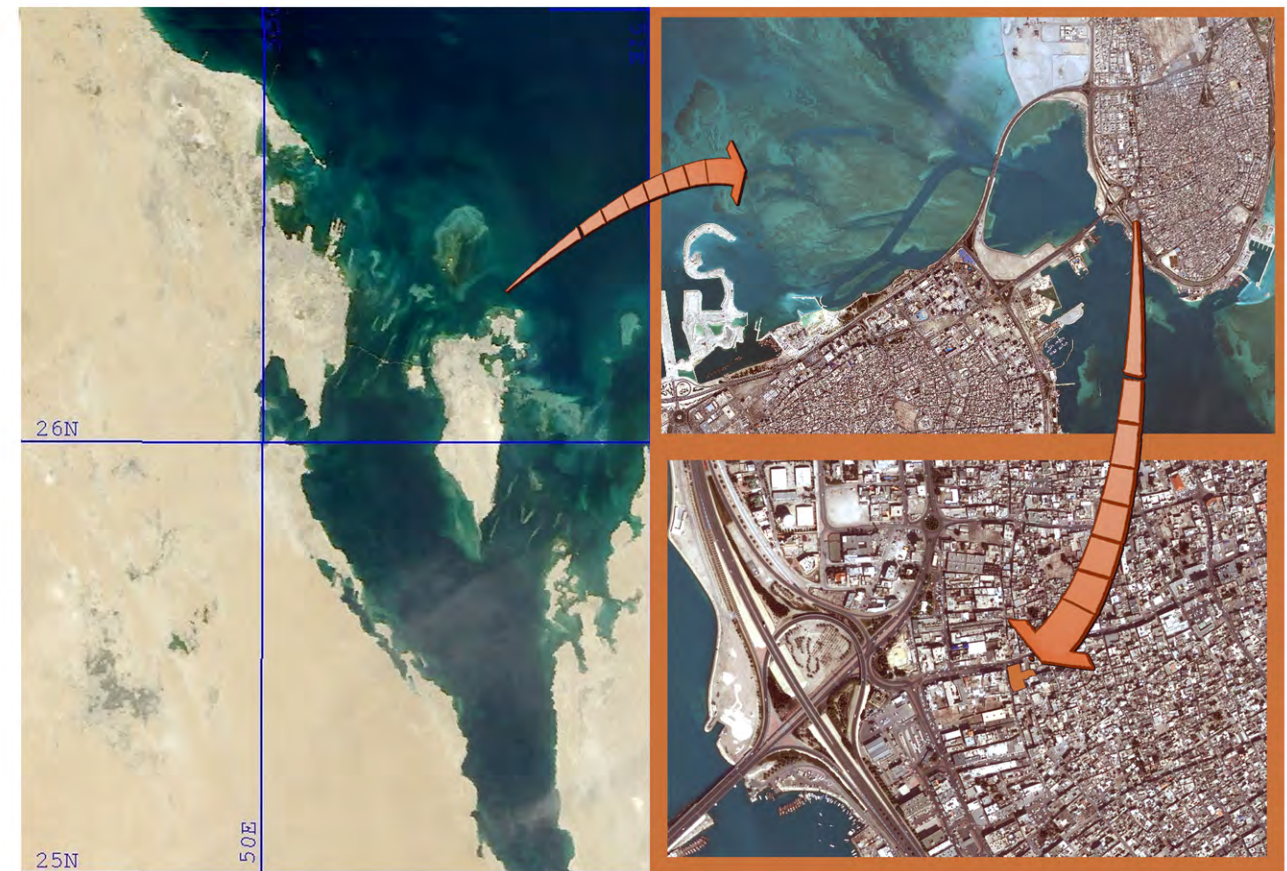


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SUQ AL-QAISARYA DEVELOPMENT AL MUHARRAQ



LOCATION MAP



SITE PLAN

SCALE 1:500



United Nations Development Program-Bahrain Ministry of
Municipalities and Agriculture Affairs

Capacity Building for the Enhancement
Of Urban Governance
(Stage 2)

Photogrammetric Documentation for Muharraq and Manama Urban Design Pilot Projects

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1. Introduction

This report presents the results of the heritage documentation team's mission in connection with "Capacity Building for Enhancement of Urban Governance," a joint undertaking of the United Nations Development Program (UNDP) and the Bahrain's Ministry of Municipalities and Agriculture Affairs (MoMAA). The two members of the team worked concurrently for most of the time although commenced and concluded work at different dates. Dr. Jose Luis Lerma, a geodetic and cartographic engineer as well as photogrammetry specialist, worked for the period June 20-July 1; Dr. Salim Elwazani, a conservation architect and documentation specialist, worked for the period June 21-July 4. The work served the three projects of Stage Two of the UNDP/MoMAA undertaking:

- Pilot Project 1: Urban Design of the City of Muharraq Cultural Heritage Area
- Pilot Project 2: Urban Design of the City of Manama Cultural Heritage Area
- Pilot Project 3: Architectural Re-Design of the Qayseriyyah Souq in Muharraq

In consultation with the UNDP/MoMAA Project Director and the three pilot project consultants and understanding their needs, it became clear using the Digital Rectified Imagery (DRI) method was—because of its relative speed, simplicity, and output format—an appropriate choice for the purpose of the projects. The short mission period of the documentation team consultants made the choice even more appropriate. The documentation work proceeded through data acquisition phase on site and data processing and presentation in the office.

The team mission was carried out with the UNDP/MoMAA Phase One mandate in mind, specially the part that was dealt with in the IT Consultant's report. This report emphasized establishing of a national heritage documentation center and developing a decision support system for urban conservation planning. The IT Consultant proposals dealt with diversity of documentation issues. For example, training and education was one of five functions of the proposed National Heritage Documentation Center (NHDC). The Report (p. 272) emphasizes "training of architects and preservation specialists in the procedures of architectural documentation." As part of the documentation team's mission, training through demonstration and personal implementation of rectification has therefore been extended to a number of architects and architectural interns of the Section of Studies and Research (SSR).

2. Documentation Considerations in the Context of the UNDP/MoMAA Undertaking

2.1. General

Photogrammetric documentation is embedded in the UNDP/MoMAA undertaking requirements. As such, the documentation team has appropriated and used the Digital Rectified Imagery, one survey and documentation method of the field of photogrammetry. A series of measurable urban and architectural ensemble elevations have been produced. To assimilate the basis and the scope of the documentation team work, a brief definition of photogrammetry and a number of its known methods is brought up below. Further, the level of documentation provision versus pilot projects needs is mentioned. Finally, a description of the documentation procedure and activities is outlined.

2.2. Photogrammetry and Digital Rectified Imagery (DRI)

Photogrammetry means measuring from photographs or images. A photogrammetric procedure consists universally of data collection and data processing phases. The demand for efficient use of the dimensional information resulting from the photogrammetric process requires a compatible information management system in place. A synopsis on DRI is presented below with the intent of placing the documentation team's utilization of the rectified imagery method in an informative context for the DoDAA's Section of Studies and Research and other interested parties. Further, a clarification for stereo-photogrammetry and orthoimagery, other documentation approaches of particular relevance to heritage site documentation, is also presented to provide basic but distinguishing information about methods of photogrammetry. This will help make educated decisions on using appropriate methods for measured survey projects in future.

Rectified imagery (or photography) is based on satisfying a parallelism condition between the plane of the architectural surface under documentation (the object) and the plane of the image. This very condition implies that the object plane has to be essentially "geometrically" plane. The process of bringing the two planes into parallelism (namely, removing "tilt" displacement between the two planes) is called rectification, hence rectified imagery. The outcome of the rectification process is a scaled rectified image well suited for dimensional measurement of building surfaces and, subsequently, for producing measured drawings of building elevations, flat ceilings, and the like.

Rectified imagery is a single image approach, in the sense that images are rectified individually, although two or more rectified images can be further processed to yield extended scenes—expressed as mosaics in the photogrammetric parlance. In a geometric sense, DRI corrects tilt displacement, but not “depth” displacement (that is typically associated with the side of the building apparent in the image, for example). Tilt displacement is expressed through the angle formed by two unparallel planes, in this case, the architectural surface plane and the plane on which the image is formed in the camera.

Stereophotogrammetry, on the other hand, employs two or more photographs. It deals with and turns depth displacement to a measurement advantage. Its principles are based on how the eyes perceive depth distances in viewed objects. Viewing objects by two eyes is called binocular vision. Binocular vision is far superior to monocular vision (by one eye) in judging depth distances. Binocular vision of an object leads to stereoscopic model. Simulating a stereo model setting begins with arranging two images, called stereo pair, in a stereoscopic instrument in such a way that the left eye sees (in the created model) the left image of the object point, and the right eye sees the right image. The formulation of the stereoscopic model enables the measurement of distances in three dimensions—in plan and elevation.

Ortho-imagery, a third approach of relevance to documenting heritage sites, goes one step further beyond rectified imagery to collapse all objects in a scene into (the) one reference plane. All planes parallel to the reference plane collapse to this reference plane. All information in the scene, now framed at the scaled reference plane, turn into measurable dimensional information. Either 3D models built up after stereo-photogrammetric plotting or surveying methods can be used to produce true orthoimage (or orthophoto) elevations. The benefit of orthoimagery is that all the image content (texture) is placed on its correct position on the reference plane. As orthoimagery corrects both tilt displacement and depth displacement, it combines the application advantages of both DRI and stereophotogrammetry.

From the array of photogrammetric methods, the documentation team had, from the outset, considered the use of DRI for the UNDP/MoMAA undertaking. After conferring with the Director of the SSR and with the consultants of the three pilot projects, the decision to employ the method has been confirmed. The two urban design projects and the architectural re-design project all lacked information of individual building elevations and of extended elevations of urban scenes in their respective project areas. The “visual” rectification version of the rectified imagery approach was determined as an efficient technique to use, as it

combines the benefits of practicality and speed. This implementation of this method resulted in a series of scaled photographic elevations that can be readily converted into measured drawings in a CAD environment.

2.3. Pilot Projects Needs for Documentation

Slating buildings and areas for documentation was done intermittently in an incessant flow of consultations with the three design pilot project consultants. Constrained by the limited time availability of the documentation team members (nine and twelve working days, respectively), the design consultants were pressed to prioritize the need for survey and documentation in their respective urban areas of study. The result was limited survey coverage of the two urban design cultural heritage areas of Muharraq and Manama. Conversely, the Qayseriyyah Souq complex received considerable coverage as a decision was made early on by the SSR Director to do so because of the relative urgency for completing the Souq’s re-design coupled by clarity of what needs to be documented.

The limited availability of the documentation team did not only restrict the magnitude of building ensembles that could be recorded, but also derived the thought of the need for three classifications of images:

1. Rectification action images: these are the images that are meant to be rectified, and were indeed rectified by the documentation consultants.
2. Rectifiable images: these are images that can be rectified at some time in future by the SSR architectural personnel.
3. Context images: these are images that are not meant to be rectified, but provide context information mostly for buildings documented by images of Classification 1, rectification action images.

3. Field Operations and Office Rectification Tasks

3.1. General

The documentation consultants’ work consisted of field operations and office activities. In specific terms, the work comprised:

- Capturing images on site (data acquisition)
- Rectifying images in the office (data processing)
- Training young architects and interns on digital rectified imagery processes, mostly in the office
- Touring and exploring the three project areas with the SSR Director, pilot project consultants, and office architectural personnel

- Conferring with the SSR Director and design consultants on a daily basis for coordinating documentation work with project requirements
- Note taking and development of the documentation consultants’ report
- Collaborating with the Qayseriyyah Souq project consultant for initial thoughts on the re-design program and site historic information

3.2. Field Operations

Field surveys for capturing images followed a linear pattern of operations. Using a wide-angle camera (Canon Digital Camera EOS D60, resolution 6.3 MPixels; 15mm Sigma lens), image capturing had been, in all cases, initiated at one end of a building row—which coincided with a street junction corner in many cases. Moving towards the other end of the building row, a series of digital images were captured in such a way to maintain an overlapping coverage between images of adjacent buildings. Photographic operations had of course dealt with buildings, but the emphasis was placed on the continuity of the linear “scene,” including voids and objects between buildings. This emphasis goes well with the type of information needed to carry out urban analysis and design. The camera’s image numbering system helped link individual images to a separate hand-marked image identification setup on a hard copy map. This linkage enabled the retrieval and arrangement of the series of sequential images, and in the end, enabled the selection of appropriate images for rectification.

3.3. Office Rectification

Office rectification of the captured images was completed in a repeated, but structured procedure using Adobe Photoshop CS and plug-in Panorama Tools. In its simplest structure, the procedure begins with rectifying two adjacent images separately; taking advantage of the overlapping region in the two images, it advances to fusing the already rectified images into a new entity called a mosaic. In an additional step, another single rectified image is then brought to fuse into the initial mosaic to form a new, expanded mosaic. The steps repeat and the mosaic expands till the building row is all accommodated in a final mosaic-ed scene.

4. Output Images and Mosaics

4.1. General

Images captured in the field amounted to 454 distributed unevenly among the three pilot project areas. The lion’s share went to Pilot Project 3, the Qayseriyyah Souq in Muharraq, and not to any of the remaining pilot projects for the urban cultural areas of Muharraq and Manama. The fact that the Qayseriyyah Souq complex is of a set size and of graspable architectural re-design program prompted the decision to concentrate on this complex for almost the first week of the documentation activities. Table 1 depicts image distribution by a) project and, b) image classification—as either action image, rectifiable image, or context image. It also shows the final output of the documentation function, the mosaics—measurable ensembles of building elevations.

Table 1. Image distribution by pilot project, image classification, and output mosaics

<i>Pilot Project</i>	<i>Action Images (rectified)</i>	<i>Rectifiable Images</i>	<i>Context Images</i>	<i>Total</i>	<i>Resulting Mosaics</i>
Pilot Project 1: Muharraq Cultural Heritage Area	13	60	9	82	1
Pilot Project 2: Manama Cultural Heritage Area	15	146	6	167	2
Pilot Project 3: Qayseriyyah Souq in Muharraq	26	159	20	205	3
Total	54	365	35	454	6

The balance of this section identifies the mosaics completed for each pilot project and provides summary information about the alternative forms in which the mosaic was produced based on its resolution and the size of sheet it is meant to be printed on.

4.2. Pilot Project 3: Muharraq-Old Suq Al-Qayseriyyah (Shaikh Hamad Avenue, Boomaher Avenue, Tujjar Avenue, Mosque Plaza and Surroundings)

Summary

Total number of images: 167

Total of rectifiable images: 146

Contextual: 6

Rectified imagery: 15

Mosaics: 2

- Bab Al Bahrain Avenue

Total number of images: 108 (55 for East Elevation; 53 for West Elevation)

Total of rectifiable images: 106

Contextual: 2

Rectified imagery: 0

- 105 Road

Total number of images: 42 (19 for North Elevation; 23 South Elevation)

Total of rectifiable images: 33

Contextual: 0

Rectified imagery: 9

- Ammar Bin Yasser Avenue

Total number of images: 17

Total of rectifiable images: 7

Contextual: 4

Rectified imagery: 6

Output mosaics

Full resolution: 105 Road-North Elevation_A.jpg

105 Road-North Elevation_B.jpg

Low resolution A3 (42 cm width and 100 dpi): 105 Road-North Elevation_A3.jpg

Low resolution A4 (21 cm width and 100 dpi): 105 Road-North Elevation_A4.jpg (Fig. 2)

Full resolution: Ammar Bin Yasser Av-East Elevation 74-72_80-78-76.jpg

Low resolution A3 (42 cm width and 100 dpi): Ammar Bin Yasser Av-East Elevation 74-72_80-78-76_A3.jpg

Low resolution A4 (21 cm width and 100 dpi): Ammar Bin Yasser Av-East Elevation 74-72_80-78-76_A4.jpg (Fig. 3)



Figure 4. North Elevation_A4.jpg



Figure 5. Suq-West Elevation_A4.jpg



Figure 6. Boomaher Ave-West Elevation_A4.jpg

5. Summaries, Conclusions, and Recommendations

The documentation team assignment proved to be multifaceted in content and intense in action. The salient facets of the assignment include the following:

- Adherence to the UNDP/MoMAA Undertaking
- Documentation needs and coverage: the scope of work
- Documentation pace and progress
- Training of architects and interns
- DRI and photogrammetry
- Documentation output and its use

This section presents summaries, conclusions, and recommendations associated with each of the facets mentioned above.

5.1. Adherence to the UNDP/MoMAA Undertaking

Summary

Phase One of the UNDP/MoMAA undertaking “Capacity Building for Enhancement of Urban Governance,” is the basis for the Phase Two work involving the three pilot projects. The documentation team mission was expected to adhere to the intent of the undertaking in general, and to the requirements of the pilot projects in particular. The documentation consultants used the Phase One reports’ information as a reference for their work—particularly that of the IT Consultant. Among other things, the IT Consultant’s report emphasized training and education as one of five functions of the proposed National Heritage Documentation Center (NHDC)

Conclusions

The documentation consultants worked closely with the SSR Director and with the design consultants in charge of the Phase Two pilot projects to identify and prioritize the scope of documentation work. The results accord particularly with Phase One IT Consultant’s proposed strategies. The process and outcomes of the documentation function as well as the personnel training activities represent a nucleus unit for realizing the IT strategies.

Recommendations

The results of the documentation team mission should be capitalized on to jump start the IT proposals. This could be done, for example, by an attempt to relate the team’s work aspects (DRI choice, training component, and the like) into the IT strategies. An early thrust in this direction is bound to yield a more effective response to IT strategy proposals.

5.2. Documentation Needs and Coverage: the Scope of Work

Summary

The documentation needs of the pilot projects were roughly described before hand. These needs gradually evolved during the initial stages of projects. The documentation consultants strived to figure out what segments of the pilot project areas to be covered.

Conclusions

The documentation coverage and schedule has been influenced by the

evolving needs of the pilot projects, and more so by the duration of documentation consultants’ mission. Interestingly, at this point (second week of Stage 2), the pilot project design consultants are not yet in a position to use DRI output images and drawings in effective way. However, they sense the potential value of DRI documentation to their respective projects.

Recommendations

A reasonable assessment of urban design project documentation needs is required. Soliciting pilot project consultants’ views on the *need* for documentation services and documentation outcome formats will be useful in directing future integration of documentation with urban and architectural design projects. Their views are best to be solicited while still on their mission, and more so towards the end of the mission. The duration and synchronization of documentation consultants and design consultants work is expected.

5.3. Documentation Pace and Progress

Summary

At the beginning of the mission, there was little grasp of how fast documentation activities would progress.

Conclusions

Faced by the vast physical and spatial contexts of the pilot projects, the documentation consultants strived to establish a pace or some sort of “rate” for documentation activities to help predict documentation performance, and subsequently, to help estimate the scope of work that can realistically be achieved.

Recommendations

An approximate rate of documentation (depending on established factors) needs to be set. A documentation pilot exercise at the outset of the mission is a recommended vehicle for working out a rate.

5.4. Training of Architects and Interns

Summary

Although assumed, training the SSR architects and interns had no fixed plans before the documentation consultants arrived.

Conclusions

The training component turned out to be intense and time consuming; it took time that could have been used in documenting more buildings and producing more measurable mosaics. However, the implemented training holds a definite promise. At least four trainees showed a reasonable grasp of the DRI and its associated digital skills. To gain real benefits, the trained personnel need to enhance their skills by sustaining a stream of rectification work.

Recommendations

A plan for the trained personnel to sustain their understanding and skills in using the DRI is to be instituted and followed immediately. Also, a design for a training program in the area of documentation in general, and photogrammetry in particular, should be initiated.

5.5. DRI and Photogrammetry

Summary

Besides the DRI, other photogrammetric methods, such as stereophotogrammetry and orthoimagery, can be used for documenting heritage buildings and areas.

Conclusions

The decision to use DRI was based on its simplicity, pace, accuracy level, and the inherent characteristics of producing scaled elevations. These factors made it an efficient and compatible method for “serving” the pilot projects—as they stand now.

Recommendations

As the needs for the UNDP/MoMAA undertaking expand and change, other photogrammetric methods should be considered for use—well in advance. A drive is encouraged towards anticipating what kind of urban and architectural projects are likely to emerge in the short, intermediate, and long terms. A preliminary, but guiding, view should be developed on the possibilities of using photogrammetric or other survey techniques to serve the anticipated projects.

5.6. Documentation Output and Its Use

Summary

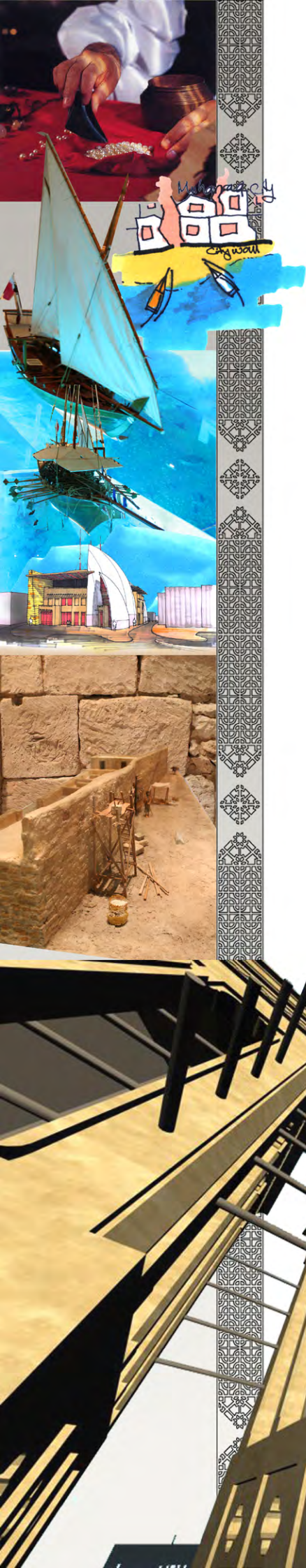
Over 450 images have been produced in the three pilot project areas, but still these images covered only limited segments of street elevations especially in Muharraq and Manama cultural heritage areas. Only 54 images were rectified to produce, in total, six elevation mosaics—a measurable ensemble of building elevations. Eighty percent of the images are of the “rectifiable” classification and left for rectification by others.

Conclusions

The limited number of buildings and scenes for which images have been captured in the three pilot project areas, and the limited number of the captured images that had actually been rectified hardly provide comprehensive documentation. However, the documentation consultants’ enterprise provided an opportunity for all parties, including the SSR Director, the design pilot project consultants, and the trainees: to be introduced to the DRI methodology, assess their needs, and adjust their thoughts about how best to take advantage of the opportunity.

Recommendations

Pilot project consultants can be instrumental in assessing and characterizing the need for documentation in urban design and urban complex re-design projects in general. Their views should be taken into account in formulating future documentation guidelines on “what” “how much” and “how” to document. Further, a system for organizing and accessing all classes of image information needs to be developed. This will function as the nucleus for an evolving comprehensive image data base serving urban projects and municipal needs.

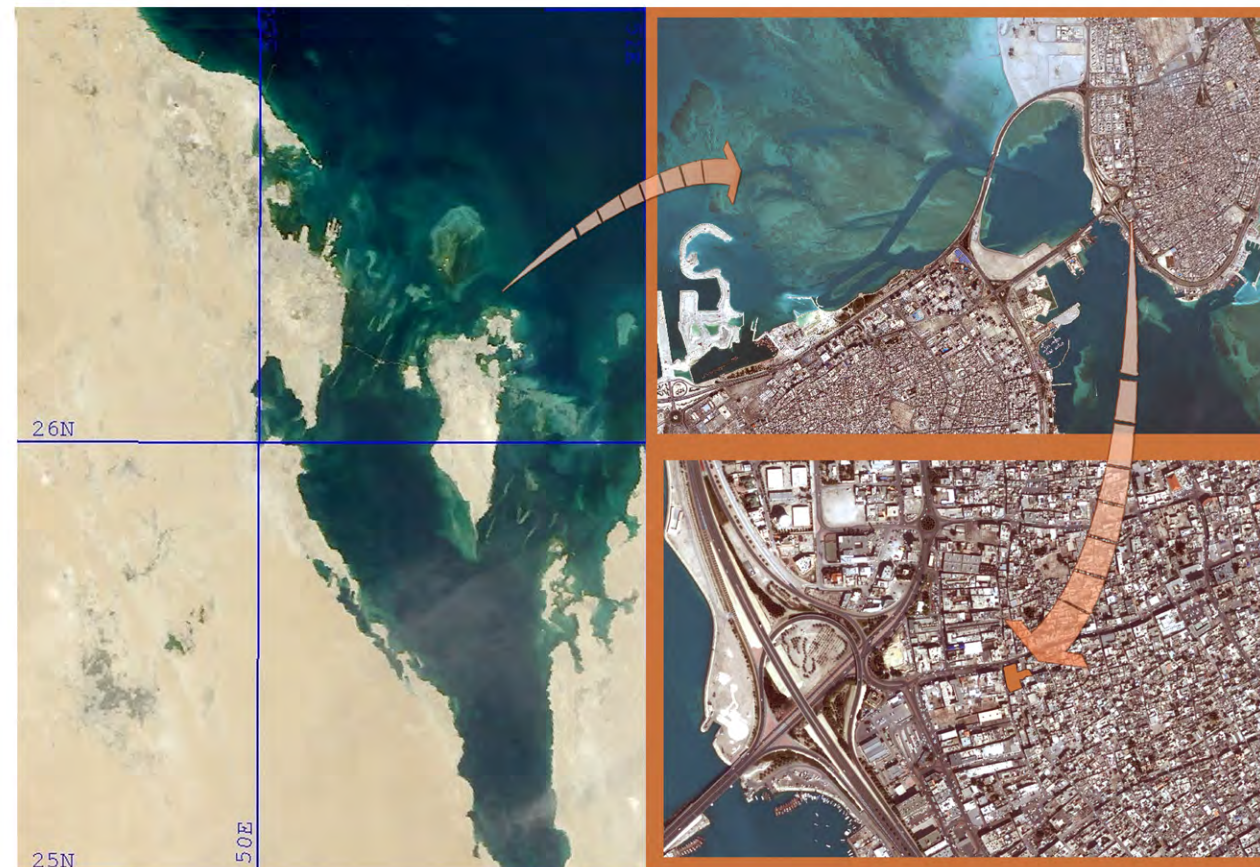


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SUQ AL-QAISARYA DEVELOPMENT AL MUHARRAQ



LOCATION MAP

TOTAL PROJECT LAND AREA = $3150M^2$
TOTAL PROJECT BUILT AREA = $7200M^2$

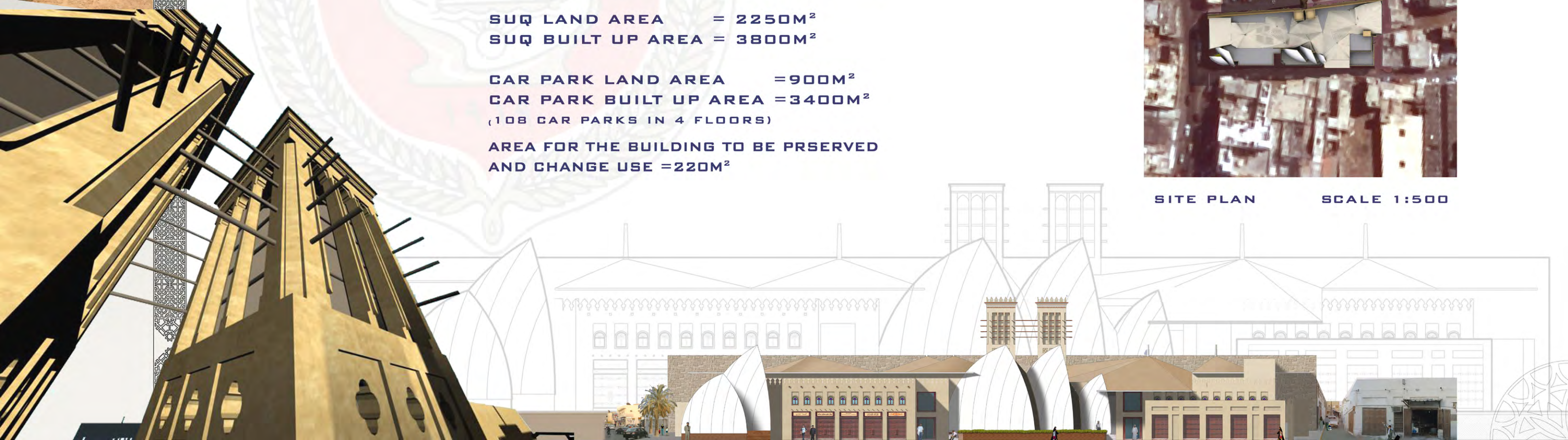
SUQ LAND AREA = $2250M^2$
SUQ BUILT UP AREA = $3800M^2$

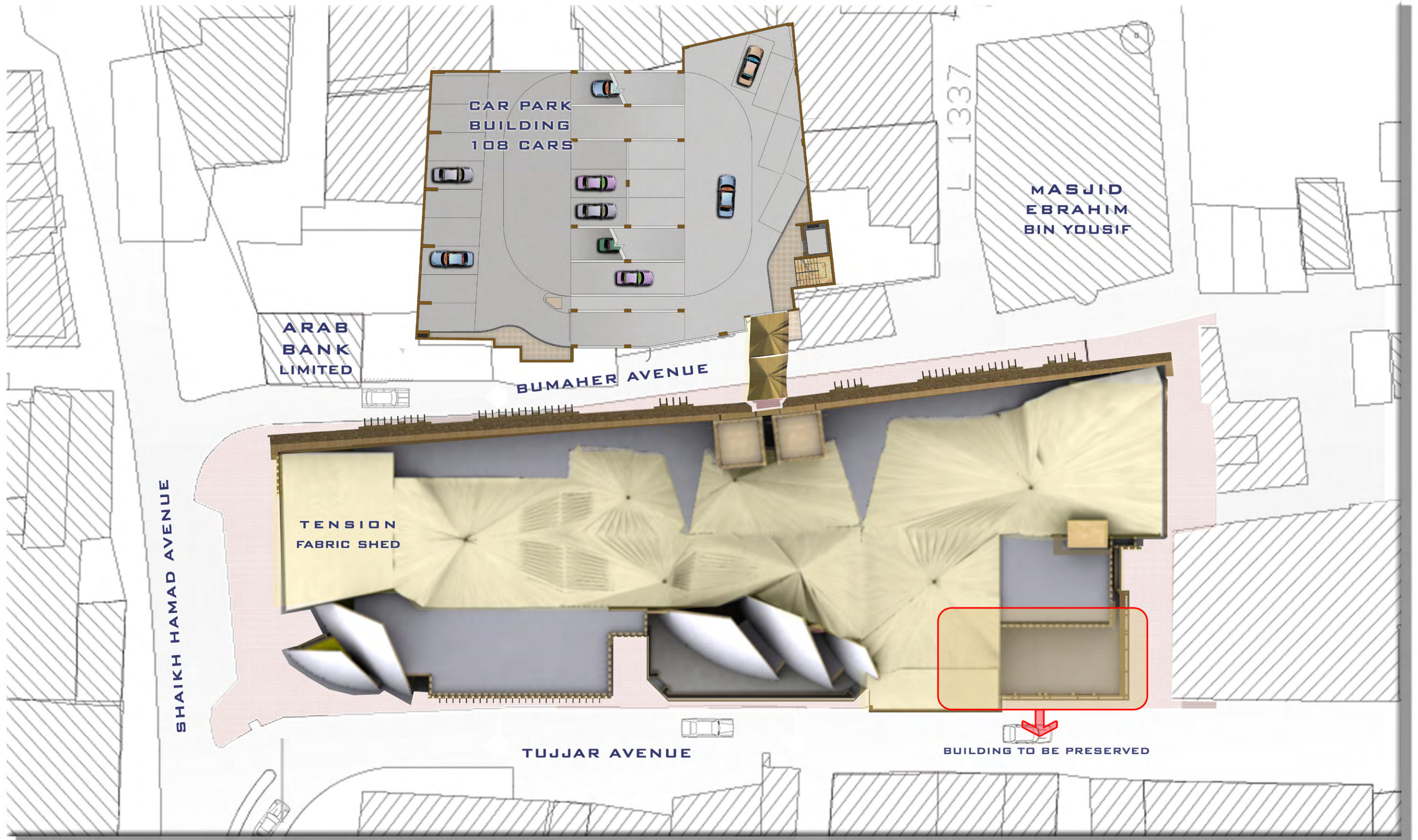
CAR PARK LAND AREA = $900M^2$
CAR PARK BUILT UP AREA = $3400M^2$
(108 CAR PARKS IN 4 FLOORS)

AREA FOR THE BUILDING TO BE PRSERVED
AND CHANGE USE = $220M^2$



SITE PLAN SCALE 1:500

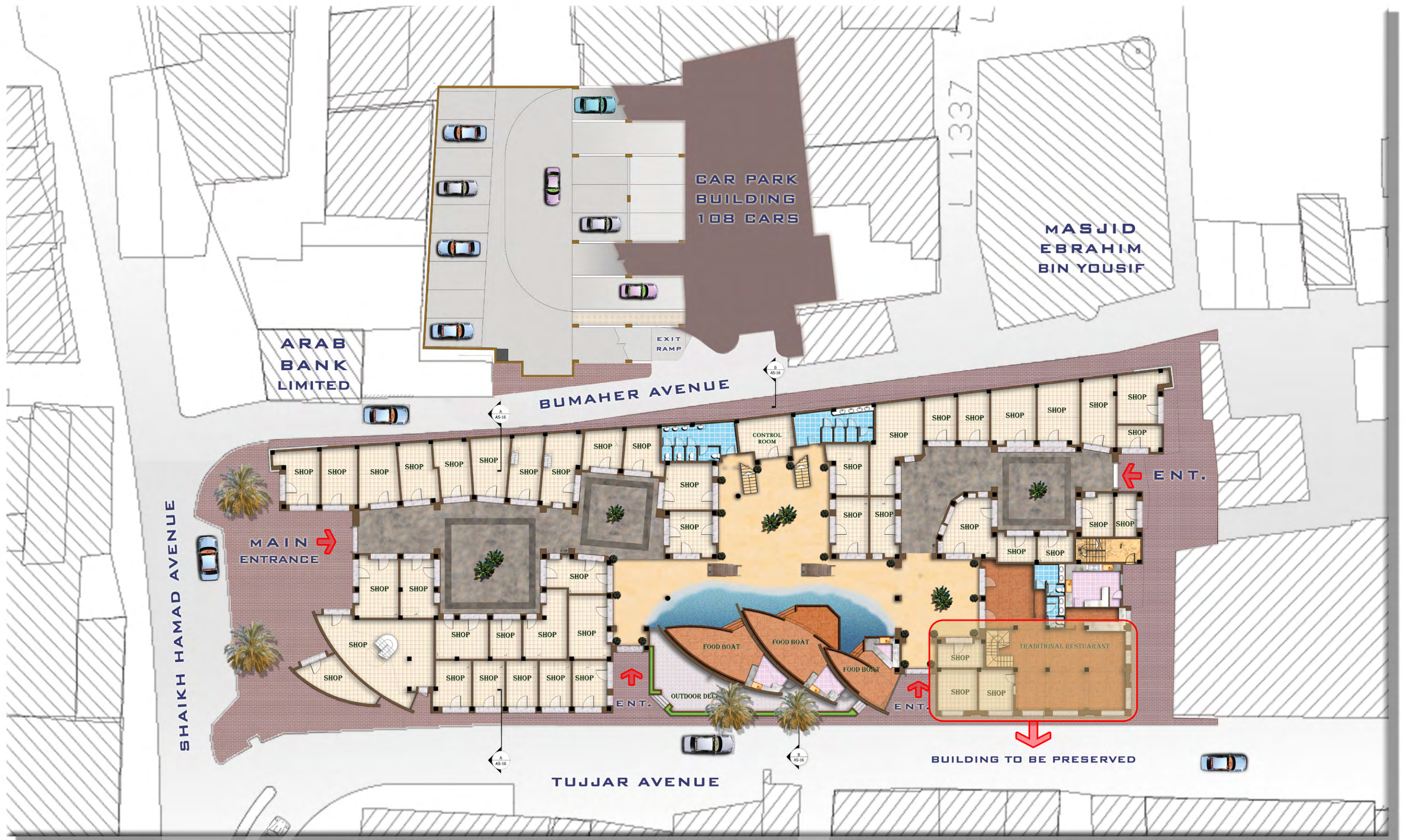




ROOF PLAN

SCALE 1:100





GROUND FLOOR PLAN

SCALE 1:100

Suq Al Qaysaria Project Al-Muharraq / Bahrain

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1. Executive Summary

The development of AlQaysaria Suq has been identified in Phase One of the Ministry of Municipalities and Agriculture Affairs and United Nations Development Program in Bahrain (MoMAA / UNDP) undertaking (Capacity-Building for Enhancement of Urban Governance – Summary Report, Strategies and Policies, February 2006) as one of three pilot projects. The study shows an urban analysis to the existing fabric, which gave an overview of previous architectural approach and was concluded with urban design guidelines that was a valuable starting point for site analysis and architectural design of Al Qaysaria project.

The city of Muharraq and in particular the site of Al Qaysaria Suq has a rich history that can be traced from site features, recorded aerial photographs and living memories. The Suq of Al Qaysaria have played an important role in the development of the city of Muharraq and the daily life of its inhabitants.

The site of Suq AlQaysaria features a living memory of the daily life of a vibrant city, the original geography and relationship with the sea and the city-wall of Muharraq along seashore.

Above aspects combined makes the project of Suq Al Qaysaria a potential historical statement that would revive history and would be an architectural feature which attracts local Bahrainis as well as tourists to have a taste of local Bahraini Suq environment.



Figure 1: Traditional Bahraini Houses

2. Project in Brief

Briefly, the development of Suq AlQaysaria starts from the study and the analysis of the options laid in Phase One of the MoMAA / UNDP undertaking "Capacity-Building for Enhancement of Urban Governance", the brief was also to analyze existing structures, understand the local history of Muharraq and the Suq area, develop an understanding of the traditional Bahraini architecture and come up with an architectural solution for the Al Qaysaria Suq that is rooted to the history and driven from the local Bahraini architectural style.

The car parking solution plays an important role in making Al Qaysaria Suq attractive and practical to the public by providing a car parking facility to Suq visitors. Both the Suq and the car-parking projects were designed under direct consultation with the project manager appointed by MoMAA / UNDP.

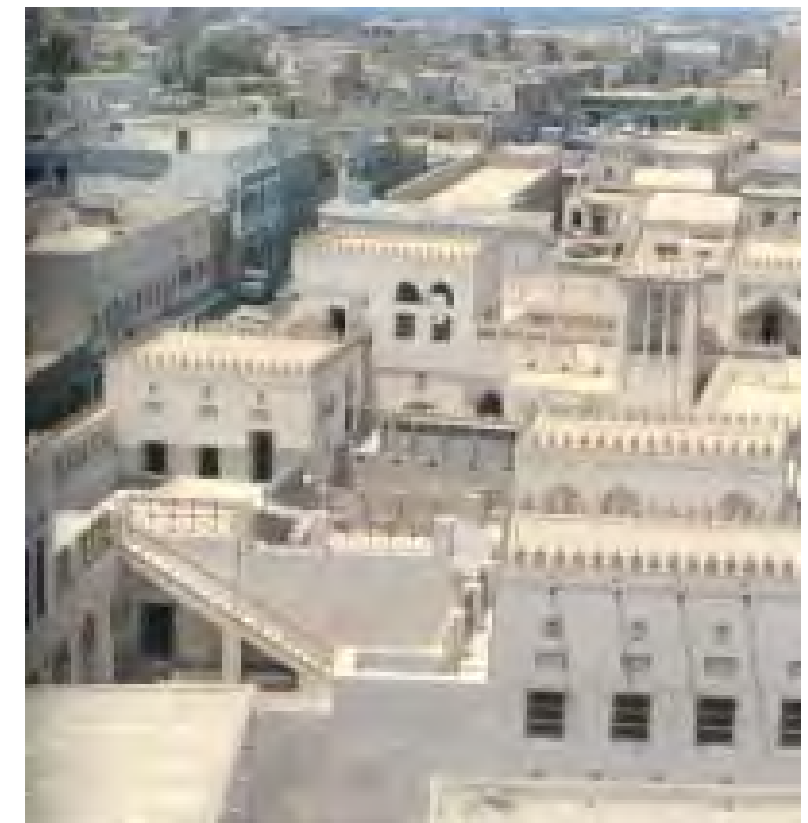


Figure 2: Traditional Bahraini city fabric

The suq was required to provide an architectural solution that suitable to the current lifestyle and requirements such as availability of car parking, sanitary facilities, children facilities, air conditioning without compromising the architectural value and historical statements of the design.

Although, an initial project budget was discussed prior to the design of the Suq, at an early design stage (conceptual design presentation) it was clear that this project could become an icon for the city of Muharraq and quality was set as the first priority. Given the history behind the area of Suq Al Qaysaria and the fact that the area was on the coast and the city-wall location, all these factors made the project of Suq Al Qaysaria culturally important and sensitive and gave the project another cultural and historical dimension.



Figure 3: Bahraini pearls



Fig. 4 : Boats out for pearl diving in early twentieth century (Wali p. 41)

3. Historical background

Bahrain is known as a centre for trading in the region and for pearl diving, Wali (P40, 1991) “pearl diving is the oldest business in Bahrain, and Bahrain was famous with pearls”. The city of Muharraq was known as a centre of trading, boats loading and unloading of goods takes place as part of people’s day-to-day life. Boats and boating were an integral part of the Bahraini lifestyle, more so for the area of Al qaisarya Suq area.



Figure 5: Boats out for pearl diving in early twentieth

Bahrain was also known for its building of boats, different boats designs are developed for different purposes (trading, fishing or pearl diving), part of which is the Al-buma, Albanush ..est... Almost all boats used to have an overhead shed to provide a cover from direct sun exposure for extended time. Shed structure used to follow a simple construction method of stretched fabric over timber structures mainly reliant on the central post of the boat and sometimes on secondary side-posts.

4. The Growth of Muharraq

It is important to understand the growth of the city of Muharraq because it clarifies the original location of the Suq in relation to the city; it also clarifies the relation of the Suq with the sea.

The city of Muharraq has gone through stages of growth by land reclaiming, reference indicates that Al Qaysaria Suq used to be on the shore where boats load and unload, moreover, the Suq area was the connection to Al Manama through the ferry, this fact can be traced through the aerial photographs below. The growth of the city of Muharraq by land reclaim have shifted the coastline and caused the Suq to grow gradually.



Fig. 6: The city of Muharraq in mid twentieth century (Wali, p. 39)



Figure 7: Muharraq city in 1951 (MoMAA)



Figure 8: Muharraq city in 1966 (MoMAA)



Figure 9 : Muharraq city in 1977 (MoMAA)

The aerial photos show the growth pattern of the city of Muharraq, it also shows how the Suq location was on the shore and as a point of connection to Manama as shown in the diagrams below.



Figure 10 : Muharraq city in 1983 (MoMAA)



Figure 11 : Muharraq city in 1996 (MoMAA)

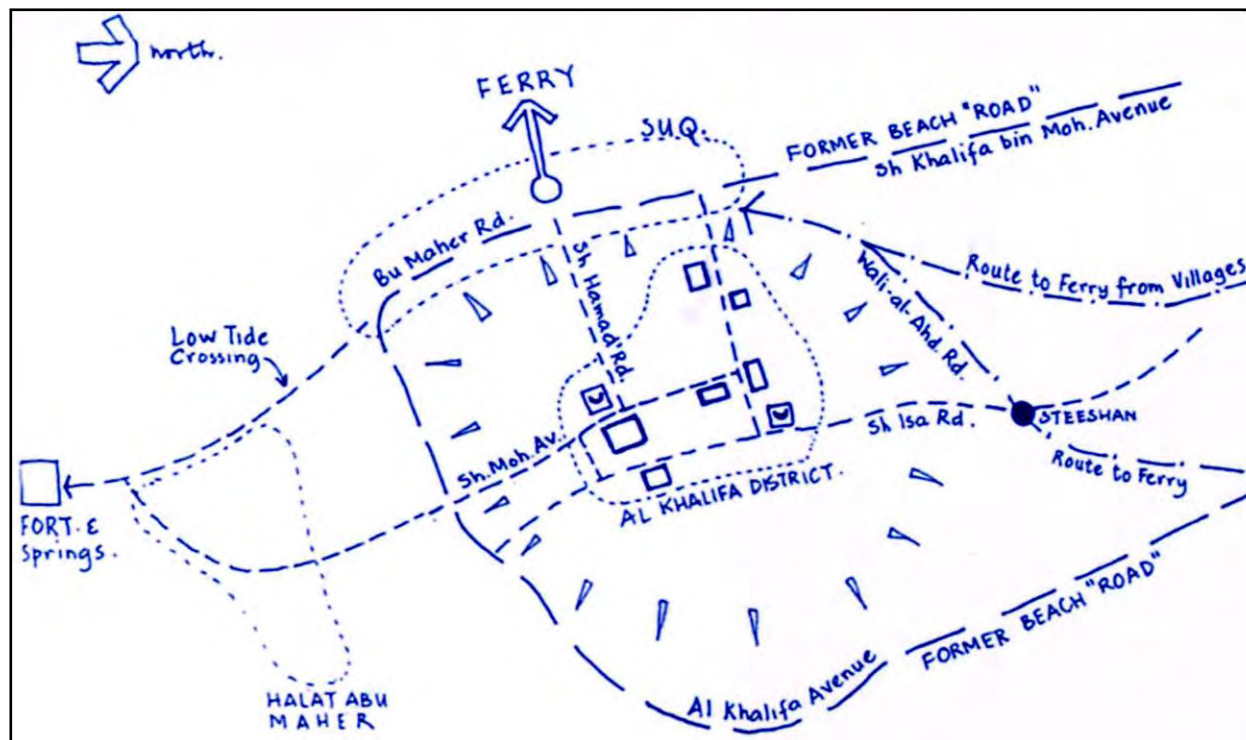


Figure 12: Analytical diagram of town structure (Yarwood)

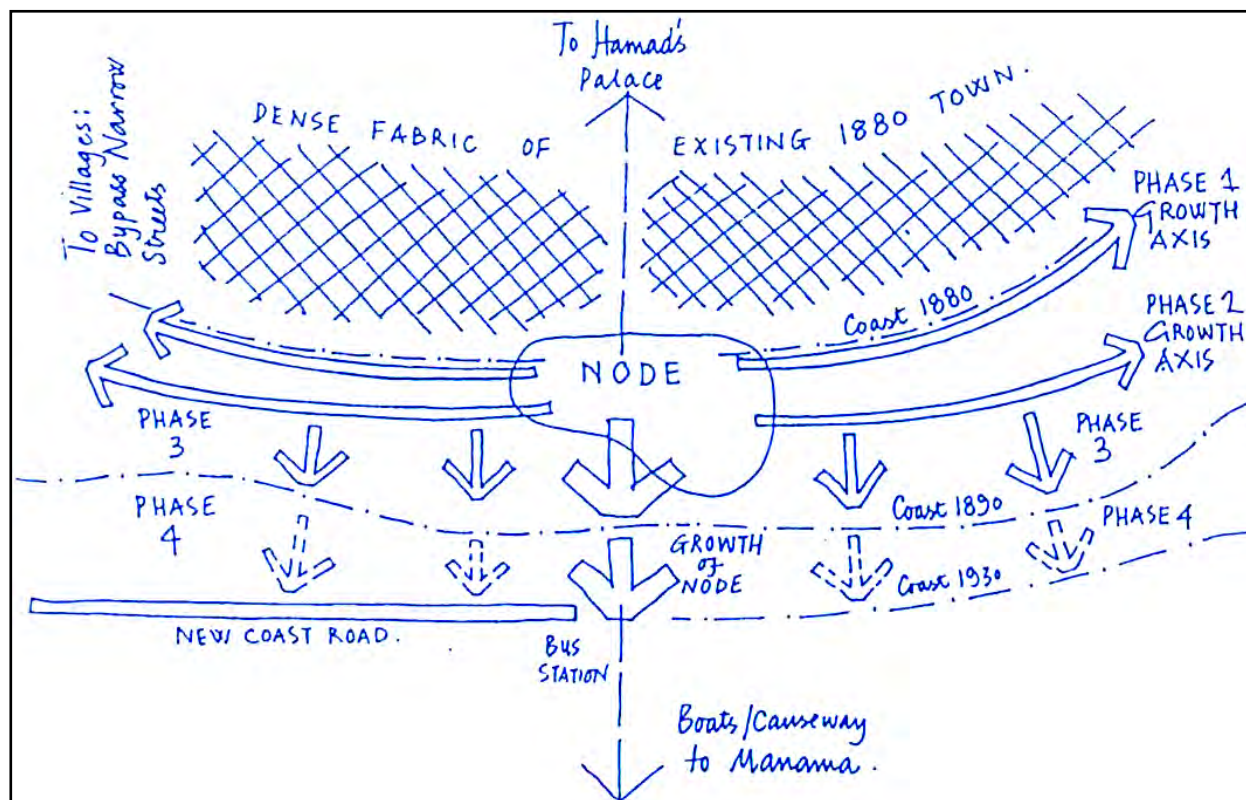


Figure 13: Urban growth of Muharraq Suq (Yarwood)



Fig.14: The Old City Wall of Muharraq



Figure 15: Boat preparations for the sail



Figure 16: Remaining of the old city wall found in the Suq block across Sh. Hamad Avenue (site photo July 2006)

5. The City-Wall

There are references to indicate that the city was fenced with a wall. Wali (p.124 .1991) said "There is a view that the market took place in the reign of Sheikh Abdallah bin Ahmed Al-Fateh (the Conqueror), the founder and the ruler of the city of Muharraq starting from 1810 AD.



Figures 17: Excavations next to the old city wall shows remaining of stone (site photo July 2006)

The Ruler decreed a wall to be built, which had three lockable gates supported by night guards." He goes on to say "It is almost certain that the Suq in 1869 AD was well established". However, Indications of the city-wall can be found on the eastern boundary of the project site, this explains the 2.5m average difference in ground levels between the eastern side (Bu Maher St.) and the western side (Al tujjar St.). This difference in site levels is consistent on the other side of the suq across Sh. Hamad Avenue. Further more, the remaining of parts of the city-wall can be found on the north of the Qaisarya Suq across Sh. Hamad Avenue.

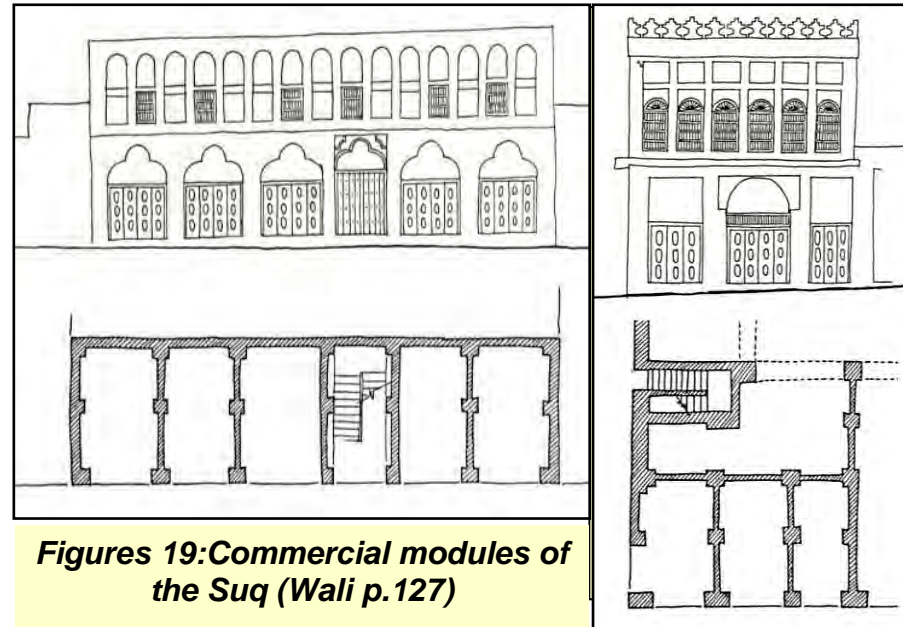
In addition to the references above, verbal memories of the elderly in the area confirms the same finding. However, there is no reference of the shape and scale of the city-wall that we could establish.

6. The Old Suq Area

The Suq of Muharraaq was in a linear form of shops comprises 300 shops (Wali P.126) and has developed an architectural style of mainly two story buildings, majority of which is purely commercial while some provide living space in the upper floor (Wali



Figures 18: Al Qaisarya Suq is in Poor Conditions



Figures 19: Commercial modules of the Suq (Wali p.127)

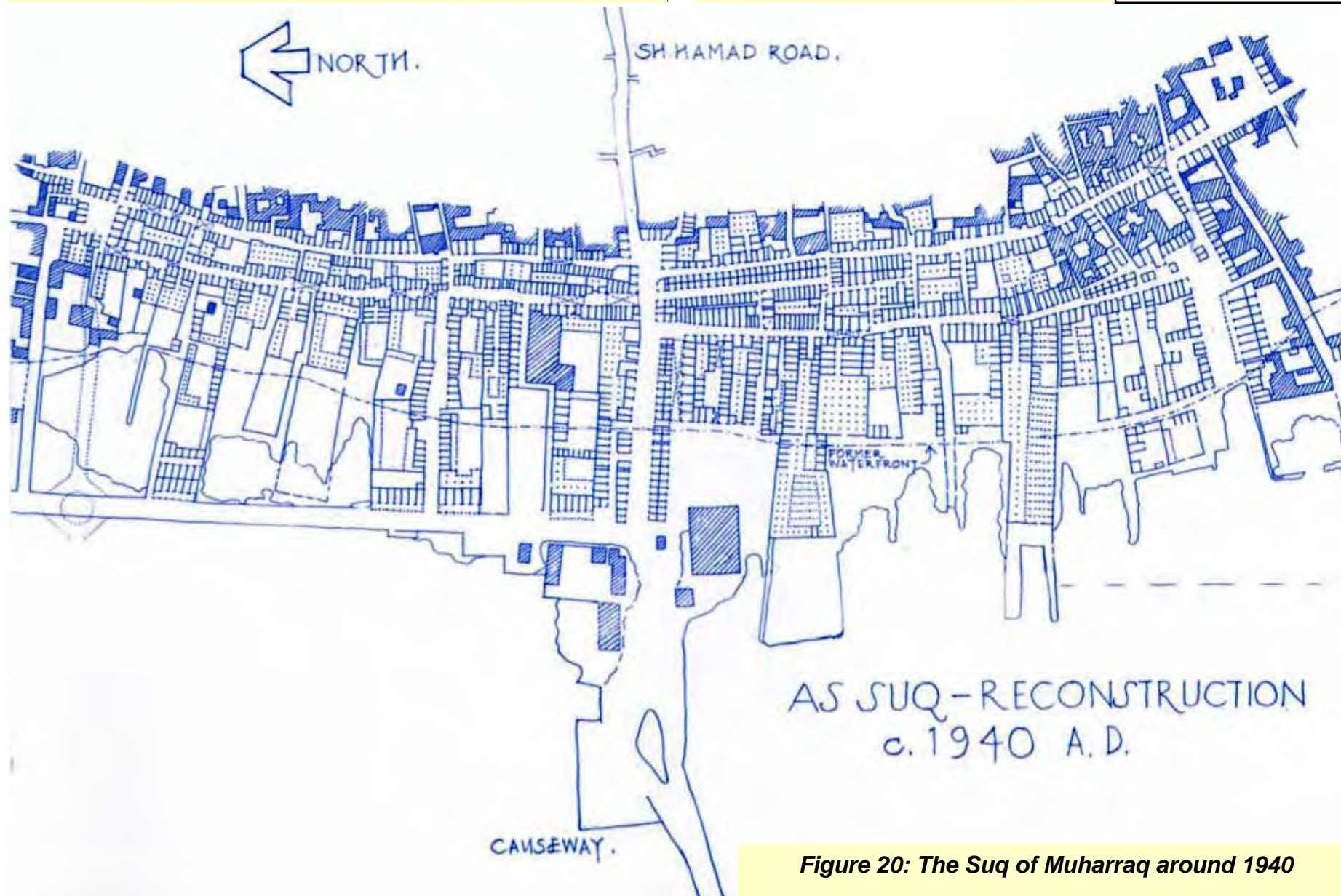


Figure 20: The Suq of Muharraaq around 1940

7. Heritage Components in the existing Suq

The current project site of Suq Al Qaysaria comprises a mixture of old, new buildings as well as open vacant areas (lots). The Municipality has made an important and successful step of purchasing the different sites that makes the Suq from current private owners to be able to combine them and treat the Suq development as one unit title. The building fabric of the existing Suq can come under three component classifications:

1-Components of heritage value: these components are mostly located at the southwestern part of the market block; a small component lies at the north-east corner of the block.

2-Components of *potential* heritage value: these components are generally located at the north-west part of the market block—surrounding a strip of newer construction shops.

3-Components with no heritage value: these make the balance of the block fabric, and occupy the south-eastern part, most of the north-eastern part, and the strip of the newer construction shops mentioned above.



Figures 21 : Traditional Building in Suq to be preserved



As part of site evaluation and assessment, it was decided to reserve the building on the south-west corner by maintaining its external walls by structural improvements and renew the inside to match with the new Suq design. To enrich the architectural identity of the later old building, it was treated as a separate building on its own in two stories and used as a traditional restaurant.



Figure 26: Different Traditional works sold in the Suq



Figure 27: Suq frontage on Sh. Hamad Avenue; Not easy to recognized the Suq

Figure 23: Pictorial record of North Elevation of Existing Suq (on Sheik Hamad Avenue)



Figure 24: Pictorial record of West Elevation of Existing Suq (on Bu Maher Avenue)



Figure 25: Pictorial Record of East Elevation of Existing Suq (on Tujjar Avenue)

8.The Design of Suq AlQaysaria

8.1. Design Concept:

The idea is to bring the Suq and the area to its history, as well as put together a design that gets visitors to reflect and relate to that history.

The design of the Suq was developed to have a mixture of the traditional Bahraini architecture as well as the historic city wall of Muharraq and the boats. It tells the story of the site as it was a traditional and an active market place in a beautiful Bahraini architectural style, being located at the coastal side of the city outside the city wall. The place was clearly dominated with the presence of boats as part of the normal day-to-day trading because of its attachment to the coast.



Figure 28: Sketch to illustrate the Design Concept

The proposed design puts together the architectural elements to make a statement of an iconic value to the city of Muharraq which becomes a valuable cultural platform that functions as a unique traditional Suq and becomes a point of attraction for Bahrainis as well as tourists.

The Suq is designed to be functioning in a ground floor level only, this is to achieve a traditional style of Suq that reflects Bahraini architecture, majority of the shops have an upper floor storage space, and this will help keep shops tidy at ground level.

The South-West corner of the site was designed as a reservation to an existing building; this building is designed as a traditional restaurant that accomplishes the Suq and gives it a special flair.

8.2. Circulation Design:

The interior circulation in the Suq is designed to reflect a traditional style of building fabric. Walkways has taken winding shapes interrupted by courtyards (*Barahas*). The *Barahas* creates an element of variety of shapes and scales and slows down the movement to improve shopping environment.

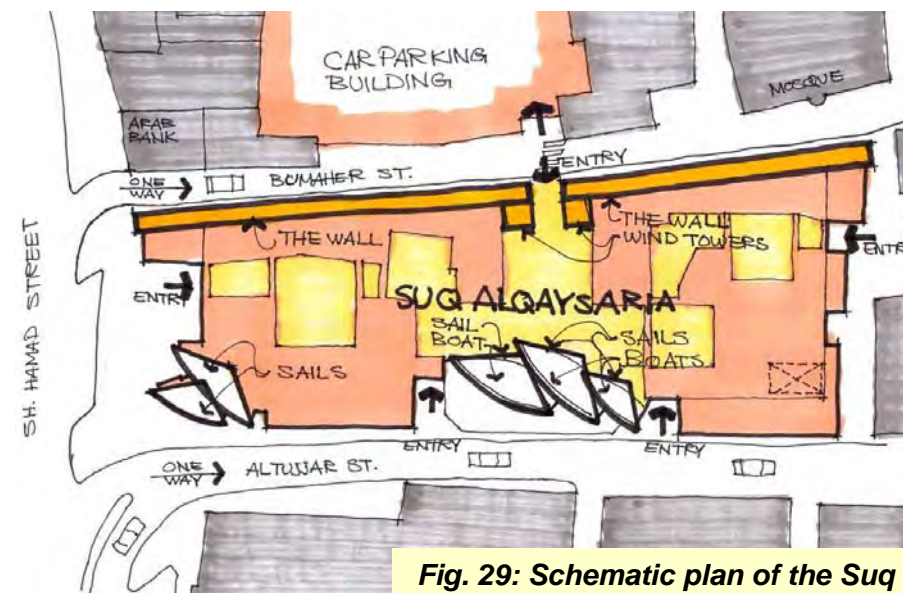


Fig. 29: Schematic plan of the Suq

The winding access of walkways inside the Suq gets visitors to keep changing their direction which gives a different perspective and focal point. This continues the change in perspective results in a dynamic environment that gets visitors to enjoy the experience and gives an opportunity to further explore and enjoy the architecture of the Suq.

Overhead thick arches are used to break the continuity of walkways by bridging from across the walkway and gives a defined statement for courtyards (*Barahas*).

The Suq has a total of five entries as shown in the figure below; this helps a smooth flow and a direct link to the car park building.

Figure 30: A traditional bridge over the Avenue.

Figure 31: Plan to highlight internal Circulation Design



8.3. The City-wall

The historic city wall of Muharraq was located at the eastern boundary of the Suq site, this has been considered in the new design and a reference to the historic wall is used. The new wall is located in the same place of the historic city wall.

The new wall has a stone finish, in reference to the historic wall that was built with stone as found in the remaining, the wall has a solid look, it starts from the ground about 2.2m thick and reaches 0.8m at the top.

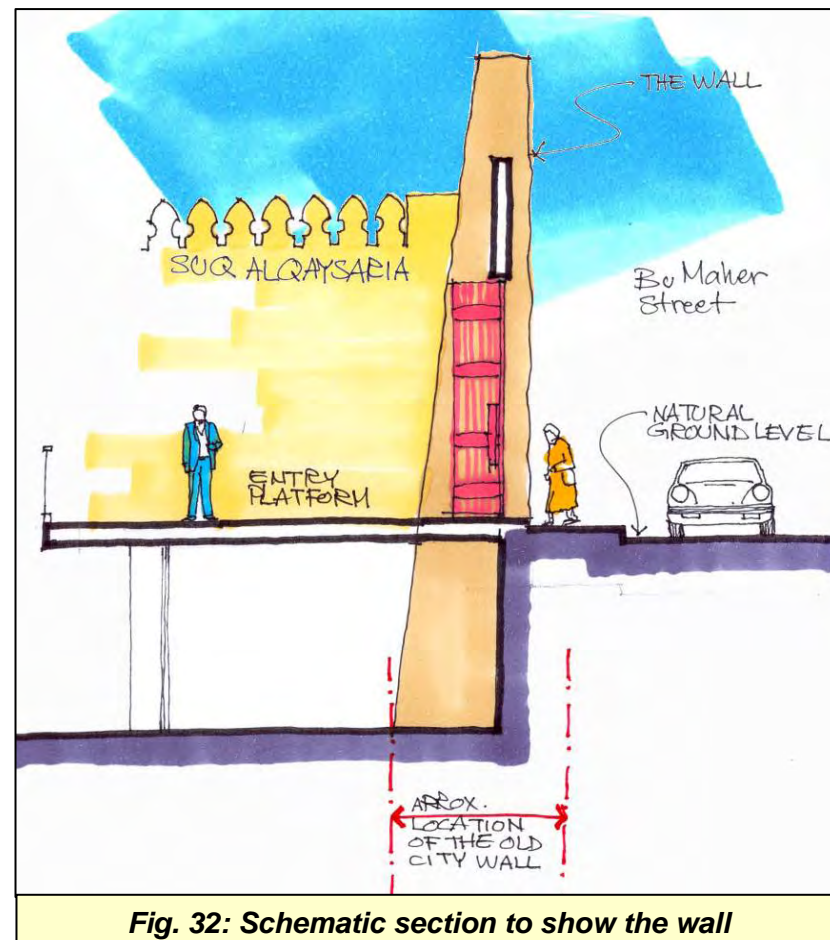


Fig. 32: Schematic section to show the wall

The construction of the wall is being made to give a visual effect of the thick wall as mentioned above, this is maintained externally where both sides of the wall are exposed. Inside the Suq, the design keeps the external face of the wall and use the space left for shops, this have made the construction of the wall more economical and allow more area for shops.

Fig. 33: Selected stone cladding for the wall



8.4. Boats and the suq

In addition to the integral role that boats plays in the daily life of Bahrainis, the Suq, as illustrated before, was attached to the sea and the presence of boats was part of the natural Suq environment.



Figure 34: Muharraq wharf in 1919 (Wali, p.48)

Sail boats are being used in the design of the suq as a design element to refer to the fact of the presence of water as part of the original nature of the site (the original shore line), it also gives feeling of the presence of boats in the area which is part of the site's original nature.

Five boats are used in the design in an organic design composition integrated with the normal building structures; sails are of 2 sizes only to ease construction by standardization.

Sails will be made of pre-cast concrete panels having a vertical tongue & groove joints, the selection of materials comes for durability purposes and vandalism resistance, and it is also widely available locally.

All sails used in the design are expressed from the outside as well as the inside, that will give the viewer and visitors a feeling of a true statement that gives comfort and value. The design provides indoor activities to allow for an uninterrupted visual exposure of sails, this will allow the sails to be an effective indoor design element.



Fig. 35: Traditional Bahraini boat

In addition to the sails, three true scale boats are used inside, in the main Baraha (the Shore Baraha). The deck of the boats as well as some adjacent platforms is used to serve food. The boats are to be designed to reflect three traditional types of Bahraini boats with the accessories of sailing. This will need to be detailed at later stage.

8.5. Roof Shade:

In addition to using the element of boats and boat-sails as mentioned above, the theme of boats reflected on the design of the fabric shed used over common areas (walkways and *Barahas*) in the Suq.

The shed design was inspired from the style, shape and structural system used in the boat-shed in the traditional Bahraini boats used for fishing and pearl diving.

In each open space (*Baraha*) a timber post is used to support the roof, the shape of timber pole and the structural system is inspired from the structure of traditional boats. Shading common areas in the suq was important for environment control, this would allow an efficient use of air-conditioning system for common areas.

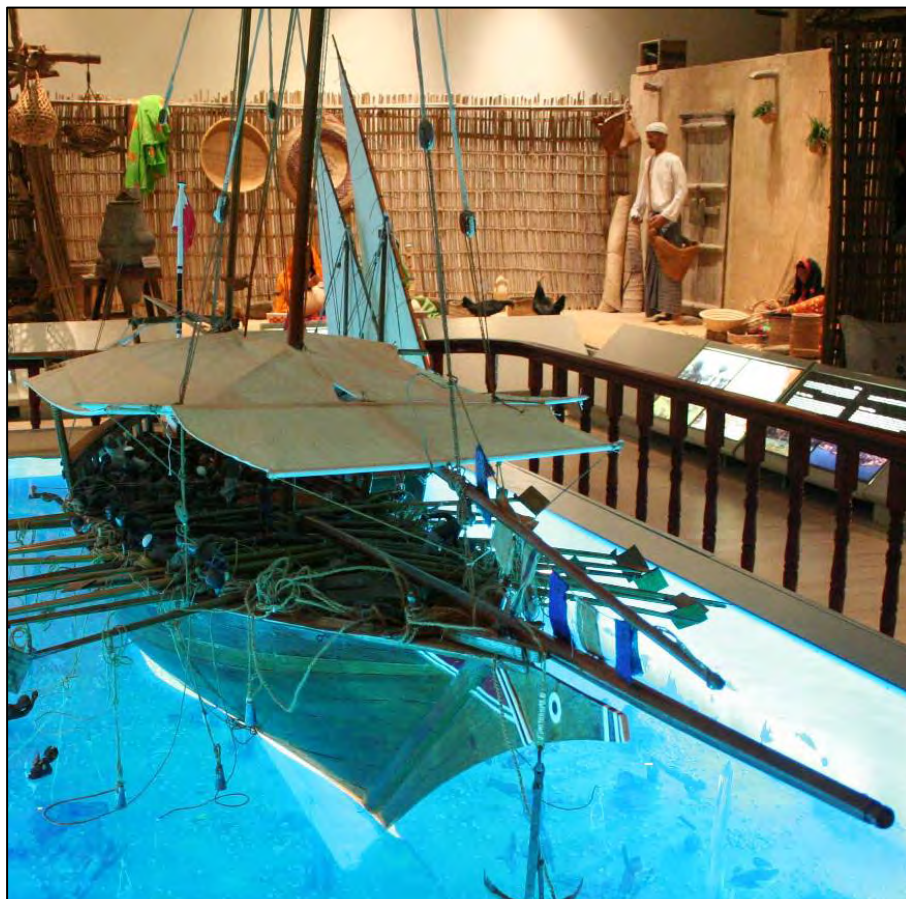


Figure 36: Traditional Bahraini boat to show the style and structural system of the boat shade

In fact, the use of sheds over common areas in traditional Suqs is very common and is a pure and natural reflection of the environmental needs in hot-climate areas.

Sheds extend over and beyond wall parapets in a floating manner and have vertical curtain drops behind the parapet to control air movement. The curtain drops and supports are designed to be invisible to viewers from inside the suq, this is to allow for an effective and complete exposure of walls for viewers.

In addition to the functional role of the shade mentioned above, the sheds are used in the design as part of the architectural statement to define the Suq entries. It is used as an over-hanger over the entries to create a shaded negative space that defines entries for visitors naturally.

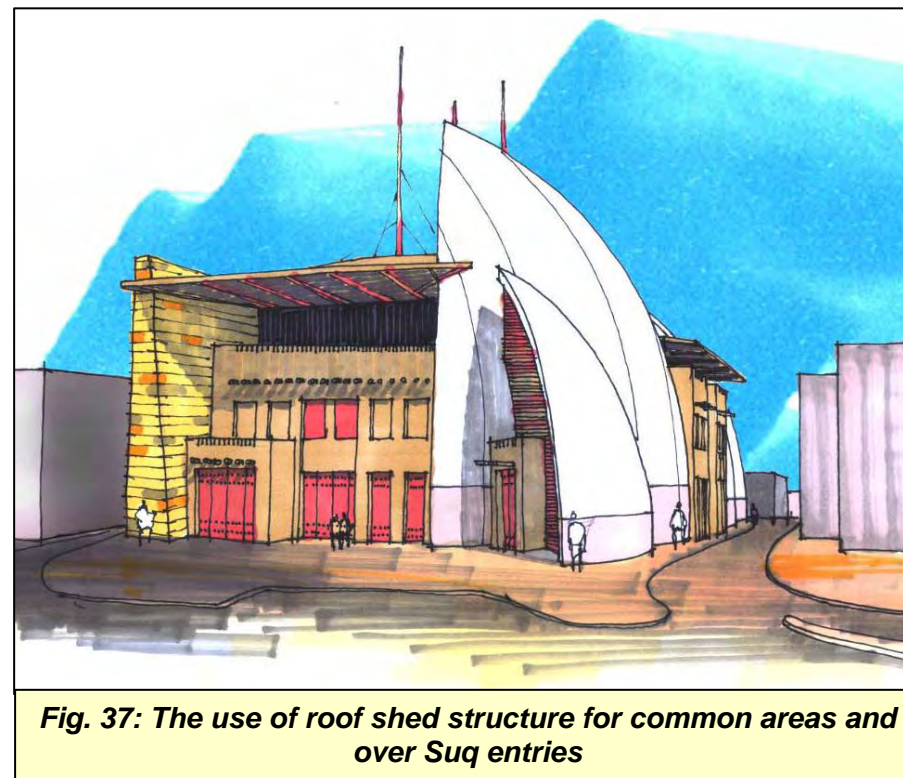


Fig. 37: The use of roof shed structure for common areas and over Suq entries

8.6. Wind Towers:

Two wind towers are used as part of the design scheme, in addition to their functional purpose of bringing fresh colder air into the Suq at times when air-conditioning is not required for common areas in the Suq, the two wind towers are used in an integrated form with the city-wall to define the west side entry. Wind towers have its deep roots in traditional Bahraini Architecture.



Figure 38: Traditional Bahraini wind tower



Figure 39: Wind towers in the suq viewed from Bu Maher Avenue

8.7. Interior Design Style:

The Suq interior design was made to reflect the traditional Avenuescape of the city fabric of Muharraq in terms of style, scale, proportion and architectural treatments.

The narrow winding walkways used in the design of the Suq gives it a special flair and a feeling of the old city Avenues, courtyards used to break axis continuity and would create unique environment and architectural style, each courtyard in the design (*Baraha* A, B, C, D & E) is to have a distinguished architectural style reflected on wall patterns, window & door treatments, parapet treatment and detail.

Each *Baraha* has a timber-finished post (similar to boat's central post) to support the roof fabric shed, some *Barahas* has trees and timber seating around tree base.

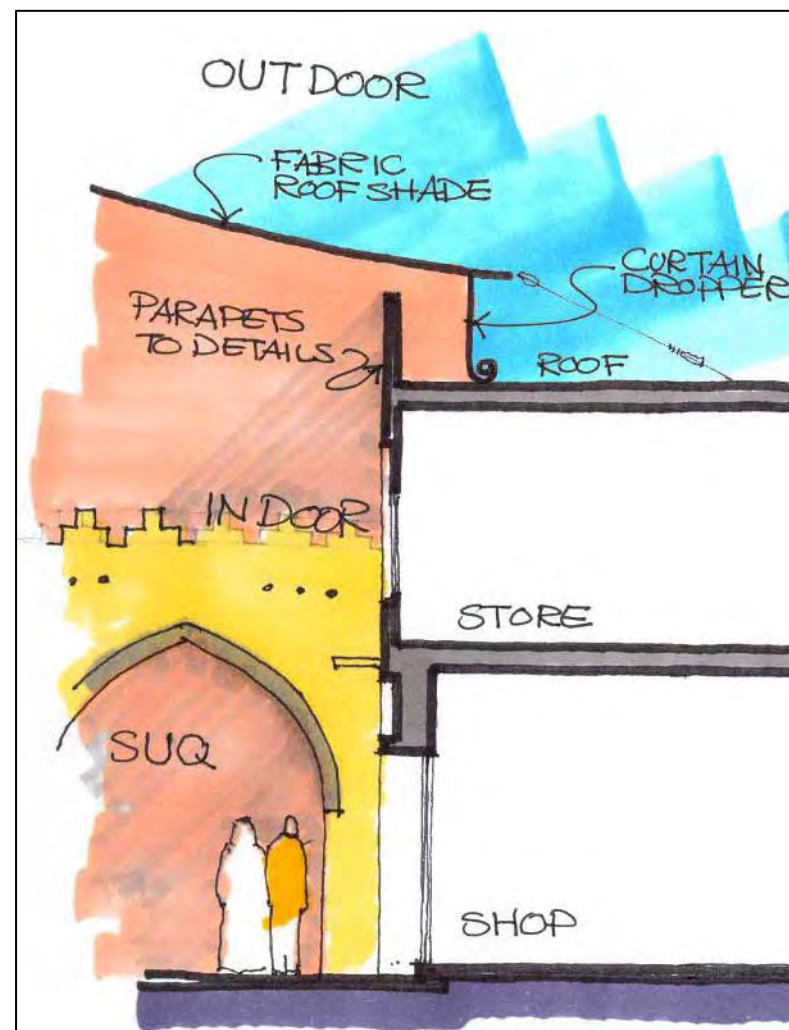


Figure 40: Suq internal wall and parapet detail

The fabric roof over each *Baraha* (and other common areas) is designed to be visually independent from walls and has a negative detail over parapets, this fabric shed is used in enclosing and shading the *Baraha* (and other common areas) as well as to provide a controlled internal environment from external weather.

This shading treatment of timber finished post and fabric roof runs in harmony with the traditional Bahraini style comparing to other modern treatments.

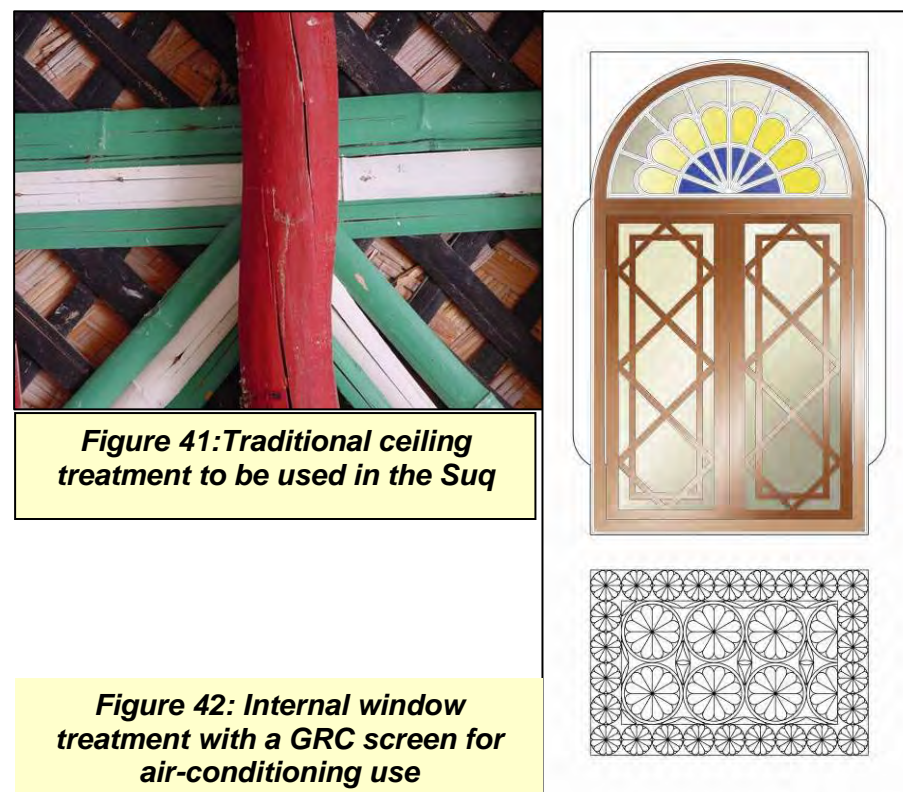


Figure 41: Traditional ceiling treatment to be used in the Suq

Figure 42: Internal window treatment with a GRC screen for air-conditioning use

The central open area in the Suq (*Shore Baraha*) has 3 full-size boats that are used to serve food and coffee, it gives a feeling and a reference to the sea shore which had existed in the area in the past. An area for mobile stalls is allocated in the shore *Baraha*, the area can take four stalls, two on each side.

In general, the Suq interior environment is rooted to the traditional city fabric of Muharraq with a clear relation to the life on the shore, which are the very two elements that are unique to the city of Muharraq.



Fig. 42: Examples of mobile stalls to be used in the shore

8.8. Architectural Façade Style:

Wall elevations are designed to achieve an aesthetic look and reflect the traditional Bahraini style. Elevations are designed to modules that give a sense of uniformity, elevation elements such as window style, door treatments or colors that can change to achieve diversity within uniformity to avoid too much repetition.

Solid timber joinery is used for windows and doors; shop front is designed to give high exposure of shops with a hinged door in the middle, patterned timber windows is used for the upper level.

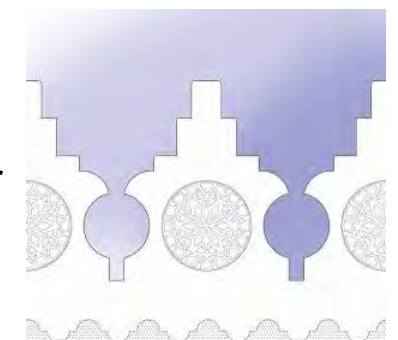


Figure 44: Parapet detail

Solid timber bi-fold doors are used for external shop front; it is treated in a Bahraini traditional style.

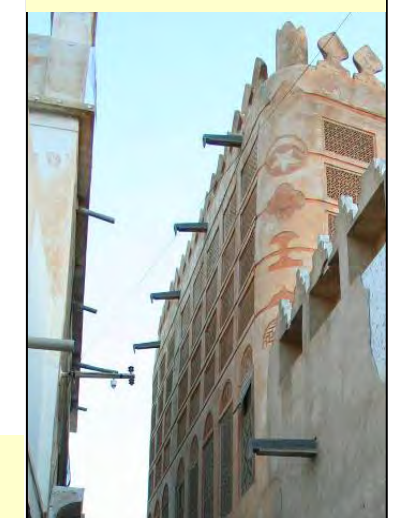


Figure 45: Example of a traditional parapet treatment

Elevation modules gave a sense of visual pillars that makes the basic vertical rhythm. The basic visual proportions used in the design relates to the golden-section proportions.

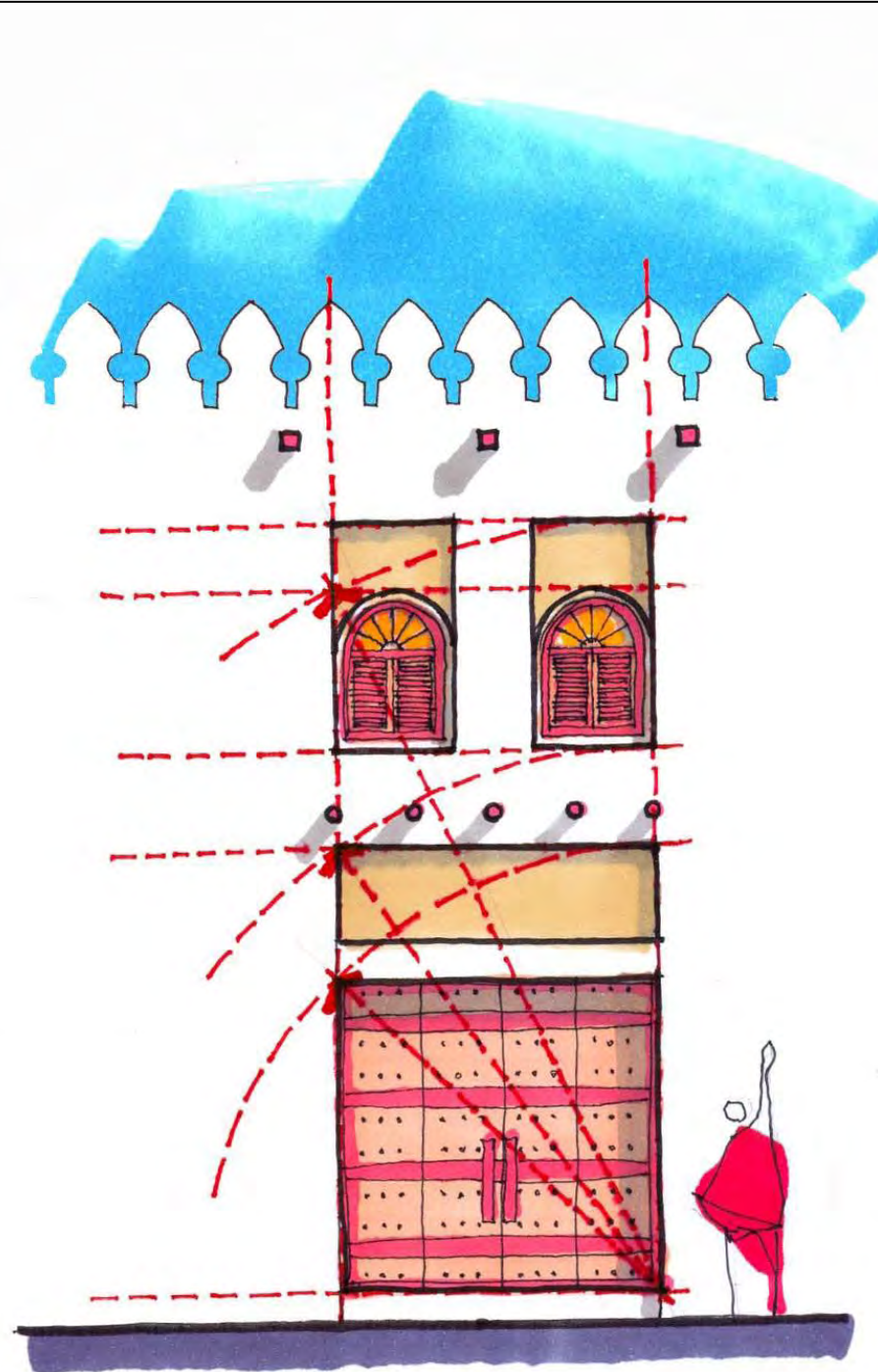


Figure 46: Elevations basic proportions

8.9. Structural System:

Except for some specific structures, concrete columns and beams are used to form the skeleton frame of the building, this is to achieve flexibility as well as cost effectiveness for a system that suits design requirements.

Infill concrete block walls are used between structural columns, concrete slab system is used for the mid-floor as well as for the roof.

8.10. The Suq in Statistics Summary:

Below is a statistical description of the suq:

Suq project site area:	2,186m ²
Suq project total ground floor area:	1,920m ²
Total number of shops:	60 shops
	(different sizes, as below)

#	Shop type	number	Notes
1	General shops	50	3 of which have second shop front on Buhaher St.
2	Boat-deck shops	3	Food / drink shops
3	Sail shape shop	1	2 storey shop (suited for rugs)
4	Sail shape shop	1	Single storey shop
5	Mobile display	4	4.7m ² each in the Shore Baraha
6	Traditional restaurant	1	2 storey restaurant using the reserved historical building
	Total	60	

9. The Car-parking Project

The car-parking is designed in a split-level multi-storey system in five levels; this system enabled an optimal use of floor area and was chosen among other options for efficiency and suitability to the relatively small site area.

The building is designed to house a total of 107 cars. A one-way circulation system is used with separate entry and exit points.

The building is served by a staircase and a lift for car users, also a pedestrian ramp is allocated to link between separate levels to allow car users to move between levels safely.

Vehicle ramps are designed to have a smooth transition between floor levels and sloping ramps, a 1:8 gradient is used for transitions at both ends of the ramps while 1:6.1 gradient is used in the middle portion of the ramps.

The car-park building has a 2.8m floor-to-floor height and a clear height of 2.1m for vehicles, this minimum height occurs at the entry point of up-ramps due to the width of overhead beams.

10. Recommendations

10.1. Design presentation

Because of the unique style of the design and the use of three dimensional forms, it is necessary to establish a proper 3D computer model and presentation. This will provide a good tool to ensure that the project is well visualized by stakeholders and understood by contractors.

10.2. Project detailed design

Further detailed design is required for the project, a list of additional details are attached in appendix 000, this list can be used as a general guideline of the scope of work to ensure that all required details are explored, designed, coordinated, and drawn for construction. It is prudent that additional details are done prior to construction as it ease the process of construction, eliminates discrepancies, ensures a good building standards and avoid extra cost.

10.3. Involvement of other parties:

Given the style of the architectural statement, the historic and cultural dimensions of the project of Suq Al Qaysaria, and because of the potential role the Suq can play in being an icon for the city of Muharraq, it is prudent to conduct a consultation session and involve the Bahraini artists, boat builders and other stakeholders in the city of Muharraq and at government level.

10.4. Services:

It is important to ensure an effective coordination between the different consultants working on the project is achieved during design stage and before/during construction, namely structural, fire, electrical, mechanical, quantity surveying and other consultants as they may get involved in providing professional advice.

10.5. Interior design:

The five different courtyards (*Baraha*) in the suq can be treated to have a unique architectural style for each *Baraha*, this can reflect on minor windows/doors style and details, parapet details, wall patterns and minor treatments etc. this can also enrich interior quality and emphasize the interior design scheme. However, it is important to maintain the design modules that will give a unifying theme to the project.

10.6. Project color scheme:

Comprehensive color scheme design is required for the Interior and exterior of the suq, color scheme will need to be designed to emphasize the architectural design.

10.7. Project management and construction:

Because some of the project components are unusual, like the sails, internal true-size-boats, timber posts in courtyards, roof shade structure and the city-wall, and to minimize the risk of compromising the quality, these items can be treated in the contract as provisional sums. This can give a better chance of quality and cost control over these items during the course of contract. It is important that these items are detailed in shop-drawings in consultation with the design office; these shop-drawings are to be submitted for approval before construction.

The Ministry of Municipalities can consider project-managing of the construction of Suq Al Qaysaria; this can be achieved by awarding the contract to a "main contractor" for conventional works and employing "third-party subcontractors" for specialized works. This management system can help to minimize construction cost and gain greater control over quality.

10.8. Future Suq extension:

Few neighboring buildings of potential heritage value exist south of the Suq site, serious consideration should be given to preserve these buildings and potentially extend the Suq southwards.

10.9. Car-park building management:

The car-park building design allows car drivers to pay while exiting at the control room provided, given the fact that it generally common practice for Bahrainis. However, we recommend the establishment of a management system where car driver's pay before driving their cars out, this will improve efficiency and safety.

Because of the shortage in the availability of car parking in the area, it is recommended to manage the car parking building in such a way to be primarily catering for the Suq Al Qaysaria. This can be achieved by allowing a free (60 or 90 min) parking for Suq Al Qaysaria users redeemed upon showing a proof of purchase from the Suq, or a similar practical system to achieve the objective above; 2.1 m. height restriction signboard is mounted at the car parking entry to alarm car drivers of height limitation and avoid building and vehicle damage.

References:

Tariq Wali: "Al Muharraq "(in Arabic), 1991. Bahrain.

John Yarwood: "Al Muharraq : Architectural heritage of Bahraini City" 2005.

Appendices:

Appendix 1: Photogrammetry Documentation,

Appendix 2: Suq Al Qaysaria Set of drawings

Appendix 3: Car parking Building Set of drawings.

STUDY GROUP:

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Dr. Jose luis Lerma Garcia: Cartographic
Engineering, Geodesy and Photogrammetry.

ACKNOWLEDGEMENTS

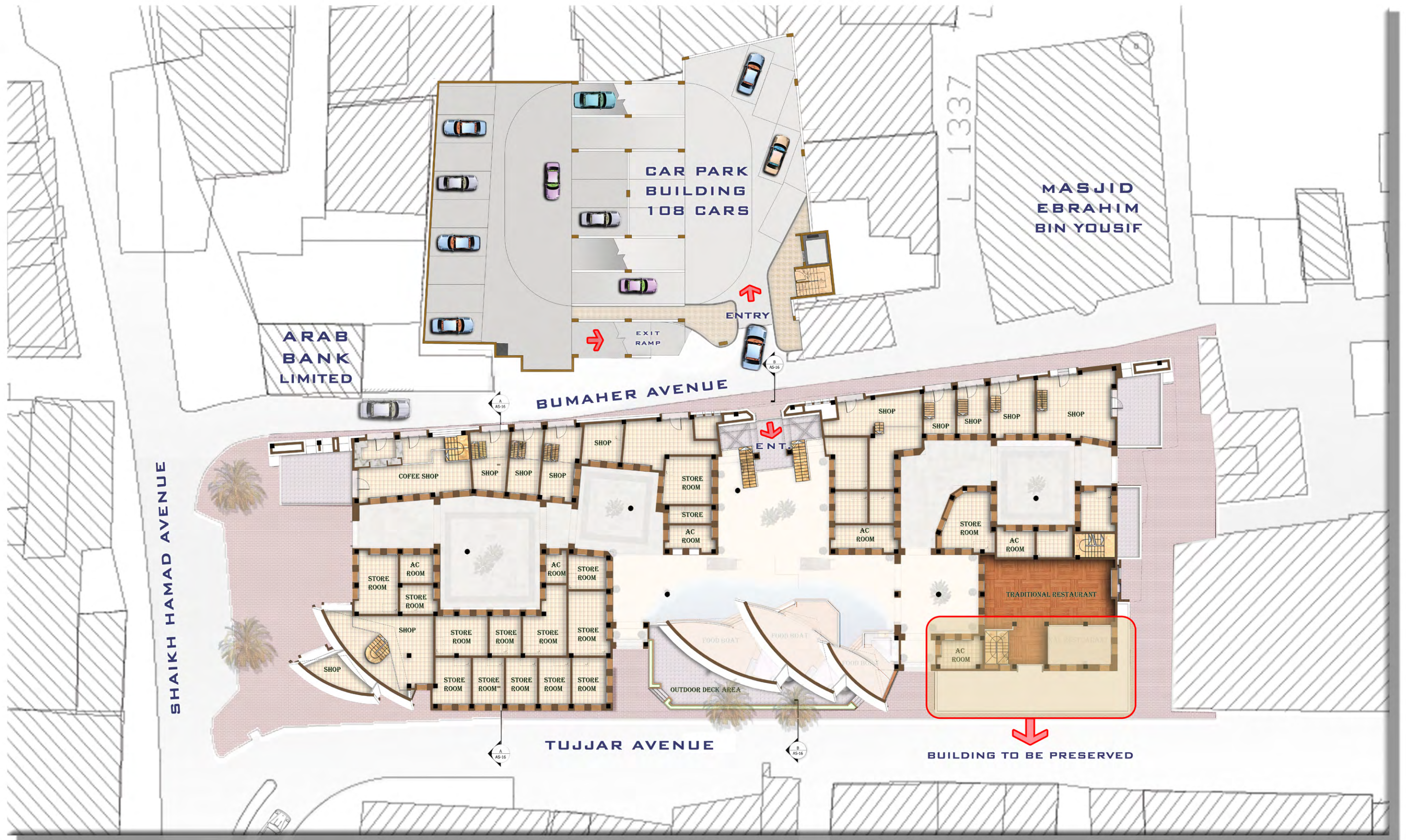
I would like to express my sincere gratitude to the honorable Minister **H.E Ali bin Saleh Al Saleh**, the Undersecretary **Dr. Jumma Al-Khaabi** and the Assistant Undersecretary **Mr. Mohammed Noor Al-Sheik** for giving me the opportunity to direct this project :

*Capacity Building for Enhancement of Urban Governance:
Urban Design Projects for Traditional Areas in Bahrain.*

Furthermore, for their continuous support and guidance in achieving successful completion of this project.

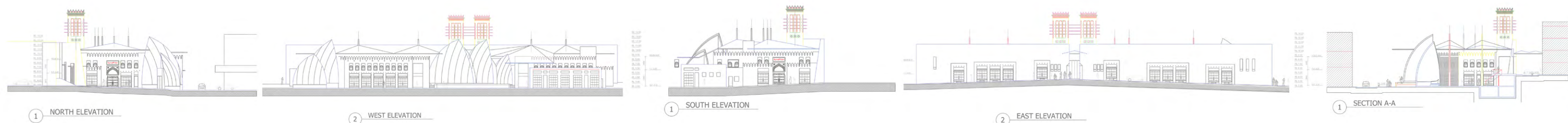
My gratitude is also extended to all the staff at United Nations Development Program in Bahrain, particularly **Mr. Ali Salman**, Program Analyst. I also wish to express my thanks to the consultants, who came all the way to Bahrain to participate in the project and played a vital role in bringing this project to its successful outcome. In conclusion, I owe special thanks to my staff at the Research and Studies Section, who helped and supported me to undertake this project with indefatigable team spirit. They are too many to be acknowledged individually here.

*Falah Al-Kubaisy (Ph.D.)
Project Director
R& D Advisor MoMAA*



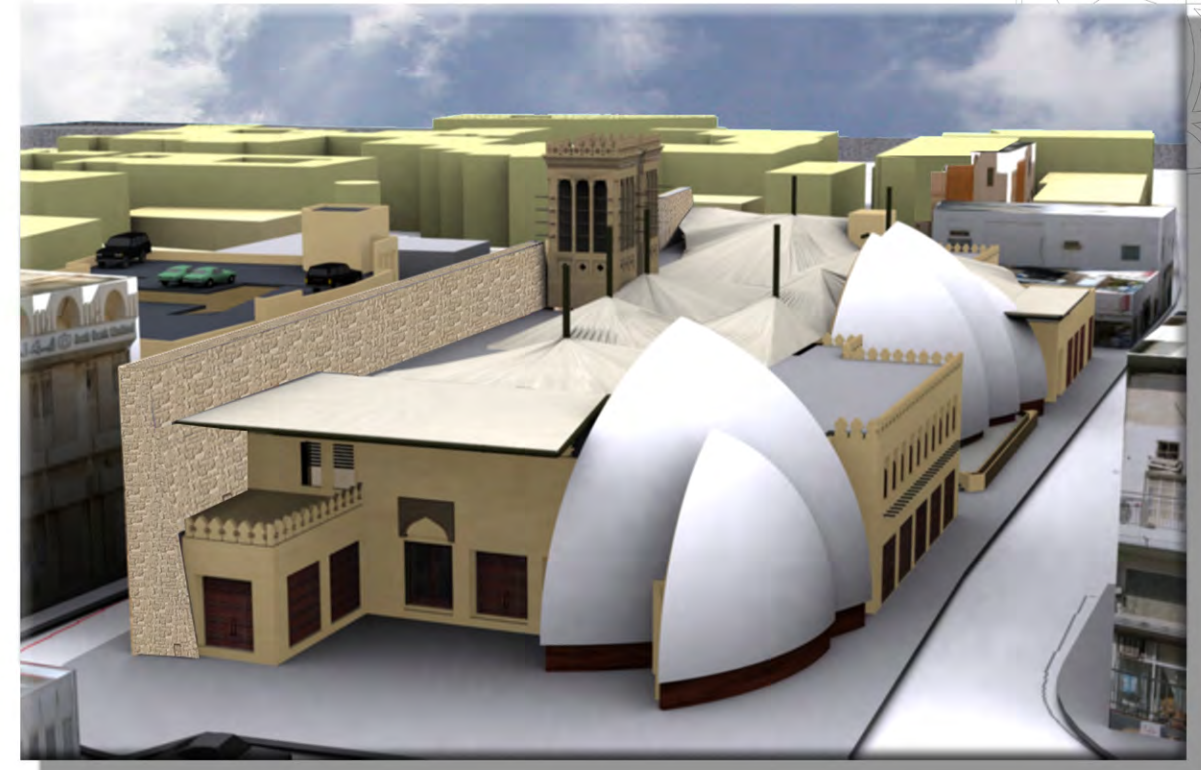
FIRST FLOOR PLAN

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NORTH ELEVATION **SCALE 1:100**



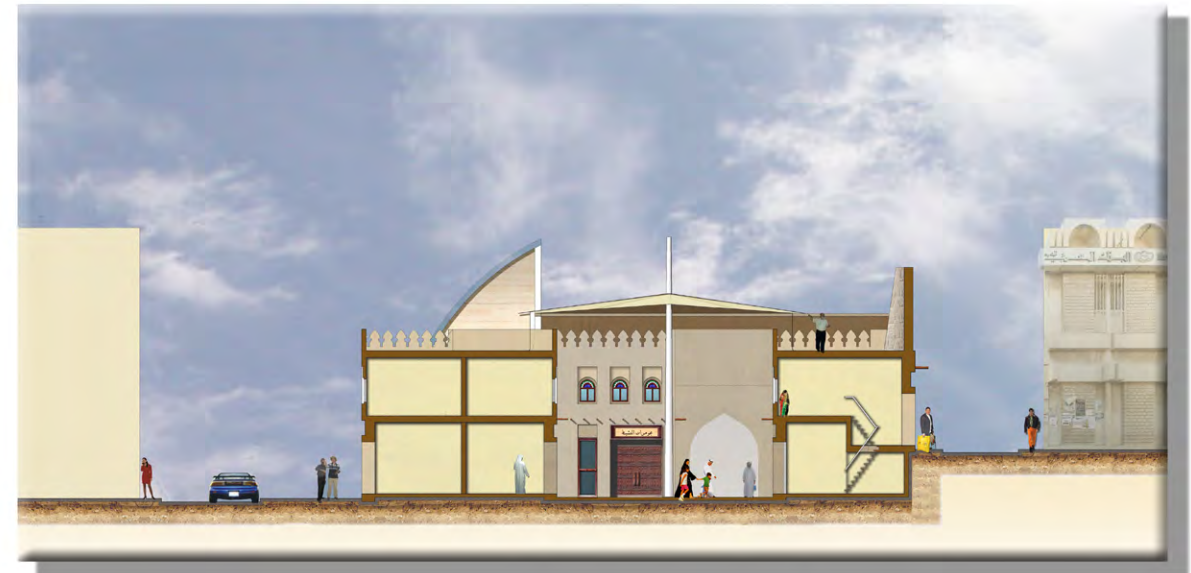
WEST ELEVATION

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SOUTH ELEVATION

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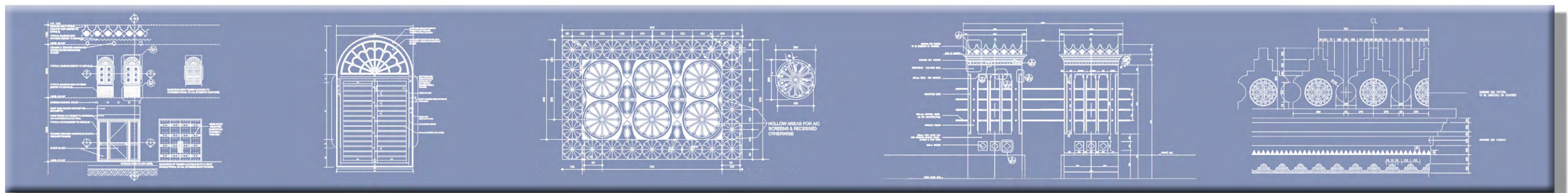
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EAST ELEVATION

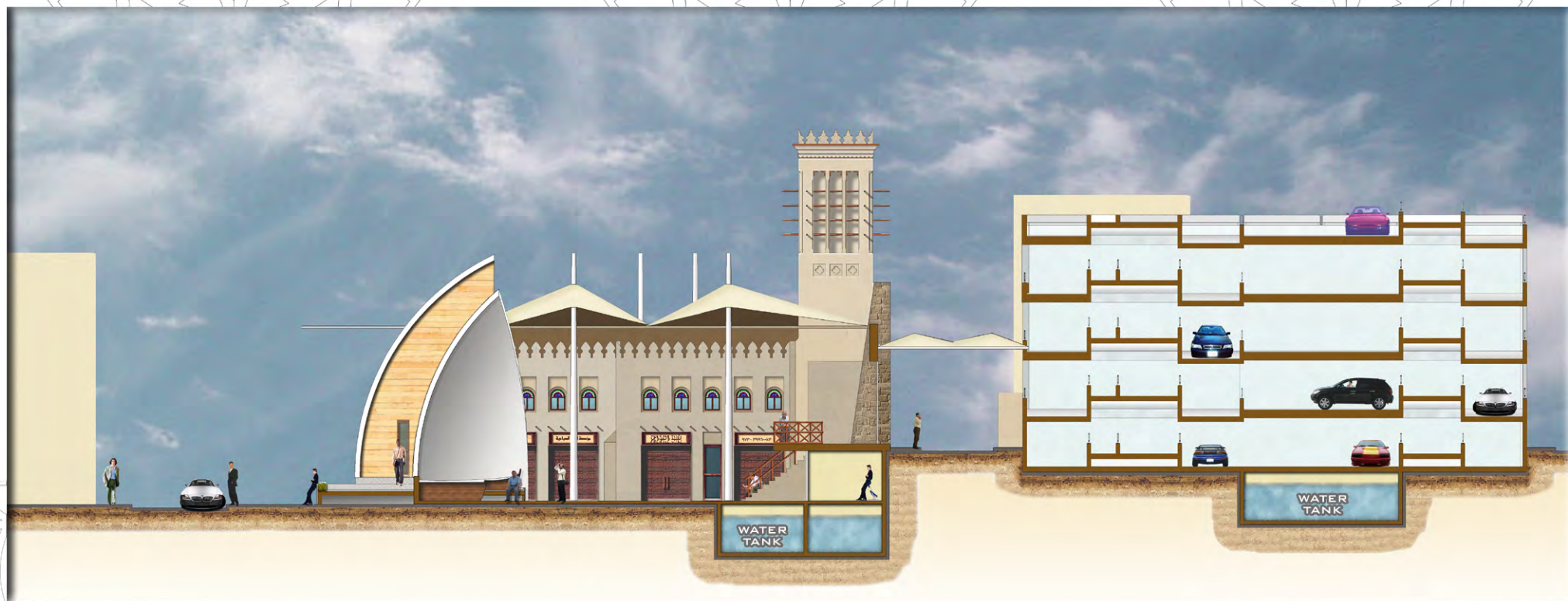
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CAR PARK WEST ELEVATION

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SECTION A-A

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