

# The River and Its Industrial Ghosts

Tallinn, Estonia

A Matter of Scale *Methods of Analysis and Imagination*  
Graduation Report

FOREWORD Tallinn is a city of varied landscapes. From the lake Ülemiste which provides the city its water, to the river Pirita as an important ecological asset, and Tallinn Bay that opens the city to the greater Baltic Sea. Various infrastructure and architecture of Tallinn are built to respond to these varied landscapes, forming a tangible dialogue between the landscape and the anthropocene.

This project delves into the exploration of one of these landscapes, albeit intangible today: there was once a river running from the lake to the sea, called the Härjapea. Its history

reveals the industrial roots of Tallinn in the past, but it also tells of its eventual demise – as industrialisation eventually polluted the river and was filled in. Traces of the river only exists in the urban form of Tallinn today, with some residual buildings from its industrial past and some residual landscapes in the form of topography.

Starting with an unused paper mill situated adjacent to the central business quarter of the city teeming with skyscrapers, the project looks into the reintroduction of the river and the reinterpretation of its exploitive industrial past.

# Table of Contents

01	Introduction	
	1.1	The architecture in Tallinn can be perceived to be reactionary to its landscape
		1.1.1 The forgotten river
		1.1.2 Traces of industrial ghosts
	1.2	Design assignment
	1.3	Relevance
	1.4	Design questions
	1.5	Scope
02	Approach	
	2.1	Theoretical framework
		2.1.1 The river
		2.1.2 The building
	2.2	Methodology
03	Results	
	3.1	Research and development
	3.2	Results
		3.2.1 River as path
		3.2.2 Ground as steps
		3.2.3 Designing with traces and gaps in existing sheds
		3.2.4 Mirroring the mill and house
04	Conclusions and Reflections	
	Appendix	
	References	
	Figures	

# 01

## Introduction

- 1.1 The architecture in Tallinn can be perceived to be reactionary to its landscape.
  - 1.1.1 The forgotten river.
  - 1.1.2 Traces of industrial ghosts.
- 1.2 Design assignment
- 1.3 Relevance
- 1.4 Design questions
- 1.5 Scope

"The architecture in Tallinn can be perceived as reactionary to its landscape."

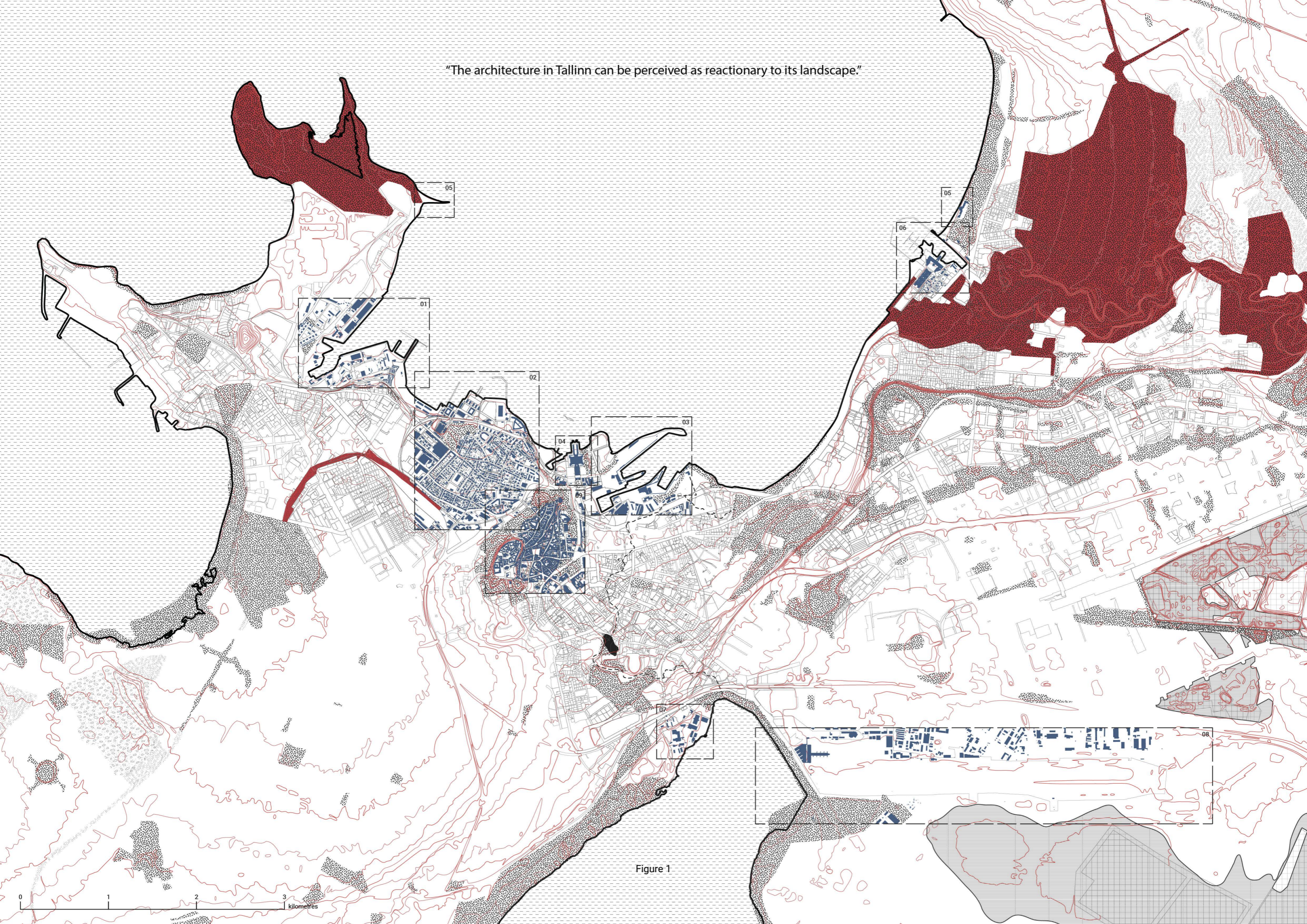


Figure 1

<i>landscape</i>	<i>function</i>	<i>anthropocene</i> <small>extractive ; restorative</small>
<b>sea</b>	leisure sailing fishing trading transport	beach marina, yachting centre fishing village <i>kalamaja</i> port harbour passenger terminal
<b>river</b>	sailing industry ecology	yachting centre mills nature reserve <i>pirita</i>
<b>lake</b>	drinking water transport	processing plant airport
<b>hill</b>	administration defence	parliament, palace <i>toompea</i> old town walls + towers
<b>limestone (klint)</b>	construction	quarry
<b>forest</b>	ecology	nature reserve pollinator highway

### 1.1 The architecture in Tallinn can be perceived to be reactionary to its landscape.

The graduation studio presents the thematic approach “A Matter of Scale” into the present urban context of Tallinn, Estonia.

The initial leading hypothesis was derived from an observation of its myriad of landscape conditions, in particular the presence of three prominent scales of water located in the city: river, lake, and sea. Thus, an initial interest of the subject matter was formed from the realisation that the architecture in Tallinn can be perceived to be reactionary to its landscape. A cataloguing and mapping exercise was done at a wider territorial scale to surface a perception of Tallinn revolved around its ground conditions. The more obvious examples supporting this statement would be the ferry passenger terminal built on the Tallinn Bay coast, or the airport which is located next to Lake Ülemiste – as it was originally used in 1928 as a ground for Finnish seaplanes<sup>1</sup>.

It can be noted that many of these anthropocentric reactions towards the landscape have been extractive, with more recent interventions taking a turn for the restorative via the designation of nature reserves and the curation of the newly-completed pollinator highway<sup>2</sup>.

Nevertheless, with new architectural projects always emerging in Tallinn, a city of many landmarks -- such as a new train terminal in the district of Ülemiste<sup>3</sup> and a new masterplan for residential blocks along the coastline<sup>4</sup> -- this project opens a line of enquiry into the relationship between landscape-context-anthropocene, and the role in which the architect plays within the lines of that relationship.

1  
Estonian World. (2021). *Pictures: Tallinn Airport through the ages*. <https://estonianworld.com/technology/pictures-tallinn-airport-through-the-ages/>

2  
Tallinn Euroopa roheline pealinn. (2023). *The pollinator highway. City's biodiverse green corridor*. <https://greentallinn.eu/en/flag-projects/the-pollinator-highway/>

3  
Rail Baltic Estonia. (2023). *Rail Baltica Ülemiste Joint Terminal*. <https://rbulemiste.ee/en/>

4  
Lynch, P. (2017). *Zaha Hadid Architects wins competition for Port of Tallinn masterplan in Estonia*. ArchDaily. <https://www.archdaily.com/878835/zaha-hadid-architects-wins-competition-for-port-of-tallinn-masterplan-in-estonia>

Figure 2



### 1.1.1 The forgotten river.

This lens then led to the realisation of the past presence of a river which once ran between Tallinn Bay and Lake Ülemiste, the Härjapea, which was what drove the independent contextual analysis for a few days during the excursion. Mapping was done to further support the qualitative observations obtained on site after several walks along the path of the former river.

The river also revealed the industrial history of Tallinn and the ways in which the Härjapea River became "lost" in the present-day due to industrial pollution, having little to no tangible evidence of this former river, with only its course traced in palimpsestic nature through parks, roads, and some residual buildings of that bygone industrial era on the surface.

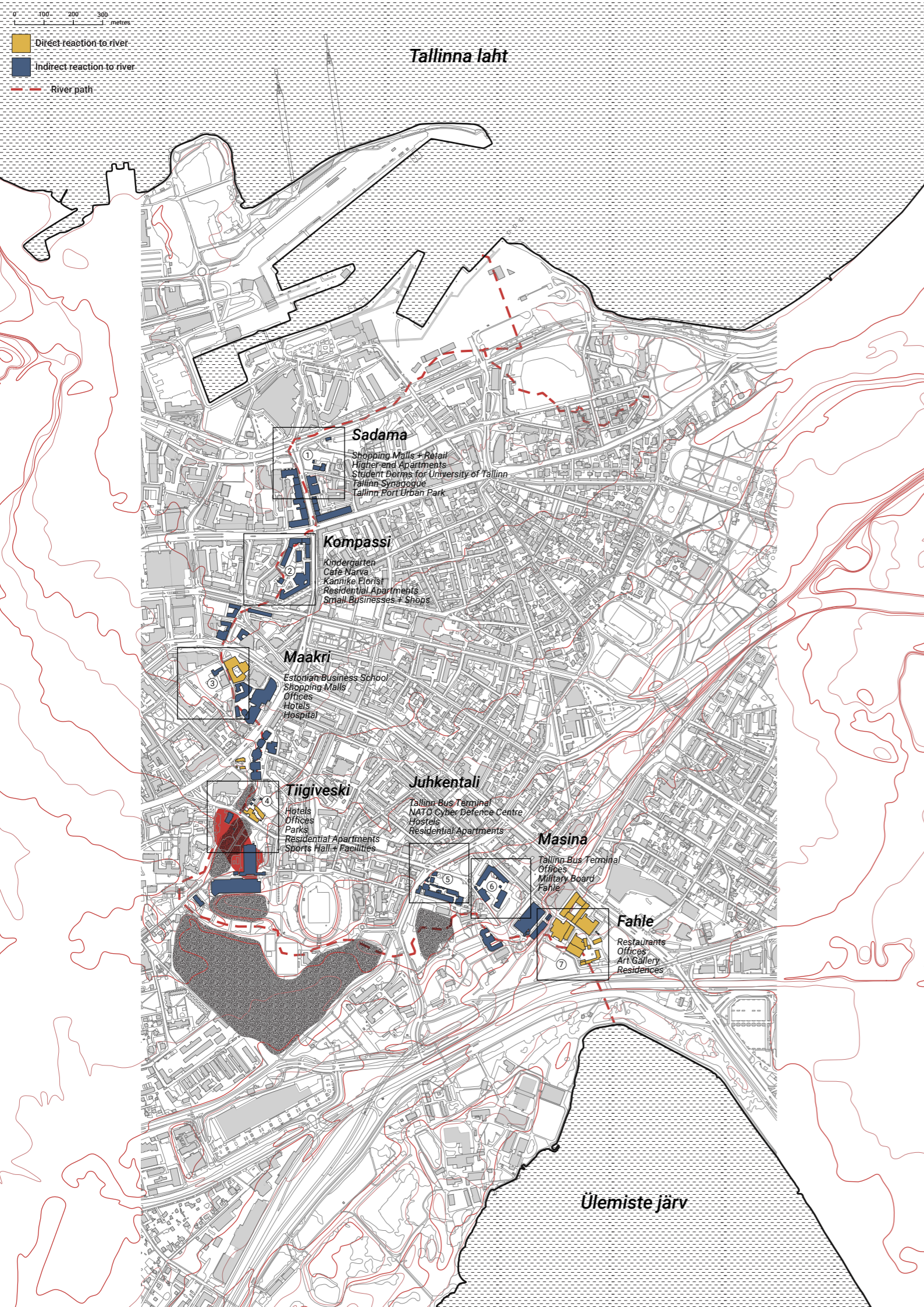
It can be observed that some parts of the city line up with the river – in particular the valley along the edge of the cemetery (now turned into tennis courts), Tiigiveski Park, along Maakri Street which continues onto Kivisilla Street – and, at the very least, it explains why Jõe (lit. "River") Street is named that. Little is perceptible of the river's presence along the route, save for some idle information boards for the transient passer-by.

The lines become blurred closer to Lake Ülemiste and Tallinn Bay. A main highway and railway run along the lake which makes following the route of the original river rather difficult, and streets do not go along the path until one reaches the cemetery. Towards the bay, one can walk along Reidi Street when emerging from Jõe Street to roughly approximately follow the path of the river, but whereabouts it once discharged into the sea is imperceptible.



Left: Figure 3  
Top: Figure 4

The course of the Härjapea River in Tallinn in the end of 19th century shown on a modern map. Course of the river based on Situationsplan der Stadt Reval, 1885.



### 1.1.2 Traces of industrial ghosts.

One recurring condition which emerged during the exploration of the river's path was the prevalence of old and seemingly abandoned buildings, and which the land attached to it had been turned into parking lots. It was an observation which was made sufficiently enough until it could emerge as a pattern: perhaps a pattern of "backyards" in the city. Thus, a rationale of using these parking lots as potential sites spurred the next mapping exercise. A shortlist of seven potential sites emerged, with short notes on their surrounding contexts.

There are some buildings which are evident traces of the river's industrial past, though -- one such example is Fahle, which was once a paper and cellulose mill factory<sup>5</sup>, now turned into a contemporary and bespoke residential-work-social complex designed -- and now houses -- local architecture firm KOKO Architects. A refurbished, reconstructed and preserved building along Maakri Street, Maakri 19/21, was once Grunwald's leather factory in the presence of the river and now oddly stands (out, jarringly) in the shadows of the soaring skyscrapers enveloped around it in Tallinn's primary business district.

With Tiigiveski Park once being the bank of the river which formed a small pond, a small cluster of buildings emerge directly opposite and next to the Arter quarter. Like Fahle, it was too once a paper mill situated right along the river<sup>6</sup>, albeit not nearly as huge and monumental as Fahle. Juhkentali 11 stands idly, unassuming.

5  
Neutra Capital AS. (2026).  
*Quarter with a historical character.*  
<https://fahle.ee/en/history/>

6  
Muinsuskaitseamet. (1999).  
*8735 Tiigiveski hoone, 14.-19. saj.*  
[Registry database]. Retrieved from  
Kultuurimälestiste registri.

Left: Figure 5



Figure 6

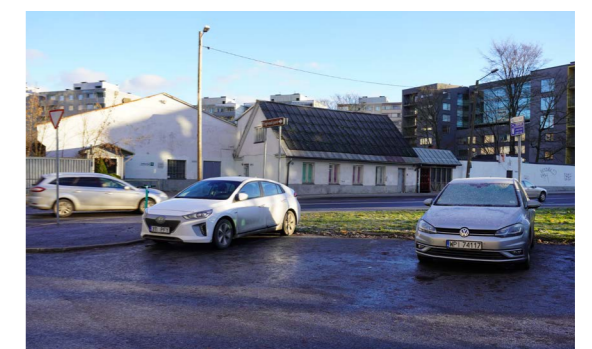


Figure 7



Figure 8



Figure 9



Figure 10

## 1.2 Design assignment.

This project acts upon a key problem statement:

Tallinn is building in ignorance of the history of the former River Härjapea.

This is derived primarily from the existing landscapes around Tallinn, in particular the traces of the former river and (the inherent lack of) common social memory attached to it. The built condition around the former riverbank of Härjapea (around Poolamagi and Tiigiveski parks, Fig.11-13, and the former paper mill of Juhkentali 11, Fig.8-10) seem haphazard and coincidental in nature, with some inferences to the former river but it is incredibly subtle.

## 1.3 Relevance.

*In the same way, we must learn to see the hidden forms in the vast sprawl of our cities. We are not accustomed to organizing and imaging an artificial environment on such a large scale; yet our activities are pushing us toward that end... In our vast metropolitan areas we do not connect the choir and the bells; like the Sherpa, we see only the sides of Everest and not the mountain.* (Lynch, 1960, p.12)<sup>7</sup>

The relevance of the project is multifaceted, but primarily deals with the topic of urban legibility. Late urban planner and author, Lynch (1960), equated the term with "imageability", going on to define it as "that quality in a physical object which gives it a high probability of evoking a strong image in any given observer (p.9)". The power of identification and distinction enriches the depth and intensity of perception, which affects one's experience in any city. If one were to relate the quote above to the context of Tallinn today, the lake and the sea are likened to the choir and the bells. The Härjapea River once connected two of the most prominent water bodies in Tallinn's natural setting; it also told the story of Tallinn's early industrial past until its eventual presumed obsolescence and yet its spine is still preserved in the bends of paths and scattered residual structures while the city merely builds around its predetermined framework.

Thus, this project aspires to highlight this hidden form – it aspires to, on one hand, reveal and resurface the presence of this forgotten river which had in past shaped the urban fabric of the city; on the other hand the project also serves to engage perceptions of space as people navigate through the city of Tallinn.



Figure 11

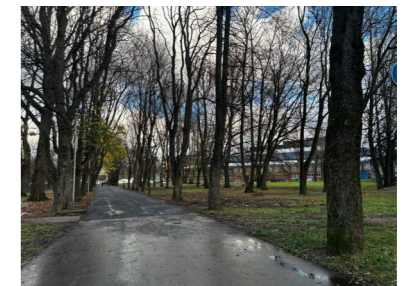


Figure 12



Figure 13

<sup>7</sup> Lynch, K. (1960). *The image of the city*. MIT Press.

As written by Macfarlane (2025, p.16,18)<sup>8</sup>, “Daylighting’ lets the water of buried streams meet the sun again. It is a means of bringing river ghosts back to life in towns and cities, of re-encountering rivers as friends and fellow citizens,” and “It is not that the city has bestowed life upon the river; rather that the river has enlivened the city.” Resurfacing the Härjapea and re-engaging with its historical impact in the present-day context can serve as a way of enriching the city of Tallinn, as referenced in a landscape architecture Master’s thesis by Raivet (2023)<sup>9</sup>, which argues that the river serves as an important urban spatial shape to preserve.

On an architectural and technical scale, the project aspires to:

- I Reintroduce the awareness of the Härjapea River into collective memory via spatial interventions.
- II Investigate the means in which existing buildings may be retrofitted and built upon with an acknowledgement of its historical relevance to the river and current landscape.
- III Spatially explore design interventions which may better engage with passing-by pedestrian(s) and introduce thresholds of spontaneous spaces that mediate between public and private spheres.
- IV Engage with themes of environmental and ecological justice due to its thematic relevance to water and the landscape.

Ultimately, this project deals with a topic that is profoundly intriguing due to its involvement of historical heritage and the natural environment, forming a unique intersection of two themes which are often viewed as exclusive binaries in the field as it currently stands. Furthermore, the subject matter being an intangible river articulates a further design challenge in this project: how should we design for a river which is no longer there? Despite its urban nature, the approach is conceived through a determined site at an architectural scale — forming the basis, or pilot, project of this nature, which could then extend into an invitation towards other suitable sites along the river in a speculative future.

<sup>8</sup> Macfarlane, R. (2025). *Is a river alive?*. W. W. Norton & Company.

<sup>9</sup> Raivet, L. K. (2023). *Transforming public space in a compact urban center: Case study of Tatari-Südalinna-Sibulaküla-Maakri-Kompassi subdistricts in Tallinn* [Master’s thesis, Estonian University of Life Sciences]. Estonian University of Life Sciences Repository. <http://hdl.handle.net/10492/8208>

#### 1.4 Design questions.

This project poses the following key design question:

How can the Härjapea River and its relevant historical building(s) be spatially and meaningfully reemerge and be reintroduced into the collective perception of Tallinn’s urban situation?

Some sub-questions which emerge include:

- I How can the Härjapea River be daylighted and reintegrated in the present-day urban context?
- II How can abandoned existing buildings of the river’s industrial past be adapted and altered to engage with the present urban context?

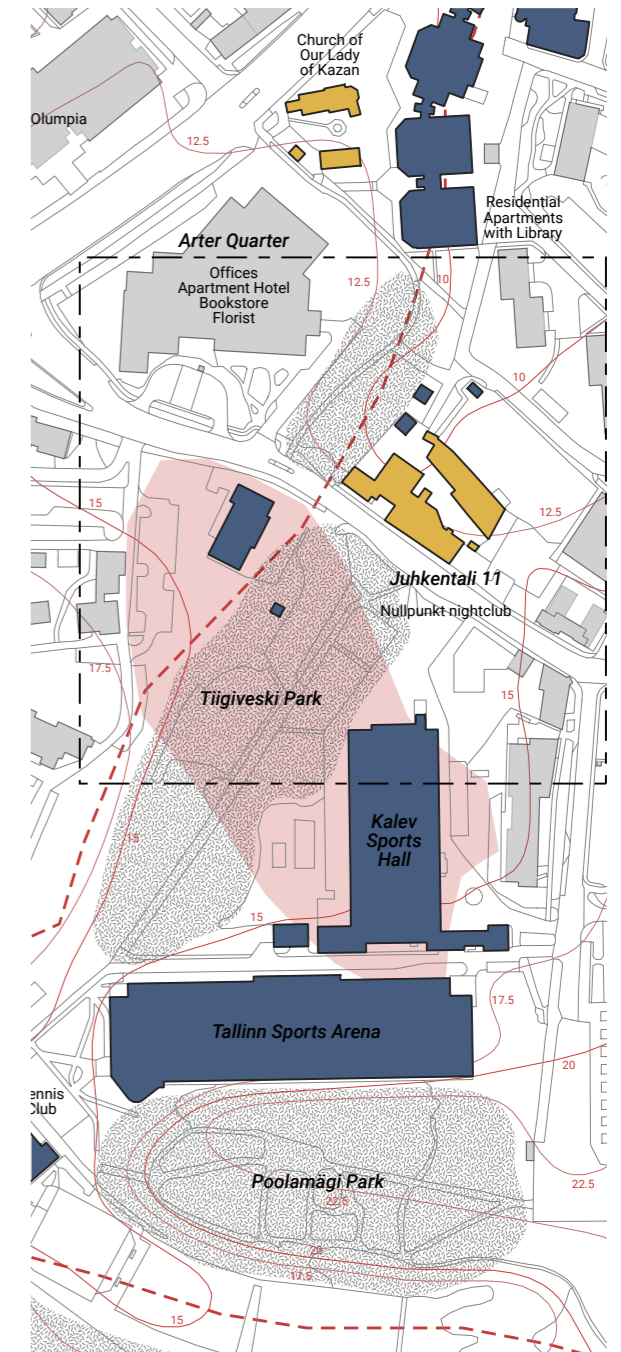


Figure 14

## 1.5 Scope.

Upon engaging with fieldwork and preliminary investigation, it was deduced that the most relevant site for the project would be the historic water mill buildings situated at Juhkentali 11, which directly faces the bed of the former river which once formed a pond, Tiigiveski Park, alongside Arteri Park, which still reveals the topography of the river in its present state. The site was selected due to its historical relevance, as it is one of the few remaining mill buildings that is still preserved but the only known case which has yet to be adapted to contemporary use. The topographical conditions of the site become a design opportunity too because the original ground conditions of the river are still preserved at the site.

The site thus becomes a suitable ground to consider the possibility of daylighting the river in deliberate extents, whilst also re-activating both the river as a public space and the mill buildings for present use.

In terms of programme, the project reflects on the historical context of the site. The relationship between the river and the mills were borne out of an extractive past. With industrialisation and means of human production, the river eventually succumbed to pollution. The Tiigiveski mill itself was, historically, once a mill for grain and leather, but eventually most recently known to be a paper mill. Thus, the programme looks instead into acts of making as a means to counteract the historical industrial legacy of the subject matter.

Paper potentially becomes an interesting perspective to explore within the context of Estonia as according to Lumi (2025)<sup>10</sup>, Estonia produces over 100,000 tonnes of paper and cardboard waste per annum, which are mostly shipped to Lithuania and Finland, resulting to less than a tenth of that amount being recycled in Estonia.

Thus, the proposed programme of the project is for it to be a paper "re-making" hub, whereby it proposes that the site of the historical paper mill can be revived as a site that explores the potentials of paper and repurposes paper into other aspects. This programme can be fleshed out to the following aspects:

10

Lumi, L.J. (2025, June 30). *Estonia ships majority of recyclable paper waste to other countries*. Eesti Rahvusringhääling. <https://news.err.ee/1609733616/estonia-ships-majority-of-recyclable-paper-waste-to-other-countries>

### I Paper waste to be repurposed in crafts.

Including some workshop spaces and crafting rooms, paper waste is collected, processed into a pulp, and simply re-made into sheets of paper in a hands-on method, with a deckle and mould, or other hands-on crafts. Paper waste is repurposed to celebrate the art of human-made crafts, which could appeal to the varied demographic directly surrounding the site. The art of making could also expand into a few atelier spaces for the local creative scene, perhaps enabling local artists and makers to own their own makerspace-shop at the site.

Paper collection and sorting space  
Paper-making and crafting workshop  
Creative studios  
Ateliers for rent  
Collective events space (eg. for makers markets)

### II Paper waste to be repurposed in construction.

Paper waste can also be explored in its potentials in construction, which could be tested on-site with extensions to the existing building fabric or as functional furniture. This would entail a larger fabrication studio which ought to also include woodworking and metalworking as functions to support the act of building. Whilst practical, this can also serve a more educational purpose in teaching people about construction, circularity, and material lifespans.

Woodworking workshop  
Metalworking workshop  
Paper-construction fabrication workshop  
Classrooms  
Storage

### III Paper waste to be repurposed in gardens.

A large portion of the site exists as an empty parking lot. The project intends to regenerate the grey space into a green space, and paper waste could play a role in this as mulch, potting mix, seed starting, and vermicomposting. This practice could improve the biodiversity of the site and extend the existing park whilst promoting a practice of community gardening.

Community garden(s)  
Storage

# 02

## Approach

- 2.1 Theoretical framework
  - 2.1.1 The river
  - 2.1.2 The building
- 2.2 Methodology

## 2.1 Theoretical framework.

The project deals with the encounter between the River Härjapea, its industrial “reactions”, and the city. It argues for these key characters to be perceived as “traces” and “reactions”: the river being an erased trace of the city, and the industrial buildings being a direct reaction to the river which now propose an intriguing design question of how a contemporary intervention may respond to the existing building and landscape in its as-found condition. In 2023, an exhibition in Antwerp was held by the Flanders Architecture Institute entitled “AS FOUND: Experiments in Preservation”. It sought to highlight seven experimental directions in dealing with the “as-found”, arguing that a more diverse, holistic view on reading history alongside current challenges of spatial and material scarcity have propelled a renewed interest in reuse and transformation. These seven experimental directions emerge as: ensemble, void, reconfiguration, inside out, traces, mirror, and nuance; acknowledging that “there is no one-size-fits-all approach to transforming existing buildings” (De Caigny, Ertas & Plevoets, 2023, p.7)<sup>11</sup>. The diagram below (Fig.15) depicts the interrelationships of the existing natural and built entities of the site, and the aspects in which the design assignment “reacts”, calling for an experimental approach in designing the reaction that is both specialised yet forms a cohesive collective.

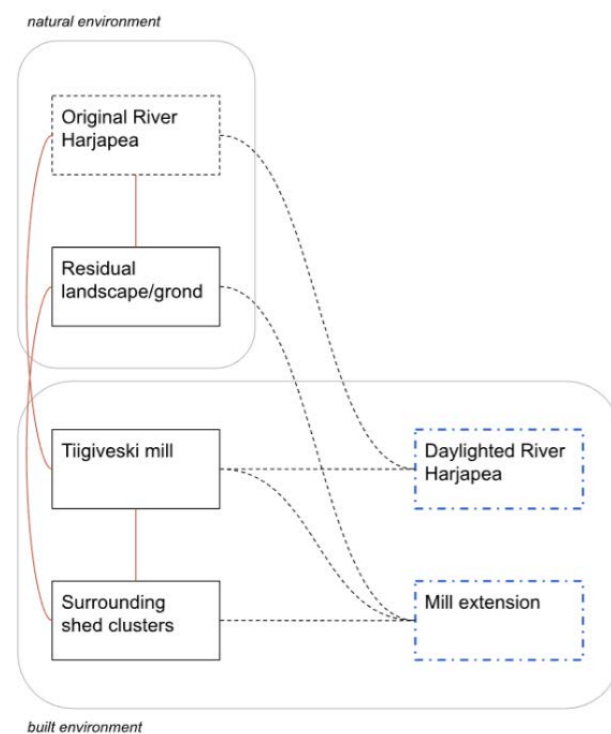


Figure 15

11  
De Caigny, S., Ertas, H. & Plevoets, B. (Eds.). (2023). *As found: Experiments in preservation*. Flanders Architecture Institute.

### 2.1.1 The river.

The general reaction towards River Harjapea is to daylight it, as a gesture of reinstating the river as a living entity in the spatial discourse of Tallinn. In *The Image of the City*, Lynch (1960) argued that an image of the environment is of importance in wayfinding, which deepens an individual's interpretation of the city and aids in forming connections and linkages otherwise unrecognised:

“In the process of way-finding, the strategic link is the environmental image, the generalized mental picture of the exterior physical world that is held by an individual. This image is the product both of immediate sensation and of the memory of past experience, and it is used to interpret information and to guide action. The need to recognize and pattern our surroundings is so crucial, and has such long roots in the past, that this image has wide practical and emotional importance to the individual.” (p.4)

When referring to an imageability, he also argued that it is not only a matter of making the object visible, but rather presented sensorially and experientially powerful, through the usage of cues. The most obvious visual cue would be to, of course, daylight the river, but this begs the question of how it might be further translated into other mediums, such as sound or touch. Some projects which are suitable as precedent studies include: De Nieuwe Mark located in Breda (NL), and the Charles River, in Massachusetts (US). These projects were selected for their scale, setting, and public integration. De Nieuwe Mark makes an interesting case study as besides daylighting the river to serve as a public space, its design of the quay walls also serve a multi-species purpose as they are specifically designed to be bioreceptive<sup>12</sup>. Meanwhile, for the Charles River, the stream was daylighted in the context of a park, and its strategy for biodiversity was through the implementation of wadi (stormwater retention gardens)<sup>13</sup>. Though, it is worth to note that Lynch also stressed on the importance of adaptability in the design of vivid environmental images: “The objective might be an imageable environment which is at the same time open-ended” (Lynch, 1960, p.139). The daylighting of the river ought to not be met with constrained and pre-determined programming.

Another cue to reinforce the presence of the new river is to utilise it as a circulation strategy, informing a spatial gesture in the design of the paper mill and its extension. A valuable precedent to observe is Sverre Fehn's Hedmark Museum located in Norway, whereby a continuous dialogue takes

12  
Landezine. (2025). *De Nieuwe Mark Breda – a new innovative nature-inclusive river in the city center by Stadsingenieurs Breda with ODC architecture and Studio Mars*. <https://landezine-award.com/de-nieuwe-mark-breda-a-new-innovative-nature-inclusive-river-in-the-city-center-by-stadsingenieurs-breda-with-odc-architecture-and-studio-mars/>

13  
Charles River Watershed Association. (2023, April 14). *All about daylighting & restoring streams* [Video]. YouTube. <https://www.youtube.com/watch?v=H1WDZIsYVQM>



Figure 16

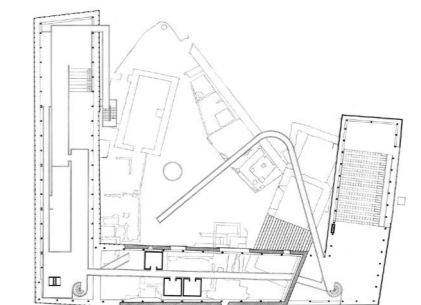


Figure 17

place between past and present, inside and outside through the construction of a simple concrete walkway that weaves through the building volumes. If the course of the river is to be physically materialised as a path, it reinforces the presence and the relationship between building and river, in which the building follows the river.

### 2.1.2 The building.

Calling into question the transformation approach for the former mill and its surrounding buildings, Van Cleempoel (2023)<sup>14</sup> suggested that traces ought to be viewed as starting points for design instead of archaeological fragments:

To see them as a possibility for something new, part of a design process, a creative contribution to a new project. Traces show a potential for the future rather than a citation of the past (p.101).

Traces, in this sense, takes on a suggestive identity and design becomes opportunistic, reactionary of the existing cues. Although the existing structures present themselves as awkward and arguably strange, one could perceive this as a potential strength in the site, as suggested by American project developer and writer, Stewart Brand (1994)<sup>15</sup>:

Another trait that invites longevity is strangeness. Almost any sufficiently odd building that has a modicum of functionality (hollow elephants seldom make it) will attract supportive community bemusement and a sequence of creative occupants (p. 216).

However, this provides only theoretical guidance of the spatial detail, whilst the question of extending the paper mill still remains unanswered. An extension as a strategy, in this particular setting, aims to consolidate and unify the ad-hoc and perhaps coincidental character of the site, whilst acknowledging the “main character” out of the building ensemble being the paper mill. De Caigny (2023)<sup>16</sup> thus argued that mirroring becomes a powerful strategy to echo homage, admiration, and recognition of the existing. She reinforced that the act of mirroring becomes meaningful because it deliberately places the architectural subject into an active dialogue on the site, however there ought to be a certain sensibility in the design of the mirror in order to avoid it becoming a meaningless copy. For this, she stated the following:

“The rebuilding of an existing work transcends scrupulous

14 Van Cleempoel, K. (2023). *Embracing Traces with a Designerly Gaze*. In De Caigny, S., Ertas, H. & Plevoets, B. (Eds.). (2023). *As found: Experiments in preservation* (pp.101-103). Flanders Architecture Institute.

15 Brand, S. (1995). *How buildings learn: What happens after they're built*. Penguin Books.

16 De Caigny, S. (2023). *L'architecture Et Son Double*. In De Caigny, S., Ertas, H. & Plevoets, B. (Eds.). (2023). *As found: Experiments in preservation* (pp.121-123). Flanders Architecture Institute.

adherence to the original. It requires adaptations to the context, both spatially and socially, the integration of new technologies and materials, and the programme may even make other demands.” (De Caigny, 2023, p.123)

In practice, a precedent comes to mind which aligns with the project’s ambitions. Take, for example, the Brussels-based architectural practice Ouest, who perceives the city as a palimpsest – their projects almost entirely focus on “the already there” (Strauven, 2025, p.6)<sup>17</sup>, with central themes of transformations and reuse. One of their ongoing projects, Ferme Maximilien-Sur-Senne<sup>18</sup>, plays a part in the larger urban-landscape project of the uncovering of the Serre River through Maximiliaan Park. Maximiliaan Farm presently sits in Maximiliaan Park. Ouest’s contribution is two-fold: 1) the transformation of the existing farmhouse sheds as a new neighbourhood node (Fig. 18 and 19), and 2) the relocation of Farm Maximiliaan to the opposite end of the park, where it is to be housed in an existing parking duplex made of concrete (Fig. 20). Mirroring and repetition becomes a strong architectural strategy in which Ouest takes on to carry out both aspects of the project. Within the existing farmhouse sheds, the two volumes are kept, connected and expanded via repetitive mirrored volumes which echo the scale and form of the existing sheds, with the new intervention using a different material palette to directly create a distinctive contrast between old and new. With the relocated farm, the odd and out-of-place concrete slab becomes a plinth to which a glasshouse nests atop. The formal and material logic of the gabled-roofed farmhouse shed is repeated in the new glasshouse volume, making the two separate sites relevant and related to one another.

17 Strauven, I. (Ed.). (2025). *Ouest: Urban legend*. Buchhandlung Walther König.

18 Ouest. (2020). *Ferme Maximilien-Sur-Senne*. <https://ouest.be/projet/max/>

19 Knaack, U., Bach, R. and Schabel, S. (2023). *Building with paper: Architecture and construction*. Birkhäuser Verlag GmbH.

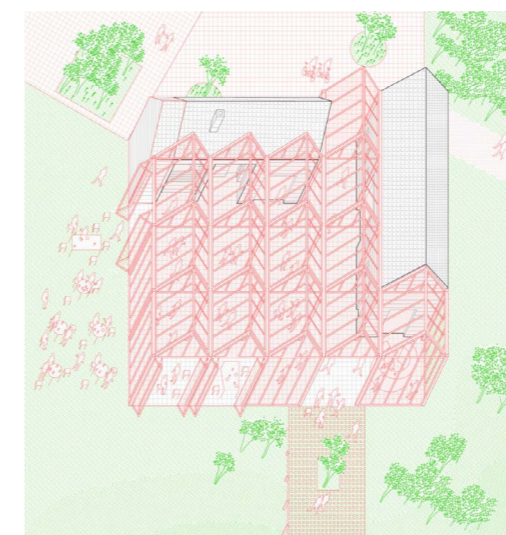


Figure 18



Figure 20



Figure 19

The opportunity to build upon the existing thus takes on a contemporary, perhaps innovative direction. With regards to the aforementioned proposed programming of the building, the design could take on a more experimental approach in construction via its use of paper, which reinforces the relevance of the material in the context of the historical mill. As a more practical framework, the project intends to refer to a book titled 'Building with Paper: Architecture and Construction' by Knaack, Bach, and Schabel (2023)<sup>19</sup>, which was built upon the research project of 'BAMP! - Building with paper' that is funded by the State of Hesse, Germany. The book focuses on the history of paper used in construction, material specificities, and numerous contemporary case studies featuring paper as a construction material. As Voet (2023) put it, "The combination of a material ecology and a design culture of circularity is the future of architecture" (as quoted by De Caigny, Ertas & Plevoets, 2023, p.160)<sup>20</sup>. Adopting paper as a material which plays a vital role in the design implementation thus acts as an anchor to both bridge the past and reel the mill out of obsolescence.

20  
 Voet, C. (2023). Challenges and Promises of the 'As Found'. In De Caigny, S., Ertas, H. & Plevoets, B. (Eds.). (2023). *As found: Experiments in preservation* (pp.159-169). Flanders Architecture Institute.

## 2.2 Methodology.

The project employs a research-by-design approach as is aligned with the studio. More specifically, the approach which will be employed is the use of hand-drawing and manual model-making in order to explore the project in its tactile extents. The use of hand-drawing enables the project to be explored in multi-dimensional mediums simultaneously, combining multiple explorations of various architectural projections such as plan, section, elevation, and axonometry.

Due to the natural topography affecting the nature of the site's construct, the project also looks into the practice of tracing as a method. It draws upon the existing ground, through which investigates how the site is nestled on the ground. Then the practice of iteration via repetitive tracing becomes a method of operation to test new ideas, forming a continuously expanding compendium of ideas. By using the practice of tracing as a core component of the project's process methodology, it ensures that the project iterates within the constraints of the-already-there, formulating a constant enquiry into how a designer may respond directly to the situated traces of the project site. The process itself thus becomes a dialogue between old and new ideas, with ideas that never truly get fleshed out in total, complete isolation.

The project can be phased out in the following preliminary schedule:

W2.1-2.2	Contextual analysis and site selection
W2.3-2.5	Formulation of design assignment
W2.6-2.7	Site analysis drawings
W2.8-2.10	Initial design iteration (A1)
W3.1-3.2	Internal spatial configuration and spatial relationships (thresholds)
W3.3-3.4	Paper construction
W3.5-3.6	Daylighting the Harjapea and water detailing in building
W3.7-3.8	Construction and connection details
W3.9	Improved design iteration (A2)
W3.10-4.2	Design finalisation
W4.3-4.6	Presentation preparation
W4.7-4.8	Greenlight presentation (A3)
W4.9-4.10	Public presentation (A4)

# 03

## Results

- 3.1 Research and development
- 3.2 Results
  - 3.2.1 River as path
  - 3.2.2 Ground as steps
  - 3.2.3 Designing with traces and gaps in existing sheds
  - 3.2.4 Mirroring the mill and house



Figure 21

### 3.1 Research and development.

The project undertakes the action of tracing as a way of working, which started off from the same grounded practice of physically tracing this past river along the existing urban setting of Tallinn. The practice of tracing led to a nuanced perspective of the city which had revealed itself beyond its tangible constraints. Thus, the act of tracing propelled the subsequent design inquiry moving forward.

With the site, Juhkentali 11, being a cluster of buildings situated on a site which still preserves the topography of the former river, the first act of tracing in this phase came with the site being translated into three dimensional form -- a physical model in scale 1:200, for an understanding of the building in relation to the ground which it rests on.

Based on this model, the next question revolved around the internal condition of the buildings. The model, with its volumetric and topographic reference, was traced into a series of speculative section drawings depicting this idea of "nestling" in the site. The material atmosphere of its existing courtyard condition was captured in the base drawing (Fig.22). Subsequent sections can only be so much as traced based on clues such as placements of fenestrations to indicate possible floor heights and internal lighting conditions (Fig.21).

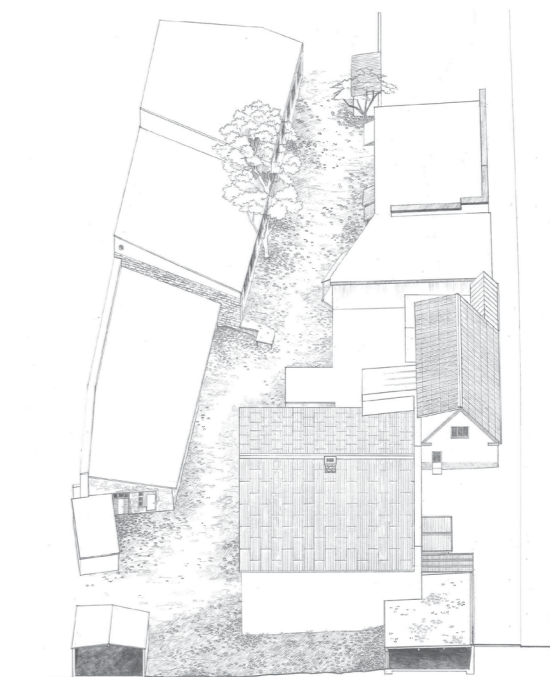


Figure 22

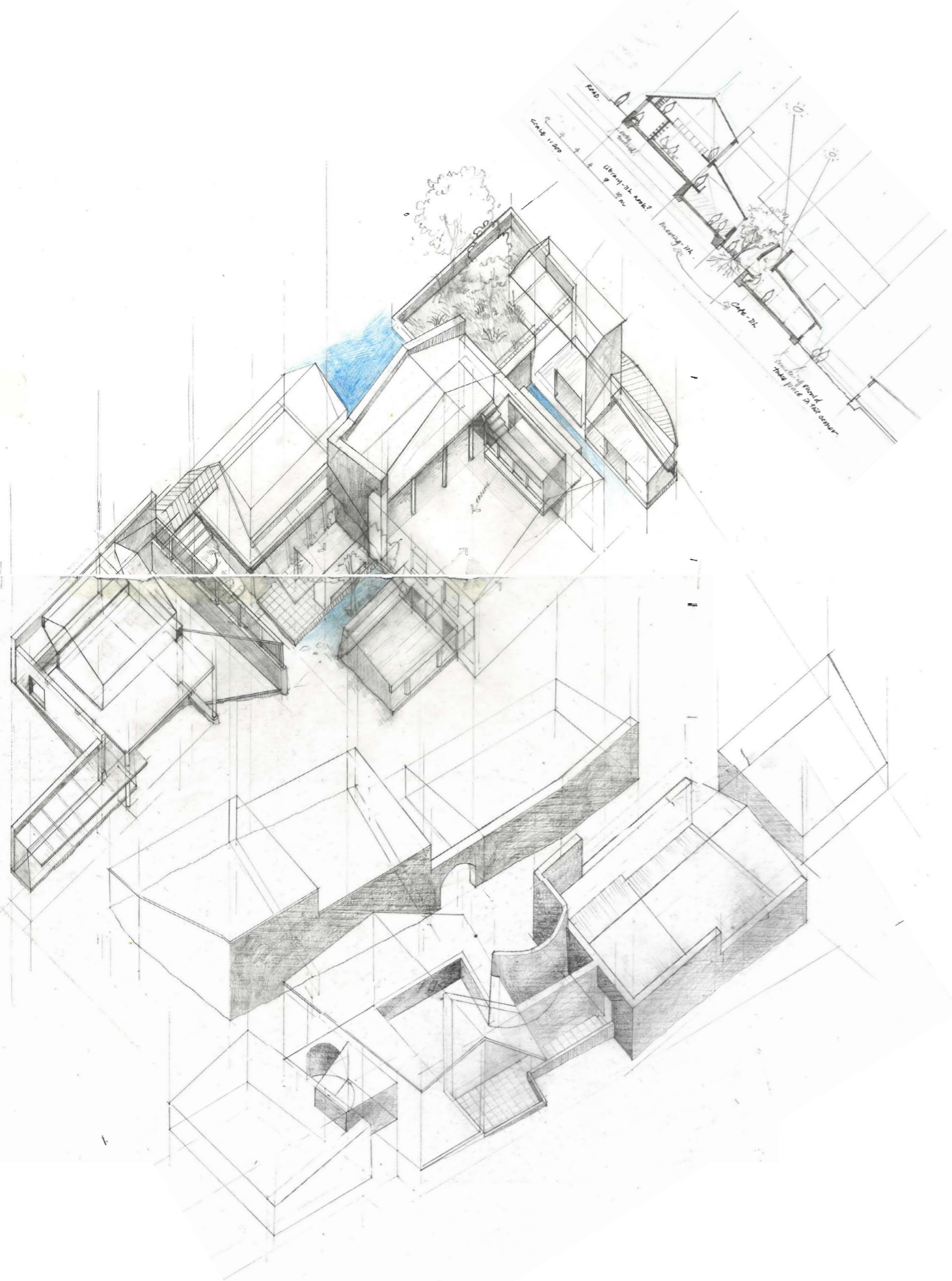


Figure 23

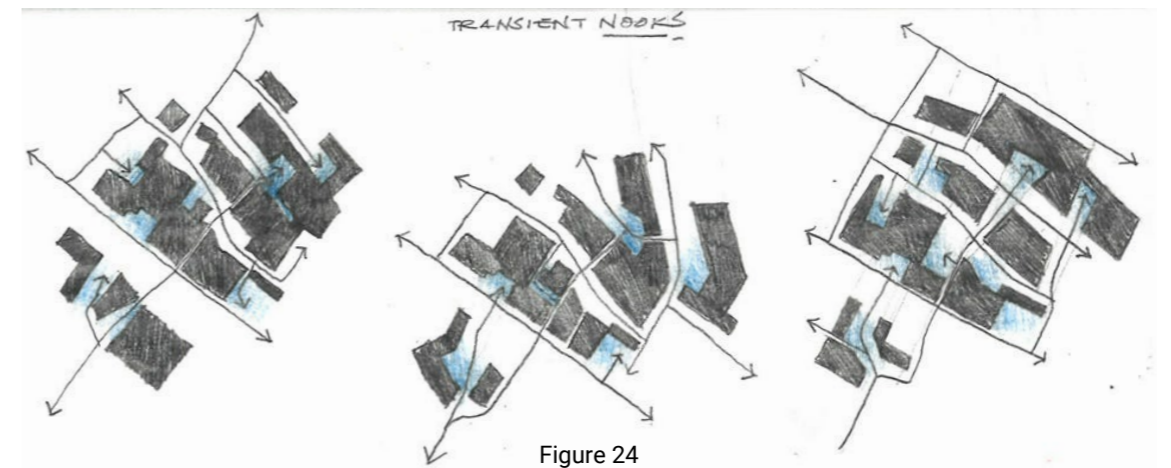


Figure 24

The first intervention of the site comes from its approaches. An early iteration exercise of the site and the ways in which people move around it formed the first designed gesture of bringing people into and through the site through a manipulation of its volumes in broad strokes (Fig.24). The circulation of the building is choreographed through a series of transient typologies – streets, passages, tunnels, alleys, and courtyards. Nooks for potential gathering and activity are coloured in blue.

These exercises formed a sufficient basis to initiate the design and ideation phase. Tracing the site has manifested into a working methodology that translates into a growing drawing (Fig.23). As a constant work-in-progress, a perpetually expanding compendium of ideas on a spatial, technical, formal and informal scale is undertaken via the means of drawing axonometric, sectional, planar, and elevational projections simultaneously and accumulatively (Fig.25). Traced and re-traced drawings became the backbone of the design process which has brought with it a thorough, fully formed final project.

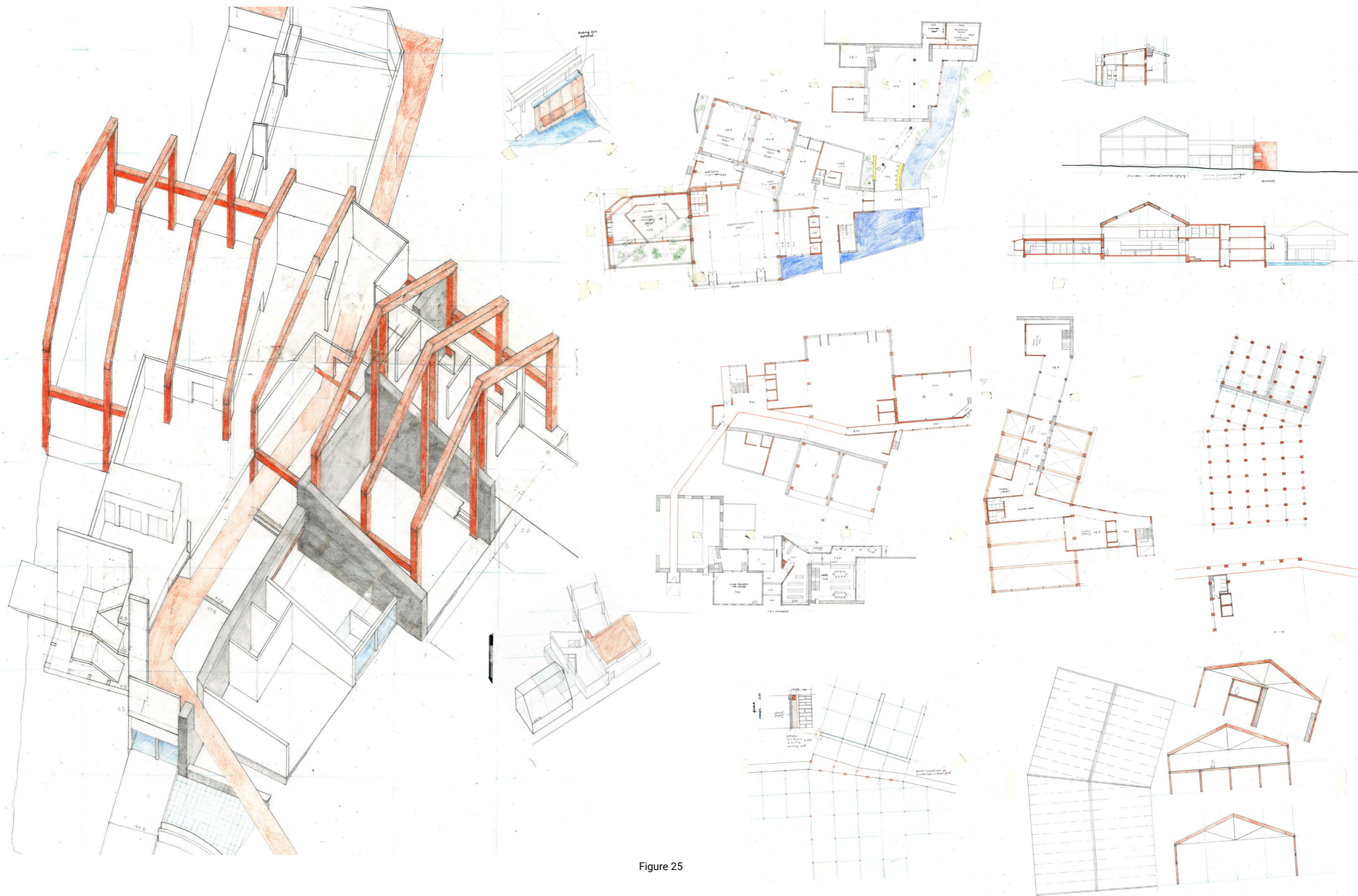


Figure 25



Figure 26

### 3.2 Results.

The project can be explained in a few broad gestures which have guided the formulation of the designed ensemble. In summary, the project is an assemblage of four components: river, ground, sheds, and the preserved buildings (the paper mill and attached house) (Fig.26), and five design operations: path, steps, trace, gap, and mirror.

#### 3.2.1 River as Path.

The first gesture relates to the daylighting of the river, which attempts to follow the recorded path of the former river as closely as possible. Daylighting the river involves the excavation of a trench in the ground, with most of its edges being softened with a curation of native plant species, turning the river into a wet bioswale (Fig.27).

The original river is known to still exist, albeit buried underground as a channel which forms a part of the larger combined stormwater-sewerage system of Tallinn (see Appendix 2). Due to this, the act of daylighting cannot be followed by conventional and traditional means, which typically entails channeling the water directly from Lake Ülemiste into Tallinn Bay. Thus, an alternative approach of stream daylighting is proposed, whereby the new river takes on a surface-retention role: whereby (rain-)water that is collected from buildings of an immediate vicinity are channelled into the river first, before being later discharged back into the underground channel. This decision acknowledges concerns of Tallinn's existing drainage systems being outdated and also acts as a potential strategy to address increasing cases of flash floods during periods of heavy, unpredictable rain. The daylighted "river" thus becomes a pragmatic, sustainable tool for the city's water management with inspiration from sponge city models, while also opening an opportunity for the river to return to the city as a meaningful and tangible public space. A similar approach has been applied in Kadriorg Park, whereby stormwater from Ülemiste junction is channelled towards the park's canals, which were historically present but reconstructed to support this issue.

Historically and naturally, developments of the city followed the path of the river. Thus, the daylighted river also establishes the axis in which the proposed new extension ought to adhere to. Thus, an axis is formed running perpendicular to the course of the river. A suspended walkway following the river's course connects the existing paper mill from the street level to the building, river, and park. Thus, the river acts as both an edge and a path whilst acting as a continuity of the street level



Figure 27

and emphasising the subtle topographical differences of the ground throughout the project.

### 3.2.2 Ground as Steps.

The residual landscape of the site presents a total topographical difference of four metres from the lowest point to the street level. The ground also becomes a sort of artifact of the former river. Thus, when intervening in the site, a deliberate decision was made to ensure that the ground levels of the project followed the sloping ground. Instead of making the ground floor levelled, the ground floor is staggered as a series of steps with increments of 500mm, connected with ramps and stairs. This creates an interesting spatial opportunity whereby steps become a generator of spatial moments, and successfully ensures that the user is in spatial dialogue with the condition of the ground.

Programmatically, the notion of care is extended to the ground through several pocket gardens implemented in nooks and crannies, becoming opportunities for paper waste to be used in the practice of gardening (Fig.28).

### 3.2.3 Designing with Traces and Gaps in Existing Sheds.

The existing site presents an odd assemblage of sheds, which are perceived as two separate clusters: the first being a row of three irregular sheds right next to the carpark space at the back of the site, the second cluster being a row of sheds adjoining the paper mill and house buildings, facing the street.

The intent is to work with the existing volumes as much as possible, and thus the building footprint of the sheds largely stays the same. A long, limestone brick wall forming the back of the site is observed to carry with it traces of the sheds' morphology – old door and window frames, now filled-in, and odd protrusions which suggest past extensions and subtractions. The design treats these traces as design clues, and thus new fenestrations and interventions are designed around these traces (Fig.29).

Nevertheless, it was necessary to address the porosity of the existing volume of sheds, should the site be adapted into a new public space. Presently, the assemblage of sheds form an unfriendly enclosure of the site – and a wall to the street. The project utilises gaps to make the site more permeable to the regular passer-by, forming alternative routes to and through the building (Fig.30).

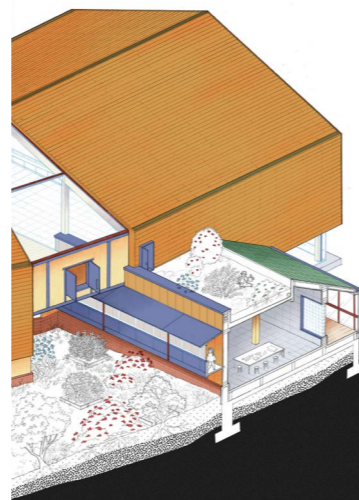


Figure 28

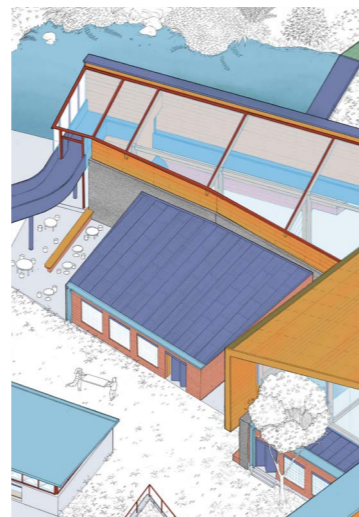


Figure 29

Together, the sheds all support supplementary cultural programmes in the project site, from housing construction workshops, a library, cafes and a restaurant, a small theatre and public classroom.

### 3.2.4 Mirroring the Mill and House.

Both the existing preserved buildings and the new extension are addressed through the act of mirroring (Fig.35). The existing paper mill and "paper house" are minimally-intervened in order to preserve their formal qualities as much as possible. They are envisaged to house both the papermaking workshop and a permanent exhibition of the River Härjapea, as direct references to the river-mill relationship.

The new extension primarily aims to unify and consolidate the building clusters into a cohesive whole whilst retaining, as much as possible, the existing walls present on the site. Using the strategy of mirroring (as previously mentioned in the theoretical framework), the central, dominant volume of the new extension is to have a geometrical resemblance to the form of the paper mill building. Whilst the original paper mill building acts as a core of (paper-)making and construction, the new "mill" complements it by thematically functioning as a communal core of gathering. The new core structurally straddles the existing limestone brick walls to ensure that no new load is added onto it. It directionally changes to align itself with the axis of the river, as if to reinsert the river's influence back into the formal narrative. The back of the existing limestone wall thus becomes a new path, a built path in contrast to the existing landscape courtyard. This also enables the fullest extents of this reconstructed river to be utilised meaningfully, as the back of the site is currently used as a carpark area. This extension returns then once again to the street in the form of a mirrored house, housing studio spaces for local creatives to occupy.

In order to complement the existing buildings while visually distinguishing itself as a contemporary addition, the mirrored extension needs to be materially different to those already used on-site. The incorporation of paper waste as a construction material can only be realised as far as internal, non-structural components. As the existing site primarily carries a language of limestone, brick and possibly concrete, it was initially thought that the use of a timber-based system could be a suitable choice as the lightness of timber both complements the lightness of paper and contradicts the heaviness of stone. Timber is also a locally abundant resource in Estonia with

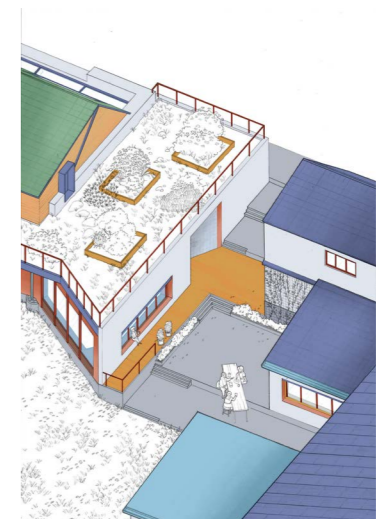


Figure 30

its vast forests. The material also has an added benefit of its durability and adaptability, as Stewart Brand (1994) once wrote that wood, as a material, “is the best of materials from the standpoint of adaptability and one of the worst in terms of maintenance” (p.237), but carries on to elaborate:

The exception is timber-framed buildings, because the wood structure is protected from the weather, it is massive, and it is exposed. Air and eyeballs can get at it to keep it dry and inspected. “According to government statistics,” reports Gene Logsdon, “the average life of a conventionally built stud house is about 75 years. The life of a timber frame is at least 300 years, and some over 1,000 years old survive.” Even if the building has to be demolished for economic reasons, the timbers have salvage value in the flourishing old-timbers market, because they can be easily disassembled and reassembled. (Brand, 1994, pp. 237)

A timber-based post-and-beam system became a point of juncture into establishing the construction method. For this, the primary structural demand was of the span of the gable roof for the new volume, which derives its span distances from the placement of the existing walls. This resulted in a span distance of 24 metres, which, if using conventional structural timber systems, resulted in a layout which consisted of too many structural members (due to an average beam span of 4-5m). It is both materially and spatially inefficient. A more desirable layout can be achieved instead with a glulam post-and-beam system, whereby beam spans of 6-8m can be achieved with merely 300x300 glulam columns. The roof of the existing paper mill is raised at a 22° pitch, which the new volume also adheres to in the construction of its roof. A three-pin glulam roof truss, with or without tie, requires a roof pitch to be greater than 15° and is able to support a span of 15-50m, fulfilling all desired structural conditions concerning the roof of the new extension (Swedish Wood, 2024)<sup>21</sup>. The utilisation of a post-and-beam structural system also presents a design opportunity to ideate on modular wall and floor systems which incorporate paper as a composite material. Paper waste in the form of cellulose insulation is applied throughout the building, with a required thickness of 400mm made feasible through the implementation of non-structural larsen truss walls. This thickness is not arbitrary, as this thickness is also used in the first certified passive house in Estonia<sup>22</sup>. This forms the overall construction logic of the new extension, from structure to envelope (Fig.31).

The experience of mirroring can thus be reflected in three designed aspects: firstly, the form of the old mill is also

21  
Swedish Wood. (2024). *The glulam handbook* (1st ed., Vol. 1).

22  
Kalamees, T. (2024). The thermal comfort and hygrothermal performance of the first certified passive house in Estonia. *Journal of Civil Engineering and Architecture* 18,165-174. <https://doi.org/10.17265/1934-7359/2024.04.002>

replicated in the new mill. Secondly, the south-facing facade of the new mill is mirrored in its composition in relation to the old mill. Lastly, the old mill can be perceived to be a rather enclosed, introverted building volume, with interventions forming this spatial experience of “peeking-in” during approach. Thus, the new mill mirrors this spatial experience, with the walkway and glazing of the ground floor allowing the structure and the occupants to “peek-out” of the new mill.

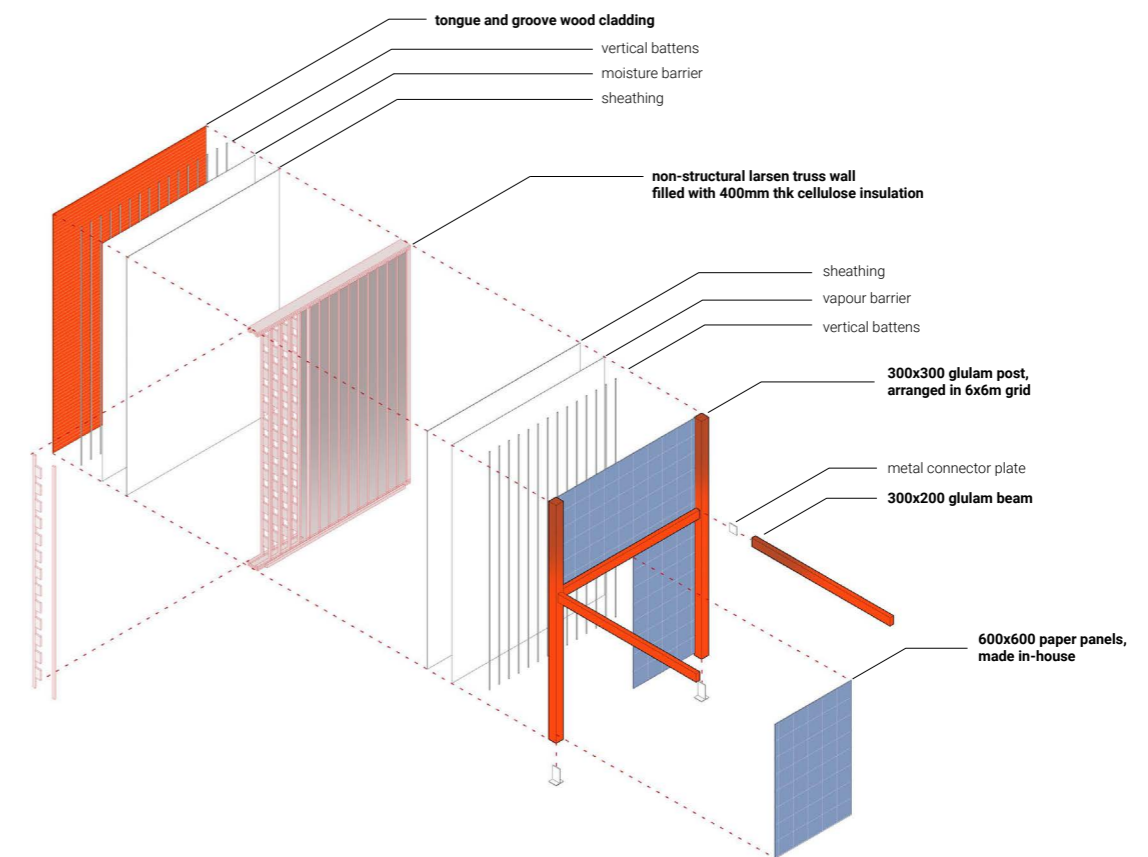
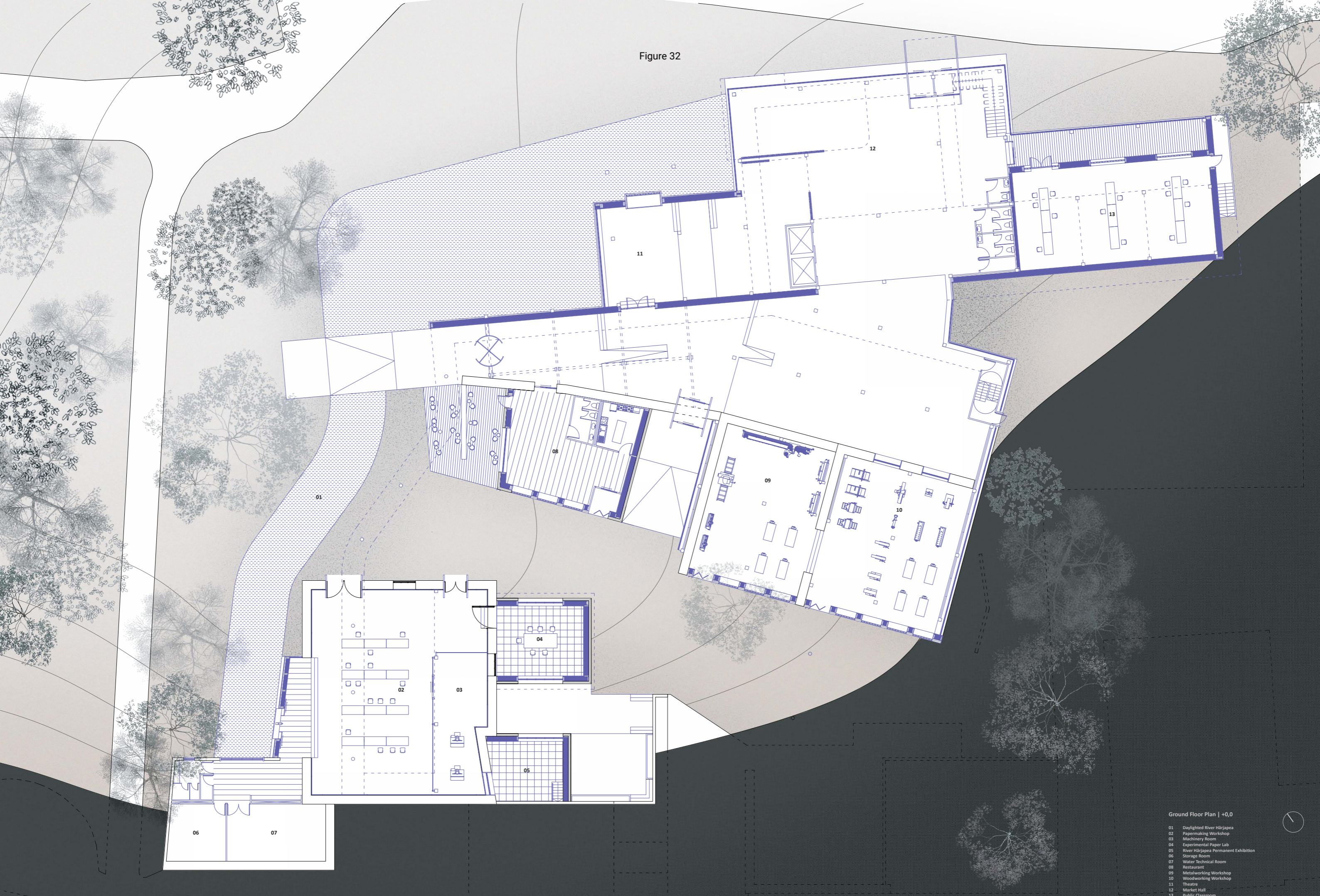


Figure 31

Figure 32



Ground Floor Plan | +0,0

- 01 Daylighted River Härjapea
- 02 Papermaking Workshop
- 03 Machinery Room
- 04 Experimental Paper Lab
- 05 River Härjapea Permanent Exhibition
- 06 Storage Room
- 07 Water Technical Room
- 08 Restaurant
- 09 Metalworking Workshop
- 10 Woodworking Workshop
- 11 Theatre
- 12 Market Hall
- 13 Public Classroom

Figure 33



First Floor Plan | +4,000

- 01 Walkway
- 02 River Hårjapea Permanent Exhibition
- 03 Library Cafe
- 04 Library
- 05 Study
- 06 Pocket Garden

0 5 10 metres

Figure 34



Second Floor Plan | +7,000

- 01 Walkway
- 02 Creative Studios
- 03 Experimental Paper Tube Walkway
- 04 House Studios
- 05 Rooftop Garden
- 06 Stairs to Street Level

0 5 10 metres



Figure 35

04  
Conclusions and Reflections

#### 4.0 Conclusions and Reflections.

Returning to the introduction, the thesis operated on the following design question: "How can the Härjapea River and its relevant historical building(s) be spatially and meaningfully reemerged and be reintroduced into the collective perception of Tallinn's urban situation?", which was supported by the subsequent two sub-questions which served as starting design inquiries:

- I How can the Härjapea River be daylighted and reintegrated in the present-day urban context?
- II How can abandoned existing buildings of the river's industrial past be adapted and altered to engage with the present urban context?

The project, in both its process and product, was entirely and rigorously guided through with these questions acting as the core, with little to no deviation. As to the matter of answering the "how", the project revealed a methodology that is situated and contextual, operating between the lines of response and dialogue. This calls back to the starting hypothesis of this entire thesis: the architecture in Tallinn can be perceived to be reactionary to its landscape. The theme of reactions is carried throughout the entire project – speaking in broad terms, the thesis can be perceived to be an investigation into how a designer may react to all the multifaceted aspects of a given project. Perhaps there were certain site-specific parameters which presented better opportunities than other sites along the Harjapea – of course, with the site being a part of a park definitely helped to justify and simplify the process of daylighting the river as an urban space – but nevertheless this realisation presents an interesting challenge for other sites whereby the reintegration of the river might not necessarily take shape in the form of public green space. The process of forming reactions and responses was also not solely constrained to the river and the mill – the question was also, to a large extent, focused on how to reestablish the relationship between the mill and the river. It can be concluded that framing this response from an organisational (the buildings follow the river!) and programmatic (by incorporating paper waste as a programme) standpoint became a meaningful exercise in reimagining the potential future of the Tiigiveski mill.

The act of tracing is an act of reacting – over and over again, layers upon layers. The employed method for this project was thus a productive and fruitful one, which aligned well with the project's ambitions and goals. By constantly tracing, one

is never really working on a blank sheet as the imprint of the previous idea is always slightly emerging from beneath. This was extremely helpful in ensuring that the design is always working with the already-there. It was perhaps because of this endeavour that physical modelling did not really become a productive means of ideation – it lacked the speed and failed to capture the multifaceted factors of the project which required them to be designed for in tandem. The more hands-on approach eventually made way to CAD and digital modelling which helped to maintain precision as the project approached its finalisation.

In addition, it is also perhaps apt to include within this thesis a small reflection on the theme of the studio, A Matter of Scale, and the role scale played in the research and design of this project. It cannot be understated that scale, in the sense of lens, was crucial in crafting a thorough, convincing and comprehensive graduating thesis. The thread of the hidden river was, in a sense, picked up only through the lens of reading Tallinn at the scale of its landscape. Throughout the project the lens gradually shifted from the larger urban/landscape scope, towards the building, and eventually ending at the material scale, with paper being a protagonist in the construction design process. The idea of scale, in its multifaceted and multidimensional forms, revealed and proved itself to be something inevitable, perhaps even imperative for the practice of architecture. A matter of scale is a matter of context and thoroughness, lending itself an understanding that the practice does (ought) not to hold isolated perceptions of buildings, but that they all both owe and contribute to a greater ensemble that is the built environment.

Due to the situatedness of this thesis, the result of this thesis cannot and should not be expected to be replicated for other "industrial ghosts" that lie along the course of the Härjapea River. But, it is hopeful to acknowledge that this thesis about a river and a mill opened up discourse on urban legibility and perception, collective spatial memory, water management and flood resilience, and material circularity – all of which are incredibly relevant and crucial endeavours in the present-day built profession. It was perhaps coincidental that this thesis was also able to establish potential solutions for Tallinn's prevalent issues of seasonal flooding and questions of Estonia's paper waste management. The scale of this project, especially if envisaged to take place along the course of the whole river, is not restricted to just the architectural practice. A full-scale implementation of a similar project along the entire river's course definitely calls for cooperation and collaboration

between varied parties in addition to architects: from urbanists, landscape designers, engineers and more. The endeavour would be much more well-articulated, thorough, and complete with the professional knowledge of these players in the built industry, which is acknowledged to be a profound limitation of this academic thesis.

This thesis, ultimately, concludes with being an open invitation to question and imagine the future of the Härjapea River in the city of Tallinn. It suggests that these residual structures can go beyond the perspective of reuse and transformation, but also present valuable opportunities in bringing back an important urban spatial shape to the perception of the city, honouring the importance of the river which once played a part of shaping the city.

# Appendix 1

## Data Management Checklist

# DATA MANAGEMENT CHECKLIST

### Instruction

This checklist is relevant for all graduation projects of the Master AUBS. The form is intended to highlight common aspects of graduation projects that require particular attention with regard to planning the research and data management. Relevant information and supplementary sources regarding each question are provided below each question.

With this checklist, the faculty wants to avoid that students unexpectedly find themselves in complex and stressful situations, in which ethical or privacy matters and/or other laws and regulations become an issue. In projects involving humans, certain types of data processing increase the risks to the human participants: planning such projects requires additional evaluations and advice from university staff before ethical approval can be received and the project can begin. In the case of a graduation project, obtaining additional advice or permits may delay the project with an extra education period or semester. To avoid this, it is recommended that students set up a graduation project with a low level of risk. Therefore, all students have to check their risk, by completing this checklist before their A1.

The first section of the checklist (A) should be completed by all students, together with their supervisor, during the planning of the graduation project, before the A1. It does not need to be submitted to anyone for review or approval. Please consider questions 1 to 3 carefully in relation to the intended graduation project, and answer with 'yes' or 'no'.

The second section of the checklist (B) should only be completed if the graduation project involves working with data from human participants. In that case, the student and their supervisor must apply for and receive ethical approval from the [Human Research Ethics Committee](#) (HREC) before the project can begin (see the paragraph 'Explanation and follow-up' after the questions). The student can submit the application to the HREC, but the supervisor is responsible for making sure that the project is compliant with relevant privacy regulations and ethical policies.

Section A. General considerations	yes	no
<p>1. Is the graduation project conducted as part of an internship (at a company), or as part of a research project at TU Delft?</p> <p>If a student's graduation project is conducted at a company or as part of a research project at the university, questions of data ownership and intellectual property rights need to be addressed in a written <a href="#">graduation or internship agreement</a> before the project begins. Students and their supervisor should consult the <a href="#">Intellectual Property Rights of Students webpage</a>. Additional information can also be found in the <a href="#">Extended Personal Research Data Workflow</a>.</p>		✓
<p>2. Does the project involve conducting (part of) the research outside the Netherlands?</p> <p>Students who intend to travel abroad (even to other EU countries) for study, exchange, research, internship, or graduation project purposes need to follow the <a href="#">Travel Safety Protocol</a>. This includes attending a mandatory Travel Safety Training Session: see the <a href="#">Disclaimer</a>.</p>	✓	
<p>3. Will the research involve processing data from humans, such as running a survey, conducting interviews or workshops, collecting data through social media or internet forums, or re-using existing datasets about humans provided by a third party? (If 'yes', see follow-up questions 4 to 13 in Checklist B.)</p> <p>Students who work with data from human participants must complete the next section and apply for and receive ethical approval from the <a href="#">Human Research Ethics Committee</a> (HREC) before conducting the research.</p>		✓

<b>Section B. Extended risk factors</b> (only if question 3 has been answered with 'yes'.)	yes	no
<p>4. Will the project involve participants who may be considered vulnerable, such as the elderly, refugees or asylum seekers, ethnic minorities, patients, or people with disabilities?</p> <p>Participants who may suffer very adverse consequences (for instance, due to discrimination) if their personal data became publicly available can be considered vulnerable.</p>		
<p>5. Will the project involve participants who cannot themselves give informed consent for taking part in the project, but for whom consent must be obtained from a legal guardian?</p> <p>Participants who cannot give <a href="#">informed consent</a> can include, for instance, children or participants with intellectual disabilities, mental disorders, or dementia. Such participants are also considered vulnerable in the context of the <a href="#">General Data Protection Regulation</a> (GDPR).</p>		
<p>6. Will the project involve processing any of the special categories of personal data below?</p> <ul style="list-style-type: none"> <li>- Race</li> <li>- Ethnicity</li> <li>- Criminal offence data</li> <li>- Political opinion</li> <li>- Union membership</li> <li>- Religious or philosophical beliefs</li> <li>- Sex life and/or sexual orientation</li> <li>- Health data (including measurements such as heart rate)</li> <li>- Biometric or genetic data (including fingerprints, iris scanning, facial recognition)</li> </ul> <p>The <a href="#">General Data Protection Regulation</a> (GDPR) defines a stricter rules for processing <a href="#">special categories of personal data</a>. If it is necessary to process these data in a project, it is important to provide additional safeguards.</p>		
<p>7. Will the project involve processing personal data that could be considered sensitive, such as the ones listed below?</p> <ul style="list-style-type: none"> <li>- Information about a person's income, debts, or other payments</li> <li>- Information about a person's (un-)employment status</li> <li>- Information about a person's performance at school or work</li> <li>- Information about relationship problems or (gambling) addiction</li> <li>- Information about poverty, domestic violence, or youth welfare/social work involvement</li> </ul> <p>Some types of personal data are considered <a href="#">sensitive</a>, because they can have a high impact on the privacy of the data subject if other persons gain access to these data. Sensitive personal data should only be processed if necessary: in such cases, additional safeguards need to be put in place.</p>		
<p>8. Will the project involve processing video-recordings, or photographs of participants?</p> <p>TU Delft considers photographic and video-materials of research participants to be <a href="#">sensitive personal data</a>. If such data need to be processed, additional safeguards must be put in place.</p>		

<b>Section B. Extended risk factors</b> (only if question 3 has been answered with 'yes'.)	yes	no
<p>9. Will the project involve sharing or transferring personal data between multiple partners or collaborating organisations involved, such as between TU Delft and an internship company?</p> <p>According to privacy law, sharing personal data between organisations requires a <a href="#">privacy agreement</a> to be in place: setting this up takes time, and requires support from additional university staff. Furthermore, personal data sharing can potentially expose research participants to different types of risks: these risks must be considered in the ethical application.</p>		
<p>10. Will the project involve deception, or covert observation of participants?</p> <p>In some types of research, obtaining <a href="#">informed consent</a> for processing participants' personal data is not an option: for instance, if the research involves deception, or the research is covert (conducted without participants knowing about it). In such situations, the steps to mitigate risks to participants are important, and an alternative <a href="#">legal basis</a> for processing the participant's data needs to be established with the help of additional support staff.</p>		
<p>11. Will the project involve working with social media data?</p> <p>Social media data are personal data, but since it is usually not possible to ask for <a href="#">informed consent</a> for processing social media data, another <a href="#">legal basis</a> for processing the participant's data needs to be established. Processing of social media data also involves legal considerations related to terms of use of data from third-party platforms: therefore, research with social media data requires expert support on privacy, ethics, and legal matters.</p>		
<p>12. Will the project involve using learning algorithms or other AI to analyse, combine, or otherwise process data from participants?</p> <p>The use of AI in research involves many considerations in terms of data protection, ethics, security, and intellectual property: for more information, see TU Delft's <a href="#">Instructions for use of Generative AI</a>.</p>		
<p>13. Will the project involve participants who are based in a country or countries outside of the EU?</p> <p>Students affiliated with TU Delft must comply with Dutch and EU regulations of personal data processing (<a href="#">GDPR</a>). Furthermore, the student and their supervisor must make sure that the research complies with <a href="#">local (privacy) legislations</a> of any foreign destinations. Additional support from an external (local) expert may be required.</p>		

### Explanation and follow-up

If you have answered 'no' to all questions 4 to 13, your project is likely to be considered low or minimal-risk: see the paragraph 'Projects with minimal or low-risk' on the next page.

If you have answered 'yes' to one or more of the questions 4 to 13, your research likely involves extended or high risks to participants, according to the [General Data Protection Regulation](#) (GDPR) and TU Delft's privacy and ethical policies: for information regarding such projects, see the paragraph 'Projects with extended or high-risk' on the next pages.

## Projects with minimal or low-risk

If you have answered 'no' to questions 4 to 13, your project is likely to be considered low-risk. This does not mean that the project involves no risks at all, but suggests that these risks can likely be addressed by the student and supervisor in the application to the [Human Research Ethics Committee \(HREC\)](#) within the timeline for a graduation project and without need for additional support.

Compiling the HREC application:

An application to the HREC generally involves a Data Management Plan (DMP), a risk-identification and mitigation checklist, and informed consent materials. Master's students at ABE who intend to compile a HREC application are advised to make use of the following support documents:

- the [student guide](#)
- the [Example Data Management Plan](#) for MSc projects

The graduation supervisor is [responsible](#) for the student's project and ethical application, and must provide support for compiling the HREC application documents.

Additional support

For low-risk student graduation projects, compiling of the HREC application documents should be done by the student in consultation with the supervisor. The Faculty Data Steward can be contacted for individual questions at [datasteward-BK@tudelft.nl](mailto:datasteward-BK@tudelft.nl); however, the Data Steward does not provide detailed feedback on student DMPs for low-risk HREC applications.

Additional resources

The HREC has guides available for [completing the checklist](#) and for compiling [informed consent materials](#). Additionally, the [Guide to the Extended Personal Research Data Workflow](#) has been created to help researchers and students who work with human participants comply with both GDPR principles and TU Delft's policies on Data Management and Human Research Ethics.

Timeline

Minimal or low-risk HREC applications are generally processed faster than extended or high-risk applications (see the paragraph below). Nevertheless, the initial evaluation by the HREC usually takes approximately 2 weeks, and may take longer during busy periods or holiday: see the [HREC website](#) for up-to-date information. Additionally, the application may require revisions before final approval is granted. If you do not receive an initial response about your ethical application after 4 weeks from the time of submission, you may follow up with the HREC to enquire about an update.

## Projects with extended or high-risk

If you have answered 'yes' to one or more of questions 4 to 13, there are potential increased risks related to how data from human participants will be processed in your project. These risks will need to be addressed in consultation with the Data Steward and other relevant support staff before submitting the ethical application to the [Human Research Ethics Committee \(HREC\)](#).

Compiling the HREC application

An application to the HREC generally involves a Data Management Plan (DMP), a risk-identification and mitigation checklist, and informed consent materials. Master's students at ABE who intend to compile a HREC application are advised to make use of the following support documents:

- the [Ethical Approval & Data Management Planning Student Information](#)
- the [Example Data Management Plan](#) for MSc projects

The graduation supervisor is [responsible](#) for the student's project and ethical application, and must provide support for compiling the HREC application documents.

Additional support

Once the DMP has been compiled and reviewed by the supervisor, feedback should be requested from the Data Steward via DMPonline. After this, any other necessary support staff will need to be contacted. Crucially, if the project involves one or multiple ways of personal data processing that could result in high-risk to the participants according to the GDPR, the TU Delft Privacy Team must be consulted to establish whether or not a [Data Protection Impact Assessment \(DPIA\)](#) is required.

Additional resources

The HREC has guides available for [completing the checklist](#) and for compiling [informed consent materials](#). Additionally, the [Guide to the Extended Personal Research Data Workflow](#) has been created to help researchers and students who work with human participants comply with both GDPR principles and TU Delft's policies on Data Management and Human Research Ethics.

Timeline

It can take a long time to compile a complete research plan and HREC application for projects involving extended risks. DMP feedback from the Data Steward usually takes around 2 weeks, but can take longer during busy periods or holidays. Receiving additional support from other staff, such as the Privacy Team, can take anywhere from a few days to multiple weeks, depending on the project and capacity of university staff. If a DPIA is deemed necessary, it can take anywhere from 4 weeks to several months.

It is important to note that advice from the Privacy Team or other support staff, as well as any additional documents (such as necessary contracts, or a DPIA, if needed) must be in place before the application is submitted to the HREC. The initial evaluation by the HREC can be processed in 2 weeks, but may take longer during busy periods or holidays: see the [HREC website](#) for up-to-date information. Additionally, the application may require revisions before final approval is granted. If you do not receive an initial response about your ethical application after 4 weeks from the time of submission, you may follow up with the HREC to enquire about an update.

Considering the limited time available for students conducting their graduation projects, students working with data from human participants are strongly advised to prioritise low-risk research projects. If a student project necessitates processing data in ways that are considered extended or high-risk, both student and supervisor need to be aware of the extended processing times involved in obtaining ethical approval and beginning the graduation project.

## Appendix 2

### Network of Waste and Stormwater Drainage Systems in Tallinn

Tallinna Vesi. (n.d.)

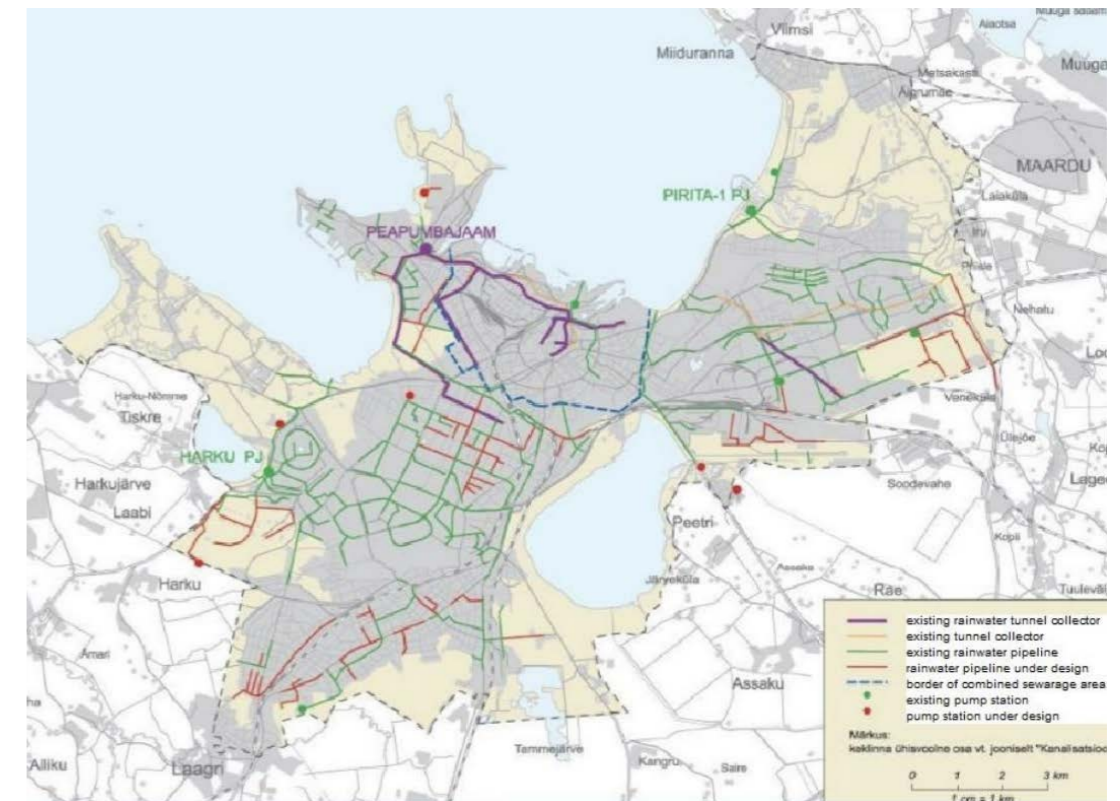


Figure 36

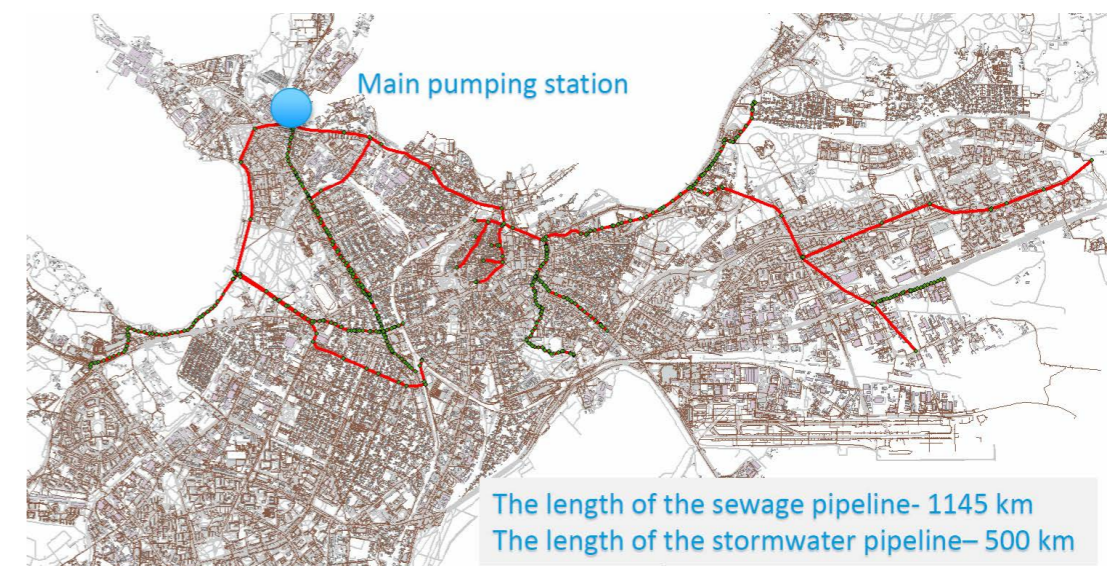
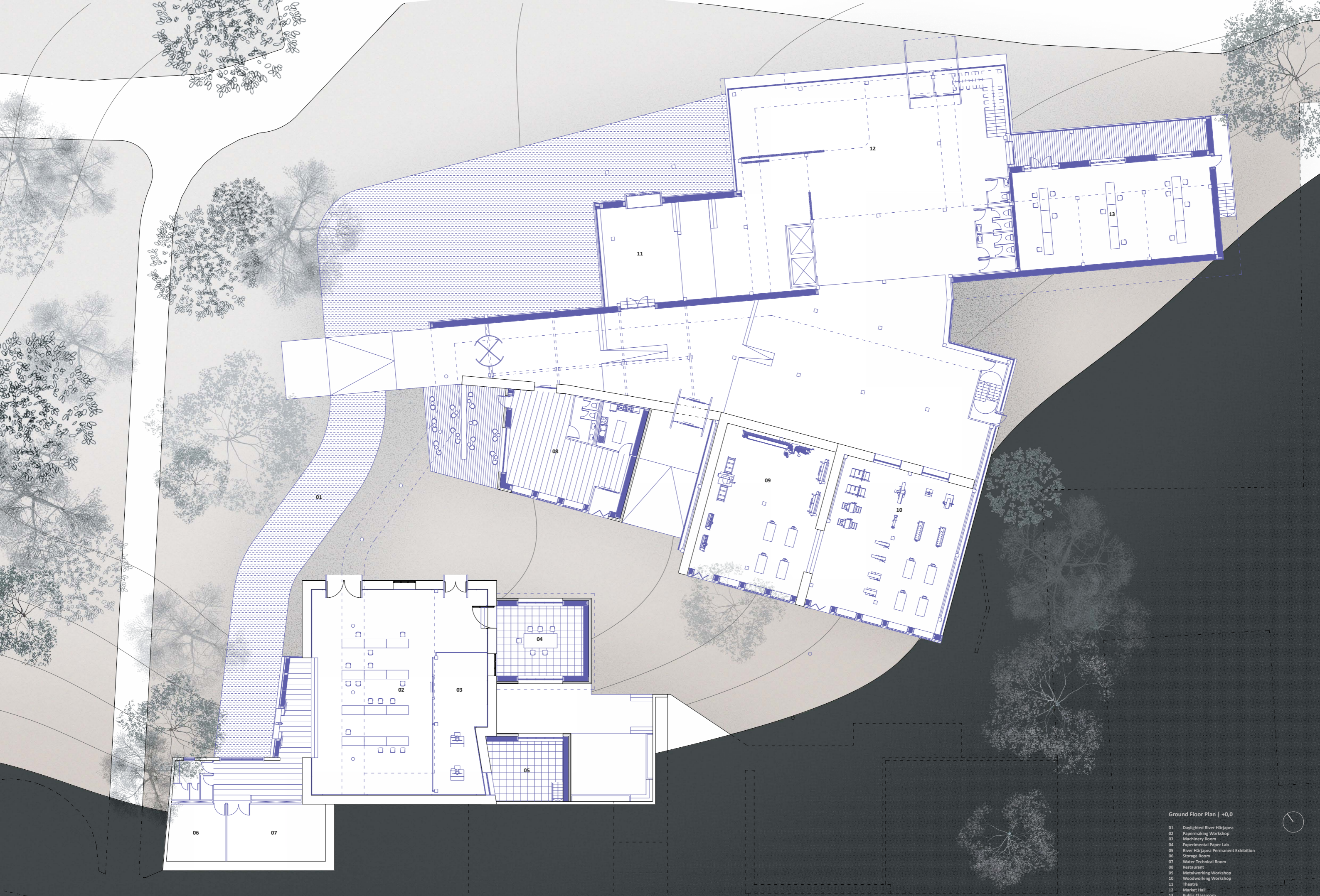


Figure 37

## Appendix 3

Complete Drawings Set from Graduation Thesis.

Author's own.



Ground Floor Plan | +0,0

- 01 Daylighted River Härjapea
- 02 Papermaking Workshop
- 03 Machinery Room
- 04 Experimental Paper Lab
- 05 River Härjapea Permanent Exhibition
- 06 Storage Room
- 07 Water Technical Room
- 08 Restaurant
- 09 Metalworking Workshop
- 10 Woodworking Workshop
- 11 Theatre
- 12 Market Hall
- 13 Public Classroom





Second Floor Plan | +7,000

- 01 Walkway
- 02 Creative Studios
- 03 Experimental Paper Tube Walkway
- 04 House Studios
- 05 Rooftop Garden
- 06 Stairs to Street Level

0 5 10 metres



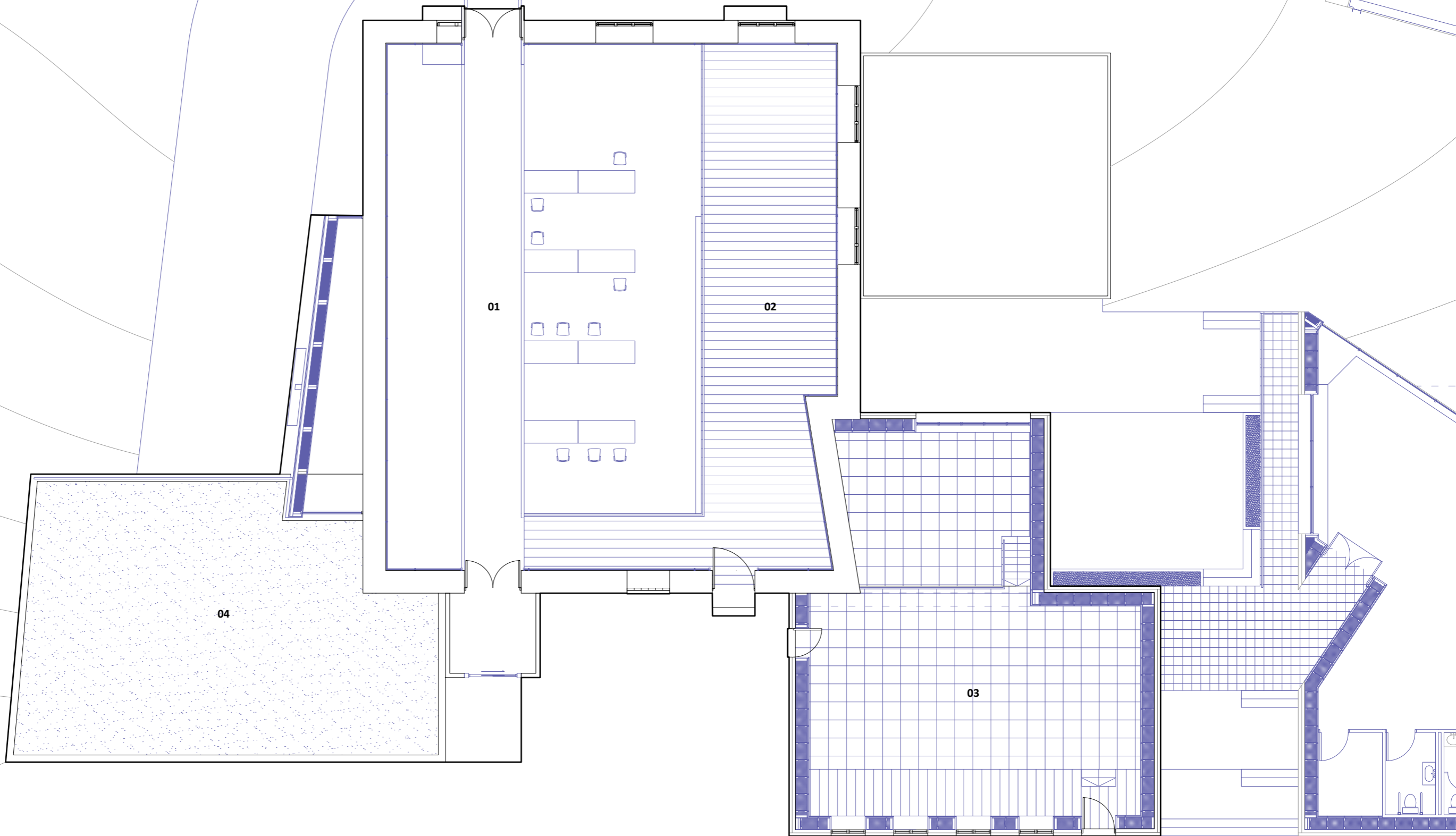


First Floor Plan | +4,000

- 01 Walkway
- 02 River Hårjapea Permanent Exhibition
- 03 Library Cafe
- 04 Library
- 05 Study
- 06 Pocket Garden

0 5 10 metres



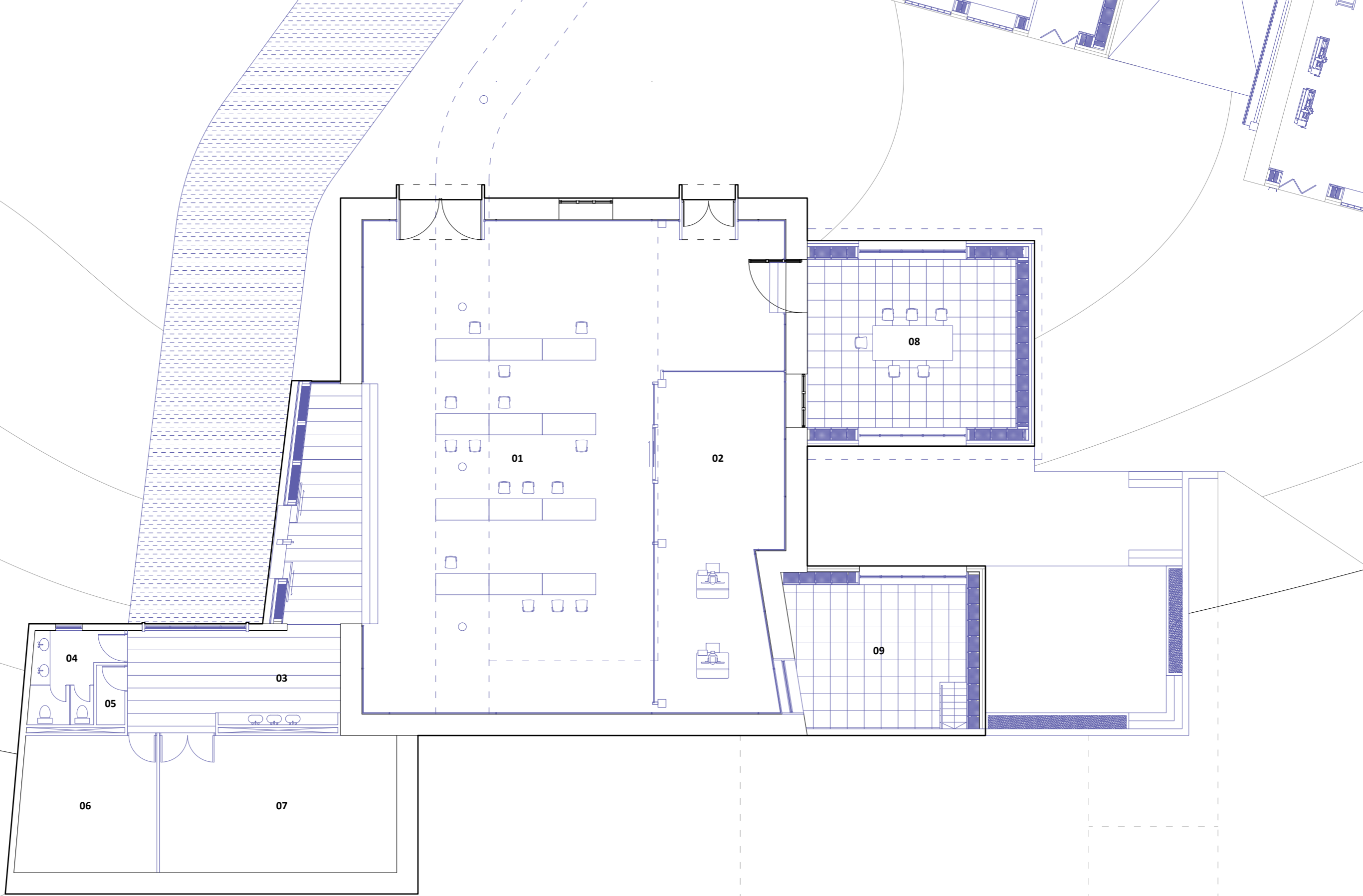


**Tiigiveski Mill | 1F**

- 01 Walkway
- 02 Observation Deck
- 03 River Härjapea Permanent Exhibition
- 04 Pocket Garden

0 5 10 metres





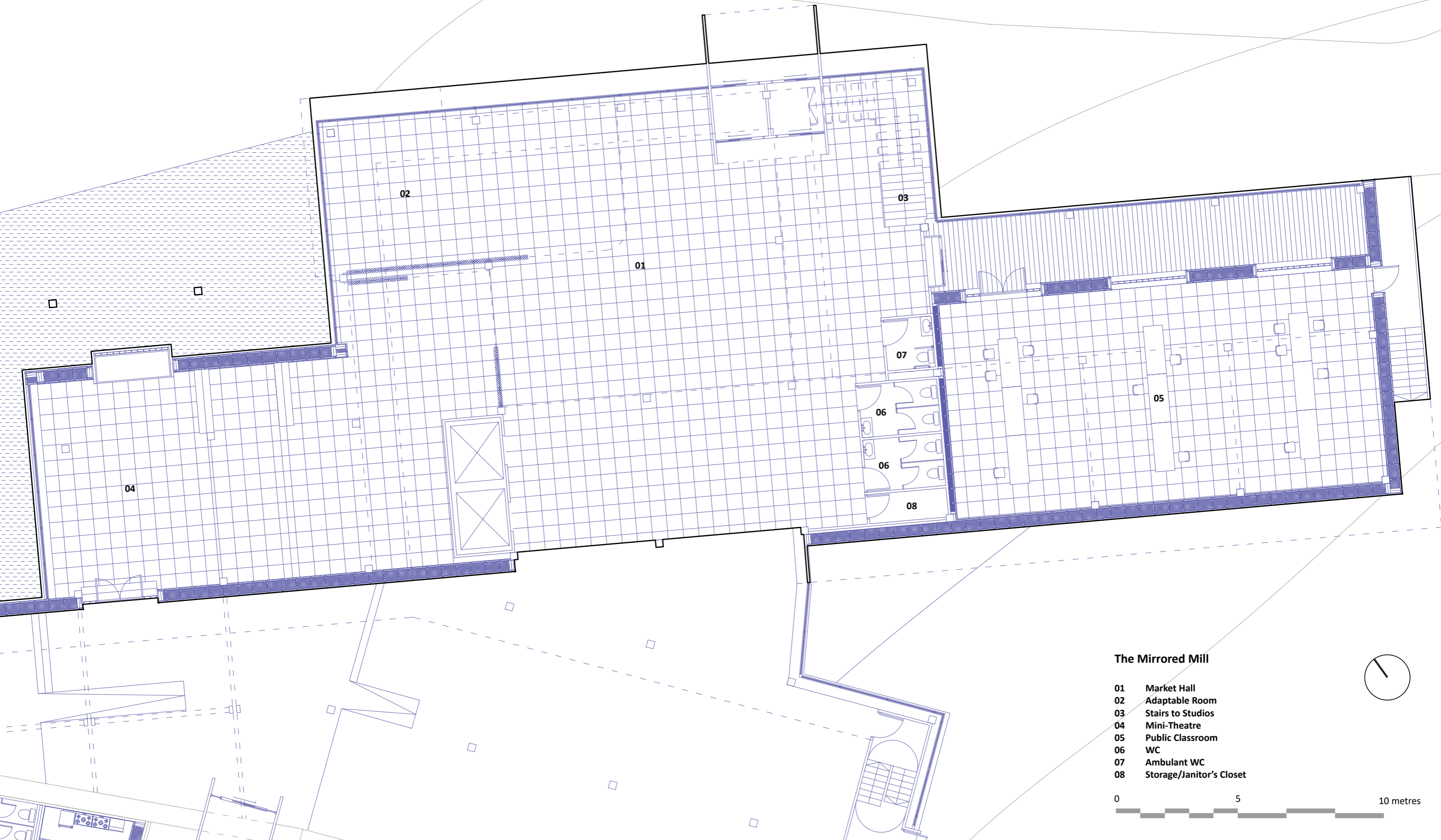
**Tiigiveski Mill | GF**

- 01 Papermaking Workshop
- 02 Machinery Room
- 03 Water Area
- 04 WC
- 05 Janitor's Closet
- 06 Storage
- 07 Water Technical Room
- 08 Experimental Paper Lab Meeting Room
- 09 River Härjapea Permanent Exhibition



0 5 10 metres

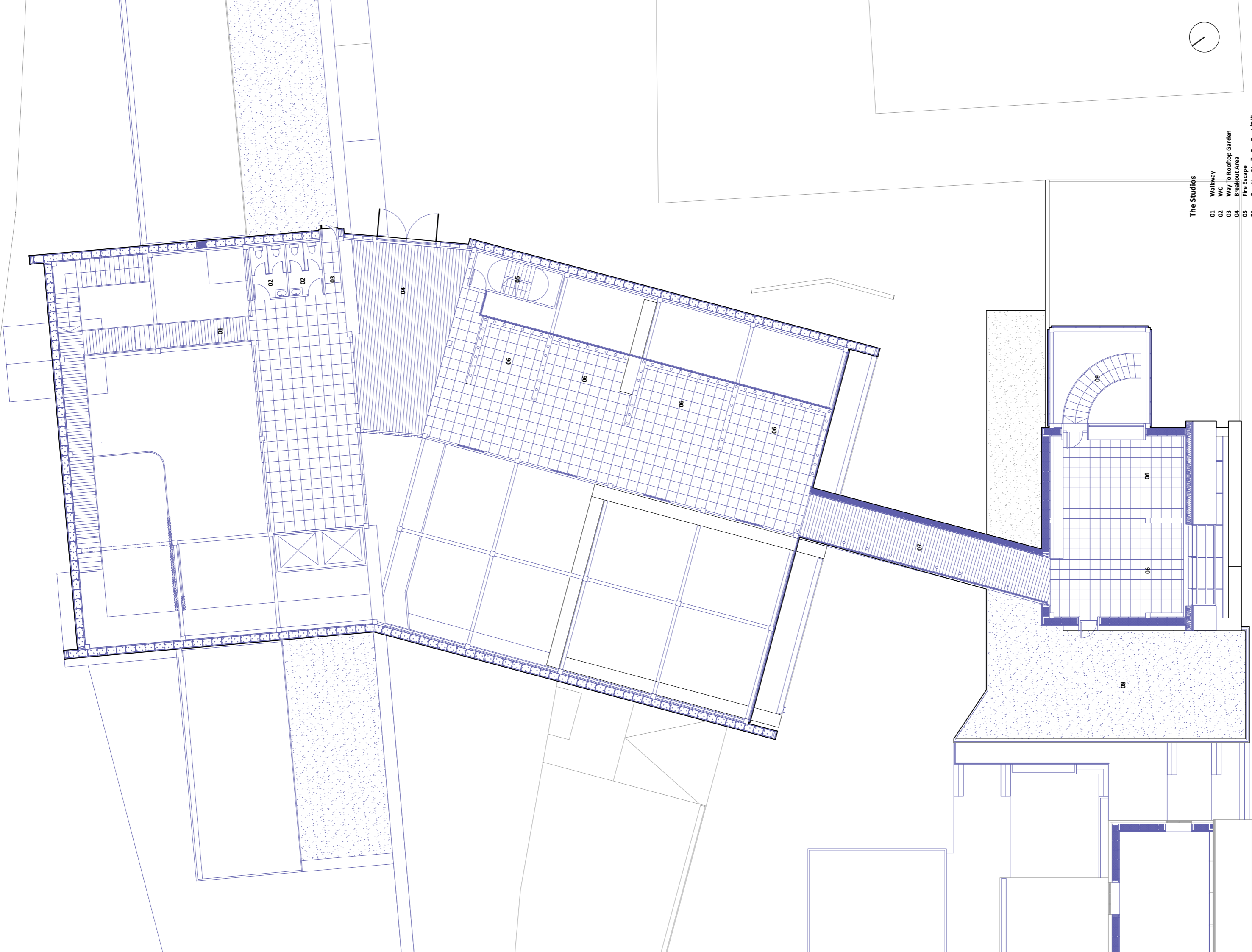




**The Mirrored Mill**

- 01 Market Hall
- 02 Adaptable Room
- 03 Stairs to Studios
- 04 Mini-Theatre
- 05 Public Classroom
- 06 WC
- 07 Ambulant WC
- 08 Storage/Janitor's Closet

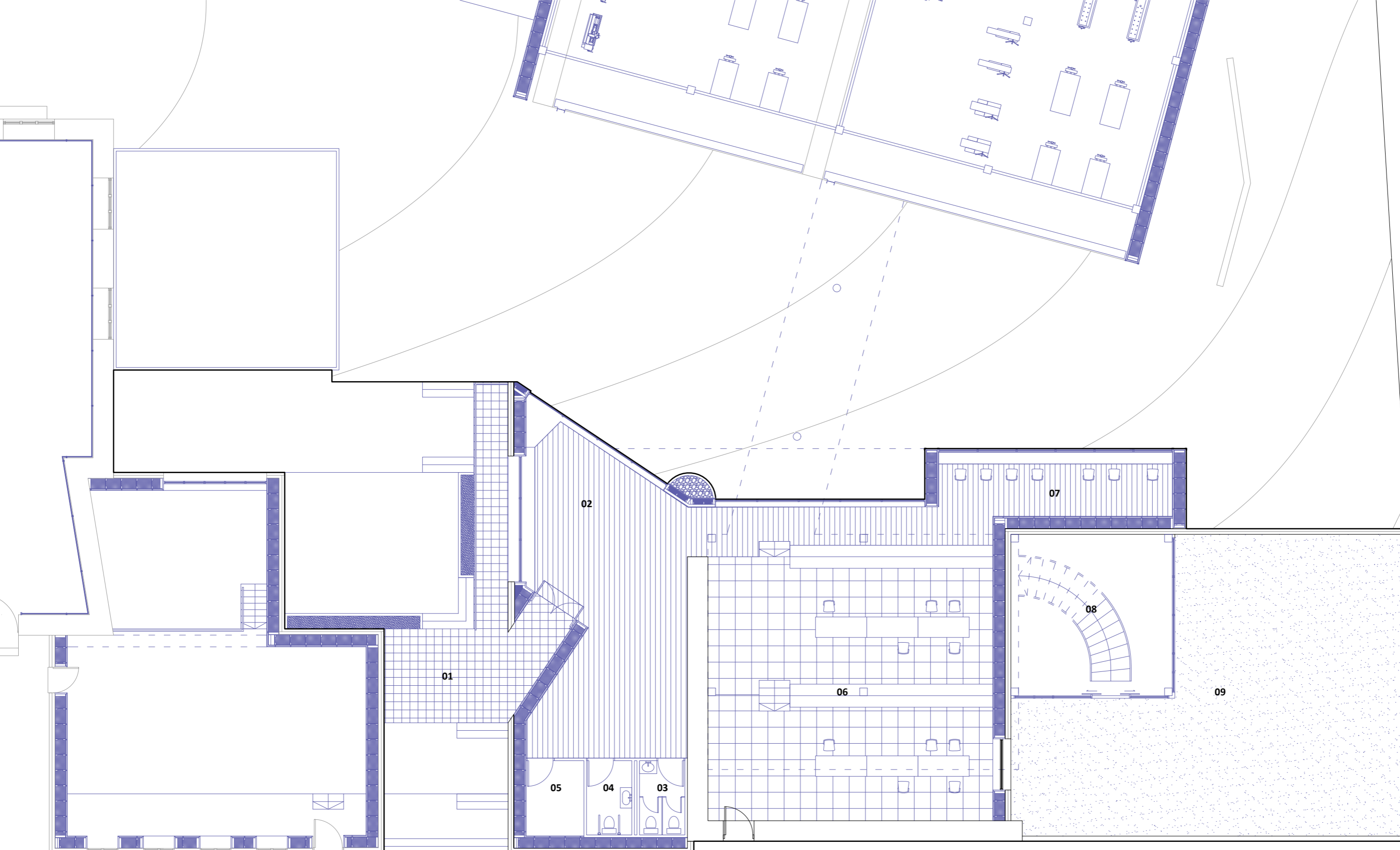




**The Studios**

- 01 Walkway
- 02 WC
- 03 Way To Rooftop Garden
- 04 Breakout Area
- 05 Fire Escape
- 06 Creative Studio For-Rent/Office
- 07 Paper Tube Walkway
- 08 Rooftop Garden
- 09 Stairs to Junkemall Street





**The Library**

- 01 Outdoor Deck
- 02 Library Cafe
- 03 WC
- 04 Ambulant WC
- 05 Storage
- 06 Library
- 07 Study
- 08 Stairs to Studios
- 09 Pocket Garden





**The Existing Sheds**

- 01 Riverside Terrace
- 02 Restaurant
- 03 WC
- 04 Kitchen
- 05 Secondary Entrance
- 06 Metalworking Workshop
- 07 Woodworking Workshop

0 5 10 metres





01

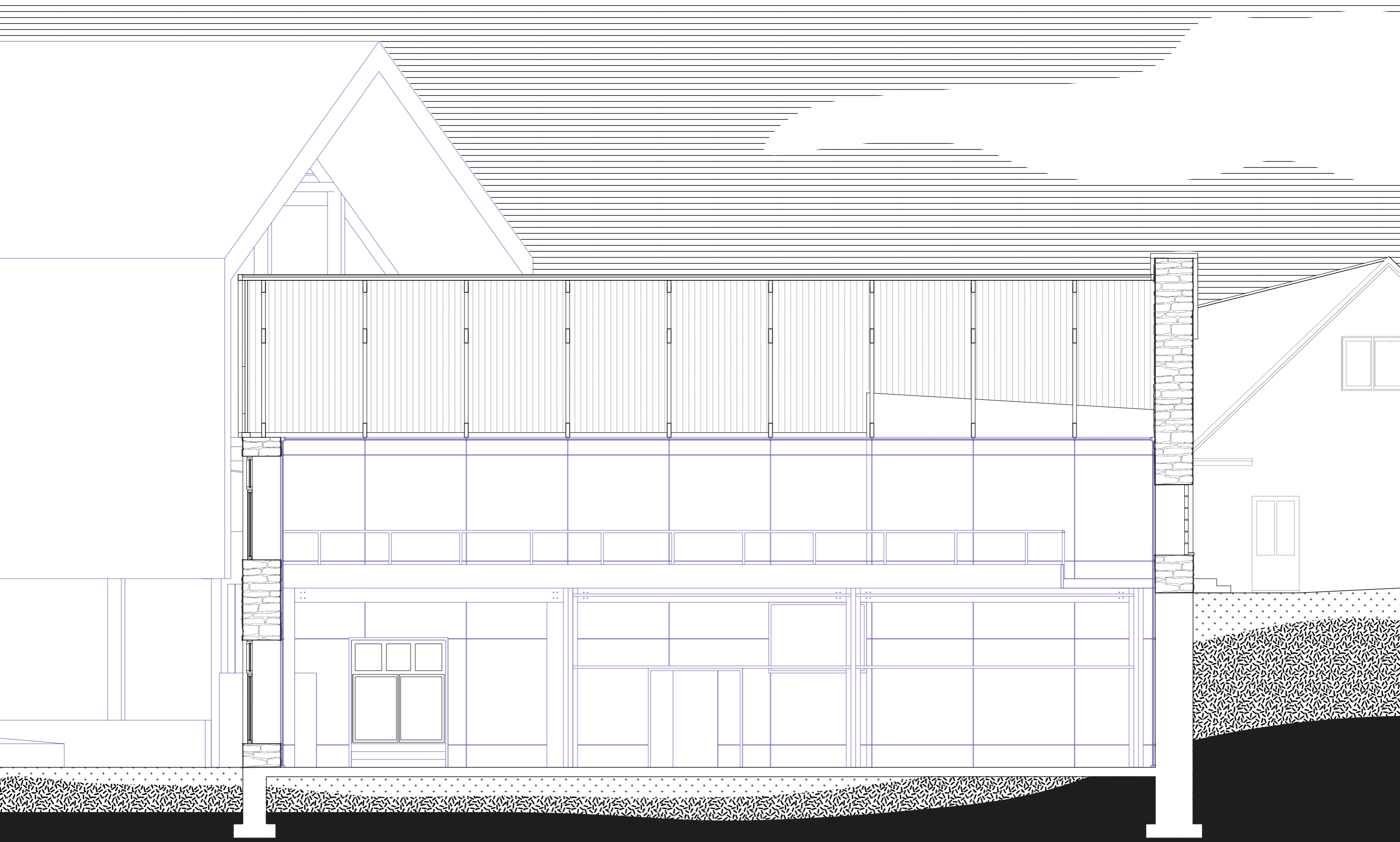
02

03

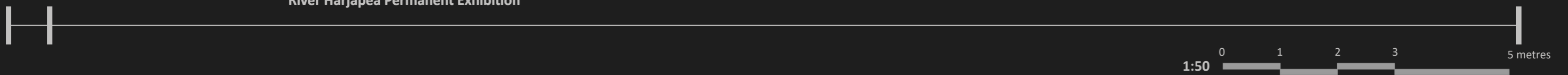
**The Built Path**

- 01 Entrance to Mini Theatre
- 02 Breakout Area
- 03 Fire Escape





River Härjapea Permanent Exhibition





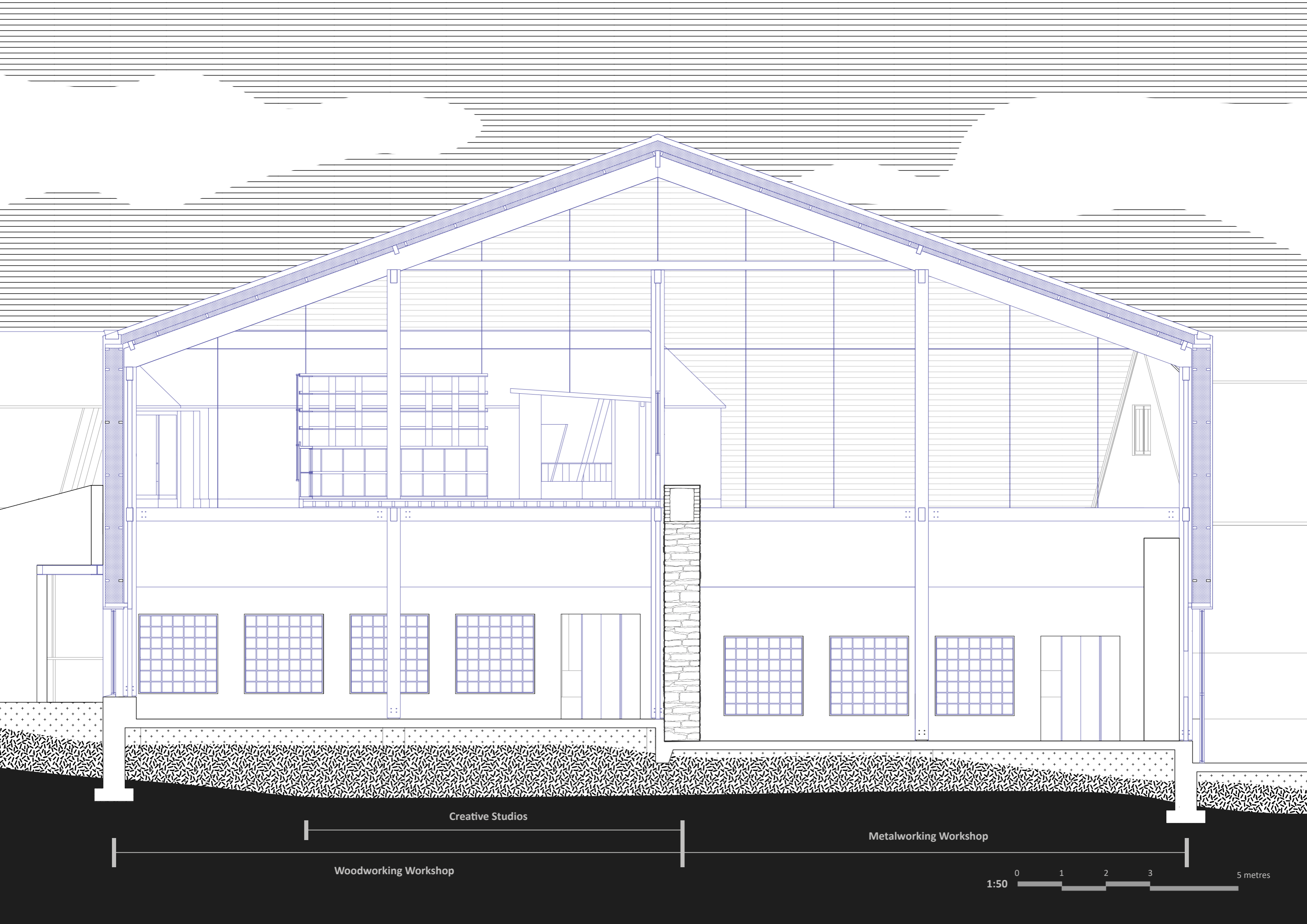
River Härjapea Permanent Exhibition

Permeable Surface

Experimental Paper Lab (Meeting Room)

River Härjapea Permanent Exhibition

1:50 0 1 2 3 5 metres

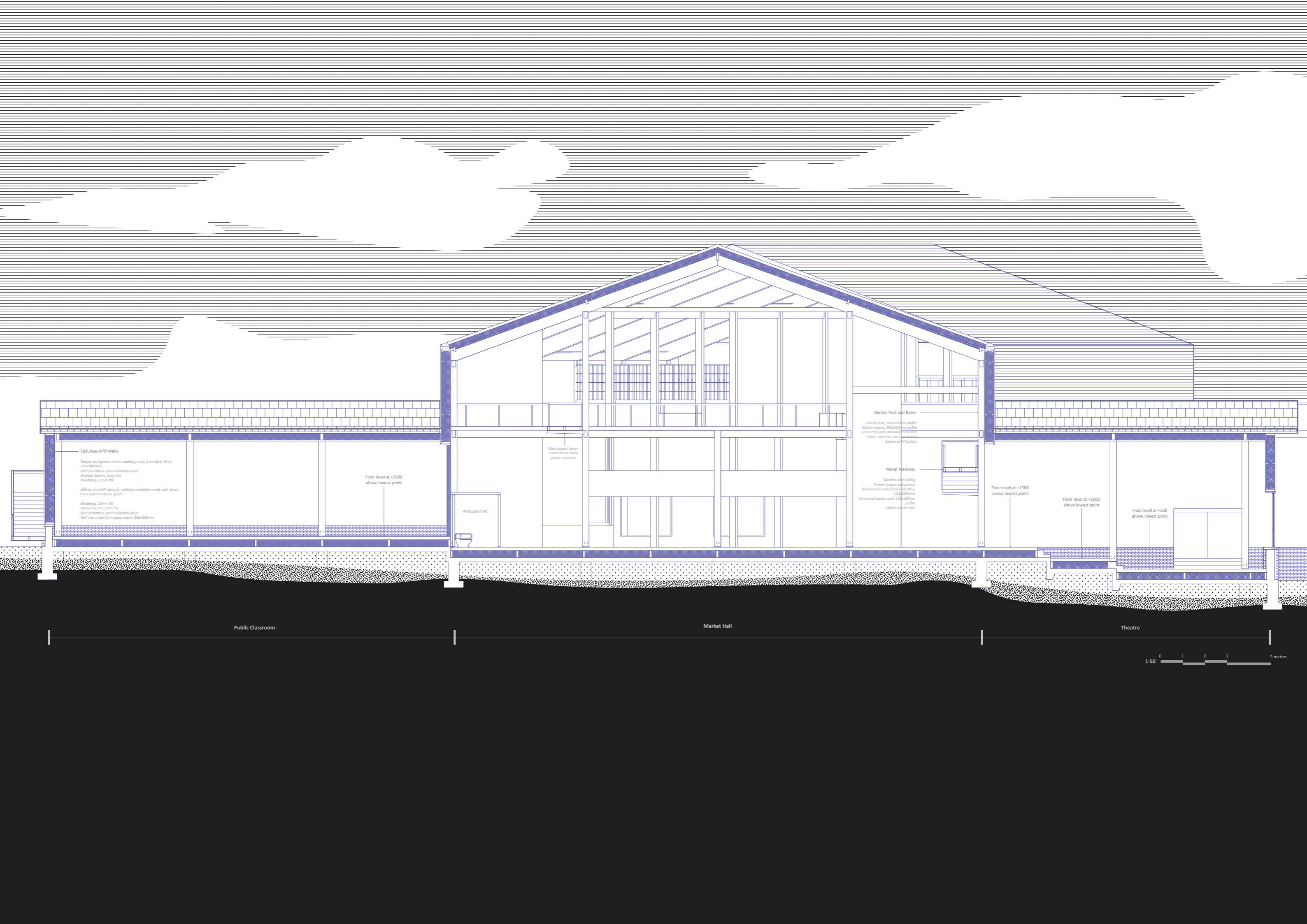


Creative Studios

Woodworking Workshop

Metalworking Workshop

1:50 0 1 2 3 5 metres



**Cellulose-infill Walls**  
Tongue-and-groove timber cladding made from Silver Birch, 230x300mm  
Vertical battens spaced 600mm apart  
Moisture barrier, 2mm thick  
Sheathing, 10mm thick  
400mm thick infill cavity for cellulose insulation made with larch truss spaced 600mm apart  
Sheathing, 10mm thick  
Vapour barrier, 2mm thick  
Vertical battens spaced 600mm apart  
Wall ties made from paper waste, 600x600mm

Floor level at +2000  
above lowest point

Steel support beam  
connected to main  
glulam structure

Ambulant WC

**Glulam Post and Beam**  
Glulam post, 300x300mm profile  
Glulam beam, 300x300mm profile  
Connected with stainless steel  
metal connector plates and steel  
bolts to VC footing

**Metal Walkway**  
Stainless steel ceiling  
Timber tongue and groove  
floorboards made from Scots Pine,  
100x160mm  
Structural square steel, 100x100mm  
profile  
Clad in corten steel

Floor level at +1500  
above lowest point

Floor level at +1000  
above lowest point

Floor level at +500  
above lowest point

Public Classroom

Market Hall

Theatre

1:50 0 1 2 3 5 metres

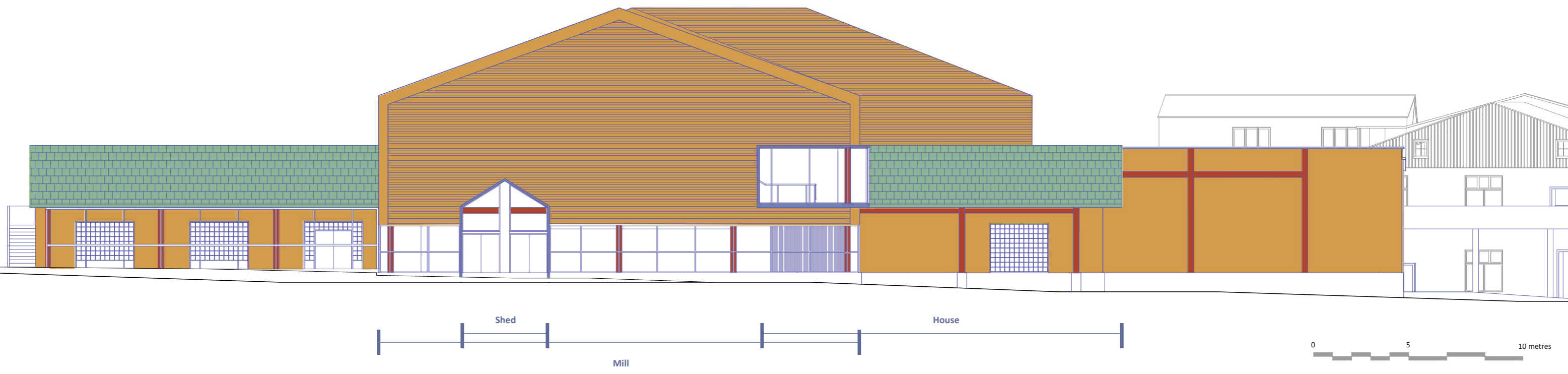
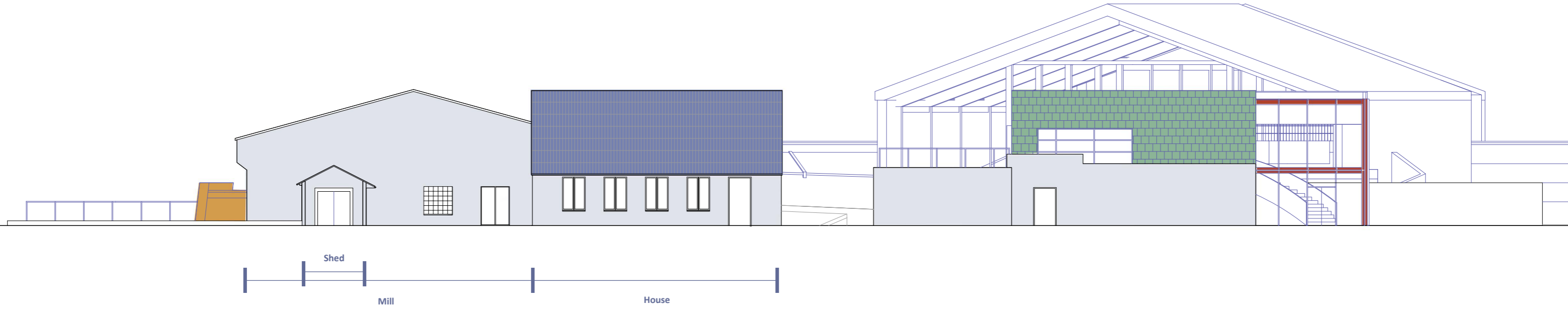
# Peeking In



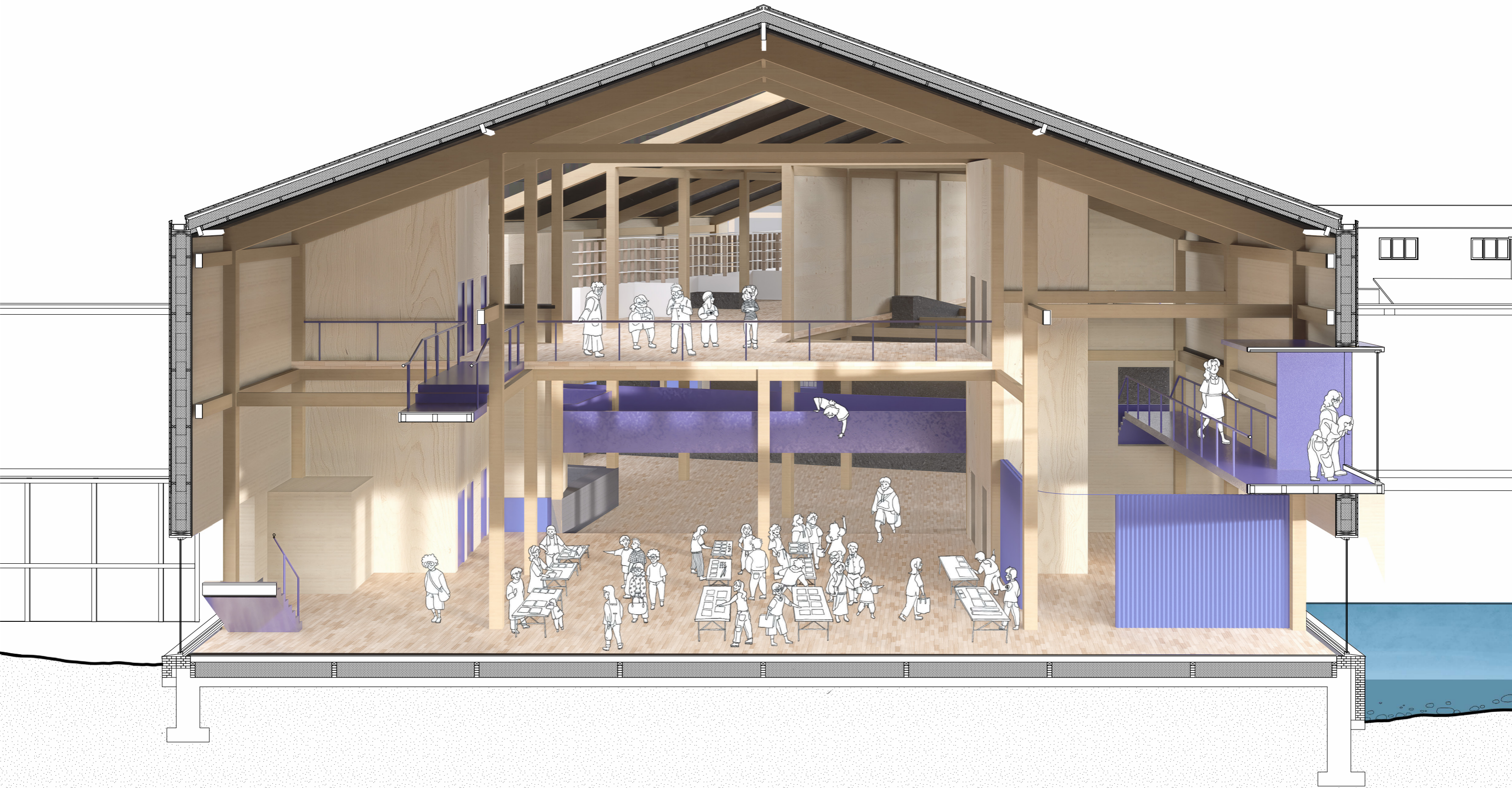
# Peeking Out

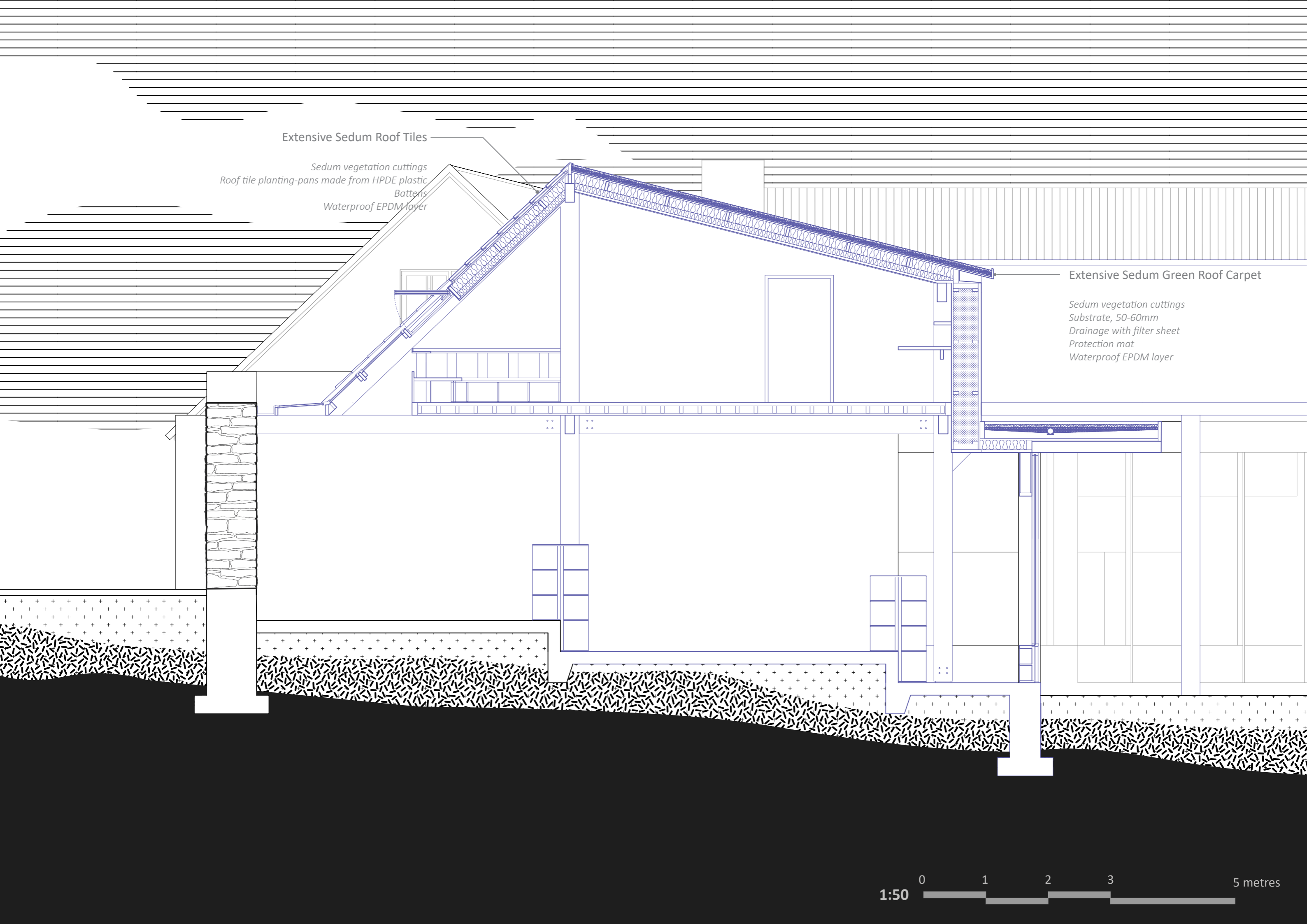


# Mirroring the Elevation









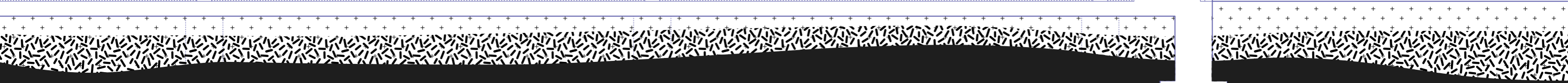
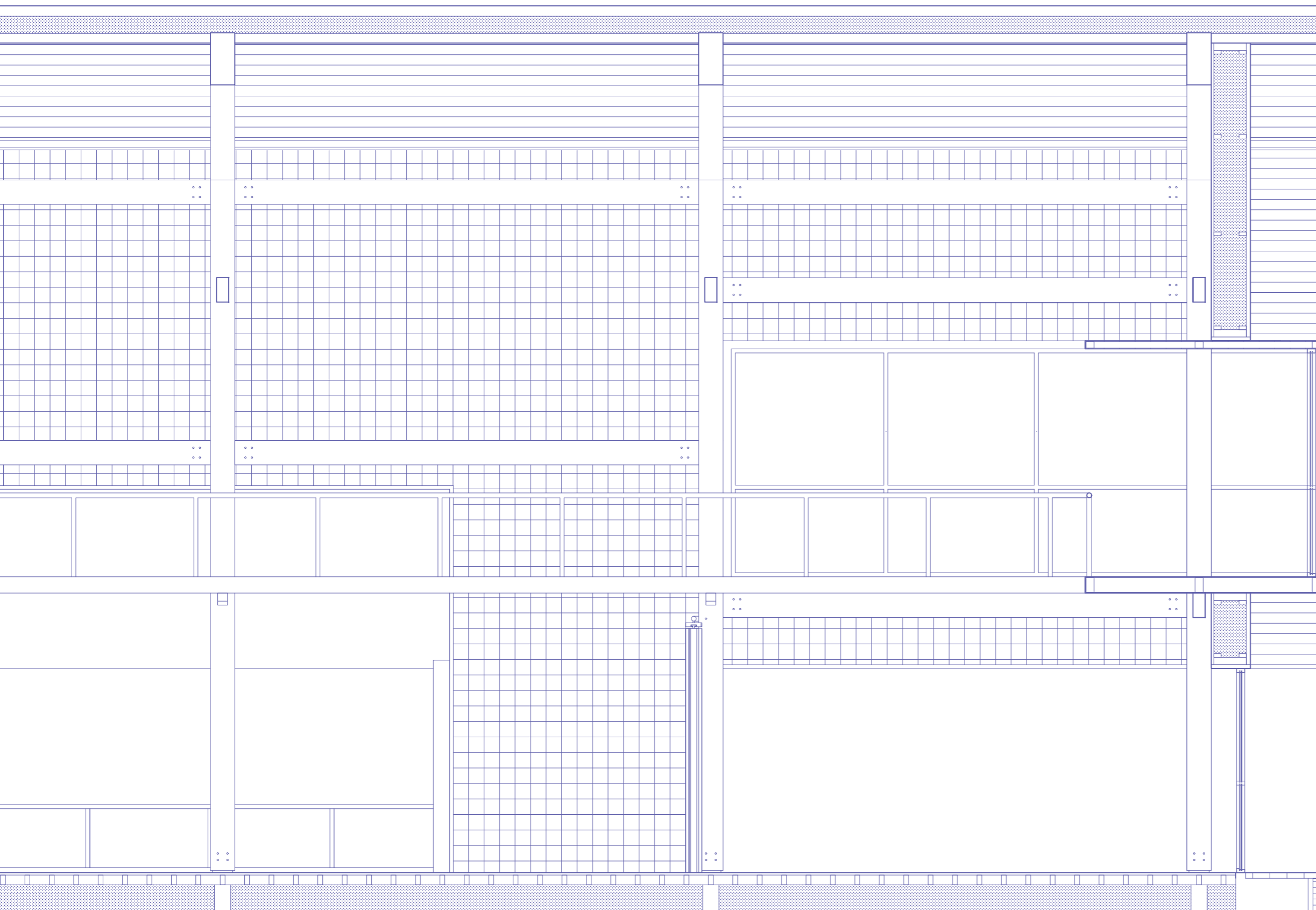
Extensive Sedum Roof Tiles

Sedum vegetation cuttings  
Roof tile planting-pans made from HPDE plastic  
Battens  
Waterproof EPDM layer

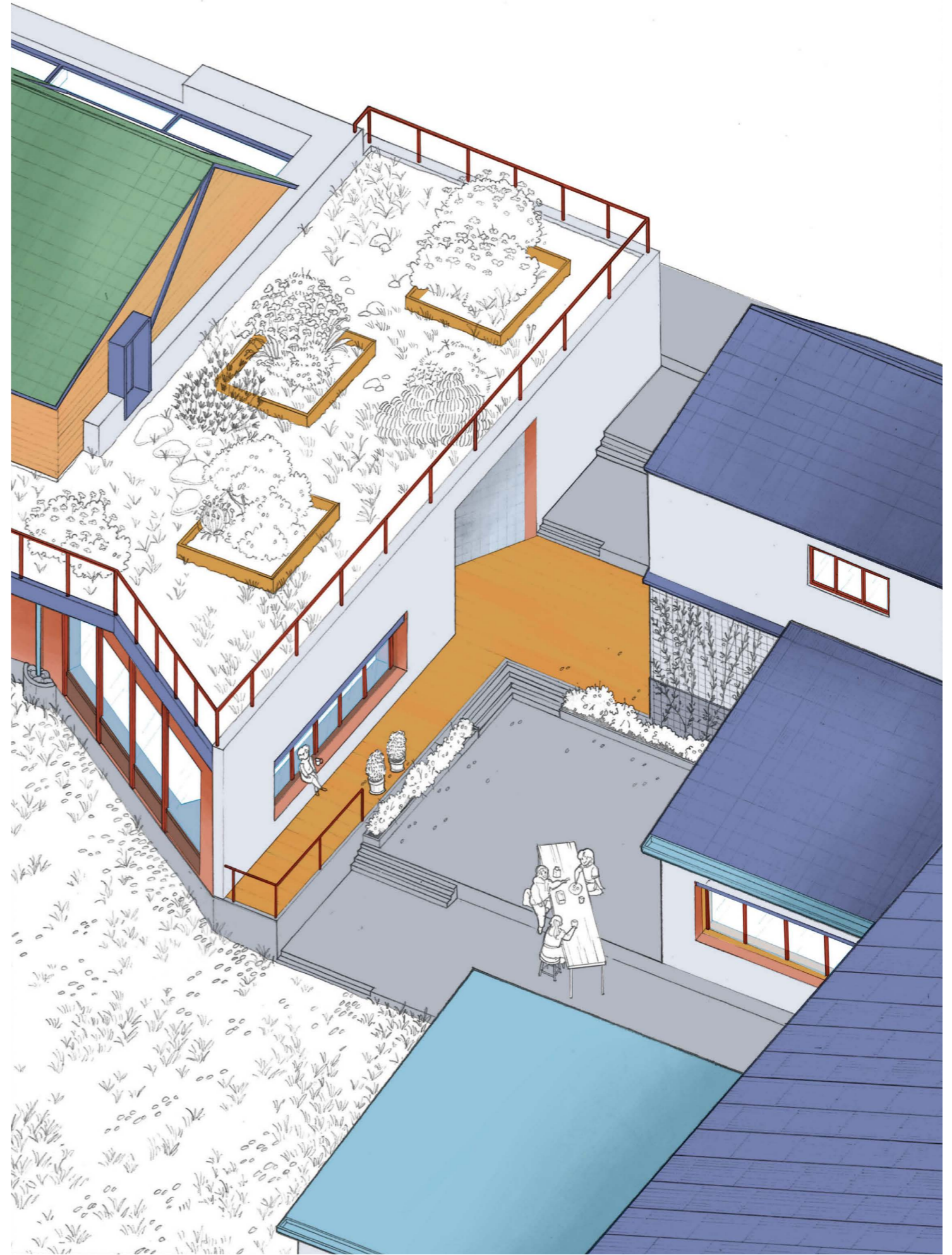
Extensive Sedum Green Roof Carpet

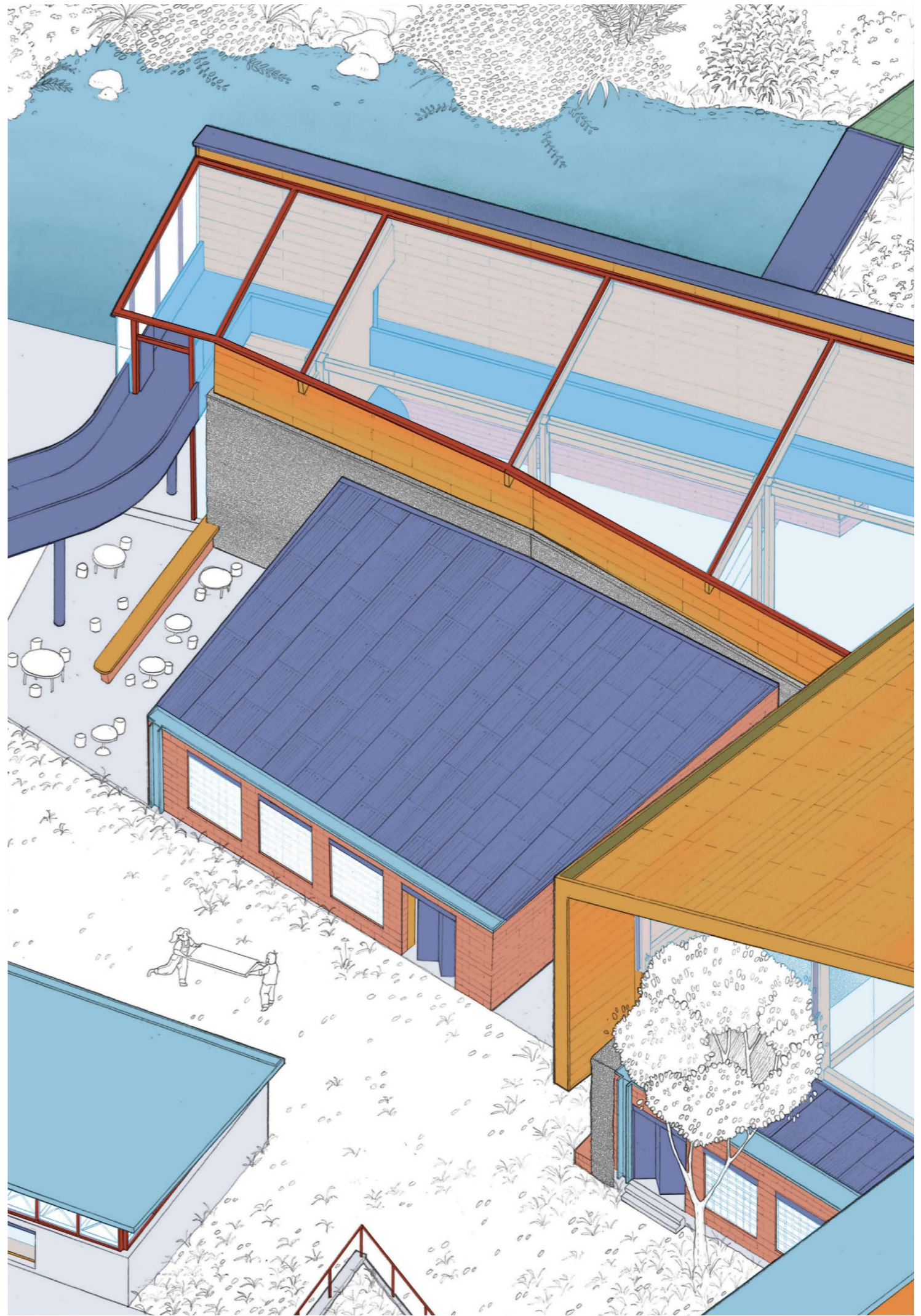
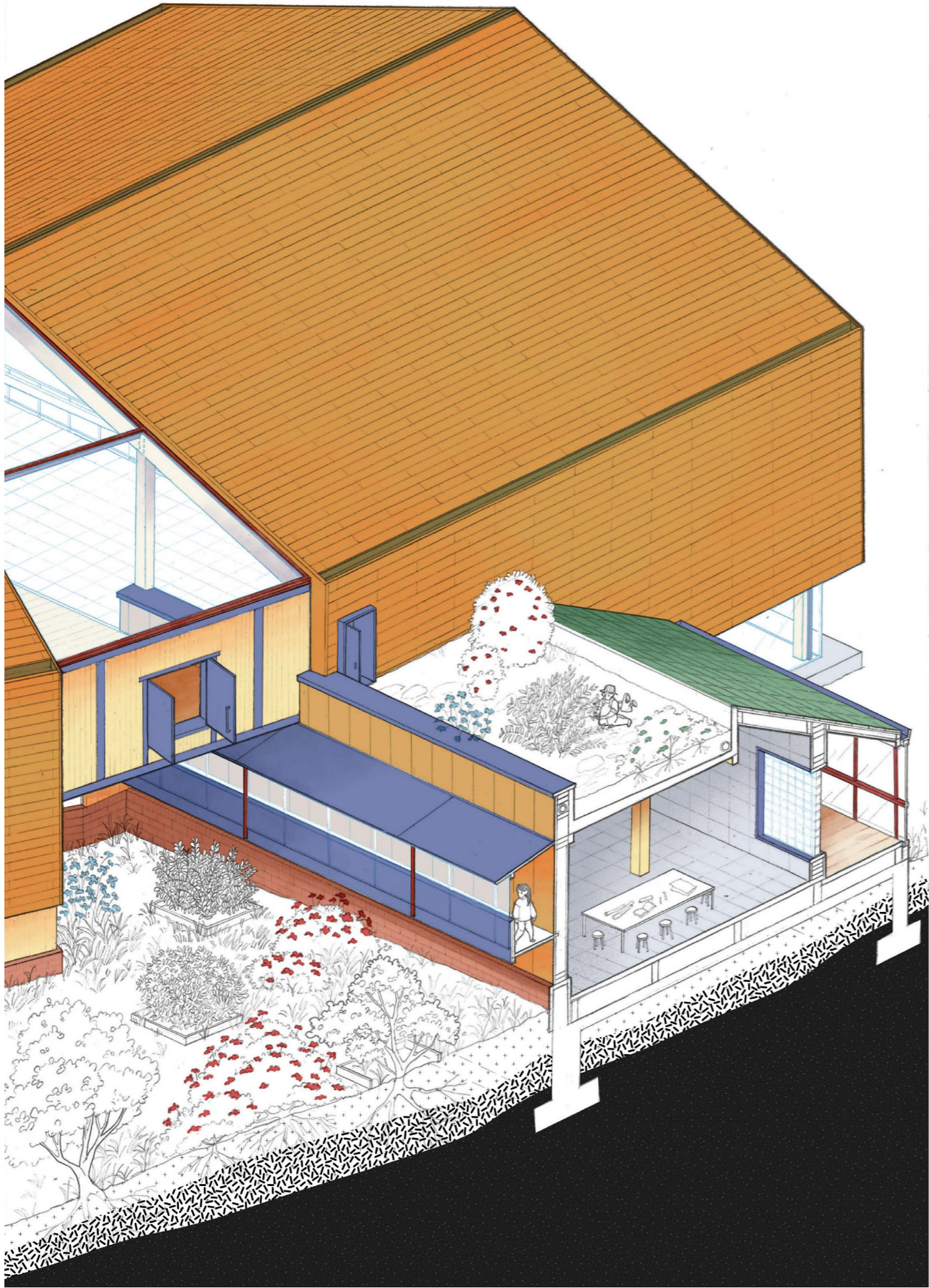
Sedum vegetation cuttings  
Substrate, 50-60mm  
Drainage with filter sheet  
Protection mat  
Waterproof EPDM layer

1:50 0 1 2 3 5 metres



1:50 0 1 2 3 5 metres

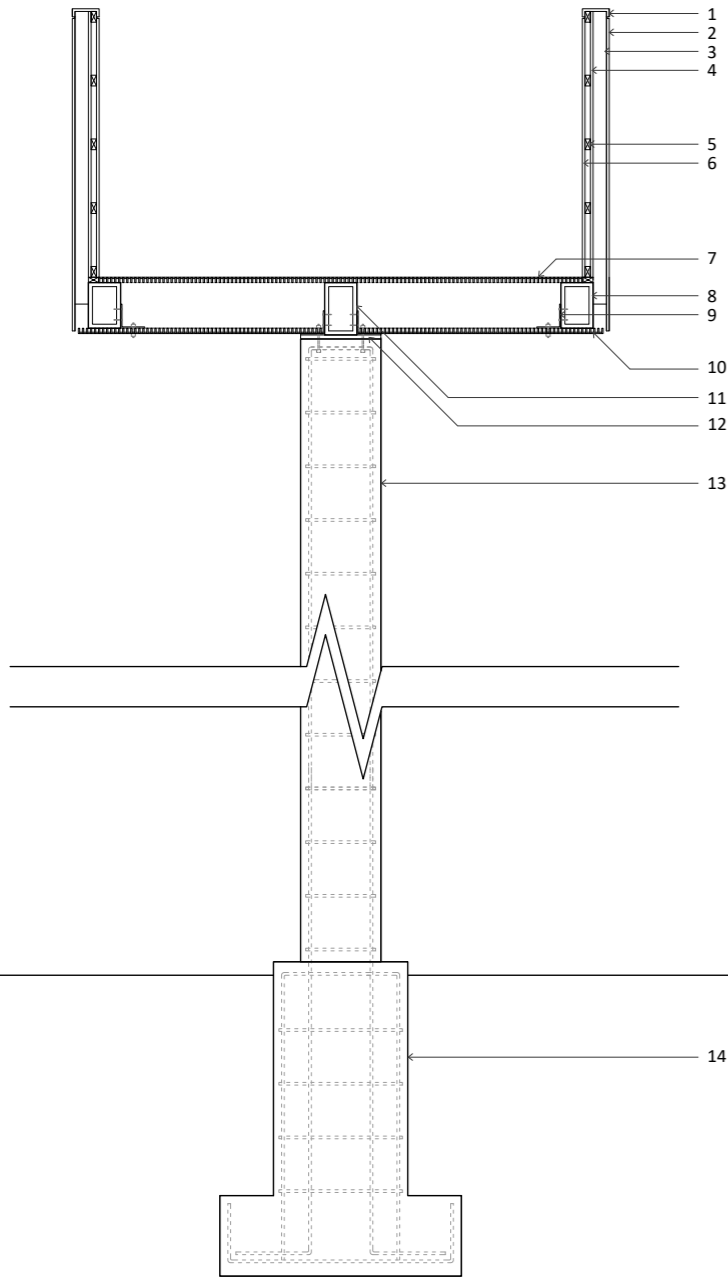






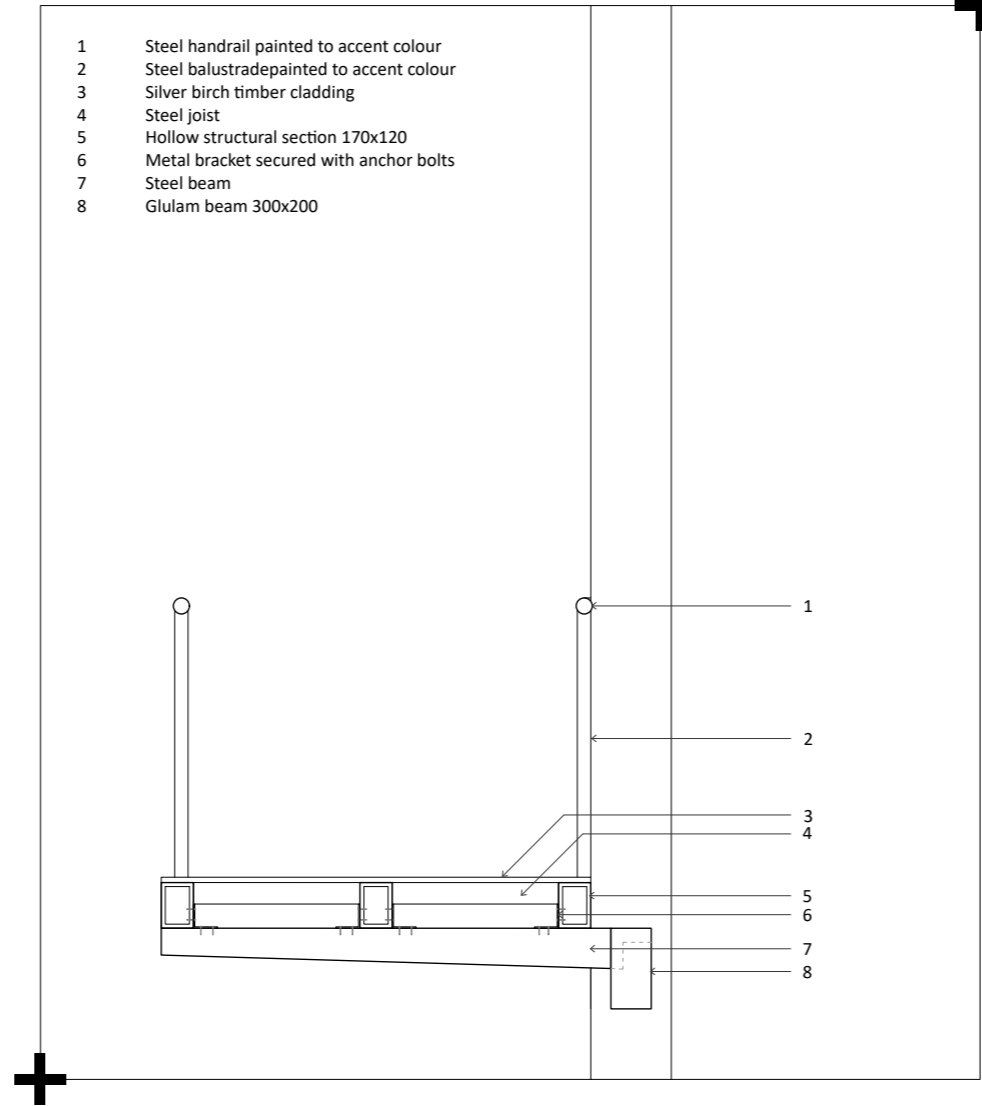
**Walkway Detail | By the River**

- 1 Corten railing flashing
- 2 Corten steel sheet cladding
- 3 50mm treated vertical battens
- 4 Sheathing board
- 5 Horizontal battens
- 6 Silver birch timber cladding
- 7 Stainless steel grate
- 8 Hollow structural section 170x120
- 9 Metal bracket secured with anchor bolts
- 10 Stainless steel grate
- 11 Hollow structural section 195x120
- 12 Steel cap
- 13 Reinforced concrete column
- 14 Reinforced concrete footing



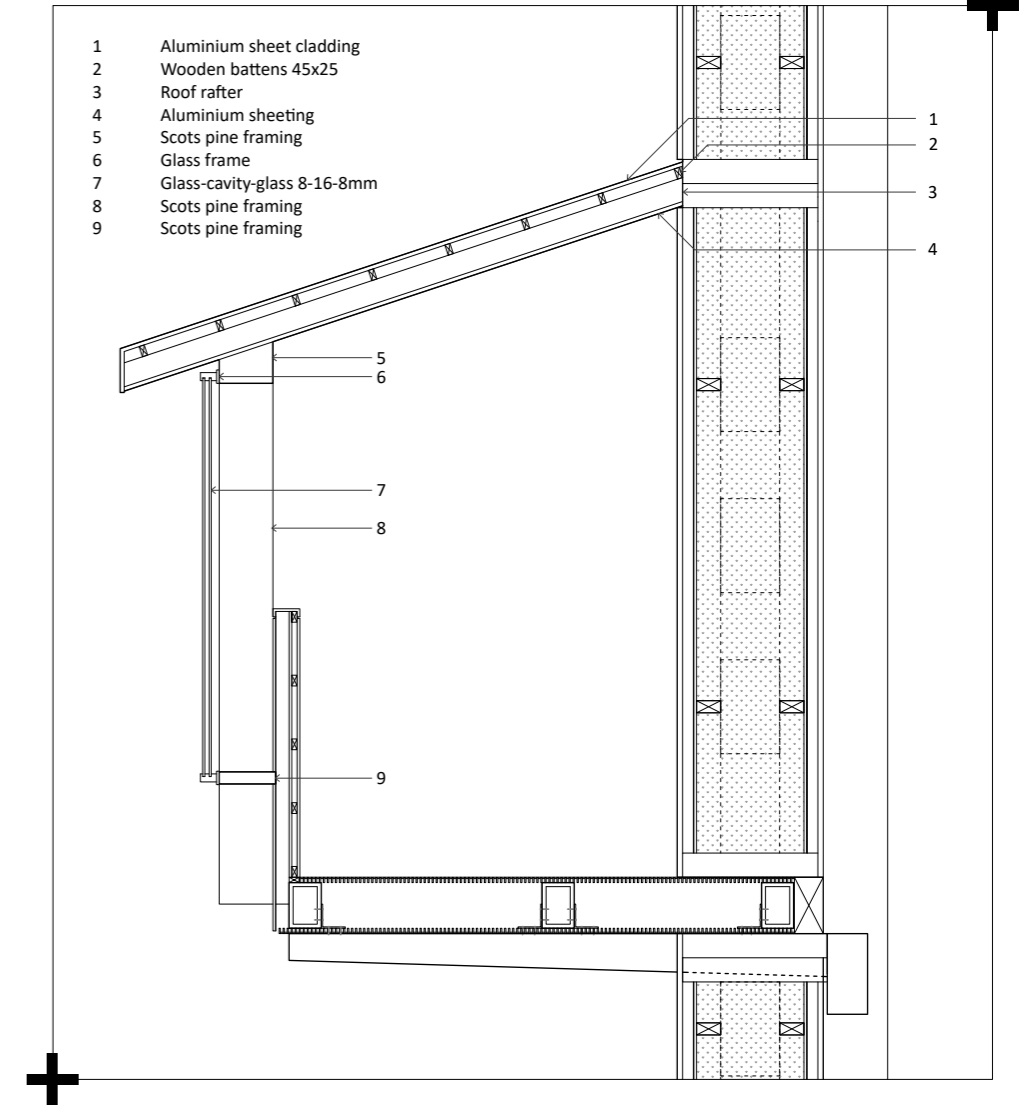
**Walkway Detail | In the Mirrored Mill**

- 1 Steel handrail painted to accent colour
- 2 Steel balustrade painted to accent colour
- 3 Silver birch timber cladding
- 4 Steel joist
- 5 Hollow structural section 170x120
- 6 Metal bracket secured with anchor bolts
- 7 Steel beam
- 8 Glulam beam 300x200

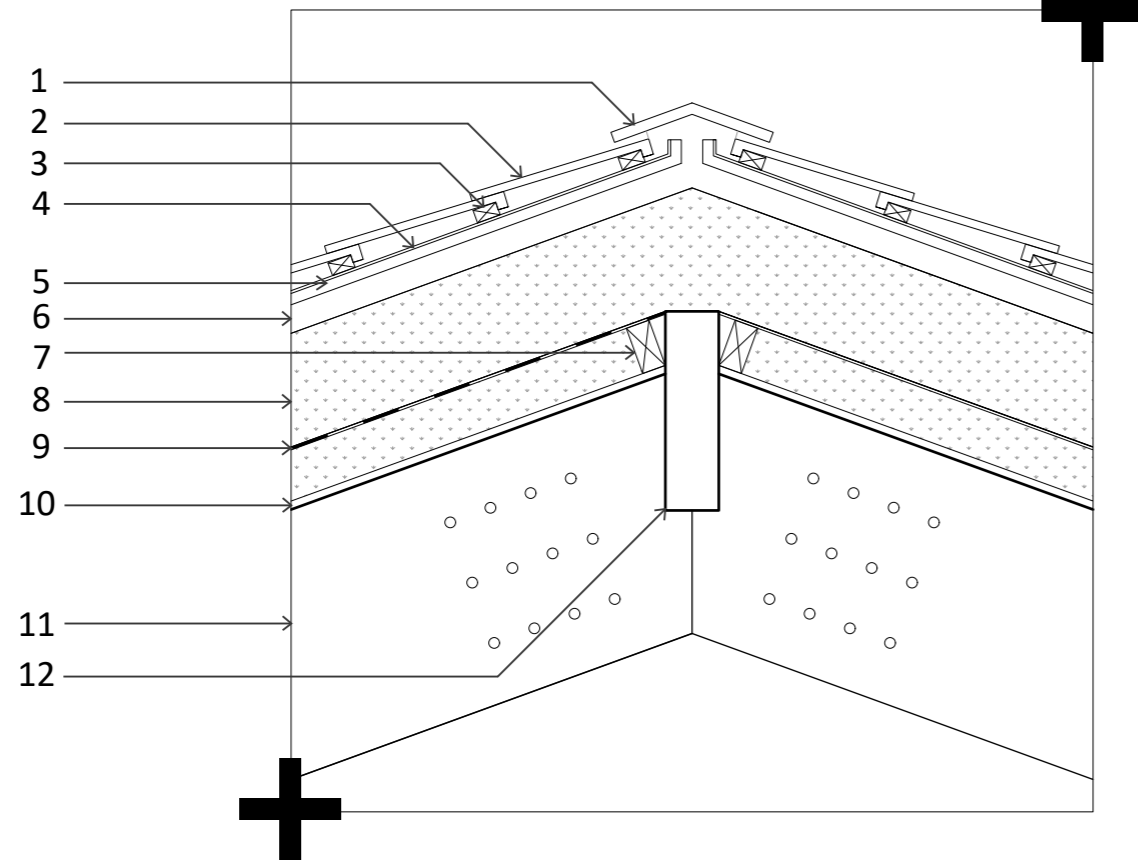


**Walkway Detail | Upon Exit**

- 1 Aluminium sheet cladding
- 2 Wooden battens 45x25
- 3 Roof rafter
- 4 Aluminium sheeting
- 5 Scots pine framing
- 6 Glass frame
- 7 Glass-cavity-glass 8-16-8mm
- 8 Scots pine framing
- 9 Scots pine framing

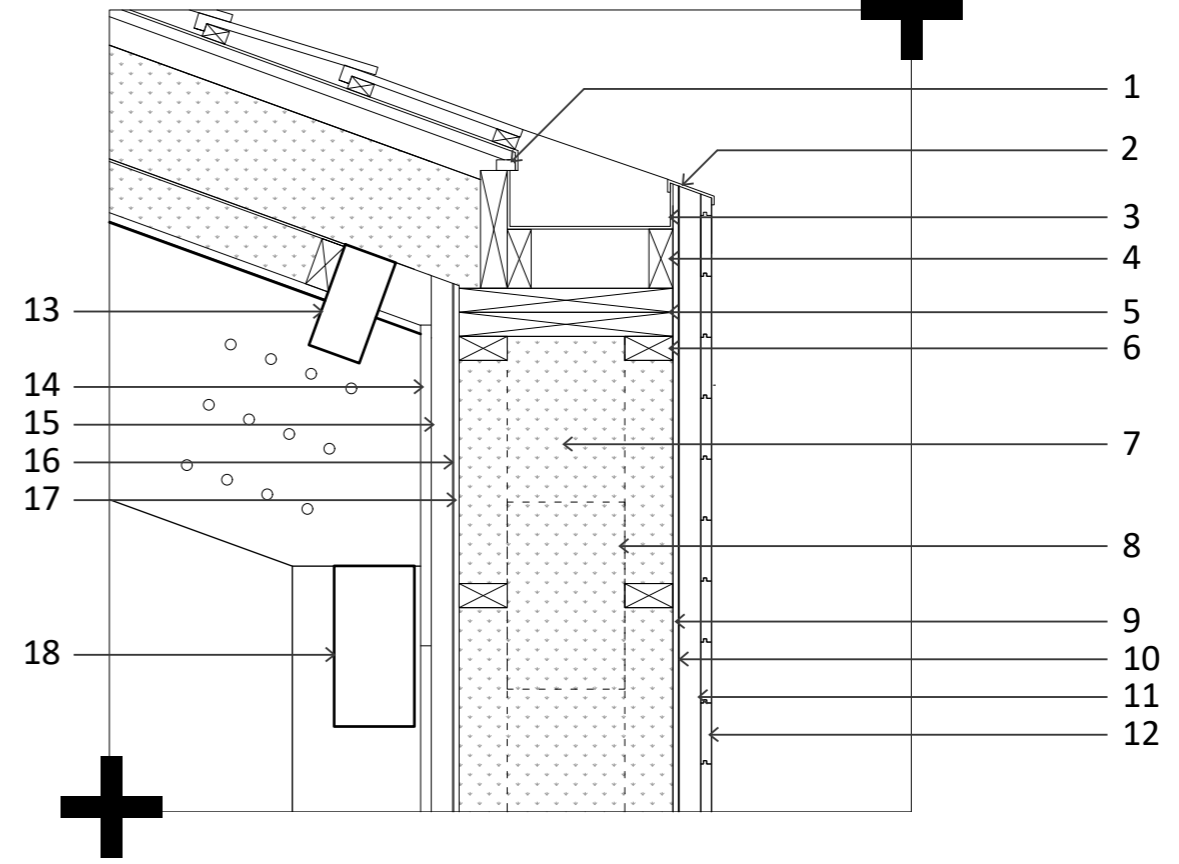


**Glulam Roof Detail**

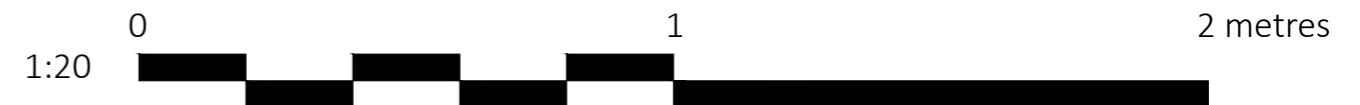


- 1 Ventilated ridge
- 2 Sliver birch timber shingle
- 3 Wooden batten 45x25
- 4 Felt underlay
- 5 Sheathing
- 6 Airing
- 7 Wooden stud 90x45
- 8 Dense-packed cellulose insulation
- 9 Vapour barrier
- 10 Interior lining
- 11 Glulam roof truss 600x300
- 12 Glulam ridge beam 370x100

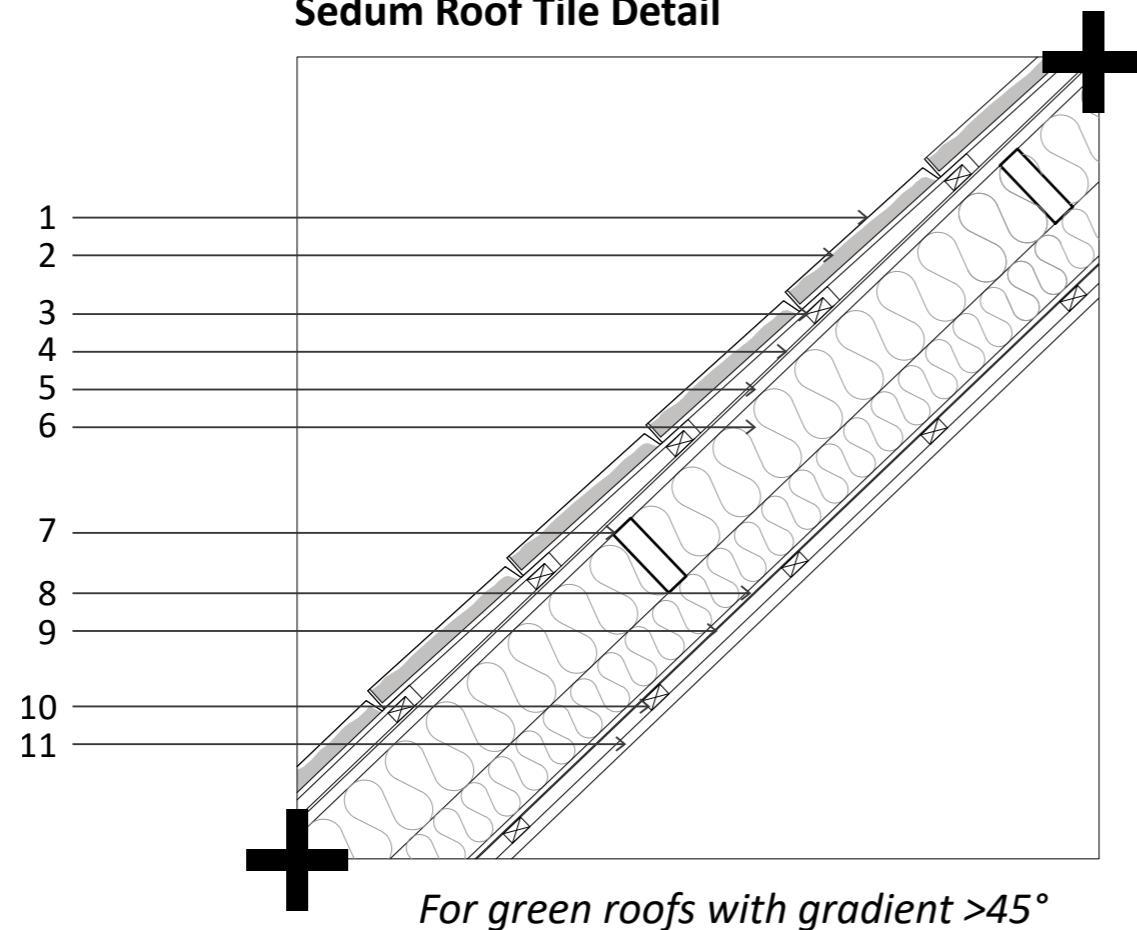
**Glulam Wall Detail**



- 1 Rafter vent
- 2 Metal flashing
- 3 Rain gutter 300mm wide
- 4 Blocking
- 5 Double top plate
- 6 Wooden stud 90x45
- 7 Dense-packed cellulose insulation 600mm thk
- 8 Plywood gusset
- 9 Structural sheathing
- 10 Moisture barrier
- 11 Vertical batten
- 12 Silver birch tongue and groove cladding
- 13 Glulam purlin 200x100
- 14 Paper-based wall tile 600x600
- 15 Vertical batten
- 16 Vapour barrier
- 17 Sheathing
- 18 Glulam beam 300x200

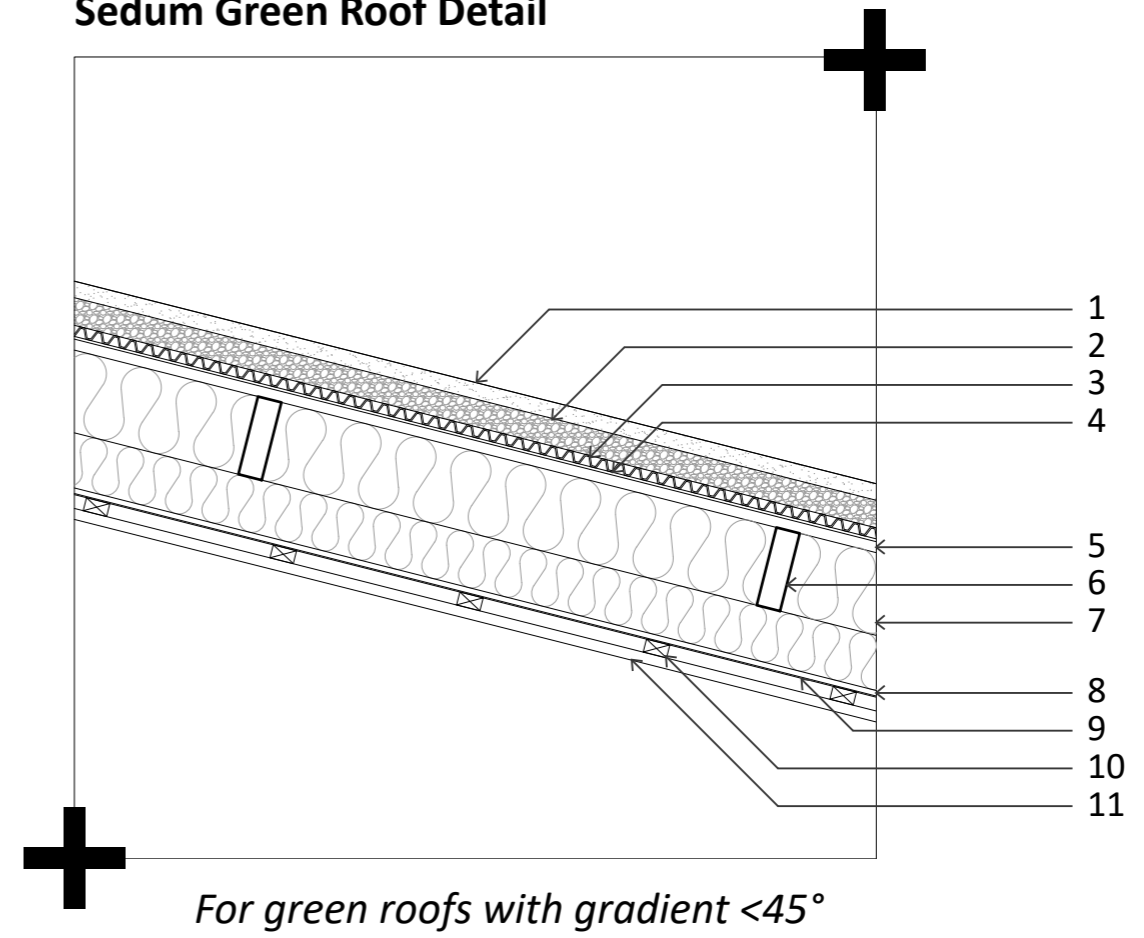


### Sedum Roof Tile Detail

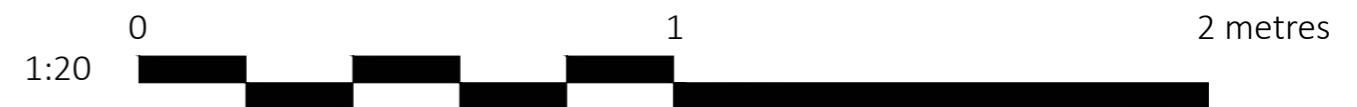


- 1 Plastic quick deck roof tile
- 2 Sedum plants with substrate
- 3 Wooden batten 45x25
- 4 Vapour open waterproof layer
- 5 Sheathing
- 6 XPS extruded polystyrene board
- 7 Roof rafter
- 8 Sheathing
- 9 Vapour barrier
- 10 Wooden batten 45x25
- 11 Silver birch tongue and groove cladding

### Sedum Green Roof Detail



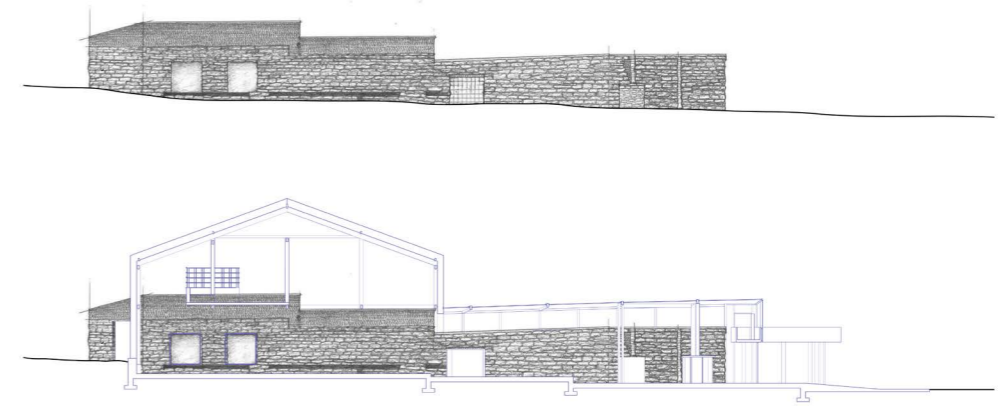
- 1 Sedum-mix blanket
- 2 Substrate
- 3 Filter fleece drainage
- 4 EPDM layer
- 5 Sheathing
- 6 Roof rafter
- 7 XPS extruded polystyrene board
- 8 Sheathing
- 9 Vapour barrier
- 10 Wooden batten 45x25
- 11 Silver birch tongue and groove cladding



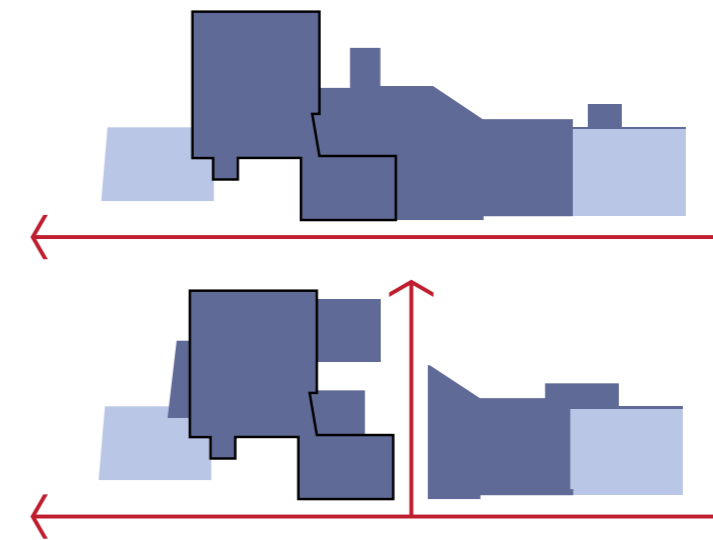
# Appendix 4

Explanatory Diagrams and Supplementary Visual Material  
from Graduation Thesis.

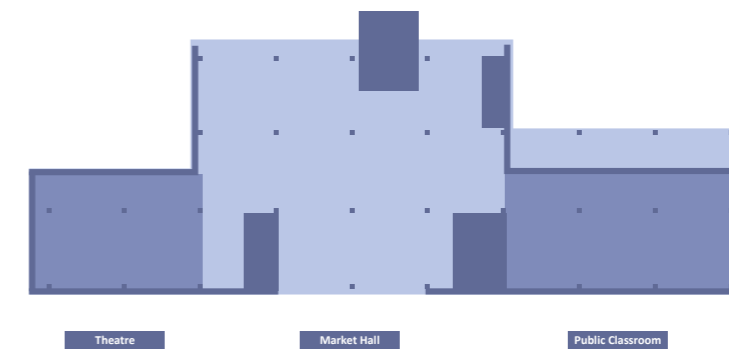
Author's own.



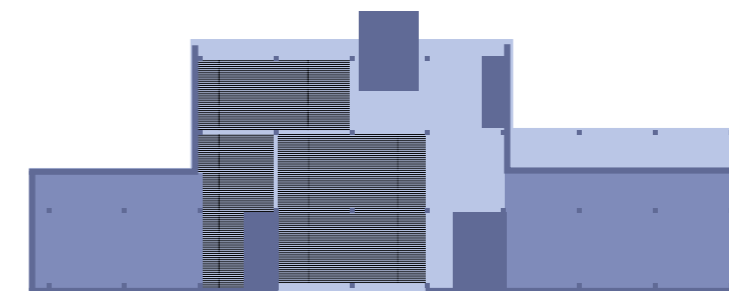
Traces as Design Clues

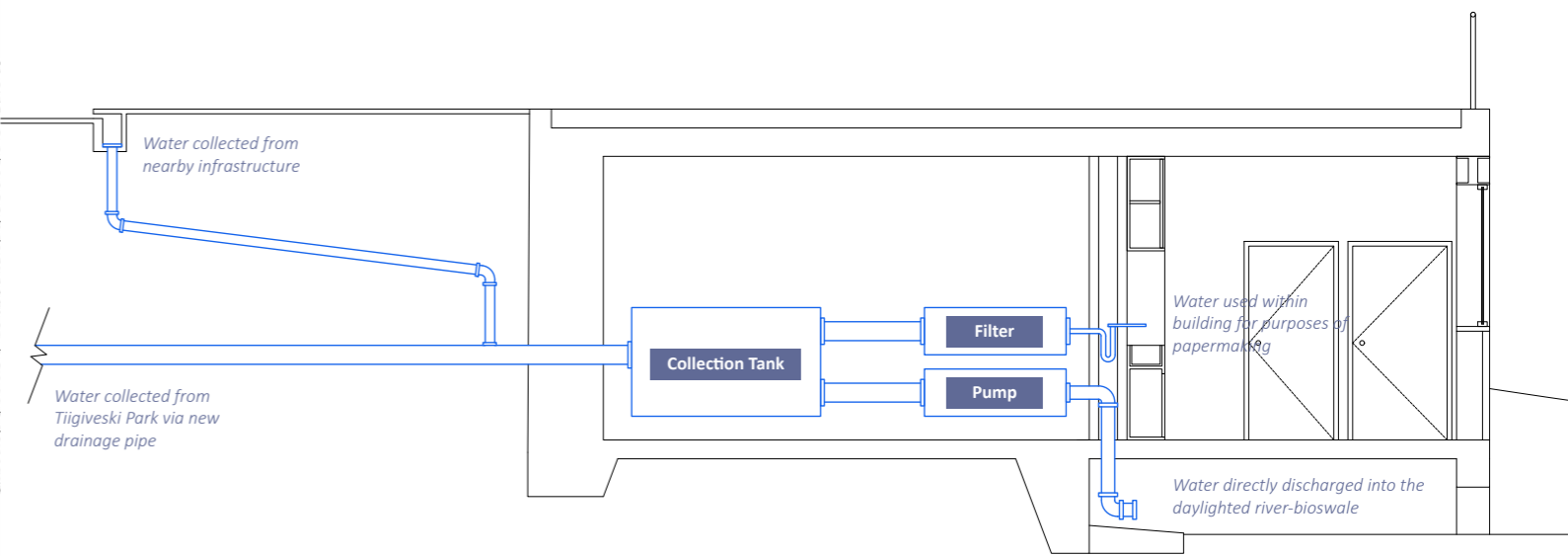


Gaps for Passage



An Adaptable Space



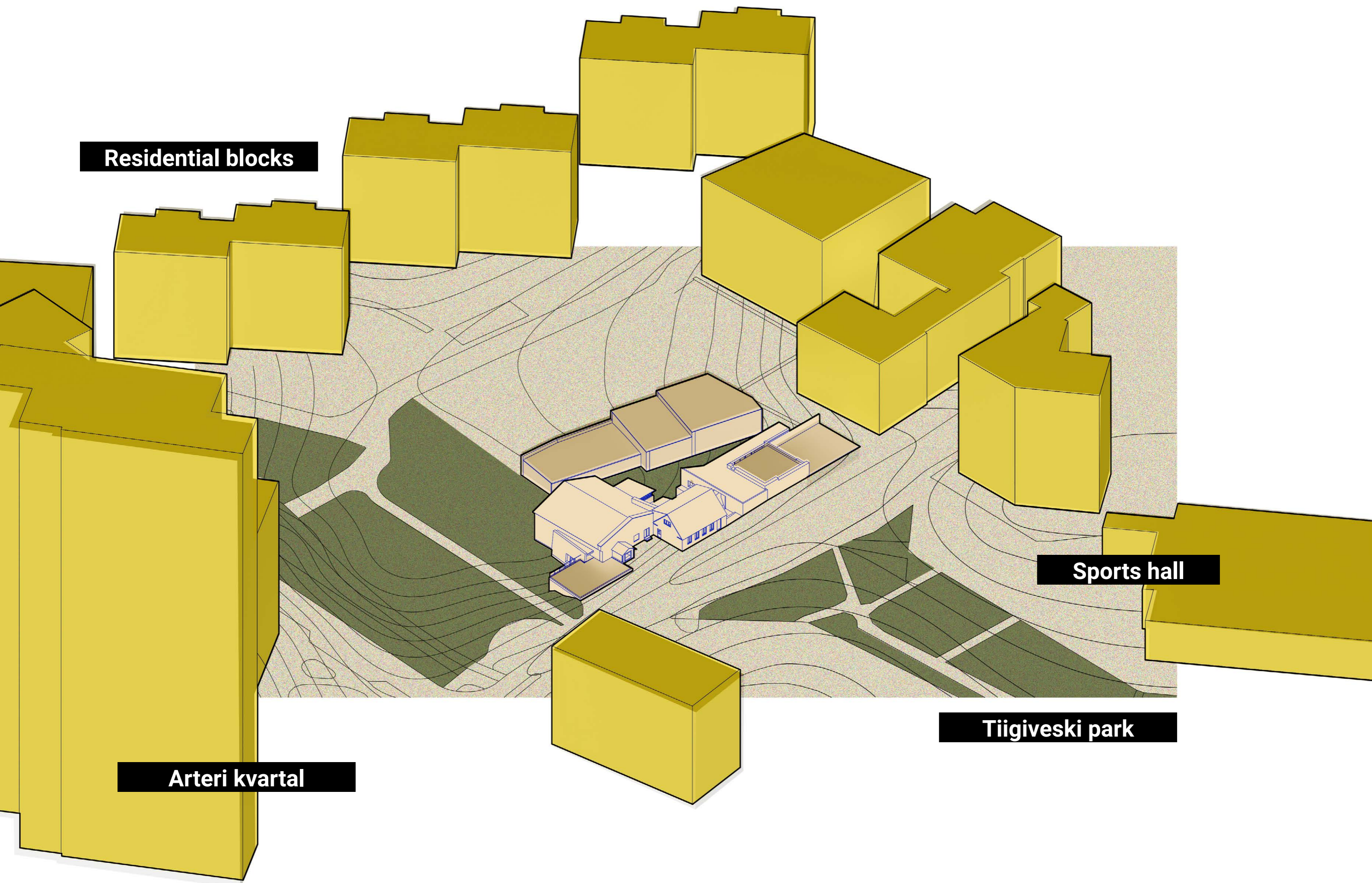


On the Question of Water Collection and Supply

On the Question of the River



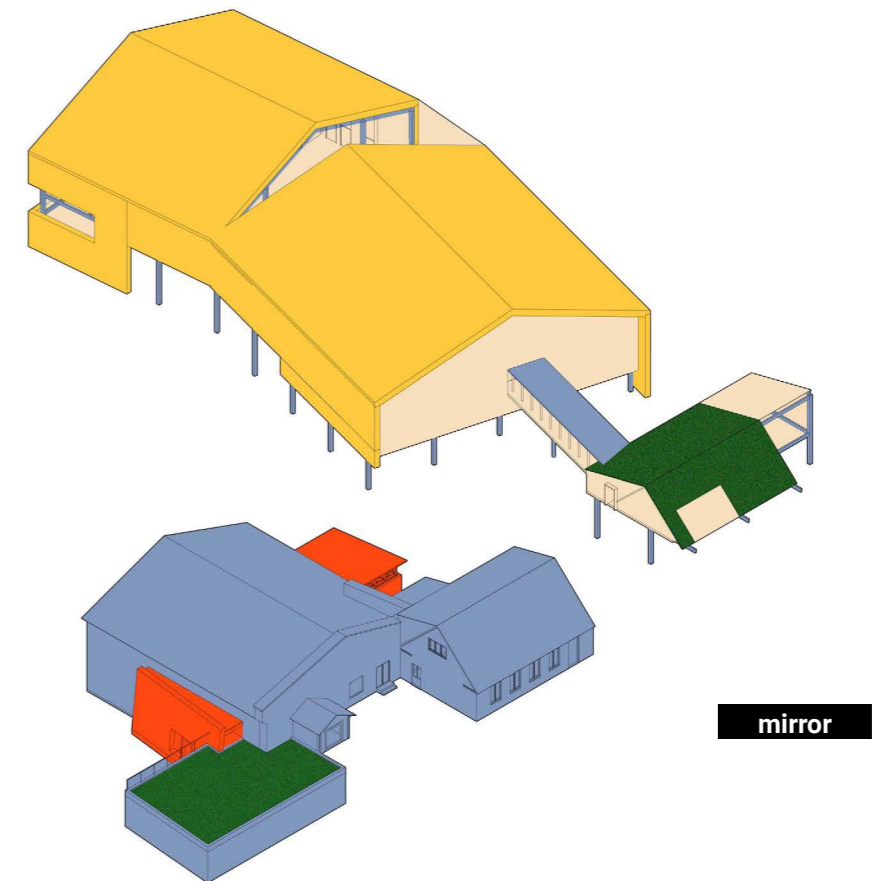
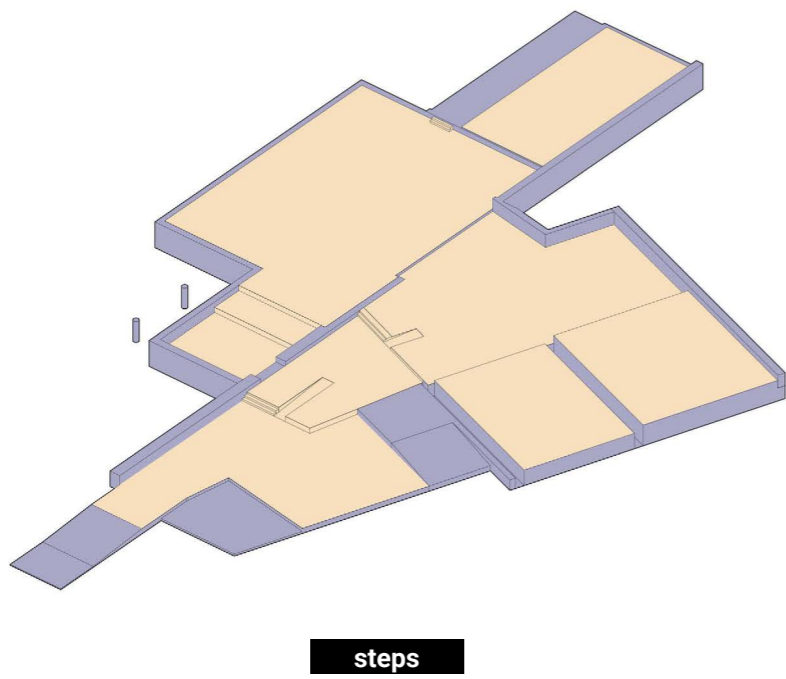
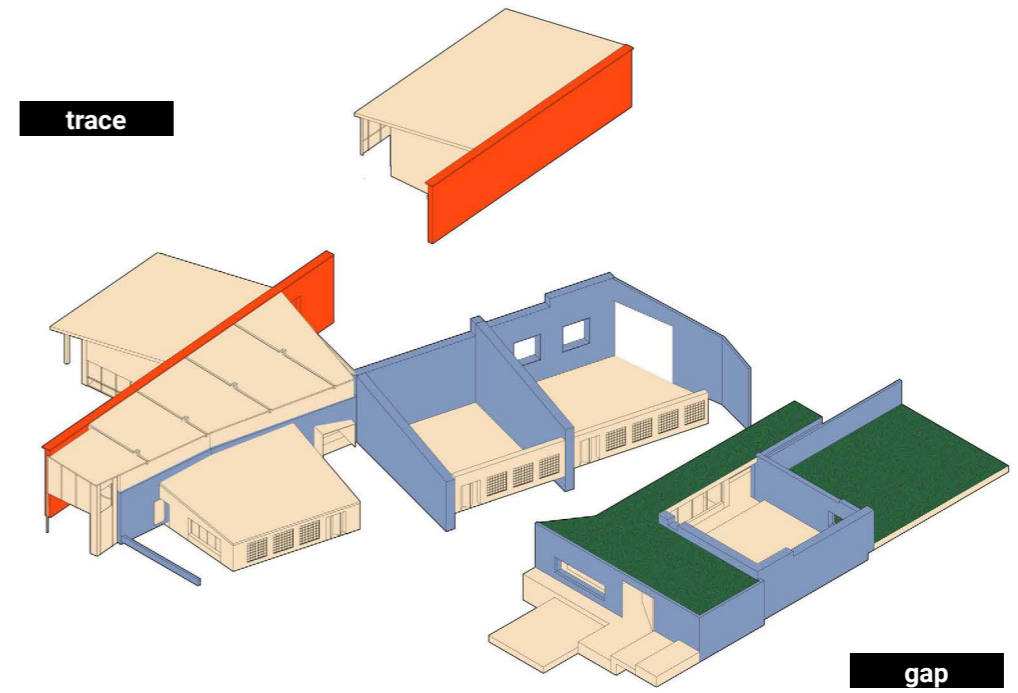
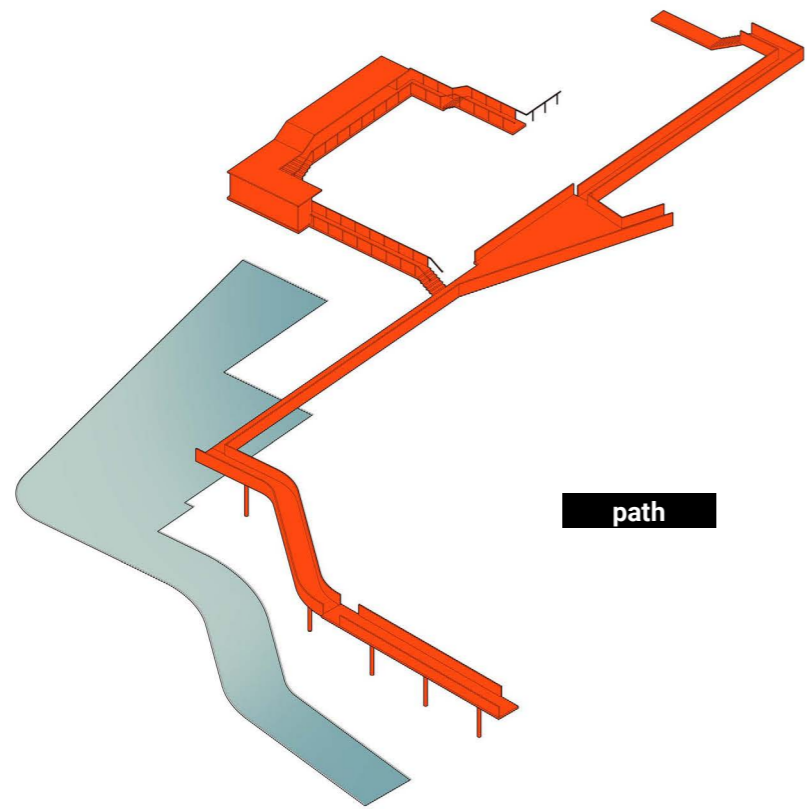
**Residential blocks**

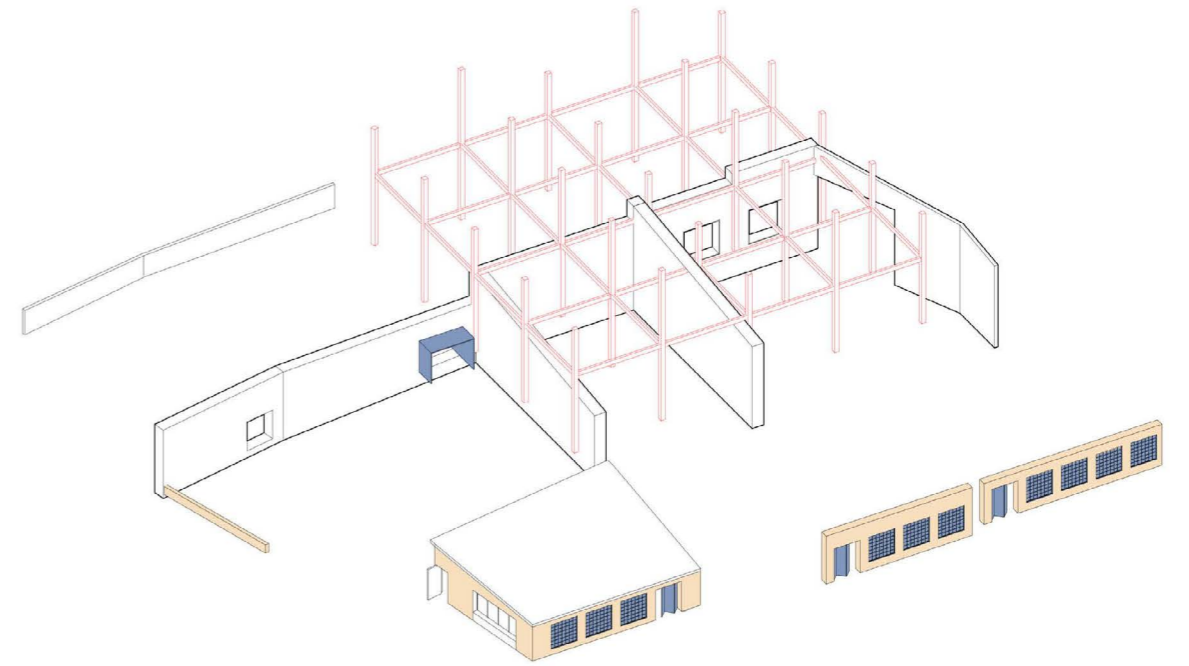


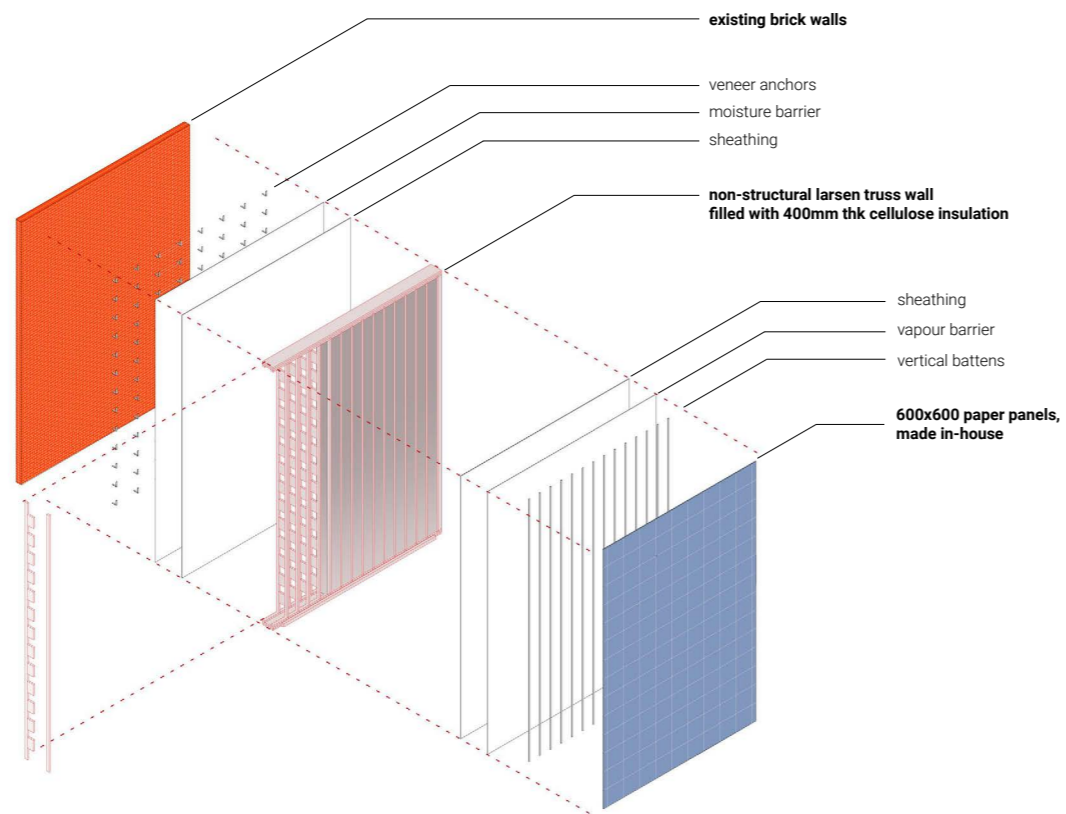
**Sports hall**

**Tiigiveski park**

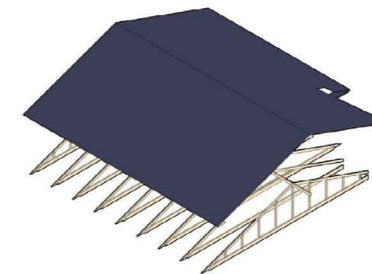
**Arteri kvartal**



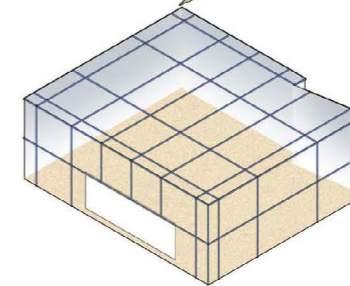




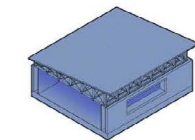
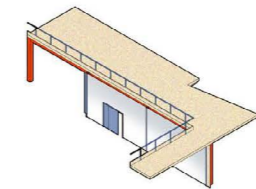
existing roof



double-glazed glass shell performs as insulation

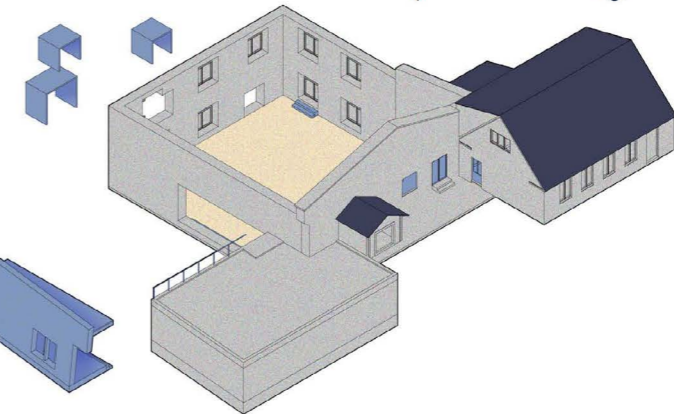


mezzanine floor spectating paperworks

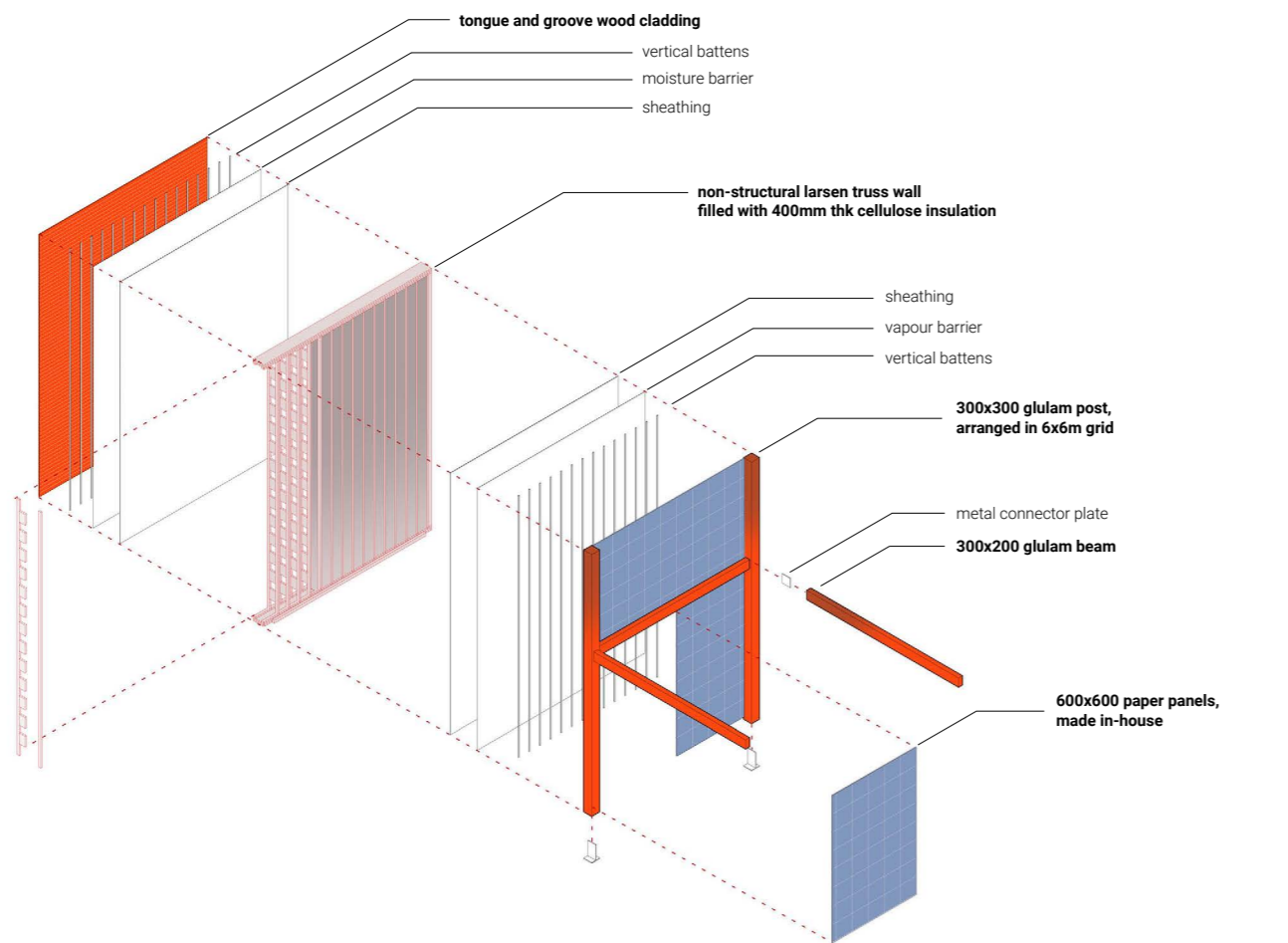


experimental paper lab acts as a meeting room

airlock compartmentalisation of operable fenestrations



extension to the river water collection



## References.

- 1 Brand, S. (1995). *How buildings learn: What happens after they're built*. Penguin Books.
- 2 Charles River Watershed Association. (2023, April 14). *All about daylighting & restoring streams* [Video]. YouTube. <https://www.youtube.com/watch?v=H1WDZIsYVQM>
- 3 De Caigny, S., Ertas, H. & Plevoets, B. (Eds.). (2023). *As found: Experiments in preservation*. Flanders Architecture Institute.
- 4 De Caigny, S. (2023). *L'architecture Et Son Double*. In De Caigny, S., Ertas, H. & Plevoets, B. (Eds.). (2023). *As found: Experiments in preservation* (pp.121-123). Flanders Architecture Institute.
- 5 Estonian World. (2021). *Pictures: Tallinn Airport through the ages*. <https://estonianworld.com/technology/pictures-tallinn-airport-through-the-ages/>
- 6 Kalamees, T. (2024). The thermal comfort and hygrothermal performance of the first certified passive house in Estonia. *Journal of Civil Engineering and Architecture* 18,165-174. <https://doi.org/10.17265/1934-7359/2024.04.002>
- 7 Knaack, U., Bach, R. and Schabel, S. (2023). *Building with paper: Architecture and construction*. Birkhäuser Verlag GmbH.
- 8 Lumi, L.J. (2025, June 30). *Estonia ships majority of recyclable paper waste to other countries*. Eesti Rahvusringhääling. <https://news.err.ee/1609733616/estonia-ships-majority-of-recyclable-paper-waste-to-other-countries>
- 9 Landezine. (2025). *De Nieuwe Mark Breda – a new innovative nature-inclusive river in the city center by Stadsingenieurs Breda with ODC architecture and Studio Mars*. <https://landezine-award.com/de-nieuwe-mark-breda-a-new-innovative-nature-inclusive-river-in-the-city-center-by-stadsingenieurs-breda-with-odc-architecture-and-studio-mars/>
- 10 Lynch, K. (1960). *The image of the city*. MIT Press.
- 11 Lynch, P. (2017). *Zaha Hadid Architects wins competition for Port of Tallinn masterplan in Estonia*. ArchDaily. <https://www.archdaily.com/878835/zaha-hadid-architects-wins-competition-for-port-of-tallinn-masterplan-in-estonia>
- 12 Muinsuskaitseamet. (1999). *8735 Tiigiveski hoone, 14.-19. saj.* [Registry database]. Retrieved from Kultuurimälestiste registri.
- 13 Macfarlane, R. (2025). *Is a river alive?*. W. W. Norton & Company.
- 14 Neutra Capital AS. (2026). *Quarter with a historical character*. <https://fahle.ee/en/history/>
- 15 Ouest. (2020). *Ferme Maximilien-Sur-Senne*. <https://ouest.be/projet/max/>
- 16 Strauven, I. (Ed.). (2025). *Ouest: Urban legend*. Buchhandlung Walther König.
- 17 Rail Baltic Estonia. (2023). *Rail Baltica Ulemiste Joint Terminal*. <https://rbulemiste.ee/en/>
- 18 Raivet, L. K. (2023). *Transforming public space in a compact urban center: Case study of Tatari-Südalinna-Sibulaküla-Maakri-Kompassi subdistricts in Tallinn* [Master's thesis, Estonian University of Life Sciences]. Estonian University of Life Sciences Repository. <http://hdl.handle.net/10492/8208>
- 19 Swedish Wood. (2024). *The glulam handbook* (1st ed., Vol. 1).
- 20 Tallinn Euroopa roheline pealinn. (2023). *The pollinator highway. City's biodiverse green corridor*. <https://greentallinn.eu/en/flag-projects/the-pollinator-highway/>
- 21 Van Cleempoel, K. (2023). *Embracing Traces with a Designerly Gaze*. In De Caigny, S., Ertas, H. & Plevoets, B. (Eds.). (2023). *As found: Experiments in preservation* (pp.101-103). Flanders Architecture Institute.
- 22 Voet, C. (2023). *Challenges and Promises of the 'As Found'*. In De Caigny, S., Ertas, H. & Plevoets, B. (Eds.). (2023). *As found: Experiments in preservation* (pp.159-169). Flanders Architecture Institute.

## Figures.

- Fig. 1 Author's own, with data acquired from:  
Tallinn (n.d.). *Tallinna ruumiandmete registri (TAR) aluskaart* [Data set]. <https://gis.tallinn.ee/taraluskaart/>  
Land and Spatial Development Board. (2026). *Base map* [Data set]. Republic of Estonia. <https://geoportaal.maaamet.ee/eng/web-maps-p35.html>
- Fig. 2 Author's own.
- Fig. 3 Author's own, with data acquired from:  
Tallinn (n.d.). *Tallinna ruumiandmete registri (TAR) aluskaart* [Data set]. <https://gis.tallinn.ee/taraluskaart/>  
Land and Spatial Development Board. (2026). *Base map* [Data set]. Republic of Estonia. <https://geoportaal.maaamet.ee/eng/web-maps-p35.html>
- Fig. 4 Hannu & OpenStreetMap contributors. (2009, September 24). *The course of the Härjapea River in Tallinn in the end of 19th century shown on a modern map, Course of the river based on Situationsplan der Stadt Reval, 1885* [Image]. Wikipedia. [https://et.wikipedia.org/wiki/Fail:Härjapea\\_River.png](https://et.wikipedia.org/wiki/Fail:Härjapea_River.png)
- Fig. 5 Author's own, with data acquired from:  
Tallinn (n.d.). *Tallinna ruumiandmete registri (TAR) aluskaart* [Data set]. <https://gis.tallinn.ee/taraluskaart/>  
Land and Spatial Development Board. (2026). *Base map* [Data set]. Republic of Estonia. <https://geoportaal.maaamet.ee/eng/web-maps-p35.html>
- Fig. 6 Oskar, G. (n.d.). *Tallinn, Tiigiveski* (TLM F 6160). Tallinna Linnamuuseum. <http://www.muis.ee/museaalView/3061435>
- Fig. 7-13 Author's own.
- Fig. 14 Author's own, with data acquired from:  
Tallinn (n.d.). *Tallinna ruumiandmete registri (TAR) aluskaart* [Data set]. <https://gis.tallinn.ee/taraluskaart/>  
Land and Spatial Development Board. (2026). *Base map* [Data set]. Republic of Estonia. <https://geoportaal.maaamet.ee/eng/web-maps-p35.html>
- Fig. 15 Author's own.
- Fig. 16 Binet, H. (2009). Hedmark Museum at Hamar [Photograph] (NMK.2018.0473). Nasjonalmuseet for kunst, arkitektur og design, The Architecture Collections. <https://www.nasjonalmuseet.no/en/collection/object/NMK.2018.0473>
- Fig. 17 Fehn, S. (1979). [First floor plan of Hedmark Museum]. ArchEyes. <https://archeyes.com/hedmark-museum-by-sverre-fehn-reimagining-time-and-space/>
- Fig. 18-20 Ouest. (2020). *Ferme Maximilien-Sur-Senne* [Axonometric drawing and model photographs]. <https://ouest.be/projet/max/>
- Fig. 21-35 Author's own.
- Fig. 36 Tallinna Vesi. (n.d.) 9. *Waste water management* [Report chapter]. Tallinn. <https://www.tallinn.ee/et/media/294708>
- Fig. 37 Vaksmaan, M. & Tallinna Vesi. (n.d.) *Strategic planning of stormwater sewer in Tallinn* [Presentation slides]. Central Baltic. [https://centralbaltic.eu/wp-content/uploads/2024/03/3.-Strategic-planning-Vaksmann\\_compressed.pdf](https://centralbaltic.eu/wp-content/uploads/2024/03/3.-Strategic-planning-Vaksmann_compressed.pdf)