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## AIUla Saudi Arabia : final report 2019-2022

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# AIUla 2019 2022

## Saudi Arabia Final report







### **About CRAterre**

CRAterre, international centre for earth construction, is a multidisciplinary team of 80 associated experts (archaeologists, architects, engineers, sociologists, etc.) having established partnerships for 40 years with major international actors including UNESCO (participation in the inscription, conservation and management of 50 UNESCO World Heritage properties), UN-Habitat or ICCROM.

CRAterre is a member of the UNESCO Chair "Earth Architectures, Constructive Cultures and Sustainable Development", representing 41 institutions in 24 countries in Europe, Asia, Africa, and Latin America. In the implementation of its activities, CRAterre relies on the network of the UNESCO Chair and on a network of 300 professionals specialized in earthen architecture trained in the postgraduate "Earth Architecture" of the National School of Architecture of Grenoble.

CRAterre has developed activities in more than 100 countries and has a longstanding experience in Saudi Arabia, with the organisation of a first exhibition on earthen architecture in Janadriyah in 1988, the participation to the Atturaif Addiriyah development project (2006-2008), the participation to the 2012 archaeological campaign on Al Yamama mosque, the coordination of the 2021-2030 Management plan for Dadan archaeological site and the participation to TRITA training programmes in Riyadh (2022).

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**GRAPHIC LAYOUT & DRAWINGS:** Sébastien MORISET

# AIUla 2019 2022

## Saudi Arabia Final report

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May 2022

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### Project technically supported by:

RCU - Royal Commission for AIUla



### Under the aegis of the UNESCO Chair

Earthen Architecture, Building Culture and Local Development





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- Betty ST-VICTOR, Assistant

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- Rémy DUVERNEY, Partnership Manager, Special Initiatives and Partnerships
- Meryam ALBALWI, Photographer

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### **HERITAGE CONSERVATION CONSULTING (HCC)**

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- Annachiara FIORE, Architect
- Mohamed ABDELAZIZ, Architect
- All the site supervisors, craftspeople and labourers employed by HCC

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- Laurent FIOCCHI, Archaeologist
- Christophe SEVIN-ALLOUET, Archaeologist
- All the EVEHA team involved in field activities

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- Apolline VERNET, Mudud Project Manager
- Julien CHARBONNIER, Oasis Project Manager
- All the team of Archaïos involved in the field activities

### **ENSAG\_AE&CC**

- Thierry JOFFROY, Chairman AE&CC
- Audrey CARBONELLE, Documentalist

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# 1 Executive summary

## 1.1. Project description

**Title of the Action**  
Old Town Conservation Project

**Funding**  
AFALULA

**Start and end date**  
October 2019 - March 2022

**Beneficiaries in the Action**  
AIUla Old Town former inhabitants  
RCU - Royal Commission for AIUla  
Conservation teams  
Future users of AIUla old town

**Implementation partners**  
RCU - Royal Commission for AIUla  
HCC - Heritage Consulting Company  
EVEHA INTERNATIONAL - Archaeological studies and enhancement



**Background**

In August 2018, CRAterre was contacted by the French Agency for the development of AIUla (AFALULA) to participate in the reflection initiated by the Saudis and French parts on the future of AIUla region following a Saudi-French cooperation agreement signed in spring 2018. CRAterre responded to this invitation by implementing a first series of activities with AFALULA including a diagnosis of Tantorah wall (September 2018), the identification of earth materials (December 2018) and the participation to an interdisciplinary workshop on local building resources (January 2019). The Old Town Conservation Project started in October 2019 and mobilised 8 experts who completed 600 days of fieldwork.

## 1.2. Objectives

**The project objectives were to:**

- Identify local natural resources that can be used for the conservation of the old town
- Conduct architectural surveys
- Recommend operational guidelines for the conservation and/or reuse opportunities for the Old Town and the summer farms.

The proposed methodological approach was based on the development of series of interdisciplinary activities, to enhance the knowledge on AIUla Old Town in order to develop adapted conservation and rehabilitation measures.

## 1.3. Activities

### Context

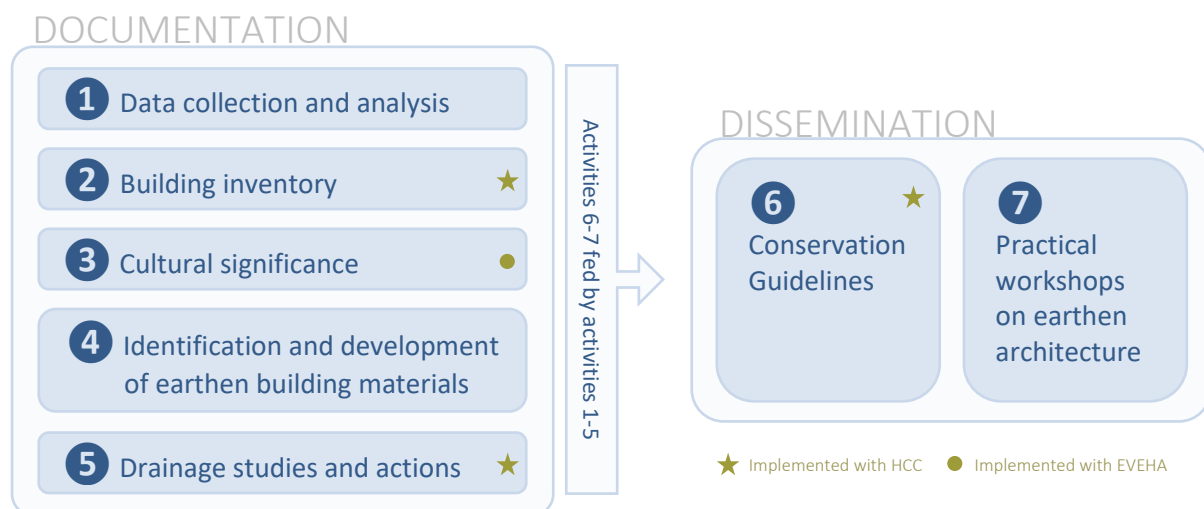
This region located in Medina province in the northwest of Saudi Arabia, rich of an exceptional natural and cultural heritage, is subject of an ambitious and innovative national project, turned towards a cultural and eco-responsible development of the city. This project includes urban and territorial development objectives based on the use of local resources (heritage, building materials, local Saudi companies) and on the enhancement of the strong tourism potential of the whole area. The development of AlUla is supervised by the Royal Commission for AlUla (RCU) established following a royal decree (No. A/29 6) in 2017, in line with the Kingdom’s 2030 vision. AFALULA is mobilising the expertise that can contribute to this ambitious project. CRAterre signed a contract with AFALULA in September 2019 to offer its skills on heritage conservation and earthen architecture regarding three main axes: HERITAGE, MATERIAL, HOUSING.

Within this global context, the current report is focusing on the specific demand expressed by AFALULA and RCU to involve CRAterre in a survey, study and conservation project for the Old Town and Oasis farms of AlUla, considered as major heritage assets for the region.

This final report describes the results of 7 activities carried out in parallel for 30 months, as per the contract established with AFALULA:

1. **Data collection and analysis**
2. **Building inventory**
3. **Cultural significance assessment**
4. **Identification and development of earthen building materials**
5. **Drainage studies and actions**
6. **Conservation guidelines**
7. **Practical workshops on earthen architecture**

Four of these activities were shared with HCC, Heritage Conservation Consulting inc. a company with more than 15 years experience in the conservation of earthen architectural heritage in Saudi Arabia (Dir. Dr. Mahmoud Bendakir) and EVEHA INTERNATIONAL (team leader, Thomas Creissen), French company specialized in archaeological studies and enhancement since 2006. The table below recalls these collaborations as well as the distribution of the main responsibilities for each activity.





## 1.4. Field missions by CRAtterre experts

### 8 experts - 28 missions - 600 days in the field

CRAtterre mobilised 8 experts who spent 600 days in AIUla in 30 months. These field missions were implemented with the support of CRAtterre administrative and financial ground staff.



ARLEO  
Luis



GANDREAU  
David



HAJMIRBABA  
Majid



HENOUS  
Mourad



MORISET  
Sebastien



SANCHEZ MUNOZ  
Nuria



SAOUDI  
Anis



VENTON  
Clement

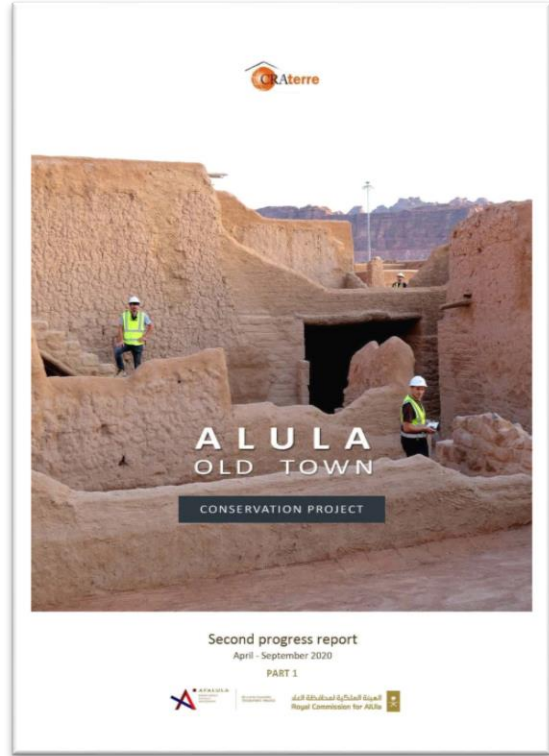
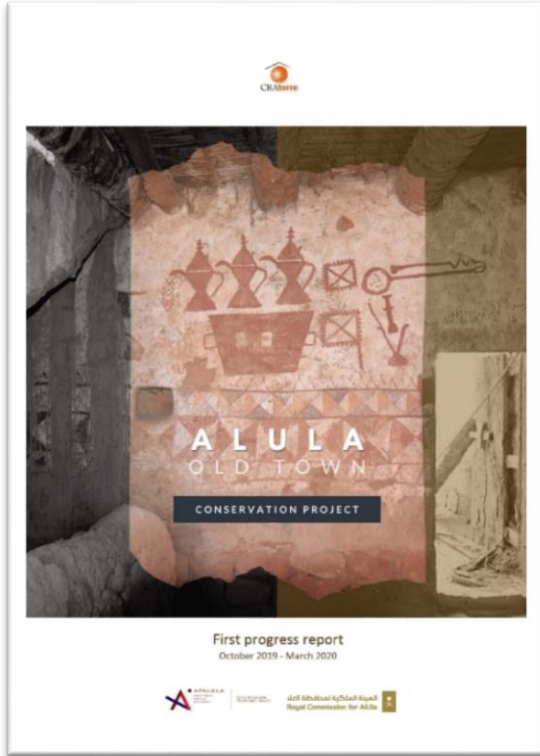
	Name	qualification	↘ Riyadh	↗ Riyadh	
2019	GANDREAU David	Archaeologist	22/09/2019	03/10/2019	
	HAJMIRBABA Majid	Engineer	01/11/2019	27/11/2019	
	ARLEO Luis	Architect	01/11/2019	22/11/2019	
	VENTON Clement	Architect	01/11/2019	13/12/2019	
	GANDREAU David	Archaeologist	01/11/2019	15/11/2019	
	SANCHEZ MUNOZ Nuria	Architect	25/11/2019	13/12/2019	
	MORISET Sebastien	Architect	02/12/2019	13/12/2019	
2020	GANDREAU David	Archaeologist	10/01/2020	24/01/2020	
	HAJMIRBABA Majid	Engineer	10/01/2020	24/01/2020	
	VENTON Clement	Architect	10/01/2020	14/02/2020	
	SANCHEZ MUNOZ Nuria	Architect	13/01/2020	24/01/2020	
	MORISET Sebastien	Architect	13/01/2020	20/01/2020	
	GANDREAU David	Archaeologist	10/02/2020	21/02/2020	
	ARLEO Luis	Architect	10/02/2020	28/02/2020	
	HENOUS Mourad	Architect	10/02/2020	15/03/2020	
	VENTON Clement	Architect	28/02/2020	13/03/2020	
	 <b>March - September 2020: Missions stopped because of the COVID-19 restrictions</b>				
	GANDREAU David	Archaeologist	26/09/2020	10/10/2020	
	HAJMIRBABA Majid	Engineer	26/09/2020	17/10/2020	
	VENTON Clement	Architect	26/09/2020	17/10/2020	
	HENOUS Mourad	Architect	26/09/2020	09/12/2020	
SAOUDI Anis	Architect	26/09/2020	09/12/2020		
2021	GANDREAU David	Archaeologist	11/01/2021	30/01/2021	
	MORISET Sebastien	Architect	27/01/2021	13/02/2021	
	ARLEO Luis	Architect	27/01/2021	04/03/2021	
	SANCHEZ MUNOZ Nuria	Architect	06/04/2021	11/04/2021	
	HENOUS Mourad	Architect	11/01/2021	15/04/2021	
	GANDREAU David	Archaeologist	03/12/2021	15/12/2021	
	SAOUDI Anis	Architect	03/12/2021	18/12/2021	
	SANCHEZ MUNOZ Nuria	Architect	14/12/2021	18/12/2021	

## 1.5. Achievements

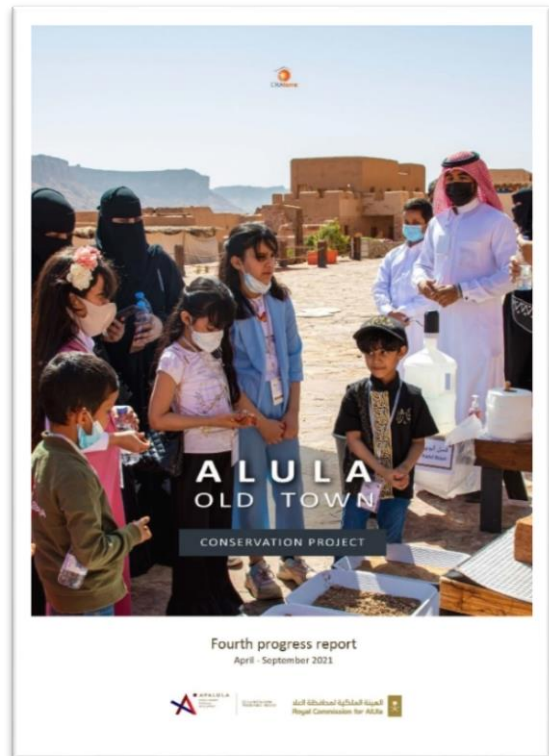
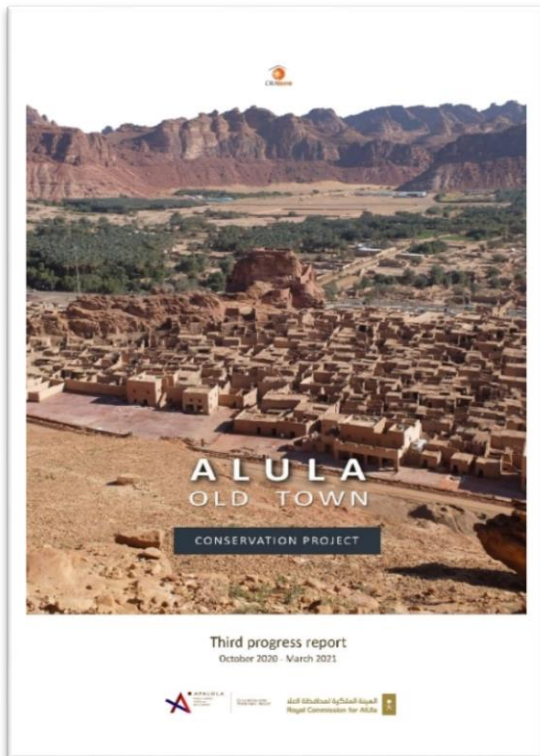
<b>1</b>	<b>Data collection and analysis</b>	<ul style="list-style-type: none"> <li>- 48 documents and 391 pictures related to Old town and Summer Farms collected</li> <li>- First synthesis of the most relevant information produced and disseminated Final synthesis produced and disseminated</li> </ul>
<b>2</b>	<b>Buildings inventory</b>	<ul style="list-style-type: none"> <li>- 5 inventories campaigns implemented with HCC</li> <li>- 400 houses and 130 tayaras inventoried by CRAtterre</li> <li>- All data transmitted to HCC and AFALULA</li> </ul>
<b>3</b>	<b>Values and cultural significance assessment</b>	<ul style="list-style-type: none"> <li>- 2 Architectural and urban studies campaigns implemented</li> <li>- 1 archaeological studies campaign implemented (Building archaeology and limited trenches by EVEHA International)</li> <li>- 1 detailed scientific project for the anthropological studies proposed</li> <li>- First synthesis of the most relevant information produced and disseminated</li> <li>- Final synthesis produced and disseminated</li> </ul>
<b>4</b>	<b>Earth resources and conservation materials</b>	<ul style="list-style-type: none"> <li>- Site organization layout provided to HCC for the worksite area</li> <li>- Site laboratory set up in the Old Town</li> <li>- Field tests equipment provided</li> <li>- 24 potential soil quarries identified</li> <li>- 6 sample walls built in Old Town displaying various techniques and finishes options</li> <li>- Soil testing and brick samples implemented</li> <li>- 3 Quarry selected</li> <li>- Quoting needs achieved</li> <li>- Complementary tests implemented</li> <li>- Testing protocol on conservation materials achieved</li> <li>- Regular progress reports disseminated</li> <li>- Final reporting produced and disseminated</li> </ul>
<b>5</b>	<b>Drainage</b>	<ul style="list-style-type: none"> <li>- 2 reactive condition survey following heavy rains implemented in 2019 and 2020</li> <li>- Results shared with HCC</li> </ul>
<b>6</b>	<b>Conservation guidelines</b>	<ul style="list-style-type: none"> <li>- Table on content fined tuned and approved</li> <li>- Sharing of responsibilities between CRAtterre and HCC determined and agreed by both parties</li> <li>- Documentation of the conservation work in progress in the pilot project with HCC</li> <li>- Design and graphic charter approved</li> <li>- 3 draft versions circulated. 67% of the document done.</li> <li>- List of missing texts and images sent to HCC, AFALULA and RCU</li> </ul>
<b>7</b>	<b>Training workshops</b>	<ul style="list-style-type: none"> <li>- Design of workshops for AlUla communities achieved</li> <li>- 14 local monitors trained</li> <li>- First practical training workshops implemented in the Old Town (April 2021)</li> <li>- Second practical training workshops implemented in Mabiti (December 2021)</li> <li>- 250 attendees from the local community directly sensitized</li> </ul>



2020



2021



Cover pages of the four progress reports submitted every 6 months to Afalula

## 1.6. Activities that were planned but not implemented

### Conservation guidelines

The conservation guidelines are a deliverable supervised by CRAtterre in collaboration with HCC, based on a table of contents elaborated by the two partners prior to the submission of the technical and financial proposal to AFALULA and RCU in July 2019.

In January 2021, this table of contents was revised in AIUla with Dr. Bendakir (HCC). The responsibilities for writing texts and coordinating the chapters were also established. The table of contents included four main chapters:

- Chap. A. General introduction
- Chap. B. Description of AIUla Old Town
- Chap. C. Conservation works
- Chap. D. Conservation materials

Until March 2020, the field missions could be carried out as planned, with data collection activities (Chapter A / B / C) and the follow-up of the first interventions on the pilot project supervised by HCC (Chapter C.).

In June 2020, a first draft was provided to the partners with approximately 50% of the texts and illustrations produced. This was followed by three other versions, the latest one (April 2021) providing 127 pages completed and 65 pages with missing elements. Unfortunately, the unfinished pages could not be produced due to the COVID 19 pandemic. Indeed, in March 2020, our team had to be repatriated and we could not return to AIUla until September 2020.

Major conservation works have been implemented during this Covid-period under the supervision of HCC, but CRAtterre was unable to document this work remotely.

Documentation was done by HCC and compiled in a publication entitled "AIUla Old Town architectural survey and conservation guidelines" which was sent to CRAtterre in September 2021. This publication contains the data missing in the conservation guidelines.

Despite numerous requests, HCC has so far refused to provide the identified elements that would allow the HCC-CRAtterre conservation guidelines to be finalized as initially planned.

### Anthropological studies

The field mission of anthropologists Mohamed Boussalh and Mustapha Jlok initially planned for April 2020 had to be postponed several times due to the COVID 19 pandemic and the closure of the Moroccan borders. The main activities scheduled were:

- Ethno-architectural description of the Old town in order to understand the functionality of inhabited spaces (use, organization, etc.) in relation to the social fabric.
- Analysis of the values, norms and traditions that govern the use of each space (symbolic nature of the spaces, importance of location, orientation, significance of myths, importance of rites and cultural practices, etc.)
- Documentation of the transformation processes (passage from one system to another, repercussions on the anthropological level)

While waiting for the lifting of the sanitary restrictions, the two Moroccan anthropologists reworked their scope of work (see second progress report pages 66 to 69) and began exchanges with Léo MARTY, the doctoral student in anthropology working in AIUla and Vincent BATTESTI (CNRS, Musée de l'Homme), his supervisor, in order to coordinate the action.

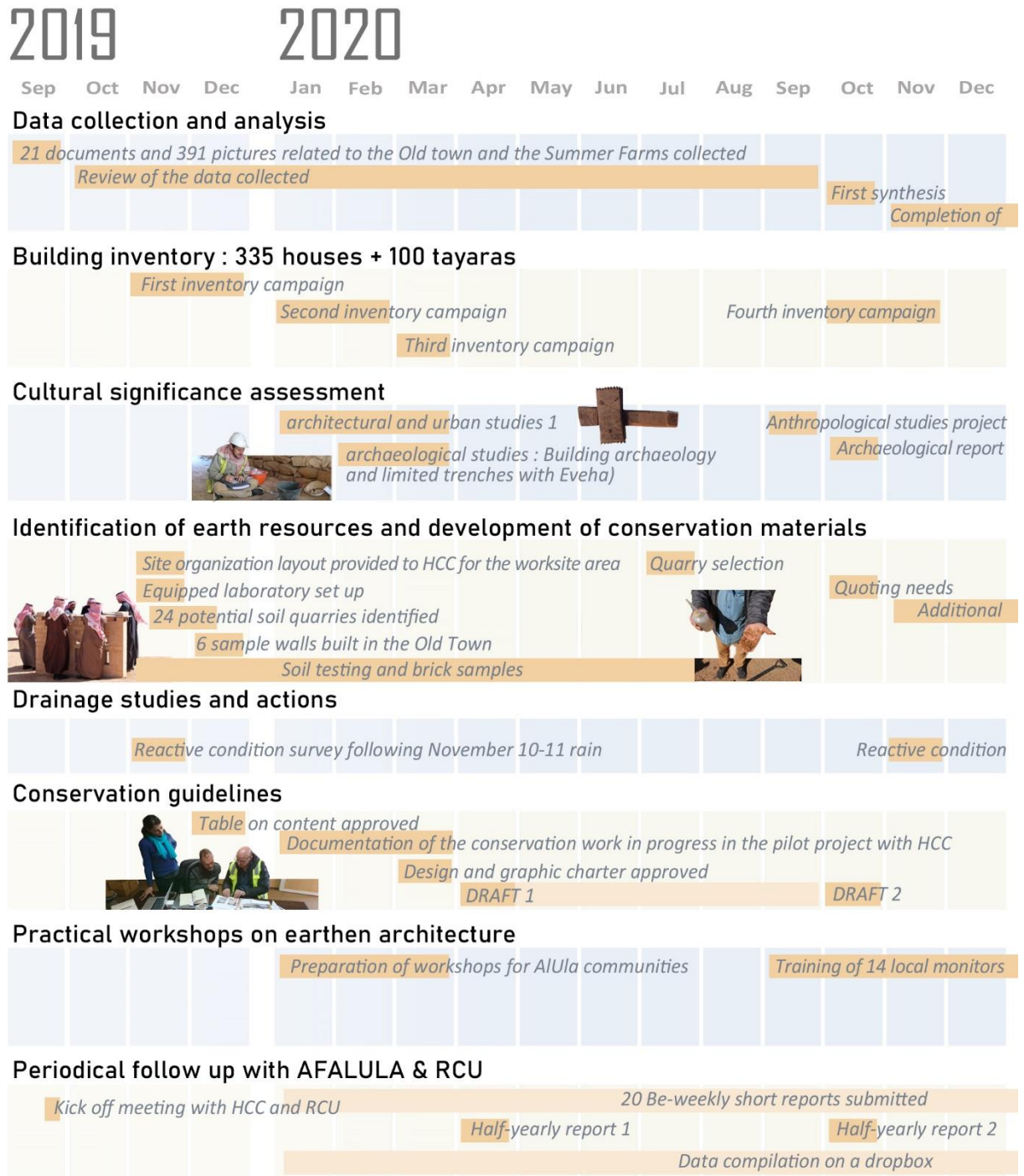
Unfortunately, the Moroccan borders remained closed and finally, in July 2021, decision was taken with AFALULA to cancel this activity.

### Budget reallocations

The budgets remaining on these two incomplete activities were reallocated with the agreement of AFALULA following two successive requests in January and July 2021. These budgetary reallocations mainly allowed to respond to a request to involve AIUla communities more in the old town activities.

Thanks to the agreement, we were able to develop awareness-raising workshops for children, families and the general public called "Making earth into architecture" and to train 14 local monitors. More than 250 people have benefited from these workshops, which can now be replicated by local facilitators who are provided with the necessary knowledge and equipment.

## 1.7. Updated action plan





# 2021

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

# 2022

Jan Feb Mar Apr May Jun

the data collection and analyses (27 documents)

Final synthesis

Fifth inventory campaign

All DATA sent to AFALULA

architectural and urban studies 2

First synthesis of the most relevant information

Final synthesis

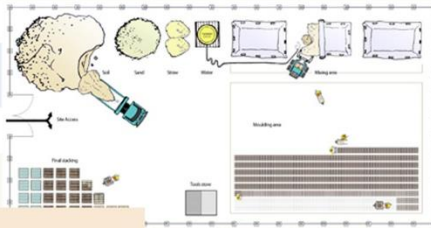


tests

Testing protocol on conservation materials

Final reporting

survey following November 9 rain



DRAFT 3

List of missing texts and images sent to HCC, AFALULA and RCU



First practical workshop



Second practical workshop



Half-yearly report 3



Half-yearly report 4

Final report  
AlUla Old Town and Oasis Symposium. TERRA 2022 Congress



## 1.8. Synergies developed

### Dadan conservation and management plan

Following the work undertaken since 2019 on the AIUla Old Town, AFALULA and RCU have asked the support of CRAterre in order to produce a management/conservation plan for the archaeological site of Dadan, located in the AIUla valley. The remains of Dadan, currently excavated by a Franco-Saudi archaeological mission, include exceptional evidence of the cultural traditions of the local Dadanite and Lihyanite kingdoms.

This management/conservation plan was developed between October 2021 and May 2022 by approximately twenty stakeholders linked to Dadan by various professional responsibilities: Site managers, heritage professionals, archaeologists, curators and tour guides.

This process helped to strengthen the links established with collaborators from RCU and AFALULA involved in the Old Town project and to create new synergies with other local and international actors involved in Dadan.

### Earth construction sector in AIUla

In parallel with the activities carried out in AIUla Old Town, CRAterre was asked by AFALULA's Architecture and Development unit to take part in a project of local materials development for the contemporary construction sector in AIUla.

In January 2019, AFALULA organized a multidisciplinary field trip to AIUla, bringing together specialists of various local building materials such as earth, stone, wood and fibres. A first roadmap was proposed by CRAterre in order to develop an earth construction sector for the region. This was followed by several activities:

- The construction of 6 sample walls in Old Town;
- A feasibility study to set-up a production unit for earth materials in AIUla;
- Ashar Tented Resort: expertise and assistance for the on-site production of earth materials and the design and construction of earthen walls.

In addition, advises have been given to develop a production unit associated with à soil analyses laboratory and a knowledge centre dedicated to earthen construction. Discussions are also engaged regarding an audit on construction standards and regulations in Saudi Arabia in order to identify the potentials and limits for the earth construction sector.

### Capacity building on earthen architecture

The activities carried out in AIUla have revealed a demand for capacity building of Saudi conservation and construction actors in the field of earth architecture. The first actions carried out in this sense were the "making earth into architecture" workshops organised in Old Town in spring 2021.

Since 2022, this pedagogic approach has been reinforced with the insertion of an earth component inside the traditional building techniques apprenticeship programme of the Royal Institute of Traditional Arts (TRITA) in Riyadh. A MoU has also been signed recently with King Abulaziz University in Djeddah which is developing a master degree on heritage conservation.



## 2 Assessment of implementation

### 2.1. Data collection and analysis

Data collection was made possible thanks to the kind cooperation of our partners since September 2019. We are grateful to them for providing us with a first set of 21 documents and 390 archive pictures, which shed light on the many facets of this complex site from the very beginning of the project. The data collection was then completed throughout the project.

The preliminary analysis of the existing documentation allowed us to situate the old town and the oasis farms in a more general context of AlUla valley (page 16). It has also allowed us to understand the historical background in relation to other major sites of the area (eg. Dadan; Hegra; Qurh), which we represent in a synthetic way in a chronological frieze (see opposite page).

The final analysis is provided in the document called "Architectural survey report".



Archive photograph by A.Jausсен and R.Savignac taken around 1910. RCU Collection

Table of collected documents

Source →	RCU	SCTH	HCC	CRAtterre	Internet
Books, thesis, publications	9	2		3	4
PowerPoint presentations	3			3	
Brochure	1			1	
Reports	19	8	5	4	2
Press articles	3			3	
Old photographs	391	391			
Plans & Ortho-photography	6	1	4	1	
Maps	6	5		1	
Excel sheet on Building Ownership	1	1			

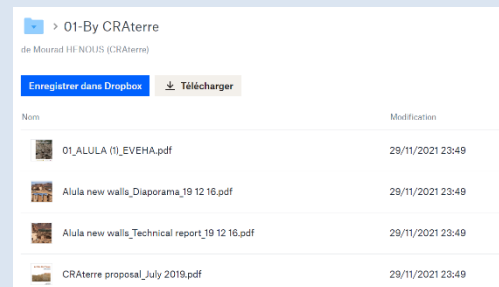
#### LINKS

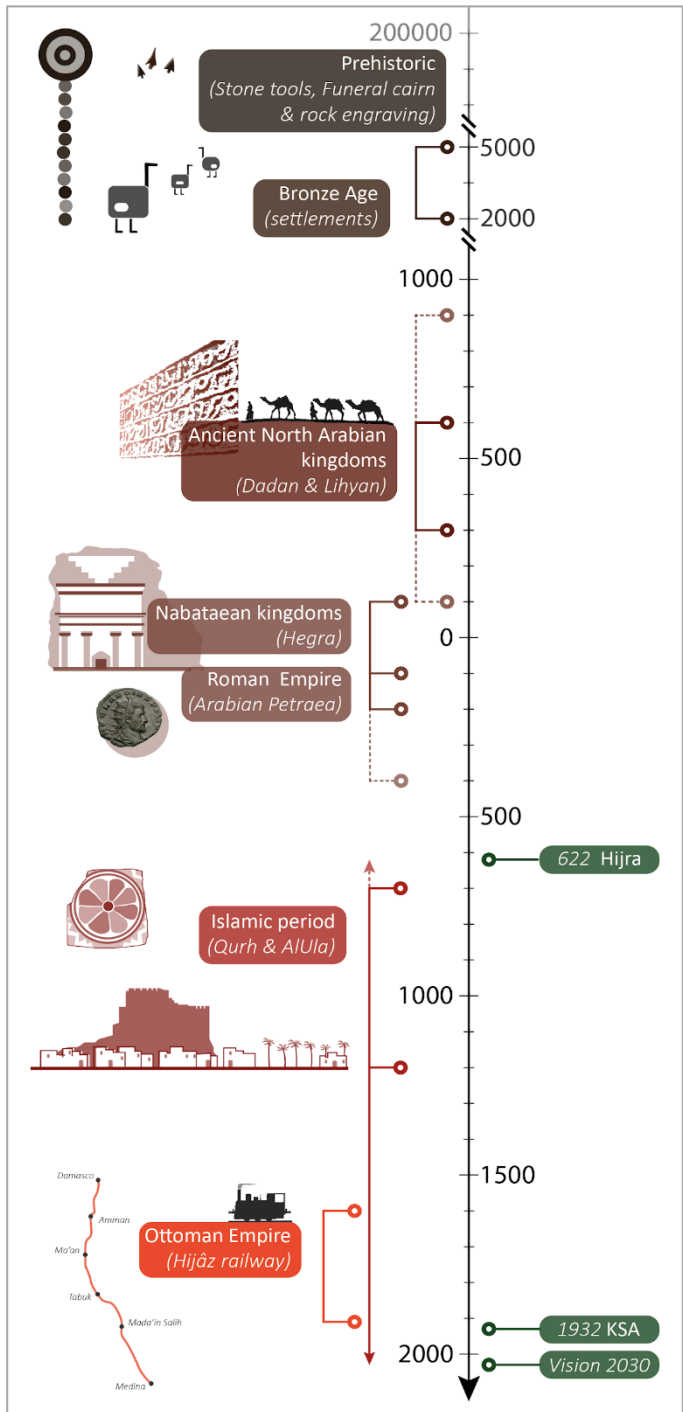
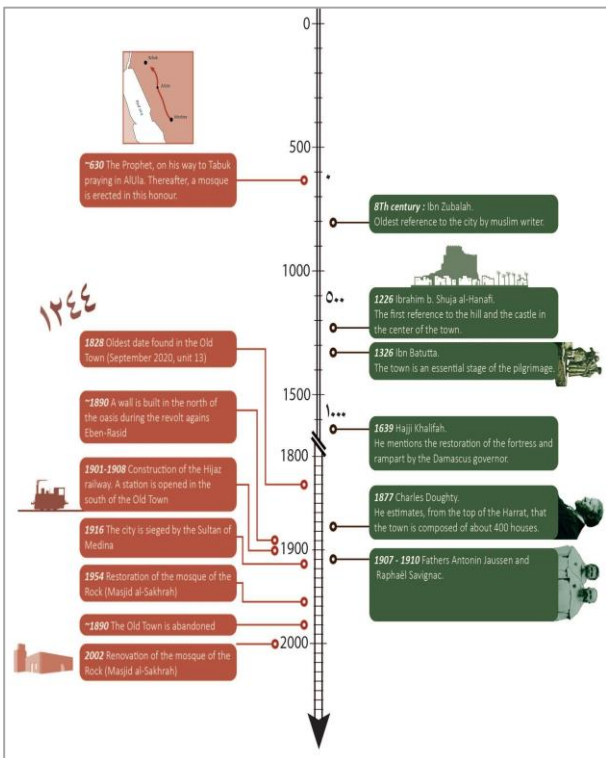
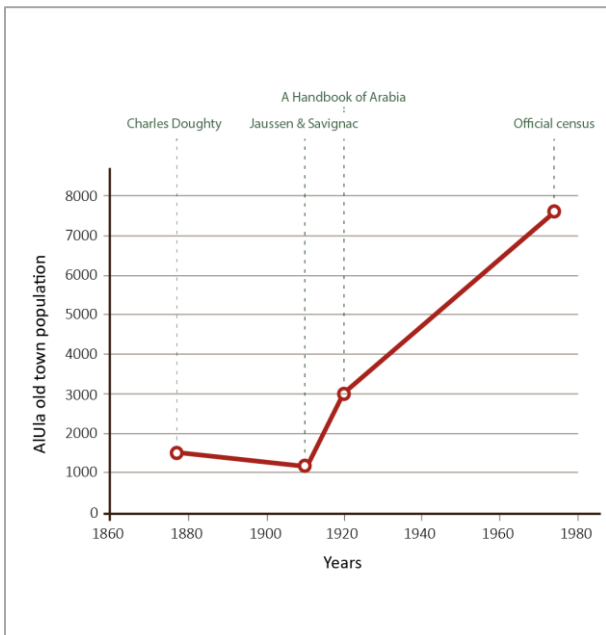
All documents collected as well as those produced by CRAtterre during the project are archived and available in a dropbox:

<https://www.dropbox.com/sh/tfrcziuhs16i9af/AACO2wwHJwZvVtAjxFwxHgxJa?dl=0>

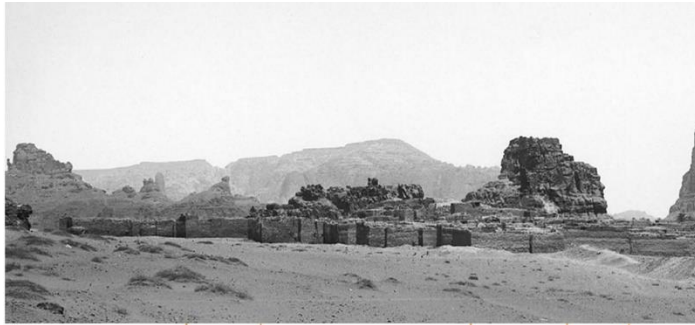
All photos taken by CRAtterre are also archived on the same platform and sorted by keyword:

<https://www.dropbox.com/sh/ddjtmc3ijhjbncq/AABGGEPDoF5bIY7kbDZY7WVka?dl=0>.





Examples of graphic works produced on the basis of the data collected



1910



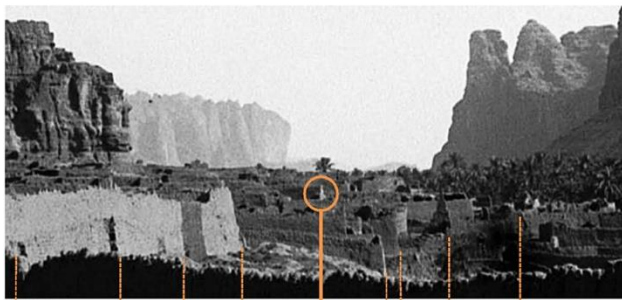
1910



2020



2020



1910



1910



2020



2020

*Examples of photographic analyses comparing reality with the collected archive images*



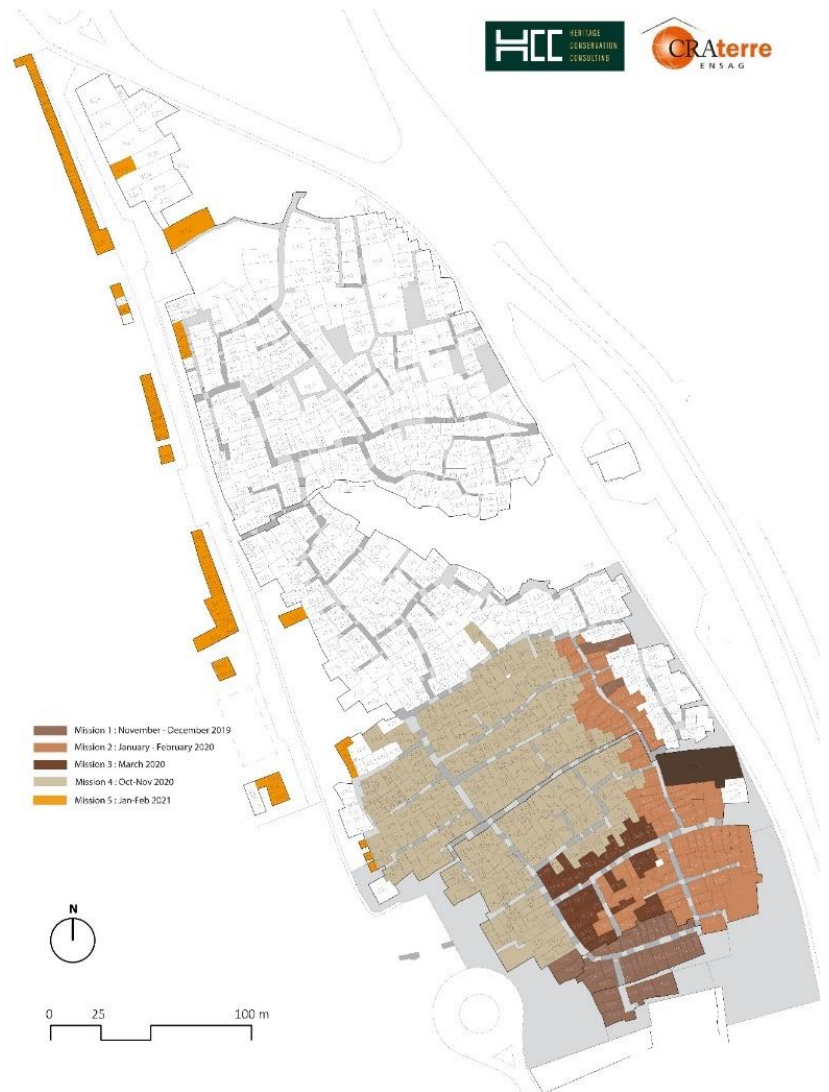
## 2.2. Building inventory

A systematic inventory of more than 900 buildings in the old town was undertaken by HCC with the support of Archaïos and CRAterre. Three experts from CRAterre (Clément Venton, Mourad Hénous and Anis Saoudi) have contributed to the inventory of 335 buildings and almost 100 tayarars.

The objective of this inventory is to record as much information as possible on the Old Town architectural heritage and to report on its current state of conservation.

Building by building, each architectural element has been described and georeferenced in a Geographical Information System (GIS). These elements include walls, doors, openings, windows, staircases, columns, pillars, benches, wall niches, wall paintings and other decorations, carved stones, fireplaces, sirdabs and waterspouts. Building materials were also identified and classified on the database, as well as the function and use of the buildings. A photographic coverage of all these elements completes the inventory work.

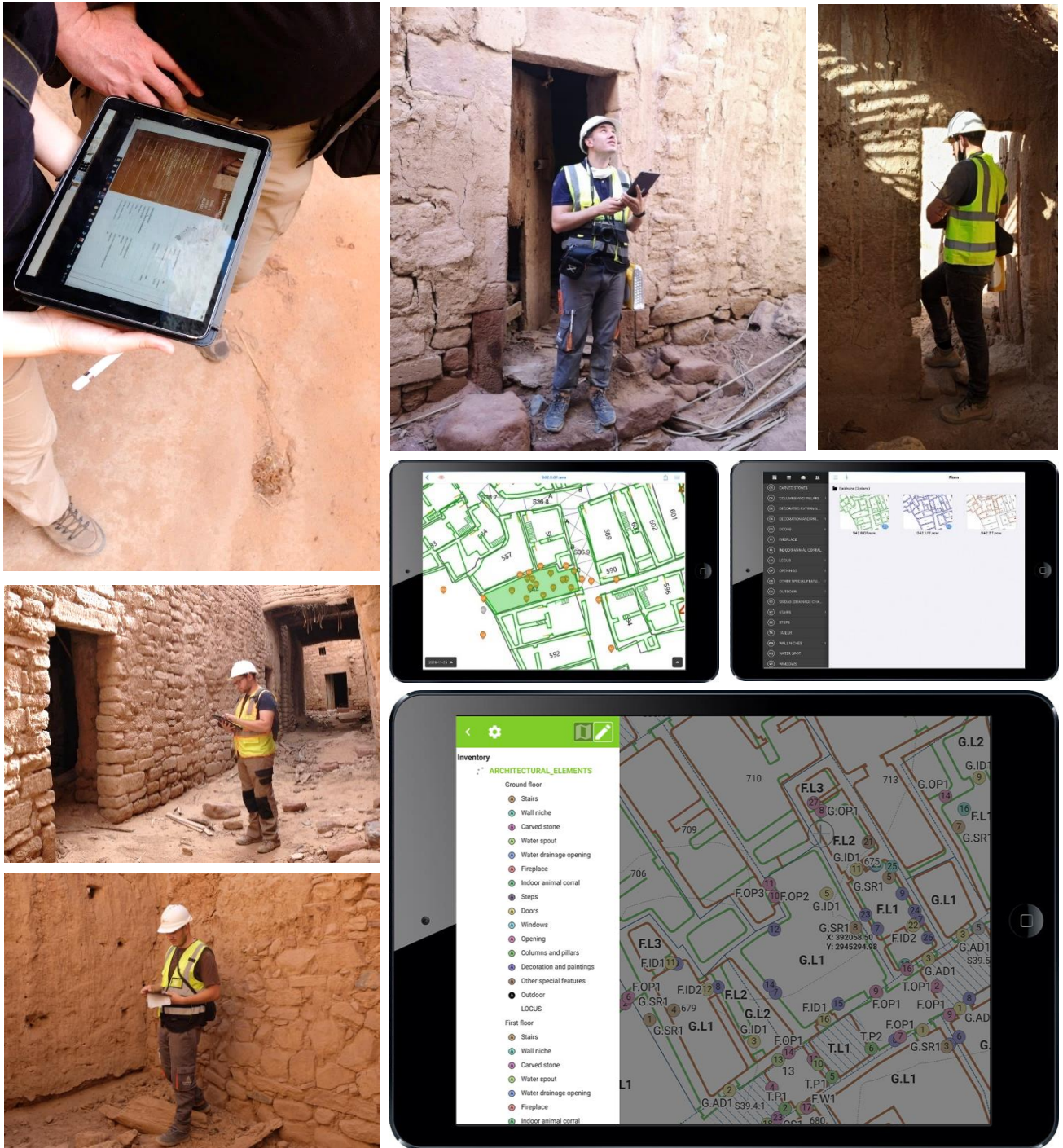
The result is a mass of unpublished information on the old town which documents its current state of conservation in a very precise manner. This information, gathered in a database, can be analyzed statistically and geographically using various maps. These data on the state of conservation of the old town in 2021 serve as a reference while interventions are currently several buildings and streets.



Map showing the houses inventoried by CRAterre

**LINK**

The report is available in a dropbox:  
[www.dropbox.com/sh/ab77p15jw6nfauj/AACsD-horBQuFttKluSi9AzQa?dl=0](https://www.dropbox.com/sh/ab77p15jw6nfauj/AACsD-horBQuFttKluSi9AzQa?dl=0)



CRAterre staff during the inventorying process



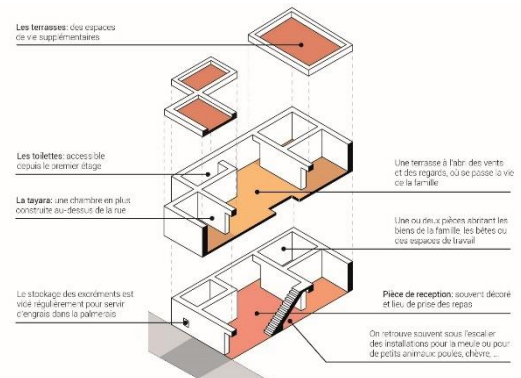
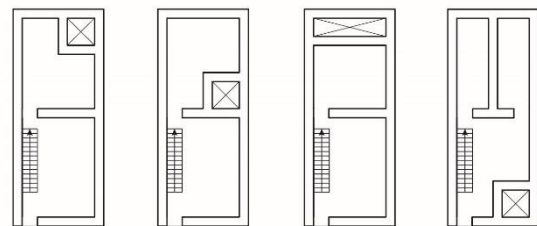
### 2.3. Cultural significance assessment

The heritage values of the Old Town and the Oasis farms have been assessed in a holistic approach, including architectural and urban analyses, archaeological investigations and interviews with stakeholders. The great cultural richness of the property is well attested and 8 categories of values can be observed:

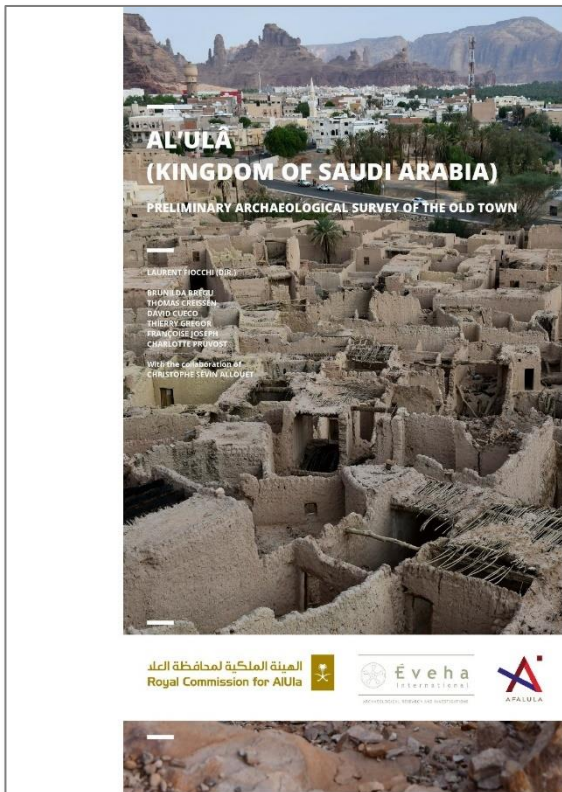
- Architectural
- Archaeological
- Historical
- Cultural and artistic
- Scientific
- Social
- Environmental
- Economic value

Respecting these values in a balanced and realistic way is an important challenge for the future of the old town and the oasis farms.

The conservation guidelines provide strategic and technical tools to tackle this challenge (see page 26-27).



Architectural typologies studies



EVEHA Report  
October 2020

**LINK**

The report is available in a dropbox:





*Study of intangible heritage*



## 2.4. Identification of earth resources and development of conservation materials

### Soils of the old town and oasis farms

Field tests and grain size analyses carried out on 13 samples of mud bricks from different locations in the Old Town and the Oasis Farms revealed a high similarity of the soils used. These results tend to confirm a very local provenance of the raw material resource as told by former inhabitants of the Old Town. In addition, the quality control tests implemented on these soils gave very good results, particularly in terms of water and abrasion resistance. The cleaning of the ruins provides large quantities of soils that can be re-used for plastering the walls the most exposed to rain and circulation.

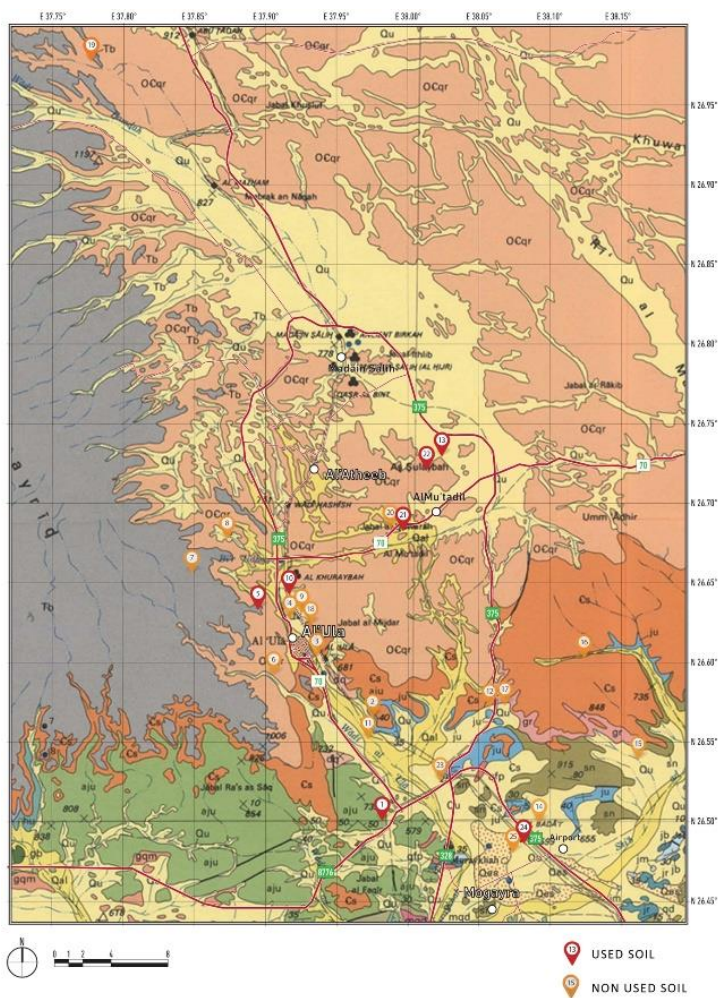
### Development of conservation material

24 additional soils were sampled and analyzed from potential quarries pre-identified within a radius of 20 km from the old town. In order to carry out these analyses, a field laboratory was installed directly on site. Two quarries were finally selected for the production of mud bricks and mortars, responding to the following criteria: availability; compatibility; plasticity; workability; shrinkage; cohesion. From these quarries, we have then developed materials suitable for the conservation of earthen structures in the old town and oasis farms and defined a quality control protocol.

### Experimental walls and plasters on site

Six experimental walls built in the old town have permitted to test the different materials at a larger scale. The intention was also to exhibit, disseminate and enhance the various earth construction techniques using AIUla soils and to demonstrate their suitability, not

only for conservation purposes, but also for the development of new construction.



Map showing the location of the 24 quarries identified

#### LINK

The report is available in a dropbox:  
[www.dropbox.com/s/qwfda9uzy72019j/SAU015\\_%20AIUla\\_SOILS\\_REPORT\\_CRAterre\\_210326.pdf?dl=0](https://www.dropbox.com/s/qwfda9uzy72019j/SAU015_%20AIUla_SOILS_REPORT_CRAterre_210326.pdf?dl=0)



*Quarry identification, testing of soil samples and demonstration of possible applications in terms of conservation and construction*



## 2.5. Drainage studies and actions

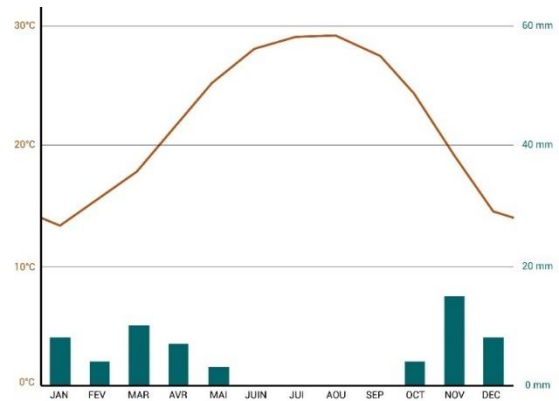
One of the major challenges in the conservation of built heritage is to keep buildings dry. This is particularly true for earthen structures, which lose their compressive strength when saturated with water.

### Impact of heavy rains

Two heavy rainfalls (November 2019 and November 2020) allowed discussing with HCC about the Old Town drainage system, based on observations made during and after these downpours.

Three main interconnected decay processes were identified. They need to be considered for the study and restoration of the Old Town drainage system:

- Rain water absorption: large amount of rain has been directly absorbed by the wall tops and the terrace floors. This reduces the volume of water flowing on the lower parts, but at the same time, it loads roofs which have already been weakened by the abandonment of the town. In addition, after three sunny days, we have witnessed several roof collapses, probably due to shrinkage phenomena of the soils when drying. The direct impact of rain is more pronounced on elevations facing south-west, where the stormy rains come from.
- Rain water stagnation: Traces of water observed inside the Old Town were relatively limited due to the absorption phenomena described above. However, some stagnations have been observed (see brief condition survey map) with associated capillary rises in the stone or earthen walls. The problem is increased when the buildings are ruined with large volumes of debris inside.
- Rain water concentration: The infiltration of water not trapped in the upper structures has created or enlarged gullies and punctual damages by concentration in many places.



AlUla rainfall and average temperature diagram  
(Data: climate-data)

The Old Town is fortunate to be built on slopes, which facilitates the flow of water towards the palm grove. However, while water flows were managed when the town was inhabited, they are no longer under control today. The lack of maintenance is blocking the flow, and areas of stagnation can be observed in many places. This lack of maintenance of the drainage slopes leads to a cascade of destructive phenomena, starting with the weakening of the wall bases. Stagnation is followed by significant infiltration into the soil and then into the structures, which eventually deform and collapse, even though rainfall is rare.

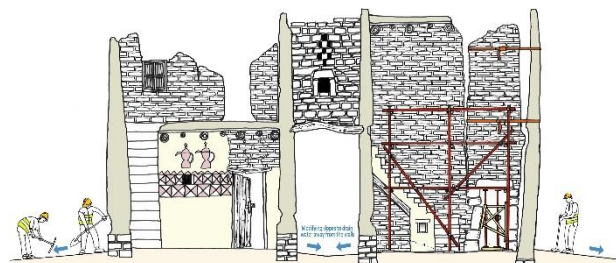
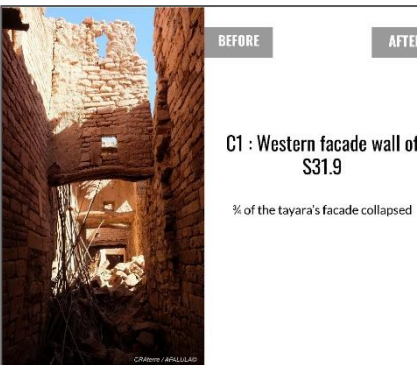


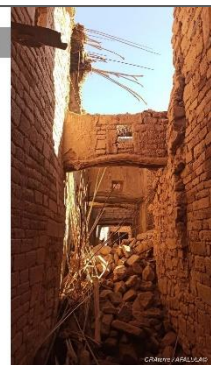
Diagram showing the drainage of structures to maintain their stability (from the conservation guidelines)



**AFTER**

**C1 : Western facade wall of S31.9**

% of the tayara's facade collapsed



**AFTER**

**C4 : Northern ceiling and facade wall of S33.2**



*Effects of heavy downpours on earthen structures*

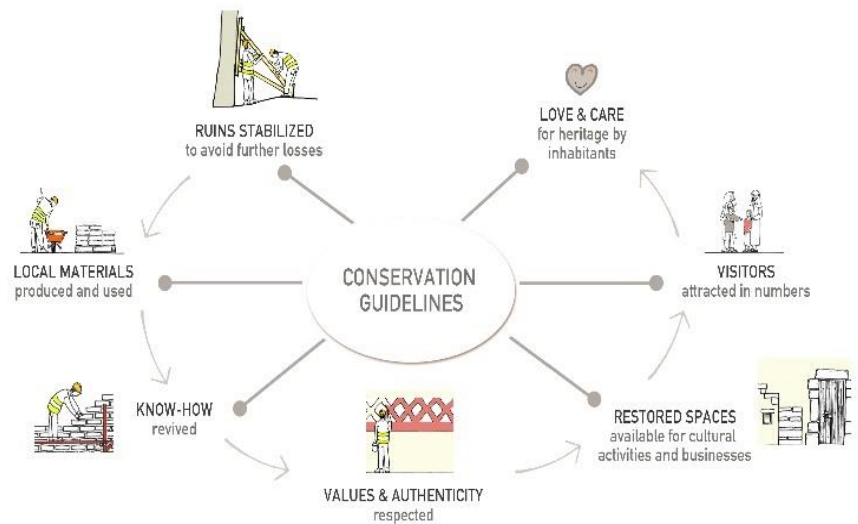


## 2.6. Conservation guidelines

### Why guidelines?

This document is intended for all those who wish to contribute to the conservation of AlUla Old Town: architects, heritage conservators, entrepreneurs, craftspeople or promoters of a revitalization projects. It provides answers to technical questions they may have when considering the safeguarding of houses. These guidelines describe what is recognized as best practices for this type of architecture and give precise indications on the materials to be used, how to prepare them and how to implement them in a professional manner.

All the photographs were taken at the construction site during the pilot phase, which made it possible to validate the relevance of the proposed options. The document also aims to share recipes that have been tested and validated on numerous sites around the world and adapted to the specific AlUla context. Beyond the simple physical safeguarding of the remains, these guidelines also propose orientations on the adaptation of contemporary projects to this dense fabric of houses and on the evolutions opportunities that do not alter the values to be preserved (see pages 28-29). In order to conserve and revitalise this ruined settlement, it is necessary to recreate functions that meet the aspirations of the town's inhabitants. But it is not always easy to fit contemporary activities into this type of dense and narrow urban fabric. It is sometimes necessary to free up larger volumes by pulling down walls or to increase the amount of light entering by enlarging openings. These guidelines are not opposed to developments and propose orientations to adapt projects to the architectural values that should be preserved. The table of content of these guidelines were carried out by the heritage conservation specialists of HCC and CRAterre, who have a long experience on earthen sites throughout the world and in Saudi Arabia in particular.



*Diagram showing that the guidelines encourage the conservation and re-use of structures to bring life back into AlUla Old Town and regenerate love and care for this abandoned settlement.*



*HCC-CRAterre meeting in January 2020 to agree on the table of content and share responsibilities*

**LINK**

The draft document is available in a dropbox:



## OLD TOWN REVITALISATION

In addition to providing conservation tips, this document offers guidance on the re-use of rehabilitated structures.

The revitalization of the Old Town will require the integration into this ancient urban fabric of contemporary activities, sometimes quite different from the original function of the buildings to be occupied. This re-appropriation is necessary to reintroduce life but it is delicate because it will lead to important architectural modifications. Walls will be displaced, openings filled in or created, volumes enlarged, materials added, etc. As stated in previous chapters, these modifications must pay tribute to the architectural values of the site, in terms of the shapes, the spirit of the spaces created, the materials used, and the implementation techniques employed. This chapter proposes some rules to be respected.

### RESPECT TO VOLUMETRIC AND SPATIAL AUTHENTICITY

#### Small adjacent volumes

The design of rehabilitation projects must maintain this spirit of small juxtaposed volumes, whose reduced size is linked to the use of palm beams that limit spans. If a large space is created by merging two adjoining houses, this should not be seen at the level of the alley, which should always display two different small facades rather than one wide facade with a unique character.

#### Simplicity of shapes

Volumes must remain simple boxes, without surface accidents such as balconies or other overhangs. No decorations should be placed on the facades.

#### Fluidity

The alignments of facades along the lanes must be respected to maintain this fluidity and the rhythm of movement in the town. No facade shall be destroyed to be rebuilt set back from the street or on the street space.

#### No towers

The town skyline indicates a relative homogeneity in the heights of the houses. The higher houses are protruding because of the topography. There are no towers or houses overlooking its neighbours. Differences in height between houses do not exceed half a level. This homogeneity must be maintained. Any extension in height must not exceed half a level, i.e. a maximum of 2 metres above adjoining houses.

#### Addition of tayarar

The extensions in the form of tayarar are recommended, to promote this game of light and shade in the streets and increase the thermal comfort of pedestrians.

#### Modification of doors and windows

The creation of new openings is allowed. Their size and proportions must respect that of traditional doors and windows, i.e. vertical rectangles not exceeding 2 m<sup>2</sup> in surface area. Horizontal windows, large commercial windows or windows with eccentric shapes are prohibited. In the case of openings in series on a project merging several houses, it is requested not to standardize the windows and to keep the character differentiation of each facade, by proposing one type of window per house facade, with possibly vertical offsets. If a door or window is to be walled in, it must not be wiped off the facade. The location must be left clearly visible with the frame and lintel in place, and the infill recessed from the exterior bare wall to create a shadow play.

#### Interior walls

With the exception of the decorated walls, the interior walls can be relocated, modified or removed, based of course on structural studies. The interior reorganization of a house must not disrupt the street façade. When two or three houses are merged into one building with large interior spaces, this should not be visible from the public space.

#### Roofs

Sloped roofs are not permitted. Only flat terraces are allowed. Any equipment installed on the terrace must be invisible from the fortress. Antennas and air conditioners in particular must be hidden behind parapet walls or wooden boxes. Roofs, on the other hand, can be equipped with pergolas to create shaded spaces and reduce the accumulation of heat by masonry. These pergolas must be covered with organic material such as palm-leaves mats. Metal pergola structures are tolerated as long as the metal is not painted in bright colours.

### ATMOSPHERE OF THE TOWN

Deformations and imperfections The clear signs of time in the deformations and patina must be valued. A slight swelling or wall sag should not be used as an excuse to destroy the wall. On the contrary, these elements must be valued as precious aging signs. These deformations must also be considered in the reworking of earthen plasters. A slightly deformed facade should not become perfectly flat after plastering.



Diversity of results and creativity Each facade must keep its character, through the layout of its openings but also through the nature of its skin, which is the result of the technical skills of the mason who shaped it. The plaster finishes, the heights of the foundations, the stones bonding should be different from the adjacent houses to maintain this rhythm of small houses built side by side, all different although all made with the same materials. For this reason, it is recommended not to have the same mason or contractor redo an entire street, at the risk of having all the houses standardized. The same mason can make one house out of three.

#### **MATERIAL AUTHENTICITY**

Stones, earth, sand, lime and wood Rehabilitation projects should make use of traditionally used materials such as stones, earth, sand, lime and wood: mainly palm and tamarisk wood. Any use of industrial material is to be prohibited except for materials that have no traditional equivalent such as electrical or plumbing supplies. Exposed stone facades must remain so. Stones with inscriptions must remain in place. They must not be coated or replaced by stones without inscriptions. Hidden water/electricity networks New equipment such as lighting or air conditioning should be kept as discreet as possible. No air conditioning unit should be installed on a street façade. The same applies to water supply and drainage pipes. The electrical boxes should be recessed into the thickness of the walls and hidden behind wooden doors.

#### **Locks**

For security reasons, an exception will be made for the locks. Wooden doors can be reinforced and equipped with metal locks. However, traditional wooden locks must be maintained, even when they are fake. For businesses requiring the installation of security doors, it is requested to conceal these doors behind the traditional door, or set back with an access chamber if space permits.

#### **KNOWLEDGE AUTHENTICITY**

New elements must make use of traditional implementation techniques. A stone wall, for example, must be a real solid wall made of mortar-bound stones using one of the many bonding patterns present in the old town. A block or fired brick wall on which flat stones are pasted is not considered to be a stone wall because it does not reflect the rich ancestral know-how. The same applies to wooden doors, which must not be metal doors clad in wood.

#### **No imitations**

As a general rule, no material imitation is permitted. Doors and windows made of aluminium or PVC imitating wood are prohibited. The same applies to sand cement plasters with false joint patterns imitating stone or emulsion paints imitating earth. Cement floor tiles imitating stone are also prohibited.

#### **HARMONY OF COLOURS**

##### **Landscape shades**

The materials used must remain those of the landscape, offering a rich palette of sand, earth and stone shades. The application of paint on the facade is prohibited, even with paints in shades imitating natural colours. The same applies to plasters, only earth plasters are allowed. Sand cement or sand-lime coatings are prohibited. Natural materials must remain visible, i.e. stone or earth. For the repointing of stone walls, the joints must have a colour close to that of the stones to avoid contrasts. White joints in lime or white cement mortar are forbidden. Different arrangements could be made for private indoor walls invisible from the public space, neither from the streets nor from the top of the citadel. However, indoors, earth plasters and lime whitewash are recommended, as well as brightly coloured earth decorations.

##### **Commercial signs**

Commercial facades must remain discreet, without disproportionate signage and without illuminated signs. Signs bearing trademarks are not permitted. Flag signs (perpendicular to the facade) are authorized at the rate of one sign per business, and on condition that there is not already a banner sign (plaque) on the facade. Flag signs shall not project more than 50 cm from the façade. The signs must be decorative and well designed, adapted to the character of the building. Metal signs, matching the antique fixtures are recommended, as well as wooden signs with engraved and/or painted letters. The colour of the facades and signage must comply with the regulations previously prescribed: natural materials, no paint and no bright colours. The opening of large bays for the creation of commercial window displays is not permitted. Only shop windows of the size of traditional doors (2 m<sup>2</sup>) can be made, respecting the proportions of the facade and the height of the lintels. The extension of businesses on the street (installation of tables and chairs, sales stalls) is permitted only in the widest places where it does not obstruct pedestrian traffic.

## 2.7. Practical workshops on earthen architecture

250 participants from AlUla community have attended the “Making Earth Into Architecture” workshops that were organized first in the Old Town (March 2021) and then in Mabiti as part of the AlUla Art Residency programme (December 2021).

With the support of local monitors trained for this purpose, CRAterre facilitators invited the participants to (re)discover the various types of soils sourced from different quarries in AlUla.

They were encouraged to play with granular compositions, plasticity, colors, textures, and finishes, as a way of exploring the creative potential of the material and thus imagine new possible uses, between tradition and modernity.

### Training sessions organised

Training for RCU Staff .....	March 2020
Training of local monitors .....	Sept. 2020 - Febr. 2021
Practical Workshop 1 .....	March 2021
Practical Workshop 2 .....	December 2021
Conferences .....	December 2021



Monitors training certificate



### LINKS

Workshops reports are available in a dropbox:





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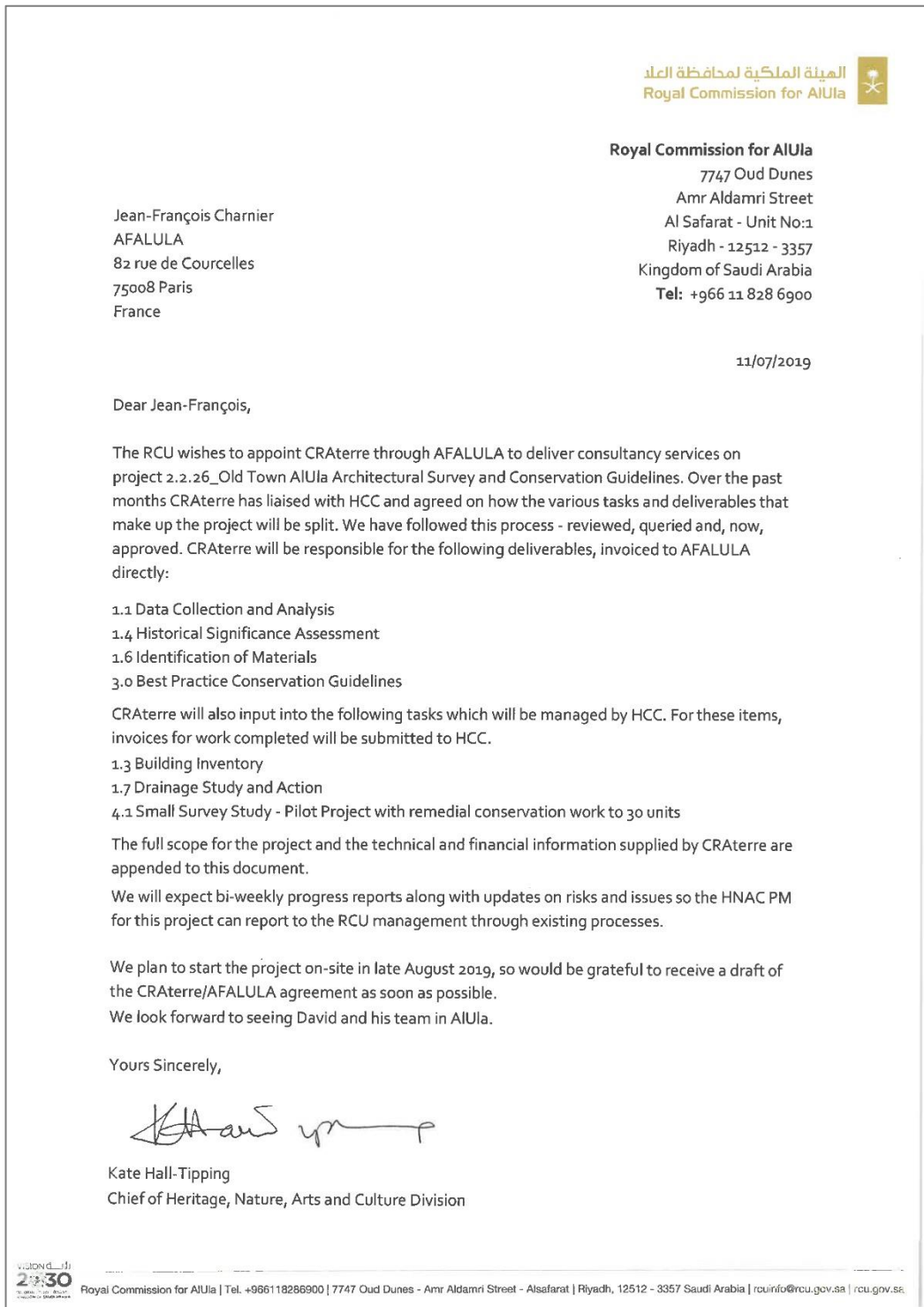
© RCU / Meryam ALBALWI

*Training of Saudi trainers, rehearsals with RCU staff and workshops*



# 3 Appendix

## 3.1. RCU appointment validation letter

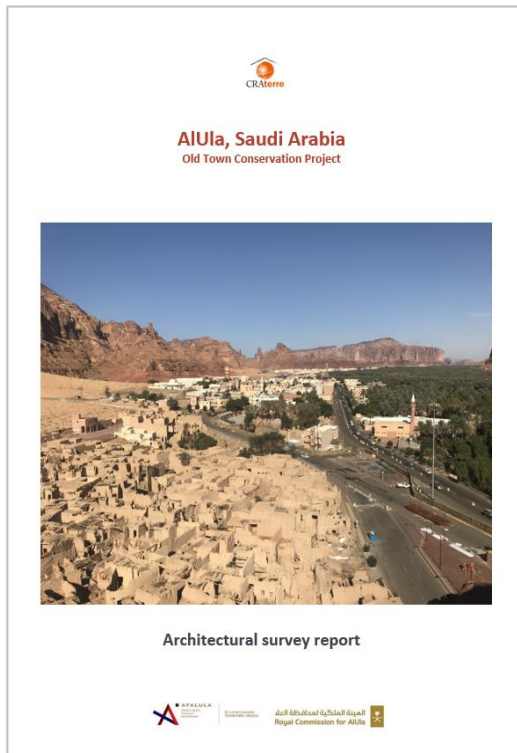


## 3.2. Bibliography

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## 4 Separate documents

### 4.1. Architectural survey report



#### SUMMARY

This document provides an overview of the heritage values of AlUla old town and the oasis farms based on the study of existing documentation and field researches (architectural and urban studies; building inventory; building archaeology).

62 pages.

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  - 2.3.2. Architectural features
  - 2.3.3. Decoration features

##### Chapter 3: Cultural significance assessment

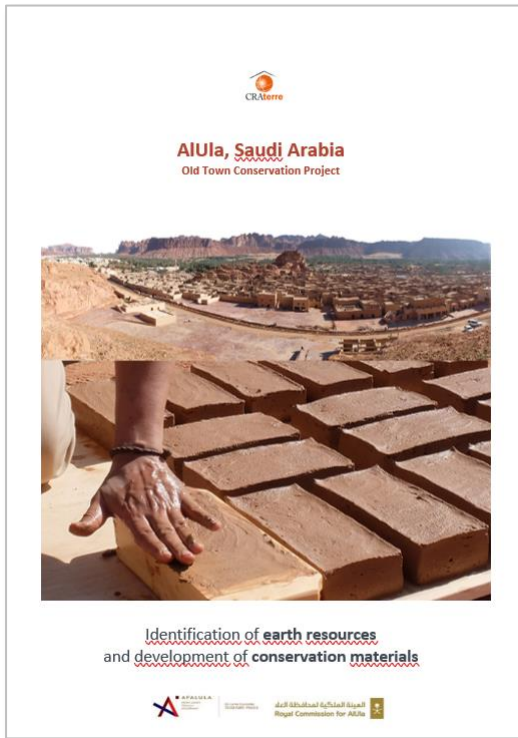
- 3.1. Architectural values
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- 3.3. Historical values
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- 3.6. Social values
- 3.7. Environmental values
- 3.8. Economical values

##### Appendix

- A1. Bibliography
- A2. AlUla, preliminary archaeological survey of the Old Town. EVEHA, 248 p. (Separate document)



## 4.2. Identification of earth resources and development of conservation materials



### SUMMARY

This document compiles all the work carried out from 2019 to 2021 to first locate soil quarries in AlUla valley, then analyse the various soils in the laboratory and finally test them, either in the form of demonstration walls or as samples subjected to various tests. The document gives recommendations on which soil to use for which specific purpose. It contains many graphs and tables to compare the characteristics of the soils subjected to abrasion, erosion and capillarity tests. The soils are also tested in mortar form.

101 pages.

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Implementation phases  
Main results and recommendations

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- 1.1.2. Slopes under the harrat: screes and colluvial cones (B1)
- 1.1.3. Slopes under sandstones cliffs: colluvial cones (B2)
- 1.1.4. Pediment alluvium (C)
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##### 1.2. Potential soil quarries in ALULA area

- 1.2.1. Soil samplings
- 1.2.2. Field-tests
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#### Chapter 2: Development of conservation material

##### 2.1. Quarries recommended for the old town conservation project

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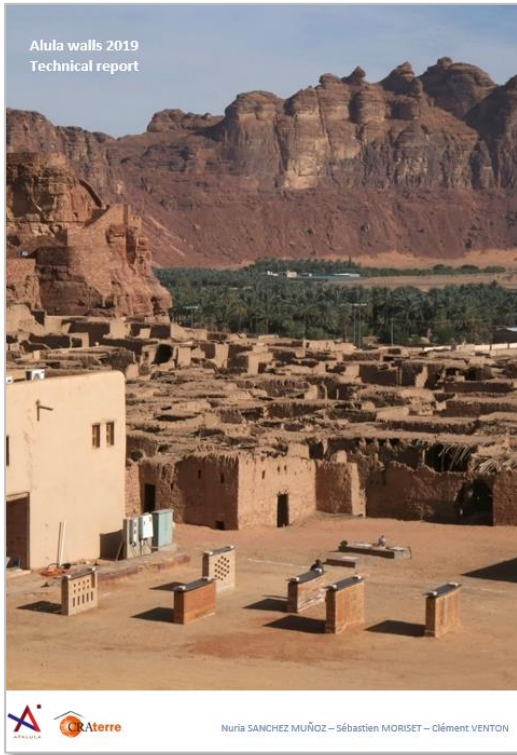
- 2.2.1. Objectives and protocol
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##### 2.3. Conclusions and recommendation

#### Appendixes

- A1. AlUla Soil sampling sheets
- A2. Experimental walls technical sheets
- A3. Plasters experimentation

### 4.3. Sample walls report



#### SUMMARY

This document describes the 6 demonstration walls that were built in December 2019 in the old town using 3 construction techniques (adobe, rammed earth and Compressed earth bricks) and numerous finishing proposals (plastered, painted, decorated). It is a technical report that describes the soil used, the additives added, the tools employed, etc..

34 pages.

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##### A. Walls layout

##### B. AlUla Soils

##### C. Walls technical sheets

###### 1. Rammed earth walls

- 1.1. Rammed earth sample - soil 13
- 1.2. Rammed earth sample - soil 13 and 24

###### 2. Compressed earth blocks walls

- 2.1. CEB sample one - Riyadh soil & 7% cement
- 2.2. CEB sample two - Riyadh soil & 7% cement

###### 3. Adobe walls

- 3.1. Adobe walls - old town soil

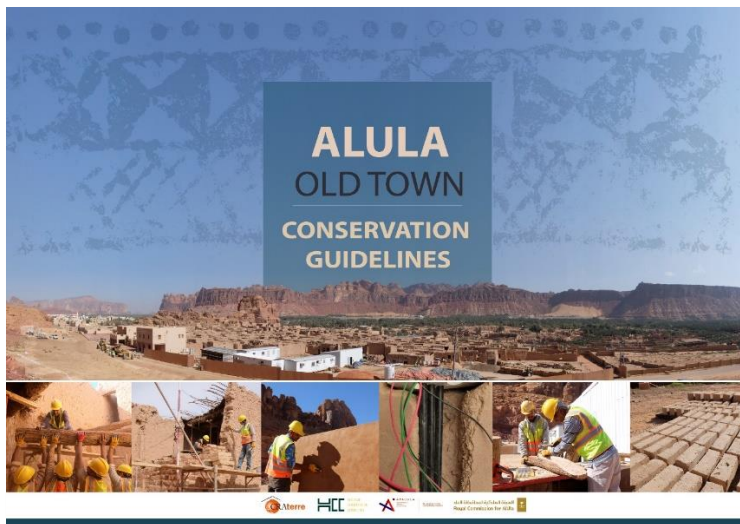
###### 4. Earth plasters

- 4.1. Smooth plaster sample - old town soil
- 4.2. Smooth plaster sample - soil 1
- 4.3. Smooth plaster sample - soil 5
- 4.4. Smooth plaster sample - soil 10
- 4.5. Smooth plaster sample - soil 13
- 4.6. Smooth plaster sample - soil 21
- 4.7. Smooth plaster sample - soil 22
- 4.8. Smooth plaster sample - soil 13
- 4.9. Smooth plaster sample - soil 21
- 4.10. Decorated plaster sample "squares" - soil 13
- 4.11. Decorated plaster sample "horizontal lines 1" - soil 13
- 4.12. Decorated plaster sample "horizontal lines 2" - soil 13
- 4.13. Decorated plaster sample "zigzag lines" - soil 13
- 4.14. Decorated plaster sample "grooves" - soil 13
- 4.15. Painted decoration - soil 13
- 4.16. Shaped & carved decorations - soil 13 or 21

#### 4.16. SHAPED & CARVED DECORATIONS - SOIL 13 OR 21

<b>MATERIALS</b>	Soil 13 or Soil 21
<b>TOOLS</b>	2 mm mesh sieve Trowel Plastering trowel Small trowels, knives, spoons Sponge
<b>PROCESSES</b>	<ul style="list-style-type: none"> <li>- Sieve the soil with a 2mm mesh</li> <li>- Mix soil with water</li> <li>- Wet the wall</li> <li>- Apply a 5-10 mm layer with a trowel</li> <li>- Shape the desired design with small trowels or knives blades or spoons</li> <li>- Smoothen the edges with a sponge or with a paint brush</li> </ul>
<b>WORKABILITY</b>	Quite easy but time consuming
<b>STRENGTHS</b>	Any shape can be created, flexible
<b>WEAKNESSES</b>	Time consuming
<b>REMARKS</b>	Can work with other colours

## 4.4. Conservation guidelines



### SUMMARY

This document provides guidelines and recipes for all those wishing to intervene in the Old City for conservation or rehabilitation projects. It is richly illustrated with diagrams and photos taken on building sites in AlUla Old Town in 2019-2020.

Unfortunately, it is only 67% complete.

192 pages

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#### A. Introduction

- A.1. Project framework
- A.2. Why this guide?
- A.3. Values to be preserved
- A.4. The conservation strategy
- A.5. Revitalisation of AlUla Old Town

#### B. Description of AlUla Old Town

- B.1. Historical context
- B.2. Urban evolution
- B.3. Resources
  - B.3.1. Stones
  - B.3.2. Soils
  - B.3.3. Wood
  - B.3.4. Fibres
- B.4. Construction techniques
  - B.4.1. Earth and stone masonry
  - B.4.2. Flooring and roofing
- B.5. Architectural features
  - B.5.1. Tayaras
  - B.5.2. Stairs
  - B.5.3. Doors
  - B.5.4. Windows
  - B.5.5. Niches
  - B.5.6. Waterspouts
  - B.5.7. Toilets
- B.6. Decoration features
  - B.6.1. Stone bonding
  - B.6.2. Stone carvings
  - B.6.3. Plastering and paintings
  - B.6.4. Door decorations

#### C. Conservation works

- C.1. Condition survey
  - C.1.1. Pathologies observed on site
  - C.1.2. Degradation factors
  - C.1.3. Priorities of intervention
- C.2. Preparing the site work
  - C.2.1. Fencing and securing the worksite
  - C.2.2. Cleaning and removing debris from the worksite
  - C.2.3. Securing, propping and temporary stabilisation of structures
  - C.2.4. Removing plasters for wall inspection
- C.3. Foundations works
  - C.3.1. Excavating and inspecting the condition and the quality of the buried stone foundations
  - C.3.2. Reinforcing and repairing stone foundation for walls
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- C.4. Site drainage works
  - C.4.1. Preventive drainage
  - C.4.2. Surface & underground drainage
- C.5. Walls works
  - C.5.1. Restoring and repairing existing stone masonry
  - C.5.2. Repairing (and reinforcing) cracks in stonewalls
  - C.5.3. Restoring and repairing existing mud brick masonry
  - C.5.4. Repairing (and reinforcing) cracks in mud brick walls
  - C.5.5. Rebuilding collapsed walls
  - C.5.6. Restoring existing door & window jambs and lintels
  - C.5.7. Creating new openings for rehabilitation projects
- C.6. Stairs works
  - C.6.1. Mud brick stairs
  - C.6.2. Stone stairs
- C.7. Networks (when needed)
  - C.7.1. Water
  - C.7.2. Electricity
- C.8. Roofs and ceilings works
  - C.8.1. Inspection of roof and ceiling timber structure
  - C.8.2. Preparing, cutting and treating new beams
  - C.8.3. Replacing damaged beams
  - C.8.4. Rebuilding timber structure
  - C.8.5. Rebuilding roof layers
  - C.8.6. Restoring and / or rebuilding parapet
  - C.8.7. Terrace waterproofing, drainage and waterspouts
- C.9. Wood treatment
  - C.9.1. Treatment of damaged wood structures
  - C.9.2. Wood treatment against insects attacks (termites)
  - C.9.3. Wood treatment against fire
  - C.9.4. Safe and environmentally friendly products
- C.10. Plastering and painting
  - C.10.1. Repairing mud plasters
  - C.10.2. Applying new mud plasters
  - C.10.3. Repairing lime plasters
  - C.10.4. Applying new lime plasters
  - C.10.5. Restoring existing wall paintings
  - C.10.6. Restoring and protecting wall decoration
- C.11. Flooring
  - C.11.1. Compacted earth subfloor
  - C.11.2. Termite and insect treatment for floors
  - C.11.3. Drainage and anti-capillary treatment for floors
  - C.11.4. Compacted final earth floor layers
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  - C.12.2. Manufacturing new doors and windows
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- D.1. Mud bricks
  - D.1.1. Raw materials required
  - D.1.2. Soil quarries identification
  - D.1.3. Soil analysis
  - D.1.4. Production yard organisation
  - D.1.5. Brick production process
  - D.1.6. Brick quality control
  - D.1.7. Mortar for mud brick masonry
- D.2. Stones
  - D.2.1. Stone quarries identification
  - D.2.2. Physical, chemical and mechanical tests
  - D.2.3. Analyses for stone suitability
  - D.2.4. Stone production process
  - D.2.5. Mortar for stone masonry



## 4.5. Workshops reports



### SUMMARY

This report describes the test training session with RCU staff and the training programme for monitors. 32 pages.

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- A.1. Project rchitectural features
- I. Practical workshops (test session)
  - I.1. Preparations
  - I.2. Presentation
  - I.3. Feedback and recommendations
- II. Training Programme for Monitor
  - II.1. Programme Outline
  - II.2. Monitor's Interview and Selection
  - II.3. Learning Journey
  - II.4. Learning Content
- 2.4.1 Introduction & Soft Skills
- 2.4.2 Material Knowledge
- II.5. Training Statistics
- III. Interactive practical workshops for public
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  - III.2. Event Communication Material
  - III.3. Activities Report
  - III.4. Event Outcomes
- IV. Conclusions
  - IV.1. SWOT Analysis
  - IV.2. Recommendations

### SUMMARY

This report describes the 15-17 December 2021 public workshops and conferences held in AIUla. 30 pages.

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- I. Summary
  - I.1. Context and objectives of the workshops
  - I.2. Main results
- II. Workshops preparation
  - II.1. Site and soils
  - II.2. Soils extraction
  - II.3. Plastering supports
  - II.4. Discussions with the artists
  - II.5. Announcement of the events
  - II.6. The talk
- III. Workshops development
  - III.1. Closed workshop
  - III.2. Open workshop
- IV. Conclusion





