 559).

US 558 SPECIES	**TOOTH MARKS**	**CUT MARKS**
Bos Taurus		Astragalus prox + dist condyles (many)
	Phalanx III (rod)	
		Tibia dist diaph cuts + many chop marks. Smooth transversal fracture (sawn?)
		Metatarsus dist j
	Thor vertebra (rod) j	
	Thor vertebra (rod)	
	Rib (rod)	
	Pelvis (rod)	

	Und diaph (rod) + fracture line	
	Humerus trochlea (rod)	
		Cerv vertebra (chop marks)
	Scapula fossa edge (rod)	
Ovis vel capra	Scapula fossa + tuber (rodents + small carnivore)	
	Metatarsus diaph (rodents) j	
	Femur metaph + epiph (rodents) j	
	Cranium foramen magnum (rodents)	
	Radius dist metaph (rodents)	
	Pelvis (rodents)	
		Scapula fossa edge
	Radius diaph + both epiph (rod + carn) j	
	Calcaneus head j	
		Mandibula proc art
	Thor vertebra (rodents + carn?) j	
	Femur diaph (carnivore)	
	Femur diaph (carnivore chewing	
Sea turtle	Peripheral plate bone (rod)	
		Ulna dist metaph (5)
fish	Ultimate vertebra (rod)	
und	Calcaneus (carn chewing + furrows on dist) j	

Table 20. Tooth and cut marked remains (US 558).

US 556 SPECIES	TOOTH MARKS	CUT MARKS
Ovis vel capra	Atlas (rod)	
Und large	Thor vertebra spine (rod)	Thor vert spine

Table 21. Tooth and cut marked remains (US 556).

US 544 SPECIES	TOOTH MARKS	CUT MARKS
Ovis vel capra		Humerus dist tuberc
	Phalanx II dist epiph (rod)	
	Metacarpus dist diaph (rod) j	
	Scaphoid medial view	Scaphoid dorsal view
	Pelvis acetabulum	
	Pelvis acetabulum j	
Bos taurus		Phalanx II prox epiph + diaph

Table 22. Tooth and cut marked remains (US 544).

Measurements

The fragmentation as well as the bad preservation of the surface of bones made measurements not always viable. When the required elements were preserved, standard measurements were taken according to VON DEN DRIESCH 1976 standards, showing a global picture of dimensionally small individuals. For all the species involved (exception made for fish and turtles, that have a constant growth, determined by individual lifespan and events) a difference was constantly recorded in comparison to European archaeozoological assemblages. This diffused discrepancy has been noticed in all the anatomical parts of the skeleton and is particularly evident in the appendicular skeleton. Taking into account great length as well as depth, breadth and diameter, metrical data constantly remain below the expected dimensions, roughly 1-2 mm on average, but some cases

show a less relevant discrepancy. Concerning *ovis aries* and *capra hircus*, we recorded two size ranges, a smaller one and a slightly larger one, both morphologically compatible with *ovis vel capra taxon*. It must be said that since the fragmentation of the assemblage made sexing of the bones impossible, some single cases may not reflect reality with precision.

The small size of the anatomical proportions recorded in the present assemblage confirms the observations previously made for osteological remains from other areas of the site[49].

The analysed assemblage can be divided in three groups on the basis of the recurrent features that link them. It is interesting to notice that this subddivision actually corresponds to the relative chronology established through the stratigraphy. US 560, 558 and 559, located at the same elevation and therefore considered contemporary by the excavator, are linked by the relevant amount of specimens with similar species proportions, age at death of the animals, gnaw marks and butchery practices, that correspond to household refuse patterns. While US 556 and 544 can be grouped following similar criteria and reflect a short, non-intensive occupation. US 555 presents peculiar features that find no comparison nor explanation yet (even considering the digging primary documentation).

[49] See CARENTI/WILKENS 2008 and the Preliminary Report of 2012C campaign.

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SUM12C, US 560

US	SPECIES	ANATOMICAL PART	OBSERVATIONS	MEASUREMENTS (cm)
560 (A197, BA13)				
	ovis vel capra	scapula L dist fr	80%	SLC 1.6; GLP 3; LG 2.1; BG 2
	ovis vel capra	scapula R fr	fossa missing; 45%	SLC 1.4
	ovis vel capra	scapula R fr mesial	fossa missing; 40%	.
	ovis vel capra	scapula L mesial fr	gnaw marks (small, rodents); 20%	.
	ovis vel capra	scapula L mesial fr	10%	.
	ovis vel capra	scapula L dist fr	cut marks on ventral side of fossa limit (3 almost parallel cuts); tuber + acromion missing; 40%	SLC 1.7; LG 2.15; BG 2.05
	capra hircus?	astragalus R		GLI 2.7; Bd 1.7; SD 1.5
	ovis aries	radius L prox ep + diaph	heavy weathering (corroded surfae); 45%; big?	Bp 3.1; BFp 2.9; SD 1.8
	ovis vel capra	tibia R prox diaph fr	partially horizontal regular fracture line at epiph base; 40%	.
	ovis aries	radius L prox ep + diaph fr	2 parallel cut marks on diaph below epiph; gnaw marks on diaph below epiph (rodents); oblique fracture; 50%	BFp 2.2; SD 1.2
	capra hircus	radius L dist epiph + diaph fr	gnaw marks of epiph (rodents); vertical fracture with steps; 40%	Bd 2.5
	ovis aries?	radius L dist epiph + diaph fr, + dist ulna	gnaw marks on dist diaph (small, rodents); 50% radius, 30% ulna	Bd 2.6; SD 1.7
	capra hircus	tibia L dist epiph + diaph fr	few gnaw marks on epiph (small, rodents); 50%; oblique fracture	Bd 2.2; Dd 1.6
	ovis vel capra	pelvis R fr, ischium fr + acetabulum fr	10%	
	capra hircus	humerus L dist epiph fr + diaph fr	gnaw marks on epiph (punctuated hole and gnaw marks on posterior condyles and tuberculi); 30 %	Bd 2.6; Bt 2.4
	capra hircus?	humerus L dist epiph fr	one condyle missing; gnaw marks on tuberculi (rodents); <10%	Bd 2.6

	capra hircus	calcaneus R fr	gnaw marks on corpus and processus (small, rodents); 95%	GL 5.5
	ovis vel capra	metatarsus R diaph + fr prox epiph	unfused (< 20-28 months); entire diaph; gnaw marks on all diaph (small, parallel, rodents), both epiph missing with horizontal shape and gnaw marks al around limits (epiph gnawed), prox epiph remains around round shape void; 95%	SD 1
	ovis vel capra	radius L dist portion	unfused (<36 months); surface corroded; 50%	SD 1.6
	bos taurus	femur prox epiph; head	unfused (< 42-48 months)	.
	bos taurus?	humerus diaph L fr	10%	
	sea turtle	carapace bone fr	peripheral dist edge; 20%	
	sea turtle	carapace bone fr + rib fr	periph dist edge; 40%	Bd 6.3
	sea turtle	carapace bone fr + rib fr	peripheral dist edge; 30%	
	sea turtle	4 peripheral bones fr		B 3.2
	sea turtle	rib dist fr		
	und medium	thor vertebra fr	dorsal spine fr + neural arch fr; 40%	.
	und medium	thor vertebra fr	dorsal spine fr + neural arch fr; cut mark on spine and arch (two aligned segments of the same cut); 30%	.
	und medium	1 lumb vertebra fr	gnaw marks on centrum (small, rodents); 40%	
	und medium	flat bone fr		
	und medium	flat bone fr (scapula?)		
	und large	maxilla fr + und max tooth fr (root fr + 7 fr)	illness?	.
	und medium	rib fr		
	und large	maxilla fr	maybe connectd to ill tooth	
	und large	2 cerv vetebra fr	transverse process fr	
	und large	vertebra fr	neural arch fr; 15%	
	und large	2 scapula mesial fr	.	.
	und large	flat bone fr		
	und large	cranium fr	gnaw marks (small, rodents)	.

	und large	scapula fr ?	.	.
	und large	rib fr		
	und large	und diaph fr (metacarpal?)		
	aves	pelvis fr		
	aves	femur prox epiph fr?		
	fish	5 medium vertebrae		
	fish	1 big vertebrae		
	shell	2 arcidae		
	shell	oliva bulbosa	pierced on apex	L 4.2
	shell	oliva bulbosa		L 3.7
	shell	cypraea		L 2.7
	shell	2 mytilidae (?)		
560 II (A197)				
	ovis vel capra	scapula R dist fr, fossa + spina + collum	fossa fr, acromion missing; traces of burning; 35%	SLC 1.9; BG 1.9; GLP 2.7; LG 2
	capra hircus	mandibula R fr + M1 + M2	M1 (2-3 years); M2 (1-3 years); traces of burning	M2 B 1.4, L 1.2; M2 B 1.4, L 1.4
	ovis vel capra	humerus diaph fr (L?)	traces of burning; 40%	SD 1.6
	ovis vel capra	pelvis R fr acetabulum fr + ilium fr	traces of burning	
	ovis aries	P3 mand R + mandibula fr	unworn (12-16 months); traces of burning	B 1; L 1.1
	bos taurus	astragalus L fr	surface edges worn out; tiny trace of burning; 50%	GL 5.8; Bd 3.6; SD 3.1
	bos taurus	astragalus R fr	surface damaged; traces of burning; 45%	Bd 3.9; SD 3.4
	bos taurus?	ulna L fr prox portion	incisura semilunaris fr; traces of burning; 15%	
	und large	cranium fr ?		
	und large	cerv vertebra fr	transv proc + foramen fr; traces of burning; 15%	
	und large	rib fr		
	und large	pelvis R fr, acetabulum fr + pubis fr		

	und large	5 diaph fr	traces of burning	
	und medium	rib fr		
	und medium	und epiph fr, humerus head?	traces of burning	
	fish	vertebra fr big		
	fish	vertebra fr medium		
	shell	oliva bulbosa	surface corroded; apex pierced	L 4.1
	shell	architectonidae fr		
	shell	1 und		L 5.5; B 4
560 (A197, 13-11-12)				
	ovis vel capra	scapula R dist fr	fossa + spina; acromion missing; few gnaw marks (rodents, on tuber); 15%	SDC 1.5; BG 1.6; LG 2.1; GLP 2.55
	ovis vel capra	femur R prox diaph fr + epiph	unfused (<30-36 months); troch maius fr + foramen; traces of burning; gnaw marks on epiph (small carnivore + rodents on troch minus and metaph); 20%	DC 1.8
	ovis vel capra	metacarpus R	unfused (<18-24 months); 100%	Bp 2.2; Dp 1.4; SD 1.1; Bd 2.2; Dd 1.1; L 7.4
	ovis vel capra	tibia R dist epiph fr + diaph fr	unfused (<18-24 months); gnaw marks (rodents on metaph and diaph); traces of burning on diaph; 45%	SD 1.3; Dd 1.5
	ovis vel capra	scapula L fr	spine fr; < 10%	
	ovis vel capra	scapula L fr	fossa fr; 10%	
	ovis vel capra	scapula L fr	mesial portion; 30%	
	ovis vel capra	femur prox epiph fr	head; unfused (<30-36 months); traces of burning; surface damaged (corrosion, root etching); fovea non visible	DC 3

	ovis vel capra	humerus R dist epiph + diaph fr	prox portion diaph fracture regular horizontal; unfused? (<10 months); foramen; cut marks (8 on caudal lateral condyle; 7 on caudal aspect and edge of medial cond, some aligned derived from same cutting action; 1 on medial metaph); 70%	
	ovis vel capra	pelvis L fr	ilium fr; 5 scrap marks or cuts on edge	
	ovis vel capra	pelvis R fr	ilium fr + acetabulum fr; score on ilium?; 20%	
	capra hircus	humerus L dist epiph fr + diaph fr	3-4 cut marks on lateral condyle; gnaw marks (on both cond, small carnivore?); burning traces on all internal, ext surfaces and diaph section; 60%	SD 1.3; Bd 2.5; BT 2.4; Dd 2.1
	capra hircus	mandibula R fr + hinge + M2 + M3	proc cor + proc art; gnaw marks (rodents); M2 (3-6 years); M3 (3-4 years) = 3-4 years	Wr 3.6; Hr 5.3; M2 L 1.5 B 1.1; M3 L 1.9, B 1.0
	capra hircus?	metapodium dist epiph fr	trochlea; unfused (<24 months); traces of burning; gnaw marks on all metaph	
	capra hircus	mand M1/M2	M1 (6-12 months); M2 (1-2 years)	L 1.6; B 1.4
	ovis aries	tibia L dist epiph + diaph fr	spiral fracture; many gnaw marks (on diaph, rodents; 80%	Bd 2.4; SD 1.2; Dd 1.8
	bos taurus	femur R dist epiph fr	epicond medialis fr; surface damaged and flaky, worn out edges; <10% same bone as following two	.
	bos taurus	femur R dist epiph fr	epic lateralis fr; traces of burning; gnaw mark (score?); surface and edges damaged; <10% same bone as previous and following	.
	bos taurus	femur R dist epiph fr	trochlea fr; traces of burning on surface and section; surface and edges damaged; <10% same bone as previous two	.
	bos taurus	humerus prox epiph fr	head fr; cut marks (2 parallel cuts on articular surface); traces of burning; regular fracture line (straight); worn out edges; 10%	.

	bos taurus	humerus L dist epiph fr	tuberculum minus + medial condyle + tuberc maius fr; cut marks (2 deep cuts on ventral tuberc minus, chop marks?; 2 parallel thin cuts on medial condyle); chop mark on metaph (caudal view); surface damaged, worn out edges; gnaw marks on medial cond (all sides + diaph; small teeth, not rodents) + score on lateral tuberc + rodent marks; <10%	
	bos taurus	metatatarsus ? dist epiph fr + diaph fr	traces of burning; gnaw marks (rodents on all sides of trochlea, metaph and diaph also on mesial zone, post fracture, scavenging activity; carnivore on metaph?)	
	bos taurus	radius L dist epiph fr + diaph fr	worn out surface, root etching; stepped fracture; traces of burning on sides and section; gnaw puncture mark?; 15%	
	bos taurus	astragalus L	edges slighly worn out, flaky zones; 99%	GL 6.1; B 4.2; Dl 3.3
	bos taurus	phalanx II	surface corroded, worn out edges; traces of burning everywhere; scrap or gnaw parallel marks on dist ad prox epiph; 100%	GL 3.8; Bp 2.7; Dp 2.9; Bd 2.2; Dd 2.3
	bos taurus	mandibula L fr	hinge, proc cor	
	bos taurus	astragalus fr	worn out edges; many gnaw marks (rodents on all edges, also carnivore) also on fracture lines; 60%	GL 6.6; B 4.3; Dl 3.6
	bos taurus	cubonavicular L fr	traces of burning; cut marks (3 on dorsal aspect); 80%	
	bos taurus	mand incisor	completely worn down (10 years?)	L 1; B 0.8
	bos taurus	calcaneus L fr	facies art talaris + proc anterior fr + corpus calcanei fr + sustentaculum tali; traces of burning on surfaces and section; cut mark above facies articularis ?; 40%	BS 3.3

	bos taurus	tibia prox epiph fr + metaph fr	condylus lateralis fr + sulcus muscularis fr; some cut marks on caudal aspect of metaph; traces of burning on surface and trabecular section	
	bos taurus	tibia L prox epiph fr	condylar eminence + intercondylar tubercles	
	bos taurus	carpal capitate-trapezoid L	flaky surface; gnaw marks on dorsal and medial aspect (rodents)	
	bos taurus?	tibia? prox epiph fr	unfused (<42-48 months); gnaw marks (some rodent marks on metaph); <5%	
	bos taurus	femur prox diaph fr	trochanter minus fr; gnaw marks (long, following all fracture line and on trochanter edges, long and in radial disposition)	
	und large	thor vertebra fr	spine fr + neural arch fr; 20%	
	und large	vertebra fr	neural arch fr + entrum fr; unfused;regular fracture line (straight and almost central); surface worn out (cancellous bone visible), very heavy weathering; 10%	
	und large	rib fr	40%	
	und large	rib prox fr	artic; burning traces; gnaw marks (on artic and edges; rodents + carnivore? portion missing, chewing?); <10%	
	und large	vertebra fr	centrum fr; 10%	
	und large	rib fr	<10%	
	und large	thor vertebra fr	spinous proc fr; <10%	
	und large	2 diaph fr		
	und large	femur diaph fr + metaph fr	trochanter minus fr; <5%	
	und large	diaph fr (humerus?)	tuberositas?; <5%	
	und large	2 rib fr	traces of burning; <5%	
	und large	rib fr	<5%	
	und large	2 und fr	<5%	
	und large	rib fr		
	und large	flat bone fr		
	und medium	cerv vertebra fr	90%	

	und medium	vertebra fr (thor?)	unfused; centrum + neural arch fr; scrap marks? (on ventral centrum); 30%	
	und medium	cranium fr		
	und medium	scapula fr	<10%	
	und medium	3 rib fr	30%	
	und medium	rib fr prox portion	cut marks below articulation (3 parallel thin marks on edge); gnaw marks (rodents)	
	und medium	rib fr prox portion	cut marks below articulation (3 tranversal cuts)	
	und medium	pelvis fr	ischium fr; gnaw marks (rodents + score); cut marks (2 cut marks on edge)	
	und medium	6 und flat bone fr	<5%	
	und medium	metatarsal diaph fr	traces of burning; <5%	
	und medium	2 flat bone fr		
	und medium	flat bone fr (mandibula?)		
	sea turtle	carapace bone nuchal portion	sutures; 100%	
	sea turtle	carapace bone suprapygal fr	suture; gnaw marks on external edge (rodents); 90%	
	sea turtle	carapace bone fr	sutura	
	sea turtle	hypoplastron fr	edge portion; one of the fracture lines is very regular (straight and smooth, sawn?); traces of burning on surface only	
	sea turtle	peripheral plate bone fr	1 sutura; gnaw marks (on all internal edge, rodents)	
	sea turtle	carapace bone fr lateral portion	suture; traces of burning on surface	
	sea turtle	peripheral plate bone fr	sutura; traces of burning on ext surface	
	sea turtle	carapace bone fr lateral portion	external edge + sutura	
	sea turtle	rib fr		
	sea turtle	carapace bone fr		
	sea turtle	pelvic girdle fr	pubis edge	
	sea turtle	ulna R	cut marks (2 on prox metaph); gnaw marks (rodents, on metaph and diaph); 100%	GL 9.2; Bd 3; Dd 1.5; Bp 3.6; Dp 2; SD 1.8
	sea turtle	fibula ? fr	gnaw marks (rodents, on diaph); 98%	GL 6.9; Bd 1.3; Dd 1.1; Bp 1.5; SD 0.8

	sea turtle	atlas	unfused; alar foramen + dorsal tubercle fr +wing +cranial articular cavity fr + caudal articular surface	
	sea turtle	tibia? diaph fr	traces of burning; gnaw marks (rodents, on diaph); gnaw marks on one fracture line, on edge and on fracture section (carnivore? portion asported)	
	shell	chlamys townsendi fr	20%	
	shell	oliva bulbosa	pierced apex; well preserved surface	L 4
	shell	cypraea	surface worn out	L 2.1
	shell	mytilidae fr	10%	
	shell	4 arcidae	2 fr; accidental hole on top ?	L 6.3, 5.9, 5.9, 6.2
	fish	5 vertebrae		diam 2.1; 2; 1.9; 2; 2.3
	fish	8 vert fr		diam 1.2; und diam; 1.8; 2.6; 2.5; 2; 3.1; 2.1
	fish	3 und bone fr		
	fish	vertebra + dorsal spine fr		diam 1.5
	fish	vertebra	oblong	1.5 x 2.4
	fish	skull fr ?		
	fish	skull fr preopercle?		
	fish	mandib fr angular?	articulation	
	fish	vertebra + dorsal spine fr		diam 2.4
	fish	3 vertebrae fr		diam 2.6; 2.2; 1.9
	fish	vertebra thor? + dorsal spine fr		diam 1.1
	fish	vertebra	oblong	1.8 x 2
	fish	vertebra	oblong	1.6 x 2.4

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US	SPECIES	ANATOMICAL PART	OBSERVATIONS	MEASUREMENTS (cm)
559 I (A200; BA13)				
	ovis vel capra	scapula fr, dist R, fossa art + spina	fossa weathered (flaky, cancellous visible), acromion and tuber missing; 30%	SLC 1.4; BG 1.7
	ovis vel capra	scapula fr, dist L; fossa art + acromion + spina	4 parallel cut marks fossa art edge);tuber missing; well preserved; 25%; long collum	BG 1.9
	ovis vel capra	lumb vertebra fr	spine + 1 transverse process + 1 articular pr missing; unfused; 90%	.
	ovis vel capra	lumb vertebra fr	unfused; 90%	.
	ovis vel capra	lumb vertebra fr	unfused; 90%	.
	ovis vel capra	lumb vertebra fr	centrum; unfused; 40%	.
	ovis vel capra	lumb vertebra fr	unfused; 90%	.
	ovis vel capra	mand P2 L	unworn; >20-30 months; juvenile	L 0.9; B 0.7
	bos taurus	atlas fr	caudal art cavity + caudal art surface fr + wing fr + dorsal tubercle fr; cut marks ?; 20%	
	bos taurus	atlas fr	anterior dorsal tubercle + cranial art cavity fr; 10%	
	bos taurus	und molar fr	e-g stages wear; <50%	.
	bos taurus?	scapula dist fr, fossa + collum fr	cancellous bone visible at fossa edges, tuber missing; 10%	.
	bos taurus	femur L epiph fr	trochanter maius fr + neck fr + trochanteric fossa fr; very damaged and fr; 5%	
	bos taurus	ulna R prox fr	incusura semilunaris fr; some cut marks above incisura; gnaw marks on incisura articular edges and external edge (rodents); 15%	
	bos taurus	atlas fr	cavity fr + wing fr; 10%	
	sea turtle	carapace fr + rib fr	10%	
	sea turtle	carapace fr + rib fr	peripheral dist edge fr; 20%	
	sea turtle	pelvic girdle fr	acetabulum fr + suture; unfused; <10%	
	sea turtle	2 carapace fr		
	sea turtle	pelvic girdle fr	acetabulum fr + sutura; unfused; <10%	
	und large	flat bone fr, scapula?	>5%	.
	und large	thor vertebra fr	centrum + neural canal; unfused; 60%	.

	und large	3 long bone diaph fr	<10%	.
	und medium	rib fr	art fr; <5%	
	und medium	thor vertebra fr	dorsal spine + art process; 40%	.
	und medium	vertebra fr	neural arch fr; <10%	.
	und medium	4 pelvis fr ?		
	und medium	8 flat bone fr		
	und medium	rib fr	art; gnaw marks (small, rodents); 50%	.
	und medium	3 rib fr		.
	und medium	rib fr	art; 30%	.
	und medium	4 pelvis fr ?		
	und medium	7 flat bone fr		
	und medium	diaph fr	foramen; <10%	
	und medium	2 cranium fr		
	und	5 und fr	<5%	
	und medium	2 cranium fr		
	fish	3 small vertebrae		
	fish	1 big vertebra		
	shell	cypraea grayana?	entire; pierced body; surface corroded	L 6.8
	shell	cypraea fr	teeth	L 5.3
	shell	2 oliva bulbosa	pierced apex; corroded surface	L 4.3
	shell	2 oliva bulbosa	pierced apex; heavily corroded surface	L 3.7
	shell	oliva bulbosa	pierced apex; corroded surface	L 3.9
	shell	oliva bulbosa	pierced apex; corroded surface	L 4.1
	shell	oliva bulbosa	pierced apex; corroded surface	L 2.6
	shell	conidae	pierced apex; corroded surface	L 4.4
	shell	arcidae ?	corroded surface	L 6.6
	shell	cardiidaee fr ?	corroded surface	L 6.4
	shell	cerithiidae ? pyramidellidae?		L 9.6
	shell	terrestrial shell?		L 2.2

559 II (A200, box 3)				
	ovis vel capra	scapula L dist epiph fr, fossa fr, collum	tuber + acromion missing; 30%	SLC 1.9
	ovis vel capra	scapula R dist epiph fr; fossa	tuber + acromion missing; 30%	SLC 1.6; LG 2; BG 1.9
	ovis vel capra	scapula R dist epiph fr, fossa	15%	LG 2; BG 1.8
	ovis vel capra	scapula L dist epiph fr, fossa fr, collum	tuber + acromion missing; 30%	SLC 1.8; LG 2.1; BG 1.8
	ovis vel capra	scapula L mesial fr, spine fr	<10%	.
	ovis vel capra	scapula L mesial fr	<5%	.
	ovis vel capra	scapula R dist fr	acromion missing; 45%	SLC 2; GLP 3.1; LG 2.3; BG 2.3
	ovis vel capra	scapula R dist fr	tuber + acromion + fossa fr missing; 15%	SLC 1.9
	ovis vel capra	2 scapula R mesial fr	<10%	.
	ovis vel capra	scapula fr	<10%	.
	ovis vel capra	radius L dist epiph + diaph fr	gnaw marks on epiph and diaph (small, rodents); <5%	.
	capra hircus?	humerus R dist epiph + diaph fr	cut marks (1 deep long large cut on posterior and lateral aspect of lateral condyle, 1 deep large cut on ventral part of tuberculum till mesial condyle; 2 deep large parallel cuts on lateral aspect of lateral condyle, one transversal long, 1 on lateral dist diaph) 50%	Bd 2.8; SD 1.3; BT 2.6
	ovis vel capra	humerus R dist epiph + diaph fr	gnaw marks on mesial condyles (rodents); olecranon fossa fr; not completely fused (not much >10 months); 40%	Bd 2.7; BT 2.5; SD 1.2
	ovis vel capra	mand L fr; hinge fr	proc cor + proc art; <10%	.
	ovis vel capra	metatarsus L prox epiph fr + diaph fr	gnaw marks (rodents) on metaph and articular surface; surface damaged by root etching;70%	Bp 1.9
	ovis vel capra	metapodial prox epiph fr	<5%	
	ovis vel capra	metatarsus R prox fr, epiph + diaph fr	gnaw marks on all sides of epiph and diaph (rodents); 30%	Bp 1.8; Dp 1.6; SD 1.1

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	capra hircus	metacarpus R dist epiph fr + diaph fr	gnaw marks on all diaph and metaph (rodents); 50%	SD 1.2; Bd 2.2
	capra hircus	mandibula R fr + P2 + P3 + P4 + M1 + M2	foramen fr on diastema (anterior to P2); 5-6 years	P2 B 0.5, L 0.7; P3 B 0.8, L 0.9; P4 B 0.9, L 0.8; M1 B 0.9, L 0.8; M2 B 1.2, L 1
	capra hircus	M1/M2 mand R	M1 2-3 years; M2 3-6 years	B 1.2; L 1.2
	ovis aries?	M1/M2 mand R	unworn M1 2-6 months; M2 6-12 months	B 1.4
	ovis aries?	M1/M2 mand L	M1 6-12 months; M2 1-2 years	B 1.5
	ovis vel capra	femur R dist epiph	unfused (< 36-42 months)	Bd 3.6
	capra hircus	horn core L fr	40%	.
	capra hircus	horn core L fr	60%	.
	ovis vel capra	femur diaph fr	70%	.
	ovis vel capra	pelvis R fr; acetabulum fr +pubis fr	gnaw marks on acetabulum (rodents); <10%	.
	ovis vel capra	tibia prox diaph fr	unfused (<36-42); corroded surface; 45%	.
	ovis vel capra	scapula dist fr; fossa fr	<5%	.
	ovis vel capra	mandibula L fr		
	ovis vel capra	horn cor fr	<5%	
	capra hircus	mandibula R fr + P3 fr	foramen on diastema anterior P2	.
	ovis vel capra?	radius prox epiph fr + diaph fr ?	unfused (<10 months); gnaw marks (rodents, on diaph); 80%	SD 1
	ovis vel capra	mandibula R fr + M2/M3 fr	roots; completely burnt (partial calcification); if M2 <18-24 months	
	bos taurus	femur R dist epiph fr	1 troclea fr; cut marks (3 thin ones on lateral metaph, two oblique bigger on anterior metaph); 20%	Bd 7.6
	bos taurus	humerus R dist epiph + diaph fr		
	bos taurus	phalanx III	flaky surface	L 5.9; B 2.3
	bos taurus	humerus R dist epiph fr	trochlea fr; 20%	.
	bos taurus	humerus R dist epiph + disph fr	flaky surface; 25%	Bd 6.6; BT 6.3
	bos taurus	humerus dist epiph fr	tuberculum fr unfused (<12-18 months)	.

	bos taurus	femur head fr	surface almost completely worn out (trabecular structure visible); fovea capitis; <5%	.
	bos taurus	tooth fr (mand M1/M2?)	lingual surface	
	bos taurus?	ulna diaph fr	10%	
	bos taurus	fourth carpal ? R	gnaw marks (rodents); surface damaged (flaky and consumed)	
	camelus	femur L epiph + metaph fr, head fr	heavy weathering, surface very flaky and corroded, worn out	DC 5.4
	camelus	phalanx II	gnaw marks (rodents) on diaph and dist epiph; cut marks on prox metaph (2 thin long parallel ones, one short on caudal side)	
	und large	metacarpus diaph fr	gnaw marks (rodents); 5%	.
	und large	lumb vertebra fr	dorsal spine fr + neural arch fr; 5 parallel thin cut marks on spine; 20%	.
	und large	scapula fr	5%	.
	und large	cranium fr		
	und large	vertebra fr	centrum; 20%	
	und large	cerv vert fr ?	30%	.
	und large	tibia diaph fr	crista tibiae; 10%	.
	und large	diap fr (tibia? humerus?)	<10%	
	und large	ulna diaph fr	10%	
	und large	8 flat bone fr		
	und large	pelvis fr ?	<5%	
	und large	5 diaph fr		
	und large	cranium fr (foramen magnum?)? Or vertebra fr ? (atlas?)		
	und large	rib fr		
	und large	2 und vertebra fr		
	und large	3 und fr		
	und medium	cerv vertebra	98%	
	und medium	thor vertebra fr	80%	
	und medium	lumb vertebra fr	45%	
	und medium	cerv vertebra fr	90%	

	und medium	thor vertebra fr	dorsal spine; 30%	
	und medium	lumb vertebra fr	10%	
	und medium	thor vertebra fr ?	centrum; 20%	
	und medium	vertebra fr	neural arch; <10%	
	und medium	vertebra fr	neural arch; gnaw marks (rodents); <10%	
	und medium	thor vertebra fr	dorsal spine fr; <10%	
	und medium	rib fr		
	und medium	mand fr		
	und medium	7 flat bone fr		
	und medium	6 diaph fr		
	und medium	lumb vertebra fr	20%	
	und medium	rib fr prox	art portion	
	und medium	2 rib prox fr		
	und medium	4 rib fr		
	und	19 und fr	smaller than 2cm	
	cetacean small	caud (lumb?) vertebra fr	transversal prosesses fr + centrum; unfused; dolphin?	diam 4.7
	cetacean small	caud (lumb?) vertebra fr	centrum; unfused; dolphin?	
	cetacean small	vertebral epiph	unfused; dolphin?; matches with vertebra	
	cetacean small	vertebral epiph fr	unfused	
	sea turtle	hypoplastron dist fr		
	sea turtle?	phalanx	very damaged surface; or medium cetacean?	GL 5.3; Bp 2; Bd 2
	sea turtle	tibia	damaged surface (flaky, root etching); cut marks on diaph and dist epiph edge	GL 10.3; Bp 2.5; Bd 1.9
	sea turtle	4 carapace bone fr		
	sea turtle	carapace bone fr	periph edge	
	sea turtle	2 carapace fr	lateral portion	
	sea turtle	vertebra fr ?	art process	
	sea turtle	carapace bone fr	lateral portion, articulation fr	
	sea turtle	carapace bone fr	articulation fr, lateral and periph edge portion; regular fractural line (sawn)	
	sea turtle	cranium fr?		
	avis (corvidae?)	tibiotarsus R dist epiph + diaph	corvidae? cuculidae?; 60%	Bd 0.85; SD 0.5
	fish	dentary bone fr		

	fish	skull fr opercle fr?		
	fish	skull fr mand artic ?		
	fish	skull fr ?		
	fish	3 und fr		
	fish	2 vertebrae small		
	fish	1 vert fr medium		
	fish	3 vert big		
	fish	vertebra very big		
	shell	cypraea fr		L 6.2
	shell	cypraea fr	animal holes on operculus	L 5.4
	shell	2 mytilidae		L 5.6; 8.7
	shell	1 trochidae fr		
	shell	8 oliva bulbosa	pierced apex; surface worn out and corroded	L 4.6, 4.2, 4.5, 4.1, 3.7, 3x 3.2, 4.7
	shell	oliva bulbosa fr		
	shell	arcidae fr		
	shell	2 arcidae		L 5.8, 6.0
	shell	cassidaria?	heavily damaged surface, corrosion	L 7.1
	shell	conidae	surface worn out	L 2.25
	shell	bursidae? Fr	surface heavily corroded	
	shell	tunnidae fr	tonna luteostoma?	
	shell	haliotidae fr		
	shell	fissurellidae		L 4.4
559 III (A200, box 3)				
	ovis vel capra	femur prox epiph fr	head + fovea capitis + metaph	DC 1.75
	und medium	cerv vertebra	gnaw marks (rodents, on tranv proc); unfused; 100%	
	und medium	cerv vertebra fr	unfused	
	und large	scapula dist fr, fossa fr	surface highly damaged, worn out, flaky; <10%	BG 3.9?
	und large	diaph fr humerus? Tibia?		
	und large	rib prox fr	articulation	
	und large	rib fr		

	und large	pelvis fr?		
	shell	oliva bulbosa	pierced apex	L 3.7
	shell	und fr	mother-of-pearl on both sides	thick. 0.3
559 IV (A200, box 3 , 7/11/12)				
	fish	vertebra fr big		
	fish	vertebra fr small		
	und medium	radius fr L?	ulna groove	
	shell	oliva bulbosa	pierced apex	L 4
	shell	oliva bulbosa		L 3.5
	shell	cypraea	broken back	L 4.6
	shell	cypraea fr	small hole on back	L 6?
559 V (A200)				
	ovis vel capra	scapula R fr mesial	spina fr; <10%	
	ovis vel capra	scapula R fr mesial	spina fr; <10%	
	ovis vel capra	scapula L dist fr, collum + spina + fossa	acromion + tuber missing, fossa fr; 15%	SLC 1.5; LG 2.5
	capra hircus	humerus R dist epiph fr + diaph fr	edges worn out; not completely fused on condyles (around 10 months)	SD 1.4; Bd 2.8; BT 2.6?
	ovis vel capra	femur L (?) diaph fr	foramen; 40%	SD 1.4
	capra hircus	mandibula R fr	foramen on diastema anterior to P	
	capra hircus	horn core R fr dist portion		
	ovis vel capra	pelvis R fr acetabulum fr + ischium fr		
	ovis vel capra	mand M1/M2 fr	lingual layer (<10%)	
	und large	femur dist epiph fr ?	unfused (<42-48 months)	
	und large	rib fr		
	und large	scapula mesial fr		

	und large	6 flat bone fr		
	und large	2 diaph fr		
	sea turtle	carapace fr lateral portion		
	sea turtle	carapace bone fr prox portion + rib fr	unfused?	
	sea turtle	pelvic girdle fr, acetabulum	sutura; 1/3 acetabulum	
	sea turtle	pelvic girdle fr, acetabulum fr	sutura	
	sea turtle	pelvic girdle fr, acetabulum fr	sutura	
	sea turtle	carapace vertebral body fr	70%	L 4.6
	sea turtle	pelvis fr?	<5%	
	fish	vertebra fr big		
	fish	vertebra fr very big		
	fish	vertebra small		
	fish	vertebra fr small + metapophysis fr		
	shell	2 oliva bulbosa	pierced apex	L 4.1; 3.5
	shell	oliva bulbosa	pierced apex and body	L 3.7
	shell	und bivalves conglomeration	reef shells	

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US	SPECIES	ANATOMICAL PART	OBSERVATIONS	MEASUREMENTS (cm)
558 (* A196, box 2)				
	bos taurus	astragalus L	trace of burning; cut marks (2 on each dist condyle on cranial view; 2 on prox condyle caudal view; 3 on prox condyle prox view; 2 on lateral side); 95%	GL 6.7; Bd 4; SDI 3.5
	bos taurus	astragalus L fr	60%	GL 6.2; SD 3.35
	ovis vel capra?	femur diaph fr ?		SD 0.9
	und large	und diaph fr		
	und medium	2 rib fr		
	und medium	cranium fr	sutura fr	
	und	7 und fr		
	sea turtle	carapace bone fr		
	sea turtle	phalanx		
	sea turtle	carapace bone fr + rib fr		
	sea turtle	3 carapace bone fr	lateral portion	
	sea turtle	3 plastron fr		
	sea turtle	und epiph fr	<5%	
	sea turtle	und diaph fr		
	shell	mytilidae		VH 6.3
	fish	7 teeth	loose	L 0.6
	fish	3 und bone fr		
	fish	facial dentary bone fr mandibula? + 6 teeth + 2 teeth fr	50%	L 0.18
558 (A196a)				
	ovis vel capra	scapula R dist fr, fossa + collum + spina	acromion missing; gnaw marks on fossa and tuber (small and parallel on tuber, small and not parallel on tuber, rodents and not); 30%	SLC 1.8; GLP 3.1; LG 2.4; BG 1.8

	ovis vel capra	metatarsus L	unfused (<20-28 months); gnaw marks on diaph (rodents); 99%	SD 1.2; Bp 1.9; Dp 1.7; GDd 1.3; L 1.3; Bd 2.8
	ovis vel capra	femur L prox diaph + epiph fr	unfused (<30-36 months); gnaw marks on metaph and trochanter minus (rodents); 60%	SD 1.6; Bp 3.2
	capra hircus	radius L dist epiph fr + diaph fr + ulna dist diaph fr	root etching, 70%	SD 1.5; Bd 2.4; Dd 2.1
	ovis vel capra	pelvis L fr acetabulum fr + ischium fr	tuber ischiadicum fr	
	ovis vel capra?	cranium fr	foramen magnum fr; many gnaw marks (rodents)	
	ovis vel capra	metatarsus L dist epiph fr + diaph fr	unfused (<20-28 months); 70%	SD 1.2
	ovis vel capra	scapula L dist fr; fossa + spina + collum	tuber + acromion missing; 20%	SLC 1.6; GLP 1.8; GB 1.9
	ovis vel capra	scapula R fr	acromion + spina fr + collum; glenoid fossa missing; surface corroded, root etching; traces of burnt earth	SLC 1.6
	ovis vel capra	pelvis R fr	ilium fr + acetabulum fr + ilium fr; some gnaw marks (rodents); 70% of L pelvis	
	ovis vel capra	radius R dist epiph fr + diaph fr + ulna dist epiph fr+ diaph fr	gnaw marks on metaph (rodents); oblique fracture; 20%	SD 1.4
	ovis vel capra	scapula L dist fr; gl fossa fr + tuber fr + spina fr + collum	acromion missing; cut marks on collum close to fossa margin (small cuts); 15%	SLC 1.6; BG 1.6; LG 2?
	ovis aries?	radius L	dist epiph unfused (10 months< age at death < 36 months); surface corroded, root etching; gnaw marks on all diaph and metaph (rodents), some gnaw marks on prox epiph edge non corresponding to rodent marks (other small carnivore); 99% (prox epiph damaged)	Bp 2.65; Dp 1.4; SD 1.4; Bd 2.5; Dd 1.7
	ovis vel capra	calcaneus L	unfused head (<30-36 months); gnaw marks on processus ant; sustentaculum fr; proc ant fr; traces of burnt earth; 98%	GDde 2.3

	ovis vel capra	pelvis R fr	acetabulum fr + ischium fr; surface completely corroded	
	ovis vel capra	mandibula R fr hinge	proc coron + proc artic + foramen ment; cut mark on proc art (1 thin cut)	Wr 4.3
	ovis vel capra	mandibula R fr, hinge	proc coron + proc art + foramen men fr	
	ovis vel capra	M1/M2 max		L 1.3; B 0.9
	ovis vel capra	M1/M2 max L	6-12 months?	L 1.5; B 0.9
	ovis vel capra	M1/M2 max R	M1 (2-3 years?), M2 (3-6 years?)	L 1.4; B 1.1
	ovis vel capra	M1/M2 max L fr	occlusal surface fr	L 1.6
	ovis vel capra	M1/M2 max L	occlusal surface fr	L 1.6; B 1
	ovis vel capra	M1/M2 max R		
	ovis vel capra	M1/M2/M3 fr		
	capra hircus	mandibula L fr + P3 + P4 + M2 + diatema fr	P3 unworn (21-30 months), P4 unworn (21-40 months), M2 (2-3 years)	P3 L 0.8; P4 L 0.9; M2 L 1.5; Hdiast 1.5
	capra hircus	mandibula R fr + P3 root fr +M1 +M2 + diastema fr	M1 (3-4 years), M2 (3-6 years) = 3-4 years	M1 L 1.45; M2 L 1.05; Hdiast 1.4
	capra hircus	mandibula R fr + diastema fr + P2 + P3 +P4 + M1 + M2	P2 and P3 not yet erupted (21-24/30 months); P4 in eruption (21-24/40 months); M1 (2-3 years); M2 (1-2 years) = 2 years	M1 L 1.1; M2 L 1.4
	capra hircus?	M1/M2 mand R	unworn erupting, M1 5-6 months, M2 8-12 months	L 1.6; B 0.5
	capra hircus?	M1/M2 mand R fr	unworn erupting, M1 5-6 months, M2 8-12 months	L 1.6; B 1.1
	capra hircus	M3 mand R	unworn (1-2 years)	B 1.3, L 2
	capra hircus?	pelvis fr	pubis fr; juvenile	
	ovis vel capra	und loose tooth fr		
	ovis vel capra	maxilla fr		
	ovis vel capra	mandibula fr		
	ovis vel capra	3 maxilla und fr	<5%	
	bos taurus	calcaneus R fr	corpus calcanei fr; very damaged surface, flaky; traces of burning; 80%	GB 4
	bos taurus	astragalus R fr	traces of burning; 90%	Bd 3.8; Dl 2.9
	bos taurus	phalanx III	gnaw marks (rodents, on all edges and articular surface); traces of burnt earth	L 6.6; Bd 2.5

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	bos taurus	tibia R dist epiph + diaph fr	surface damaged (worn out and flaky); smooth perpendicular/transversal cut line due to sawing; slightly visible cut marks on diaph; parallel chop (?) marks on metaph; splintering; 30%	Bd 6.1; SD 3.8; Dd 4.1
	bos taurus	radius L dist epiph + diaph fr	unfused (<42-48 months) corresponds to unfused epiph of same animal; heavily damaged surface, completely corroded or worn out, trabecular structure visible(only a few flakes of original surface preserved); 20%	Bd 8.4
	bos taurus	radius L dist epiph fr	unfused (<42-48 months) corresponds to unfused epiph of same animal; worn out surface, edges especially; 60%	Bd 8.7
	bos taurus	tibia L prox epiph fr	unfused (<42-48 months);damaged surface, worn out edges 30%	
	bos taurus	femur L dist epiph fr	lateral condyle fr; surface corroded, root etching, worn out edges; 10%	
	bos taurus	metatarsus ? dist epiph condyle fr	unfused (if metatarsus <27-36 months; if metacarpus < 24-30 months); two cut marks on lateral aspect of condyle edge;49% of complete epiph (1 condyle fr; Bd 2.2)	
	bos taurus	M1/M2 mand R	unworn (M1 5-7 months; M2 15-17 months)	L 2.9; B 1
	bos taurus	ulna L prox epiph fr	olecranon tuber; 10%	
	und medium ?	metapodium ? diaph fr	surface seems polished (wear? used as tool?); juvenile?;30%	SD 2
	und medium	cranium fr	2 contiguous sutures; brain cavity; round edge	
	und medium	tibia diaph R fr ?	foramen + crista tibiae; < 10%	
	und medium	2 rib fr		
	und medium	thor vertebra	dorsal spine fr + transverse proc fr missing; unfused; gnaw marks on spine (rodents), small cuneiform marks (?); 95%	
	und large	thor vertebra fr	centrum; traces of partial heavy burning on a small preserved area; gnaw marks on centrum (rodents); 30%	

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	und large	thor vertebra fr	dorsal spine; gnaw marks (rodents); corroded surface; 30%	
	und large	rib fr		
	und large	3 rib fr		
	und large	rib fr	gnaw marks (many, rodent marks on boh edges of both sides)	
	und large	pelvis fr		
	und large	pelvis fr	gnaw marks (rodents) on edge	
	und large	4 diaph fr		
	und large	diaph fr	gnaw marks (rodents) on fracture line	
	und large	vertebra fr		
	und large?	femur prox diaph fr ?	surface heavily damaged	SD 2.5
	und	7 und fr	too small	
	und			
	sea turtle	peripheral plate bone	gnaw marks (many on all edges, rodents); sutures	B 1.8; L 4.4
	sea turtle	peripheral plate bone fr	gnaw marks (many rodent maks on all edges of both sides, one series of thinner and shorter marks); sutures fr; curved shape (smooth edge on one extremity) first plate piece close to nuchal bone (R?)	
	sea turtle	peripheral plate bone fr	gnaw marks (many, on edges of all sides); one suture	
	sea turtle	carapace bone fr	50% completely burnt (surface and section)	
	sea turtle	ulna R epiph + diaph fr	surface corroded and worn out;cut marks (5 cuts on metaph and epiph edge; 20%	B 3.2; D 1.3
	shell	oliva bulbosa	pierced apex; well preserved surface	L 4.1
	shell	chlamys townsendi fr	traces of burning on internal surface and section (circular concentration of burnt surface, oil lamp?); 45%	
	shell	chlamys townsendi fr		
	shell	2 arcidae		L 5.3; L 5.6
	shell	patellidae		L 3.4
	shell	tunnidae	entire, surface very well preserved	H 4.6
	shell	ranellidae fr ?		

	shell	und fr + serpulidae incrustation		
	fish	3 vertebrae fr medium		
	fish	2 vertebrae fr very big		
	fish	vertebra fr big		
	fish	vertebra fr very small		diam max 0.9
	fish	ultimate vertebra	gnaw marks on caudal edge (rodents)	diam artic 1.8
	fish	2 skull fr		
558 (A201, box 3)				
	ovis vel capra	epistropheus fr	odontoid process fr; flaky surface, damaged	
	sea turtle	carapace bone fr	lateral portion	
	sea turtle	carapace bone fr	lateral portion	
	sea turtle	2 carapace bone fr		
	shell	chlamys townsendi fr	internal surface and cross section completely burnt, part of external surface burnt	
	shell	2 oliva bulbosa	pierced apex	L 4.4; L 4.5
	shell	conidae		L 3.8
558 (A201, 7-11-12)				
	capra hircus	pelvis L fr	ischium fr + acetabulum fr	
	ovis vel capra	astragalus L	edges partilally non preserved; 100%	GL 2.6; Bp 1.6; SD 1.35
	ovis vel capra	pelvis L fr	acetabulum fr + ilium fr; flaky surface; worn out edges	
	ovis vel capra	pelvis L fr	acetabulum fr + ischium fr	
	ovis vel capra	metacarpus R prox epiph + metaph fr	<5%	Dp 1.3

	ovis vel capra	femur diaph fr	one of the fracture lines regular profile may bear gnawing carnivore marks (chewing); other multiple flaking fracture; 30%	SD 1.3
	ovis aries?	metapodia dist epiph	unfused (<24 months); entire trochlea	Bd 1
	ovis vel capra	humerus prox epiph fr		
	bos taurus?	humerus fr	external portion of trochlea; gnaw marks (few, rodents)	
	bos taurus	tibia L dist epiph fr	unfused (<24-30 months); 50%	Dd 3.6
	und medium	flat bone fr		
	und large	flat bone fr		
	und large	2 long bone diaph fr		
	und large	diaph fr humerus?	tuberosity; <5%	
	und large	diaph + metaph fr tibia?	vertical fracture; C-shaped cross section; ridge slightly twisting; <10%	
	und large	diaph fr tibia?	soleal line?; <5%	
	und large	diaph fr	traces of burning	
	und large	scapula L mesial fr	spina fr; trace of burning; < 15%	
	und large	und fr	only cancellous bone preserved; surface almost completely worn out; 1 surface with regular/flat profile and traces of surface; partially burnt	
	und large	und flat bone fr	cancellous bone preserved; surface almost completely worn out except for a tiny portion with flat profile and a bigger but more worn out portion of surface parallel to the previous (distance 3.5 cm one from the other)	
	und large	vertebra fr	traces of burning; <5%	
	und large	cerv vertebra fr	centrum + neural arch fr + foramen; traces of burning on ext surface; 2 neat linear fracture lines (chop marks?), the first dividing vertically the vert almost in its medial axis, the second oblique to the first one, just penetrating the vert body, both have very smooth regular surface and profile; 45%	
	und large	vertebra fr lumbar?	transv proc; surface damaged; 15%	

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	und large	humerus prox diaph fr	unfused (if bos <42-48 months); tuberculum fr?; <5%	
	und large	scapula dist fr, collum fr +fossa fr	heavy weathering; flaky worn out surface; gnaw marks (rodents, on fossa edge); traces of burnt; <5%	
	und medium	femur diaph fr	one of the fracture lines regular profile may bear gnawing carnivore marks (chewing); other multiple flaking fractures; 30%	SD 1.3
	und medium	humerus diaph fr?		
	und medium	3 diaph fr	<5%	
	und medium	flat bone fr		
	und	calcaneus L prox fr	unfused (juvenile, bos<36-42); heavily weathered surface (only partially preserved), root etching; facies art fr; traces of burning; gnaw marks (chewing both epiph, furrowing and scooping out dist portion); 45%; small bos?	preserved parts: Bp 1.5; L to facies art 5.4; BS 3.2; D lower 2.8
	fish	vertebra fr		diam 2; L 4.7
	fish	preopercular fr		
	fish	und bone		
	shell	oliva bulbosa	pierced apex; surface corroded	L 3.7
	shell	arcidae		L 4.7
	shell	conidae	surface worn out	L 6.6
	shell	trochidae		
	shell	cerithiidae fr		
	shell	chlamys	entire in 4 fr	L 10

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US	SPECIES	ANATOMICAL PART	OBSERVATIONS	MEASUREMENTS (cm)
556 (A201, 6-11-12, box 3)				
	ovis vel capra	atlas fr	foramen + dorsal tubercle fr + wing fr + cranial articular cavity fr + caudal articular surface fr; 45% traces of burning on surface and fractue; gnaw marks (many rodent marks on caudal art surface)	
	ovis vel capra	scapula L dist fr; collum + spina + fossa fr + tuber	acromion fr; trces of burning on surface (spots); gnaw marks on tuber (rodents); 25%	SLC 1.9; GLP 4?; LG 2.3?; BG 1.7
	ovis vel capra	pelvis L fr	ilium fr; surface damaged, root etching; 40%	
	fish	vertebra		diam 3
	fish	vertebra	oblonque section	diam 2.8
	shell	mytilidae		VH 5.3
	shell	2 und fr		
	shell	buccinidae	babilonia spirata?	VH 4.8
	shell	chamidae?		VH 5
556 (A201, box 3)				
	shell	3 oliva bulbosa	pierced apex	VH 4.1; 3.6; 3.7
	shell	und fr	mother-of-pearl on internal surface	
556 (A201, 4-11-12, box 3)				
	ovis vel capra	tibia L dist epiph fr + diaph fr	unfused (<18-24 months); 10%	Dd 1.7?
	capra hircus?	astragalus R fr	surface completely corroded; 95%	Bd 1.7; SD 1.5
	ovis vel capra	scapula mesial fr	spine fr; <5%	
	ovis vel capra	humerus diaph fr	foramen; root etching; <10%	SD 1.4
	und medium	thor vertebra	spinous proc fr + neural arch fr; traces of burning; <10%	

	und medium	radius diaph fr	root etching; <5%	
	und medium	cerv vertebra fr	transv process fr; <5%	
	und medium	cerv vertebra fr	centrum; 25%	
	und medium	2 und diaph fr	<3%	
	und medium	2 und fr	<3%	
	und large	tibia dist diaph fr	medial malleolus; heavy weathering (surface almost completely worn out, flaky, cracked; edges worn out); 5%	
	und large	rib prox fr	art; 5%	
	und large	thor vertebra fr	spinous proc fr + centrum fr + neural canal; gnaw marks on spine (rodents); unfused; cut mark on dorsal aspect of spinous process above art surface; 30%	
	und large	und diaph fr	heavily damaged and flaky surface; <5%	
	und	2 und tooth fr	<5%	
	shell	dentalium octangulatum		
	shell	3 arcidae fr		
	shell	2 oliva bulbosa	pierced apex	VH 3.8; 4.5
	shell	buccinidae	babilonia spirata?	H 5.2
	shell	potamididae ?		
	shell	und		
	shell	und very big fr	serpulidae traces	
	shell	mytilidae fr		

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US	SPECIES	ANATOMICAL PART	OBSERVATIONS	MEASUREMENTS (cm)
544 (A196)				
	ovis vel capra	humerus R dist epiph fr	discriminant criteria non preserved; cut marks on lateral aspect of tuberculum maius	Bd 2.7; BT 2.6
	ovis vel capra	tibia R diaph fr	prox portion, crista tibiae; 70%	
	ovis vel capra	phalanx II fr	discriminant elements non preserved; prox epiph fr + diaph fr + dist epiph fr;gnaw marks (rodents, on dist epiph); 45%	GL 3.2; Dd 0.9?
	ovis vel capra	metacarpus L dist diaph fr + metaph fr + epiph fr	unfused (<18-24 months); gnaw marks (rodents, on all sides of diaph); 40%	SD 1.1
	ovis vel capra	metacarpal scaphoid R	cut mark (on dorsal view); gnaw marks (on medial aspect)	D 1.7; B 1
	ovis vel capra	tibia diaph fr	crista tibiae fr; <3%	
	ovis vel capra	tibia R prox epiph fr	unfused (<36-42 months); 10%	
	ovis vel capra	tibia prox epiph fr	traces of burning	
	ovis aries?	M3 mand L fr	2-3 years	L 2.1; B 0.7
	bos taurus	phalanx II	damaged surface (flaky, breaks); traces of burning; cut marks (on prox epiph edge and diaph, on cranialaspect of diaph); fits with following sesamoid	GL 3.8; Bd 2; Dd 2.5; Bp 2.7; Dp 3
	bos taurus	tarsal L sesamoid 2pts prox fr	fitting under previous phalanx II	B 2.1
	bos taurus	metapodia dist diaph fr	2 trochleae fr; falky damaged surface; 15%	Bd 4.9; Dd 3.1
	rattus	femur R prox epiph	troch maius + troch minus + head; 50%	DC 0.35; Bp 0.8; Bd 0.5; Sd 0.35
	und medium	thor vertebra fr	unfused; 60%	
	und medium	pelvis R fr	acetabulum fr + ischium fr; gnaw marks on ischium	
	und medium	pelvis L fr	ilium fr	

	und medium	pelvis R fr	acetabulum fr + ischium fr; gnaw marks; unfused; surface damaged	
	und medium	lumbar vert fr	unfused; spinous proc fr; transv proc missing; cut mark on dorsal aspect of articular processes; 80%	
	und large	rib prox fr	artic; traces of burning	
	fish	rib fr?		
	fish	3 vertebrae		diam 1.9
	fish	vert fr		diam 1.6
	fish	vert fr + spine fr		diam 1.4
	fish	vert fr + spine fr		diam 2
	fish	2 vert		diam 0.8
	fish	2 vert		diam 0.9
	fish	vert fr + dorsal spine		diam 1.6
	fish	vert fr		diam 1.8
	fish	vertebra + dorsal spine		diam 0.9
	fish	4 mand fr		
	fish	palatine bone fr		
	fish	2 palatine bones	100%	
	fish	symplectic fr?		
	fish	und bone fr		
	fish	vertebra fr		
	cetacean large	und fr (vertebra?)	2 parallel foramina; partially burnt; surface worn out (only cancellous bone preserved)	
	cetacean large	und fr (vertebra?)	2 perpendicular foramina; partially burnt; surface worn out (only cancellous bone preserved)	

SUM12C, US 544

	cetacean large	vertebra fr ?	foramen fr; surface worn out (only cancellous bone preserved); partially burnt; caudal?	
	cetacean large	vertebra fr ?	two foramina (1 entire, the other fr) parallel; surface worn out (cancellous bone preserved); traces of burning; caudal?	
	shell	4 oliva bulbosa	pierced apex	L 4.4; 3.8; 4; 3.6
	shell	cypraea fr	lip; 40%	L 6.9
	shell	fasciolariidae fr		
	shell	cardiidae fr	ambon	
	shell	und bivalv fr		
	shell	und gastropod fr		

SUM12C, US 555

US	SPECIES	ANATOMICAL PART	OBSERVATIONS	MEASUREMENTS (cm)
555	cetacea medium/large	mandible fr ?	foramen mental; surface partially preserved, heavily corroded; <5%	
	cetacea medium/large	23 maxilla/cranium fr ?	flat surfaces and foramina consistent with maxillar anatomy or in some cases cranial one; surface partially preserved, heavily corroded; <5%	
	cetacea medium/large	4 und fr, maxilla/cranium?	surface partially preserved, heavily corroded; <2%	

IMTO – Italian Mission To Oman

University of Pisa

KHOR RORI

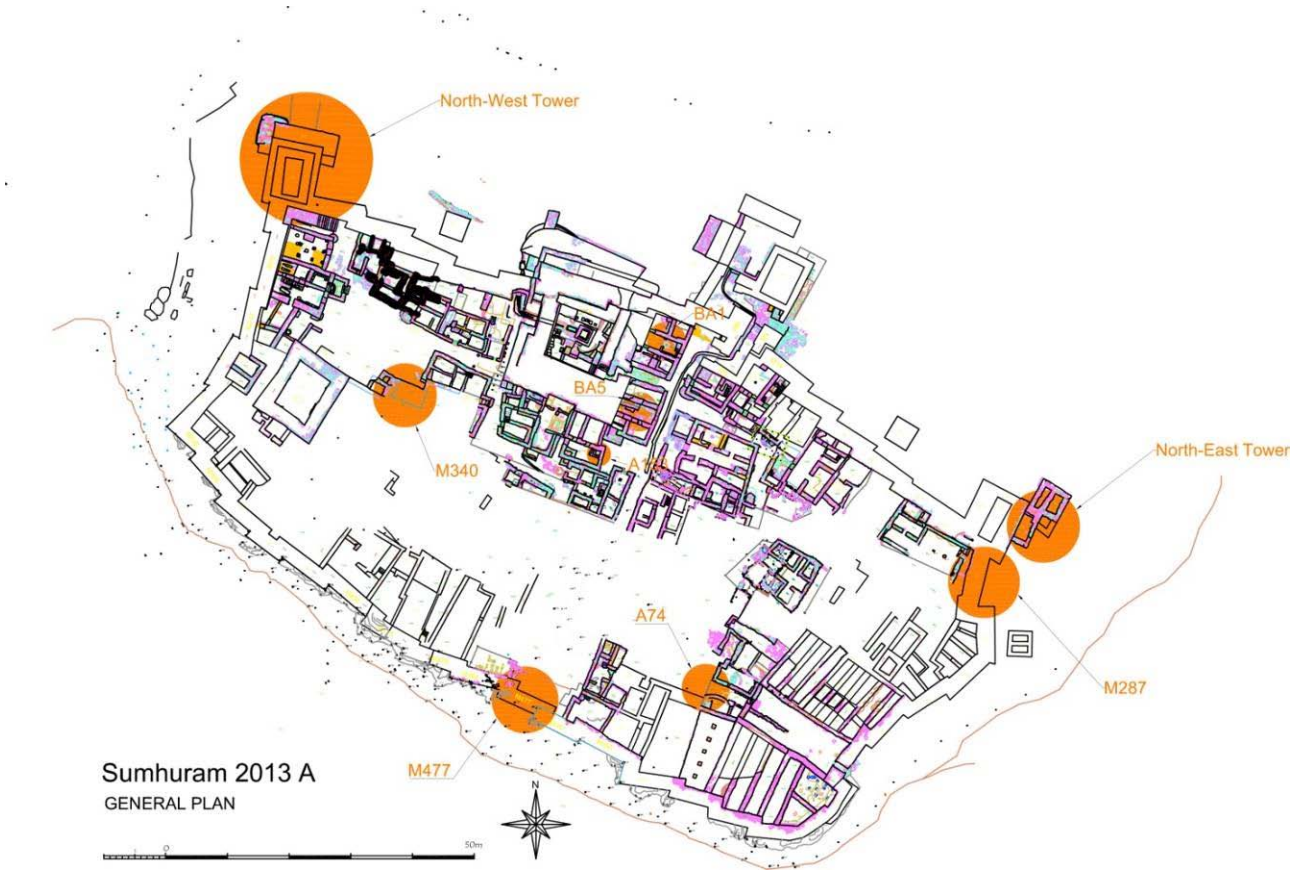
Technical Report

26th January – 15th March, 2013

(arch. Roberto Onofrio, arch. Valter Filatondi)

Introduction

This campaign on the site of Khor Rori took place from 2013 January, 26th, to March, 14th. During the seven weeks of activity, the effort was concentrated on the restoration of the several areas as shown on the plan below.



1. Restoration of the wall M129 at the north-west side tower of the city
2. Rising up of some rows of the city wall M477 at the south side of the city
3. Restoration of the city wall M287 at the east side of the city
4. Restoration of the external leaves of the north-east side tower of the city
5. Demolition of the false wall at the room A74
6. Remodelling of the tourist platform close to the wall M340
7. Restoration of some wall and doors at the areas BA1 and BA5
8. Restoration of the stair at the room A153
9. Removing of a part of the south-east tourist path

Two teams of workers, each of twelve members, have been engaged for all the needed operations to complete the restoration of the above mentioned walls and areas. One team of six people was engaged to prepare the sieved sand and the mortar used by the other teams.

Mortar preparation

Before starting the reconstruction of the walls, we provided several samples of composition for the mortar. We tried different percentages of brown and yellow colour in order to reach the same chromatic tone as the mortar previously used in the restoration. We prepared four different samples using the following mix:

1. **80** parts of brown colour with **200** parts of yellow colour
2. **80** parts of brown colour with **250** parts of yellow colour
3. **100** parts of brown colour with **300** parts of yellow colour
4. **200** parts of brown colour with **300** parts of yellow colour

Sand and lime were always:

- four buckets of sand with eight scoops (600grams/each) of lime.

As soon as the mortar dried, we chose the composition n. 2 that was the more similar to the previous used mortar.

To fix the stones each other, we used two different kinds of mortar as it has been done during the previous campaign:

- **stone mortar**, for the external stones, obtained by the mix of sieved sand, hydrated lime, brown and yellow oxides for the chromatic tone.
- **filling mortar**, used for the back filling of the structure, made with the same components, except the use of raw sand instead of sieved sand.

Working progress status

In order to check the advancement of the works, we daily took a significant number of pictures of all the areas in which we had to make the restoration.

The number of the pictures and the position from which they are taken from, are hereby reported in order to have a weekly update about the working progress status. From every reference point, two or three pictures have been taken, depending on the significance of the point of view.

Restoration of the wall M129

On 28th January 2013, we started the cleaning of the wall. The actual situation is shown on the picture below.

The cleaning of the collapsed or not vertical part of the wall started on the west side (M129) and stopped as shown on the following picture

Then the reconstruction of the wall M129 started installing a layer of geotextile over the original stones and the new ones above.

On 28th February the wall M129 appears as shown in the following picture

On 09th March the wall M129 appears as shown in the following picture

On 12th March the restoration of the wall was finished. See picture below.

Restoration of the wall M287

On 28th January 2013, we started the cleaning of the wall. The wall is shown on the picture below in its original situation.

Then the reconstruction of the wall M287 started installing a layer of geotextile in between the original and the new wall above

The picture below shows the situation after the restoration of the wall.

At the end the restoration and the beautification is as shown on the following picture.

Restoration of the wall M227

On 10th February 2013, we started the work of restoration. The wall is shown on the picture below in the original situation.

We started with the cleaning and the removal of the bettered stones

A layer of geotextile has been posed on the original stones and is started the setting with the new ones and the beautification.

This picture shows the situation of the wall after the restoration.

Restoration of the walls M228-M229

On 12th February 2013, we started the cleaning of the walls and the removal of the bettered stones. The walls are shown on the picture below in the original situation.

Than the reconstruction of the walls starts with the installation of a layer of geotextile between the original and the new stones.

The picture below shows the situation after the restoration.

Restoration of East Tower (walls M308 and M311)

On 17th started the restoration of the tower with the setting of some new stones on the walls M308 and M311.

wall M308 before restoration

wall M308 after restoration.

wall M311 before restoration.

wall M311 after restoration.

Rising up of the city wall M477

This restoration becomes necessary to better understand that the opening in the city wall, facing to the south, was not a gate of the city. It has been decided to rising up a row of stones to remember that no gate was provided in that location. The pictures below show the sequences of the restoration.

(continue M477)

Restoration of the stair at the room A153

The situation of the stair was as shown on the picture below.

After the restoration the stair is as follows:

Restoration of walls and doors at the area BA5

On 6th February under the supervision and the information of an archaeologist we took the restoration of some parts of the rooms at the area BA5. The works started with the removal of the battered stones that risked to collapse to the ground. Than these are continued with the installing of a layer of geotextile between the original and the new stones. The setting of the new stones and the raise of the walls have been the successive operations.

Has also been done a work of restoration of a little stair in the area A54

This is the situation of the wall M107 after the restoration

This is the situation of the wall M108 after the restoration

This is the situation of the wall M64 after the restoration

This is the situation of the stair in the area A54 after the work of restoration

Restoration of walls and doors at the area BA1

On 11th February another work of restoration of some parts of the rooms started in the area BA1. The points of the restoration are highlighted in the following plant.

This is the situation of the wall M31 after the restoration.

This is the situation of the wall M32 after the restoration

This is the situation of the wall M33 after the restoration

This is the situation after the restoration of the wall M27

This is the situation of the wall M28 after the restoration

Demolition and reconstruction of the tourist platform close to M340

On 28th January 2013, we started the demolition of the tourist platform. A wall was discovered under the platform and therefore the archaeologists decided to partially remove the platform and remodelling it. The pictures below show the situation.

Demolition of a false wall at the room A74

On 28th January 2013, we started the demolition of the wall that was supported by props to avoid it to collapse. The wall was not connected to any other wall and the archaeologists decided to investigate by excavation under the tourist path. The pictures below show the situation.

(continue room A74)

picture taken from south

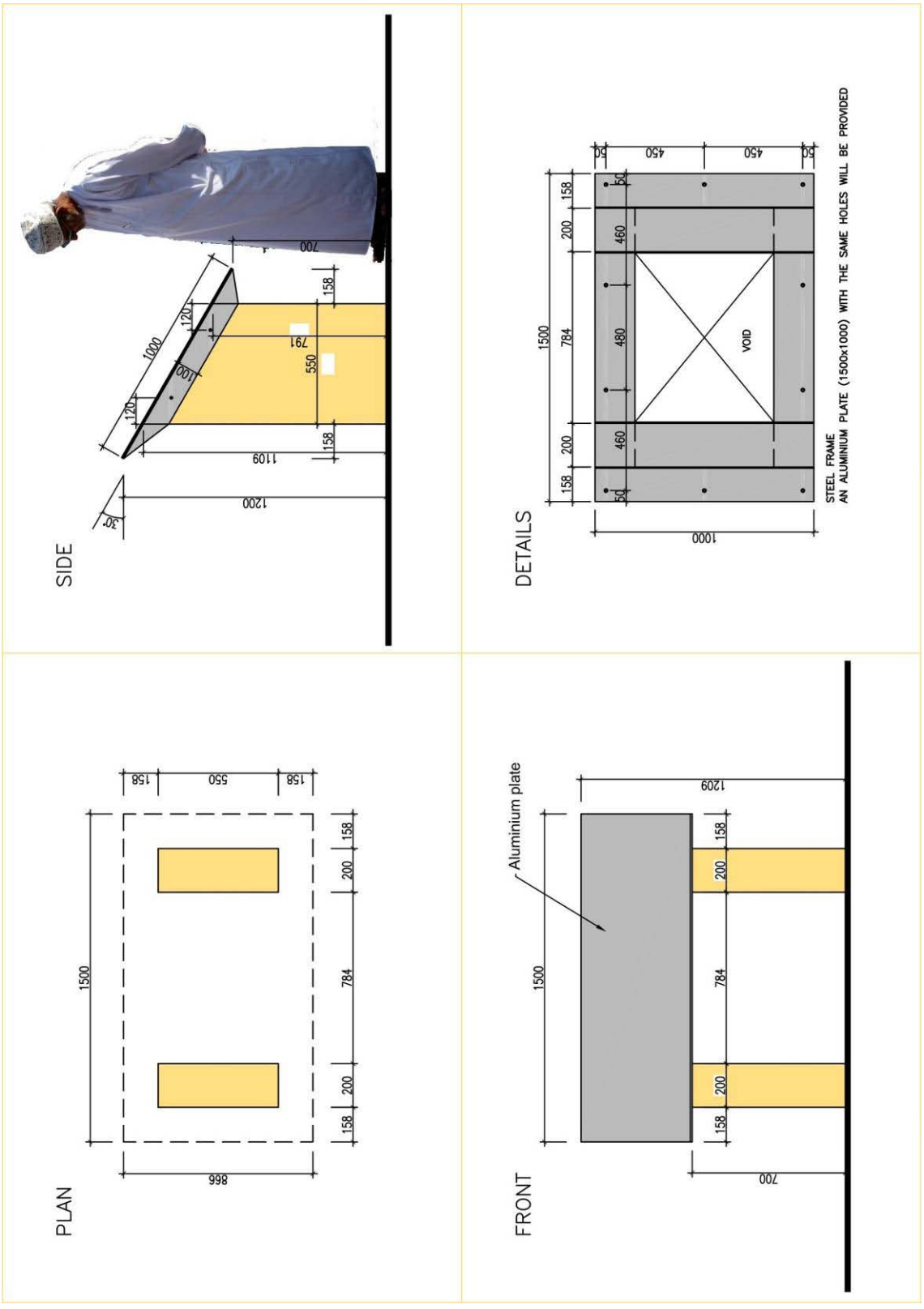
picture taken from north

Removing of the south-east part of the path

On the 6th March is started the demolition of a part of the path as a result of identification of the future new areas of excavation.

Design for the two new big explanatory panels

Following the previous design for the normal new explanatory panels, a design for the two big panels located at the entry and at the main entry path have been drown.



Proposal for a new solution for the Entry Box

The solution provides the redefinition of the internal spaces with a room dedicated for info and drinks whilst the other spaces are used as toilets for female and male separately.