Aerial photo of the Town of Um er-Rasas

The Southern Main Part Of Um Er-Rasas as seen from the north before works of excavation. In the foreground is the Church of St. Stephen (1987)
The Two Quarters of Um er-Rasas
As seen from the north. St. Stephen Church in the foreground
People at work in St. Stephen Church
Terraced Agricultural field (or a dam)

The Square double Storeyed Building in the middle, the Stylite Tower in the background, the Reservoirs in the foreground as seen from north.
Reservoirs hewn in the bedrock in the foreground. Dammed rain water in the background.

Detail of the reservoirs, one still roofed with arches and slabs.
Aerial View of
The Tower with its Church to the South

The Tower of Umar-Rasas
A watch room with rolling stone door among the agricultural fields

Another watch room with farmstead
The Twin Churches Inside the Castrum

As seen from the North. St. Stephen Church in the Foreground
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The Central area of the Nave

Bishop Sergius Church - Detail of the carpet
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Sergius Church: The Eastern Area of Carpet
The Hashemite Kingdom of Jordan

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Protection and Promotion of Cultural Heritage Project.
Preliminary design for Umm-Ar-Rasas

FINAL TECHNICAL REPORT
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1. Executive Summary

All answers to the questions concerning the site were obtained from various interlocutors and available documents.

One important doubt remains however, concerning the land property, yet a fundamental issue for the future safeguarding of the Umm ar-Rassas vestiges. In spite of a variety of formal steps and requests this issue is still not clearly addressed. This is much to be regretted since the procedure which has been initiated by the Ministry of Tourism and Antiquities. However, the simple fact that this procedure of land acquisition is on going ensures there is a will to implement it. The formulated proposals, which are gathered in the chapter ‘Management Prescriptions’ will thus be based on the assumption that the entirety of the area of the so-called “Archaeological Park” has been purchased and owned in the name of the Department of Antiquities.

Works already undertaken on the site demonstrated the geological homogeneity of the underground which is made up of sub-horizontal layers of limestone rock of good mechanical qualities. However, the examination of the ruins and their surroundings reveals the existence of many artificial underground cavities, even under the pavements of mosaics (cisterns, graver...). The presence of these fragile zones are potentially dangerous for the visitors (fall risk) as well as for old and modern constructions (possible cracks, collapse). They justify the establishment of a detailed mapping of their location (this work being also of interest for archaeologists). This work should be carried out by the sole use of adapted, non destroying techniques (radar, magnetometer...), making possible, in particular, to determine the volume and the state of conservation of the cavities. No work of restoration, installation or construction should be undertaken without such a detailed mapping of the immediate underground, especially within the St Stephen complex where prove of a large bottle type cistern under the Bishop Sergius mosaics and underground cavities (tombs ?) under St Stephen church, were provided.

Concerning site management issues, a consensus was achieved to consider the fencing of the whole “Archaeological Park” as not desirable. The selected option will preserve the open aspect of the landscape and allow a controlled land use by Bedouins in-between the two archaeological poles. Continuing traditional grazing and cropping activities in this area is essential for economic and human reasons, as well as for safety and site maintenance. Would this option jeopardise conservation of the archaeological vestiges and/or the tourist development in the near future, the decision will then be taken to enclose the protected area. If this occurs, natural technical solutions with lower visual impact will be considered, such as a hedge of prickly pear.

In the same way, extrapolation from the current amount of visitors leads at the beginning to propose only limited tourist infrastructure for the site. This infrastructure (visitors’ centre and annexes) will be designed according to a modular principle, therefore being developed if needed. The visitors’ centre complex will be established to the west of the Castrum, along the Marsa road side. This area appears as being the most suitable, offering the greatest number of assets: accessibility, proximity to the modern village, presence of various technical networks (water, MT and BT electricity, telephone...), over viewing the whole site as well as far beyond. Apparently, there is no unique structure in this area. Moreover, the construction of the VC should be an opportunity to concentrate and recognise a number of public service buildings for the modern village, such as the hospital and the post office. Existing obsolete buildings within the archaeological perimeter should be destroyed.
The major problem relates to the safeguarding, restoration and presentation of the archaeological vestiges, more particularly the mosaics. Outlines emerges from the present study:

- respect of the international conventions and reversibility of installations (except whenever the safety of the visitors is concerned),
- as large as possible integration with the site environment by the use of local materials, colours, etc,
- definition and specifications of a construction system for the shelters covering the mosaics: flexible and transposable, if needed, to all structures already excavated or to be excavated,
- respect of the general volume of the ancient monuments to be protected, without overlapping the bordering zones,
- appropriate technology for the light roofing structures for the shelters: easy made and inexpensive, feasible by Jordan manufacture.

Consideration of the preservation of the general aspect of the site, including the remarkable however dangerous "fields of ruins", leads to emphasise the development of a precise and limited itinerary network, in order to secure the visit of the ruins. The civil liability of the Jordanian Service of Antiquities should clearly be restricted to these itineraries. Such itineraries will adjust as much as possible to the ancient urban physical structure, be adequately signposted and panelled, in consistency with the information dispatched in the VC. In particular, their design will allow to resist bad weather conditions, as well as human-related degradation.
II. Foreword
The SECA experts group entrusted the elaboration of the Preliminary design for Umm ar-Rassas, within the frame of the Protection and Promotion of Cultural Heritage Project in the Hachemite Kingdom of Jordan financially supported by the E.C. was composed with:
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Mr Hijazi SAUD ASSAL
Umm ar-Rassas Municipality
Mr Jazzaa al-Dieiman, Mayor, and members of the Municip
IV. Comments about LEHUN - UAR possible duality

Within the frame of the present project, the mission was requested to evaluate a possible tourism "integration" of two archaeological sites in the Jordanian Eastern Badaya: Lehan and Umm ar-Rassas. At a distance of only 17 km from each other, both sites have been widely excavated for years by Jordanian and European archaeological missions (Belgium at Lehan, Italian and Swiss at Umm ar-Rassas) making a prior feasible their integration within a common visitor.

A. LEHUN

The potentials for tourism development of the site of Lehan does not appear as obvious to the members of the site. The offset situation of the site, at the end of a "desert road", far from any active circulation axes (during last month of May none a visitor went to Lehan), the limited "visibility" of the archaeological vestiges to non-specialist visitors, (constructions of different periods only preserved at ground level) and the unfavorable general environment (uncontrolled development of the modern village completely surrounding the archaeological zone) do considerably reduce the interest of Lehan for tourism. In addition the site is very wide, fragmented, rocky and uneven, not easily worth visiting by inexperienced walkers and old people. On the other hand, it has an exceptional setting at the edge of the wadi Majib, which would constitute a paramount asset whether specialized tourism is organized in Jordan (mountain walk, trekking, gliding ....). Lastly, the already existing very detailed development plan, related to this archaeological site, brings the mission's members to concentrate their attention on Umm ar-Rassas.

B. UMM AR-RASSAS

On the contrary, there are obviously a number of tourism development possibilities for the site of Umm ar-Rassas (The "Mother of the least"). The field of ruins offers here the seizing spectacle of a one thousand and a half years old village, quite untouched by modern urbanization and constructions.

The basic settlement of UAR is known from excavations results as Kastron Mefas, a toponym attested from the Roman and Arabic sources and from the Bible. The actual visible remains of a fortified camp of about 10 ha correspond to the fortress of Mehefat mentioned by Eusebius (Onomasticon) as the place where a unit of the Roman cavalry was stationed on the edge of the desert. The military nature of the site is emphasized by the name Kastron, recorded four times on the mosaics recently uncovered in the churches. The walled area is limited to the north by an open quarter, the "Northern settlement", roughly the same size. Eleven of the fourteen churches of this tangle of archs, pillars, wall and blocks, were excavated. Several have delivered extraordinary pavements of mosaic, which make the fame of the site today. Additionally, an exceptional monument, the stylihe's tower with more than thirteen meters height is still well preserved. Located at 1.5 km north to the castra, this monument is the only witness known still preserved monument of the mosaicism movement symbolized by St Simen "the Stylihe". This tower is associated with a small church and a series of additional constructions. Between this group of buildings and the castra, all old agricultural fields are exceptionally preserved.

UAR main tourism assets are: homogeneity of a sizeable site, immediately identifiable monuments (castra, churches, houses, wine press...), importance of preserved elevations, quality of the discovered vestiges, aesthetic, scientific and historical interest of mosaics and liturgical installations uncovered, stylihe's tower, antique land use in a steppe environment, and last but not least, the site is established at the top of the highest point of that part of the plateau, offering a beautiful sight over the steppe of Moab. Which is offered to the visitor is thus a unique archaeological testimony of the way of living in a small village at the edge of the desert, at the era of the finishing time of the Byzantine glory and the first centuries of the emerging Islam.
V. PHYSICAL CONDITIONS OF THE SITE

A. LOCATION

Umm-ar-Rassas is located 26 km to the south-east of Madaba, 13 km to the east of Dhiban, 9 km to the north-east of Lehnun and 34 km to the east of the Dead Sea. It lies on the fertile plateau of Madaba at an elevation of +760 m above sea level, and has developed a complex of very deep canyons. At Lehnun, 13 km to the south-west, which is located at the rim of the plateau at an elevation of +720 m, the canyon reaches a local depth of 580 m, offering spectacular views. (Figs. 1 to 5 – XII.)

The site of Umm-ar-Rassas, situated at the highest point of the plateau, is visible from the distance.

B. GEOLOGY AND SEISMOLOGY

1. Lithostructure and stratigraphy

The geological substratum at Umm-ar-Rassas consists of sub-horizontally layered marine sediments belonging to the Maestrichtian Stage of the Late Cretaceous Period. These sediments are deposited some 80 million years ago in a calm, shallow marine sub-tidal environment. Two litho-stratigraphical units occur near the surface (fig. 6 – XII):

1. The upper Qazana Phosphorite Member (QP): 18 m thick consisting of alternating thin layers of marls, micritic-cristalline limestone and chert and thicker layers of phosphatic chert. The latter are very hard, contain 14-21% of P2O5 and provide an excellent building material.

2. The lower Bahiya Coquina Member (BC): 30 - 46 m thick, composed of thick banks of shelly limestone alternating with thin layers of marl; the limestone is composed of mega-cross-bedded layers of bivalves (oyster) and gastropods and shows a mega-cristalline structure, the coquina contains 60% of carbonates and 40% of phosphates and silice; the coquina is easily hewn and provides an excellent building material.

2. Hydrology

Umm-ar-Rassas is located on the highest point of that part of the plateau, at the edge of the desert steppe, between two main wadi’s structures, Wadi Wala and Wadi Mujib deep valleys. There is no permanent running water, nor spring. The only important underground water originates in an important aquifer developed in the 125 m thick Wadi as Sir Limestone Formation (WSL) resing on the marls of the upper Shuays Formation (FIES) that play the role of aquicludes. The aquifer/aquiclude boundary is exposed on the escarpment of the Mujib Canyon at an elevation of around +425 m and there gives rise to a number of springs and Late Pleistocene travertine deposits. A deep well in the vicinity of Umm-ar-Rassas draws water from a depth of 300 m with a capacity of 120 g/hour.

At Umm-ar-Rassas as an important local and seasonal aquifers may develop in wadi-bottoms. However they are not sufficient for a large population. For that reason the water supply must be assured by the construction of water-tight cisterns and by water conservation practices such as the construction of culture terraces in wadi-bottoms. Both structures are very well represented all over the ancient site. The enormous number of underground cisterns shows that water collection was one of the main problem of the site in the antiquity.

All these cisterns were supplied during the rain season, which was, most probably like today, short and unpredictable. Most of the water was generated by storms, short in time but strong in sudden quantity.
The network of cisterns (for human use) and large open air water tanks (for animal use and eventually for agriculture) was an efficient solution to solve the problem of water supply.

Seismicity

Umm-Ar-Rasas lies 34 km to the east of the North-South oriented Dead Sea Transform fault zone. The Sijawa Fault, a significant east-west fault, which has been associated with basin extrusions, lies 12.5 km to the west of the site.

The Dead Sea Rift, along with its associated perpendicu lar faults, such as the Sijawa Fault, is the predominant earthquake generator of the region. The majority of these earthquakes have low magnitudes, although infrequent events occur with a local magnitude in excess of 6 on the Richter Magnitude Scale. All earthquakes with a magnitude in excess of 6 have occurred along the Dead Sea Rift.

According to the Map of Natural Hazards of the 'Munich Reinsurance Company', the area of the Mujib Dam, which is currently under construction and which is located at 11 km to the south-west of Umm-Ar-Rasas, belongs to Zone 3' with intensity VIII on the Modified Mercalli Intensity Scale. Intensity VIII, corresponds to 6.2 - 6.9 on the Richter Magnitude Scale and is described as follows: "Panel walls thrown out of frame structures; fall of chimneys, factory stacks, monuments, walls; heavy furniture overturned; sand and mud ejected in small amounts". The risk is defined as "the probable maximum intensity with an exceedance probability of 20% in 50 years; equivalent to one occurrence in 25 years (return period) on average, for medium soil conditions" (Jordan Valley Authority-Amman, personal communication).

As an illustration the earthquakes with a local magnitude of 6 or more on the Richter Magnitude Scale registered by seismographs in the region for the period 1900 - 1998, as well as all earthquakes (major and minor ones) for the sample year 1998 are listed in Annex 1 (Natural Resources Authority-Amman, Seismological Department, personal communication).

A list of yearly tremor intensity is given in Annex 1.

4. Subsoil

In all observation points the hard unweathered geological substratum was at shallow depth. In most cases the geological substratum is covered by a thin saprolite (= rotten rock) of 1 to 1.5 m thick. The soil and loose saprolite is the result of chemical weathering of the geological substratum. In most cases the saprolitic layer is covered by a hard calcite of 0.5 to 0.7 m thick. The calcite originated from superficial carbonate concentration by superficial and subterraneous waterflow. In case of exploitation of the bedrock, the calcite often forms overhanging roofs ensuring typical rocky shelters offering shelter for man and cattle.

C. CLIMATE

Situated at the edge of the Arabian desert steppe, Umm-Ar-Rasas benefits from a dry continental climate with two seasons: summer, very sunny, dry and hot and winter, cold and rainy. Spring and autumn are limited to a few weeks. Even though The rains are very scarce: the limit of the 160 mm isoyet line just near, allowing only very specific cultivation, sometimes without success for a succession of years (see socio-economic chapters).

Rains occur in December, more frequently during January/February and cease in may, sometimes earlier. They are mainly issued from sudden storms. Snow is expected to occur (a few cm in one hour, once in 30 years).

Winds mostly blow from west. They can be violent (40/50 knots). Blowing from the east, more exceptionally from the south, they may be dusty, sometimes carrying red soils from Egypt.

Temperature varies; from about 9°C in winter (frost is exceptional) to 40°C in the summer. Temperature will be one of the most important parameter to take into account for the sheltering and restoration of the different churches.

Graphics of the yearly rainfalls, highest and lowest temperatures, humidity and winds are displayed in Annex 2.
water tanks covered with arches and slabs and large debris mounds created by accumulation of
the cisterns' silt removed from them, and of the town's refuse.
4. The agricultural fields created in antiquity by terracing the wadis flowing towards the North.
5. - North-east and North-west of the Cistern. This unit comprises two groups of buildings. The
first is a watch tower and a small church with associated quarries and cisterns, and the second a
building whose function is still undetermined, with an associated cistern.
5. The Tower complex, which is in a discrete unit, 1.5 km North of the castrum, comprising a huge
well preserved tower and a small church annex, two ruined buildings, quarries, cisterns and a
wine press.
6. The cemetery, which has not been located, but according to de Savignac existed to the west
of the castrum. Old aerial photos probably show its presence to the west of the road to Wadiha,
where the modern village is presently growing.

2. Chronology of excavation works
Excavation works focused on: - vestiges of area 1, 2 and 4; (with more or less intensity since 1986), by
Jordanian teams (DoA), Italian (Stadium Biblicum Franciscorum) and Swiss teams (Foundation Max von
Berchem). The chronology of the excavations is provided in annex 3.

3. Description and provenance of ancient building materials
Following types of building materials were observed in different places of the site. These materials were
used separately but most of the time mixed together. Characteristics of materials are given in annex 4.
Cagnina, phosphatic chert and limestone are found in abundance in the geological substratum at Umm-
Ar-Rasas. They were extracted from numerous large and small quarries all over the site area. Black shale
and gypsum are not found at Umm-Ar-Rasas. The gypsum is found at the boundary of the lower Wadi as
Sir Limestone Formation and the Upper Shu'ayb Formation. The black shale occurs in the lower
members of the Shu'ayb Formation. Both stone types are quarried in the canyon of the Wadi el Mujib.
We observed fi, a modern gypsum quarry at position X = 076057 Y = 238352 at + 30m.

4. Construction techniques
a) Structures
Apart from some very specific buildings (e.g., the Tower) and parts of some other ones (e.g., central apse
of some churches), the walls built at Umm Ar-Rasas were made with undressed raw materials of all
kinds and nature put one over the others without any lime mortar. The internal filling, between the two
faces of the walls, were made of simple earth mixed with chip stones. The solidity of such structures was
therefore ensured only by the roof protection (for the heads of walls) and the general side gypsum plaster
coating. Nowadays, all the buildings have lost their roof protection and most of their mortar coating. Rain
and wind erosion have destroyed the unprotected walls earth filling. The protection/restoration of
the excavated structures is one of the most urgent and important works to be implement at Umm Ar-
Rasas.
The doors jams, the arches supporting the stone roofs (or wooden ones in most of the churches), the
churches ovens, were made of well cut rectangular stones. All these blocks were put together in dry
masonry construction way.
Most of the roofs (even for some lateral naves of churches) were flat, stone arches supporting ovens of
stone slabs and earth covering.
b) Floors
Different types of floor were found during the excavations:
  • simple earth floor type,
  • plastered floor type, such as in the Tower church,
  • stone slabs paved floor type, such as in the annexes of St Stephen church ( irregular cut stone slabs) or
in the Aedicula church ( rectangular alabaster slabs),
  • mosaic floor type, such as in Bishop Sergius, Lion, St Stephen, ... churches and in the wine press.
VI. CURRENT SITUATION, ANALYSIS

A. BRIEF HISTORICAL REMINDER

The modern village, actually known as Umm ar-Rassas (the Mother of the lead) gathers a few tens of houses, of breeze blocks and concrete, aligned along the road from Madaba to Jizza passing by Ntil. The village is drawn up not far from the vestiges of an important site, known from excavations results as Kasr commemorated in the Roman and Arabic sources and from the Bible. The military nature of the site is emphasized by the name Kasrorn, recorded four times on the mosaics recently uncovered. The remains of a fortified camp of about 10 ha correspond to the fortress of Mephaat mentioned by Eusebius (Onomasticon) as the place where a unit of the Roman cavalry was stationed at the edge of the desert. This walled area is limited to the north by an open quarter with roughly the same size. The most visible monument of the site is visible 1.5 km far from the north of the Castrum, where a tower, probably built for a nylete, still stands more than 15 meters high.

B. SITE MANAGEMENT

The UAR site is under management and control by the Inspector of Antiquities for the Madaba Region (figs 7 Plans 1 & 2 - § X). There are 5 guards on site, part from the MTA, part from the UAR village Police Station.

Guards are accommodated, on a rotational basis, in the small nearby very spacious concrete building. The task of guards is to control the visit of the St Stephen mosaics by visitors and to ask them fulfilling the visitor book at the exit. There are no guide. Entrance is free, as the MTA considers site enhancement not sufficient to justify a fee.

At the moment the UAR site is currently under-exploited by tourism. Or the other hand there is only very poor tourist infrastructure (the St Stephen shelter) and management (see §. 'Socio-economic and tourism context').

Occasionally, the Inspector authorities (or asks for) archaeological excavations at UAR. At the period of the mission one Jordan team was working on the restoration of the small Byzantine church and altar near the nylete tower (Zone II) and started two new excavations in the ancient fields area (small tower, undetermined building).

Despite gaps in site management and equipment, the key UAR archaeological remains are only slightly degraded by human activities. For example, out of the sheltered St Stephen complex very few mosaics have been looted (Peacock's church, Lions' church, ...), albeit the protective earth cover is very thin in some areas. This situation demonstrates the local will to preserve the UAR cultural heritage, not only because it is protected under the Antiquity Law, but also because local people (Beni Sakhr tribe) considers this site to be an opportunity for the future.

C. ARCHAEOLOGICAL REMAINS

1. Site Typology

The archaeological area of Umm Ar-Rassas is about 2 km² (fig. 7 Plans 3 to 11 - § X). It includes several components that will be considered separately because of different issues and constraints affecting their management, conservation, and presentation. Proceeding from South to North these are:

1. The Castrum, an almost square fortified settlement which includes relatively well preserved fortifications and towers and a densely built interior area where three excavations have already been conducted: the southwest area is the most extensive, comprising the so-called Churchyard. The other two excavations have exposed the North and South gates.

2. The Northern settlement area (300x200m) consisting of collapsed structures, where 4 areas have been excavated. The Church of the Priests [II] and the Church of the Tabulae 4th Northwest, the St. Stephen complex to the North-west, and the area including and around the Chapel of the Peacocks, Church of St. Paul and the Church of the Lions to the East.

3. The cisterns and town debris, which surround the entire site and include built shaped rock-cut cisterns, a large rock-cut rectangular open-air basin, several large rectangular underground
On standard and well-known techniques were used. A special attention should be given to the mosaic conservation, since they were likely built rapidly, using mortar of poor quality, over uncompacted materials. The conservation of these important testimonies will need attentive care and precise investigation studies before implementing any restoration work.

### 3. State of conservation of the remains

#### 3.1. The Castrum

The fortress of Kastoria Mefas, built at the end of the IIIrd or the beginning of the IVth century A.D., appears as a large quadrilateral of 158m by 159m, surrounded by a solid wall 2m thick, reinforced by circular towers with only one gate on the northern side. The walls, of cyclopean size, are made of large undressed blocks of stone, without any mortar and wedged with stones of smaller size.

At the beginning of the IVth century, an indigenous wing of cavalry was stationed there. After the demilitarisation of the camp, during the VIth century, a settlement remained within the enclosure. Thus, the internal fortress organisation originally structured around two orthogonal ways is gradually modified by constructions built above courtyards and streets. Out of the four churches within the enclosure, have been excavated (Twin churches). There are two other excavated spots: the North gate and the South gate area.

1. **Walls and gates**

The tops courses of the fortifications are lost. Nowhere has the original height of the wall been preserved. In Annex 4 are grouped observations related to the physical condition of fortification structures. The single number refers to a tower (number 1 is the north-east corner tower), while the hyphenated numbers to the portion of wall in-between two towers. Both are represented on the plan, with recommendations for presentation.

No restoration work was done on the whole enclosure excepted limited work by the Swiss team near the Twin Churches.

The excavations of the North gate were conducted by Swiss mission in the years 1991 and 1992. Excavations have exposed the passage and the guard rooms. Consolidation of walls has taken place in the form of repointing, but it is insufficient as regarding the use of insufficiently prepared cement and lime mortars. As well have the debris been thrown around the outside walls and presently hide large parts of the external ramparts. Earth mixed with architectural fragments and blocks is visible among the debris.

The gate provides access to a street which is now completely blocked with ancient collapse (2.2.5 meters of depth). That street should be the normal access to the Twin Churches complex.

This structure is different from the North gate, as there is a small passageway gate to the left of it, and a less clear use of the towers controlling access to the castrum. It is clear from the excavation that this gate didn’t exist in the initial setting. There has been some consolidation of this structure, but the site needs considerable consolidation efforts would the intention be to open it to the public.

A detailed state of preservation of the castrum walls and towers is given in Annex 8.

2. **Twin churches complex**

Successive excavations of this complex were conducted in 1988-1992 by Swiss archaeological expedition founded by the Max van Berchem Foundation and directed by Jacques Doziad. Both churches have mosaic floors, poorly preserved, new covered by a layer of earth, although some shrubby vegetation is growing on it, raising doubts on the current conservation condition of the mosaics.

There are traces of plaster on the wall, which is detaching and generally in a bad state of conservation. The North church has capitals and columns in the physical condition of the portico area that show advanced weathering phenomena in the form of cracking, spalling and exfoliation.

Larger restoration work were done in that area where all the exposed structures were consolidated (even the general remarks on the condition of the mosaics are also valid here).

Vandalism or clandestine excavation have taken place in this area, namely in a small room south of the southern church, and in one of the rooms to the north of the northern church.

A detailed state of preservation conditions of these churches is given in Annex 8.
(1) The Churches

There were 9 churches (8 excavated) and 2 chapels (both excavated) lying in that part of the ancient city. Constructed in all parts of the settlement, these religious buildings are sometimes grouped by two or more, in large complexes. Their architectural development covered hundreds of years and most of the churches are remarkable due to their mosaic pavements, some of them dated from the Abbasid period according to clear and readable inscriptions. All these churches were destroyed by collapse of their upper structures (earthquake?). All their walls, either completely or partially, were covered according to the same way, suffered different structural disorders.

A detailed statement of the different churches is given in annex 3.

(2) The other structures:

General observations on St. Stephen complex:

Although this is one of the best known sectors of the site of Umm ar-Rasas, this complex is not fully excavated. The three rooms and the courtyard east of St. Stephen are only partly excavated and many areas around the churches need final clearing (especially St. Stephen’s south side and the area east of Bishop Sergius’ apse). The entire west sector of the complex is not fully excavated. There is a large debris area shutting and partly covering the north east corner of the complex, another to the west of the complex, and two large open soundings along the northern wall.

Baptistery:

This sector of the complex is unfortunately in a very deteriorated condition: the mosaics are now covered but were found with many lacunae; the basin is visible only as a trace (also covered), and the walls have lost their cohesion.

General observations on St. Paul’s area:

This is still an open excavation which is confusing and difficult to interpret, but also extremely dangerous as some of the pits are more than 7 meters deep. In the northern sector between two churches, there is an area 3 floors deep which is being excavated. Without proper dismantling or consolidation of the upper structures, the entire pit is threatening to collapse. Immediately to the west of the complex there is a courtyard area with three structures used until recently by the local Bedouins. This is a well preserved ‘modern’ complex, which should be properly documented and possibly displayed.

A large debris area, partly covering the vernacular structures, is accumulated to the west of the excavation pits. Open soundings are also found to the south of the church of St. Paul.

Wine press:

The Northern Settlement includes most of the excavated areas. The area extends over 6 ha and is covered by an extensive part of the town (it is however possible that a secondary wall enclosed this section later). It is densely built, containing number of churches, houses, handicraft dwellings... Some local families have occupied this area, living during the 1st 100/150 years, in some of the structures with their animals sheltered beside. In some cases the robbed structures are the ancient ones, re-adapted through the consumption of extra walls or the plastering of internal surfaces. In some other cases typical arches (characteristic of Jordanian vernacular architecture) have been completely rebuilt using the ancient foundations and construction materials. 37 recent traditional houses are remaining on site. No detailed plans and/or elevations exist for these structures, which form an important element of a little investigated component of Jordan’s cultural history. One of our proposals is to preserve and, if possible, display to the public a small group of these structures. Unfortunately, most of these small and narrow houses are in a bad state of preservation. Whereas all of them could (and should) be studied, only few will be open to the public after restoration.
The area between the Church of Saint Paul and Chapel of the Peacocks.

The area between XXXX and the present has conducted excavations at this location, which includes a site of approximately 1200 m2. Excavations are still being conducted at this location, which includes several features: a church, a chapel, a unique winepress, and a deep subterranean feature, which likely corresponded to a three storeys underground store rooms.

Cisterns And Water Tanks

Some cisterns are still visible and a few are still in use in the settlement’s surrounding area. In this area can be found most of the cisterns as well as a large rock-cut pool that collects water from a small wadi. It has been recently fenced by the Department of Antiquities. Several elongated and half circular mounds surround the settlement, especially in its northern and eastern sides. As far as we know, no explanation, has been provided related to these mounds, some supporting Bedouin graves at their top. In our opinion, (confirmed by the geological analysis of the deposits carried out by Dr De Dapper) they are constituted with the same refuse and the result of centuries of cisterns cleaning. We feel that the most obvious ones, with a ring of debris surrounding a central depression where water accumulates in winter, hide a filled or collapsed cistern (visible for some of them)

A GPS survey of these structures has been conducted. The UTM coordinate given in appendix corresponds to the centre of the depression, or the mouth of the cistern with a ±5m accuracy. 74 of these structures have been mapped: 48 are depressions that may hide a cistern, 4 are completely filled cisterns with a slight visible mouth, 7 are empty cisterns, 6 cisterns still in use contain water, 4 are collapsed cisterns or tombs, 1 a cistern (tomb?). 1 is a cistern supported by built arches and it is a pool covered by arches and stone slabs.

Many of these structures are lying within the protected area, but the fact that they have not been neither fully recognised nor studied is a major problem for the conservation of the vestiges (risk of collapse) and for the security of the visitors. We should also consider that not all of them have been located. From a security point of view, most of them do represent a potential danger as they are unchecked underground cavities, their size is unknown as well as the structural resilience of their reef.

Some of them have been discovered inside the churches (Bishop Sergies, Lions...). They were operational at the time the churches were utilised as cultural places, as this is demonstrated by the fact that mosaic pavements adjust cisterns’ mouths. They may represent a major risk for the future conservation of the churches mosaic floors (see also the problem of the tombs under the mosaic of St Stephen, St Paul, ...).

The list of coordinates in annex 6 derives from a quick GPS survey of the water collection structures observed around the castrum and northern settlement area. Depressions surrounded by debris have been interpreted as filled cisterns surrounded by soil resulting from their regular cleaning. For practical purposes, 5 types of cisterns are catalogued:

1. Bell-type cistern with plaster, in use and containing water
2. Bell-type cistern with plaster but without water
3. Bell-type cistern filled almost completely to the rim by debris
4. Possible cistern, largely collapsed
5. Centre of depression surrounded by debris.

d) Man-Made Hills

A number of low man-made hills lie in the southern part of the site around the Castrum and the city (fig. 7 PLAN 4 - § 3). Their origin whether natural or artificial (partially or entirely) was longly discussed. Their restricted distribution just around the antique site is a first element in favor of their human origin.
The documented work (with the exception of a topographic survey) has been conducted on the extensive network of terraces which cover much of the land to the north of the town of Umm er-Rassas. The fields were terraced or perhaps lying down behind dams crossing the small wadis that flow from the plateau where the castrum is located. The assumption of small dams is validated by the presence of small structures in the middle of each wadi possibly wastewaters. Rather than for collecting water, however, such dams were built to trap silt and enough water to allow a slow soil improvement, an effective substitute to irrigation. None of these features have been so far excavated or properly investigated in Jordan. As far as we know, the group of Umm er-Rassas ancient fields (such dam-like structures can also be observed along each wadi around the site, within and around the archaeological park perimeter) are the best preserved of this type in Jordan and constitute a comprehensive ancient agricultural system.

Erosion is a matter of fact, since in many cases the small wadis have cut channels through these dam-like structures. On the other hand, easy stratigraphic studies of the “dams” can be undertaken.

In the same area, and in relation to the antique fields, groups of ruined buildings are visible. Two of them are presently being excavated by the Madaba Office of the Department of Antiquities under the direction of Hazem Jasser (May-June 2001). The first is a tower, or guard post, with an internal bottled shaped cistern and a nice 1,60m large circular stone as door lock, associated with a church (?) (it may be an antique oil press), quarries, and at least one large open-air rectangular cistern. The function of the second building is still unknown. A cistern still in use is associated with the latter. Most of the fields are in the protected area (outside the two sanctuaries), but several also lie down beyond its boundary, especially to the west and north-west of the castrum.

Some remarks are given in annex 9.

f) The North Tower Complex
The North Tower complex includes a high standing « Style tower » (more than 13 m height), a small three naves churches with simple plastered floor, with annexed premises and different dwellings around : wine press, cisterns, ancient quarries, two story building... Excavation have targeted the small church near the standing tower, and areas around it. Conservation work has been conducted on the two-story building north to the tower, and is currently in progress on the church (directed by the Madaba office of the Department of Antiquities). The tower was never restored. Plans and elevations of most of this area’s buildings are available.

A description and detailed state of preservation conditions of the Tower-Church is given in annex 8. A detailed state of preservation of the Tower is given in annex 10.

g) Cemetery
The discovery during the XVII/XIX centuries, of lead made coffins in the cemetery may explain the actual name of Um ar-Rassas (“Mother of the lead”). The precise location of the large cemetery (entirely looted during the 19th century) is not known today. According to de Savignac, it was located to the west of the castrum. Aerial photos may confirm that location at the west side of the actual asphalt road to Madaba. That part of the antique site, now under construction with the new village, might well be considered as lost.

h) Semi Subterranean Houses
Since the last century the local population has occupied several houses in the site. We spared them on a general layout (figs. 7 – Plans 5 to 7 - 8 XI). Such dwellings mainly reused ancient structures, in the way they were for some of them or sometimes only partially reusing former Byzantine structures (mainly
still standing arches). The usual distribution of these permanent nomad houses is quite simple: one or two independent rectangular rooms, exceptionally four or five, are spread around a large courtyard, closed by a perimeter wall. Rows of arches supported the terrace roof, covered with a layer of earth. Each room has one door, a unique opening to the courtyard, the building being buried along three other sides.

These subterranean houses are not in a good state of preservation: walls and terrace roofs, except in a few cases, collapsed as well as the supporting arches. Even for the few not too much degraded, access is difficult and dangerous for workers and archaeologists, a fortress for tourists.

Quite not a single study has been carried out on such traditional modern reoccupation of ancient structures. The Second interest of Umm ar-Rassas is to have preserved a complete village of that recent dwellings.

Complementary information is supplied in annex 11.

D. SOCIO-ECONOMIC AND TOURISM CONTEXT

1. The region and the lack of economic resources

The UAR district with its Bedouin population is situated in the middle part of Jordan, south of Amman. Due to this localisation, the district is on the periphery of main and important tourist sites like Madaba (40 km.), Karak, the Dead Sea or the Jordan valley and even Petra and thus it has no profits from this tourism economy. In the same way, the district lies on the periphery of the country's main economic and industrial regions that are mainly concentrated in and around Amman-Zaraq, the north and Aqaba in the south.

The southern regions of the country have encountered important economic development in the last decades and especially on a tourist ground with sites like Petra, Wadi al Ram, Aqaba etc. In the eighties important development projects, mainly agricultural, but also socio-economic and the Bedouin's sedentarisation projects have also drawn into this region changes and some economic wealth. On the other hand, Madaba and the northern parts of the high plateau are witnessing important economic development these last ten years due to the valorisation of the archaeological and historical sites and the creation of the archaeological park. For instance, Madaba counts today some ten hotels since 1994. Before, the town had none.

Surrounded by other regions and towns that are living economic development, the district of UAR is quiet isolated, peripheral to all. It is also a place where tourists pass by and seldom stop. Too close to Madaba to create its own interest, too far from Amman-Zaraq to take part in the industrial movements, and also, too far from the south in order to have some profit from the tourists activities. The inhabitants of the district are lacking all these economic opportunities.

With the absence of any economic activity and job possibilities, UAR's tourism development appears as the only opportunity and economic potential for the local population to rely on.

2. Administrative context

UAR Archaeological site is located on um ar Rassas municipality territory (Budayya). UAR municipality has been recently created (in 1999) and 6 villages belong to this municipality: Saluya, Mousaybet, Thrayya, Rejim theil (including Nahda district), Abou Rileifet, Rejim Qaris (including Mousaybet Akhbar Shehri district).

The UAR village is both chief town of UAR municipality and chief town of the governorate (Qadha'). UAR governorate encompasses 4 municipalities (that is 22 villages or settlements), including UAR municipality (encompassing UAR archaeological site) and Rama municipality (encompassing Lehun archaeological site).

UAR village shall be considered as the real centre for the governorate development, including a variety of archaeological sites to be enhanced; promotion of a regional development planning searching for a complementary between UAR, Lehun and the other archaeological sites spread over the district territory. There are only a few administrative structures within the UAR Municipality territory:

- the social development centre (created in 1999).
• military and civil schools,
• post office,
• Royal Police centre
• forge supply center.
• Administrative representations in Umm Ar-Rassas:
  ⇒ Ministry of Interior: the governorate of the area, the police, the Municipality of Umm Ar-
      Rassas and the Post Office (postal services are to be privatised in July 2001 in Jordan).
  ⇒ Ministry of Social Development: the social development centre
  ⇒ Ministry of Health: the clinic.
  ⇒ New offices for the Municipality are under construction (may 2001) along the main road,
    facing the archaeological site.

An urban planning has been designed in 1996 for UAR village by the Ministry of Planning, including zoning of already built areas and urban extension, which has initially been planned on each side of the road, but which will finally be limited on the opposite side to the archaeological site.

The mayor referred to a 10,000 JD loan obtained from the Bank of Urban and Rural Development. He also referred to the 58,000 JD granted by the Social Security Program Unit of the Ministry of Planning, which will be devoted to the improvement of road conditions and lighting.

There is no plan illustrating the future extension of the Municipality infrastructure.
Water is mainly supplied by the Swaga wells near Qatraheh. Water is available for human residential consumption on daily basis and for surrounding villages on a weekly basis.

Key data on UAR municipality and its six villages are indicated in annex 17.

3. Population

The population of the UAR municipality amounts about 400 inhabitants, composed with 790 families shared among the six villages. Local populations living in UAR municipalities can be divided in two groups:
• Bedouins which have been recently settled in UAR village, from the Bani Sahir tribe;
• Nomadic Bedouins from the ‘Azaznet tribe.

Bedouins from the Bani Sahir tribe live in modest constructions (the modern village of UAR is currently developing along the site western boundary). They own all the land and the greater part of the sheep herd.

On the opposite, nomadic Bedouins from the ‘Azaznet tribe live in tents and cultivate the Bani Sahir lands. Although they possess some livestock, they are extremely poor.

All inhabitants of the six villages in the UAR municipality belong to those two tribes, albeit members of the Bani Sahir tribe are the most numerous. ‘Azaznet tribe members are nomadic Bedouins throughout the district. No other tribes or families live in the district.

The Bani Sahir:

It is one of the most important tribe of Jordan. Bani Sahir’s land covers most of the medina part of the country stretching from the higher plateau in the west to the saudian borders in the east.

The tribe is composed of 4 sections with an important number of descent groups.

The Hugashity form a descent-group belonging to the Al Ghuffi section. All are established in the 6 villages of the municipality, which means the inhabitants of these villages are not only originated from the tribe of the Bani Sahir, they belong to the same descent-group and forms a tribal unity. This is a very important fact, not only because the population is unified when internal problems are solved through customary law, but also an important solidarity exists among the inhabitants who are aware of their common origin. The region therefore represents a socio-economic-based unit to be taken into consideration; the six villages are in fact only one.

This structural aspect of the social group has to be studied. Its solidarity and interest social organisation will be the basis for the locally-managed tourism development.
In the important tribe of Bir as Sahra'a. They arrived in this part of Jordan in 1948 as refugees having fled from their lands in southern Palestine. As a result, the 'Azazzet is considered as a "families" tribe in Jordan. The tribe is also composed with different sections and numerous descent groups. But, unlike the Bedouin, they are scattered all over Jordan and within the district of UAR, they do not form any settlement but if not the tribe as a whole, although they are the only nomadic tribe within the district. The people among the different families is the tribal one. The 'Azazzet are nomads. They move to the eastern parts in winter with their black tents and herds for pasture land. In summer, they exchange the black tent for a lighter one made of jut and they roam around the villages. The direction of their movement is east-west mainly, but the herds; move down to the Jordan valley in search of daily work. In spring and summer, they settle around the Hujjarah villages for harvesting.

The 'Azazzet live in this region since 1948, practicing rain-fed agriculture as they used to do in Bir as Sahra'a. They are also shepherds and have herds of sheep and goat. In Jordan, they crop within the tribal territory of the Beni Sahra whose fields were surveyed in the fifties and registered as private parcels. The latter are the landowners. The Azazzet cultivate the Hujjarah land on a share-holding system. Nomads, shepherds but also daily workers, the 'Azazzet do not have any other opportunity. Landless, they do not have the financial capacity to buy land or to build their own house. They are obliged to remain nomad people, although their children attend village public schools and they participate to elections of the mayor. Relations between Hujjarah and 'Azazzet are those of "share-holders" (showrata) only and not those of "harra" (who plough land). The latter type is quite frequent in the Jordan Valley being relevant of a strong social hierarchical situation, that it is not found in the UAR district. It is important to point out that relations between shareholders and landowners are those of "sharing" and not of "services" or dependencies.

According to the local development potential and the key most role played by the present archaeological and tourism UAR project in such a development, three types of stakeholders are distinguished:
- the sedentary Bedouins (Beni Sahra), living in hard dwellings in UAR village and owning the whole land, in and outside the archaeological site;
- the nomadic Bedouins ('Azazzet), living in tents and cultivating the lands. Although nomads, they stick to the site and to the owners land in UAR;
- all other inhabitants of the UAR municipality distributed in the 6 villages scattered around UAR village. They wish to benefit from the project.

4. Socio-economic background: farming, production system and income generation

The district covers great portions of desert that extend eastwards to the Saoudon borders. Since 1992-1993 the country is recording a drought cycle. Rain-fed agriculture that used to be a significant activity, together with pastoralism, are no more profitable with costs higher than benefits. Shepherds are continuously indebted. The region is overgrazed and the number of heads has considerably decreased and the agricultural products. It is

It is revealing that Army and General Security have become the main economic generators in the UAR municipality. For example, within the Naef family, one of the two large families from UAR village, 10 have a member employed by the army, 7 in the Security and 1 other employees. 5 families altogether possess 190 donums of olive trees on their and vegetable gardens.

The fact that there is no movement to own or any emigration to other countries is noticeable.

Employment opportunities are very scarce. Main sources of income for the locals are issued from agriculture and dairy products.

5. Land tenure

UAR archaeological park encompasses 120 ha, from which 24 ha belong to the Government (Ministry of Antiquities). This area is divided into two sub-areas:

- 132 donums (13 ha) around the Tower;
- 107 donums (11 ha) around the Castrum.

This is the only government-owned land in the site, all remaining land being private (mulk) and seem to belong to 2 families of UAR village: Al Neith and Al Mor families.
From a rapid survey and measurements with the local population, private lands likely belong to only one family composed of 8 brothers, Dhurban’s sons (1 Tal Duiban), the main part of the AlMor family. 8 people should be involved in land tenure in UAR archaeological park, although this information needs to be confirmed by the Land and Survey Department, especially because site boundaries are not exactly known by local population. The mission members were unable to obtain precise and documented information from administrative services about the very pressing issue of land ownership in and around the site.

The Antiquities Department has declared to the local population it will buy the entire land within the archaeological park boundaries, including current buildings. Given the archaeological restrictions put on this land by the MTA, owners are interested to sell. For example, they can no more build any houses or planting trees. All land reclamation being under the control of the Department of Antiquities, local owners alternatives are restricted.

6. Urban development and physical planning

The village of Umm ar-Rassas is under construction. Some 10 houses are built mostly along the main road, especially the road to Madaba. They are simple one or two storeys concrete houses mainly associated with a garden, or at least with a courtyard. They form a quiet linear village built without pre-planning design. Only few buildings are located inside the archaeological perimeter:

- the post-office, near the main cemetery.
- the first aid hospital, in the south-west corner of the archaeological park.
- the police station, on the north-eastern limit to the park, out of view from the site.
- the guard house/Toilets in front of St Stephen complex.
- three private houses, one in the south-west corner, the other two ones near the Tower (all of these buildings are under purchase by the Ministry of Tourism and Antiquities).

The two most important buildings of the area are the schools, located in front of the castrum to the south of the Dibban/Jizzah road. They are highly visible from the inner site.

In 1999, the Ministry of Planning and Public Works prepared a general Master Plan for the town extension and reorganisation, that document stated authorised constructions to be built on both sides of the Madaba road and in the south-western part of the site. Currently, only construction to the west of the road are being developed (eg. new Baladyeh). All constructions planned on the east side (archaeological park) are apparently cancelled and the land put under the archaeological law.

7. Tourism

From the tourism point of view the UAR site is currently under-exploited. The lack of tourism management and organisation (except under the St Stephen’s shelter) does not incite the (few) tourist operators and individual visitors to spend more than one hour at UAR. There are no signposting and the sanitary facilities are out of work most of the time. In addition, lack of security conditions does not encourage Tour-Operators to guide their groups across the ruins area. They generally restrict the visit to the St Stephen’s mosaics complex.

The annual number of visitors varies between 8000 and 12000 (source: Inspector of antiquities). But from other sources the average number might amount 8500 visitors (700-720 / month, reaching 870-900 in May). Peaks are in winter and during vacations in spring and autumn. The table in annex 13 shows a breakdown of visitors spread over a 13 days peak period. The great majority of tourists only visit the St Stephen mosaics, staying less than one hour on site.

A list of Visitors data is given in annex 13.

On-site tourism-related commercial activities

At the moment there are no tourism-related commercial activities (no shops, no restaurants) and therefore no income for the local communities. Information policy is reduced to the poorly designed panels of ‘Museum without Frontiers’ (general information on the Omeyyads and very simple map on the Madaba region historical sites).

Existing tourism circuits:
E. LANDSCAPE

The major and most interesting scenic points are situated at the top of the tell (especially the east cemetery), the Khastur (northern wall) and at the top of the Byzantine tower within the ancient city. The most preserved visual axis are towards the east. At the moment, the most destructive elements spoiling the landscape are: the existing shelter of St Stephen, the guard post near St. Stephen, the new post office, the first-aid building, the line of UAR houses along Madaba road, the telephone and power lines along roads, buildings south of the Khastur, various concrete-made houses within the proposed archaeological site boundary (see map), a warehouse near the N.W. boundary and the agro-industrial compound a few kilometers to the north (bright white roofs and walls).

VII. PRESCRIPTION FOR MANAGEMENT AND RESTORATION

A. SITE MANAGEMENT

1. Administrative Protection Of The Site

The first and key condition towards an effective site protection depends on land property. Currently, only two pieces of land belong to the Ministry of Tourism and Antiquities. Extending that ownership to the whole area, considering at least the whole Archaeological Park, is an absolute priority (see §. Executive Summary). The whole land will be registered under the name of the Department of Antiquities. It is also expected that a broader general landscape regulation could be implemented with the aim of protecting the overall view to the North and to the East, providing construction autorisation solely to the west of the site, where the new village is under construction.

2. Site Zoning

Zoning is considered as an essential mechanism for managing a protected area whatever it is natural or cultural (fig. 7 - Plan 12 - § X). Site zoning forms the basis for any further conservation and tourism development. It is a prerequisite to an efficient implementation of the project and the future site management plan. Zoning will be adjusted to the cultural, ecological and socio-economic situation of each area. The carrying capacity of the site and zones with archaeological concerns (sanctuaries) is discussed in the section ‘Tourism development’.

Zoning related to tourism and to research activities can not be considered as a definitive statement. Periodic findings will necessitate zoning adjustments over time. For example, if new key archaeological discoveries occur in the agricultural and grazing zones, a new sanctuary might be established with specific regulations and possible tourism development (with subsequent increase of site carrying capacity).

The proposed zoning of the UAR site is based on the distribution and importance of the archaeological remains, on the current land use (refer to the socio-economic section) and on the landscaping values of the site. The land tenure constraint is expected to be defended through the MTA’s land purchase
The proposed zones can be distinguished as follows:

<table>
<thead>
<tr>
<th>Type of zone</th>
<th>Proposed locations (see map)</th>
<th>Size</th>
<th>Objectives</th>
<th>Regulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanctuary I</td>
<td>Antic religious city, Kastrum, large fenced rock-hewn cisterns</td>
<td>10 ha</td>
<td>Conservation and restoration of the antic remains.</td>
<td>Strict protected zone</td>
</tr>
<tr>
<td>Sanctuary II</td>
<td>Styli's tower, Byzantine tower, rock-hewn cisterns</td>
<td>5 ha</td>
<td>Sustainable tourism development; income generated through entrance fees</td>
<td>Restricted tourism development (carrying capacity, no walking off demarcated trails)</td>
</tr>
<tr>
<td>Kastrum, central zone</td>
<td>(Byzantine tower and rock-hewn cisterns), other</td>
<td>5 ha</td>
<td>Improve understanding of the site; Restoration of vestiges (enhancing site value, improving security)</td>
<td>Archaeological research; controlled educative activities; monitoring of tourism impact; restricted use of official service</td>
</tr>
<tr>
<td>Controlled zone I</td>
<td>Sanctuary I inside sanctuary II</td>
<td>15 ha</td>
<td>Natural recovery of vegetation</td>
<td>Grazing prohibited; Cropping prohibited</td>
</tr>
<tr>
<td>Controlled zone II</td>
<td>Central and Northern part of the site</td>
<td></td>
<td>Keeping the traditional way of rural life; Soil erosion control; landscape improvement; income to local communities; marketing of handicraft and local products</td>
<td>Traditional agriculture and pastoralism; research (archaeological, antic farming systems, ...); landscape architecture; No infrastructure development (houses, power lines, ...); besides existing unpaved roads and paths; possible stone-made restoration works (small dams, embankments, ...); Nomad tents allowed</td>
</tr>
<tr>
<td>Controlled zone III</td>
<td>Parking area, entrance gate, VC, market area</td>
<td>3 ha</td>
<td>Concentration of tourism-related nuisances in restricted areas: parking lots, ...; Control of tourist numbers; Income to local populations; Information, public awareness</td>
<td>Allocated to the sole licensed traders (local association to be created); Controlled access of parking lots; Entrance gate and VC have specific internal regulations; Strict protected zone (no human access, no grazing); Boundary grazing prohibited until plantations get the right size</td>
</tr>
<tr>
<td>Cemetery</td>
<td>Out of the AP</td>
<td>3 ha</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>
A sustainable resource management zone should be defined in-between the two archaeological
uplands (core zones). This sustainable resource management zone which is called “cropping and
rearing zone” can be divided into two sub-zones:

- *Cropping management area*: including potential archaeological remains in the ground, this area
will be preserved from agricultural and plantation reclamation. That the reason why only grazing
animals (during the spring grazing period) will be allowed here. Some cisterns located nearby can be
also used as watering point for livestock.

- *Agriculture terraces area*: located in the bottom of the small wadis the have to be reclaimed because
they represent the old agricultural field pattern which is part of the whole archaeological site
management. Archaeologists agree that no archaeological remain could be found inside these old terraces.
Obviously, no building has been set in wadi bottoms, except little dams and cisterns. Reclamation of
these agricultural terraces will help Bedouins (i.e., ‘Azazmat tribe) supplying some agricultural (food and
water) based products and to sustain their livelihood.

For each zone specific regulations will be set up by the Ministry of Tourism and Antiquities.

3. Fencing and Boundary Development

At the moment livestock is freely grazing within the site, including within the two proposed sanctuaries.
Some ancient cisterns are currently used by pastoralists to water their livestock. Overgrazing is general
outside enclosures (walls or metallic fences delineating private gardens and olive tree plantations) and
the soil cover very thin if non existant. As a consequence of soil erosion in this semi-desertic area, sand
and dust winds are frequent. As already stated humans looting and vandalism is not a real problem at
UAR given the solidarity and interest in conservation shown by the local society.

Given the strong traditions and links governing the social life in the area and the capacity of the local
society for self-regulating movements, walls and metallic fences do not appear as the most efficient
solution for protecting the UAR site. Nevertheless, some form of boundary development is necessary.
Access restrictions should be limited to the sanctuaries, as well as to some other areas under cultivation
in the multiple-use zone (this under the responsibility of the leaseholders).

A suitable form of land and zone demarcation could be:

- a visual green demarcation of the site everywhere land uses are radically different: along the
Madaba road and the southern limit road (urban development). It is proposed to maximise the use of
strip plantations (10 m wide) along boundaries, composed with local species of trees and shrubs (refer
to § 2.4: ‘Landscaping Preservation & Improvement’)
- the establishment of a vegetal thorny fence around the sanctuaries, only in case arrangements with
the local nomads cannot prevent animal divagation or other kinds of disturbance to sanctuaries
(2 years testing period).

Once land will have been purchased by the Government (fig. 7 - Plans 13 to 14 - § X)), the site boundary
needs to be delineated along some stretches, without physically becoming an enclosure. Most of the site
area (central and northern areas) will be reclaimed or remain extensively used by the local communities,
so that no obstacle to movements of people and herds is envisioned (with the exception of tree and shrub
plantations during the earlier stages of growth). Preserving the landscaping value is another reason for
avoiding the artificial fencing of the site and sanctuaries. Moreover, the total length of the site external
boundary exceeding 8 km, the cost of such a fence would be high (investment, recurrent costs).

Several information workshops and meetings will be held in order to achieve an acceptable local control
over the site during a pilot period of 2 years and to strengthen the social acceptance of site restrictions.

In case of poor implementation of the contractual specifications to be agreed upon by the community (a
local association could be created –refer to socio-economic section-), in particular the failure of self-
regulated movements control of humans and herds, it could be decided to establish a natural thorny fence
around the sanctuaries (see map), and to effectively control such a fence during the sensitive period of
5 years (to reach plant maturity).
B. RESTORATION AND PRESENTATION OF THE ARCHAEOLOGICAL REMAINS:

Restoration and display of the archaeological remains face different problems that can be grouped in 4 main sections, from the basic ones to the more elaborated, the last ones including part or totality of the recommendations of the first one.

1. Consolidation, restoration, cleaning: a general policy and technical recommendations have to be elaborated and applied. For example no restoration will be implemented if complete architectural study has not been carried on, only specific mortar will be used, after composition tests implementation (the construction of a lime kiln is recommended), mosaic restoration will be monitored by specialists...

2. Works to be done: for each type of vestiges;

3. Anastylosis: if many parts of monuments could be rebuilt as they were in the Antiquity (using original materials), only few buildings could be entirely anastylosed. The chapel of the Peacocks is one of them.

4. Shelters: most of the ancient monuments need modern sheltering structures to be safeguarded as well as correctly displayed to the visitors. St. Stephen complex, churches of the Lions, of Peacocks, of Priest Wa'il of the Tabula are in this case.

1. Consolidation, restoration, cleaning

a) Overall policy and technical recommendations

Archaeological works have been conducted for years with great success at Umm ar-Rassas, then preparing a suitable basis for the present project. Nevertheless, while the archaeological discoveries were of paramount importance from the scientific, historic, aesthetic, ... points of view, the conservation of the uncovered remains was not undertaken as it could be expected. Great efforts were spent for the preservation and presentation of some monuments: shelter over St Stephen church and apse of Bishop Sergius church mosaics, systematic consolidation of Twin churches area vestiges, on-going work at the Tower church, ... Unfortunately, systematic post-excavation conservative and protective works were not carried out. For a site such as Umm ar-Rassas, all the walls and structures have to be taken into consideration. Would some particular vestiges be of great interest, the whole site becomes unique, therefore forcing to preserve it.

It is highly recommended to proceed to the systematic protection and consolidation of all the uncovered vestiges. That work will be conducted only after a comprehensive study and registration of the remains (work devoted to archaeologists). Then, case by case, each monument will be considered and the most appropriate conservation solution implemented (including restoration or anastylosis wherever these solutions are feasible). Tentative or permanent sheltering will be studied too. Taking into consideration the great number of structure in need of consolidation works (as a minimum), it is proposed to reduce as much as possible the number of new excavations, which will also have to integrate the requirements stemming from the proposed tourist management scheme, and in particular clearance/excavation of the antique streets the visitors may walk on.

The work should focus on the restoration of the already excavated parts of the site. It will need a permanent team of trained workmen (labourers, masons, stone cutters, and supervisors) working in our collaboration with archaeologists and with architects and other specialists whenever necessary. A substantial part of this staff should be originated from Umm ar-Rassas.

A general restoration policy and techniques will be prepared by specialists and a chart of restoration adopted before being implemented. For example, it is strongly recommended to precisely define the mortar to be used for the restoration (composition, ...), as well as strictly follow specified conditions for using it.

A particular attention will be paid to the security of the visitors and the monuments filling back all studied soundings and looted spots. A list of these dangerous cavities is given hereafter.

It is also highly recommended that a general policy will be adopted for the excavation dumps, in order to avoid the current situation of new debris hills all over the site (see hereafter a preliminary list of such...
b) List of archaeological soundings to backfill (Fig. 7 - Plans 8 to 9 - § X)
Approximate size of sounding is indicated, in meters. It is assumed that proper documentation of the sounding has been made, but this need to be verified prior to backfill, as some of these soundings reveal important stratigraphic components essential for the understanding of the evolution of the settlement.

c) List of the clandestine excavations to assess and backfill (Fig. 7 - Plan 11 - § X)
Included hereafter are clear clandestine excavations, leaving behind debris and traces of digging carried out with the purpose of discovering objects, and signs of activities, maybe vandalism.

d) List of excavation debris areas to be removed (Fig. 7 - Plan 10 - § X)
In all excavation debris there are stone blocks that could be useful for conservation and wall consolidation purposes. These need to be retrieved and arranged in each area, to maintain a certain relationship with the original area. In some cases there are decorated stones and architectural elements that need to be recorded and correctly stored. The earth could be reused for filling back the ancient fields (after their complete study), as rubbish stones should be reused in restoration work and/or in rebuilding the "dams" of the old fields. Dump materials will have to be selected directly from the excavation (see general recommendations) and reused in a proper way.

e) Suggested conservation actions (ranked by priority per each area)

(1) General remark
Most of the uncovered structures have not been fully recorded, especially as regarding their elevation. This preliminary work has to be carried out for all excavated structures, prior to any other work. In the same time, systematic study of all the architectural remains will be done (étude du bâti). As a priority, further research work will have to concentrate on these two aspects.

(2) Castrum
The walls:
1. Restore the entire wall, eventually with reconstruction, with the goal to prevent from any further collapse and to access to the interior not from the north gate,
2. Remove excavation debris and architectural fragments

North gate:
1. Complete excavation work
2. Remove excavation debris and sort stone blocks and architectural fragments
3. Complete walls consolidation

Southern gate complex:
1. Complete wall consolidation
2. Excavate postern gate to understand its relationship to the main gate.

Twin churches complex:
1. Monitor mosaic conditions
2. Assess and monitor wall conditions, especially in the southern church
3. Repair damage caused by clandestine excavations
4. Remove stones blocking the passage between the southern and northern church
5. Eliminate steps that facilitate visitors entering the excavation area from southern fortifications between towers 8 and 9) and from room near tower 4.
6. Eliminate debris from along the castrum walls
7. Arrange the "lapidariums" ...
8. Raise the wall between towers 4 and 5 to make it inaccessible
9. Excavate 3 more rooms and possibly a courtyard to complete the study of the complex.

(3) Church of the Priest Wa'il and of the Tabula

1. Consolidate the walls of both churches.
2. Monitor the decay of plasters (especially in the church of the Priest Wa'il) and eventually substitute cement plasters with more compatible lime plaster. Provide better protection for the decorated walls.
3. Remove channels from the Church of the Tabula, as well as from other weathering decorated stones, and store them in a closed atmosphere, except if a general protection of the church is proposed (roofing as for St Stephen complex).
4. Remove the debris from around the churches, and organise the stone blocks by type and size in an open area to the west of the complex.
5. Restore the alabaster floor in the church of the Tabula (area of clandestine excavations in the Northwest sector), and over the channel that during the antiquity brought water to the cistern.
6. If the shelter project is developing, document the current condition of the mosaics and conduct a full programme for their consolidation and conservation.
7. Complete the excavations of the three rooms abutting the church of the Tabula and of the tower-like building.
8. If the footpath proposed in this report is further developed, clean the rubble and consolidate the walls of the structures besides the passage, open the blocked passages in the south wall of the church of the Tabula, and reconstruct the arched passage.

(4) Church of the Lions

1. Consolidate walls.
2. Backfill deep sounding in room to the south of church.
3. Consolidate walls, arches and roofs of rooms to the south of church. Rebuild roofs.
4. Monitor mosaic conditions and carry out appropriate conservation and maintenance programs.
5. Consolidate tombs west of the church and replace displaced tomb slabs. These should then be appropriately presented or backfilled.
6. Clean debris, complete excavation and consolidate walls of rooms to the north of the church.
7. Complete excavations of annex to the west of the church.
8. Properly document nave collapse. Study the feasibility of leaving it in situ, or complete excavation and reconstruct using the archaeological evidence for arch span and height.

(5) Area of church of Saint Paul and chapel of Peacocks

1. Consolidate existing walls, especially in chapel and church.
2. Fill up large excavation between two churches: walls are in very precarious state and in immediate danger of collapse (except if a complete program of excavation and restoration is planned).
3. Carefully eliminate vegetation growth above the buried mosaics, after verifying their actual impact on the decorated surface.
4. Fill up clandestine trenches in both churches and restore damaged mosaics.
5. Remove decorated stones and capitals, presently outdoor, and store them in a room.
6. Fill up soundings to the south of Church of St. Paul.
7. Remove debris and avoid damage to the vernacular houses immediately to the west of the excavation area.

(6) St. Stephen complex

1. Assess detailed condition of mosaic floor in St. Stephen and Bishop Sergius, including a geomagnetometry or radar survey to reveal channels and/or passages under the floor.
2. Consolidate mosaics and continue conditions monitoring.
3. Stop water infiltration presently damaging the mosaics in the Church of Bishop Sergius.
4. Clean and stabilise the mosaics in Bishop Sergius.
5. Consolidate walls and complete excavation of area to the east of the St. Stephen.
The Twin churches complex
The walls of the church have been fully restored by the Swiss team. The general remarks about the quality of the mortar used and its implementation are valid here, but that church is one of the two monuments at Umm ar-Rassas which are already fully consolidated and actually in a quite good state of preservation. All the area has been fully excavated. Would the mosaics be shown to the public, the construction of a shelter is proposed (see technical proposal), although such a solution is not required for tourism purpose. Indeed, there is no direct access from the Castrum North gate. This shelter will not only aim at protecting the building, but also the mosaics which are, at the moment, simply covered by a few centimetres of earth.

Church of the Palm Tree
With the church of the rivers, it is one of the two monuments at Umm ar-Rassas actually in a quite good state of preservation, all the structure been fully restored by the Swiss team members. All the area has also been fully excavated. The general remarks about the quality of the mortar used and its implementation are valid for the restoration done on that monument. If the mosaics have to be shown to the public, the construction of a shelter is recommended (see above remarks on church of the rivers and general technical proposal).

Annexes
All the excavated structures were restored and/or consolidated, but many of the carved blocks found (lintels, capitals, some of them still plastered,… specie) mention to a beautiful = alabaster = base of cu umm datable from Roman time) were left in situ. They may be protected from weathering and visitors.

b) The northern settlement
The Churches
Excavation to be completed, mainly along the outside limits of the church: to prevent humidity and over weight from accumulated earth and debris on one side of the wall and to allow their restoration
Restoration of the walls
Removing ancient dump from excavation
Presentation of the surroundings
Second step: building a shelter in connection with the ones necessary over the Tabula church,
Restoration of the plaster and mosaics
Restoration of the ambo and chancel
General cleaning.

Church of the Tabula:
Large restoration works have to be carried out in that church: wall conservation and restoration, clearance around the building. It is expected that all the church will be sheltered, theshaped and modulo, stored (after implementation of a stone consolidation process), the mosaics and stone floor presented after restoration. The restoration and sheltering of that church should be planned together with that of Priest's Wall.

Unit I the sheltering becomes operational, it is recommended, for the other mosaics of the site, that regular inspections are organised, such as cleaning, the outer earth layer from herbic growth and animal incursions.

Church of the Lion:
The archaeological exploration has to be completed, the fallen arches first dismantled then restored, or kept as they are, but fully protected. A general restoration of the walls is required prior to the construction of the shelter. The North wall, and, in a smaller scale, the South one have greatly suffered, resulting in the collapse of the internal arches. The reconstruction of the arches is quite possible, yet unnecessary for the construction of the light protection structure. A general consolidation of the walls, built of pseudo square or less similar blocks for the apse, and from the double irregular with internal pocket for the others parts, is needed. The construction of the modern shelter will follow the general procedure (see general explanation.)

Chapel of the Peacocks:
This monument is actually the only one at Umra or Ravas which could be dismantled. Sufficient elements and blocks ensure the restoration on paper as a material one. There are nine capitals (out of likely 10) among some stones arranged to the west of the chapel, as well as many stone slabs belonging to the original roofing. This building could be theoretically reconstructed as most of its original building material seems to be present, although the original height of the pillars is questionable (archaeologists have been requested to provide this information). Reconstruction (deconstruction) of the monument will be proposed, after general consolidation of the in situ structures.

Church of St. Paul:
A lot of work remains to be done:
- complete clearance of the neighbourhoods,
- excavation and dismantling of the collapsed arch still in situ,
- consolidation of the walls,
- restoration of the plaster and the mosaics,
- rebuilding the walls and construction of a protection roof.

Church of St. Stephen:
- research and determination holes size under the mosaics (radar, magnetometry...), reasons of decay...
- protection of the mosaics and disassembling of the current shelter,
- completion of the excavation, in particular along the external wall of the apse,
- fill back the soundings (south-eastern passage),
- restoration and consolidation of the existing structures, in particular the vault and walls of the south-eastern passage,
- general rejoicing of the structures,
- construction of the new shelter,
- restoration of the mosaics, general presentation.

Church of Bishop Sergius
The northern wall, in critical condition, was partially rebuilt some years ago. The restoration should be pursued. The West wall and the closing partition, build between Bishop Sergius and St Stephen, are in a very bad state of preservation. Overall consolidation of the structure is necessary. The whole church should be protected by a new efficient shelter. This new structure will take place on restored walls (see general layout for such structures) and will be part of an overall protection and restoration of the area which will include sheltering of the four churches and the baptistery of Bishop Sergius church. The St Stephen complex should be restored has a whole.
The main restoration problem will be the conservation of the mosaic pavement. As there is a cistern inside the nave, under the main mosaic floor, it is recommended, prior to any other work and as for St Stephen church, to undertake a non-destructive exploration work (radar, magnetometry...).

Church of the Aedicula
The main problem concerns the restoration of the existing structures, in particular those of the southern wall, preserved on more than three meters high. This wall shows many clues of instability (swelling, cant, compressions, crackings, disintegration of the rocks, broken lintel ...), amplified by the presence of the underground corridor and the aedicula. Recent consolidation works have prevented from the collapse of the structure but did not solve any of the structural problems. A shelter could not be built until the entire wall is dismantled and rebuilt, reinforced and rectified. The underground corridor should be entirely restored, as well as the whole of the pavement of the nave and the apse. For more legibility, the pillars of the nave will have to be rebuilt up for two or three rows.

Church of the Courtyard
- Consolidation of the walls,
- rebuilding of the two arches of the North nave...
- restoration of the stone floor.
As the building is directly connected to the church of Bishop Sergius, roofing is a need to insure the protection and the continuity of the volumes within the St Stephen complex.

The other structures
Wint press: The structure is not completely excavated and is in need of consolidation, as both plaster and walls are in precarious conditions.

c) Cisterns and water tanks
- general survey and study, including research with non-destructive adapted techniques (see churches of St Stephen and Bishop Sergius).
- Cartography of all underground structures

d) Ancient Fields
Cultivated terraces were built by damming the bottom of local wadis with low terrace walls. The bulk of the terrace infill consists of colluvium composed of angular gravel in a matrix of fine sandy silt. In most cases the colluvium is topped by a 30 cm thick cover of fine sandy silt. The colluvium is very similar to the silt originating from the excavations.

This dirt could be used to restore the cultivated terraces provided a cover of fine material on top of the dirt layer is applied, after comprehensive study and documentation of the whole system and identical reconstruction of the ancient walls.

A general survey and study of the structures is a preliminary need. These structures have to be protected and possibly restored (including the excavated ones), and prepared with the view of future investigations, tourist presentation and agricultural use (antique rural life theme). After a comprehensive study, they could be used again as fields for agriculture and grazing to fulfill local Bedouins requirements.

Restoration of such structures will be easy while simultaneously being a good solution for recycling the debris found during the excavations: rubbish stones could be used to rebuild the walls and the earth to fill back the fields. Under the condition to keep their ancient configuration and utilisation this action will: 1) illustrate tourists' understanding of an antique village's agro-economy in arid lands, 2) improve site cleanness and avoid summer dry fallow land fires, and 3) generate income for local populations. Additionally, this action will maintain a local interest for Bedouins to control the area.

e) North tower Complex

The Tower
Although cracks do not affect any key stones but their joints, monitoring the tower is recommended, especially because a clandestine excavation has destroyed—and destabilized—the lower part of the inner core (large hole opened in the northern facade). This tower may be also the place where general and detailed in situ studies on local stone weathering degradation could be monitored. An overall and comprehensive detailed drawing and study should be carried out.

The Church of the Tower

The church has masonry work problems. Presently, the conservation works conducted by the Department of Antiquities consist of wall consolidation and reconstruction, but the use of cement mortars of untested type may create future problems linked to mechanical and chemical incompatibility with the used type of stone.

Area around the Tower
- registration and study of the existing remains before implementing any restoration work (for example, the courtyard limiting walls were recently cleared without any prior archeographic expertise and recording).
- complementary excavations, mainly around the «farm» building
- restoration of the unweathered structures
- general cleaning of the whole area's dump
- restoration and protection of the stone slabs roofed cistern still under use.

f) Semi-subterranean Houses

A thorough examination should be lead on a selection of two houses prior to start any restoration work. Prior to this step, consolidation will be executed and excavation conducted. A general survey and comprehensive study of this recent conversion of the unique remains are also expected.

3. Anastylosis

Reconstruction of part or totality of a building is the exact way and shape it was before destruction, and using the original materials required to:
- discover all the necessary elements during the excavation;
- design the restoration project of the building demonstrating that anastylosis is possible;
- be sure that, from a technical point of view, the remains will allow rebuilding (state of preservation of the discovered elements, conservation and solidity of the different components...).

Nowadays, out of all the excavated monuments of UAR only the church of the peacocks reasonably appears to be completely anastylosable (Fig. 7 – Plans 15 to 18 - § X). All information and elements needed for its reconstruction are likely available: pilasters capitals, vassoiros of the arches and stone slabs from the roofing are preserved. The graphic restitution of the whole monument seems possible. Therefore, it is recommended to prepare a complete and precise study of this building. Anastylosis (if possible), of that chapel could be a very interesting opportunity to display to the visitors the ancient method of the roofing construction technique used in the city.

In some other buildings, only partial anastylosis is possible (see for example the fallen down arches of the church of the Lions). On an other hand, reconstruction in situ of the arches, of the chancels... of the churches must be studied, especially as regarding the monuments to be sheltered.

4. Shelters

The St. Stephen's complex consists in a group of churches including the church of St. Stephen and adjacent areas, the church of Bishop Sergius, with the baptistry and the Diakonikon, the church of Courtyard, the Church of Aedicula, and adjacent areas. The floors of churches of Saint Stephen and of the church of Bishop Sergius are paved with exceptional ancient Byzantine mosaics, the two other edifices being covered with paving stone.

The churches of St. Stephen and the choir of Bishop Sergius have been protected by a closed covered superstructure. So far, this decision has helped to protect and conserve the mosaics, but also to authorize visits. Constant and regular visits have emphasized the celebrity of the site as regarding its religious...
and beautiful mosaics. The ongoing increase in the number of visitors from various
cultural origins demonstrates the wide interest shown by the international community.

Scales of the others churches (churches of the Lions, Peacocks, Priest Wa'll, and twist churches)
ecologies buried under 20 cm thick sand layer, protecting them from potential damage by weather
storms.

Propose of the project is to deal with tourist demand, by seeking a solution for protection, in the long
rather than in the short term, in integration of the site and enabling discovery and conservation of all
structures.

Hence, the existing superstructure covering Saint-Stephen will be demolished and removed letting
in to a new and relevant structure.

Current situation

Metal shade in place, a temporary installation, awaiting the arrival of a global project, has allowed
space to admire the mosaics of Saint-Stephen, along with part of the choir of Bishop Sergius'Re
(see Annex 3.8 & 8.9).

Composed with a steel frame and columns and lattice trusses, approx. 4 m from each others.

Covering is made of a saddle roof, in thin steel plates. The supporting columns are founded on the
site of the original walls, within unexcavated zones. Elevation are pierced with large glass-openings.

One access allows visitors to come in, using footbridge, 1.20 m distant from the floor. The building
is the gable, 7.5 m high. All the shade are coloured in light yellow-green. There is no signposting
in it.

Shade is used to play a role protecting from bad weather conditions (winds, rains, etc...). However,
issues have not been addressed such as water-tightness and air-tightness, air circulation and light.

Well, should the issue of the presence on the site of this huge and obtrusive shelter as well as the
esthetic quality of the interior volume be addressed.

However, the presence of outer claddings of the antic walls, in unexcavated zones has so far prevented
archaeological work in the surroundings.

Their negative characteristic is that the indoor walkways are built too high and too far away from the
stairs.

Beams are conventional lattice truss and iron corners. Parts are welded on the site. The ageing of the
parts is noticeable (fallen lattices, broken welding, worn fixings) and replacement work will be
needed in a very short time.

Proposal: general policy

All constraints are guiding the choice of the shelter's shape and roofing system:

- Migration to the site obliges to adopt a construction system respecting the general volumetric of the
protected buildings, and the use of materials whose nature and colour could adapt the ensemble of the
vestiges, or/and to be dissimulated to the sight.

- Respect of the archaeological, dense and complex environment, obliges to conceive structures
which are strictly limited to the vestiges to be covered, only means of preserving any possibility of
excavation and presentation of the possible vestiges, possibility. This solution does not allow to
operate on the underground basis since the old structures are used as foundations for new
constructions. However, this system obliges to design a structure of a total weight lower than the
overall mass of the destroyed parts of the old buildings.

- Adjustment to any type of structure in potential need of protection (in the future it may be necessary
to cover and protect the wine press, dwelling houses, shops...). Obligo to adopt a simple and modular
system.

- Costs of manufacturing should be as low as possible obliging to conceive a simple system, with the
use of inexpensive and at the national scale marketed materials.

- Implementation must be as simple as possible, without requiring highly qualified workmen nor an
additional equipment (large crane special tools, ...). Who more is this implementation has to be
able to be done in difficult to reach zones (huge hip of ruins), which resulted in conceiving modular
structures, easily transportable, easy to assemble and implement;
increasing discovery pleasure; bringing tourists closer to the
justification: nationally-recognised recommendations of the Venice Convention and
its sister

The lattice work system distant of 2.5m, carrying a large translucent
covering above the central part and a corrugated thin steel sheet above the
structure will be supported by simple masonry walls built over the antique
minimises its visual impact on the site while simultaneously clearly
rise from antique vestiges.

loss interests:
central part: no need of specific electric devices for the lighting
from rigid bodies (steel plate) of small span of 1.75m max. (no need of heavy
attaching rain water drainage and supporting the sand and dust accumulated
in the vertical part of the frame
be adapted to each buildings without extra cost of engineering
and erecting
he anchoring points on masonry walls in respect of their carrying ability
materials (galvanised steel – PES/PVC fabric)
using ditches down to cisterns.

Provided by archaeologists, it has been proposed to restore the load-bearing
cover them with a structure of light fabric. The difficulty being, in detail, to
that may be reconstructed, and in the spacing of any windows to be bored.
fire iconographical, or archaeological element, it is proposed that the lower
structure will be at the level of the extrados of the nave arcades in case they are
proposals, designed to illustrate a concept. All works should be of course
architectural analysis of the remains.
installed, at about 50 cm above the finished floor. Such walkways (1.20m
the beams, so as to keep the floor clear and to cause no damage to the
cover over all the important and interesting features.
installation such as electricity or water in those premises.
resolved is to supply the structure inside an archaeological area where
of Lions, of the Tabula, Twin churches, etc.) (fig. 7 Plans 19 to 36-
inside each sheltered structure.

Walls are in poor condition they are about 90 cm thick, in order that they
off the existing copings. The existing walls need to be reinforced using the
materials (stone and lime).
will be placed about 10 cm away from the faces. A simple trip of grey

marble, and 30 cm high for the new stone layer.

Carved stones to reconstruct the outer walls, with the same finishing line
found stones, different to the old masonry, in rubble stone. While work is
face finish will be executed (sawn, polishing, ...). There will be no
25 cm can be created, the highest part also 25 cm thick.

air in the facings, to air the enclosed volume. Sand and dust will be

turbin water to the outside from the cover. These waterspouts will consist

of about 30 cm.

To remove the levelling of the new walls, and clearing of some elements

to the setting up of a light covering structure.

Selection of materials, stock, nearby arrangements

parts and occultation of holes in existing walls

walls by reemployment of materials with mortar and light lime.

Once, with a light brushing of the facings

setting plaster.

supply and installation of wood protections on the grounds.

of stone faces of local cuttings 0.50m thick, 0.51 high, 0.60m long, supplied

and sawed. Facing laid on all visible sides. On the higher points, wall of 0.25m

structure. Reservations in new walls to create waterspout, ventilations...

exterior and interior siphon guttings.

toa the ancient and new parts of a terracota bricks 0.01m thick.

of scaffoldings.

different doors.

steel door, supply and installation.

other work is terminated.

installation of metallic footbridges on the ground or fixed to the beams, all elements,

being included.

installation of marge signposts 1.20x0.80m.

installation of steel doors.

are delivered with special anti corrosion paint, brown finish, with rusted protective

structure of the buildings: a modular concept

The concept consists to use an unique truss system for all the buildings. However as the

(Church of the Aedicula) to 13.50m (Church of the Lions), it has been decided to

lengths for the vaulted central part in order to use a peripheral self-supporting corrugated

truss structure which can be adjust directly on site on the peculiar borders of the stone

use of a delayed building, the initial engineering work will be still appropriate.

Concerned building

Church of Saint Stephen - Church of the Court Yard - Church of the Lions

- Church of the Tabula.

Church of Sergius Bishop - Twin churches - Church of the Priest Va'al

Church of the Aedicula.

Mystery

part of the baptistery is identical to the other buildings. It will receive a lattice work

adaptation of half type 3 truss. Its bay is also of 2.5m. Its peripheral edge is realised

supporting with folded steel plate eaves for the rain water drainage in cisterns.
calculation, assumptions, proposal

The wind speed from the weather report of Madaba, Q.A.Airport, Er-Rubah, on 20th shows a maximum speed of 20 km/h (10.5 knots) at Q.A.Airport

a poor average, and in lack of peak values insufficient. Therefore, it has been

corresponding to the whole inner land. In that system, (Z) corresponds to a load intensity of 105 daN/m². The wind coefficients to

corresponding to an extreme uniformly distributed load of 85 daN/m².

loads, it is common to take into account a vertical gravity load of 30

The regulations, the standard frame will be:

cumming wind speed and snow load: N.V.65 completed by N.84 modified 95,

European Norms

Tl'Art des Structures Membranes Textiles Tendues » (CRAST)
Pour la conception des ouvrages permanents de couverture textile =. Annales
Public. n° 9, septembre 1997 = modifications septembre 91,

description

be made of galvanized steel. All the different steel components will be welded

workshop and bolted on site. No welded joint will be allowed on site.

In:

composed of:

\[ \text{0101.4x3.6} \]

\[ \text{3x200} \]

\[ \text{3x25} \]

then at the bottom of the vaulted top chord allows the lacing of the peripheral

corrugated sheet with light secondary structure.

of the truss allows the fastening of a venting system, U-bend type, to prevent

the system is reinforced by a grid to avoid emergence of reptiles, birds and

long sides using a folded steel plate aisles, welded to the bottom chord of

hinge for the first and a sliding bearing for the second. This principle

wells and allows thermal dilatation.

the plane of the bottom chord is adopted in order to transfer horizontal

complex, some of the waterspouts can not be put in place because they

3 Stephen / Sergius – St Stephen/Courtyard – Sergius/Baptistery). The

account the rainfall data and the surface of the incident covering.

From the two coverings

1 (Church of Bishop Sergius / Church of the Courtyard and Twin

right replace the masonry wall to be rebuilt in all other cases. The end

support in order to absorb sufficient thermal dilatation.

rain waters to the extremities (gable).
must be at least:

- Polyester
- PVC double face anti U.V. anti crypto
- 1000 g/m² (NF G 37 102)
- Warp: 420 daN/5cm - Weft: 400 daN/5cm (NF G 37 103)
- 12 daN/5cm (NF G 37 107)

M2

2. Technical product are exclusively from the western countries.

Conforming the specific design and drawings, ensuring a double curvature process uses the High Frequency Welding technology, the prepared in Europe, and carry to the site.

A simple principle of saddle shape textile carried on arches with reinforcement for the contact area on arches and peripheral eyelets for

(political will, accidental collapse of a membrane ...), a substitution plan. In fact, the concept of small 2.50 m bay, allows to use a membrane that clipping of the membrane is placed under it. The disadvantage is the

of this kind of membrane in the Mediterranean countries with very high

the relevance of this choice which brings about a great comfort and

through simple yearly maintenance (namely a stretching of the lacing ropes

needed if needed). The full-day presence of the VC keeper is a sufficient

and monitoring.
(5) **Volum fabric**

The quality of this membrane is: Grid or Screen with a permeability of about 25%. It is stretched by facing upon specific tubes welded under the bottom chord of the trusses.

The modularity Side / flaye / Side is adopted in order to enhance the existing shape of the mosaics. Traslucent, this technical product ensures a zomitt type lighting, avoiding use of electric devices.

- Constituion of the membrane must be at least:
  - Fabric Type Screen: Polyester
  - Support: Coating
  - PVC double face anti U.V anti crypto
  - Total weight: 386 g/m² (NF G 37 102)
  - Tensile strength: Warp: 230 daN/cm – Weft: 160 daN/cm (NF G 37 103)
  - Fire reaction: M1

Manufacturer of this kind of very technical product are exclusively from Western countries.

(6) **Secondary structure**

A secondary structure must be added to the main elements:

- A set of 41 beam IPN 100 or corner L50 x 5 must be used for supporting the corrugated sheets.
- A set of tubes Ø101.6 x 3.6 with bracing must be used to ensure the vertical stability of the lattice works.

(7) **Erection**

The main trusses can be realised with two different ways, according to the erection principle adopted:

- The trusses are manufactured in one welded piece in the workshop, carried on site and hoisted in place using semi-heavy lifting device. The approximate weight of the heaviest piece is about 500 to 600 kg (Church of the Lions) inducing the use of a 6 to 10 tons crane for a 10 meters long span.
- The trusses are pre-manufactured in disjoint elements in order to be hoisted on site with light lifting device. The heaviest part is about 200 kg, limiting the need to a light crane or even more hand carrying using hoist.

The choice has to be fitted at each building according to access criteria to the site, stationery area, crane disposal, carrying time, ...

The membrane (weight: 460 kg in case of Church of the Lions) can be hoisted as a bag upon the frame using the lifting devices or can be hoisted manually if the lifting device is disabled. Final facing is done by hand.

5. **Exhibition Of Valuables Architectural Pieces**

Some rare and valuable architectural elements were found during the successive excavations. They are on display or stored in the Masada Museum and at Mount Nebo Franciscan Institute. Some remain in situ.

Some of these pieces are very representative of the Umm ar-Rasas history, so that their exhibition is recommended on the spot. The different findings can be divided into two groups:

- Huge stone pieces, such as carved lintels, chancel amboss, ...
- Small pieces, such as polycandilos, bronze plates, bronze crosses, ceramics, glass, ...

Exhibition of these objects doesn’t require a complete equipped museographic installation and structure. Heavy stones of the first group can be easily movable and robbed, although they should be protected against weathering and other risks. They can be aesthetically displayed and cleverly interpreted. If archaeological evidence and architectual remains justify it they will be replaced at their original setting within restored and sheltered monuments (e.g., ambos and chapels in churches of Priest Wail and of the Tabulae). May the anastylosis operation be not possible, such pieces will be deposited all together in a protected area such as in the Bishop Sergius basilica. Exceptionally, some of them will be presented together with the small pieces (e.g., Iron Age column base). A detailed proposal will be prepared only
after exhaustive inventory of the carved blocks by archaeological teams, analysis of their state of preservation and degree of interest for visitors, have been carried out.

Representatives of the second group could be displayed in show-boxes, in the exhibition room of the Visitors' Centre (see § 'Visitors' Centre'). Illustrated with photographs, drawings and models, they will contribute to the visitors' information upon their arrival at UAR. They might be contemplated once more after the visit, stored in a safe place, under direct supervision of a guard. Only a few, carefully chosen items will be exhibited. Accompanying illustrations, such as on the daily life and the environment, the know-how of the ancient UAR's inhabitants. A showcase from the Byzantine-Omeyyad collection of the Future National Museum in Amman could be lent to the VC.

C. LANDSCAPING PRESERVATION AND IMPROVEMENT

In order to improve the quality of the site landscape, the following measures will be taken:

1. Destruction of obtrusive in-site buildings
See figure 7 - Plan 37 - § X

2. Use of vegetation

a) Climate constraints
Key climatic data for UAR (750 m elevation) show that (in average) temperature drops to 3°C in winter, raising up to 40-45°C in summer. Dominant winds blow from the West and the NW.

b) Objectives
Vegetation should be considered as a useful mean to achieve several objectives, but mainly for landscape improvement and zone demarcation. A variety of trees and shrubs are proposed not only for improving the landscape, but as well to reduce soil erosion, to reduce the wind consequences (wind break effect) - such as plastic bags blown from the NW (UAR village) - to demarcate the site boundary and zones, to provide shadow to small market areas and parking lots, and to generate income to leaseholders of the socio-economic zone.

c) Selected species
For this area, most commonly adapted tree species are: cypress (Cupressus sempervirens), oriental pine (Pinus brutia), thuja (Thuja orientalis), Cataracta aquatilis, caroub (Ceratonia siliqua), tamarix, olive tree, black mulberry, almond tree, pomegranate tree, juniper. In addition, oleander, jujube (Ziziphus jujuba, Z. spina-christi), prickly pear (Opuntia), vine (Vitis), are possible shrub species. Thorny shrub species (Opuntia, Ziziphus, Cramagus) are livestock-proof once reaching a certain density and height. Years after they are able to greatly limit human access.

Besides their landscaping role, fruit tree species have additional socio-economic advantages: olive, black mulberry, pomegranate, almond, apricot and apple trees, can usefully improve the local farming system in the socio-economic zone. However, apricot and apple trees are more expansive (2.5 JD/plant) and require regular watering over time (refer to socio-economic section).

<table>
<thead>
<tr>
<th>required planting density:</th>
<th>300 plants/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 plant olive tree (60 cm high, 1-2 years nursery):</td>
<td>1 JD</td>
</tr>
<tr>
<td>1 ha plantation (10 donums) equipped with drip irrigation (not including soil preparation + labour):</td>
<td>700 JD</td>
</tr>
<tr>
<td>cost unit labour:</td>
<td>3-5 JD/day</td>
</tr>
</tbody>
</table>

NB: A private nursery is located at Madaba. Nearest state-owned nurseries are at Wala (60 km) and Yajouj.
d) Watering

Yet, given severe droughts, all plantations should be watered during the first years after planting. A locally commonly used watering system such as the drip irrigation is convenient. Once watered the plantation growth is relatively fast, as it has been observed in the UAR area (olive tree plantations, cypress and pine-made row plantations).

e) Thorny fence

Prick y pear (Opuntia) and jujube (Ziziphus) are ideal shrubs for restricting access to livestock and humans, so are able to provide an effective barrier protecting the sanctuaries provided they have reached the mature stage. They are thorny plants and drought-resistant when enough rooted. The weakness of this kind of fence, while compared with metallic fence, is the time required to achieve this goal. Plants should be protected as long as they are young and watered during earlier growing stages. However, once effective (after 5 years minimum) this natural fence is maintenance-free and unobtrusive in the landscape.

The prickly pear has to be watered during the 2 earlier years every 2 weeks, then watering will be definitely stopped. Fruits (pear-like) can be collected but green succulent parts should not be cut (used as fodder for livestock, especially during droughts), as the plant growth must be fast. Propagation is by cuttings. Initial planting is about 100 cutting / 150 m and the cost : 0.3 JD/cutting.

Cost of 1 km of 1 single row (not including watering and labour for plantation) : 200 JD

f) Tree row plantations

They will be discontinuously developed along the western and southern boundaries of the AP, both to demarcate the Park (visual demarcation, not physical fence) and to hide the most obtrusive components of the landscape.

Mediterranean cypress (Cupressus sempervirens) mixed with oriental pine (Pinus brutia) are tree species to be planted. If correctly watered (drip irrigation system) they will reach 5-10m high at the age of 8-10 years. Such species will be planted preferably along the Madaba road and the southern boundary (see map); to hide obtrusive elements (discontinuous plantation). During the young stages herbs (especially goat) should graze at a distance from this plantation getting in or out through non planted passages. Olive tree, black mulberry tree, almond tree, pomegranate tree can also be used along different stretches of the boundary where the height is not determinant. Olive trees are particularly well developed when 8-9 years old.

g) Aromatic and medicinal herbs

As grazing will not be allowed within the sanctuaries, it is expected natural vegetation to recover. Among the steppe species several aromatic and medicinal herbs may develop such as Artemesia herbula-alba. Vegetation will be monitored after 2 years of protection. In case of failure, several species of aromatic and medicinal herbs will be planted. Most suitable herbs are : sage (Salvia officinalis), Artemesia spp., savory (Thymus serurioideus), gysun, camomile, lavender (Lavandula spp.), rosemary (Rosmarinus officinalis). The objective of such plantation is to cover the soil in and closely around the archaeological sanctuaries, to create a contrasting between the mineral nuns and their natural setting, as well as to provide a source of seeds for surrounding areas. This plantation is to be distinguished from the cultivation of herbs by leaseholders on the terraces with meagre soil cover in the agricultural zone of the site (see map) (refer to socio-economic section).

1 hectare plantation requires 800-900 plants (8000-9000 plants/ ha). Artemesia can be sowed at a reasonable price, but sage is very expensive (300 1D/kg of seeds !). Plantation of sage plants seems preferable. It is advisable to water plants during first years of plantation, yet in that case the cost of equipping several hectares with drip irrigation is excessive. Therefore, the solution is to equip the site with a mobile water tank (£. 'Site Maintenance').

h) Mixed tree and shrub plantation

This type of plantation will provide shadow to the market stalls and parking areas. Plantation shape will be irregular. A variety of species will be planted : olive tree, cypress, pine, juniper, almond tree, black
mulberry tree, pomegranate, carob, etc. This plantation will be watered with a subterranean drip irrigation system (to avoid damages brought about by human movements).

(a) Table: Plantation characteristics.

<table>
<thead>
<tr>
<th>Zone</th>
<th>i</th>
<th>Objective of plantation</th>
<th>Action</th>
<th>Main species</th>
<th>Location</th>
<th>Size</th>
<th>Watering</th>
<th>Cost (investment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site boundary</td>
<td>Natural demarcation of site</td>
<td>triple row tree plantation (10 m wide)</td>
<td>cypress, pine, juniper, olive tree</td>
<td>W and S boundary (discontinuous)</td>
<td>3 km 3 ha</td>
<td>drip irrigation</td>
<td>6000 JD (2000 JD/ha)</td>
<td></td>
</tr>
<tr>
<td>Boundary of sanctuaries</td>
<td>Visual demarcation of core zone</td>
<td>double row of thorny shrubs (700 cuttings/km)</td>
<td>Opuntia, Ziziphus</td>
<td>Sanctuaries 1 &amp; 2</td>
<td>2.5 km</td>
<td>manual (2 years)</td>
<td>1500 JD</td>
<td></td>
</tr>
<tr>
<td>Tourism zone</td>
<td>Shadow decorative plantation</td>
<td>tree plantation</td>
<td>olive tree, cypress, pine, juniper, almond tree, black mulberry tree</td>
<td>near entrance gate &amp; VC, parkings and market stalls</td>
<td>3 ha</td>
<td>drip irrigation</td>
<td>9000 JD (3000 JD/ha)</td>
<td></td>
</tr>
<tr>
<td>Gripping and grazing zone</td>
<td>Keeping the traditional way of rural life</td>
<td>see SE section</td>
<td></td>
<td>Central and Northern part of site</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil erosion control</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Landscape improvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Income to local communities</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Marketing of handicrafts and local products</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

The cost of all plantations (investment zone) amounts about 25,000 JD. Recurrent costs are mainly composed within the salaries of the two employees in charge of watering and general plantation maintenance during the two first years following the plantation, then with only one labourer’s full-time salary.

D. SOCIO-ECONOMIC DEVELOPMENT

1. Introduction

UAR archaeological site is unique, showing a large ancient village and its land on the desert fringe. Presence of these vestiges justifies some-controlled tourism development that may represent a source of income, especially for the people living around the site and the landless tribes. Local population should probably be more involved in restoration and maintenance works than in direct tourism development activities, but this is uncertain due to the regional policy context.
On an other hand, the old agricultural field pattern located in the bottom of the small wadis has to be enhanced, specially because rains are located on Bedouins tribal land which were recently sedentarised and because of the weaknesses of the local farming production system. In such difficult agro-climatic conditions, barley production and livestock feed (as supplement for the long bridging period) must be supported by the project.

This project for the Protection and Promotion of the Cultural Heritage of Umm ar-Rassas is expected to generate a major economic development in this semi-desert area. The proposed action plan put the greater attention on this issue, emphasising the necessity to understand the needs of the local community and municipality plans, with prior agreement of the local stakeholders. The management plan has to focus both on restoring and enhancing the archaeological remains, as well as on the consideration of other stakeholders and plans of governmental organisations.

2. Land purchase of the whole site

Field pattern should be purchased by the MTA for the whole site. The Department of Antiquities is in the process of acquiring land around the archaeological area and the area extending from the tower to the fort, thereby solving zoning issues related to site protection. In the first step, land and property plans (cadastral field plans) have to be agreed by the landowners, the Municipality, the Department of Lands and Survey and the Department of Antiquities. In order to fit the needs, a local Committee will be set up including all the stakeholders after site limits designing. As the cadastral field plans do exist and because land owners agree to sell their lands inside the archaeological site limits, the purchasing process may succeed in a short term.

After landowners identification, the second step will define areas and costs for each field or plot. However, one should pay attention to the following elements inside the archaeological park:

- the cemeteries still in use for one of them, they should be out of the agreement because they belong to the Ministry of Awqaf;
- cisterns and traditional water tank (stoned made) are private owned and used for livestock watering; their purchase should be justified in agreement with local shepherds;
- buildings and houses: 6 houses are located near the tower and one in the south-east (that is to say they are inside the limits of the park). Purchasing these houses need a previous design of their use and of their potential contribution to local development. For example, part of them could be used for archaeological park guards housing and for a restaurant managed by a local association.

Purchasing these land is very important for MTA as it will allow:

- a real control of human activities inside the AP in a sustainable way (escaping from private and economical pressures)
- to avoid conflicts between private owners and MTA about types of activities which could be allowed within boundaries and those which are prohibited.
- to substantially improve nomads' production systems, especially those for the Azamleh (the poorest Bedouins tribe) located in and around the AP site, through contractual agreement for land reclamations.

Action:

- Land-ownership assessment and cadastral field pattern purchasing (MTA, Department of Lands and Survey).
- Purchasing all the AP site lands could be one of the Jordan compensation to the European funding for the tourism development of the site.

3. UAR municipality development plan and urban development

Planning guidelines for the villages inside the UAR municipality (physical planning) have been established. The current zoning plan for Umm Ar-Rassas town (prepared in 1997), currently used by the Ministry of Municipal and Rural Affairs, should be updated.
In addition, referring to the Social and Economic Development Plan prepared for the country for the period 1999-2003 (in Arabic), a new overall land-use draft policy is also under-preparation at the Regional Planning Office of the Ministry of Municipal Affairs.

There is a project for the area of Umm-ar-Rassas funded in the range of 58,000 JD focusing on developing better roads and lighting fixtures for the inhabited areas of the town of Umm-ar-Rassas, as well as dealing with social aid and training.

Some changes in the zoning of the area around the archaeological sites should be studied. Some of them are being under preparation by the MTA, although they should be fulfilled. Several aspects should be taken into consideration, not only buildings and tourism activities. For example, the adjacent cemetery to the archaeological area; where no action appears to be possible, unless another area is found in the town to replace it.

The UAR Baladiyya (municipality) is the appropriate entity to design an area’s tourism development project. It gathers 6 villages of the same tribe (Beni Sultan) and the same nomadic Bedouins (Azazmeh). Moreover, several archaeological sites are spread over the 6 village lands. All these small archaeological sites have to be considered as part of a whole and may contribute to strengthen and balance local and tourism development of this area, so far focusing on the exclusive UAR village.

Lastly, the fact that Lebun has a smaller community than Umm-ar-Rassas and that tribal political influence is larger at Umm-ar-Rassas, must be taken into account.

For all these reasons, a local development plan has to be set up for the whole municipality territory, taking into account the several tourism sites (including Lebun for its landscape and tourism potential), their potentialities and complementarity.

The purpose of this action is to propose guidelines and standards dealing with settlements and buildings in the UAR municipality, especially around the archaeological park of UAR and Lebun site. An urban planning vision would replace the present urban plan providing urban zoning for the village and building regulations for each type of zoning; people and regulations are key factors in the development planning of the area.

4. Community development and contractual agreements for site management

Tourism development in and around UAR site (and Lebun site as well) should contribute to generate income for local population and stakeholders of the UAR municipality. To do so, local population has to be involved in all steps of the tourism project preparation and implementation. Moreover, they should benefit from tourism activities and from the revenue generated by visitors’ entrance fees. Several activities could be developed consistent with this local population participatory strategy:

a) A socio-economic survey as a mean to define a local community participatory process

A study based on the needs and values of the local community and stakeholders is proposed as the right approach leading to a successful site management. The goal of such study is to objectively address local needs, thereby, being less imposed by planners or decision-makers.

Local population participation in the planning process of the site development is a key issue. All also show great concern on the economic development and involvement of local Bedouin groups.

Namely, the local community and the municipality agreed upon to be the main stakeholders for the future success of the physical planning of the whole area.

Issues of local community participatory process has to be discussed in order to define and prepare the way of managing the site and the contractual agreements to be signed between the local stakeholders, the UAR municipality and the MTA.
b) Contractual agreement for agricultural plots management inside the AP

It is recommended to reclaim the old terraces system located in the bottom of the small wadis inside the AP (taking into account that no archaeological remains could be found in such areas). This reclamation plans to react the three following goals:
- landscaping management of the archaeological site in order to insure land maintenance where no excavation will be carried out; agriculture should also be considered with the view of maintaining the landscape of the whole area.
- generating local revenues from agricultural development benefiting to the local population (especially the poorest)
- integrating the agricultural terraces to tourism development project through the terraces exploration.

Other local revenues will be generated by the agricultural development within the archaeological site through a land leasing contractual system between the MTA and the association and involving the Ministry of Agriculture (refer to socio-economic section). Similarly as with tourism, agricultural activities will be specified in the contract with the association, as agriculture should also be considered with the view of maintaining the landscape of the whole area. The proposed animal husbandry improvement system will mainly benefit the poorest, namely the Jerash nomads (refer to socio-economic section).

With this view, a multi-annual contract should be signed between the MTA (Department of Antiquities), the new landowner on the one hand, and the people in charge of the development and the maintenance of these grounds on the other hand. The contract will envision investment starting phases (in particular trees and fruit-bearing seedlings and irrigation equipment if needed) to the load of the project and carefully indicate conditions and responsibilities of the owners specifying methods for agricultural settings and maintenance obligations (in time and space). Products and by-products of the exploitation and the maintenance of these grounds will be left to the farmer.

With regard to the uncultivated lands or open areas a contract specifying the use conditions could be designed as well, allocating pasture lands being annually re-considered insofar as no new excavation is planned. The authorisation have however to consider resting and regeneration periods of the steppe vegetation.

c) Contractual agreement for tourism activities and income management

The local population should benefit more adequately from tourism. Regarding the revenue generated by the entrance fees paid by visitors the current antiquities Law is unfortunately not compatible with a sharing mechanism, as such fees are entirely allocated to the MTA.

In the current situation, local revenues can only be those created by employment (guides, guards...), shops (tours, handicrafts, tea shops...), restaurants, on-the-spot services.

However, without changing the Law a possible solution should be to create a local association with the aim of developing tourism at UAR. This association would be agreed upon by the MTA and registered by the Ministry of Social Affairs. A contractual agreement will be signed between this association from UAR municipality and the MTA (Madaba Department of Antiquities) which will regulate:
- the percentage of entrance fees to be allocated to this association,
- planning of tourism activities in and around the site,
- obligations and commitments of the tourism promoter.

Entrance fees will be allocated to the association assuming it respects prior tourism activities planning and commitments.

The association status seems to be the best legal tool for local community development and tourism activities management. This association should gather all representatives of traditional and legal authorities, technical and administrative services for this area and local population representatives, as well. The aim and the field of activities of such association might encompass not only the tourism development but the agricultural, handicraft and social development as well. This association might be
under the umbrella of UAR municipality and managed by a steering committee gathering all 6 villages to be involved in UAR area tourism development.

Once a year the steering committee will assess and plan the tourism activities and define the ways of sharing revenues for local project in the municipality area.

d) Participation in restoration and maintenance works

Future digging and excavation

The Madaba Mosaic school and its contribution

Restoration works done by the students

Training of young persons from Um ‘ar Rassas municipality for the conservation in situ of the mosaics.

e) Social development

Intend in collaborating for future work of micro social development for the area in an integrated manner

The UAR social development center

This center, attached to the Ministry for the Social Development, was created in 1999. It does not rely on the Saladin alone in its range of intervention is the UAR district (governorat comprising a core of localities). The objective of this center is to support young people and women for implementing small projects in various fields such as: health, family planning, school crib, boundary and weaving, data processing, hair dressing, etc.

Two training activities are in the pipe in that center, both with direct connection to the tourist development of the UAR site:

• Training of tourist guides in relation with the Ministry of Tourism: this formation address young UAR people in order to open, them with a step of reception, in the tourist places, in particular through English training. This formation contents and precise objectives would require clarifying.

• Training on the maintenance (and the conservation) of the mosaics: still at the idea level, it would allow UAR's young people to be initiated with cleaning maintenance and conservation of mosaics as a preparation to work for the UAR project. It would be carried out by the Madaba Mosaic School according to methods which remain to be defined. The center plans to train about 20 UAR young people (men and women).

Later, the center is also planning to develop in the area a domestic garden project (between 2 and 4 domums per family) targeting agricultural systems, practising agro-foresters and market-gardeners.

f) Local handicraft development and traditional know-how enhancement

Jordan is a tourist country sufficiently known yet for its traditional and professional handicraft, much lesser than Egypt or Syria.

Nowadays two types of tourist handicraft items can be found in Jordan. The first type concerns new objects made from ancient techniques basis—especially embroidery —; such as the products from the Queen Noor foundation, or the "Bedouin" carpets of the Bani Hamida. These products are often very beautiful and decorative, but quite expensive. The second type, more from individual initiative, consists in creative and modern artefacts of individual artists. This concerns objects made from pottery, embroidery, carpet weaving. An example of this is the "Handicraft Center" on the way to Mount Nebo, near Madaba. Usually, these artefacts are sold together with products like jewellery, copper objects and other made in India.

In most tourist sites we find more often this second type of "handicraft" that is a mixture of modern creations and commercial "Indian" imposed. These latter are of course found in every other country.

This situation shows on one hand that there is an extreme poverty in this matter and on the other hand, it expresses the lack of giving any value or of recognising as of "tourism" value the Jordanian know-how, that are traditional, local and used in everyday life. This is because, as we mentioned above, there has not been any industrialised and specialised production of handicrafts.

For Um ‘ar Rassas project, it is very important to make a study of the local know-how, the traditional handicrafts even if the region seems at first hand to be poor in this respect.
For example, the black tent weaving from goat hair can be reorganised and woven in much smaller dimensions, as well as the saddlebags and all other weaving that is done by the Bani Sakhr. The same concerns the embroideries of the 'Azama women's dresses. There is an important embroidery making with the 'Azama that can represent important inputs as tourism goods. All these will soon be forgotten if they are not valorised.

There are also important know-how related to medicinal and aromatic herbs, in this arid and desert environment.

The Bedouin way of life is based on pastoral economy. We underlined above the difficulties that these shepherds face today. A revalorization of the dairy produce is necessary: yogurt, butter, cheese, goat-hair and sheep wool, etc.

The Bani Sakhr were important camel and horse breeders and they still continue to raise some. This may also be valorised on a tourist ground.

The valorisation of local know-how together with the tourist development of the archaeological site is important for it implies the valorisation of a whole cultural way of life - that of the Bedouins - and it also implies the revitalisation of a culture which is disappearing very quickly these last decades. This valorisation is important because it helps revive traditions through tourism. And even more, the integration of the local population through the valorisation of its own cultural artefacts helps create links and responsibilities with the site and insure, locally, its protection.

5. Land use and rural activities inside Archaeological Park

a) Reclamation of agricultural terraces

Agricultural terraces (see Archaeological park design from Picciotto) should be reclaimed and enhanced. These terraces can be divided into 3 areas each with a specific objective:

(1) Aromatic and medicinal herbs terraces

These terraces are lying on the bad and arid soil of the western part of the AP. Unoccupied, there are not very visible. They will be cultivated with aromatic and medicinal plants, such as sage, Artemisia, sature (thyme),... and will be managed and exploited by a women group within the framework of the UAR social development centre, which will make it possible to imply more people apart from the village of UAR. A contract should be passed between the MTA and the Social Development Centre. Harvested aromatic plants could be prepared and marketed by the women together with Bedouin embroideries.

(2) Agricultural terraces

Located in the middle of the AP at the wadi's bottom and junction, such type of terraces encompasses the best agricultural land (deep and moist soil). An agroforestry scheme will be developed there associating fruit tree plantation and cereals (wheat and barley). Fruit tree plantation will be costit in olive, almond, fig., syriac, pistachio and possible carob trees. A single row will be set up along the border of each terrace in order to control erosion and improve terrace stabilisation, as well as benefiting from moisture.

(3) Fodder terraces

There are located in the eastern part of the AP, where Bedouins of the 'Azama tribe use to settle with their tents and herds.

Animal husbandry is the income generator for these Bedouins, who periodically know problems of fodder supply (high cost). Fodder species could be developed on terraces by the project for the benefit of their users. Fodder crops will be irrigated using the large ancient water tank located in the eastern part of Castrum. Fodder will be composed with (non exhaustive list) " Balsam " , Seshania seshan, Acacia cyanophtha and A. cyclop, Apilex halima, retam, ....

Concerning these two types of terraces (agricultural and fodder) a contract of exploitation should be signed between the MTA and the association. The cultivation development, maintenance and exploitation of the various crops and trees should be consistent with contractual specifications established by the
b) Use of water cisterns

Within the AP a lot of cisterns and water tanks are visible. Some are still under use by the nomads for the herd watering, whereas the majority of the cisterns are no more usable (filled collecting water channels and/or cisterns). However, there are 3 important cisterns that deserve restoration with the aim of being used again: 1) cisterns in the Tower complex (one still stores water and is used by Bedouins), 2) a large collapsed cistern in the central area of the site (near the north gate) and, 3) the large water tank located to the east of the Castrum.

The latter with a large size (24m x 24 m) and impluvium is probably very deep also (6 m, according various interlocutors). Although with no more plaster protection, it apparently never dries up and may contain as much as 3500 m3. The use of this water for agricultural purpose (e.g., irrigation of the fodder plantation) is likely feasible water being pumped by means of an electric-driven pump (important head of discharge) and delivered by gravity to the fodder terraces thanks to a network of channels.

E. TOURISM DEVELOPMENT

1. Tourism potentialsities

The UAR site undoubtedly contains a high potential for tourism development: mosaic of the churches and several other vestiges such as wine press area, three-stored cellar, subterranean rock-hewn cisterns, stylobo tower, castrum area, houses... are the main components of this potential, to which we have to add exceptional antique fields and agricultural installations, preserved landscape and view on the desert steppes.

However, turning the archaeological site into a tourist attraction will raise several constraints. The tourism-associated infrastructure and amenities will take into account the archaeological remains which have not yet been excavated, as well as the dangerous areas where visitors' circulation may be risky without prior consolidation (e.g., castrum, cellar, ...).

2. Visitors' Carrying Capacity

Putting into effect the visitors' carrying capacity for the site will facilitate the implementation of the above-mentioned strategy.

The carrying capacity for a site (whatever it is natural or cultural) is the sustainable threshold above which visitors' impacts on the site are no more acceptable. It is recommended to start with a number of Visitors over the site which is below the estimated carrying capacity and steadily adjust this number to the upper limit of acceptable change, given the cultural and natural values (cultural / ecological impact), the local population (socio-cultural impact) and the visitor satisfaction (psychological impact).

The method used is empirical. The carrying capacity is defined here as the number of visitors per time unit within each core zone of the UAR site.

Stemmed from the experience gained in other similar sites, the small size of the site and the restricted range of possible itineraries (with only one entrance gate for each core zone) determines the carrying capacity to be defined from the actual capacity of the most sensitive areas which, in the case of UAR, are undoubtedly the complex of 12 churches and their mosaics.

It will reasonably be difficult without significantly impacting the vestiges or stressing and frustrating the visitors themselves (large compact groups and short visit time) to accommodate more than 20-25 visitors together inside St Stephen's church, which is considered to be the core (and simultaneously the bottleneck) of the site. We assume the time to be allocated to an average visit is 20' (refer to annex 13 & 14 ‘Visitors Carrying Capacity’). Given that all visitors will more or less use the same itinerary, a time interval should be respected between the waves of visitors. We assume this time interval is 15' to 20'.

Assessment of the UAR site carrying capacity strongly relies on the number of entrance points. Two entrance points are a minimum, as the site is divided into two parts requiring two separated visits (Sanctuaries I & II: high protected areas).
There is no great advantage for visitors to walk from one sanctuary to the other, except if the central area reveals (after being excavated) interesting remains and/or if the ancient agricultural features (irrigation system, terraces, crops, ... ) are enhanced and promoted. In that case new itineraries could be developed in-between and the duration of the visitation extended. Nevertheless, research activities should be carried out prior to any development in that area.

At the moment, and according to the logic of tour operators which is to minimise the duration of the visit, tourists will most likely go by vehicle to sanctuary II after the visit of sanctuary I.

The magnitude of the tourism development as well depends on the socio-economic activities developed in the site.

3. Strategy for tourism development

a) Form of tourism

The strategy for tourism development to be encouraged for UAR will be based on the approach of sustainable cultural tourism. This form of tourism should prevail over mass tourism. The key characteristics of such a form of tourism can be summarised as follows:

- main motivation of the tourists is the observation and appreciation of ancient remains and traditional cultures prevailing in the area;
- it contains educational and interpretation features;
- it is organized for small groups;
- it minimizes negative impacts upon the cultural, natural and social environment;
- it supports the protection of the cultural area by generating economic benefits for host communities and relevant authorities in charge of site management, providing alternative employment and income opportunities for local tribes, increasing awareness towards the conservation of cultural assets, both among locals and tourists.

b) Package regional circuits

The strategy will also take account of the current tourism operators’ timetables and programmes (see above). A full day ‘biblical circuit’ from and to Madaba can be developed. Main stopovers would be: UAR (4 hours including the lunch at or near the Visitors’ Centre), Dhiban with a view over the wadi Mujib, Macherotte and/or Mount Nebo. The R Meil site (Moabite / Nabatean palace) on the road from Madaba to UAR may be planned in the future as an interesting stop over once enhanced. In this perspective, tourists will spend one or two nights at Madaba (20’ from the international airport) where hotel number is growing (10 hotels at the moment).

Given its location between the King’s Road and the Desert Road, UAR can as well be easily added to the commonest circuits of most TOs in Jordan: Amman-Kerak- Shobak-Petra-Wadi Rum. In that case and for time constraint, only Sanctuary I would be visited.

c) Duration of visit

A half day visit is the appropriate time duration for a normal visit of the UAR site. It does not appear realistic for visitors spending overnight here, whatever the level of diversification of products that can be reasonably achieved. Therefore, the development of hotels should not be encouraged around the site. Madaba is the right platform for discovering the biblical sites of the region.

d) Groups’ size

One of the main problems to be solved at UAR is the size of the visiting groups. Several TOs are using large buses with a capacity of 20 to 50 tourists, and for various reasons such groups will be difficult to split for the purpose of the visit. A compromise might be in the mid-term that TOs accept smaller group sizes (limited to 20-25 people) on some circuits, increasing the quality of the visit (cultural tourism vs. mass tourism). In the short-term, it is suggested to test various
e) Ticketing policy

Visitors will pay at the entrance gate to Sanctuary I. There will be no ticket delivery at Sanctuary II. The ticket will be delivered with a simple folded pamphlet and a map of the site (design and editing comprised in the fee). Guiding will not be compulsory for individual tourists and small groups (5 persons max.). For the same price visitors will be free to enter the various closed shelters. In order to avoid the same person to visit the same spots several times the ticket will comprise one detachable coupon for each key spot (1 guard appointed at each one). Trespassing will be strictly prohibited. Signs will be placed at definite locations to inform visitors about the site regulations.

f) Expected local benefits

As a pilot project, a component of the UAR development strategy is that the local population should benefit more adequately from tourism and that the needs of tourism should be integrated with the aim of protecting architecture and landscape.

Regarding the revenue generated by the entrance fees paid by visitors the current antiquities Law is unfortunately not compatible with a sharing mechanism, as such fees are entirely allocated to the MTA. In the current situation, local revenues can only be those created by employment (guides, guards,...), shops (curios, handicraft, tea shops,...), restaurants, on-the-spot services.

A possible alternative solution to changing the Law might be to create a local association with the aim of developing tourism at UAR. This association would be agreed upon by the MTA stipulating the percentage of entrance fees to be allocated to this association, the planting of tourism activities in and around the site, obligations and commitments (see socio-economic section for more details).

Other local revenues will be generated by the agricultural development within the archaeological site, through a land leasing contractual system between the MTA and the association and involving the Ministry of Agriculture (refer to socio-economic section). Similarly as with tourism, agricultural activities will be specified in the contract with the association, as agriculture should also be considered with the view of maintaining the landscape of the whole area. The proposed animal husbandry improvement system will mainly benefit the poorest, namely the Azzameh nomads (refer to socio-economic section).

Besides traditional bedding handicraft, specific local agricultural products could be sold to tourists by women, such as aromatic and medicinal herbs, dried fruits, olives, etc. (refer to socio-economic section).

4. Visitor Circulation within UAR Sanctuaries

The proposed visitor itineraries within sanctuaries I and II (see map) are designed for the discovering of the most valuable vestiges within a reasonable period of time. Walking off designated circuits should be prohibited. It is suggested that the itinerary within Sanctuary I plans a viewing point at the top of the tumulus (if the cemetery is removed to another place) (see map). From the Visitors' Centre, the successive key spots along the itinerary are displayed on the relevant map (refer to map section).

The itinerary within the tower complex will be much simpler as the area and the number of key spots are reduced here. The footpath will start at the parking area to the small recently restored Byzantine church and altar, the styli tower, the byzantine military tower, the rock-hewn cisterns, then back to the market and parking area.

Average time visit for Sanctuary I will be about 3 hours and 1/2 hour for Sanctuary II.

a) Principles of design for the footpaths

The team's members have agreed upon several principles as regarding objectives, design and installation of the footpaths. Among them are:

- Need of respecting historical ways (eg., implying the removal of recent unofficial paths in the eastern part of the Castrum and use of the castrum's original gate);
- Prevent traffic from unstaffed sections, especially the Castrum's enclosure, which would create important security problems unless security is put into effect:
Possible reversibility, with or without loop circuit (difficulty being proportional to groups size). Several circuits are envisaged, one of them avoiding the ruins of the church in the Castrum.

Conservation of the external aspect of the Castrum’s walls without modern additions.

Creation of the shortest possible circuit towards the twin churches, where the mosaics are in very poor condition.

b) Circuits

The circuit will start at the visitors’ center. Visitors will walk towards the north-west corner and the northern wall of the castrum, which are located in the outskirts of the old city. On the right, they will find the antique and only entrance to the castrum. From this point they will have to choose between:

- a round trip across the old quarter passing by the most interesting buildings: churches of Lions, of Pea-rocks, the Saint-Stephen complex, churches of Prior Wa’il and Tahula.
- an extension to the outer Castrum’s basis, with a high point at the top of the ancient cemetery, where an orientation table will be set up.
- a second extension entering the Castrum, to visit the Twin churches (without loop):

(1) Castrum

Admixture of visitors into the castrum is questionable, given the constraints, the minor interest of visiting the Twin churches compared with the other churches and the poor state of the mosaic conservation here. Moreover, 90% of the Castrum grounds have never been excavated therefore deserving protection as a potential archeological site.

Several circuits are envisaged, one of them avoiding the ruined facade of the church. All these circuits are based on the assumption that the external shape of the city walls are conserved without any modern additions. The shortest possible circuit towards the Twin churches, where the mosaics are badly damaged, is given priority. Layout of the ancient streets in the castrum will be restructured. Bearing in mind that streets are filled with fallen ruins and the need of reducing works magnitude in this sector (scientific and financial reasons), it is proposed to create a separate two-way footpath. A platform over the ancient street is suggested, to be easily constructed using light modular elements (materials: wood and sweet). The work will be carried out in two steps: ground preparation, platform manufacture, assembly. For the first step, several possibilities can be envisaged:

- remnants clearing on 1 m max., to give the visitors a better view of what existed before. To the right of the church, maintenance of the ruins with the creation of treads. The footbridge will be wedged on a stable structure, levelled either with sand bags or packed directly with sand, which is more difficult to put into practice. No mechanical system is possible.
- or maintenance of the current levels: the ruins area will be packed way as above and the footbridges installed without clearance or excavation.

For the second stage, work will be made easier by prefabrication, fitting, and assembly of the parts outside the site. The footbridges can be delivered in pieces of about three metres long. Particular attention will be paid to fitting the levels of the contact points.

The width of the passage will be approx. 1.4 m, . Protective fences will ensure safety and mark out the passage. All metallic parts will be treated against corrosion.

(2) The circuit across the open quarter

Few works are needed to open the passage to visitors walking across the centre of the old residential quarters. Such works will only consist in removing the old boulders and ruins from the antique streets. Additionally, given the dangerous presence of a lot of very deep cisterns at ground level along itineraries, a padded metallic cover on each opening will be set up.

The looping circuit links together the well-known buildings of Umma or Rasas, crossing the ancient residential quarters. Some subterranean houses are to be found along the itineraries, so that visitors will be enabled to discover an example of this kind of dwelling.

(3) Circuit around the Castrum

This circuit is feasible only if the prior dedication of the old cemetery is achieved (to a nearby hill). Using this circuit, visitors will access to the overlooking point over Umm or Rasas site, where an
orientation table will be installed. Visitors will then be invited to walk around the Castrum back to the visito’s centre. No works are planned except signposts to guide visitors and a well-trodden way.

(4) Circuit across the Tower complex
This circuit is simple and short. From the car parking area, the visitor walks around the style tower, looking at the small church nearby, then visits the “farm”, the cisterns, the quarries and come back. The “farm” needs to be excavated and the area cleaned. The roof of the water cistern (still used by people) will be restored including a protective disposal preventing people from falling down into the cisterns or the quarries.

c) The Visitors’ Centre

(1) Purposes
The Visitor centre will be:
- the unique entrance gate to the site (for the visitors)
- a resting place
- a place where visitors will buy their tickets
- a place where to find necessary information on the site, before or after the visit.

The poor legibility of the antique city is a fact which must be remedied, as it leads to misinterpretation. The most important themes which should be explained in this centre in order to acquire a frame of reference for understanding the site, are:

- the regional geographical context: UAR plateau, Wadi Mujib canyon;
- the successive periods of occupation;
- the modern sociological context: the Bedouins’ tribal distribution and tribal way of life;
- the explanations of the UAR urban religious settlements;
- the water supply network and management: antique (subterranean cisterns, rock-hewn cisterns, ...) and modern (forages, cisterns,...) vis-à-vis the needs and the physical / ecological constraints
- the characteristics of the Byzantine religious buildings and mosaics;
- the Byzantine religion;
- itineraries for archaeological discovery and for discovery of natural sites (eg., wadi Mujib).

The possibility for hiring a local guide (individual tourists and small groups) whatever the goal: interpretative visit of the site, visiting an archaeological dig, will be indicated precisely in the VC (possibility of reservation).

The major themes would be developed in the form of maps, panels, showcases housing selected objects from each historic period. The VC would be equipped with a permanent audio-visual show (12’ long video tape).

d) Revenue Estimate
Refer to table in annex 15.

The revenue estimate can be derived from the carrying capacity (3 assumptions) and the assumptions that can be made on the distribution of visitors (age class, nationality).

A possible 500 000 JD could be reasonably expected annually from entrance fees alone. Plus an additional 15% income from indirect activities (75 000 JD).

e) Visitors’ Monitoring
The level of visitation should be monitored and visitor impacts evaluated. Visitors number can be monitored at the entrance gate. Forms should be fulfilled every day providing data on the number of groups, groups’ size, daily number of tourists, nationalities, and age classes (this kind of information which is already collected by the guards on the visitor’s book). One of the two controllers appointed at the entrance gate will be responsible for collecting the information.
Whether the impacts on the site are considered to be too high and the sources of impacts identified, measures will be taken such as: reducing the daily number of visitors, modifying their overall distribution, reducing max. groups' size (e.g., splitting the groups), increasing the number of guards, etc. The index of visitor satisfaction should be known. A random sample of visitors will be enquired over the year.

Dissatisfaction among visitors should be evaluated and the reasons identified: overcrowding, too large groups, security conditions, scarcity of animation, lack of tourist services and facilities, abuses, etc. Mostly data will be entered into a data base then processed and interpreted at the Maatba office. A short training session (two staff) will be conducted by the project.

f) The Guides
Local guides should be trained including on deontology in order to avoid abuses (minimising time and serve to increase turnover and maximise profits). A minimum of 3 local guides will be appointed. Guiding will not be compulsory to individual visitors and small groups. Groups of 3 or more than 3 persons should be guided. Compulsory guiding (local guides) for accompanied tourist groups is questionable.

g) Publications
Cheap brochures and pamphlets as well as fold-out map and guide with itineraries need to be developed. A comprehensive individual guide book of a high standard could be designed as well although with less urgency. We must point out that such a guide could be rapidly designed from the available information sources (Father Piscinello's 'Mosaics of Jordan' and 'Gli Scavi del Compresso di Santo Stefano', the latter edited with E. Alliata).

Sanctuary
See: Socio-economic section.

5. Site Maintenance
Although the area's dryness alleviates the problem, plastic bags and other materials (scraps of metal, old rugs, refuse, ...) are polluting the site. Part is generated by the nearby village of IAR, part by on-site dwellers (nomad terms). As dominant winds blow from the north and the north-west, it is expected that in the future proposed row tree plantations will make an effective barrier. Simultaneously, and despite recommendations related to the visitor's behaviour, there will be as well daily rubbish left behind in the site.

The maintenance of the site's cleanliness is therefore an important issue to be dealt with. One full-time labourer would be appointed to this task, equipped with a donkey towing a simple trailer. A solution must be found at the municipal level as regarding this problem: garbage dump, public awareness of the IAR inhabitants, etc.

One full-time and one part-time (summer) gardeners will be hired during the first 2-3 years of plantation. The site will be equipped with a water tank trailer towed by a tractor. From year 3 onwards only the full-time gardener will be employed with the task of plantation maintenance.

F. Infrastructure Development

1. Design Of The Visitors' Center

a) Architectural Concept
Prior to site development and reception of a growing number of visitors and to manage it, suitable infrastructure will be developed, especially in the entrance gate area. The keystone element of such infrastructure will be a small sized visitors' centre (Fig. 1 - Plans 38 by 50 - § X). This site will correspond to lower assumptions on visitors' frequency (see: §. 'Visitors' carrying capacity'). At the moment, there is no justification to oversize infrastructure, albeit the proposed programme is planned to be enlarged if needed (possible extension of the infrastructure). Components of the VC are:
• Waiting room, ticketing office, with craftshop approx. 12m².
• Exhibition room 100m².
• Administration office 13m² x 2.
• Public toilets (handicapped included).
• Store room 30m².
• Laboratory office with a working unit 20m².
• First Aid approx. 12m².
• Guard house (to be a separate building) approx. 190m².

Questions have been raised, such as whether to install a café, restaurant and shops in the visitor centre or leave such activities initiated by the local community as a source of income. The visitor centre will be located at the edge of the protected area, near the urban area and the main roads (reduced costs, respect of site integrity). The VC must be clearly visible. It should be noted that the south-eastern extremity of the site is also the junction area of the Madaba, Dhiban and Desert roads. Subsequently, all amenities and facilities for visitors will be grouped near main roads. The existing obtrusive buildings (post office, first aid hospital...) will be demolished and re-built outside the AP, or on the contrary build in connection with the Visitors’ Centre (café, restaurant...).

Advantages of this choice are:

• Better respect of the site integrity, avoiding building in several different types of area. Any construction in this exceptional site raises questions about surrounding areas and the landscape vis-a-vis the architecture and the natural environment;
• To develop an area of unobtrusive institutional presence adhering to instead of breaking the site historical continuity;
• To provide a contemporary solution developing a functional working environment with suitable welcoming and information conditions towards the public. A modern way of life will be displayed through a balanced architectural design;
• To unify a range of various activities, thereby facilitating the site management through a clear and well-adapted layout;
• To limit investment costs, while offering quality services through clear technical choices;
• To integrate the tourist facilities with the modern settlement making easier potential contacts between tourists and local inhabitants.

The design of the building is deliberately modern. Indeed, there should be no confusion between ruins and new buildings. The construction will fit the landscape through a balance between mineral and vegetal, between artificial and natural, rather than imitation or camouflage. The slightly undulating horizon will be reproduced in the building design. Accordingly, walls will fit into the ground, as a melting process where architecture and nature separately exist, each one enhancing the other. Straight lines will cut through the land and sky with purity, like vast parallelepipeds, with higher geometric outlines, without any curves, similar to Bedouin tents rooted into the ground. Visitors and users would have the feeling of merging with the environment, rather than being enclosed in the monument.

Buildings will be deliberately low, developed on one floor, creating various atmospheres:

• On the south end entrance side, the building like a wall will open onto an olive grove and a formal garden. A partition, sometimes vertical, sometimes horizontal, will serve as a guide or conducting thread, with few openings, to show the way to the building’s entrance;
• On the north end, the building will open widely onto the site, offering a broad view over the remnants, it thanks to large outlets.

The visitor centre will occupy a strategic position, between the roads and ruins. From here, the public will have an outstanding view, over the roman Caesarea, the open quarter and the tower in the distance. At this point, the visitor has entered into history. The personnel will also take advantage of a pleasant environment, with several views overlooking the site, not the parking area.
The architectural design option combines large vertical and horizontal planes, with opaque and transparent surfaces, on which light and wind play. The edifice spreads and stretches downwards, differentiating the various zones open to the public. It will generate a feeling of comfort, of peace and quietness.

The VC will contain an area to answer the public requirements, an administration zone, a first aid and accommodation zone. The restaurant service zone will stand apart, being considered separately as to ensure the greatest flexibility in the overall operating conditions. The information building will include: a reception hall with sale counter, ticket office, access control, exhibition room and washrooms. From the hall, visitors will have a panoramic view over the site. The reception counter will play a central role linking the various areas, making easier to staff their management and control. The exhibition room will open straight onto the hall, as well as onto the site beyond its terraced extension. The administration offices, laboratory, and services are grouped in the east wing building aisle with separate access to each, and oriented to let entered as much light as possible.

b) Rooms area size

- Visitor center:
  - Entrance Hall: 93.53m²
  - Public Toilets: 51.92m²
  - Exhibition room: 106.78m²
  - Entrance office: 25.90m²
  - Office 1: 11.57m²
  - Office 2: 16.73m²
  - First aid: 11.74m²
  - Laboratory: 21.53m²
  - Reserve: 33.70m²
  - Toilets: 5.68m²

- Guard Housing Premises:
  - Living room: 31.48m²
  - Kitchen: 10.30m²
  - Bedroom 1: 13.76m²
  - Bedroom 2: 15.44m²
  - Bathroom: 9.20m²

- Restaurant:
  - Reception: 71.27m²
  - Kitchen and toilets: 29.96m²
  - Storage: 28.05m²

c) Materials and Construction

Proposed key materials are stone and uniformly treated glass. The selection criteria are: material, patina, durability, and local origin (as far as possible).

Stone, the statutory building material in Jordan, is extracted in the very country at Ajlon (pinkish colored) and at Hallabat (grey-beige), Maan, ...a colour and a pattern better fitting the natural landscaping composition. Stone will be used for its resistance and inertia, both indoors and outdoors. It will be operated in accordance with the traditional methods, which mainly consists in a single thickness of 50 cm appropriate to local temperature conditions. Various stone facings will be produced: surface finish, joints, size of blocks.

Glass is used in large sheets which are heat and burglar-proof.

The use of mosaics in modern architectural context underlines an attachment to local materials and skills. Coral-surfaced concrete can be used as a complement. Its composition will be clearly defined to produce a final colour as close as possible to that of the local stone, along with specially treated steel, in relation with local climatic conditions.
The colour of the building will reproduce the landscape's general colour, the whole complex in grey-bagge and enhanced by the mosaic.

de-1e, which reflects the local nomadic presence will be used as a complementary material in the outdoor areas, forming an interface between the building, the vehicle parking and the site sensu stricto.

d) Technical summarised description

Indoor exhibition arrangement and equipment is not considered here. Works will be broken down into different lots.

Concerning the visitors' centre, restaurant, and guard-housing premises, all are built using the same techniques.

The following lots are grouped in annex 16: 1) excavation and masonry, 2) carpentry, 3) metal work, 4) painting, 5) mosaics, 6) plumbing, heating and air conditioning, 7) electricity, television, telephone networks, 8) green areas and outdoor areas, 9) the covered way in the Visitors' centre.

2. Public equipment

It should first be stated that no plan or drawings of the supply networks within the AP were available. The present study has therefore been conducted on the basis of visual information gathered in situ.

Electricity telephones and water supplies:

There are electricity poles along the roadside and exposed main water piping near the site boundary. All houses on both sides of the road are connected to the existing supply network. The site can similarly be supplied. In order to alleviate the visual pollution of such installations, it is recommended: 1) either to move the poles to the other side of the road, or 2) to bury networks along the archaeological site boundary.

All poles and main pipes within the site will be withdrawn. Only the buildings close to the road will be connected (reception building, restaurant, accommodation, post office, clinic). The archaeological remains will not be supplied. The church shelters will be lit using daylight.

a) Drainage network:

There is no drainage network to collect wastewater and sewage from the planned buildings (reception building, restaurant, accommodation, post office, etc.). Therefore, assuming archaeologists' agreement, a septic tank with a disposal field would be set up.

Networks supplied to all buildings and burying of the main water network beside the site (alteration of show-ground electricity and telegraph network costs are not included in this project). Water supply connection should be provided for the Tower complex vehicle parking:

- all kind of preparatory work (cleansing, earthworks, installation)
- earthwork and excavation for trenches in dry ground
- supply and installation of prefabricated concrete manholes with cast iron covers, connections, etc....
  Diameter 1.00m, depth 2.00 max approx.
- Trench filling and ground levelling.
- Loading and removal of excess earth over a 1 km radius

b) Sewage drainage piping:

- Supply and installation of PVC piping, waste water and sewage series, cuts, fixing, settings, points, etc... Diameter of 150/160.
- Supply and installation of septic tanks, including earthworks, piping and connection of all equipment for 25 users, x 5 units (visitor centre x 2, restaurant x 2, accommodation, + post office + clinic x 1), grease removal tank, purifier.
- Construction of disposal field.
- Cold water supply.

Supply and installation of piping for cold water supply, all fixing, joints, setting, connection to existing network, in high density polyethylene, pressure - 10kg, diameter 42/63. For all buildings + ten water outlets for car parks.

- Low voltage electricity network:
- Supply and installation of PVC ducts (diameter 130/142), all clamps, supply and spreading of sand for cable installation, warning grid.
- Supply and installation of aluminium + neutral conductor cables.
- Supply and installation of meter boxes (1 per building).
- Street lighting network, pedestrian crossings, supply and installation of cables.
- All adjacent network connections.
- Telephone network:
- Supply and installation of PVC ducts, supply and spreading of sand, warning grid, cable chambers, manholes with cast iron covers, etc...
- On access roads: Two-layered asphalt surface and construction of natural stone-coloured concrete pavements.
- Cavities for trees with borders.

c) Vehicle parking

Umm ar-Rasas is divided into two distinct sanctuaries, about 1.5 km far from each other. Designing two vehicular parks near the remains is therefore advisable to limit the duration of the visit and risk generated by the very hot summer weather. The main parking is planned to the right of the visitors' center, at the entrance gate and the other one near the Tower complex area (Fig. 7 - Plan 31 - § X).

Space requirements for each are limited: 1 for buses and... for private vehicles. The parking areas will be greened with trees planted to provide the maximum shade and coolness, while being environmentally integrated. No gate entrance checking is planned at the parking level (free access).

Work description

Works will include:
- Excavation works on road and vehicle parking area
- Asphalt road work
- Tracing of buried networks
- Concrete ground work for footpaths
- Tree planting (see: landscaping)
- Signposts (panels) providing general information on the whole site.

d) Access ways

Various access ways are planned on and around the site:
- Asphalt road towards Madaba, Dhiban and the Desert
- A permanent paved road to be created linking the tower with the north west
- In-site unpaved roads, currently used for maintenance and servicing
- Footpaths.

It is advisable to keep the natural shape and surface of in-site existing ways, without introducing any additional environment-unfriendly surface materials. Existing tracks will be maintained and a new double lane paved service road will be constructed parallel to the main road connecting the Tower area and the VC.

3. Footpaths

The whole site is free and accessible as no fence encloses the monuments. Visitors are therefore free to roam across the ruins, including the most dangerous ones such as the semi-subterranean houses and the Castrum (Fig. 7 - Plan 41 - § X).

Objectives to achieve are to channel visitor, to inform them while adequately protecting the major remains, and proposing a comprehensive visit opportunity. With this view, the walkways will be enhanced through the clearing of some stretches, avoiding level changes, setting up light removable equipment, facilitating access (such as entrance into the Castrum). The linking way between the information point and the site sensu stricto can be surfaced with concrete (local sand colour) about 140 m wide, to better guide visitors towards the starting point. Sun protection made with a light textile structure is also planned along this way. These structures will reproduce the grey-beige textile material used for tents. Metal poles will form the framework and stack out the path.
IX. Annexes

From M. PICCIRILLO
## A. Annexe 1: Seismicity
Earthquakes (dates, geographical co-ordinates of the epicenter) for the sample year 1998
(all registered local magnitude values on the Richter Magnitude Scale)

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### B. Annex 2: Climatological parameters

Graphs of yearly rainfalls, max. and min. temperatures, winds, humidity...

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#### 202 MEAN MINIMUM TEMPERATURE°C

#### 203 TOTAL MONTHLY RAINFALL (MM)

#### 204 MEAN MONTHLY RELATIVE HUMIDITY %

#### 205 MEAN WIND SPEED (KNOT)

#### 206 MEAN SUNSHINE HOURS

#### 207 PREVAILING WIND DIRECTION *
C. Annex 3: Excavation chronology

1986: Church of Bishop Sergius
      Church of St Stephen

1987: Church of Bishop Sergius (north chapel)
      Church of St Stephen (south chapel)
      Church of the Aedicula
      Church of the Courtyard
      Church of the Tower

1988: Church of Bishop Sergius (funerary chapel and baptistry)
      Church of St Stephen (area to the East)
      Church of the Aedicula
      Twin churches (Swiss team)

1989: Church of St Stephen
      Church of the Courtyard
      Area south of St Stephen complex and some work around Lion's church
      Twin churches (Swiss team)

1990: Church of the Courtyard, soundings
      Church of Bishop Sergius: soundings
      Church of St Stephen: soundings
      Church of the Lion
      Church of great Wall (D.A.J., Taysir Alizy)
      Twin churches (Swiss team)

1991: St Stephen complex: soundings
      Church of the Lions and surroundings
      Church of priest's Wall

      North Gate (Swiss mission)
      Church of the Lions and surroundings
      Chapel of the Peacocks
      Church of the Tufah Amasa
      North Gate and South Gate (Swiss mission)

1993: St Stephen complex: excavation of the north-west angle of the complex
      Church of the Aedicula: architectural survey and study
      Prospect of the Archaeological Park

1994:

1995: Church of St Paul
      Church of St Paul
      Church of St Paul and vicinity

1996: Vine press and surroundings
      Church of St Paul south-west flank
      Vine press complex and northern area
      Church of the Lion: soundings and architectural studies
      St Stephen complex: soundings

1998: Church of the Tabula Amasa
      Area between St Paul church and the chapel of the Peacocks
      Church of the Lions: tombs and soundings


D. Annex 4: characteristics of building materials

Following types of building materials were observed in different places of the site. These materials were used separately but most of the time mixed together.

Coquina:
- mega-crystalline accumulation of oyster shells
- 50% carbonates, 50% phosphates and silica
- reaction with HCl: strong
- hardness: not easily scratched with a steel knife
- typical color: 5 YR 7/2 (light brownish gray)
- easily brown
- excellent building stone used in most buildings
- sensitive for picking by acid chemical weathering and granular disintegration by physical thermolastic weathering

Phosphatic chert:
- micro-crystalline accumulation of phosphates (14 - 21% of P2O5), derived from phosphate mud of fish fragments and fossil (yellow) and silica
- reaction with HCl: none
- hardness: not scratched with a steel knife
- typical color: 5 YR 3/1 (dark purplish gray)
- not easily brown
- mostly used for wall construction (wall of the Khatron, culture terraces walls)
- sensitive for cracking and flaking by physical thermolastic weathering

Limestone:
- micro-crystalline structure
- reaction with HCl: strong
- hardness: easily scratched with a steel knife
- very limited use
- typical color: 7.5 YR 6/0 (light yellow-orange)
- sensitive for flaking by physical thermolastic weathering

Black shale:
- micro-crystalline structure
- reaction with HCl: weak
- hardness: easily scratched with a steel knife
- very limited use
- typical color: 2.5 Y 7/1 (brownish black)
- sensitive for flaking by physical thermolastic weathering

Gypsum:
- mega-crystalline structure
- reaction with HCl: very strong
- hardness: very easily scratched with a steel knife
- slabs are used as pavement
- typical color: 7.5 Y 6/1 (gray)

Provenance:
Coquina, phosphatic chert and limestone are found in abundance in the geological substratum at Ummi-At-Rasai. They were extracted from numerous large and small quarries all over the site area.
Black shale and gypsum are not found at Ummi-At-Rasai. The gypsum is found as the boundary of the lower Wadi al Sir Limestone Formation and the Upper Sha'arab Formation. The black shale occurs in the lower members of the Sha'arab Formation. Both stone types are quarried in the canyons of the Wadi al Majid. We observed a modern gypsum quarry at position X = 47.0157, Y = 34.8352 at an altitude of 330 m.
E. Annex 5: Castrum: state of preservation of walls and towers

The single number refers to a tower (number 1 is the north-east corner tower), while the parenthesized numbers in the point(s) of wall in-between two towers. Both are represented on the plan, with recommendations for presentation:

1. Good preservation. Remove collapse on the east side to make it inaccessible. Thamatic inscription.
2. Two meters of collapse (2 courses). Thamatic inscription.
3. Collapse on north corner (to fill); collapse on south side (to rebuild).
4. Entire wall to consolidate and rebuild.
5. Missing blocks to replace; blocks cracking under the weight of upper courses. Thamatic inscriptions.
6. Top 5 courses missing. Partially consolidated, mortar and stone filling.
7. Entire wall is consolidated; East wall collapsed.
8. Repair 4 or 5 courses.
10. Top stones missing for a length of 20 meters. 3 courses high.
11. Missing stones to replace, empty area between stones. Fill.
12. At the base, stones cracked to be replaced and reinforced.
13. Stones missing on East wall. Very weathered stone in South wall to be replaced. Danger of collapse of this corner.
14. The entire wall has moved and should be consolidated to avoid collapse.
15. North wall has collapsed. To be rebuilt for at least 5 courses. East wall is repaired. It should be transported and removed. South wall replaced and partly collapsed (2 courses to rebuild). Traces of mortar on exterior wall.
16. An access to the courtyard of the two churches has been built here by the Swiss mission. If the idea of limiting access to the castle prevails, PA access should be dismantled.
17. Collapse of East and West corners. 3 courses to rebuild.
18. 1.5 meter missing here too.
19. Construction work following excavation not to standard. Need to dismantle and rebuild.
20. Pedestrians gate only 150 cm and top 50 cm of plate are exposed. Expand and complete founding or backfill. Missing 2 courses in center of wall.
22. Kurs inscription. West corner leaning and in danger of collapse. West wall cracked and displaced 40 cm on top.
23. Collapse of upper 4-5 courses.
24. Tower collapsed on Both corners.
25. Five meters west collapse of at 5-6 courses. Wall deformation and leaning.
26. Large collapse of East and West corners.
27. Large collapse of top 5 courses. Differential weathering of different stone types; concrete stones are developing filling, while phosphite is scaling and cracking.
28. Three courses collapse of south corner.
29. Wall preserved section, although a number of stones is cracked and voids need to be filled.
30. Collapse or vertical opening of this section in recent times; 4-5m wide, 5 courses high.
31. Small collapse on southern and northern sides. 4-5 courses high in the latter.
32. 6 meters wide 2 courses section of missing stones.
33. Collapse in proximaty of 19: 4-5 courses over three meters.
34. Shar and especially north corner. Large collapse in center of north wall.
35. Large collapse of top 3 courses on central of wall.
36. Tower has a small collapse, but it also top 2 vertically and a niched to north.
37. Small collapse near tower 20. Large void to fill in east of wall.
38. Large collapse of west corner.
39. Large voids in lower part.
40. Large voids in lower part.
41. Covered by excavation debris. Top 4 courses missing.
42. Southern wall plate. Debris from excavation must be removed.
43. Needs lining of voids.
44. Many voids need to be filled.
45. Large collapse of western corner and north wall. 6 or 7 courses missing.
46. Large collapse of entire wall.
Work to be carried out:
A general detailed study of the entire wall has to be carried out. All the parts in immediate danger of collapse have to be restored and/or consolidated. Targeting a wider objective, the wall has to be restored in a way that avoids any passage from outside to the interior of the castrum, except through its 'natural' north gate. The provisional stairway placed by the Swiss archaeological team has to be dismantled. It is premature and too costly to foresee a tourist circuit inside the fortification, even if the construction of a platform over ruined ancient streets seems technically feasible (see proposal §...).
All excavation dump accumulated on the eastern side will be removed. Hopefully, the North Gate excavation will be terminated.
## F. Annex 6: Coordinates of water collection structures

Coordinates are UTM, zone 36R, European datum 1950, collected with a Garmin x-trek GPS with an accuracy of +/- 5m.

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*Work to be carried out:*
general survey and study, including research with non-destructive adapted techniques (see churches of St Stephen and Bishop Sergius).

Carography of all underground structures.
G. Annex 7: List of archaeological soundings to backfill, clandestine excavations to assess and backfill, excavation debris areas to be removed (see Fig 7 – Plan 11 - $X$)

List of archaeological soundings to backfill

Deep sounding (3x1x1.5 deep) North of the Church of St. Stephen complex

- Long sounding (20x1x1 deep) North of northern external wall of St. Stephen complex
- Tombs in chapel at east end of right aisle of St. Stephen
- 2x11.2 deep sounding in a room south of St. Paul
- 2x12.5x1 deep stepped trench between South wall of St. Paul and opposite wall (good stratigraphy here)
- 2x15.5x1 deep trench at the base of wall opposite south wall of St. Paul's
- Hug trench, 20x50 deep in a structure to the west of the wine press in St. Paul's complex. This is a current excavation.
- Large sounding 2x3x2.5 deep at the southern foundations of Church of the lions, in a small room adjacent to the church
- 2x11.1 deep in front of a door along a street south of Lions complex. There is a tabula ansata in situ into it, possibly belonging to the same door
- Entire room west of the Church of the Lions. Displaced tomb slabs in situ
- 3x2x1 deep. Slabs in situ. Partially exposed tomb, to the west of the Church of the Lions
- 4x1.5x0.5 deep: Slabs in situ. Partially exposed tomb or tombs, to the west of Church of the Lions
- 1x3x1 deep. Slabs in situ, possibly a tomb, to the west of Church of the Lions
- 2x4x0.7: Partly backfilled trench, to the west of Church of the Lions

List of the clandestine excavations to assess and backfill:

- Room south of Church of Aelia: floor slabs dislodged
- NW corner of Church of St. Paul: 50 cm deep, 2m wide hole through mosaic floor. Tesserae in debris, but not in sufficient number to reconstruct mosaic. Was the mosaic stolen?
- SW corner of Church of St. Paul: deep (1.5m) hole through a mosaic, 2m wide. A tomb was found, its covering stone displaced and left in situ. Debris to be sifted to recover tesserae.
- Room N of Chapel of Peace: deep (1m) hole through mosaic, 1.5m wide. Uncertain whether mosaic was stolen or destroyed. The debris should be sifted to recover tesserae.
- Courtyard of modern complex: north of Northern gate: large soundings across the courtyard, with stone paving visible throughout the area at an average depth of 40cm.
- Interior of house east of the previously mentioned courtyard: 2m wide excavation which uncovered a paved area. Slabs partly-dislodged.
- Ancient structures transformed into house, shutting unexcavated church north of fortifications: Large excavation which uncovered stone slabs, possibly tombs.
- Room north of northern twin church in the castra
- Area in front of northern door of northern twin church: slabs removed and displaced, columns base displaced
- Room south of southern twin church: displaced slabs
- Courtyard complex north of unexcavated church in northern settlement: the house with the double arcade has an excavation that uncovered a paved floor, its slabs dislodged.
- Church of the Tabula. Excavation in the Northwest corner of the church.

List of excavation debris areas to be removed

The presence of these excavated materials is indicated per each area. From North to South the areas are:

- Tower complex, North of unexcavated building.
- Tower at coordinates xxx: debris abutting the north wall of the tower
- Tower at coordinates xxx. Debris abutting structure.
- Large area, approximately 400m2, North of St. Stephen complex, north of present track. In this area there are many decorated stones
- Area immediately north of St. Stephen complex: this has been arranged by bulldozer, but stones need to be sorted out.
Area to the North-east of St. Stephen complex. East of present guard post: this debris area includes also fragments of chancel and pillars that need to be retrieved.
Area or the North-east corner of St. Stephen complex
Area to the west of St. Stephen complex
Area to the west of St. Paul's complex
Area to the west of Lion's complex
Area to the north of North gate complex. This area includes decorated stone.
Vast area (at least 2000 m2) to the east of castrum ramparts. Some of the blocks from the Swiss excavation were already arranged in an area to the east of this debris, but many more exist in this debris and in another immediately to the south of this "lapidarium."
Small hill to the east of eastern ramparts, containing many blocks, also part of the Swiss excavations fill.
II. Annex 8: State of preservation of the Churches

1. Church of the River

Excavation:
Swiss archaeological Mission, Max van Berchem Foundation (Jacques Bujard)

Date of excavations:

Superficies:
125 m²

Plan:
Earliest of the twin churches excavated by the Swiss mission members. Monoapses church with three naves separated by two rows of three arches. Raised presbytery, limited by chancel and flanked by two small rectangular chambers closed with doors. Three doors (one to nave) gave entrance through the western wall (from a kind of narthex). One entrance, in the north wall, give access into a small rectangular chamber (a sacristy or ward covered by two arches. In later times, one of the west doors was blocked, and benches built along the wall, inside the church.

Walls:
They are from the common double side of local teca stones from different size and nature with medium filling of earth. Only the inner wall of the nave was built of well dressed and cut limestone blocks of pure and identical aspect. The first row of voussoirs of the « cul de four » is still in situ, over a small lintel covering the nave wall. The apse was partially cut off through the inner side of the city wall. The walls are quite well preserved, sometimes over three meters high. All of them have been restored by the Swiss mission members.

Floor:
All the church was paved with coloured marbe, half of which are still in situ, under 10 to 20 cm of dust and total protection.

Datation:
The mission is dated of 378-379 or 392-394 A.D. The church was probably built half a century earlier.

Bibliography:

2. Church of the Palm Tree

Excavation:
Swiss archaeological Mission, Max van Berchem Foundation (Jacques Bujard)

Date of excavations:

Superficies:
220 m²

Plan:
South to the twin church which have been excavated by the Swiss mission, the church was the latest to be built. Monoapses church with three naves separated by two rows of three arches. Raised presbytery, limited by chancel and flanked by two small rectangular chambers closed with doors (in the original state, these chamber were completely open to the naves). Three doors (one by nave) gave entrance through the western wall (from a kind of narthex). Two other doors are visible in the south wall, the one situated in the east opening into a small rectangular chamber covered by two arches. The nave was partially cut off from the inside side of the city wall.

Walls:
They are from the common double side of local teca stones from different size and nature with medium filling of earth. The inside wall of the apse is of better quality, the stones are being more regular, of quite rectangular shape and put on horizontal courses. The first course of the voussoirs from the « cul de four » covering, are still in situ over the crowning moulded layer. Benches were found along the north and south walls. Two small niches later opened during the excavations prove that two small windows existed over the « triumphal arch ». Traces of plaster still exist on the different walls.

Floor:
site of an apparent unit, this church is extremely heterogeneous in its structure. Added to the south-east corner of the church of bishop Sergius is a narthex partially on the latter which it covers at the end of its southern nave. This organisation made it possible to have the two buildings communicating. The construction of St Stephen was also done with the site of former buildings whose walls were more or less integrated in the new place of worship. One penetrated there by two-storey pointed in the southern wall and two others in the western wall. In the northwest angle, a flight of 6 steps gave direct access to the church of Sergius located at more than one meter downstream.

Walls:

Example of the late construction of the church, in and above former buildings. Its walls are very heterogeneous. They call into question the general system of the double facing in blocks of all natures and sizes, cut as from the quarry, bound by an internal ground afflicting interfered walls. In general the walls are well preserved but they will have to be systematically consolidated, their old lime coatings mortars protection being currently reduced to the state of traces. Only the northern one, added presents a regular face of well dressed rectangular blocks. That chamber was to be covered by a "cul de four" proceeded by an also well dressed stones barrel vault similar to the one still in situ above the south-eastern passage.

The walls of St. Stephen have various problems, going from weathering of various types of stones, to cracking, loss of quality, deterioration of mortar, etc. The vault of the chapel at the end of the right aisle rests on minimal support and is in danger of collapse. Plaster are also in bad conditions, and some of them have salt efflorescence.

Floor:

The floor of the church is entirely covered by an extraordinary carpet of geometric and figurative mosaics, which are at the origin of the celebrity of the site of Umma al-Rassas. The images of the pavement were destroyed during the iconoclasm crisis but carefully restored at the same time. The pavements are well charted by inscriptions also mentioning the names of the mosaics. In spite of their appearance, the mosaics are not in a good state of preservation. It is generally described. Recent damage occurred at the vitiage of Kastrom Mebas, when a small area collapsed in a subsequent passage. This may indicate the existence of chapels, vaults or passages under the floor of the church.

A curious graphic documentation was made of the floor of St. Stephen: this shows the following damage occurring to the mosaics, in order of event and importance of damage: detachment (generalised, but more evident close to walls and in the spot), erosion (grey and yellow slate residue tied in borders, and red substance used to render walls and roofs in the vitiage representing Madjha, Freshova, Bileonova, Anaportis and Kard), bulging (such as in the area to the left of the panels representing Garo, Askelon and Bethlehem), and loose tesserae. Comparisons with photos taken shortly after the excavations show that the slate tesserae, while already showing some deterioration, were not in the advanced weathering shown today, where some of them have lost more than half of its surface compared to those in their proximity. It is possible that the microclimate of the shelter may have a role in this damage. Without proper investigation it is not possible to advance hypotheses on the reasons for this behaviour. It is enough to say that more and detailed study is necessary in advance of shelter construction to understand the reasons for the almost total detachment of the mosaic from its support and the accelerated decay of a specific stone type. It has also been observed that in the same church there are at least 3 or 4 types of modern lacquer filling. Besides being aesthetically unpleasant, the use of different mortars to fill lacquer creates a problem of methods and formulas, some of which are mixed.

Bibliography:


10. Church of Bishop Sergius

Excavation:

Studium Biblicum Franciscanum and Department of Antiquities of Jordan.

Date:


Superficial:
The plan of that church has been changed after the construction of St Stephen and Courtyard churches. We may suppose, from the archeological evidence, that originally the church had three naves, the main one with an apse and raised presbytery, the two lateral ones with small chambers. Only the northern chamber remains. It is of rectangular shape with central arch, still in situ, that supported the roof of covering stone slabs. Archeological evidences shows that the lateral naves were roofed with stone beams and slabs supported by outside walls and rows of small arches separating the naves. These slabs (two actually in situ), one by nave, opened from the west wall. We know nothing from the South wall, to day totally demolished after the construction of St Stephen and substituted by a balustrade with central pillar. At the same time, the southern chamber was demolish and replaced by a group of six steps giving access to St Stephen church.

Walls:
East and north walls are built with the double rows of rectangular regular local limestone blocks (only the external face for the north wall), perhaps reused from an older building. The apse is entirely built with stone blocks, till the molding and the first rows of voussoir of the sill of four. All the others walls are of the traditional or site double irregular with internal pock. The pillars were of good rectangular limestone blocks. The high of support is well known from the southern apse side pillars, still in situ, with their mezzaline capitals. The springing of the arches is well known and a restoration of all the southern row of arches could be done, as in the Church of St. Stephen the walls suffer various type of damage, from stone weathering (mostly cracks) to loss of cohesion and mortar deterioration. There are two arcade in the wall separating this church from St. Stephen which are in need of stabilization.

Traces of plaster protection are still visible. During the excavation fragments of painted decoration were found in the sanctuary. The remains of paint are rapidly deteriorating.

Floor:
Entirely covered with stones. The central apse floor is raised and limited by chancel foundation. The mouth of a bottle shaped cistern is visible between the central and southern nave, at the level of the first arch. That cistern mouth was integrated in the mosaic pavement and was under use during the time of the church.

Only portions of the mosaics of this church are visible today, but they were totally preserved. Those that are outside the shelter are covered by 10/20 cm of sand and dump. Those that are under the shelter, are in critical conditions: water penetrates at the base of the shelter, and stagnates on the paved floor. We have observed serious damage occurring in this area: including a recent, rapid deterioration of pitting of white limestone tessers. But also heavy stains and salt efflorescence as the consequence of water infiltration. There are also lacuna formations that are of recent genesis, also perhaps the effect of water infiltration. Dechalcification, spalling and efflorescence are the most common phenomena.

Decoration:
586 A.D. Second in chronological order of the churches built in Umm as-Rasas.

Bibliography:

11 Church of the Aedilula

Excavation:
Sudium Bibliotheca Franciscanum and Department of Antiquities of Jordan.

Date of excavations:

Superferry:
155 m2

Plan:
Single apse church with three naves and raised presbytery. Its name come from the small aedilica instead of its south wall. Two rows of three large arches separated the nave in three parts. A portion of two columns supporting three arches preceded the entrance, by two slabs in the west wall. On the south wall, a door with lined and arch in situ, open on a small closed room the floor of which paved with large gypsum (calabaster) slabs.
It is the only church actually known in Umm ar-Rasas, which is not inscribed in a rectangle. The outside walls of the apse present a unique trapezoidal plan, and there are no lateral chapels.

Walls:
Except for the pillars and the door jambs which are treated in well cut limestone blocks, all the building is built with undressed stones, of different sizes, simply adjusted with small fragments, in double irregular with internal postes of mixed earth and silt stones.
The north wall, which did not support the ground path, was completely rebuilt in the summer of 1991. The wall facing south (where the acinaria is located) is preserved to the high of more that three meters, but it is in the worst state of preservation. It presents accumulated lins of verticality and a state of complex cracking. The acinaria build on a lintel (actually broken) spanning over the underground passage form a large bulging. The east doorjamb (which has been restored recently) may collapse rapidly (large crack) due to the desiccation of the stone doorjamb.
The apse, constructed in pseudo square blocks, more or less similar, is the best-preserved wall. Structurally it is more reliable, however some disjoint between blocks are visible.

Floor:
The entire floor was paved with local alabaster slabs. The pavement was discovered almost complete excepted over the underground corridor passing under the floor at the level of the church presbytery. Today large parts of the pavement have been removed by archaeologists (soundings) and probably by others. It is in urgent need of restoration.
A clumsy soil excavation was conducted in the room in the South of the church, leaving disastrous floor slabs and debris.
There are many decorated stones lying on the floor of the church. They all suffer various degrees of weathering, including oxidation and cracking.

Bibliography:

12. Church of the Courtyard

Excavation:
Studium Biblicum Franciscanum, Department of Antiquities of Jordan
Date:
1987, 1990 (soundings)

Superfice:
150 m²

Plan:
This church has the particularity of having a reversed apse, located at the west. This unusual plan is due to the fact that the building (probably an old transformed court) was inserted in a postern between the churches of the Aedilicia of Bishop Sergius and of St. Stephen. It is thus above an additional building, adapted to the former structures. Its plan can be regarded as with three naves (separated by two lines of two arches each), if it is admitted that the southern side of the church of the Bishop Sergius could continue on the northern side. The apse presents a raised pretory, originally provided with a chancel. The access to this building was done by two doors hinged in the medium of the southern wall and by the cloister churches. It is more probable than it served as a "place of distribution" for the churches of St. Stephen and of Bishop Sergius on which it was separate only by two arches between which a chancel was established.

Walls:
Very heterogeneous, the building being inserted inside various pre-existent structures. The walls are of the general type with two irregular facings of blocks of various sizes and natures separated with an earth filling. Only the quality of construction varies from one wall to another. They were originally covered with lime plaster, more or less thick, of which it remains important fragments in situ.

Floor:
The floor was entirely covered with rectangular blue/grey * gypsum * flagstones, including for presbyterium. Several tombs were excavated under this last. It is possible that others existed in the vicinity. The floor of presbyterium is crossed by a series of water pipeline supplying the cistern of the church of the Bishop Sergius.

**Datation**:

Very late in relative chronology (posterior with the construction of the church of St Stephen whose pavements of mosaic are dated from the VIII* century*)

**Bibliography**:


**13. The Church of the Tower:**

**Excavation**: Department of Antiquities of Jordan and Studium Biblicum Franciscanum

**Date of excavation**: 1987

**Superfacy**: 125 m²

**Plan**: Three small naves separated by two rows of two arches. Central nave with apse and elevated presbyterium flanked by two small rectangular chambers completely open on the lateral naves. Two out of the three doors in the north wall were opening to the inside large enclosure surrounding the tower. The third one gave access to an annex. Remains of a door (which was blocked during the antiquity) in the axis of the western wall, are still visible.

**Walls**: The walls are of irregular masonry erected with poor care and attention, using all kind of materials. Simply bounded by earth mortar. They were under collapse. They were primitively covered and protected by a plaster of muddy lime mortar, some patches of it still remaining.

**Floor**: Simply plastered. Half of it was preserved. A large underground, covered by stone slabs was found in front of the presbyterium.

**Datation**: Unknown

I. Annex 9: Ancien Fields

Work to be carried out:

A general survey and study of the structures is a preliminary need. These structures have to be protected and possibly restored (including the excavated ones), and prepared with the view of future investigations, tourist presentation and agricultural use (antique rural life theme). After a comprehensive study, they could be used again as fields for agriculture and grazing to fulfill local Bedouins requirements. Restoration of such structures will be easy and, in the same time, a good solution for recycling the debris found during the excavations: rubbish stones could be used to re ub the walls and the earth to fill back the fields. Under the condition to keep their ancient configuration and utilization this action will: 1) help tourists understand antique village agro-economy in arid lands, 2) improve site cleanliness and avoid summer dry fallow land fires, and 3) generate income for local populations. Additionally, this action will maintain a local interest for Bedouins to control the area.
J. Annex 10: The Tower Complex

1. The Tower
14.70 m high for a section of 2.5 x 2.5m, this exceptionally preserved tower does not possess either internal or external stairs. The plain core support, at an elevation of 11m above ground, possesses a simple chamber, with a door on the northern side. The 2 x 2m chamber was domed. This tower has already been studied. Since the absence of internal stairs and its location near a church exclude a military use, a more probable interpretation is that it served as a bell-tower (high level mediating platform for 3 monks). If this interpretation is correct, it would be the only known erected structure of this type.

The blocks which come from a nearby quarry are laid in a dry, pseudo square more or less similar. The joints are always regularly stepped and the rows maintain almost constant height. The inside is filled with waste (?) material, and only a small vertical « channel » can be noticed on its southern side (toilets?).

The tower is threatened by loss of verticality, bulging, rotation, cracks, and major phenomena of stone weathering, especially on its northern side where the wind, which blows with power in this area, has caused incrustation and superficial abrasion of the external surface.

Work to be carried out:
Although cracks do not effect any key stones but their joints, monitoring the tower is recommended, especially because a clandestine excavation has destroyed and destabilized the lower part of the inner core (large hole opened in the northern façade). This tower may be also the place where general and detailed in situ studies on local stone weathering degradation could be monitored. An overall and comprehensive detailed drawing and study should be carried out.

2. Area around the Tower
The excavation of the perimeter wall of the church and tower should be documented, as future reconstruction work may hide important evidence to understand its chronology and relationship to the buildings it surrounds.

The two-storied building to the North of the tower has been consolidated. The building however threatens to collapse given large cracks and a visible bulging on its northern side.

Another building to the east of the previous one remains unexcavated, as are the quarries, cisterns (still in use by local Bedouins, belonging to a rarely found type, consisting of a plastered pool covered by arches (supporting a slab roof) and an exposed rock-cut wine press, in relatively good condition

Work to be carried out:
registration and study of the existing remains before implementing any restoration work (for example the courtyard limiting walls were recently cleared without any prior stratigraphic expertise and recording).
complementary excavations, mainly around the farm building.
restoration of the unearthed structures.
general cleaning of the whole area’s dump.
restoration and protection of the stone slabs cisterns still under use.
K. Annex II: Semi Subterranean Houses:

Work to be carried out.
A thorough examination should be done on a selection of two houses prior to start any restoration work. Prior to this step, consolidation will be executed and excavation conducted. A general survey and comprehensive study of the remains are also expected. Quite not a single study (???) has been carried out on such traditional modern reoccupation of ancient structures. The second interest of Umm ar-Rassas is to have preserved a complete village of such recent dwellings.
### M. Annex 13: Data on visitors frequency

#### Visitors data: April-May 2001 (13 days)

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- Mean number of groups / day (n>2 persons): 3.0
- Mean number visitors / day: 45
- Mean size of groups / day: 6.0
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- Min. group size: 1
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<tr>
<td>Summer</td>
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| CC winter (n1 visitors/day) | 150 | 200 | 270 | 360 |
| CC summer (n2 visitors/day) | 210 | 260 | 360 | 480 |

Average number of days / month

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<tr>
<th>Season</th>
<th>Month(s) of visit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>6</td>
</tr>
<tr>
<td>Summer</td>
<td>6</td>
</tr>
</tbody>
</table>

CC winter |

| CC winter | 25200 | 33400 | 45360 | 60480 |
| CC summer | 35280 | 47040 | 60480 | 80840 |

CC per year |

| CC per year | 60480 | 80840 | 109440 | 147120 |
P. Annex 16: Lots for the Visitors' Centre

1. Lot No1: Excavation, Masonry
   a) Preliminary works:
      - All suggestions (?????) of the preparation of the working area, fences, equipment for workmen, storage for materials...
   b) Plot preparation:
      - General excavation of all ground levels after the plantation (????) of stakes
      - Trenching, for all networks.
      - Excavation on full ground, raising up and level of the dig (????).
      - Earth transportation, excavation
      - Supply and set up sewerage and rainwater pipes, housing (????), all suggestions (????). Joining of the tracery (????).
      - Supply and set up polyethylene drinking water pipes. All suggestions (????). Joining of the tracery (????).
      - Supply and set up floodgates in concrete boxing (?).
   c) Walls, floor, faceboard, false ceiling:
      - Supply and installation of concrete foundation, for long timber. Approx. 0.50m.
      - Supply and installation of store surfaces. approx. 0.50m thick, 0.51m high, 0.70m long. Laying, size, and sawing handling. Assembly of thin joints, lime mortar. Fencing layer on all visual sides. Incorporation of mosaics.
      - Preliminary samples and trials. The inner faces of the rooms reserved for the staff will have doubled partitions.
      - All scaffolding prepared for the work.
      - All suggestions (?????) for openings, supports, and doorways.
      - All suggestions (?????) for the making of the inside pillars and beams in strong concrete, frames include (positioning and taking up). Finished in rough concrete.
      - Foundation blocks of 0.30m thick.
      - Polishing including forms of 0.10m thick, cement, joints, armatures, by welded wire-mesh, Screed smooth 0.12m thick. Finishing screed smooth 0.04m thick. Water repellent incorporated into the form and screed. Setting up of the ducts, tubes and diverse reservations.
      - Joint dilatations.
      - Supply and installation of the floor, full of concrete paving, framing, steel, support, ...Use chertios for ventilation, or smock tubes etc...
      - Supply and installation of insulation 0.10m thick.
      - Water-tightness of roof. Heavy protection. Lifting of water-tightness, cover joints of dilatation, water receptacles...
      - Masonry of bricks full from the mortar with cement to the interior separating walls (0.10m thick) posed on a phallac platform. Making of lintels, Sealing of the doorframes finished bay the carpenter, double compartment in brick of 0.07m, for the different offices.
      - Grooves in the compartments include reblocking to inerterate the ables, girders, and canalsations.
      - Linel on the opening provides, supply by two visible iron IPE, filling in with concrete.
      - Supplying and laying down of stone to restore the ground dimensions. Making of doorway, of steps and ramp for external access, restoring stone the same. Shining, etc.
      - Concern all areas reserved to the public apart from sanitary.
      - Supply and laying of grey tiles 26x20 for sanitary, for lab, reserve and storage, first aid. Decorating of the walls will be the same, 1.40m in height, and work surface.
      - Work surface in concrete, including supports in map.
• Smoke ducts and ventilation of 40x20 in heat resistant cement. Stack of ventilation, Fumes extracting equipment.
• Lime mortar coatings in all interior compartments.
• All exterior carpenters sealing.
• Supply and installation of suspended ceiling plasterboard in all rooms.
• Making of girdles in staff air and ventilate.
• Gutters.
• Export of rubble, cleaning of the site.

2. Lot No 2 - Carpentry:
• All the carpentry will be delivered pre-painted.
• Supply and installation of block exotic wooden doors 40mm thick. Dormant frame included and sealing clay. To be painted. Handle lock in chromed cane. Bolts for bathroom doors, mixed locks in offices. approx. 0.95x2.04m.
• Joint covers.
• Supply and installation of plinth in exotic wood to be painted, in all rooms. 0.20m high.
• Supply and installation of the cupboard doors framed in exotic wood, exterior side coated in exotic wood. Chrome lock. Two leafed door.
• Supply and installation of a reception desk made of framework 22mm thick. 0.80m wide bench, coated with sandblasted glass. Vertical separation of service side - cash register.

3. Lot No 3 - Metal work:
All the metal pieces will be delivered in the finishing stages treated with anti erosion paint.
• Supply and installation of steel door 0.95x2.10 for the staff accesses.
• Supply and installations of several openings of aluminium extrude. in dark brown. All watertightness, security locks. Supply and installation of burglar proof glass, double-glazed.
• Supply and installation for steel entrance door. With burglarproof glass. doubled glazed.

4. Lot No 4 - Painting:
• Protection of all floors and stone walls.
• On wooden doors, panels, and cupboard faces: Two coats of glyzerphalique paint on new carpentry including all preparations.
• On fake ceiling: two coats of glyzerphalique paint.
• On metal works: two coats of anti-rust Dryproof paint.
• All interior walls are lime unpainted.
• Signposts in the public toilets, and on each office door.
• Mirrors, brush carpeted.

5. Lot No 5 - Mosaics:
• Supply and installation of mosaics in outer walls.

6. Lot No 6 - Plumbing / heating / air conditioning:
All ducts, pipes, etc ... to be buried in the floor, or hidden in compartments.
• Supply and installation of all sanitary, heating, air conditioning fittings.
• All connections, distribution.

7. Lot No 7 - Electricity, television, telephone networks:
• Supply and installation for all necessary circuits.
• All connections and distribution.
8. Lot n°8 - Green areas and outdoor areas:
- Supply and installation of trees (olive trees, local pepper trees, etc.), staking, excavation on 2.50x2.50m, 1.00m depth.
- Supply and installation for watering.
- Maintenance for two years.
- Realisation of passive concrete path, with stone borders, slope, benches.

9. Lot n°9 - The covered way in the Visitors' centre

Description
The covered path of the Visitors’ centre reproduces the Bedouin’s tent concept adopting the double inverse curving principle, already used for traditional tents. The main frame is composed with two oblique V masts using tube of Ø89.9x2.2 above the path. They carry on their common head the membrane which is stretched on each side by lateral small mast shore-up with shrouds. Membrane’s sides between two frames are composed with galvanized cables. Their ends are bolted and fastened in a plate for the membrane end. Turnbuckles allow adjustments. The membrane is PES/PVC of type 2, alike the covering membrane of the churches. Its colour can be either black dominant (winter colour) or sand dominant (summer colour). The structure erection can be proceeded directly on the floor using light lifting devices, and even by hand (with hoist and specific hoist-frames). The membrane is hoist by hand on the frames, fasten on the anchoring points and then stretched until taking its shape.

The yearly maintenance (action on turnbuckle) is absolutely essential in order to ensure a life span of over 25 years.