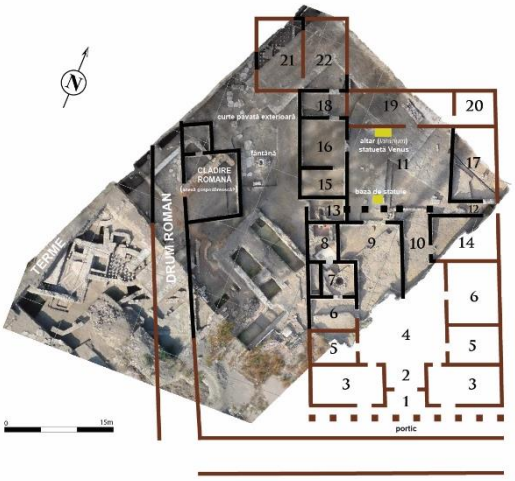
LOCAL ARCHEO PLAN

APULUM. DOMUS-THERMAE

AN URBAN ARCHAEOLOGICAL PARK IN ALBA IULIA, ROMANIA



Interreg Danube Transnational Programme ARCHEODANUBE

Consiliul Județean Alba

MUZEUL NATIONAL AL UNIRII ALBA IULIA

PRIMĂRIA MUNICIPIULUI ALBA IULIA

LOCAL ARCHEO PLAN

NATIONAL MUSEUM OF THE UNIFICATION ALBA IULIA

APULUM DOMUS – THERMAE ARCHAEOLOGICAL PARK

Cod LMI: AB-I-m-A-00001.02

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National Museum of the Unification Alba Iulia

3/3 - Alba Iulia - October 2022

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Annexes

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BASIC INFORMATION OF THE SITE	
Name of the site(s):	**APULUM DOMUS – THERMAE ARCHAEOLOGICAL PARK**
Name or number of the site(s) in the national register of archaeological sites and monuments:	**LMI number: AB-I-m-A-00001.02**
City, town:	**Alba Iulia**
Region:	**Alba County**
Country:	**Romania**
Complete cadastral reference:	
Landowner(s):	**SC DACO – TARRACO PROMOCCIONES SRL**
Manager:	
Investor(s):	
Responsible monument protection institution:	**Cultural Direction of Culture Alba County (Ministry of Culture)**

1. Introduction

The development and the urban evolution of Alba Iulia municipality through the rise and expansion of the real estate investments implicitly determined the increase of the number of rescue archaeological researches in the city: urban archaeology.

The Roman site Apulum was declared an area of national interest, respectively an area of archaeological priority, a regime that is established on a territory that includes archaeological sites whose archaeological research, protection, and enhancement is of exceptional importance for national history and culture.

The offer of cultural services of Alba Iulia is strongly supported by the historical and implicitly tourist importance of the locality, to this being added the need for continuous education, to increase the educational and informational contribution, the museum and the archaeological research having a decisive role here.

The valorisation of the archaeological heritage within an archaeological park is a sustainability project for the national and even world cultural patrimony, an example of good practice in the field of highlighting the past both for the city's inhabitants and for the general public.

The aim of this archeo plan is to create the necesary framework of information needed by the local authorities and heritage institutions to create an urban archaeological park. This document is a cummulative effort made by specialists from various areas of expertise, archaeologists, architects, restorers, conservators.

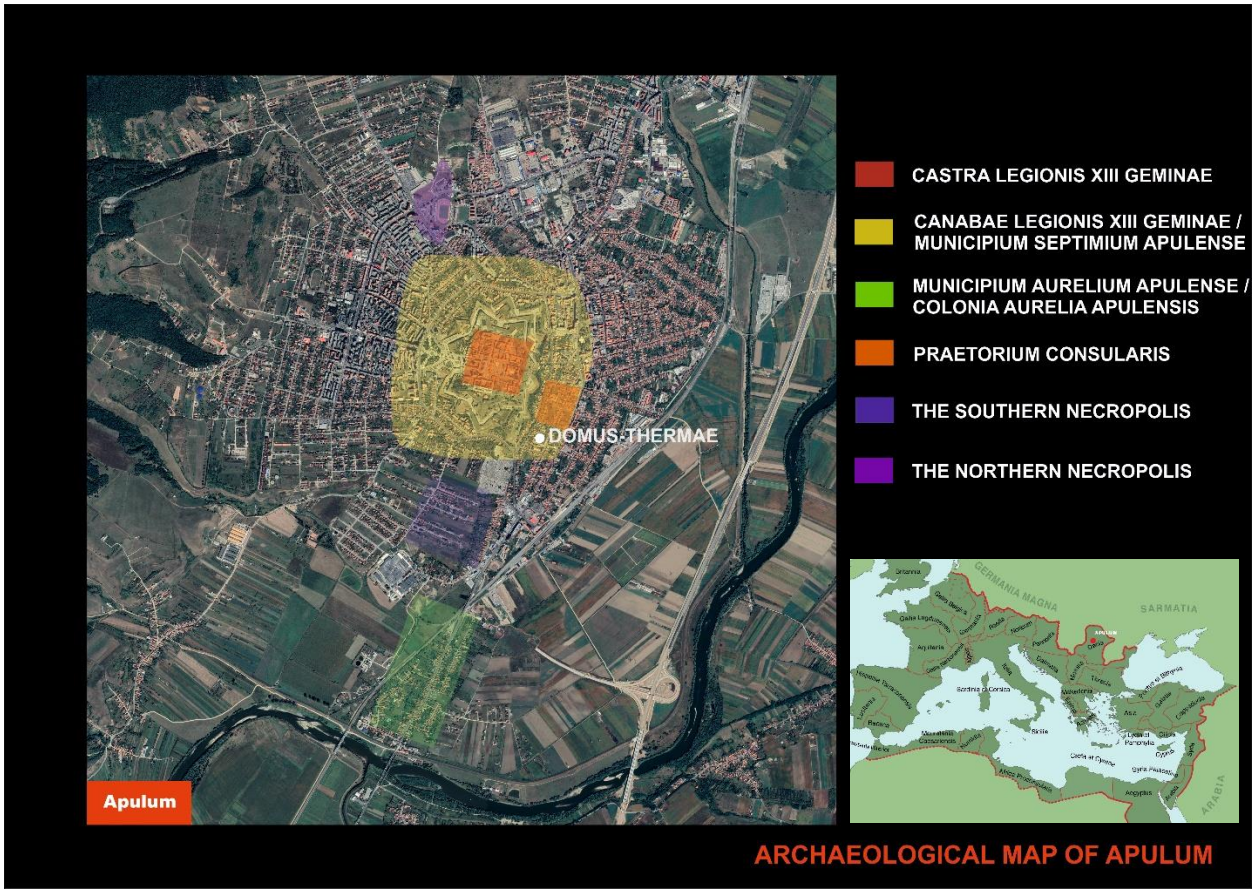
The presence of an archaeological park in the city will greatly involve the local population and tourists in new ways to learn about heritage while increasing awareness about the site’s importance. It will act as a stepping stone to further develop other similar objectives within the historical city to help promote the site to national and international tourists.

We wish to include Apulum on the World Heritage List and the degree of integrity and authenticity of the site are essential conditions for inclusion on the UNESCO tentative list.

2. Assessment of the local archeological heritage

2.1 Geographic and historical setting

The place where the fort and most of the *canabae*-type settlement were built is on the third terrace of Mureş river, also called the Plateau of the Romans, and the eastern sector is located on the first terrace. Next to the Mureş River, the two tributaries, the Sebeș and the Ampoi rivers, flow near the Roman settlement. The terraces on which the fort and the first civilian settlement from Apulum were built are located on the Alba Iulia - Turda corridor (110 km long, between 5 and 10-20 km wide), part of the Transylvanian Plateau. The 13th Legion camp was placed in the central area of the province, in a strategic place, at the confluence of Mureş and Ampoi rivers.



Apulum is the great cosmopolitan center of Roman Dacia, the largest Roman conurbation in this province founded by Emperor Trajan after the conquest of the Dacian kingdom in 106 AD. Apulum is the generic name of a complex that includes: the fortress of the Legio XIII Gemina, the

seat of the governors of Dacia (*praetorium consularis*), two urban centers, and two large cemeteries, the Southern and the Northern necropolises.

Together with the construction of the Roman fortress, a civilian settlement called *canabae* emerged. The settlement developed fast around the fortress, reaching to fulfill in 197 AD. the conditions for access to the first urban status. Thus, Emperor Septimius Severus, due to the fidelity of the legion, expressed gratitude and accepted *canabae* to become a city with the name of *Municipium Septimium Apulense*. Thus, Apulum was a flourishing urban centre in the 2nd and 3rd c. AD.

The Roman site Apulum was declared an area of national interest, respectively an area of archaeological priority, a regime that is established on a territory that includes archaeological sites whose archaeological research, protection, and enhancement is of exceptional importance for national history and culture.

2.2 Identification of the local archaeological heritage and its conservation status

The type of archaeological site taken into consideration for this LAP is a part of the ancient Apulum civil settlement that developed around the Roman legionary fortress. More specifically, a Roman house (domus type) alongside the Roman imperial road, *thermae* installations (baths) and underfloor heating systems (*hypocaustum*). Together with these structures present in various degrees of conservation, many artifacts were discovered on site, such as: a Venus bronze statuette, lamps, various decorated pottery, tools, coins, painted plaster. A wealthy and influential family from Apulum, probably that of a local official, built this luxurious house in the residential area of the city. *Domus* was the private Roman house located in the urban environment, with a rectangular plan and numerous rooms with a special purpose for the use of family members. It was comfortable, with large spaces for rest and recreation in the courtyard (*peristylium*).

The family had set up a place of worship (*lararium)* for the protective gods of the house, in which there was a small bronze statuette representing Venus, the goddess of beauty and love.

The structures occupy a single area within the modern city of Alba Iulia, Romania, size of the area occupied by the site is about 2000m^2 and are considered to be part of the archaeological park. Archaeologically, the site was completely investigated in 2009 and 2019 during rescue archaeological research. No further investigations are necessary for the area considered for the archaeological park. The already investigated remains are still visible, they are protected with textile covers.

The archaeological structures belong to the Roman period, after the second half of the 2nd century AD, with 2 phases of construction. The *domus* was built after the second half of the 2nd century AD.

The responsible for the archaeological research was The National Museum of the Unification Alba Iulia. The documentation and recovered artifacts of these investigations are held and owned by The National Museum of the Unification Alba Iulia.

From a conservation point of view, the structures on the site are only protected with textile covers in an open area so they are subject to various degrees of degradation even if the site is closed on private property. Most portable artifacts were restored and were part of a full exhibition as a pilot action “DOMUS VR – Inside of a Roman house from Apulum”.

Domus-Thermae Sector

2.3 Social and economic significance of the local archaeological heritage

Types of activities conducted in structures/areas occupied by archaeological remains	Yes	No	Permanent	Occasional/ seasonal
Habitation		X		
Movement/traffic		X		
Agriculture		X		
Other economic activities		X		
Touristic activities		X		
Recreational activities		X		
Cultural activities		X		
Educational activities		X		
Religious activities		X		
Other public activities		X		

2.4 Accessibility of the archaeological site

Physical accessibility around the site is provided by the surrounding roads and citystreets, the area in on private property in an open area. Stairs will be needed to climb down the

archaeological park. The road around the park (Miron Costin Street) is not a main street so the traffic allows visiting the site on foot or with small cars. Two bus stations are 300m and 400m away from the site. Informational accessibility is only provided digitally at the moment through the museum's official channels. Explicative panels and various other infographics will populate the area once the park is built.

3. Fesability study

3.1 Identification of the legal and administrative framework

The existence of the urban centers from Apulum (of the two Roman cities *municipium Aurelium Apulense/Colonia Aurelia Apulensis* and *Municipium Septimium Apulense*, of the *Praetorium Consularis* - the headquarters of the governors of the three Dacias and the fort of the 13th Gemina Legion) imposed the need to develop and modernize archaeological research and processing methods, but also a dynamizing the process of recovering the vestiges and protecting them, either within systematic archaeological researches, either following those of a preventive nature. The legislative framework regarding the archaeological heritage and the entire mechanism for its protection is based on the European Convention for the Protection of Archaeological Heritage (revised) signed in Valletta on January 16, 1992 and adopted by the Romanian Parliament by Law no. 150 / 24.07.1997.

Legally, the park needs to be administered by, either the local authorities (City Hall, County Council), or the local cultural institution, the National Museum of the Unification Alba Iulia. An example of this is the existing Principia Museum that is administrated by the City Hall.

Without being in any national master plan to develop tourism, the creation of the park faces some legal and administrative issues. The land is privately owned; thus, the City Hall has to make a study to determine the value of the land, allocate the money to buy the land, allocate money to build the park and then launch an open auction for interested construction companies. This process could take at least 1-2 years to complete, taking everything into consideration.

3.2 Design and architectural concept

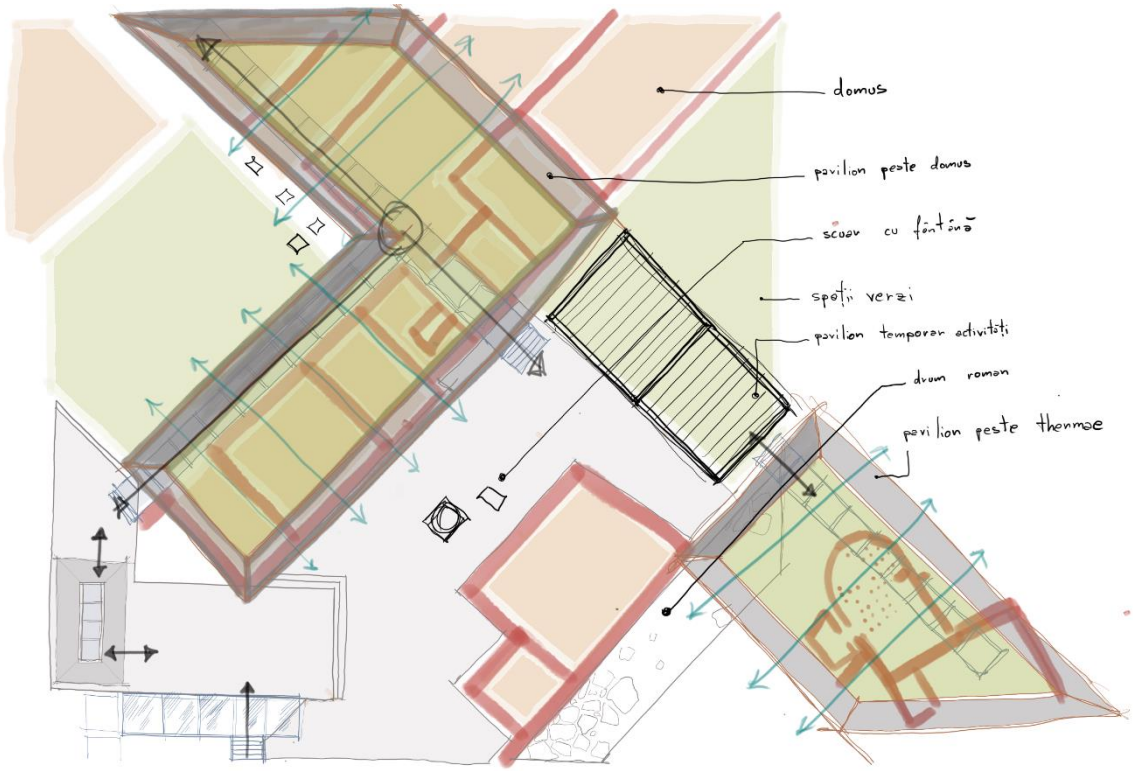
The proposed new architectural ensemble is intended to protect the ruins of the *domus* and *thermae*. The aesthetic approach is not one of an antithesis between the two periods, modern and

ancient, but of highlighting and valorising the archaeological findings. This will be done by adopting a minimalist architectural style in image and design.

The colours and materials used complement this sober manner. They create a neutral background against which the ancient pieces are displayed, where they are highlighted. The created layout anticipates an evolution of the dwelling and the thermae and is thus proposed so that the rooms and displayed elements can be observed as easily as possible. Beneath the proposed roof covering, the route is marked by a suspended glass walkway, a transparent material that allows a visual opening over the entire site. This walkway covers the circuit of the entire dwelling as seen from above. Another suspended walkway leads visitors to the ruins of the baths.

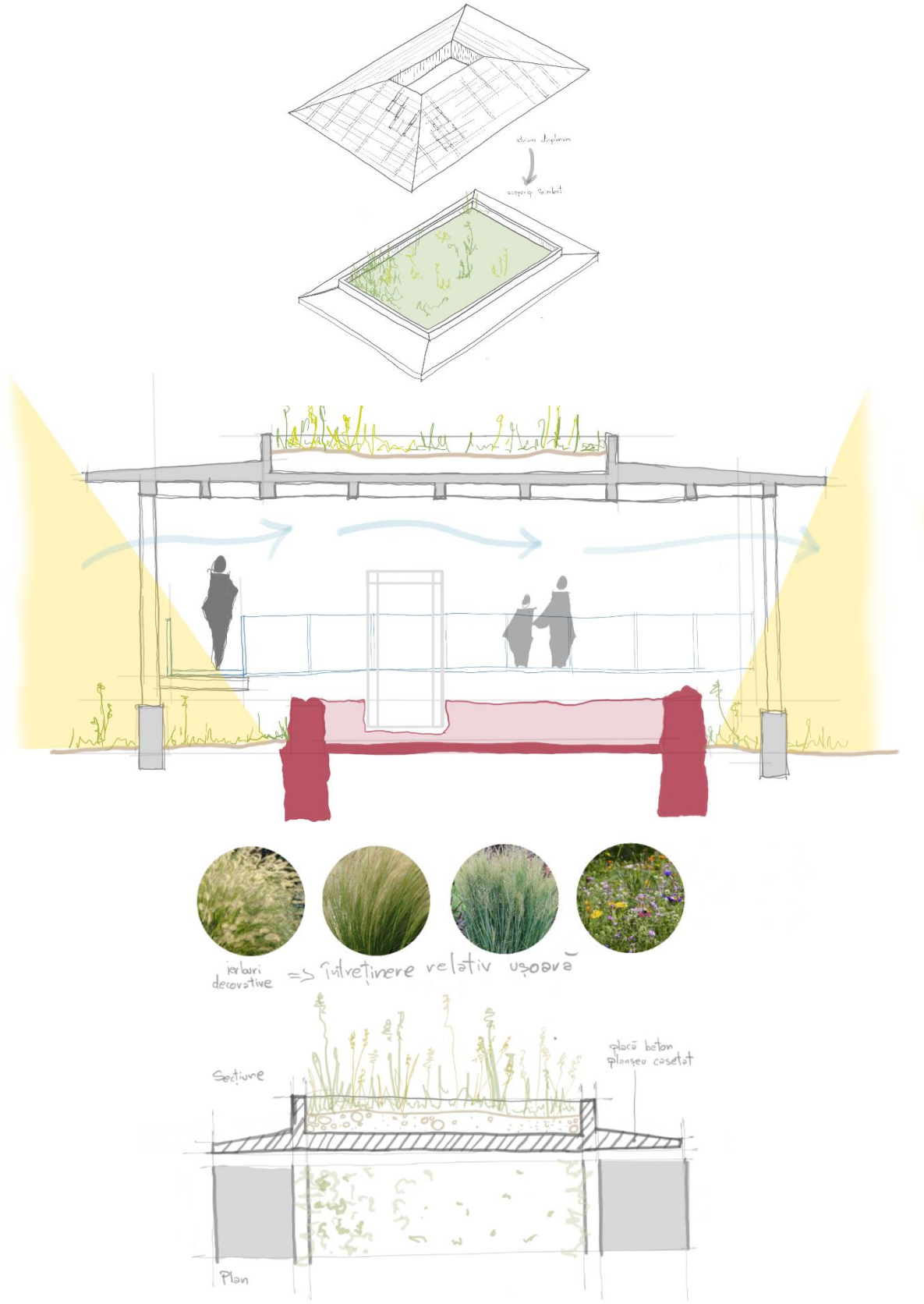
The proposed roof reinterprets an *atrium displuvium*, but the void is replaced by a grassed area, best seen from the buildings neighbouring the site. The vegetation chosen will be wild-looking, low to medium height, predominantly wild grasses. Like the roof, the metal pillars are an interpretation of ancient columns in a modern manner. The main access will be from the street via stairs and a platform lift for the disabled. In the access area, there is a waiting platform allowing entry to the archaeological park. Also at the entrance is the hypocaust, protected by a glass floor.

The newly created architectural space can also accommodate related activities such as workshops, courses or other types of programmes, either specialised or for the public. The volume of the two pavilions is designed to occupy the site in a harmonious way without crowding the space. Architectural aesthetics thus becomes important in the urban context. The low height regime marks the difference in level in which the site is lowered from street level, thus making the roofs visible and outlining a mass of green space so necessary in the town.



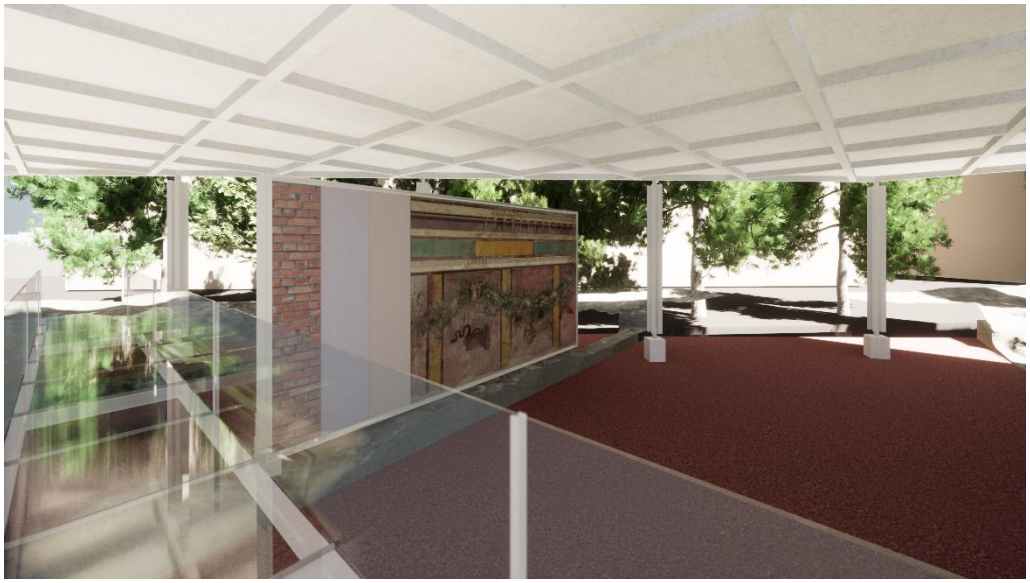
Architectural concept drawing

Architectural concept plans



Roof concept drawings

3D architectural Concept – general view



3D architectural concept – details

3.3 Estimated implementation and maintenance costs; potential funding options

Design and implementation costs will include all the park infrastructure and landscaping works, the specialist's costs, staff, equipment, materials and consumables. Maintenance will consist of utilities costs and staff salaries.

A possible funding option for all of the above can come from either the local municipality (**Direct funds allocated by the municipality in the form of an annual operational budget)** or from other EU heritage-oriented projects. Ticketing and small gains with a souvenir shop should provide enough money to cover the maintenance of the park.

BUILT AND DEVELOPED AREA

The total area of the park will be about 2100 square meters, and the archaeological remains will be covered on an area of approximately 620 sq m.

PROJECT NO. 88 / 2022, CONCEPTUAL PROJECT phase

All constructions will have the height regime of the ground floor.

OTHER PARAMETERS

The balance sheet is as follows:

Areas occupied by constructions = 50 square meters

Covered areas = 620 sq m

Arranged pedestrian areas = 580 sq.m

Green areas = 520 square meters

PRESENTATION OF THE PROPOSED SOLUTION

The total area of the park will be about 2100 square meters, and the archaeological remains will be covered on an area of approximately 620 sq m.

The info point will be about 50 square meters and will house toilets by gender and for people with disabilities, a cashier area and a specific trade area.

The visit will be made on metal and glass suspended walkways that will have a total of 70m long.

The interventions to restore and consolidate the vestiges are, in general, the following:

- Covered masonry: pre-consolidation of friable areas, biocide, removal of biological attack, cleaning, consolidation of mortars and friable rocks, injections, local repairs, waterproofing facing.

- Exposed masonry: pre-consolidation of friable areas, biocide, removal of biological attack, cleaning, consolidation of mortars and friable rocks, injections, full restoration of joints, waterproofing of the facade, application of an insulating layer over the crown, installation of a plant layer

- Hypocaust: pre-consolidation of friable areas, biocide, removal of biological attack, cleaning, consolidation of mortars and friable rocks, injections, restoration by anastylosis of the system of heating and joints, application of protection treatment - waterproofing.

- Roman road: pre-consolidation of friable areas, biocide, removal of biological attack, cleaning pavement, consolidation of mortars and friable rocks, injections, local repairs, waterproofing pavement., restoration of specific layers, completion of the road with similar stone slabs the original ones.

- *Cocciopesto* flooring: preparation of the support, pouring of the floor, application of the finish by beating.

- *Tesserae* type ceramic floors: preparation of the support, making of the tesserae, their installation, application protection.

ESTIMATED INVESTMENT COSTS

The total value of the investment objective, expressed in lei, is estimated to be 7,821,925.00 RON, to which VAT is added in the amount of 1,486,165.75 RON, in accordance with the attached General Budget. The total value of the investment according to the general estimate is structured as follows: Expenses for design and technical assistance = 540,425.00 RON without VAT Expenses for the basic investment = 6,500,000.00 RON without VAT Other expenses = 781,500.00 RON without VAT

ESTIMATED DURATION OF EXECUTION OF THE INVESTMENT OBJECTIVE, EXPRESSED IN MONTHS The effective period of the project entitled: URBAN ARCHAEOLOGICAL PARK – DOMUS–THERMAE AREA will be 34 months from the signing

of the order to start the works, of which the design period for all phases will be of 10 months, and the execution period will be 24 months.

3.4 Identification of the target public and their expectations

To identify the target public and their expectations, questionnaires were created, both in Romanian and in English, as well online surveys on Google Forms. These questionnaires were shared digitally across the social media on the museum's official page and physically at various events held at the National Museum of Unification Alba Iulia. The participants were from all categories of age and education, half locals and half tourists in our beautiful city of Alba Iulia. We plan to share these questionnaires regularly to reach as much people as possible to have a clearer view of the public's expectations.

The questionnaire has 14 questions with various answer choices, YES/NO or multiple answers.

At the time redacting this document, the statistics and charts contains the results of 200 answered surveys.

In english https://forms.gle/RKvWK6sh9B5RdaaZA

In romanian https://forms.gle/TTm171AJNTb6EbwBA

Alba Iulia Urban Archaeological Park Questionnaire

The National Museum of the Unification in Alba Iulia, a partner in the European project Interreg DTP ***ArcheoDanube - Archaeological Park in urban areas as a tool for Local Sustainable Development***, wants to find out the opinions of the general public regarding the development of an urban archaeological park in Alba Iulia, in the Roman site of Apulum - ***Domus-Thermae*** sector.

The archaeological research carried out here in 2009 and 2019 led to the discovery of a part of the Roman city located near the camp of the 13th Gemina Legion: a large house, parts of the building of Roman baths (*thermae)*, a road and other urban features of the Roman era (2nd-3rd centuries AD). The most important monument is the Roman domus-type house that probably belonged to the family of an official of the army or administration from Apulum.

We value your opinions and assure you that the entered data will be only used for the purpose of the project.

ARCHAEOLOGICAL PARK *APULUM. DOMUS-THERMAE*

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ARCHEODANUBE

How old are you?

a. □ under 14

b. □ between 14 and 26

c. □ between 27 and 65

d. □ over 66

Gender:

a. □ Female

b. □ Male

What is the highest degree or level of school you have completed?

a. □ Primary studies

b. □ High school studies

c. □ Post high school studies

d. □ University studies

e. □ Postgraduate studies

f. □ other: _____

Do you live in Alba Iulia?

a. □ Yes

b. □ No

1. How interested are you about history and/or archaeology?
   a. □ very interested

   b. □ not that interested

   c. □ not at all

2. Have you ever visited an archeological park?
   a. □ Yes

   b. □ No

3. Have you heard about the European ***ArcheoDanube*** project and the initiative to build an urban archaeological park in Alba Iulia? If yes, then please specify the source(s).
   a. □ from printed or online newspapers

   b. □ from social media (Facebook, Instagram, Twitter etc)

   c. □ from Radio-TV media

   d. □ from friends or colleagues

   e. □ I didn't hear about this project

   f. □ other: _____

4. Do you think that the residents of Alba Iulia have enough information about the Roman site of Apulum?
   a. □ Yes

   b. □ No

   c. □ I don't know

5. Do you think that the general public has enough information about the national archaeological heritage?
   a. □ Yes

   b. □ No

   c. □ I don't know

6. Do you consider that the results of archaeological research in Romania are sufficiently promoted and accessible to the general public?
   a. □ Yes

   b. □ No

c. □ I don't know

7. Which aspects of Roman culture and civilization would particularly interest you and would you like to see in the ***Domus-Thermae*** archaeological park? (you can choose multiple answers)

a. □ architecture, town planning, construction techniques

b. □ Roman art

c. □ Roman housing

d. □ daily life

e. □ ancient society

f. □ food and gastronomy

g. □ games, shows, entertainment

h. □ economic life

i. □ history and political events

j. □ army and military equipment

k. □ religion and spirituality

l. □ necropolises and funerary customs (rite and ritual)

m. □ other: _____

8. How would you prefer the information to be presented within the future ***Domus-Thermae*** archaeological park at the Apulum site? (you can choose multiple answers)

a. □ panels with images and explanatory texts

b. □ movies and video-documentaries

c. □ brochures

d. □ QR codes

e. □ 3D virtual reconstructions

f. □ classic human-guide

g. □ audio guide

9. What kind of interactive activities would you like to be organised within the archeological park? (you can choose multiple answers)

a. □ historical reenactment shows

b. □ Roman workshops (pottery, bone processing, metalwork, painting, cooking)

c. □ thematic exhibitions with the presentation of artefacts discovered in Apulum

d. □ Archaeology promotional presentations made by specialists

e. □ contests (treasure hunt type, general knowledge quiz competitions on historical themes, etc)

f. □ games (ex. "Archaeologist for a day", video games with a historical theme)

g. □ virtual tours, VR (virtual reality) and AR (augmented reality) exhibits

h. □ Open house Day

10. Would you participate as a volunteer in the cultural events and interactive activities organised within the archaeological park ***Domus-Thermae***?
    a. □ Yes

    b. □ No

11. Would you like a souvenir shop in the ***Domus-Thermae*** archaeological park?
    a. □ Yes

    b. □ No

12. What amount of money do you think it should be set for the visitation fee (1 ticket/adult) to ensure the functionality and maintenance of the archaeological park?
    a. □ 10-15 RON

    b. □ 15-20 RON

    b. □ 20-25 RON

13. How would you prefer to visit the ***Domus-Thermae*** Archaeological Park?
    a. □ organised (guide, with school, travel agency)

    b. □ unorganised (alone, with friends)

14. Apulum is the largest Roman site in the province of Dacia and one of the most important in Romania, being declared a priority area of archaeological interest. The remains of the Roman era discovered here could be capitalised by setting up an urban archaeological park alongside other archaeological objectives within an **archeological tour**. Would you visit the park and these sights as part of a **pre-arranged circuit** (archeological trail/tour)?
    a. □ Yes

    b. □ No

15. Do you agree with the statement "the archaeological heritage of Alba Iulia (the Apulum site) must be protected, valued and included in a tourist tour"?
    a. □ Yes

    b. □ No

    16. If you have suggestions, additions, examples, suggestions, please write them down:

_____
_____
_____
_____
_____

Thank you for completing this questionnaire!

Observing the results in **ANNEX I** at the end of this document, we observe that the majority of the interested respondents were from the 27-66 years old category (81%) as expected, with 86%

having graduated at least a university level of diploma. The 52% to 48% almost even split between genders together with another 52% to 48% split between locals and non-locals demonstrate that most people that live or visit Alba Iulia are interested about our heritage. From the 200 participants, the majority were very interested about archaeology (75%) and 79% of them already visited an archaeological park before. Nearly half of them found about this project through social media sharing or friends involved in the project so we consider the popularization was quite effective and reached the targeted public. In at least 2/3 of cases, the participants to the survey considered that the city residents and general public from our country doesn`t know enough about the ancient Apulum or about the national archaeological heritage.

Thanks to the survey, we found out valuable information about the targeted public and their expectations about how and what they want to learn about ancient Apulum. In 2/3 of cases, the public is curious about the Roman architecture, art, religion and spirituality, military or daily life. Their preferred methods of learning about all this are the usual explanatory panels and videos we always use as promotional materials. The most interested part was the public demand (82% of participants) for 3D visualization and reconstruction to be present inside the future archaeological park. The most desired interactive activities within the future park involves thematic exhibitions, historical reenactment, alongside virtual tours, VR and AR. The public overwhelmingly agreed (98%) that the archaeological heritage of Alba Iulia must be protected, valued and included in a touristic circuit.

4. Local Archaeo Plan – *Apulum Domus-Thermae Archaeological Park*

4.1 Integration within local urban planning

The archaeological area we would like to enhance is fully acknowledged within the Zonal Urban Plan (PUZ). The site is connected within the city through roads that grant access to the area. The immediate area has utilities (water supply, sewage system, electricity). They are needed to assure proper conditions for potential visitors. Solar panels for clean energy are planned to be used as well. In the urban environment, the park would solve two major problems at once: protection and valorization of the archaeological remains in a modern park and enhancing the urban landscape at the site, at this moment the area needs maintenance periodically due to vegetation chaotically growing.

4.2 *In situ* display, conservation and restoration of archaeological remains

Preservation *in situ* and capitalization of the Roman remains through conservation and restoration because they tell an important story about the ancient city.

The Roman city Apulum must be reborn based on the archeologically researched areas that highlight the ancient urban plan and visitors can get in touch with the architecture of Roman buildings that can present aspects of the material and cultural life of the past.

Conservation and display issues:

All structures can be displayed to the public, the *domus* house, the Roman road, the *thermae* (baths) and the *hypocaustum* heating systems, no part is needed of being reburied.
Most of the walls should be displayed under a light roof, with gravel around them, so with a proper roof, conservation *in situ* should need minimal maintenance.

Best way to preserve the authenticity of the site is to do minimally invasive actions, only restore parts that we know for sure how they looked. Same materials the Romans used and materials that resemble them will be used. Other means of presentation are planned, (ex. panels with photos and text).

4.2.1 STUDY ON MORTARS, MATERIALS, DEGRADATION FACTORS FROM THE APULUM SITE – DOMUS-THERMAE SECTOR

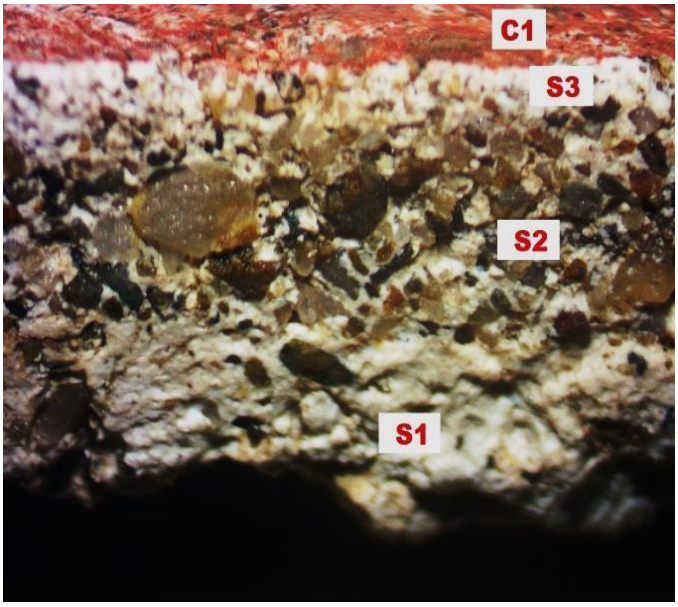
- **ANALYSIS OF MORTAR AND BIOLOGICAL FACTORS**
- **A BRIEF ANALYSIS OF THE STATE OF CONSERVATION AND DEGRADATION FACTORS**
- **INTERVENTION PROPOSALS FOR THE PRESERVATION AND CAPITALIZATION OF THE SITE**

4.2.2 Analysis of mortar and biological factors

In order to preserve and restore the Roman features of the site, chemical, biological and mineralogical analysis were carried out for a series of mortar and biological samples taken from the ***Domus-Thermae*** **sector of the civil settlement of the 13th Gemina Legion camp from Apulum (II-IV century p .Chr.), modern day town of Alba Iulia, Alba county,** an area considered a category A site, with the highest priority archaeological interest, having LMI Code: AB-I-m-A-00001.02.

a. Results of the mortar analysis

Mortar samples were taken from all areas of archaeological interest: from the plaster of the walls of the Domus type house, the courtyard and external walls, the rooms with hypocaust, the external paved area and from the edifice next to the road. The mortar used for the walls is prepared in different proportions from lime mixed with calcined kaolin clays and sand. Some fragments of painted plaster come from an earlier construction and contain 3 layers of lime mortar S1, S2, S3 and a layer of color C1 applied in this chronological order. This layer is applied with red ocher pigment in the "a secco" technique (the pigment is mixed and applied with lime water). **Although it is called "fresco" it is not done in the technique of applying pigment on wet plaster, which characterizes this type of painting.**



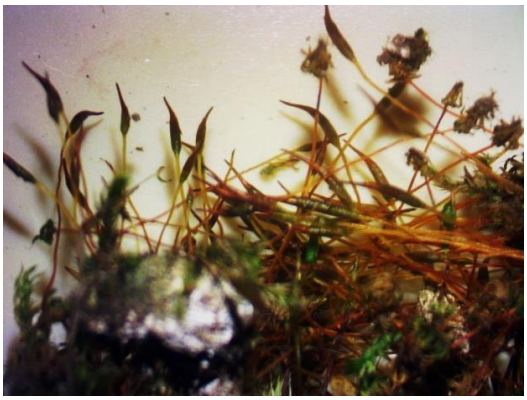
Painted plaster fragment Ap DM1b – microscope detail

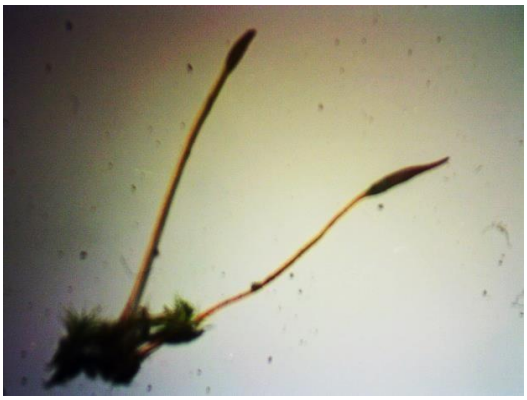
b. Results of the biological analysis

Around the Hypocaust Room in Domus, 2 biological species that developed on the surface of the masonry were identified: a moss of the Barbula species and an **algae of the Chlorococcum species**. The algae are found relatively frequently on damp walls.

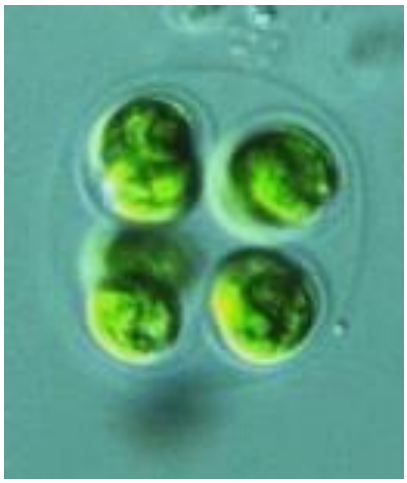
ApDB1 – Sampling Area

ApDB2 - Sampling Area





ApDB1 Barbula moss sp. – microscope detail



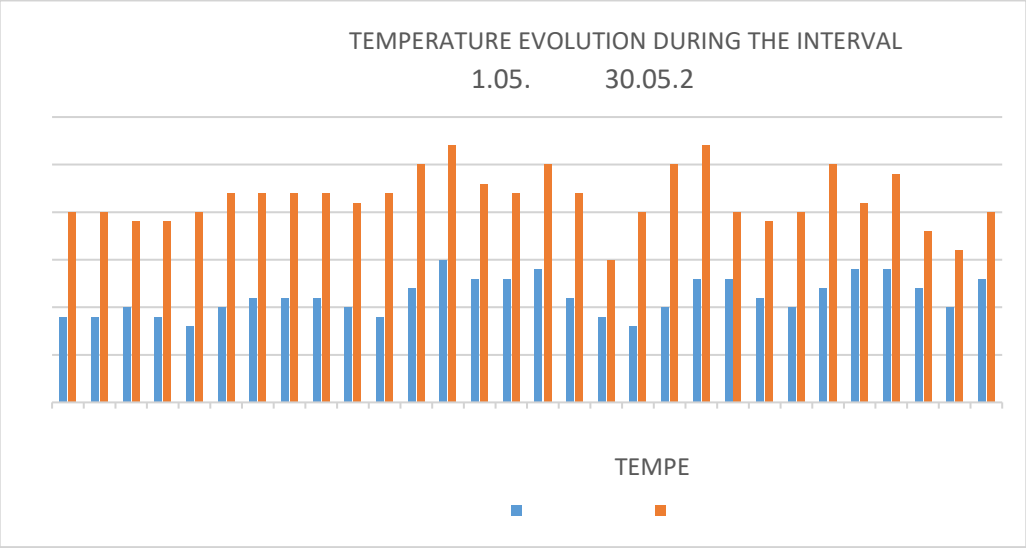
ApDB2 - algae - Chlorococcum sp - microscope detail

4.2.3 A brief analysis of the state of conservation and degradation factors

Following the excavation, the site entered an irreversible process of transformation, at variable speeds, depending on the type of construction materials used, the primary cause of its degradation is the constant exposure to the environment, permanent and direct contact with the external climate factors. Consequently, the degradation factors are:

a. ***physical**:* temperature, humidity, solar radiation, air currents***;***
b. ***chemicals**:* industrial pollution combined with rainwater but also dust***;***
c. ***biological:*** by the continuous occurrence of biological attack of different types*;*
d. ***mechanical*:** the appearance of cracks or fractures as a result of accidental mechanical shocks or as a result of structural compression or pressure.

Temperature is a determining factor because the repeated heating and cooling of rocks and mortars generates perpendicular pressures on their surface, causing cracks, peeling (exfoliation) or fracturing of the rock. The temperature measurements carried out between May 1-30, 2022, show differences of about 15-20°C between the values recorded during the day and those recorded at night, approaching the critical values that favor the appearance of thermogenic cracks. A more pronounced degradation was observed in the south-facing walls compared to the north-facing walls. These degradations are the result of the destructive action of thermal factors and large temperature differences.



The exposure of the rocks to high temperatures caused extensive networks of cracks and the excessive humidity combined with the drop in temperature in the cold season caused, through

the freeze-thaw phenomenon, the cracking and disaggregation of some stones, but also of the mortar used in construction. The infiltration of water into the cracks, followed by its transition from the liquid state to the solid state (ice) is accompanied by an increase in volume up to four times, so that the water infiltrated into the microcracks or macropores upon freezing by increasing the volume fractures the rock or disaggregates the mortar.

The presence in the atmosphere of some gases from the industrial activity in the vicinity of the site (sulphur dioxide and carbon dioxide), combined with the rainwater, forms acids that come into contact with the rock and mortars, developing a series of reactions that lead to dissolution and disaggregation of some mineral compounds with serious consequences for these materials. On large portions of the wall, in the masonry mortar, the disaggregation of the binder, respectively the lime, can be observed, its appearance becoming macroporous, highlighting the composition of the aggregate, fragments of brick, ceramics or crushed shells, sand and pebbles.

From a biological point of view, the state of preservation of the entire archaeological site is poor, the macroscopic observation shows us that the site has a 10% proportion of ruderal vegetation consisting of higher plants, small trees and shrubs, the latter being very dangerous, because the roots they can dislodge portions of the wall.

Also, on the walls it is noticeable the existence of a slightly developed plant bioderm, adherent to the substrate, grown over decades, in the form of numerous species of moss, as well as different species of algae mentioned above.

4.2.4 Intervention proposals for the preservation and capitalization of the site

Highlighting the site will be a challenge for the restoration team, as minimal intervention is desired, with the idea of conserving as much as possible of the discovered materials and its original appearance. For this purpose, the protected area of the site with covers will benefit from an approach that will strictly aim at conservation and will include specific operations of pre-consolidation, biocide-biocrust removal, cleaning, consolidation, injection into cracks, applying protective treatment, without including volumetric restructuring operations or restoration of joints.

On the elements placed outside the protective canopies, specific active conservation treatments will also be applied, but they will also include works of volumetric restructuring and restoration of joints.

Removal of biological threats

In areas where a biological threat is present and can be distinguished in the form of an extended bioderma on the surface of the walls, it is suggested to be removed by using special chemical compounds by spraying or brushing on the surface in question.

Pre-consolidation of mortar and disaggregated rocks of heavily affected areas showing swelling, detachments, before cleaning treatments to prevent possible loss of original material.

The cleaning of deposits requires the alternation use of several mechanical, physical-mechanical and chemical methods in order to reach a satisfactory result that corresponds to the following criteria:

- to not cause direct damage to the cleaned surface;

- to allow the preservation of the patina, the original texture and traces of the tools used;

- to not generate or accentuate other degradation processes.

The removal of non-adherent deposits – dust removal, will be done by brushing and vacuuming, manually and with specialized equipment.

Consolidation of the damaged surfaces of some mortars to restore the cohesion between the particles

Filling the cracks in areas where the stone, brick or mortar has deep cracks, detachments.

Important ceramic or lithic elements, of particular value or that require restoration for a better presentation of the site and that have suffered loss of material for various reasons, will benefit from **volumetric restoration** with mineral mortar, depending on the color and grain size of the support material.

Restoring the joints between the stone or brick elements with a mortar similar to the original one, which will be based on the ingredients, granulation and proportions identified through analysis.

Chromatic integration to equalize surfaces from an aesthetic point of view.

Anastylosis restoration of parts of the walls, the heating system (hypocaust) and the furnace (praefornium) using materials recovered from the site or modern replicas made in the same technique based on the analysed results.

4.2.5 Photogrammetry, a process of information for a future archaeological park

To further help the process, a photogrammetry of the entire site will provide large information for restoration and planning for a future archaeological park.

The field of cultural heritage is generally very well suited to innovative computational technologies of photographic documentation. Through these technologies it is now possible to obtain new digital products, designed for in-depth study as well as visualisation and dissemination to the scientific community and the general public, of three-dimensional digital versions and rigorous descriptions of objects, structures and territory.

These products become powerful tools in the analysis and exploration of research hypotheses, while ensuring visual support for reconstruction, conservation and restoration decisions. The computational photography domain, eminently digital as well as computer processing, is currently working together to create three-dimensional complex rendering solutions of surfaces and textures of heritage objects but also of monuments and archaeological sites, bringing an important contribution to the specialised documentation. It has a significant increase in the attractiveness of museum collections for audiences of all ages.

The photogrammetry was performed by two methods: the aerial and low altitude (CRP, proximity).

A Mavic PRO DJI UAV system was used for aerial photogrammetric documentation, software programmed for optimal photogrammetric coverage, a camera with an equivalent focal length of 28 mm, with a resolution of 12 Mp. On the ground 15 photogrammetric targets were placed whose coordinates were collected in the Stereo 70 coordinate system (simultaneously with WGS84 / ETRS89) using the centimetre precision RTK GPS unit Leica GG04. The data were processed using the software solution Agisoft Metashape v.1.6.2. The processing steps are cloud point extraction (7.37 million points), creating a solid mesh surface and applying the related texture.

Once the set of 2 data in Stereo70 coordinates were georeferenced, the main photogrammetric products could be extracted, the orthophoto mosaic, digital elevation model, their complex rendering and spatial analysis being made using the Global Mapper v.22 application. Photogrammetric documentation (CRP) was made using a high-resolution DSLR camera, Nikon D810 (36.2 Mp), equipped with a fixed lens with a focal length of 28mm, on a tripod. Georeferencing was performed using 10 coded photogrammetric targets (12 bits).

Gigapixel Art
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Interreg
Danube Transnational Programme
ARCHEODANUBE

Ground Control Points

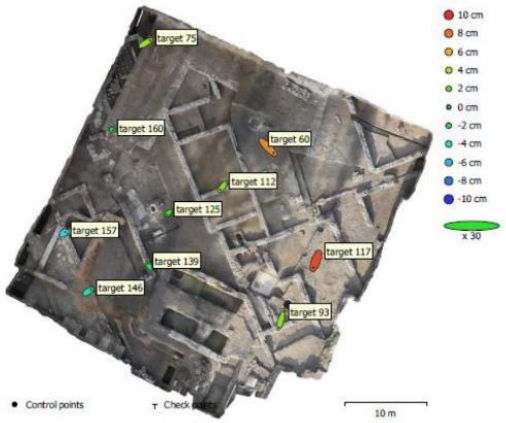


Fig. 3. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
10	2.28292	3.14209	4.56266	3.88387	5.99185

Table 2. Control points RMSE.
X - Easting, Y - Northing, Z - Altitude.

Digital Elevation Model

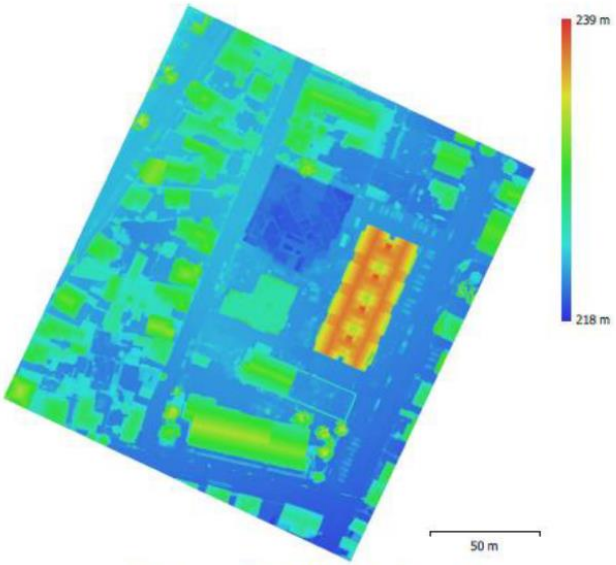


Fig. 4. Reconstructed digital elevation model.

Resolution:	3.12 cm/pix
Point density:	0.102 points/cm²

4.3 Surveillance and monitoring systems

Having a cultural / museum status, the park will need a guard or a surveillance / monitoring system to prevent vandalism and looting.

An entrance fee will be set to help with the maintenance costs

Based on our questionnaire, we expect local curious visitors and tourists interested in history and archaeology, students, seniors, etc.

4.4 Landscaping

While the Roman house would be the most attractive feature of the site, the visitors should see in sequence the Roman road, the *domus* house and the baths (*thermae)*. Ramps and stairs would increase the accessibility on the site. Ornamental trees will be placed around the site between the site and the buildings around, for privacy reasons. Finally, the park will become part of the urban landscape.

4.5 Mandatory infrastructure and services

Accessibility:

Parking will be assured temporarily by the parking spaces around the apartment buildings around the site.

Alternatively, the public transport (two bus stations, Cimitirul Eroilor and Școala Avram Iancu)is 350 respectively 400m away from the site. The road around the site is not a busy street, ideal for tourists to walk to the park from the Vauban fortress. Panels leading to the site are needed.

Basic park infrastructure and services

Benches will be placed in some areas of the park, the most important heritage features of the site will be illuminated, all the utilities should be present with a free WI-FI zone for tourists.

Toilets would be placed near the access road and garbage bins must be placed around the park

Maintenance

Regular maintenance such as toilets, fences, grass-cutting, trash disposal will need to be done.

Digital maintenance for the parks social media page and webpage should be affordable due to the ticketing system.

4.6 Communication, branding and promotion

Objectives, themes and visitor analysis of communicative planning:

Getting the information to a wider audience is always good for tourism and is pushing further heritage awareness to the community and potential investors. The community needs to know the history and the significance of the heritage around them, our purpose being raising awareness about the Roman city buried under modern Alba Iulia.

Everyone should be aware of this information, from kids to elders, locals or not. We are trying to share regularly information about the park and new discoveries around the city.

Local news media, social media (Facebook etc), and the museum presentations are the best channels to reach the people interested about history and archaeology. Putting the National Museum of Unification Alba Iulia cultural authority brand alongside an event, the public knows that everything is treated as historically correct as possible. Nowadays, using digital promotion we manage to attract new people to see our projects, 3D scans, VR products etc, the young generation especially is embracing it. The social media page of the museum is actively sharing it.

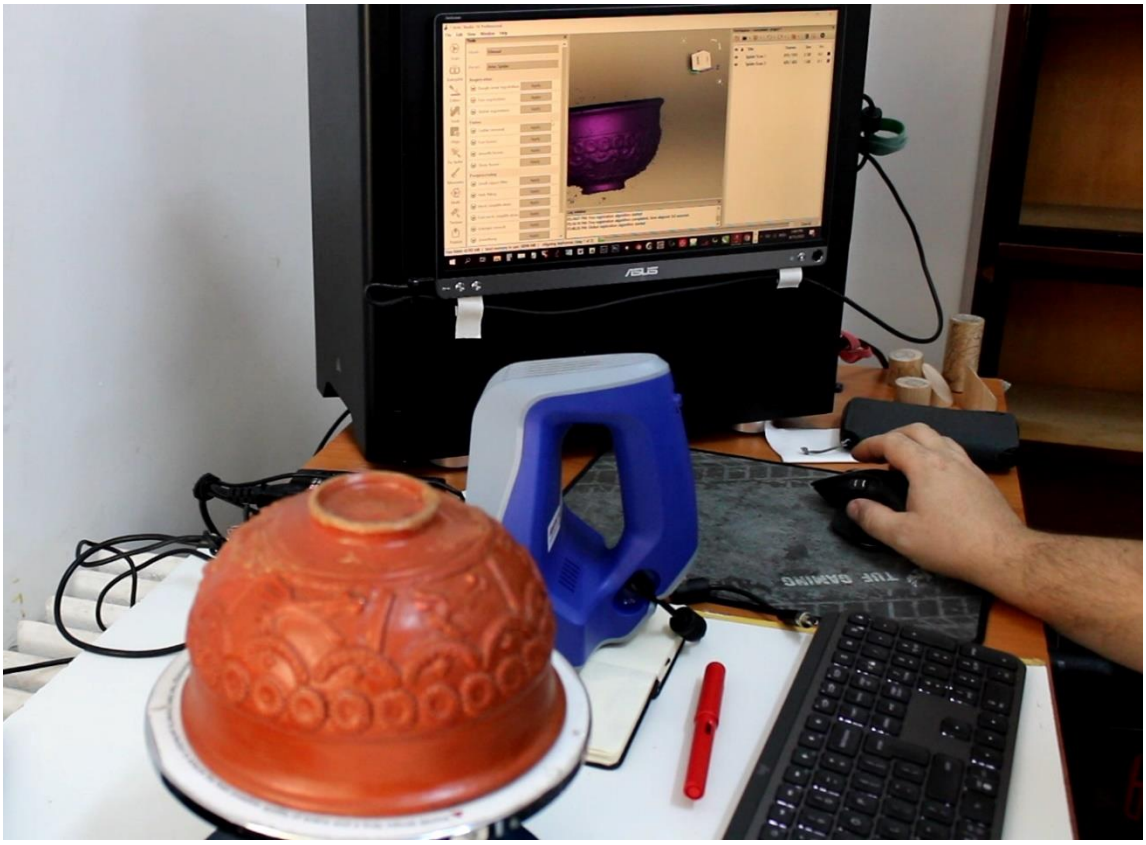
Digital promotion will consist in a 3D scanned virtual collection of Roman artefacts and excavations from the civilian environment of Apulum, available at https://sketchfab.com/MNUAI

4.6.1 The 3D artifacs scanning process:

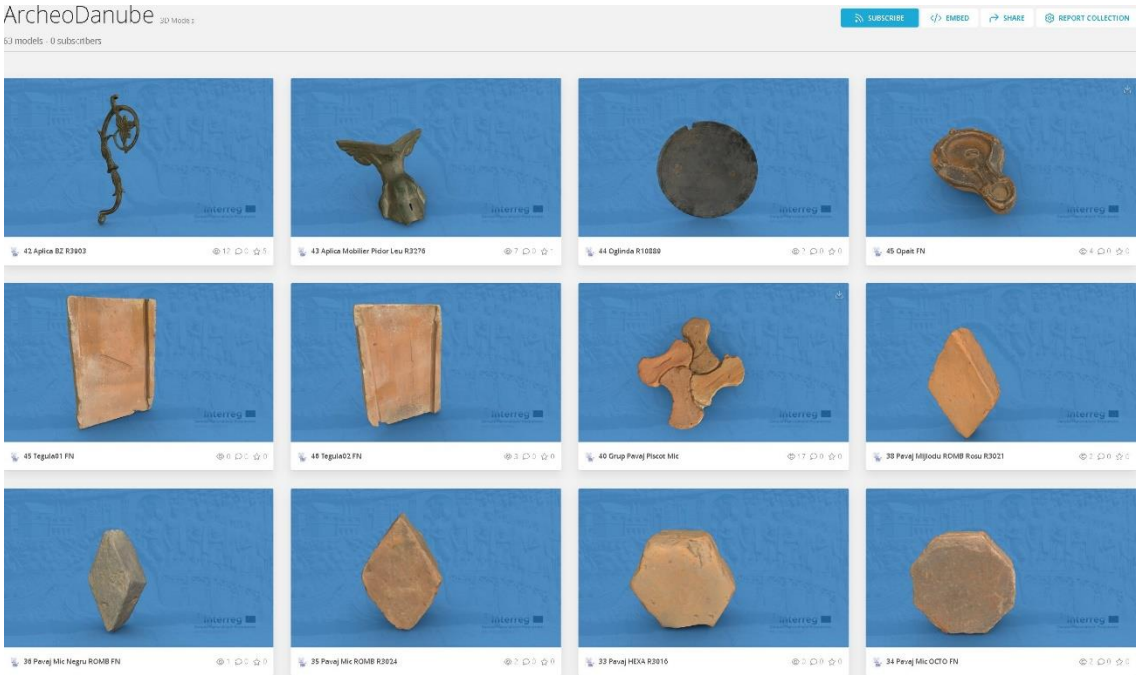
The precision of the used system, the Artec SpaceSpider scanner, is of metrological order, down to 0.1 mm, the generated 3D patterns being used in both applications of virtual museum type and detailed analysis of researched surfaces, high precision measurements etc, followed by the export of 3D models in the usual formats (*.OBJ și *.STL etc).

The projection of a complex network of light strips using laser projectors, allows registration of a very high amount of data regarding the object's surface, with remarkable accuracy and in a short period of time (Point clouds).

Thus, detailed information is collected on the geometry, volume, color and texture of the surfaces of an object without any effective contact, the result consisting in a graphic, digital rendering of their three-dimensional physical structure, a virtual surrogate.



The created 3D models are exported in the usual formats, (*.OBJ and *.STL etc) and uploaded to the MNUAI Sketchfab collection.



https://sketchfab.com/MNUAI

Currently, over 60 scanned models of artifacts discovered at Apulum alongside the photogrammetric scan of the site, are available at the address mentioned above.

Identifying the target audience:

The target audience is the local community and tourists of all ages and socio-economic backgrounds. However, our questionnaire identified the majority of curious people about the park. They have a university diploma at least and are aged 27-65. The average visit should last about an hour. Alba Iulia being a touristic city and having a significant role in Romania's history, visitors would come from the local area, schools, university students, tourists from the country at various national events and international tourists during the warmer seasons during the year.

We are trying to facilitate easy access to Roman heritage for the general public. Our concept of archaeological park sets out to answer a specific need to optimize the degree of public interaction with the archaeological environment, bringing into use new ways to exhibit, based exclusively on the latest technologies available, from 3D scanning to VR tools. The digital tools are very useful towards interactivity and diffusion.

Students and teachers

Refers to the increasing need for continuous education and informational input. The concept aims to highlight historical values in presentations and workshops for/with students, but also by organizing thematic exhibitions within the archaeological park using didactic tools.

Specialists and researchers

Also, the informational support of the exhibition and the activities within the archaeological park will be provided by specialists in the field of ancient history and archeology. Facilitating direct access to scientific information, 3D digital technology and archaeological results.

4.6.2 3D and DOMUS VR reconstruction

For communication and promotion of the importance of the site, a VR experience was created and consists of:

Visuals:

The Roman Domus type of house is reproduced in 1:1 scale with missing walls being reconstructed based on other Roman *domus* type house plans. (**ANNEX 2 and 3**)

For navigation, a player character is used that can walk and explore around the house and surroundings in a 3rd person perspective.

3D Modelling, texturing, sculpting and rendering are used for assets such as structures and various models.

Details - Paintings and pavement based on evidence found on the site will be represented

- The 3D scanned artefacts found on the site

- Trees and vegetation, used for immersion

- Thematic Music

A web version will be available in Google Chrome and Firefox browsers on Windows 10 and 11.

On the VR headsets (Oculus Rift 2) the experience should be similar, with VR basic controls.

Controls

Keyboard:

W and UP arrow –moving forward

S and DOWN arrow – moving backwards

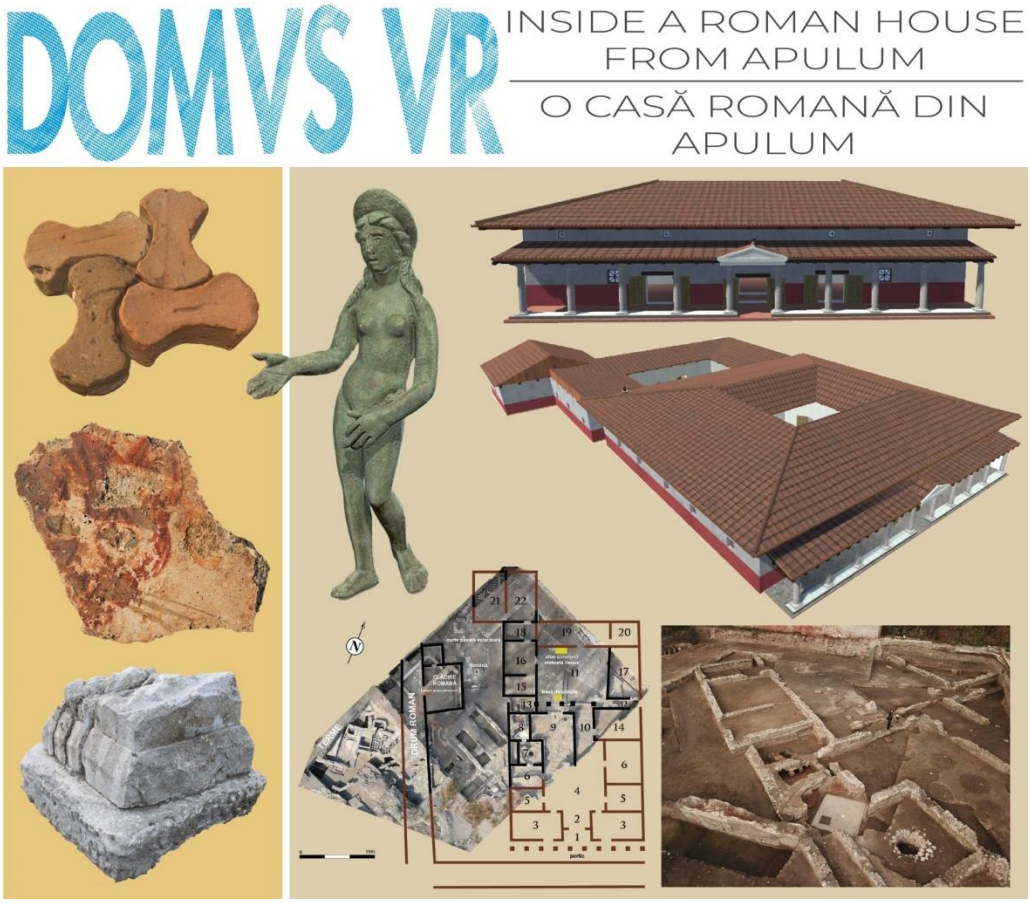
A and LEFT arrow – moving left

D and RIGHT arrow –Moving right

LEFT SHIFT – run

SPACE – jump

Mouse: Right Mouse Button / Left Mouse Button – Rotate camera and rotate character
Mouse wheel up/down – zoom in/out



Poster of the pilot event with 3D reconstruction of the Apulum *domus*

Picture from the DOMUS VR Pilot action

The VR interactive part provides for the use of several sets of VR headsets type OCULUS Quest 2.

The headsets are easy to use, the VR content is pre-installed and they have a small charging station.

Also, in the area where the headsets are used, a Mini Clean Box UVC LED light disinfector with dimensions of 326 X 343 X 432mm was present.

The Romans standardized their architectural elements, household objects, so they looked the same throughout the empire. Most organic artefacts from wood or fabrics could not be preserved so we used the remaining paintings (ex. Pompeii) to learn about these objects. Being placed next to people, we were able to find out their size through the technique of proportions. Apulum also had the same architectural elements as the rest of the Roman world. Thus, shape and dimensions were taken from buildings and paintings preserved within the Roman empire. The program has three parts:

Architecture

Based on the archeologists domus-house plan and photogrammetric scanning of the foundations, the walls were erected on a 1:1 scale with 2-3cm precision. The height of the walls is between 3.5 – 4 m, for a 1.7 m man. This was the proportion at Pompeii as well. Because painted plaster was discovered on site, part of the walls are covered with floral and geometric patterns, common in the Roman world.

The meaning of each room was found out by comparisons with similar plans from the Roman world (Carnuntum, Pompeii, etc.) and it was established by the team of archaeologists (**ANNEX 2**). The roof was built similar to those in Pompeii, or described by Vitruvius. The major difference was that the examples above are for the Mediterranean climate, not the harsh winters of the Dacian territory. Thus, the roof of the Domus Romana in Apulum must had a large slope to allow snow to fall. Otherwise, the snow that can weigh several tons would collapse the roof. Nowadays in modern Alba Iulia, all the old buildings have a pointed roof, to not accumulate snow.

Furnishing the rooms

After establishing the use of each room, it was time to furnish them. The pieces of furniture were reconstructed by scanning, or for the simplest ones by 3D modelling. Their shape is present in the paintings of many Roman houses. The pottery was similarly digitally reconstructed.

Roman clothing

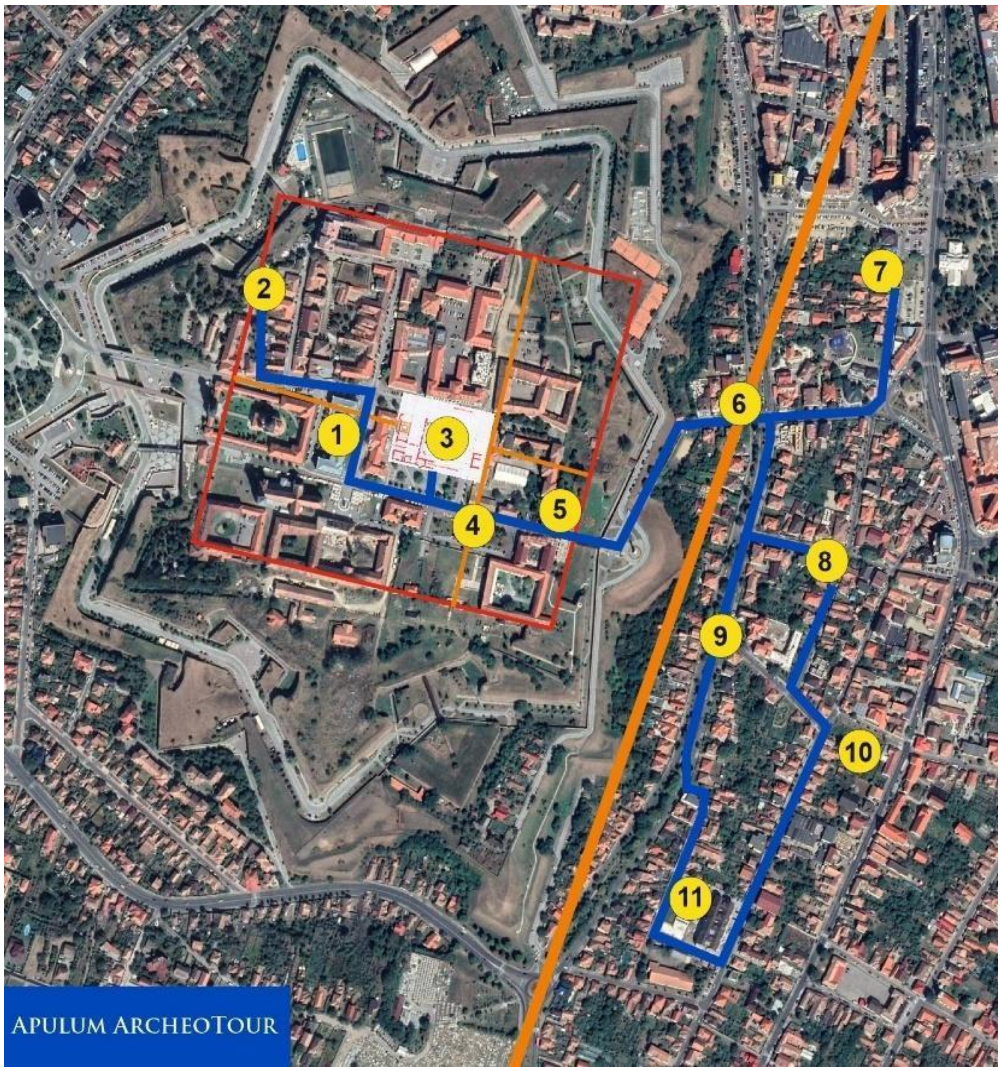
An attempt was made to create characters relevant to the Roman world: the patron of the house, the matron, the maid, the cartman, servants. The model of the clothes is taken from Pompeii. Each character is animated and stationary, apart from the user character, who moves according to the commands received.

4.7 Networking and integration with other local and regional archaeological / cultural attractions

APULUM ARCHEOTOUR

We aim to integrate the newly created archaeological park in an archeotouristic circuit that would include a route along the Roman imperial road (N-S), in the eastern entrance area of the Roman city, near the XIII Gemina Legion fortress. The archeotouristic route will include a series of archeologically researched points, where Roman remains have been discovered and which will benefit from a conservation-restoration project. Regionally we can expand this idea to the closest cities that have Roman ruins such as Potaissa (Turda), Napoca (Cluj-Napoca), Ampelum(Zlatna).

A map with the main archaeological related objectives was imagined, building a natural tour around the old part of the city, so walking around is pleasant, traffic not being that heavy in that area. Restaurants and coffee shops are around providing tourists the comfort they need in a cultural trip.



1.The National Museum of the Unification Alba Iulia – The permanent exhibition.

2.Museikon – the western wall of the Roman fortress (preserved *in situ*).

3.The Principia Museum – with preserved areas of the XIII th Gemina Legion headquarters.

4.*Via Principalis* - the main road in the camp that connected the southern gate with the northern gate (already restored)

5.The military baths (thermae) inside the Roman Fortress.

6.The Roman Imperial Road – *Cardo Maximus* (N-S).

7.Roman house (museal space and restored Roman remains).

8.Roman roads and buildings (house).

9.The Archaeological Promenade – a series of Roman remains presented to the public along a green promenade area.

10.*Praetorium Consularis* - The Palace of the Roman governors.

11.**APULUM DOMUS-THERMAE ARCHAEOLOGICAL PARK**

5. Implementation and maintenance

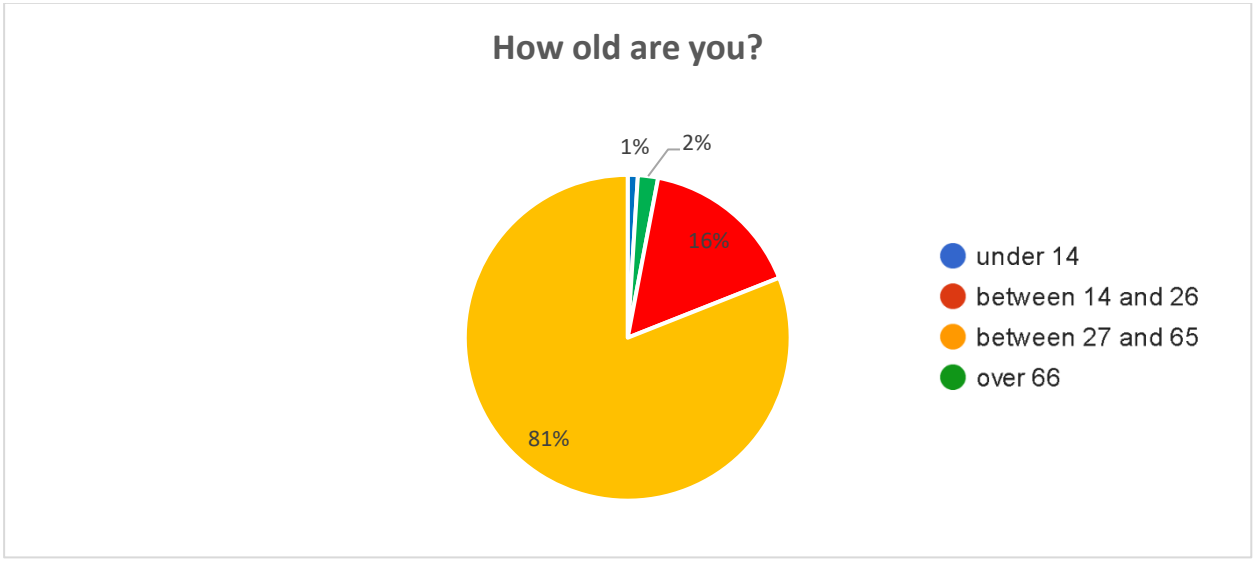
Design and implementation costs will include all the park infrastructure and landscaping works, the specialist's costs, staff, equipment, materials and consumables. Maintenance will consist of utilities costs and staff salaries.

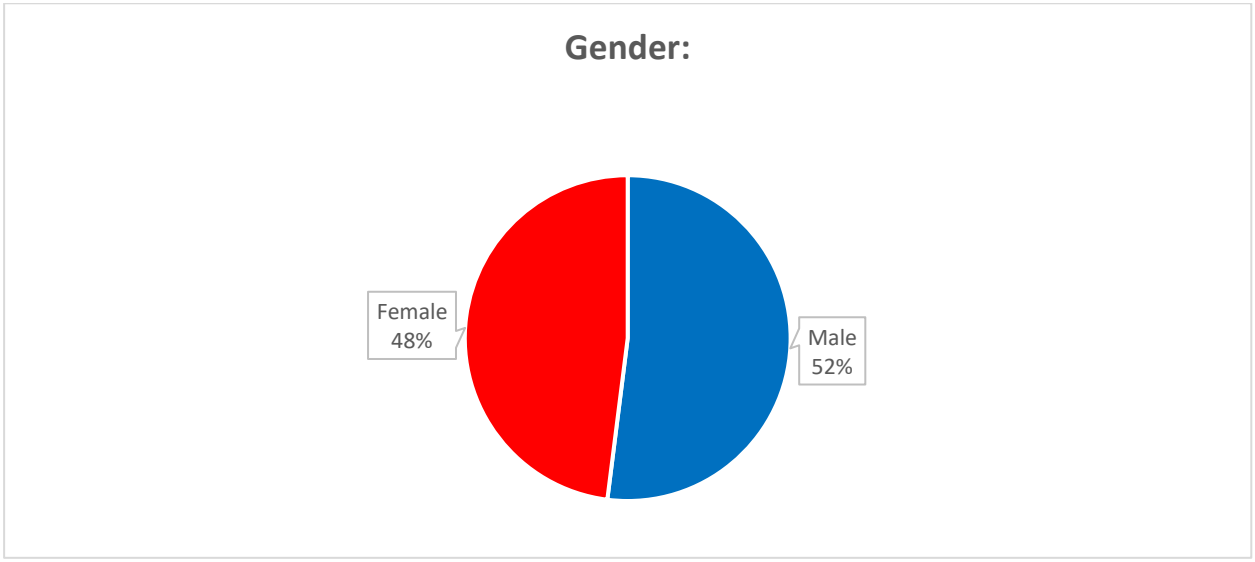
ESTIMATED DURATION OF EXECUTION OF THE INVESTMENT OBJECTIVE, EXPRESSED IN MONTHS The effective period of the project entitled: URBAN ARCHAEOLOGICAL PARK – DOMUS–THERMAE AREA will be 34 months from the signing of the order to start the works, of which the design period for all phases will be of 10 months, and the execution period will be 24 months.

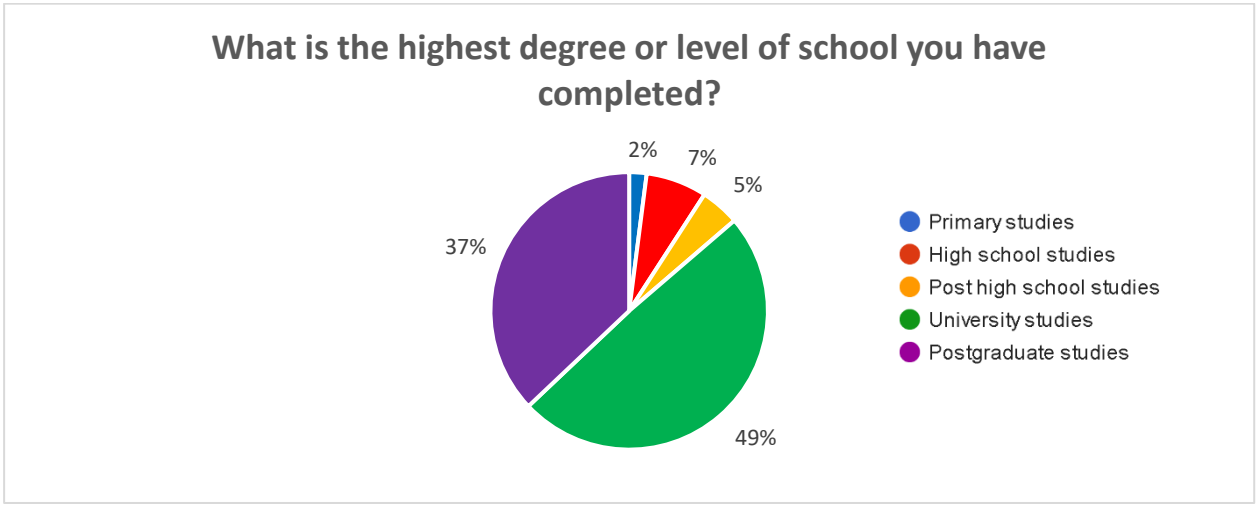
For the phasing of costs by work phases, see ANNEX 4.

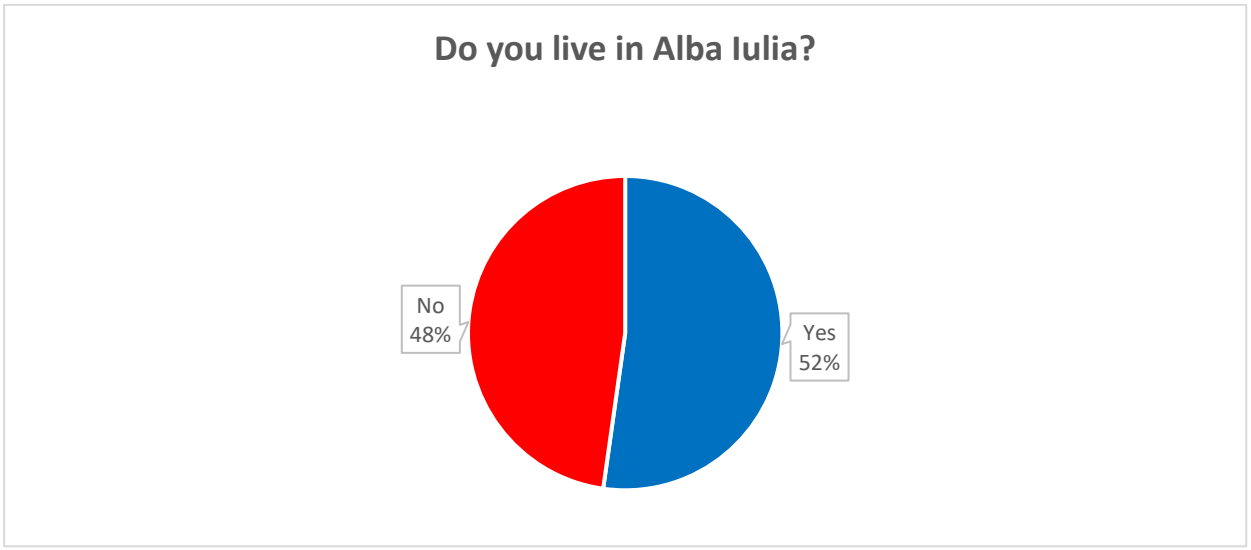
ANNEX I

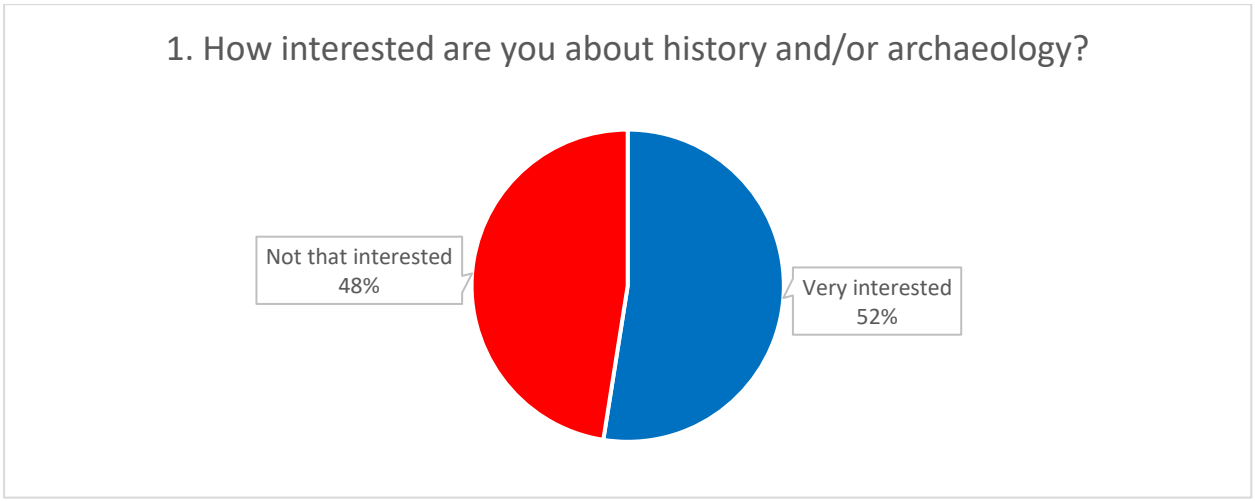
Questionnaire: An archaeological park in Alba Iulia result charts (200 respondents)





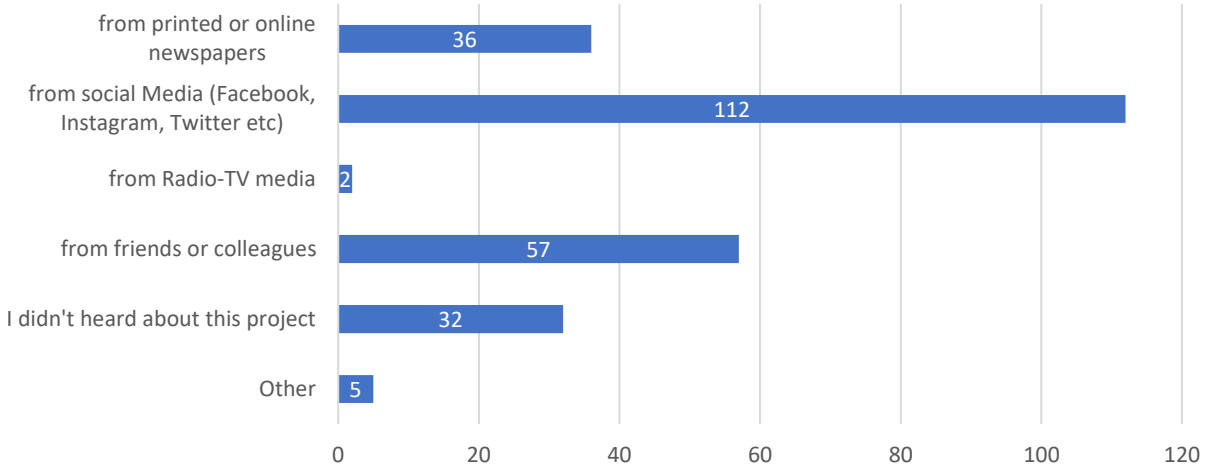



Do you live in Alba Iulia?
No
48%
Yes
52%

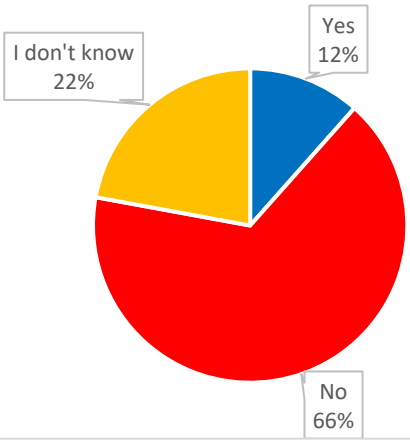

1. How interested are you about history and/or archaeology?
Not that interested
48%
Very interested
52%


2. Have you ever visited an archaeological park?
No
21%
Yes
79%

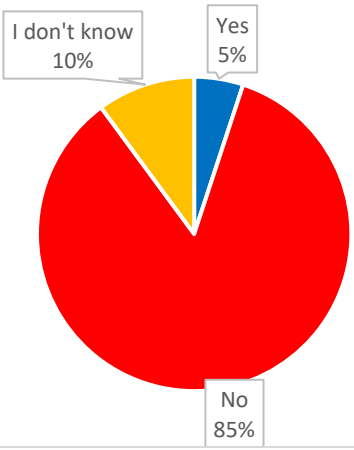
3. Have you heard about the ***ArcheoDanube*** project and the initiative to build an urban archaeological park in Alba Iulia? If yes, then please specify the source(s).



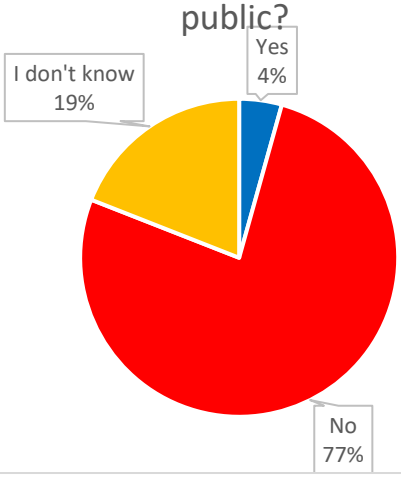
4. Do you think that the residents of Alba Iulia have enough information about the Roman site Apulum?



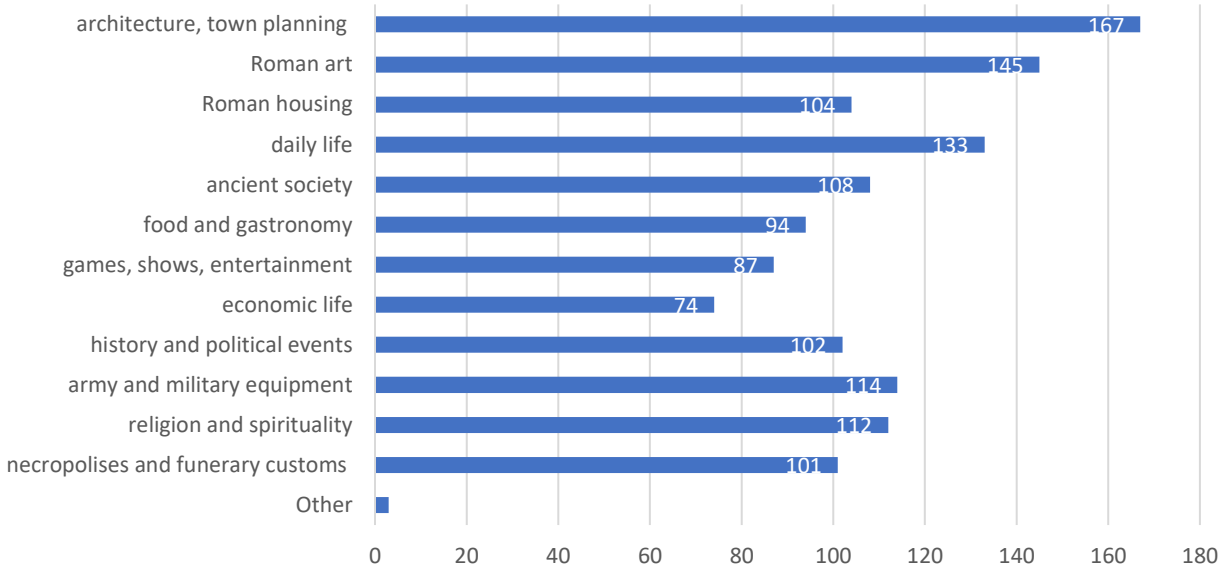
5. Do you think that the general public has enough information about the national archaeological heritage?



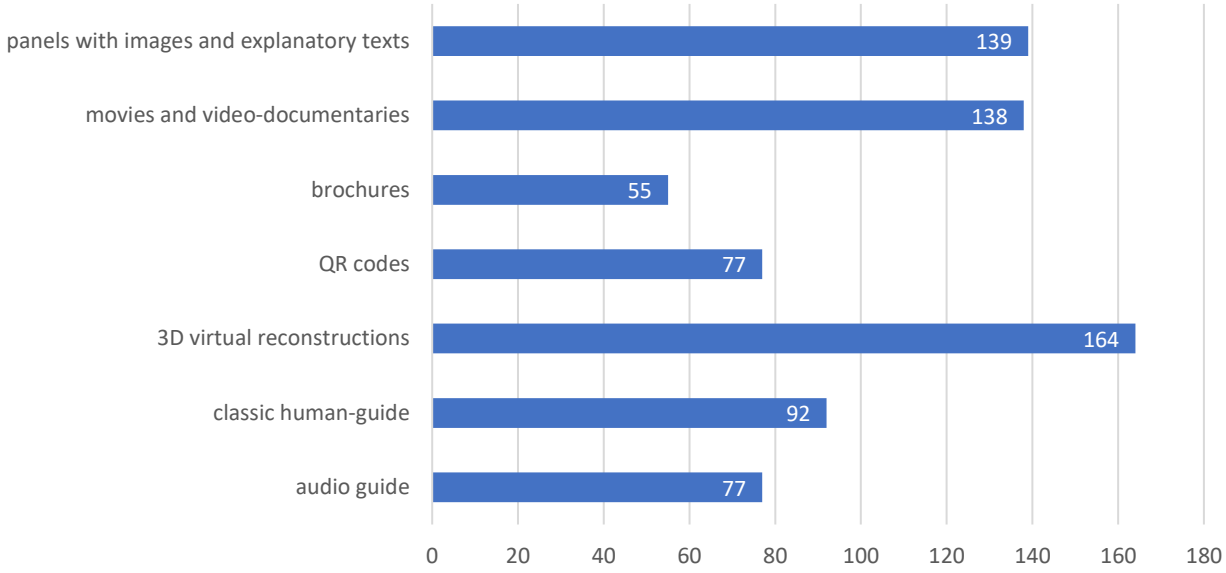
6. Do you consider that the results of archaeological research in Romania are sufficiently promoted and accessible to the general public?



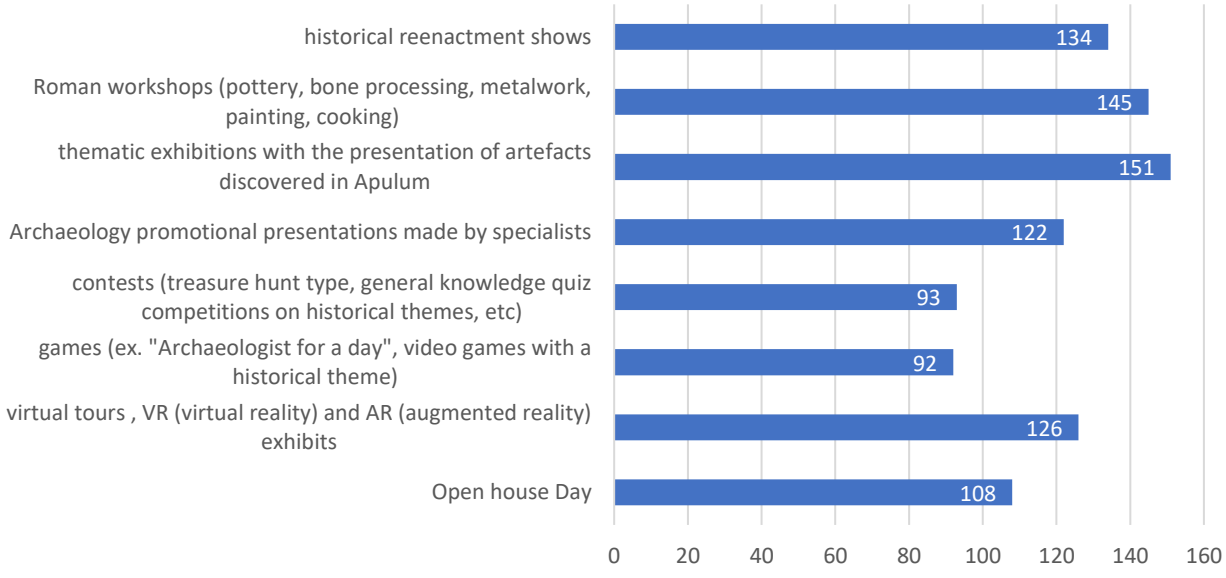
7. Which aspects of Roman culture and civilization would particularly interest you and would you like to see in the Domus-Thermae archaeological park? (you can choose multiple answers)



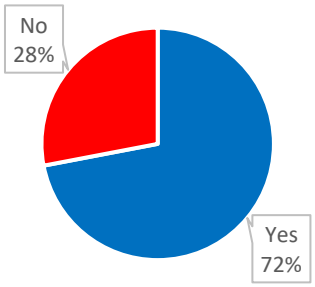
8. How would you prefer the information to be presented within the future ***Domus-Thermae*** archaeological park? (you can choose multiple answers)



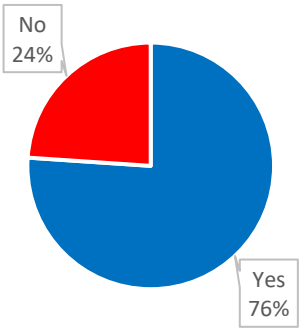
9. What kind of interactive activities would you like to be organized within the archeological park? (you can choose multiple answers)



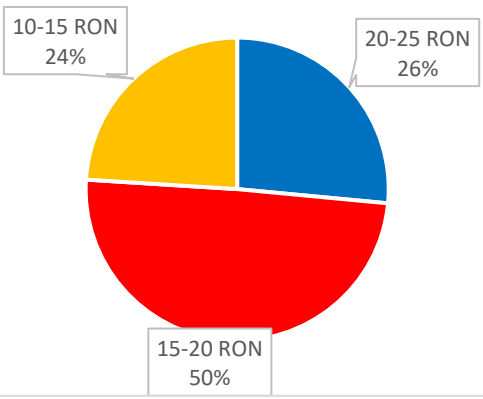
10. Would you participate as a volunteer in the cultural events and interactive activities organized within the **Domus-Thermae** archaeological park?



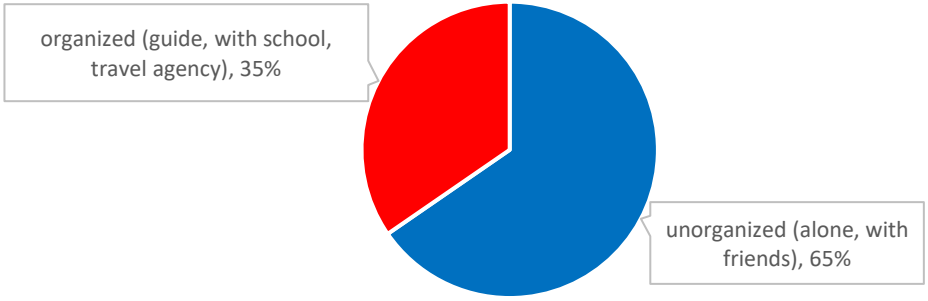
11. Would you like a souvenir shop to be set up within the ***Domus-Thermae*** archaeological park?



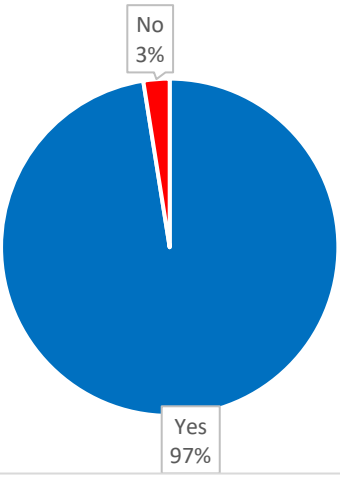
12. What amount of money do you think it should be set for the visitation fee (1 ticket/adult) to ensure the functionality and maintenance of the archaeological park?



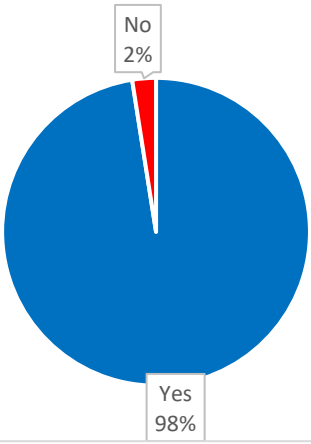
13. How would you prefer to visit the ***Domus-Thermae*** Archaeological Park?



14. Apulum is the largest Roman site in the province of Dacia and one of the most important in Romania, being declared a priority area of archaeological interest. The remains of the Roman era discovered here could be capitalized by setting up an urban ar



15. Do you agree with the statement "the archaeological heritage of Alba Iulia (Apulum Archaeological Site) must be protected, valued and included in a touristic circuit"?



ANNEX 2

Domus-Thermae plan

ANNEX 3

Apulum *Domus* vs. a typical *domus* type of Roman house

Bibliography

A. Cserni, Apulumi Maradványok I-IV, Alba Iulia, 1888.

Cronica Cercetărilor Arheologice din România; Raport preliminar de cercetare arheologică privind şantierul Alba Iulia . Str. Muneteniei, nr. 15-17 (sediul guvernatorului consular al celor trei Dacii), Patrimonim Apulense, 2, 2002, p.131-133.

R. Ota, De la canabele legiunii a XIII-a Gemina la Municipium Septimium Apulense, Alba Iulia, 2012.

Al. Diaconescu, I. Piso, Apulum, în La Politique édilitaire dans les provinces de l'empire romain, Actes du 1 er colloque roumano-suisse, Deva,1991; Cluj-Napoca, 1993, p. 67-83.

R. Ardevan, Viaţa municipală în Dacia romană, Timişoara,1998.

V. Moga, Castrul roman de la Apulum, Cluj-Napoca, 1998.

T. Goronea, Fortificaţia bastionară de tip Vauban de la Alba Iulia (prima jumătate a secolului al XVIII-lea), Alba Iulia, 2007.

ANNEX 4

DEVIZ GENERAL ORIENTATIV
privind investiția
"PARC ARHEOLOGIC URBAN – ZONA DOMUS–THERMAE" - faza PROIECT CONCEPTUAL

Octobrie 2022

Nr. crt.	Denumirea capitolelor si subcapitolelor de cheltuieli	Valoarea (fara TVA)	TVA	Valoarea (cu TVA)
		lei	lei	lei
1	2	3	4	5
CAPITOLUL 1				
Cheltuieli pentru obtinerea si amenajarea terenului				
1.1.	Obtinerea terenului			
1.2.	Amenajarea terenului			
1.3.	Amenajari pentru protectia mediului si aducerea terenului la starea initiala			
TOTAL CAPITOL 1				
CAPITOLUL 2				
Cheltuieli pentru asigurarea utilitatilor necesare obiectivului de investitii				
2.1.	Lucrări pentru asigurarea utilitatilor necesare utilitatilor necesare obiectivului– apa rece si canalizare			
2.2.	Lucrări pentru asigurarea utilitatilor necesare utilitatilor necesare obiectivului – electrice			
TOTAL CAPITOL 2.				
CAPITOLUL 3				
Cheltuieli pentru proiectare si asistenta tehnica				
3.1.	**Studii**	**10,000.000**	**1,900.000**	**11,900.000**
3.1.1	Studii de teren	10,000.000	1,900.000	11,900.000
3.1.2	Raport privind impactul asupra mediului			
3.1.3	Alte studii specifice			
3.2.	**Documentaţii - suport şi cheltuieli pentru obţinerea de avize, acorduri şi autorizaţii**			
3.2.1	Autorizatie pentru constructie			
3.2.2	Avize mediu, taxa timbru, e.t.c.			
3.3.	**Expertizare tehnică**			
3.3.1	Expertiza tehnica			
3.4.	**Certificarea performanţei energetice şi auditul energetic al clădirilor**			
3.4.1	Audit energetic			
3.5.	**Proiectare**	**340,000.00**	**64,600.00**	**404,600.00**
3.5.1	Temă de proiectare			
3.5.2	Studiu de fezabilitate/documentaţie de avizare a lucrărilor de intervenţii şi deviz general	*95,000.00*	18,050.00	113,050.00
3.5.3	Documentaţie pentru autorizarea lucrărilor de construire	*95,000.00*	18,050.00	113,050.00
3.5.4	Documentaţiile tehnice necesare în vederea obţinerii avizelor / acordurilor / autorizaţiilor	*10,000.00*	1,900.00	11,900.00
3.5.5	Verificarea tehnică de calitate a proiectului tehnic şi a detaliilor de execuţie	*10,000.00*	1,900.00	11,900.00
3.5.6	Proiect tehnic şi detalii de execuţie	*130,000.00*	24,700.00	154,700.00
3.6.	**Organizarea procedurilor de achizitie**			
3.7.	**Consultanta**			
3.7.1	Managementul de proiect pentru obiectivul de investiţii			
3.7.2	Auditul financiar			
3.8.	**Asistenta tehnica**	**190,425.00**	**36,180.75**	**226,605.75**
3.8.1	Asistenta tehnica din partea proiectantului	*95,212.50*	*18,090.38*	*113,302.88*
3.8.1.1	pe perioada de execuţie a lucrărilor	*95,212.50*	*18,090.38*	*113,302.88*
3.8.1.2	pentru participarea proiectantului la fazele incluse în programul de control al lucrărilor de execuţie, avizat de către Inspectoratul de Stat în Construcţii			
3.8.2	Dirigenţie de şantier	*95,212.50*	*18,090.38*	*113,302.88*
TOTAL CAPITOL 3		**540,425.00**	**102,680.75**	**643,105.75**
CAPITOLUL 4				
Cheltuieli pentru investitia de baza				
4.1.	**Constructii si instalatii**	**6,150,000.00**	**1,168,500.00**	**7,318,500.00**
4.2.	**Montaj utilaje, echipamente tehnologice şi funcţionale**	**100,000.00**	**19,000.00**	**119,000.00**
4.4.	**Utilaje, echipamente tehnologice şi funcţionale care nu necesită montaj şi echipamente de transport**	**100,000.00**	**19,000.00**	**119,000.00**
4.5.	**Dotari**	**150,000.00**		
4.6.	**Active necorporale**			
TOTAL CAPITOL 4		**6,500,000.00**	**1,235,000.00**	**7,735,000.00**
CAPITOLUL 5				
Alte cheltuieli				
5.1.	**Organizare de santier**	***97,500.00***	***18,525.00***	***116,025.00***
5.1.1.	Lucrari de constructii şi instalaţii aferente organizării de şantier	*97500.00*	*18525.00*	*116025.00*
5.1.2.	Cheltuieli conexe organizarii santierului			

Nr. crt.	Denumirea capitolelor si subcapitolelor de cheltuieli	Valoarea (fara TVA)	TVA	Valoarea (cu TVA)
		lei	lei	lei
1	2	3	4	5
5.2.	**Comisioane, cote, taxe, costul creditului**			
5.2.1	Comisioanele şi dobânzile aferente creditului băncii finanţatoare			
5.2.2	Cota aferentă ISC pentru controlul calităţii lucrărilor de construcţii (0.5% din C+M)			
5.2.3	Cota aferentă ISC pentru controlul statului în amenajarea teritoriului, urbanism şi pentru autorizarea lucrărilor de construcţii (0.1% din C+M)			
5.2.4	Cota aferentă Casei Sociale a Constructorilor - CSC (0.5% din C+M)			
5.2.5	Taxe pentru acorduri, avize conforme şi autorizaţia de construire/desfiinţare			
5.3.	**Cheltuieli diverse si neprevazute 10%**	***684,000.00***	***129,960.00***	***813,960.00***
5.4.	**Cheltuieli pentru informare şi publicitate**			
TOTAL CAPITOL 5		**781,500.00**	**148,485.00**	**929,985.00**
CAPITOLUL 6 Cheltuieli pentru probe tehnologice si teste				
6.1.	Pregatirea personalului de exploatare			
6.2.	Probe tehnologice			
TOTAL CAPITOL 6				

TOTAL GENERAL	**7,821,925.00**	**1,486,165.75**	**9,308,090.75**
din care: C+M	**6,347,500.00**	**1,206,025.00**	**7,553,525.00**

Data: octombrie 2022

Şef proiect
arh. Alina CUREA
Specialist M.C.C.

arh. Ștefan-Ovidiu NECHIMIȘ

Restaurator **Valentin ȘTEFAN**

Restaurator **Sidonia Petronela OLEA**