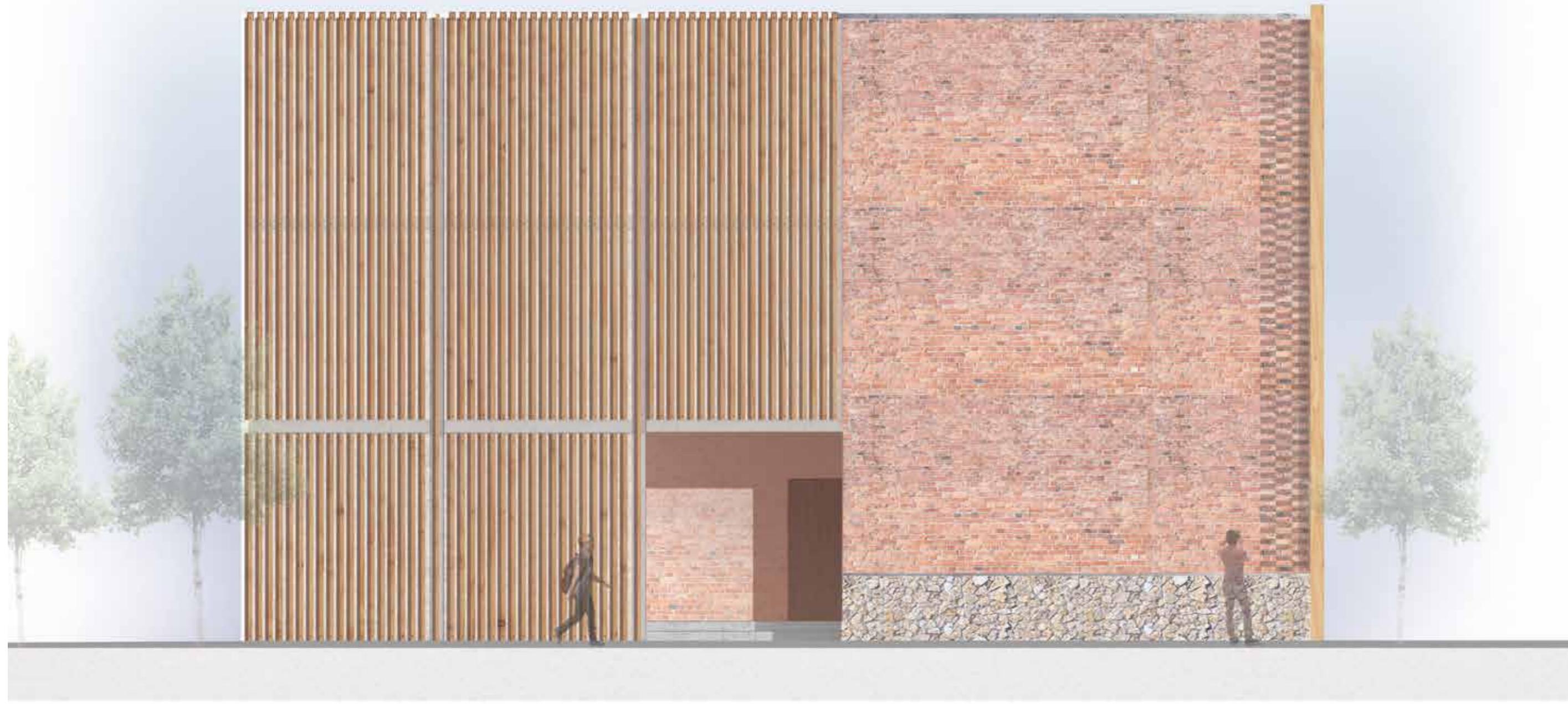


NITIKA  
DUGGAL

ARCHITECTURE  
PORTFOLIO

## Social Housing in Portugal

Tutor: Angelo Candalepas  
Masters of Architecture



The social housing was originally designed by Architect Alvaro Siza, this project aims at re-designing the Bouça social housing at Porto, Portugal. Visiting the site in Portugal helped me understand the problems for this challenging site which lies alongside an active railway line.

Continuing the philosophy of Architect Alvaro Siza of hierarchy and rhythm, Bouça housing was redesigned with articulated voids. The repetitive but hierarchical composition of the facades and the architectural elements resulted in a rhythmic play of light and shadow.

The proportion of the open spaces (recreational area) is an important consideration within the development. The lavish internal landscape between the buildings provides functional and inviting communal space. The poetic landscaping was inspired by Woodland Cemetery, which was a part of the precedent study. The stone seating, extensive landscaping, and level changes create a landscape of thresholds, providing a sanctuary to reflect and unwind within the inner city.

My re-design imagines the residential blocks as homes within a natural landscape - offering access to views, air, and light. Each block has a mixed tenure of 2bhks and 1bhks with the landscape given over to communal activities, blurring boundaries between private residence and shared spaces. The 2bhk units span the width of each block - providing sunlight, air, and views on both sides. Balconies on one side overlook the quiet landscape while the balconies and bay windows situated on the inner side overlook the recreational area.





Section A-A'



Southwest Elevation



Northwest Elevation

## Designing for the Great Barrier Reef Factory of Hyper-ecologies



Tutor: Amaia Sanchez-Velasco

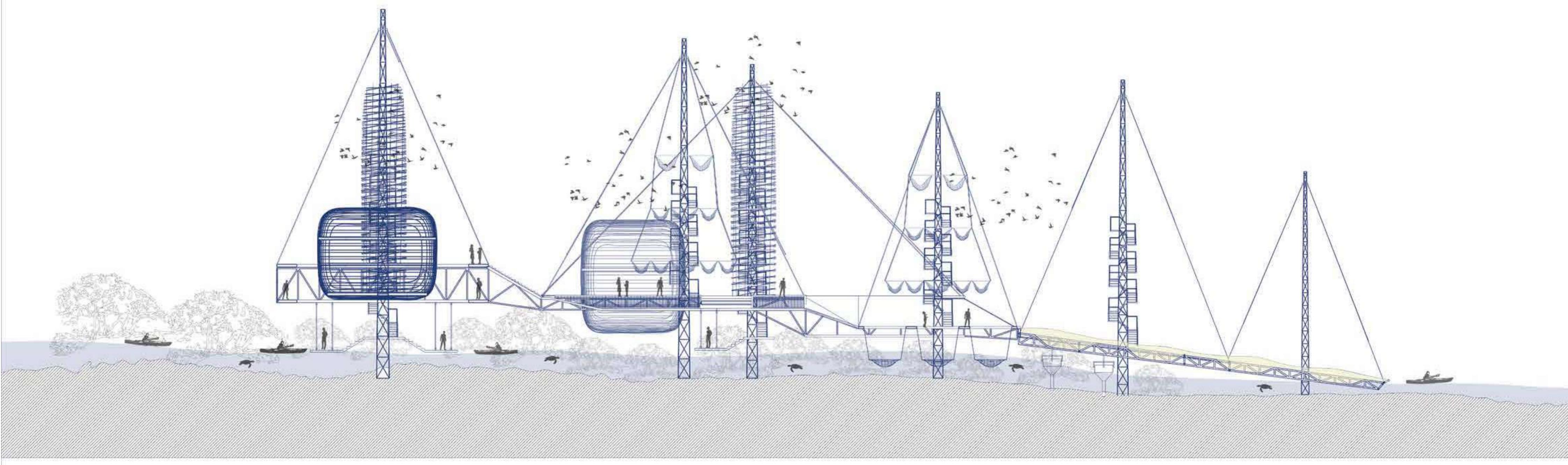
Masters of Architecture

Group member: Thi Ma Phan

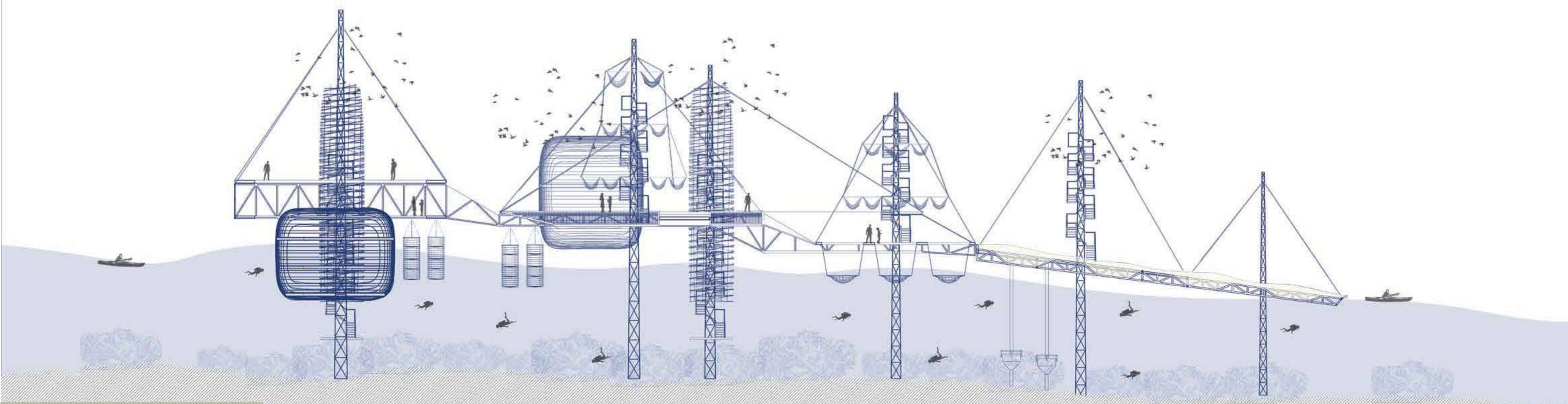
### The disappearing Landscape

The proposal mitigates the danger of climate change especially of rising sea levels and the direct consequence has been the partial destruction of the ecosystem. Over the coming years, the rare turtle species found on Heron island would lose their breeding grounds that are the sandbanks and hundereds of thousands of migratory birds would be left homeless, along with the other flora and fauna both under-water and ground. As a solution to this, we propose a new modular unit of a constructive system that is organized, distributed, and can be reproduced as a cell throughout the island. It will even rehabilitate the existing research center. This cell is elevated from the ground, to give way to the drowning areas and be a new breeding ground to the species. For this, it must be translucent and permeable, with the intention of not interrupting the natural cycles of the sun and water, which make the regeneration of the species possible.

The proposed research station will also be a testing ground for the creation and trialing of research-informed activities depending on the reef and the climate. It will consist of a library, research lab, workshop, and observation tower, uniting the scientist, the scholar, and the inventor. The island will be self-contained with small scale kinetic structures that respond to that particular environment and climate.



Section showing the current situation



Section showing the future situation

## Re-Thinking Central Station

Tutor: Nimish Biloria and Dimitra Dritsa

Masters of Architecture

Group members: Niranjan Bharti and Thi Mai Phan

Softwares: Processing  
Rhino  
illustrator



This project required studying the demographics of people in and around Sydney's Central Station and the walking behavior of different user groups as mentioned above. I also studied the attraction point for the different users. The main aim of the project was to reduce the waiting time of both the pedestrian as well as the vehicles. The current waiting time as calculated was 52%, which was reduced to 15-20%, by better connectivity of the precinct to different modes of transport and more access points to the central station.

We used the data made available from different government sites. This data was then fed to the visualisation software created using processing to carry out the varied simulations. These simulations were based on the different strategies which were based on the different user groups and there defined user paths according to the time. the attractor points depended on the speed of the user groups.

- Number of agents with more interaction with streets
- Problem area with the simulation

## Factors Of Analysis

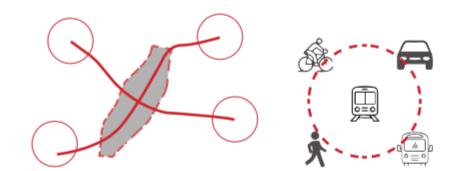
### USER GROUPS INFLUENCING FACTORS



### IDENTIFY PROBLEMS AND OPPORTUNITIES

**52%**  
AVERAGE WAITING TIME

ISSUE OF WAITING TIME



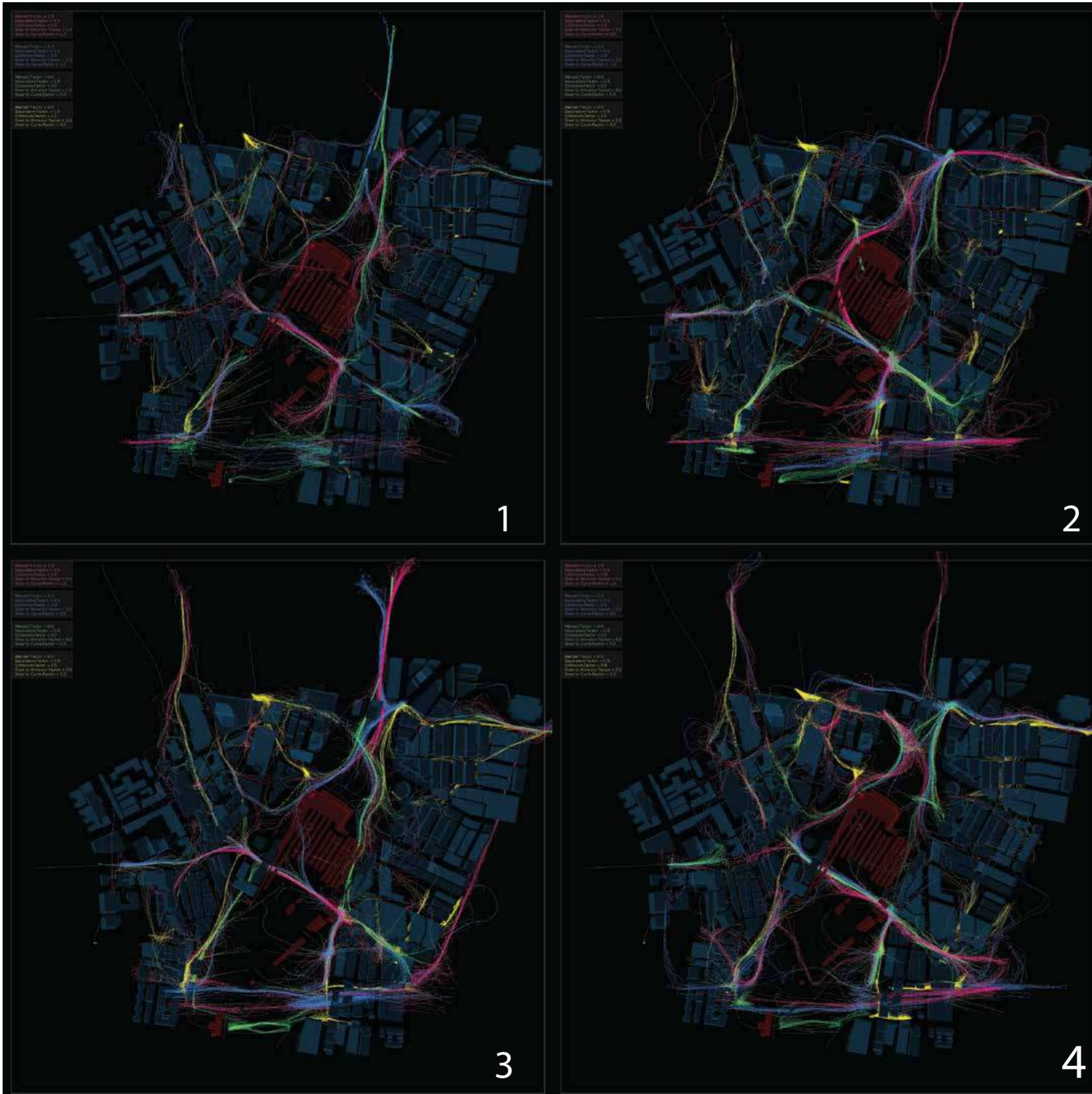
BETTER CONNECTIVITY TO PRECINTS & OTHER MODES OF TRANSPORTATION



NEW STRATEGIC ACCESS TO THE STATION

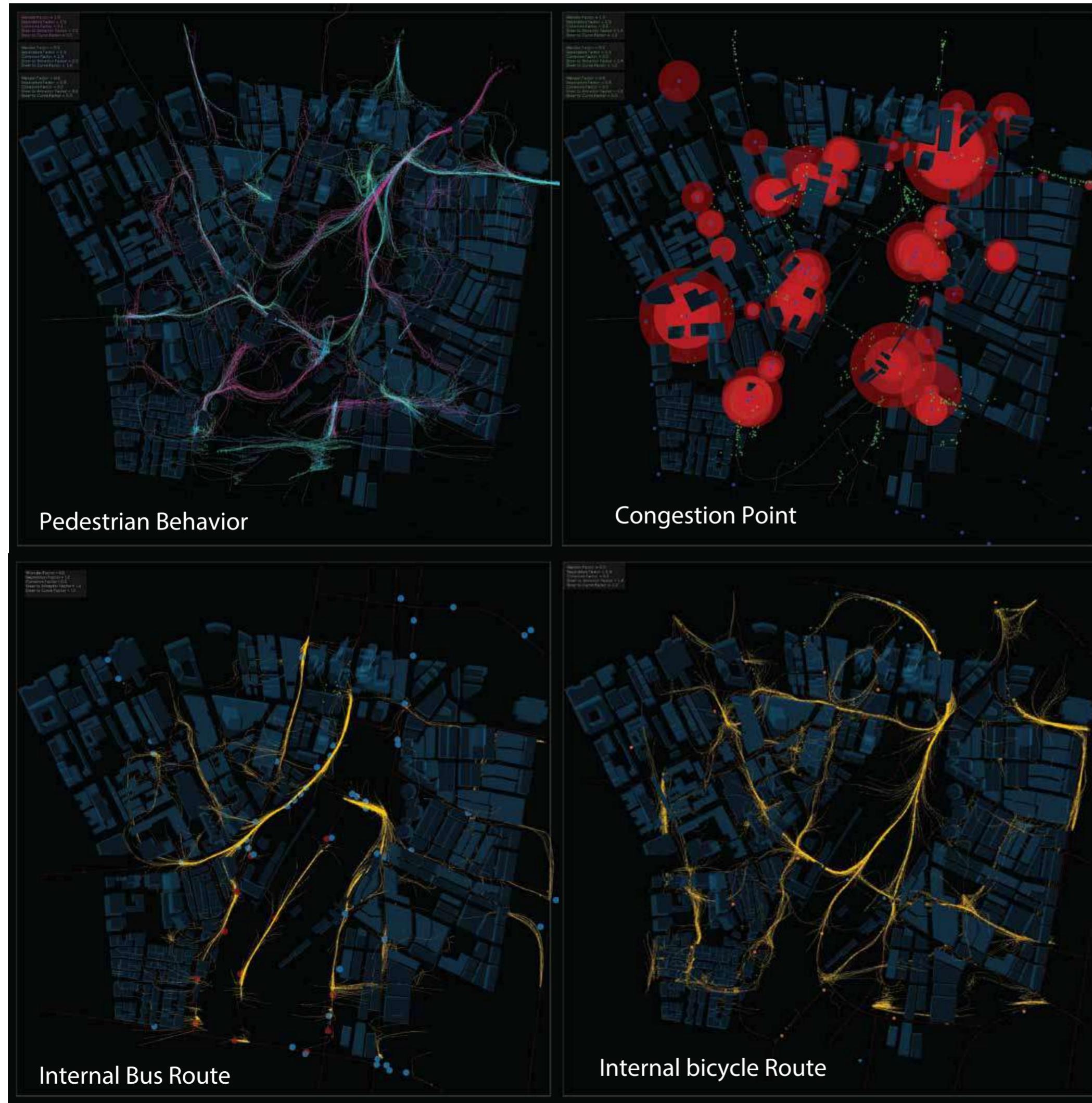


ACTIVATED SPACES WITH DIVERSE PROGRAMS

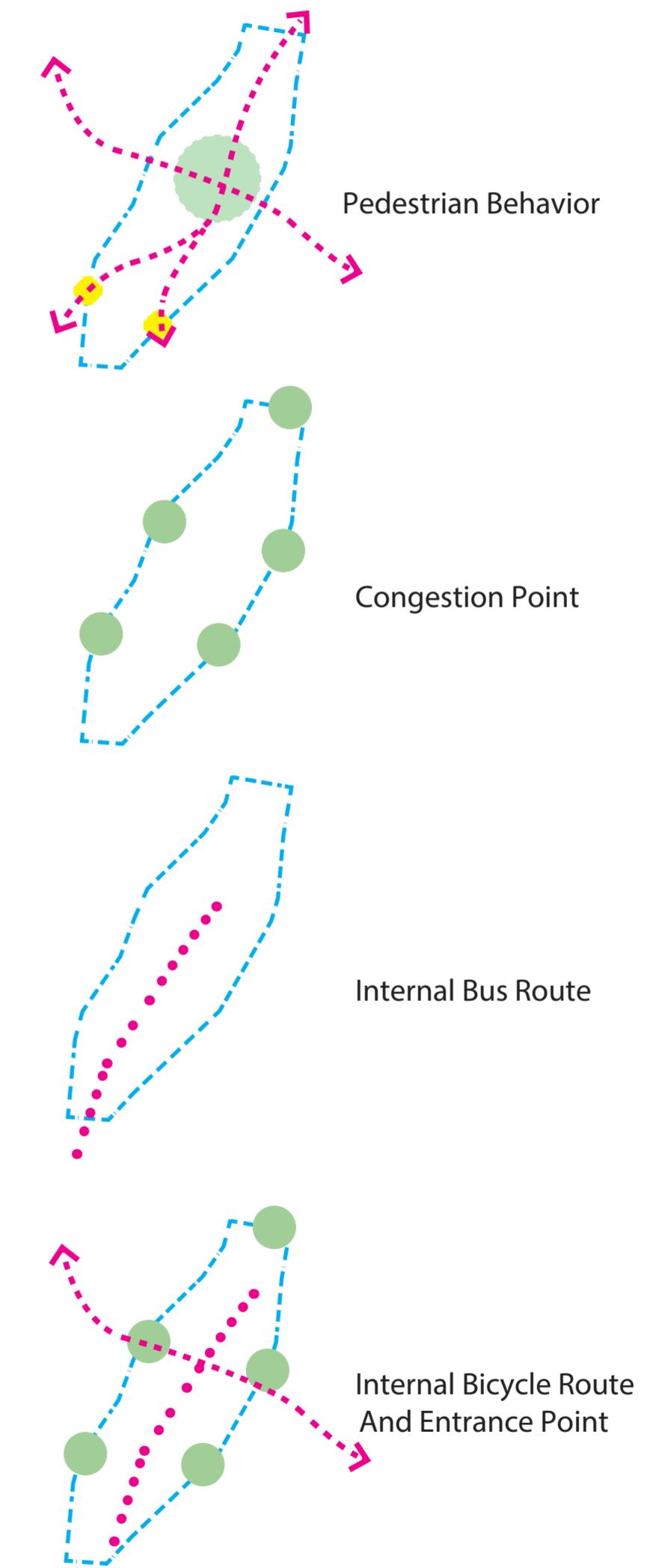


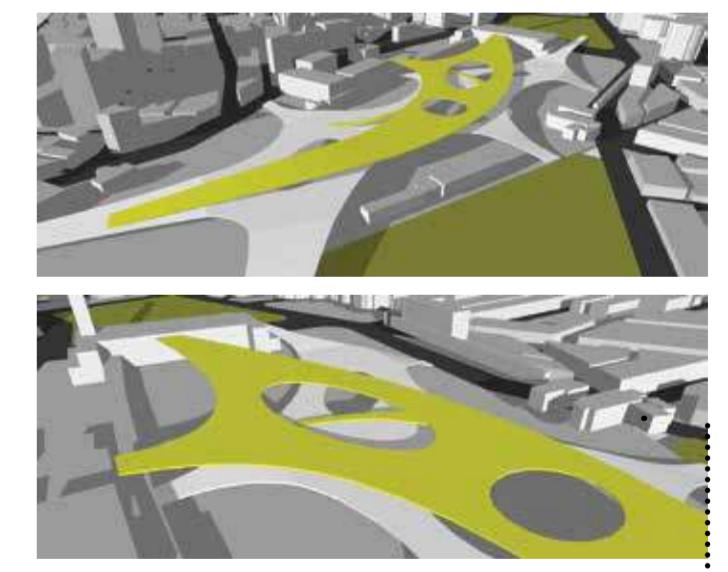
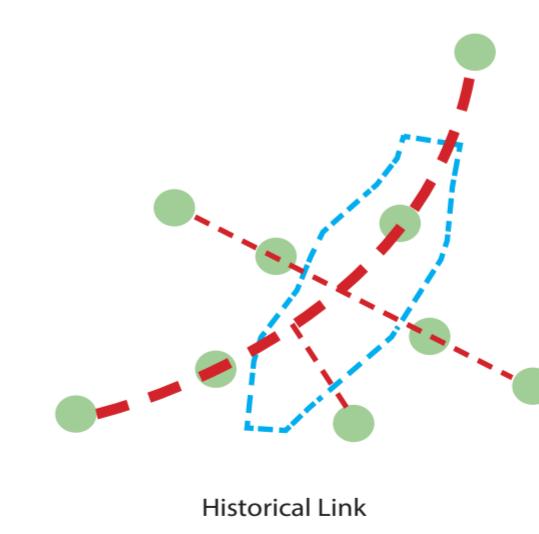
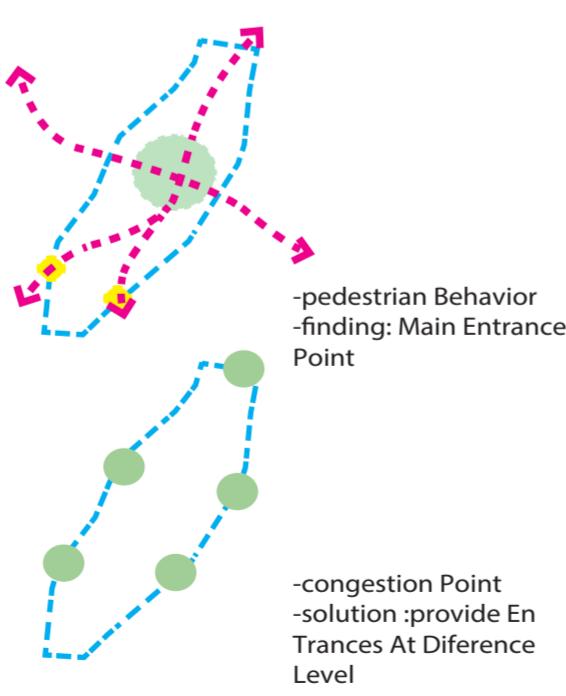
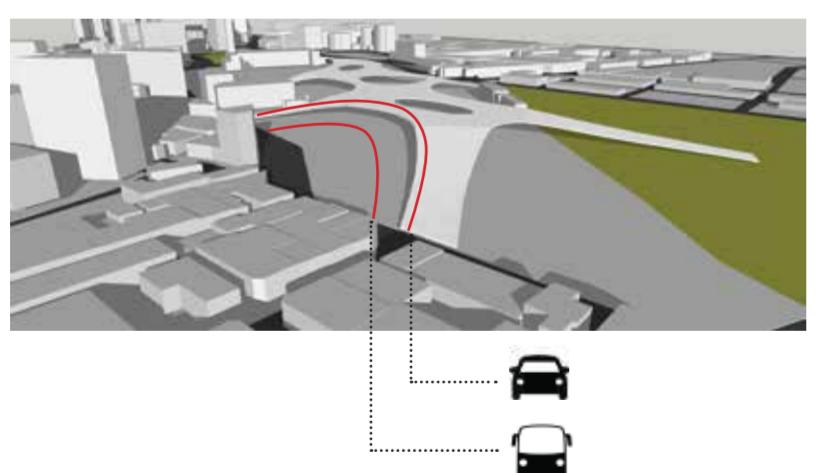
- AGENT 1
- AGENT 2
- AGENT 3
- AGENT 4

## Analysis Of Bicycle Route



**Simulation Factor**  
Wander Factor : 0.0  
Separation Factor: 5.0  
Cohesion Factor : 0.5  
Steer To Attractor Factor : 1.6  
Steer To Curve Factor : 1.2





## Rule and Rebellion

Tutor: Emma Jones, Guillaume Othenin-Girard (TEN)

Masters of Architecture

"Would Australians have done anything differently if their country had not been settled as the jail of infinite space?"

Certainly they would. They would have remembered more of their own history."

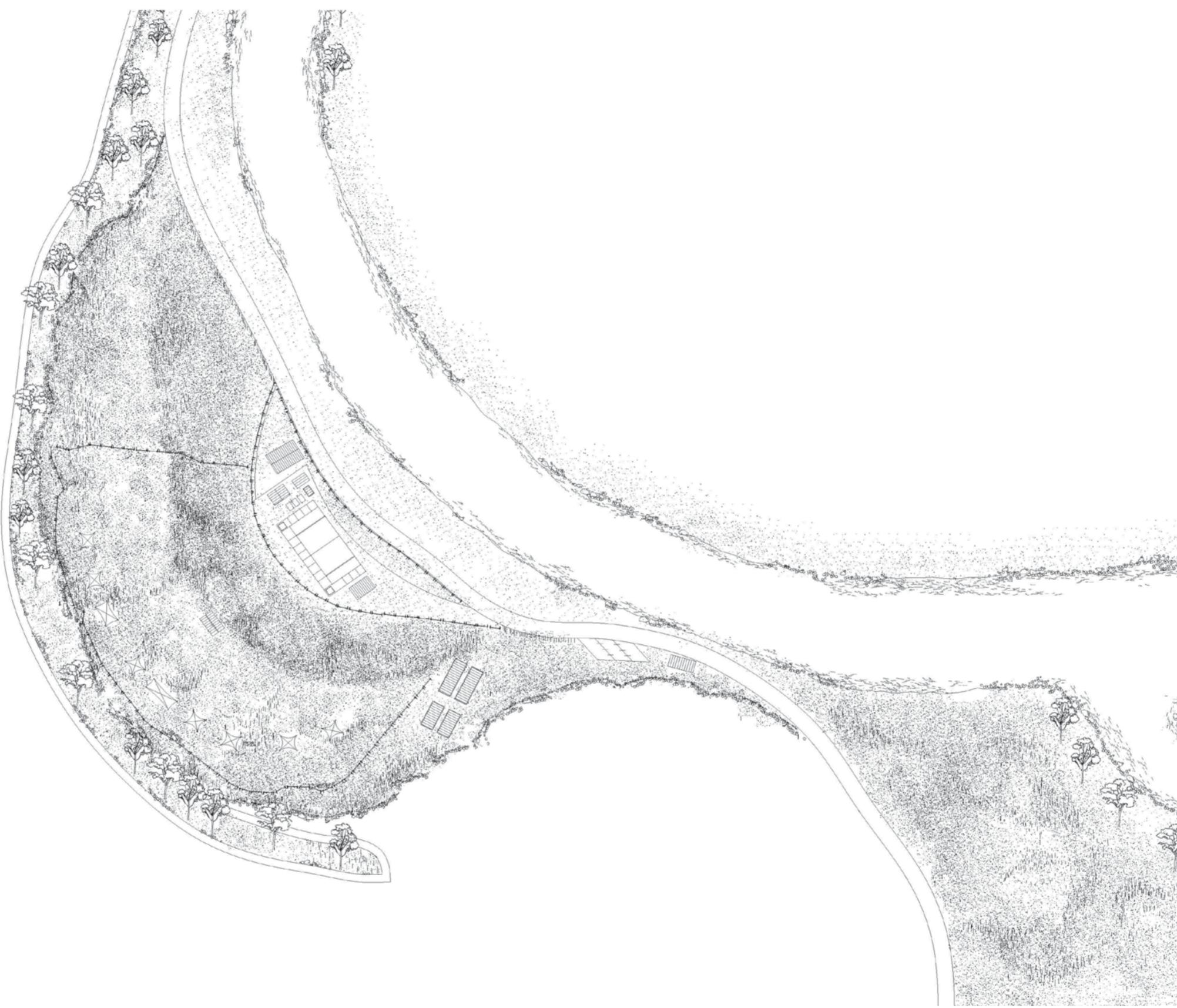
Robert Hughes, *The Fatal Shore* (1987)



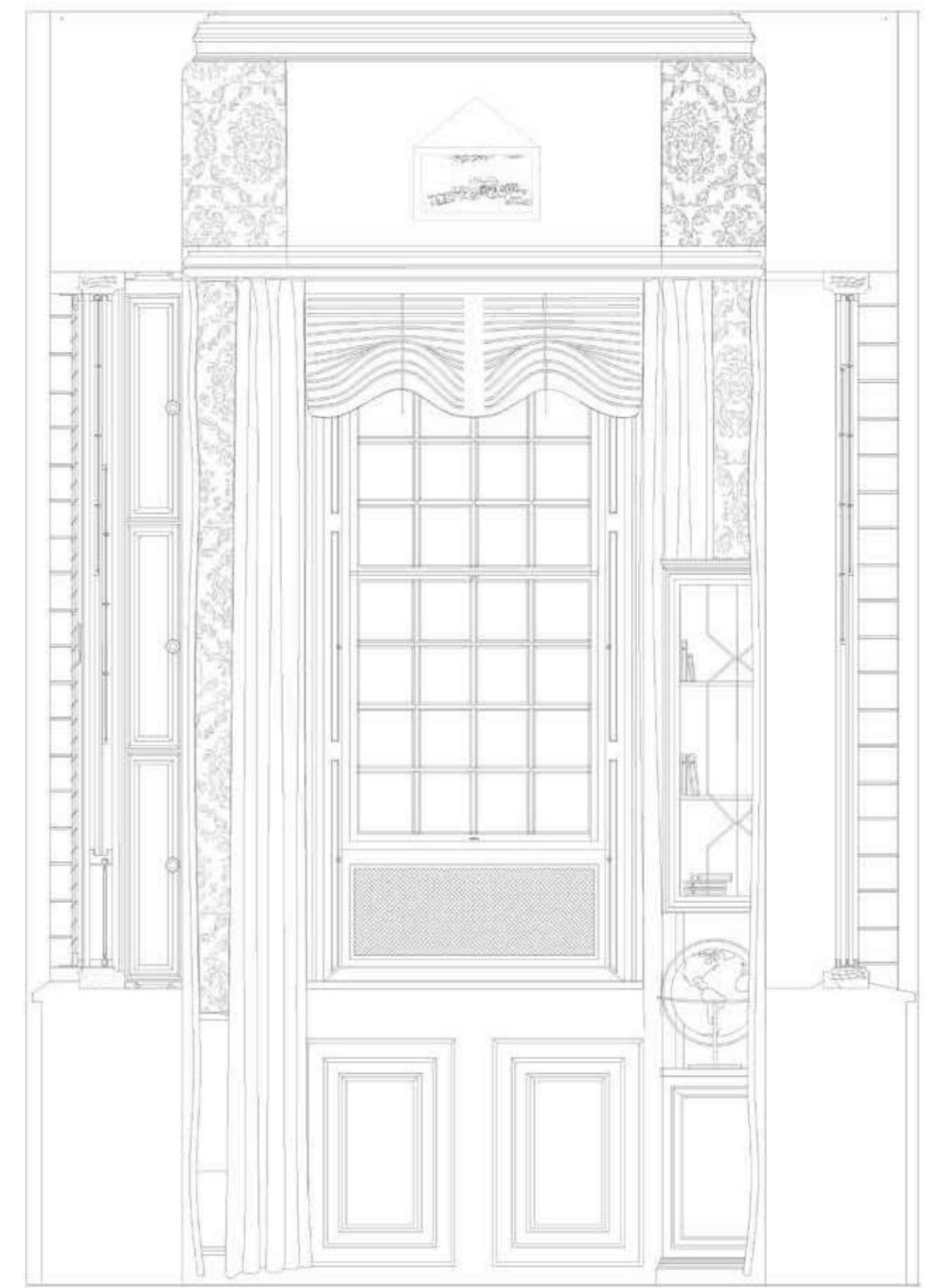
The Crescent-Elevation-The Rose Hill: 1791

With its unique geography wrapping the bend of Parramatta River where salty and fresh waters meet, the crescent has always been the focus of popular leisure activities at Parramatta Park, while the recreational activities of Old Government House were only ever for the select and controlled few.

The naturally formed outdoor amphitheatre of the crescent is an ideal setting for mass gatherings and has been used as such since before the European settlers. Artists have always been drawn to representations of this landform, yet its particular shape made its accurate depiction difficult for all but the most skilled of them. The crescent has therefore been drawn in a variety of unusual ways over the last two hundred years, depending on how the drawer wished others to perceive it. Taking our cue from this, our drawing reconstructs the crescent as it has never been drawn: from a frontal view, in its ideal form as a space of leisure, combining elements of past and present crescents to do so. A second drawing highlights the way the crescent has been violently divided and partitioned in recent years for private recreation events, ensuring this outdoor room is no longer truly civic.



The Crescent-Plan: Present day scenario

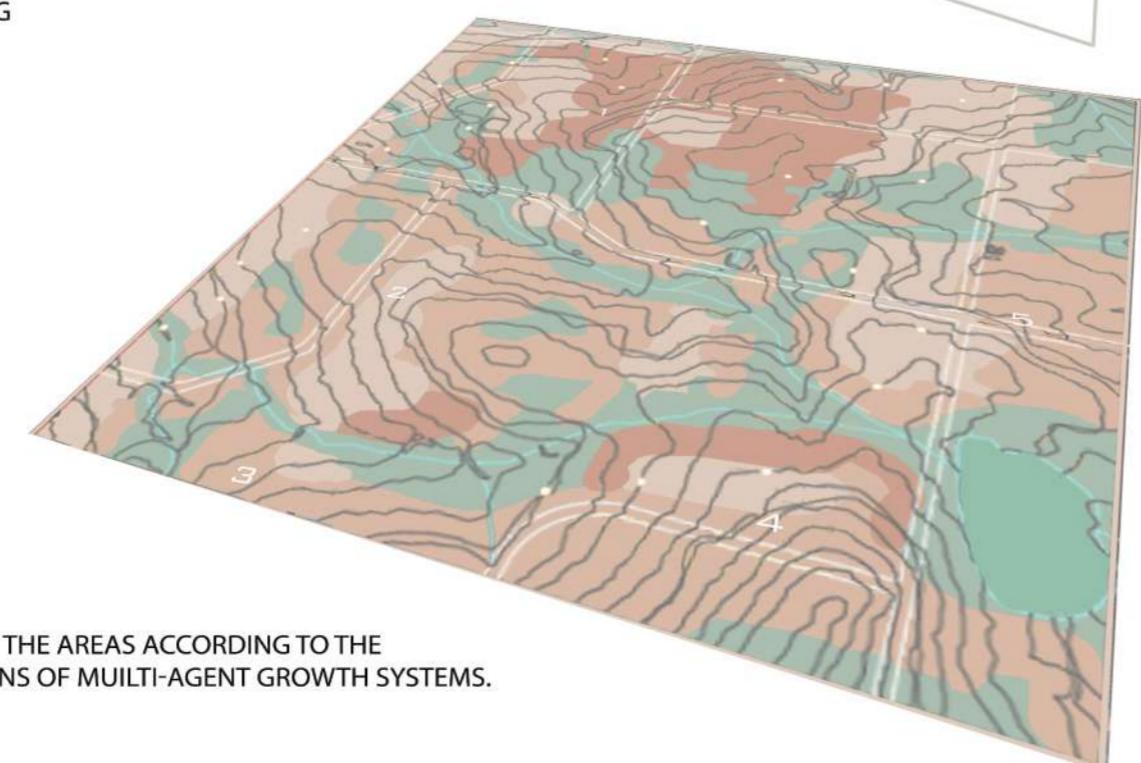
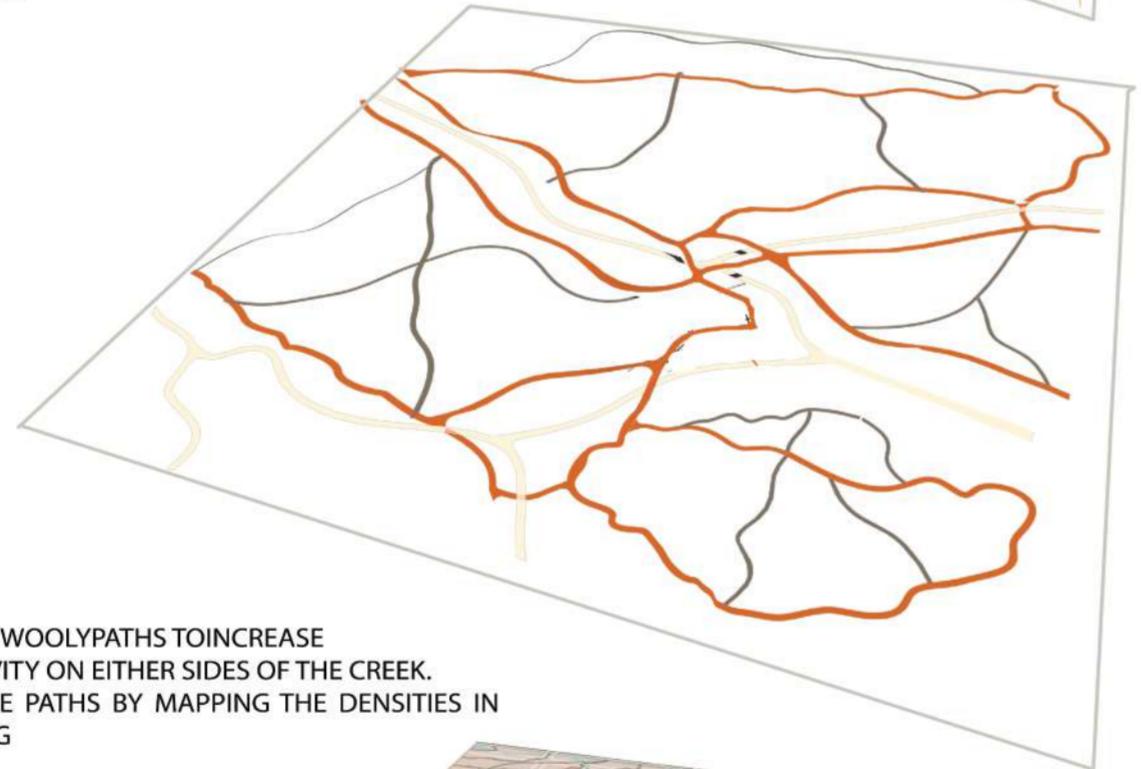
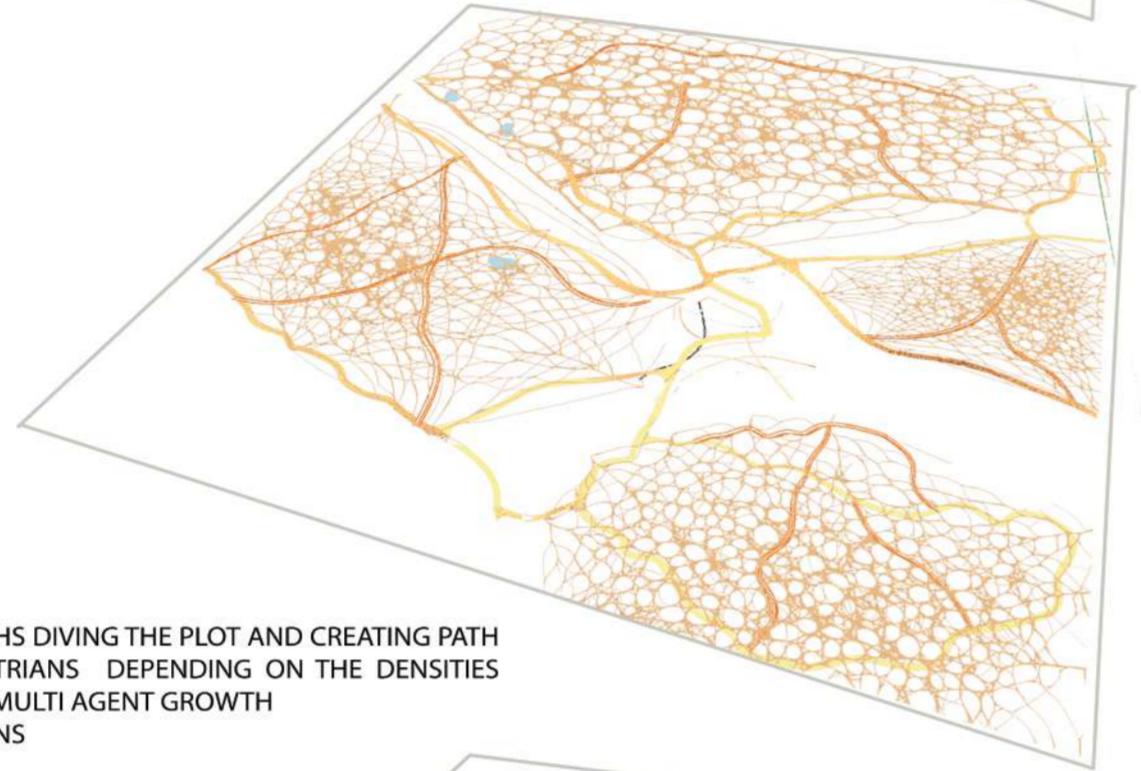
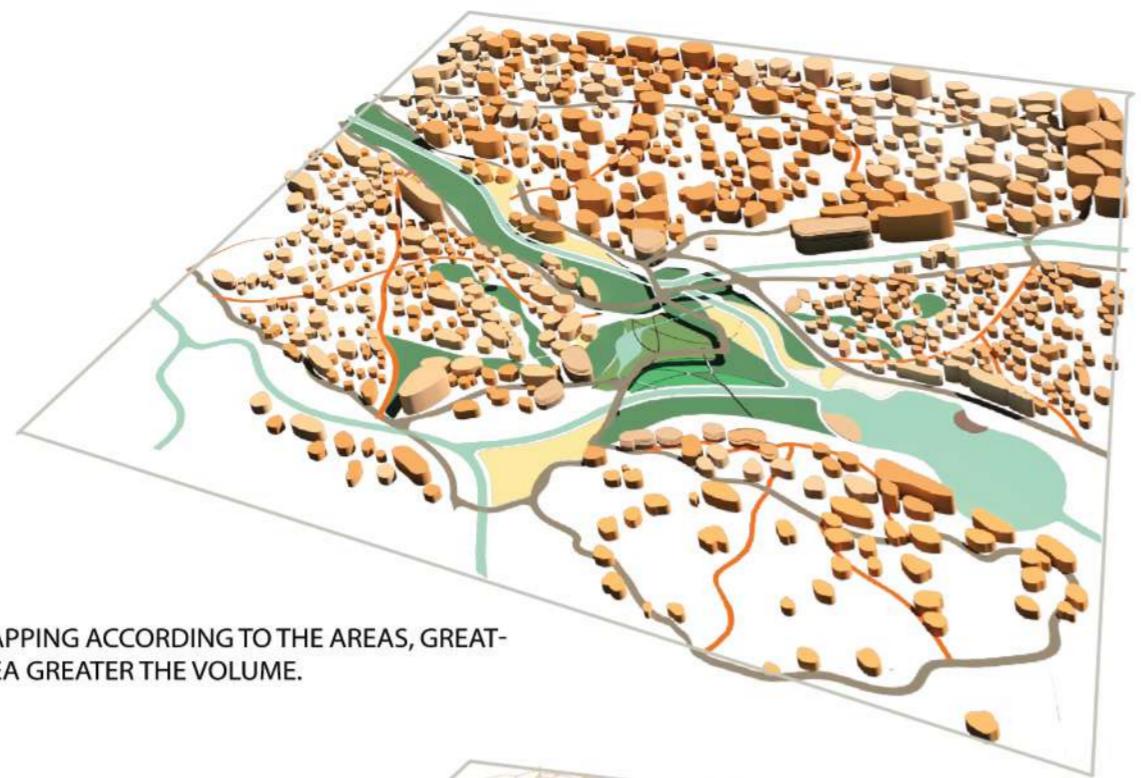


Beside the crescent, inside the Old Government House, windows that once looked onto manicured landscapes in the Macquarie era have been inexplicably closed up to visitors. These windows are shown once more open, and furnished with the Governors' private objects of interior leisure. The windows' ingeniously layered mechanisms of privacy are studied in a drawing that resurrects the knowledge contained within Peter Nicholson's *Practical carpentry, joinery, and cabinet-making*, a book first published in the late eighteenth century that was used as a building manual in the early years of the colony.

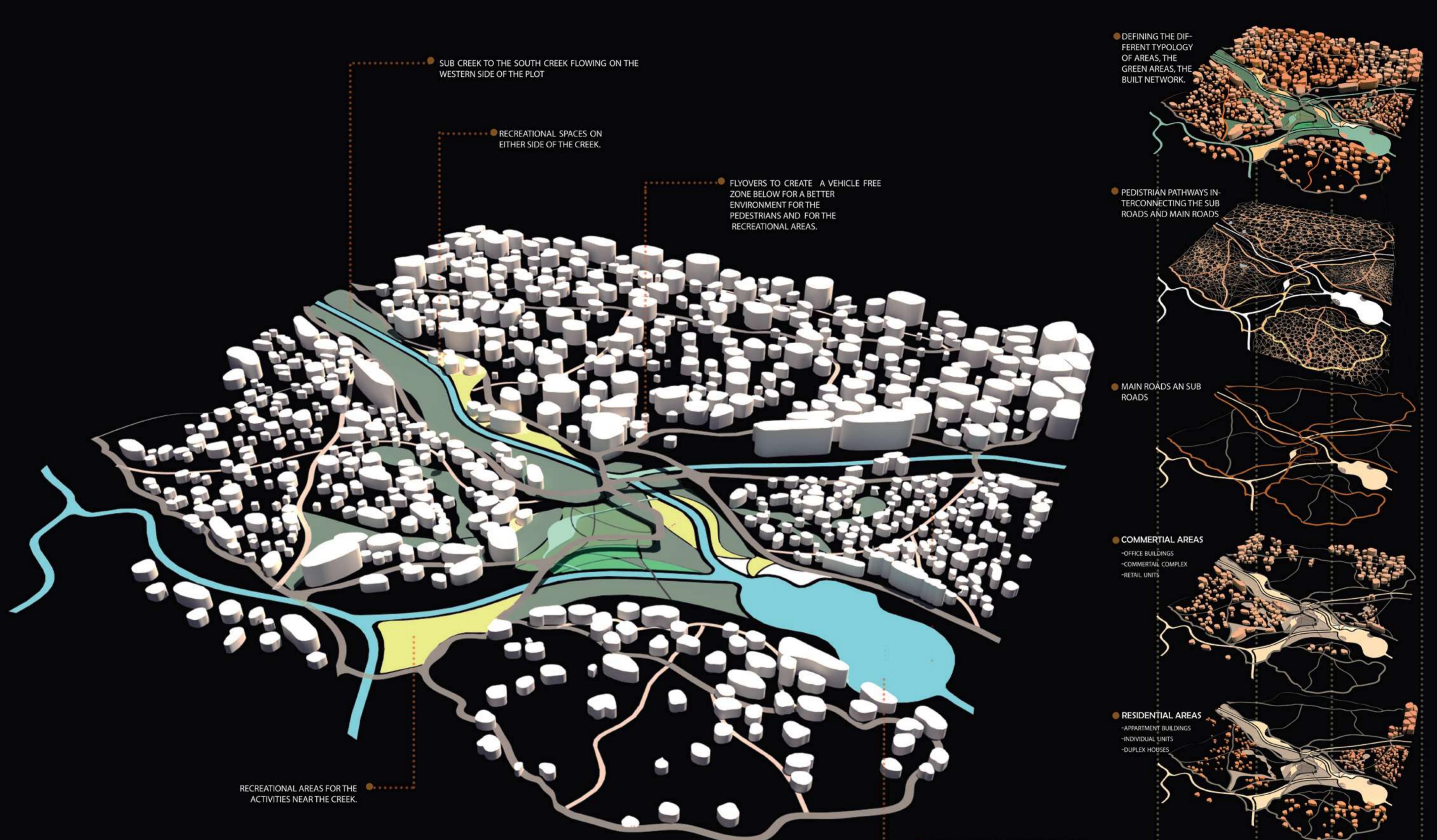
## Smart Cities for Western Airport

Tutor: Nimish Biloria and Dimitra Drista

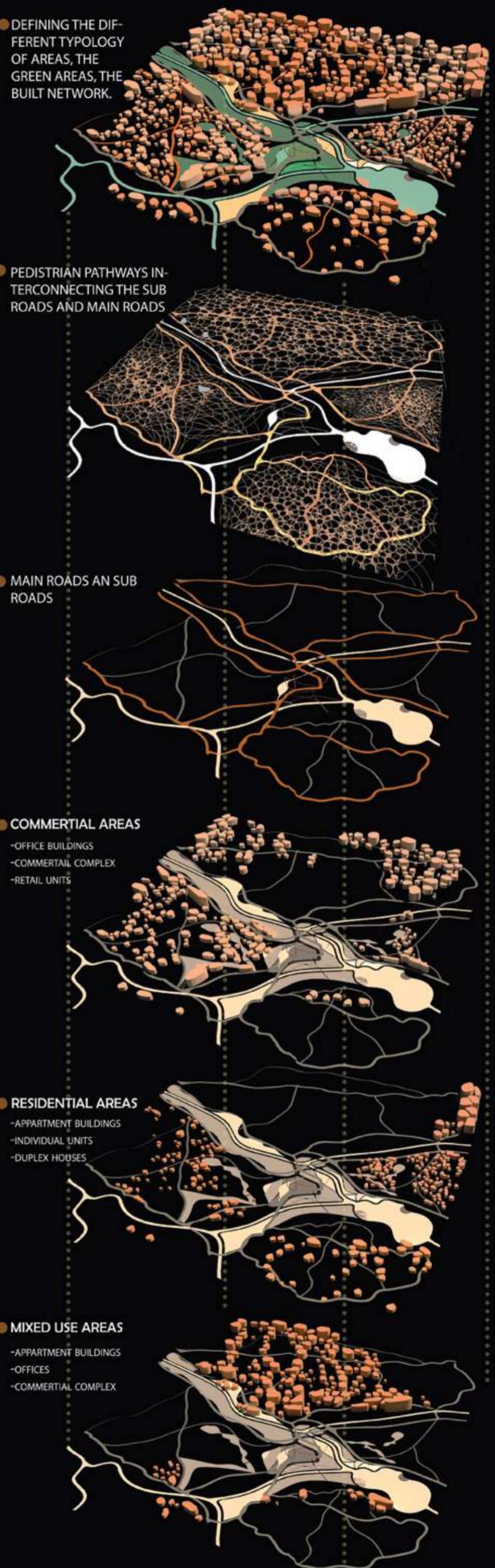
Masters of Architecture

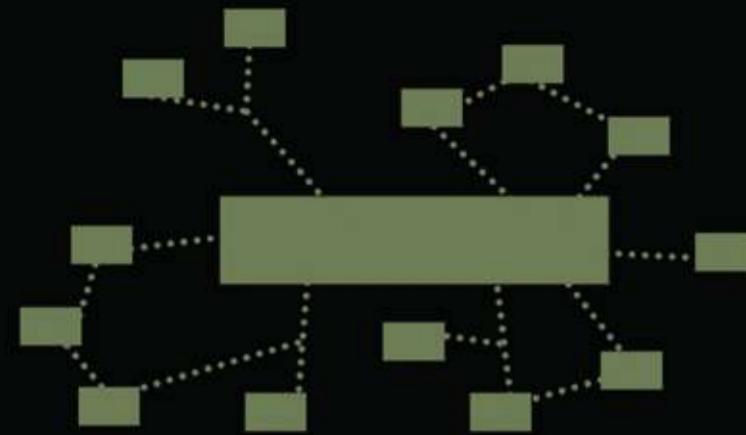


Construction of the Western Sydney Airport is now underway. Set to open in 2026, Western Sydney Airport is a transformational infrastructure project that will generate economic activity, provide employment opportunities closer to home for people in the Western Sydney region, and meet Sydney's growing aviation needs. The Australian Government is investing up to \$5.3 billion in equity to deliver the airport through a government-owned company, 'Western Sydney Airport'. Thousands of jobs and opportunities for local businesses will be created. The airport is expected to support almost 28,000 direct and indirect jobs by 2031, five years after the airport opens. This information was useful in designing a high density smart cities around the airport for accommodation and other purposes.

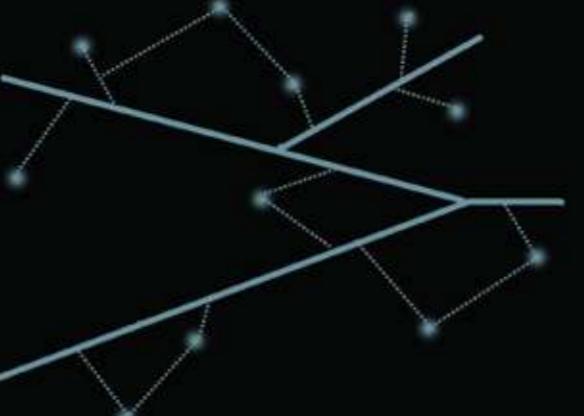


DENSITY MAP SHOWING THE MAPPING OF THE CONSTRUCTABLE VOLUMETRIC AREAS ON THE BASIS OF THE MULTI-AGENT GROWTH SIMULATIONS, SITE ANALYSIS AND FACTORS ATTRACTING DIFFERENT DENSITIES.

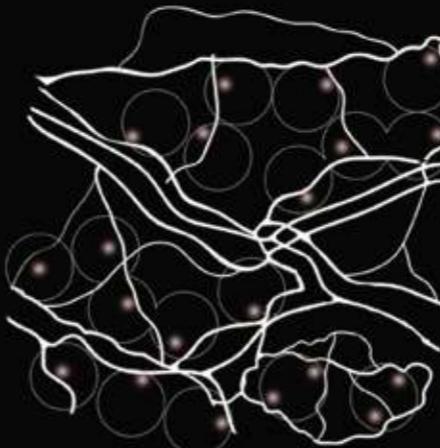




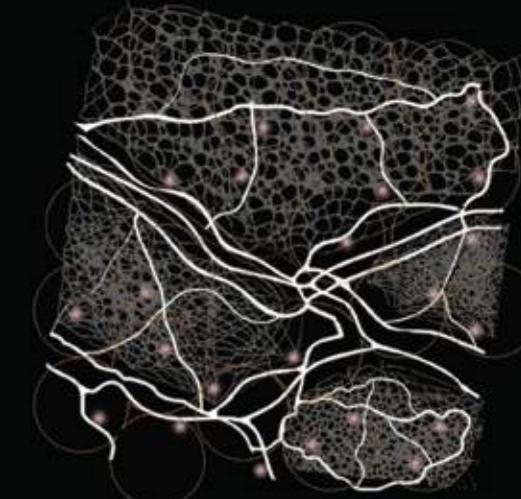
ALL THE GREEN AREAS ON THE SITE CONNECT TO THE CENTRAL GREEN SPACE, KEEPING IN MIND THE NEEDS OF THE PEDESTRIANS.



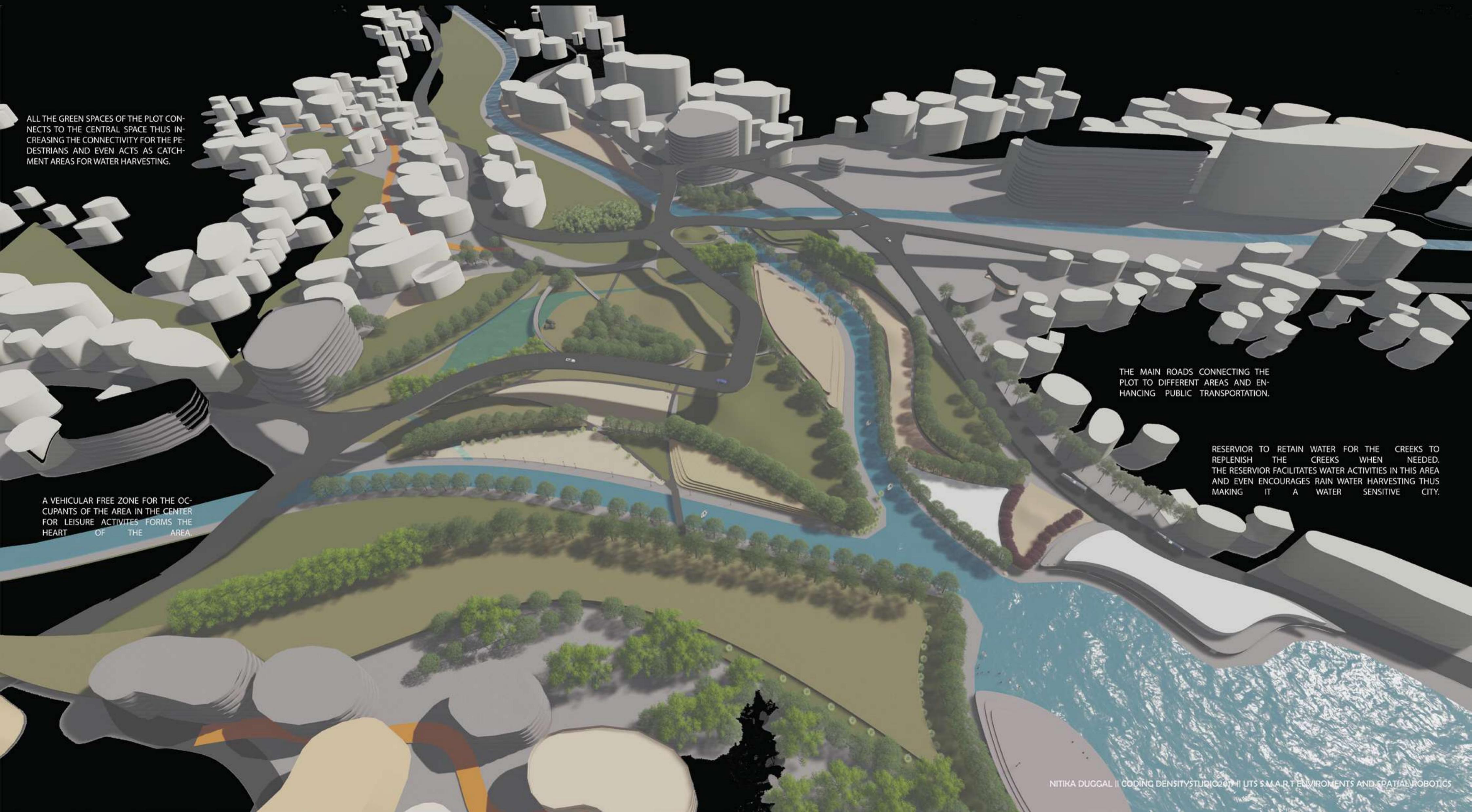
ALL THE WATER CATCHMENTS AREAS CONNECT TO THE CREEKS THUS REVIVING THE CREEKS EITHER ABOVE GROUND OR UNDERGROUND



A VEHICLE FREE ZONE, THUS COMMON PARKING ARE PROVIDED WITH 500 M OF RANGE AVOIDING POLLUTION IN THE HABITABLE SPACES



IT IS A PEDESTRIAN FRIENDLY AREA, MAXIMUM 50M WALKS FROM PARKING TO WORKPLACE OR HOME OR TO THE BUS TERMINALS.



ALL THE GREEN SPACES OF THE PLOT CONNECTS TO THE CENTRAL SPACE THUS INCREASING THE CONNECTIVITY FOR THE PEDESTRIANS AND EVEN ACTS AS CATCHMENT AREAS FOR WATER HARVESTING.

A VEHICULAR FREE ZONE FOR THE OCCUPANTS OF THE AREA IN THE CENTER FOR LEISURE ACTIVITIES FORMS THE HEART OF THE AREA.

THE MAIN ROADS CONNECTING THE PLOT TO DIFFERENT AREAS AND ENHANCING PUBLIC TRANSPORTATION.

RESERVOIR TO RETAIN WATER FOR THE CREEKS TO REPLENISH THE CREEKS WHEN NEEDED. THE RESERVOIR FACILITATES WATER ACTIVITIES IN THIS AREA AND EVEN ENCOURAGES RAIN WATER HARVESTING THUS MAKING IT A WATER SENSITIVE CITY.

## Digital Fabrication

Tutor: Tim Schork

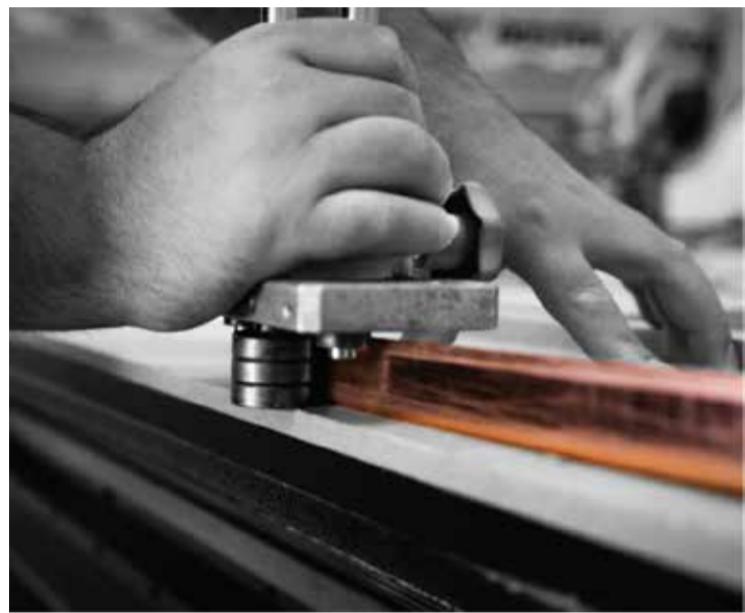
Masters of Architecture



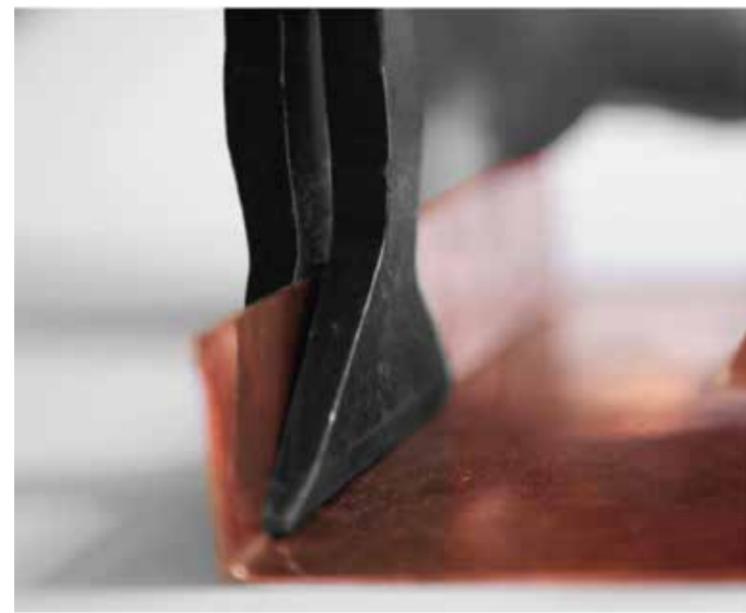
First prototype

### Incremental Sheet Forming

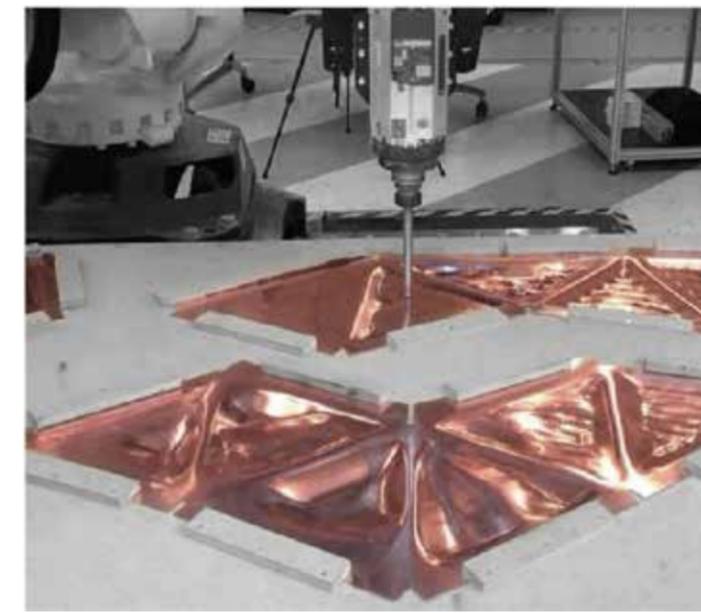
Incremental sheet forming (or ISF, also known as Single Point Forming) is a sheet metal forming technique where a sheet is formed into the final workpiece by a series of small incremental deformations. However, studies have shown that it can be applied to polymer and composite sheets too. Generally, the sheet is formed by a round-tipped tool, typically 5 to 20mm in diameter. The tool, which can be attached to a CNC machine, a robot arm or similar, indents into the sheet by about 1 mm and follows a contour for the desired part. It then indents further and draws the next contour for the part into the sheet and continues to do this until the full part is formed. ISF can be divided into variants depending on the number of contact points between tool, sheet, and die (in case there is any). The term Single Point Incremental Forming (SPIF) is used when the opposite side of the sheet is supported by a faceplate and Two Point Incremental Forming (TPIF) when a full or partial die supports the sheet.



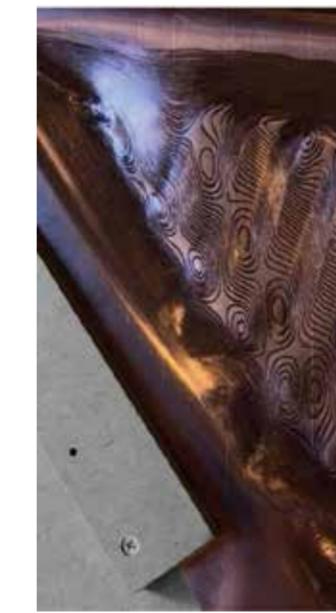
Bending double lock seam



Bending overlap seam



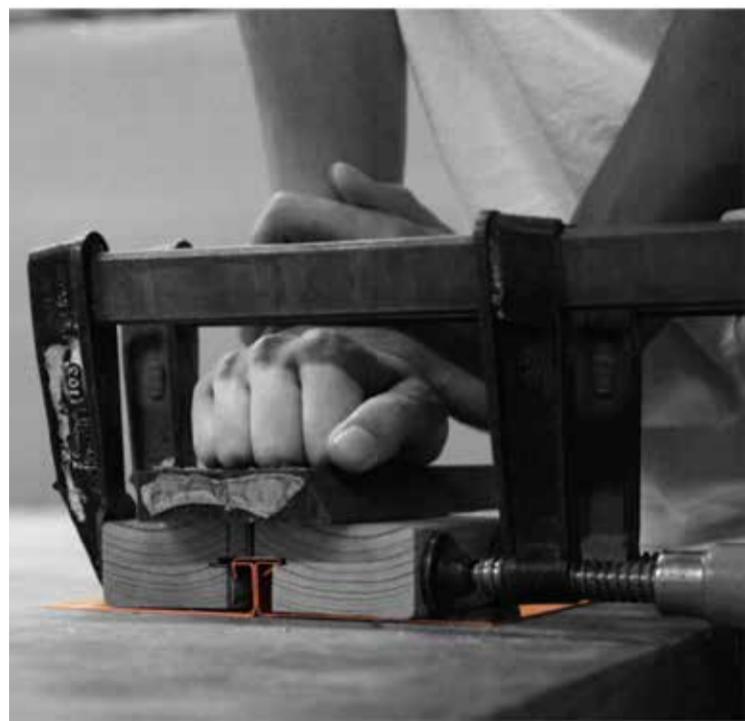
Fabrication of copper sheet



Pattern



Detail of seam



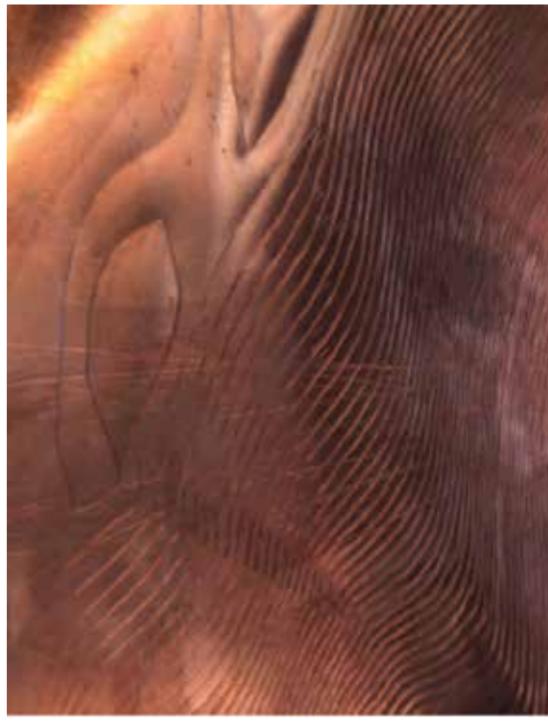
Using wood lock to form top joint



Bending overlap seam

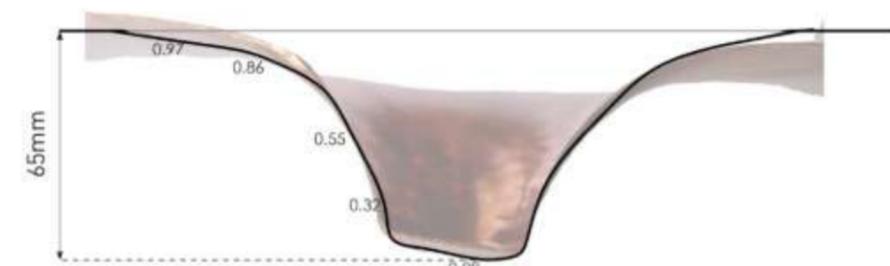


Strip after fabrication

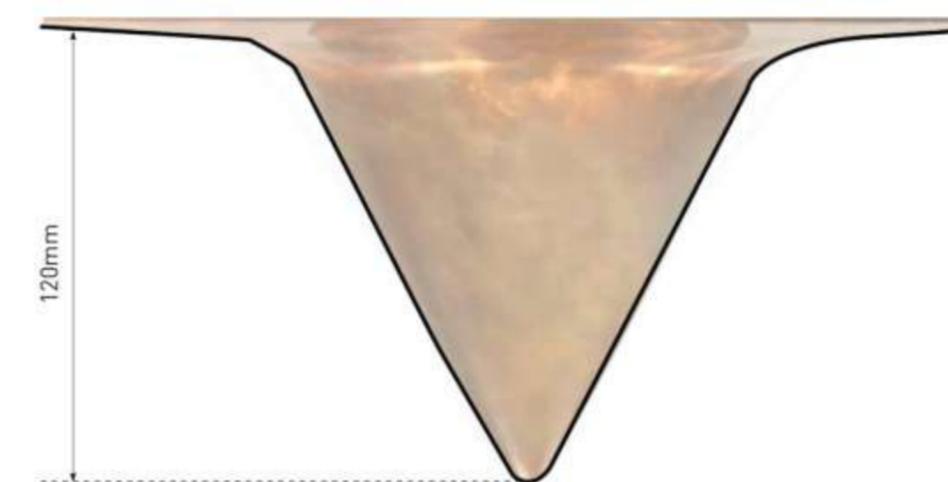
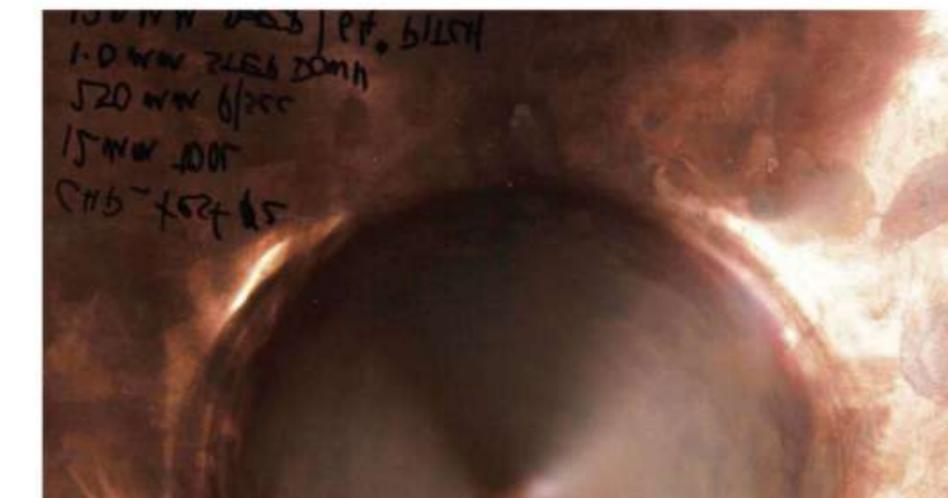


Detail of pattern

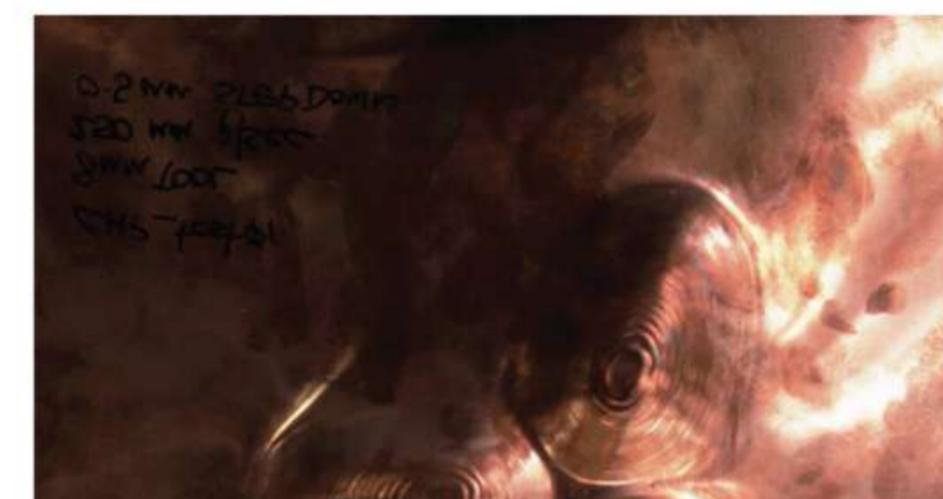
## Factors Of Analysis (Micro Level)



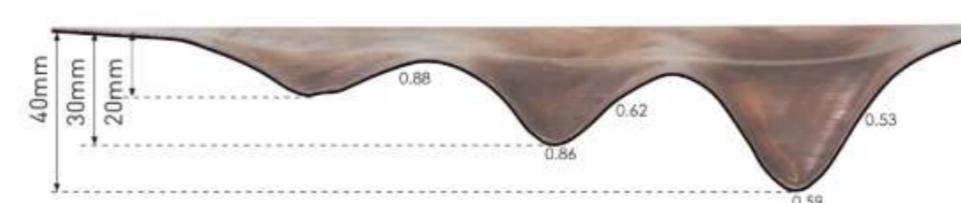
TEST A  
5 mm tool  
250mm p/sec  
1mm step down



TEST B  
12mm tool  
250mm p/sec  
1mm step down

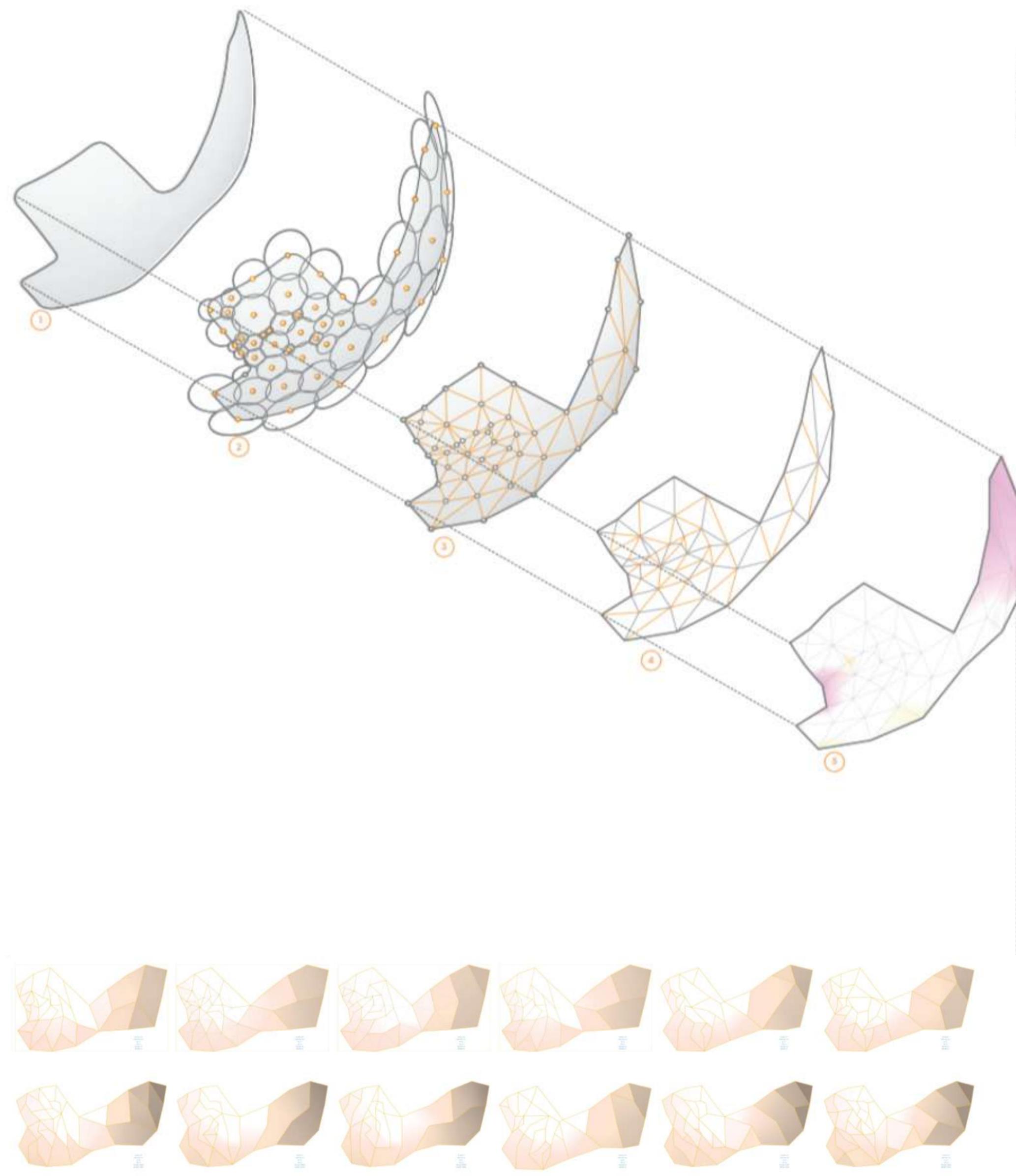


TEST C  
8 mm tool  
250mm p/sec  
0.5mm step down

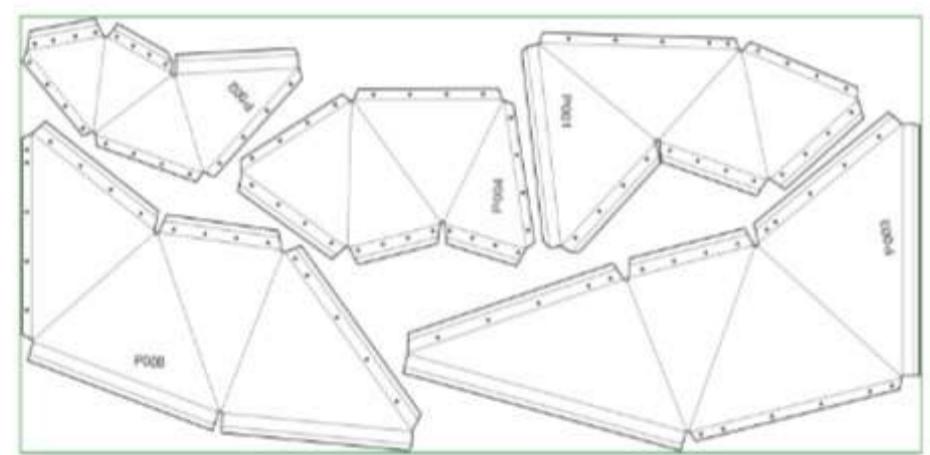
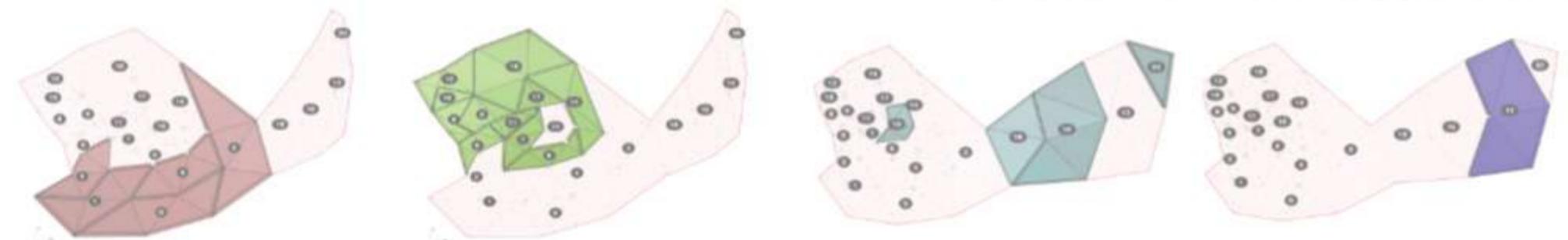
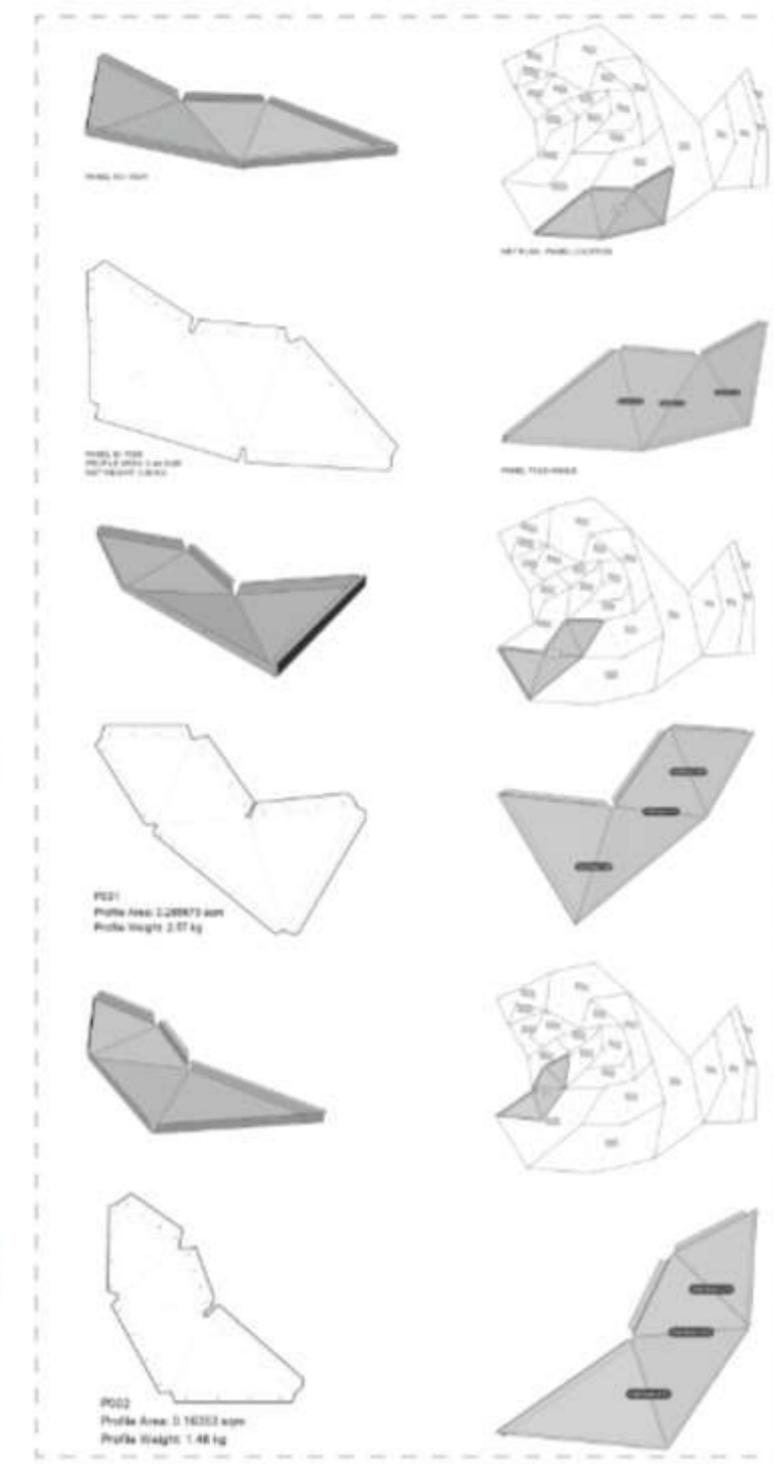
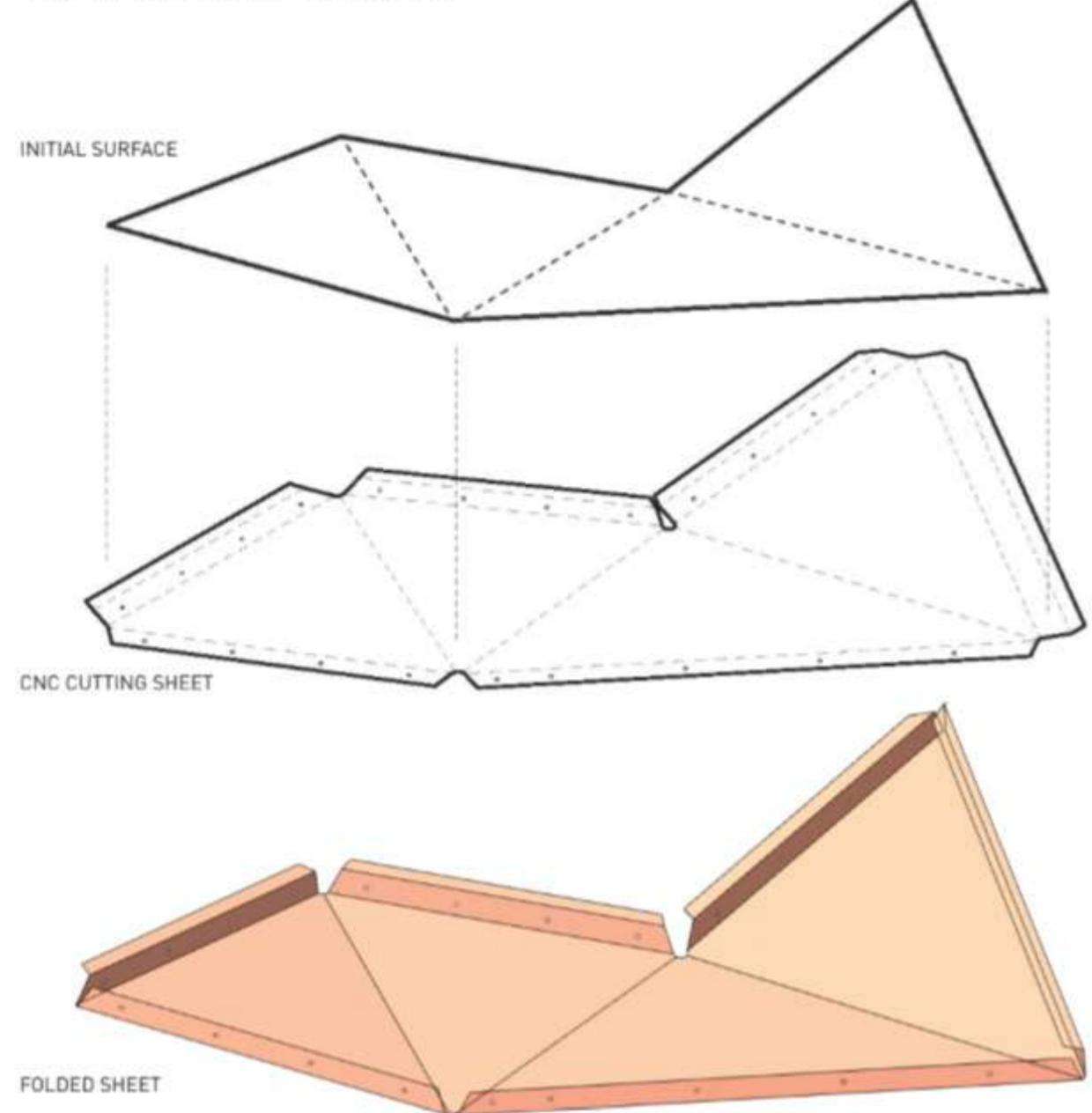


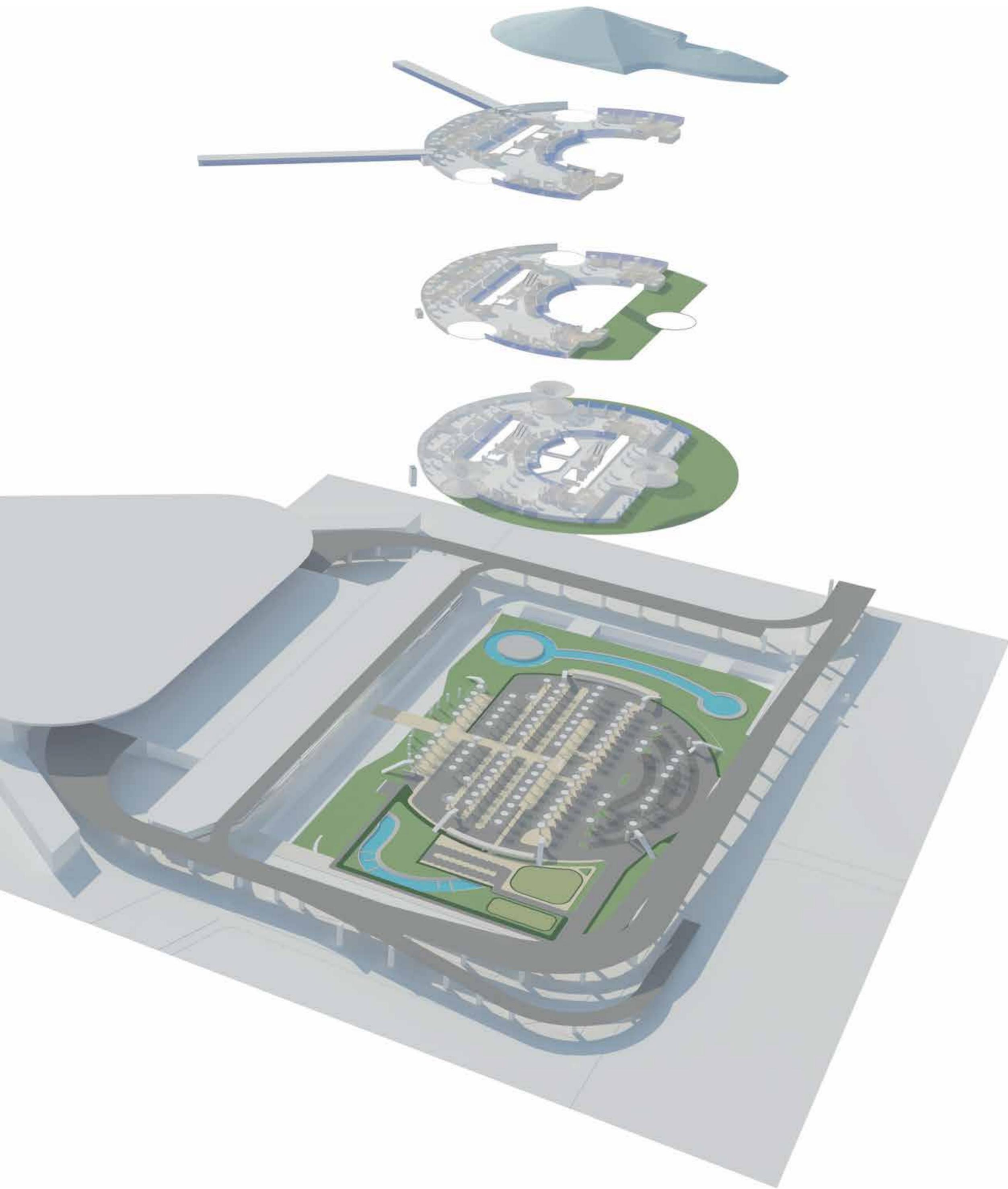
TEST D  
8 mm tool  
250mm p/sec  
1mm step down

## Factors Of Analysis (Meso Level)



## FABRICATION PROCESS





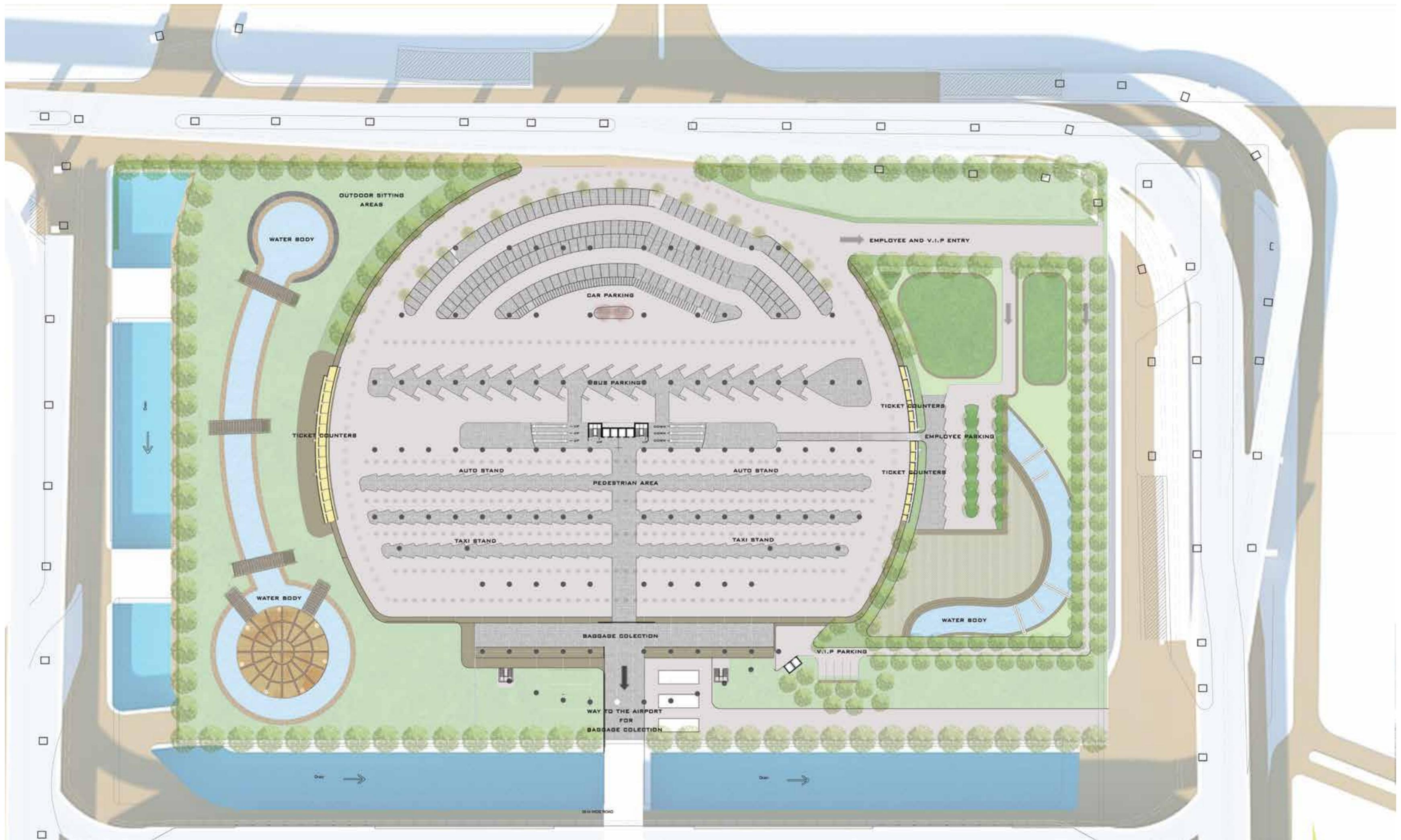
## Transportation Hub for Mumbai

Tutor: Ar. Dakshaini  
Architecture Thesis

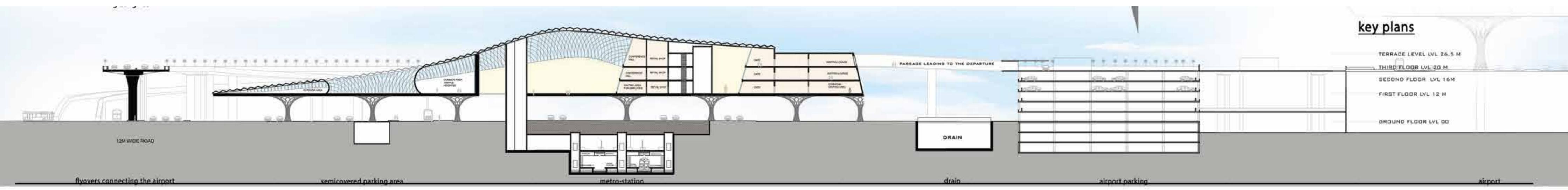
Softwares: Sketchup  
Autocad  
Illustrator  
VRay

### Transportation Hub

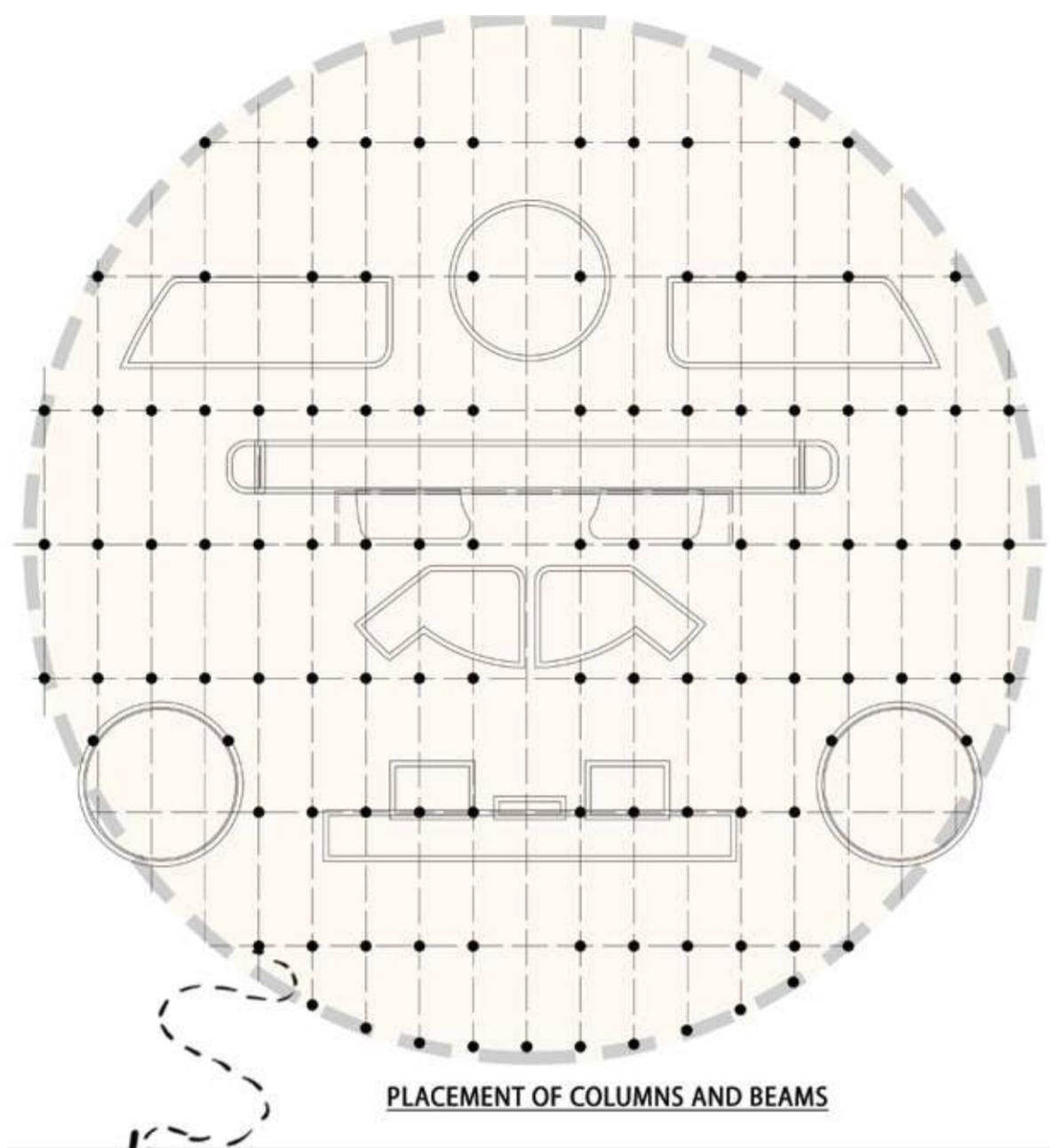
In this project, the objective was to design a transportation hub for Mumbai International Airport, i.e connecting different modes of transport like metro, buses, and taxi services for easy flow of people. Mumbai International Airport is one of the biggest and busiest airports of India since it is a gateway to India. The concept was to connect services vertically instead of horizontally for efficient utilisation of space. It acts as a business hub making it a high density/footfall area.



Ground Floor Plan ( Parking for Cars, Buses and connectivity)



Section cutting the transportation hub vertically

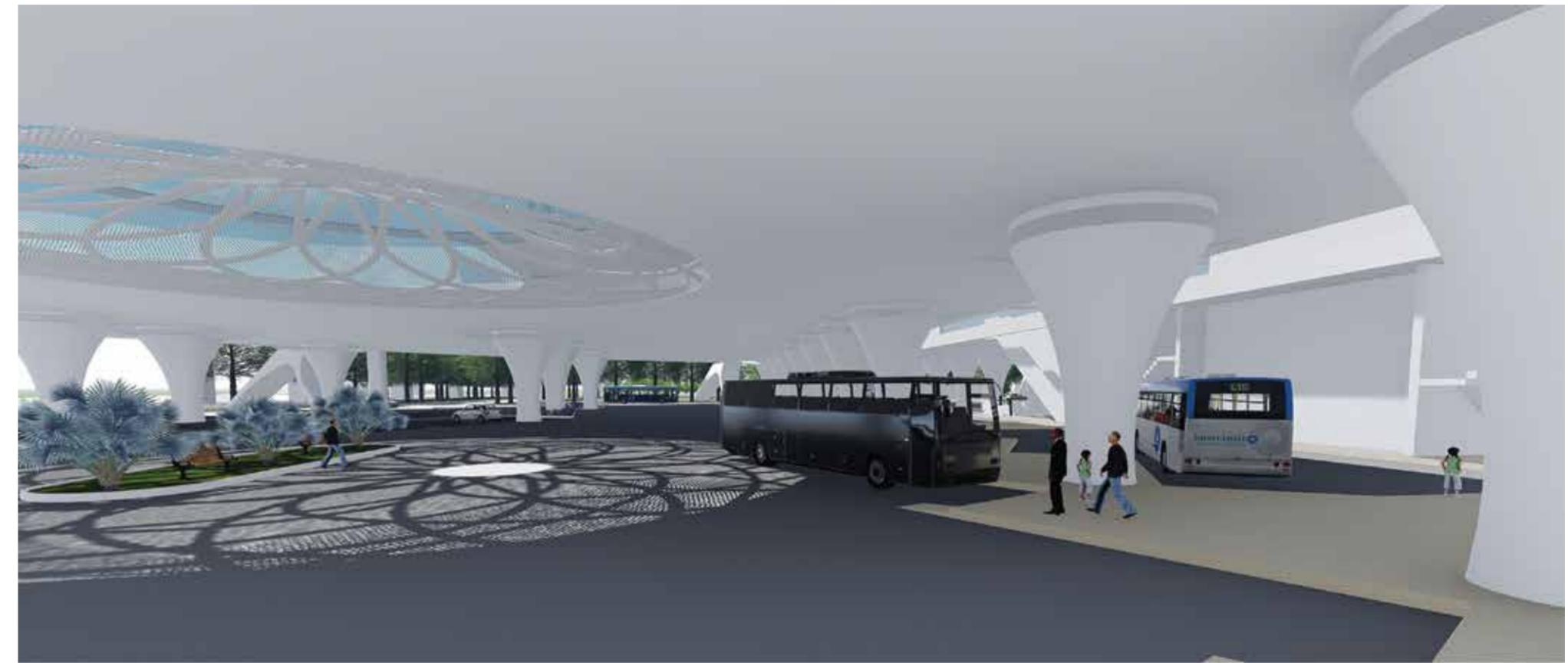


Structural System

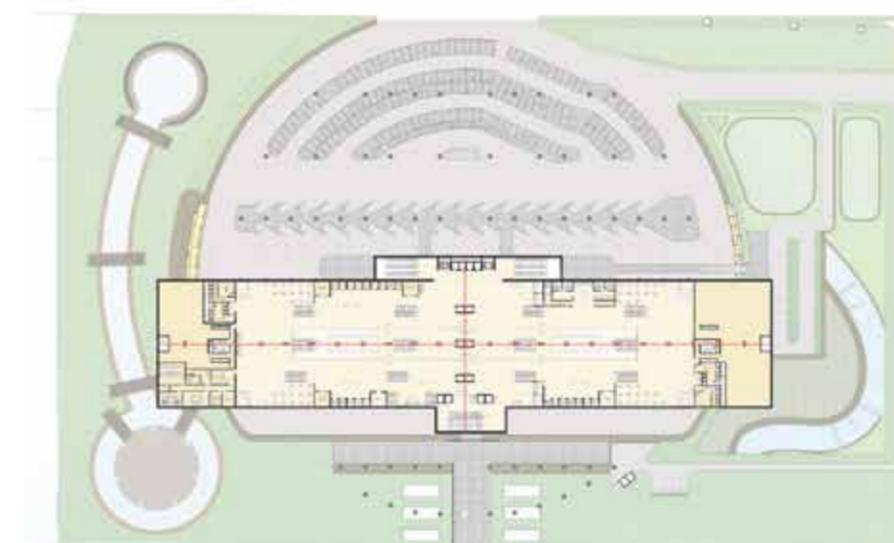
#### Mushroom Columns

A grid of 25 X 10 meters is maintained, mushroom columns are used to decrease the beam depths.

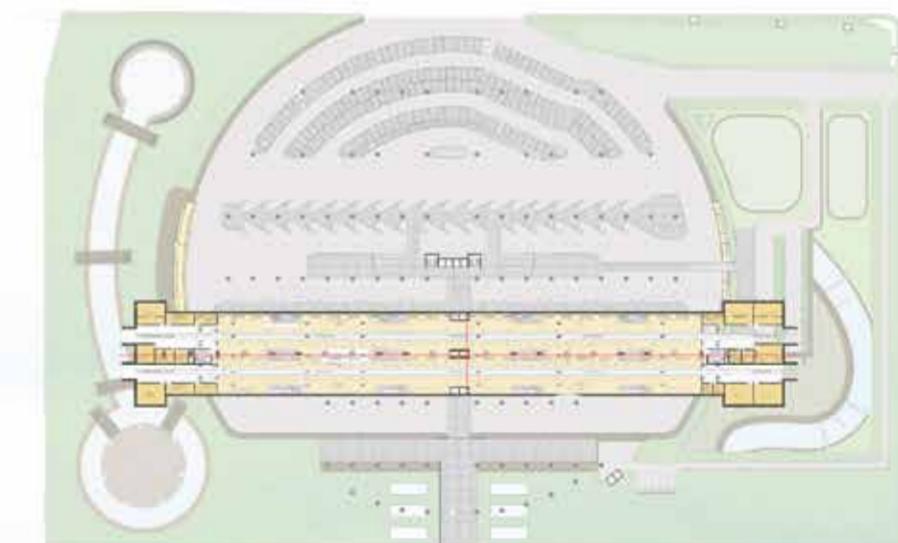
In reinforced concrete construction, a structural column, suggestive of a mushroom shape, that flares at the top to counteract shearing stresses.



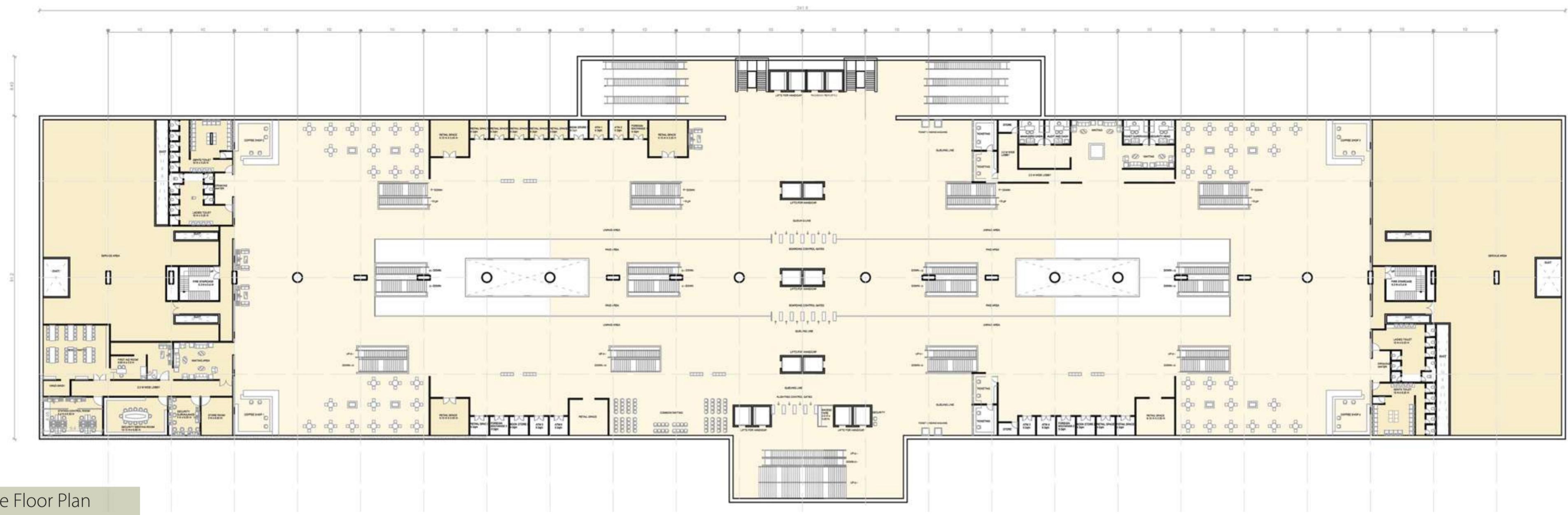
View of Ground level parking



Mezzanine Floor



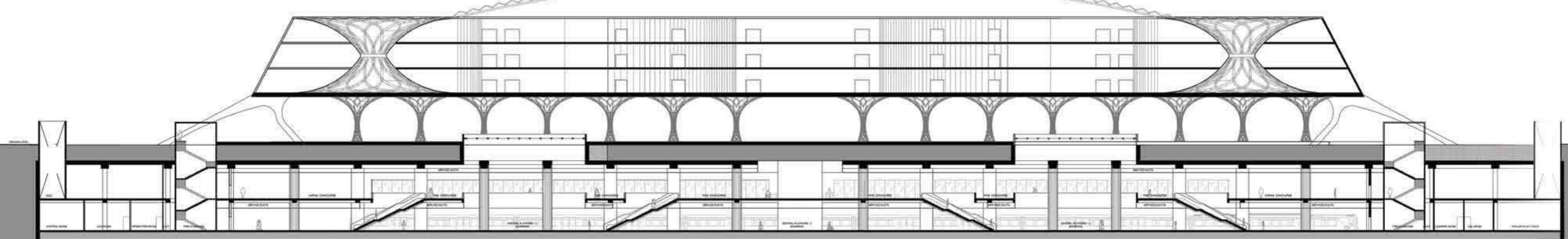
Metro Level PPlan



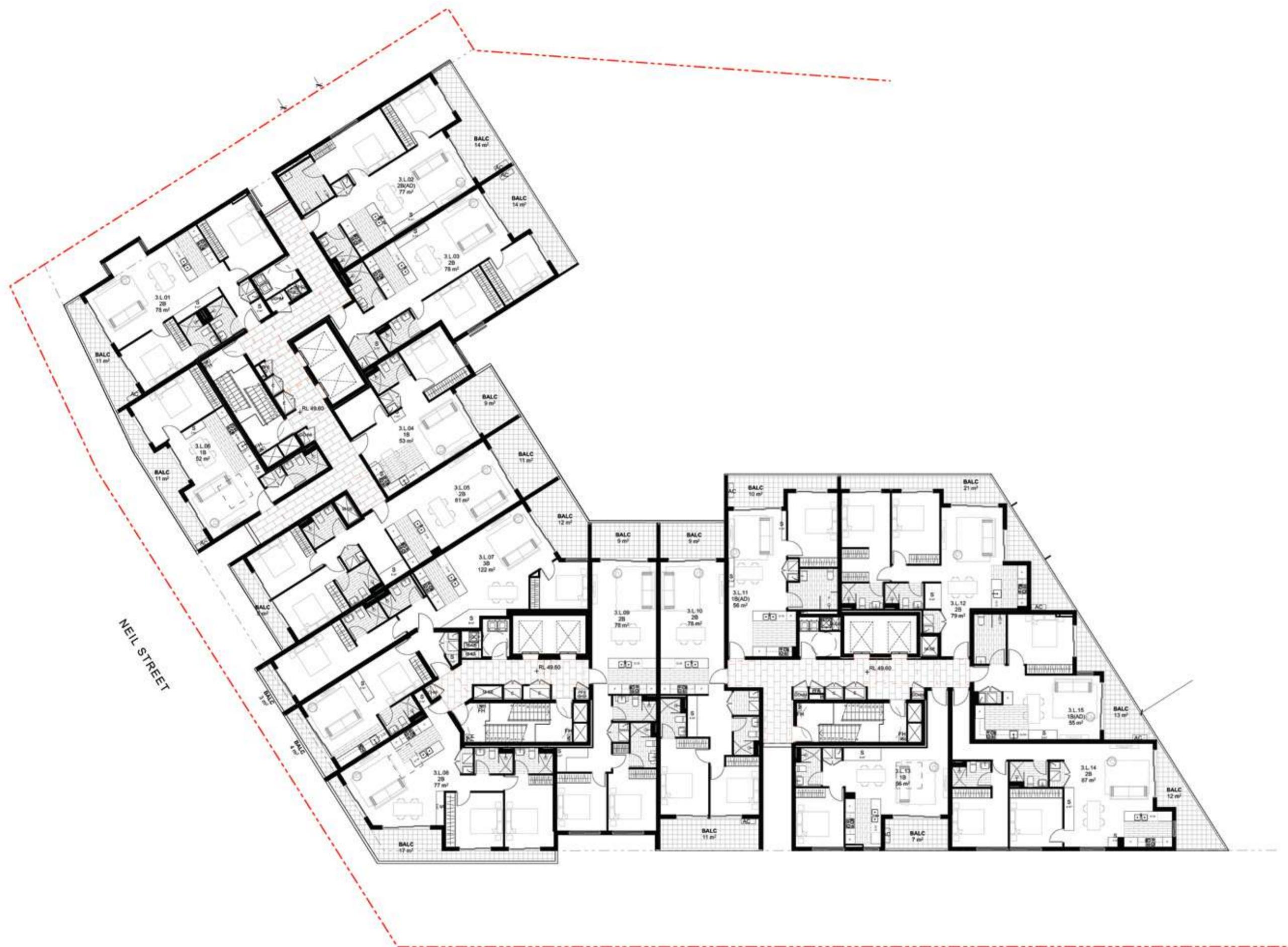
## Mezzanine Floor Plan



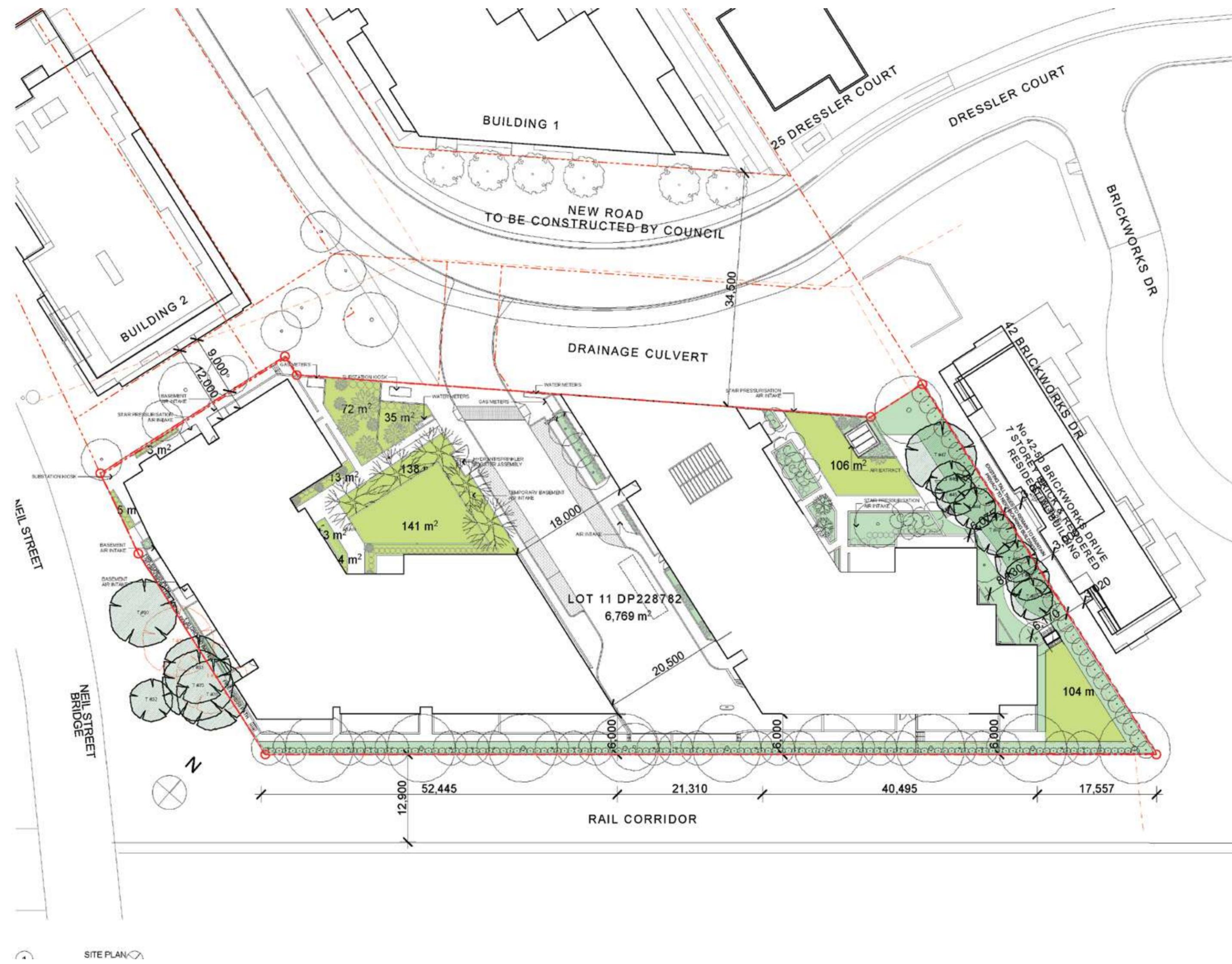
## Metro Level Floor Plan



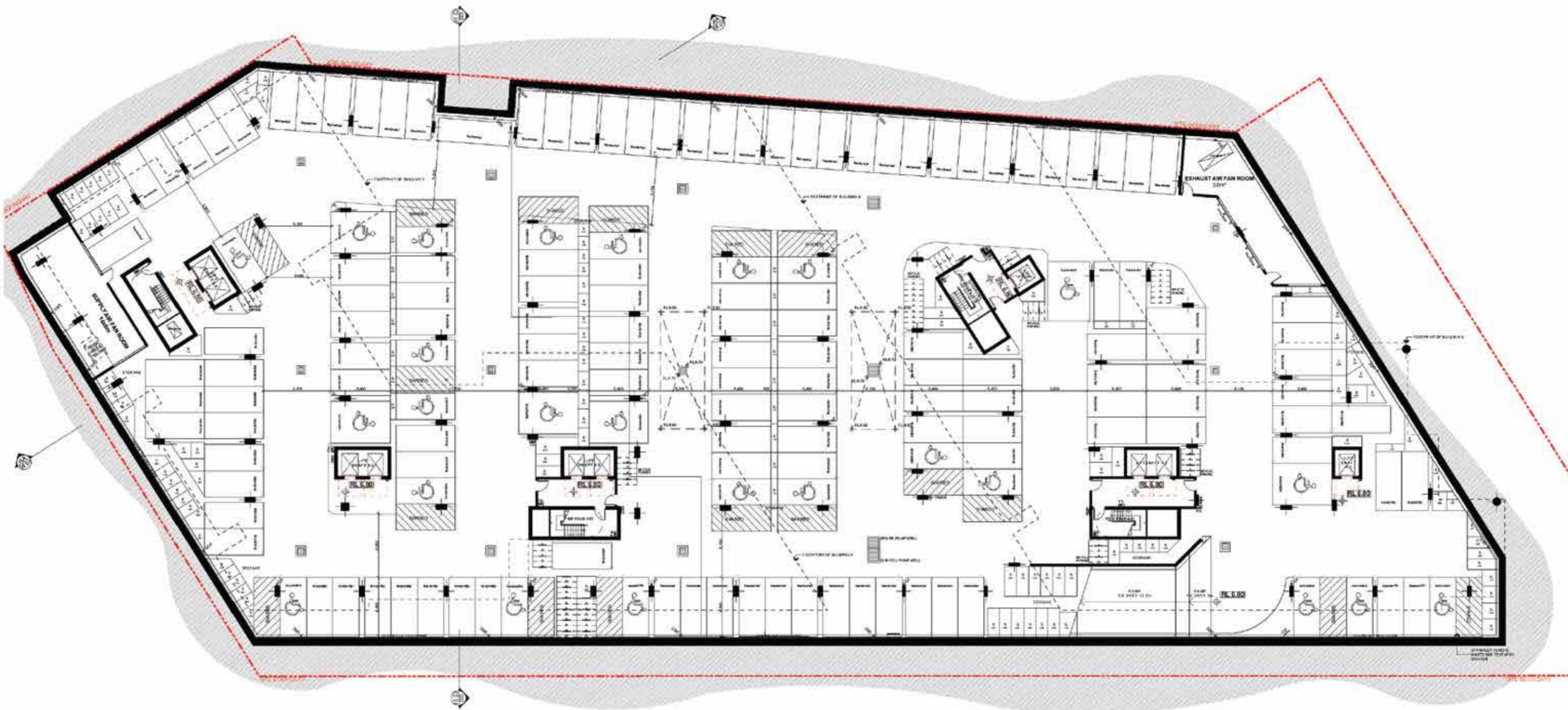
## Office Work



It is one thing to work on projects in university-run studios. While working with a client, stakes are high, and all bets are off. Good understanding of the construction processes and knowledge of software at fingertips comes in handy in such a situation. Reading architectural drawings has become second nature. I have been lucky enough to work in a dynamic office environment, enabling me to get a good knowledge of DA documentation, CC documentation. In the process you also attain a fair knowledge of NCC, especially the BCA.



Site Plan



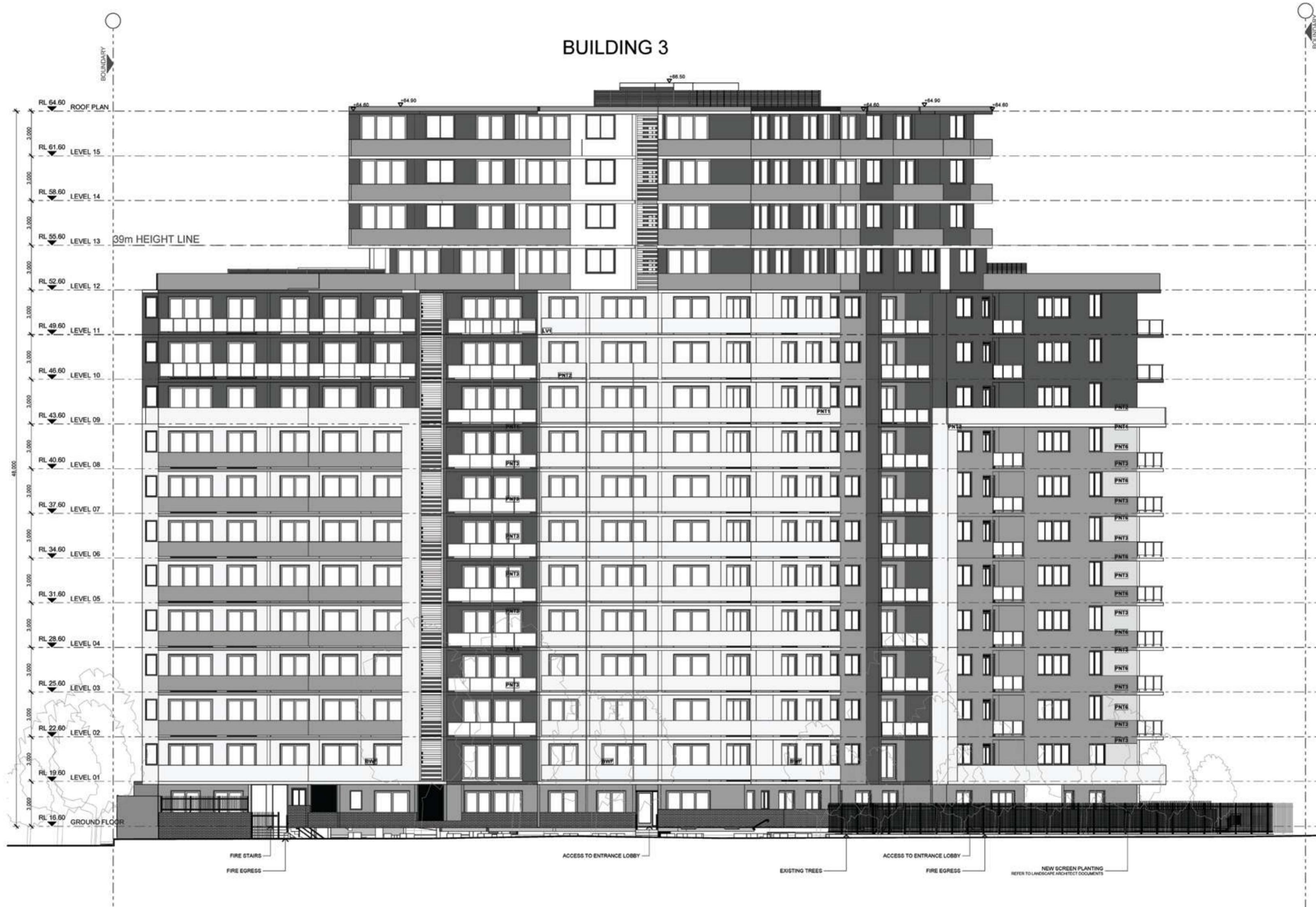
1 BASEMENT 3  
1:200

TOTAL PARKING NUMBERS	
TYPE	QUANTITY
Residential	304
Accessible	73
Visitors	67
	444

CAR PARK NUMBERS		
LEVEL	TYPE	QUANTITY
BASEMENT 3	Residential	132

BIKE SPACE NUMBERS	
LEVEL	QUANTITY
BASEMENT 3	65
BASEMENT 2	67
BASEMENT 1	73
	205

BUILDING 3



**NOTE: NO CHANGE TO FINISHES**

## **EXTERNAL FINISHES SCHEDULE**



**PNT1. DULUX PAINT COLOUR - VIVID WHITE  
EXTERIOR WALLS (PN2E1)  
LRV: 94**



PNT2 DULUX PAINT COLOUR -JUVENILE  
EXTERIOR WALLS, BALCONY BALUSTRADE  
(SG5E7)  
LRV: 73



PNT3. DULUX PAINT COLOUR -STEEL  
EXTERIOR WALLS, BALCONY BALUSTERS  
(SN4B8)  
LRV:28



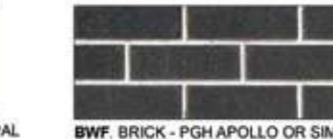
PNT4. DULUX PAINT COLOUR -NICKEL PEACH  
BALCONY DIVIDING WALLS (S13D7)  
LRV: 29.6



PNT5. POWDER COATED ALUMINIUM  
DULUX COLOUR - SILVER PEARL WI  
FRAMES (9007024Q)  
LRV: 48%



**PNT6. DULUX PAINT COLOUR - POLISHED O  
EXTERIOR WALLS  
(SN3D1)  
LRV: 73**



PAL BWF, BRICK - PGH APOLLO OR SIMILAR  
GROUND LEVEL PODIUM WALLS  
LIGHT ABSORBANCE RATING: DARK



**LV1. NICKEL PEARL POWDER COATED ALUMINIUM  
AEROFOIL LOUVRES  
LRV: 48%**



① WINTER 9 AM



② WINTER 10 AM



③ WINTER 11 AM



④ WINTER 12 NOON



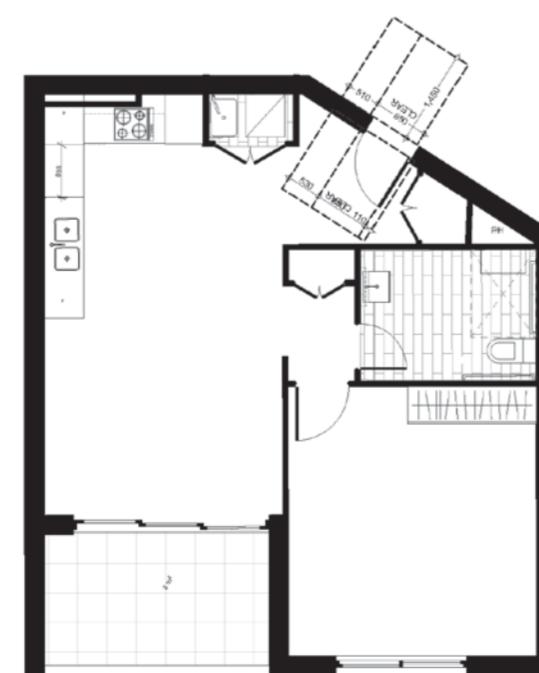
⑤ WINTER 1 PM



⑥ WINTER 2 PM

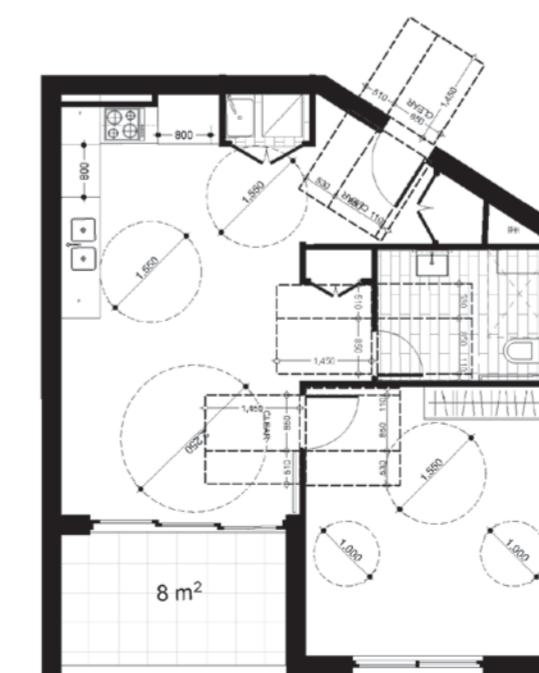


⑦ WINTER 3 PM



1 BEDROOM APARTMENT 53 M SQ:  
PRE-ADAPTION

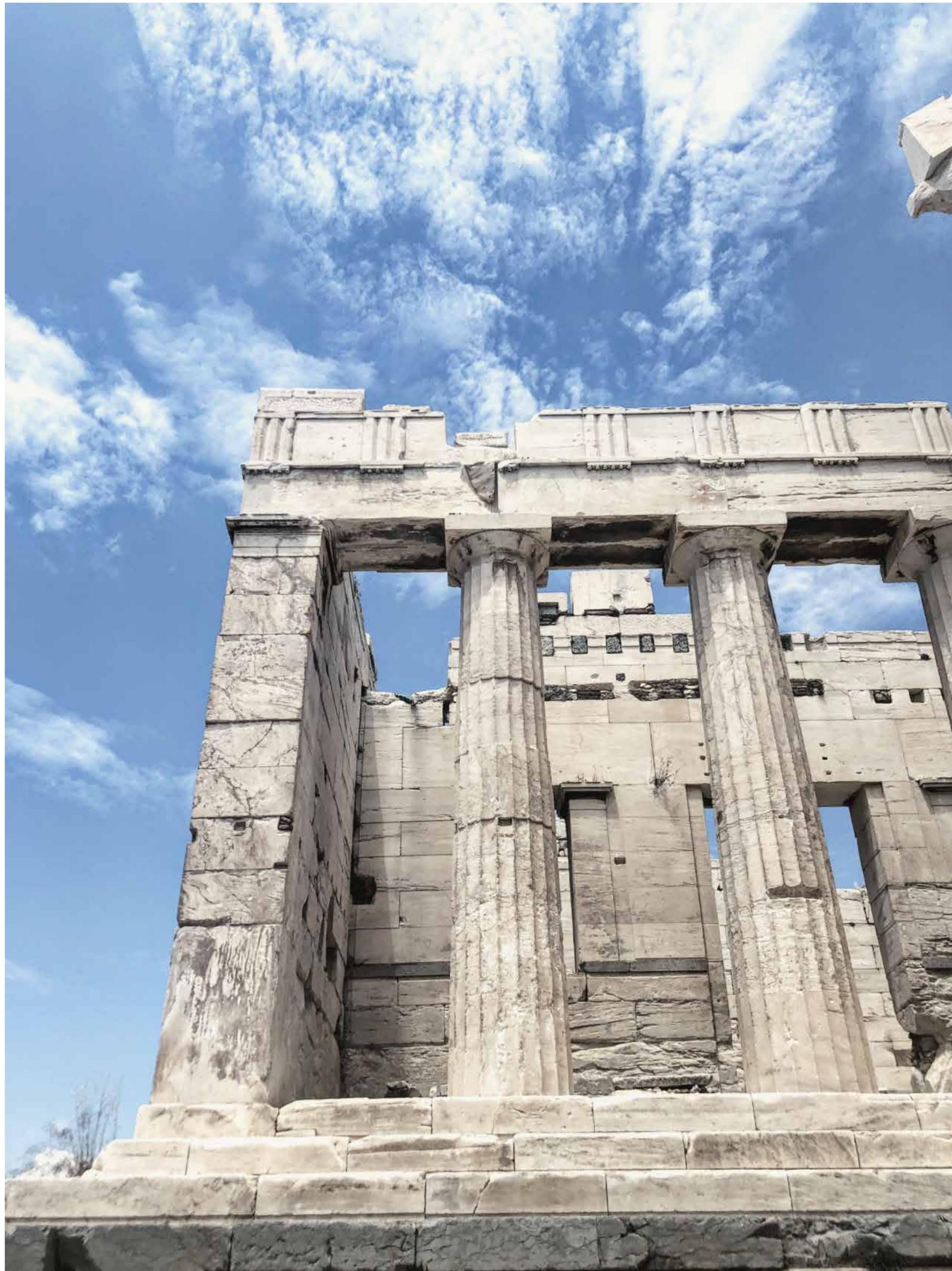
TOTAL OF 3 UNITS:  
3.12.07, 3.13.07, 3.14.07



1 BEDROOM APARTMENT 56 M SQ:  
POST-ADAPTION

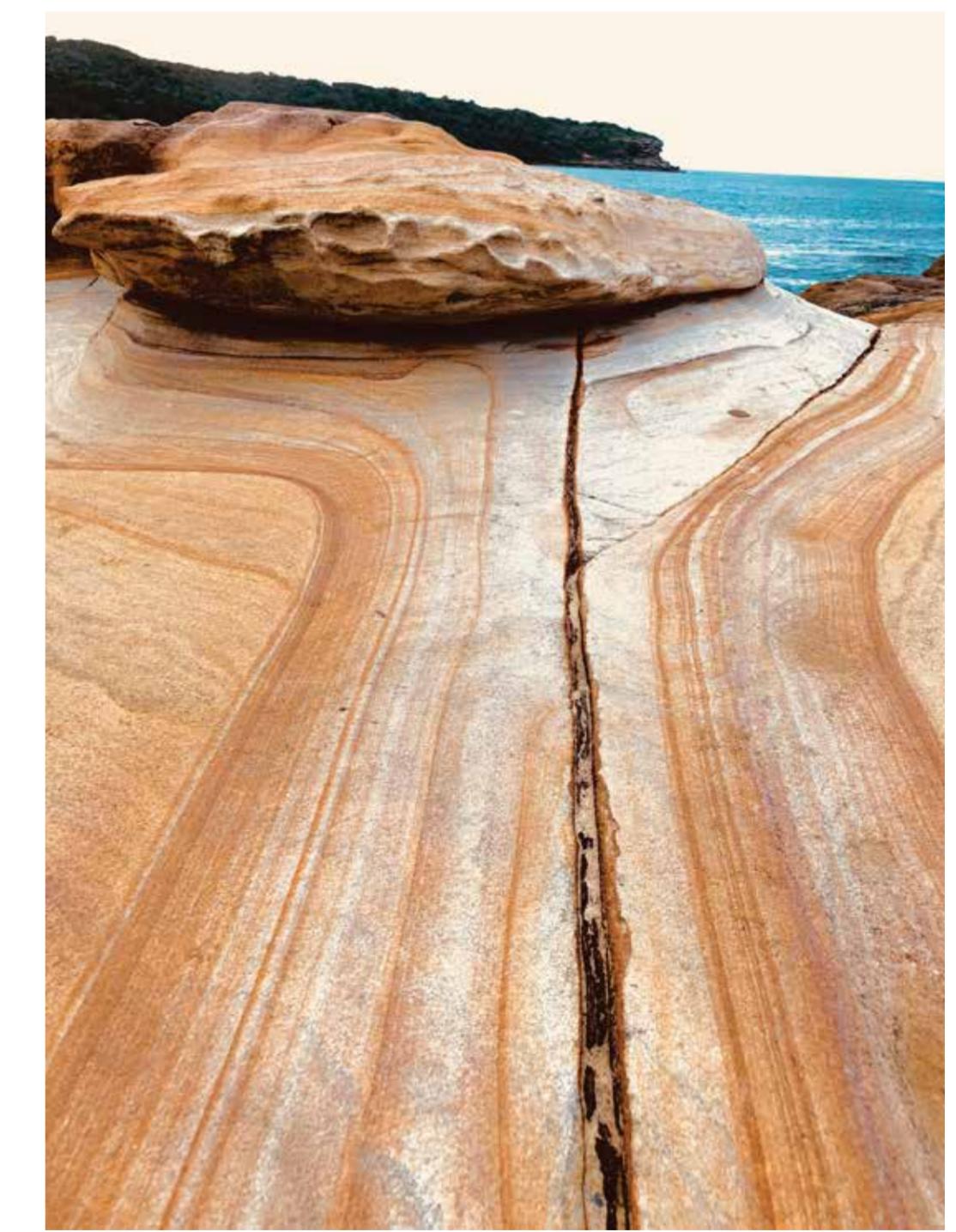
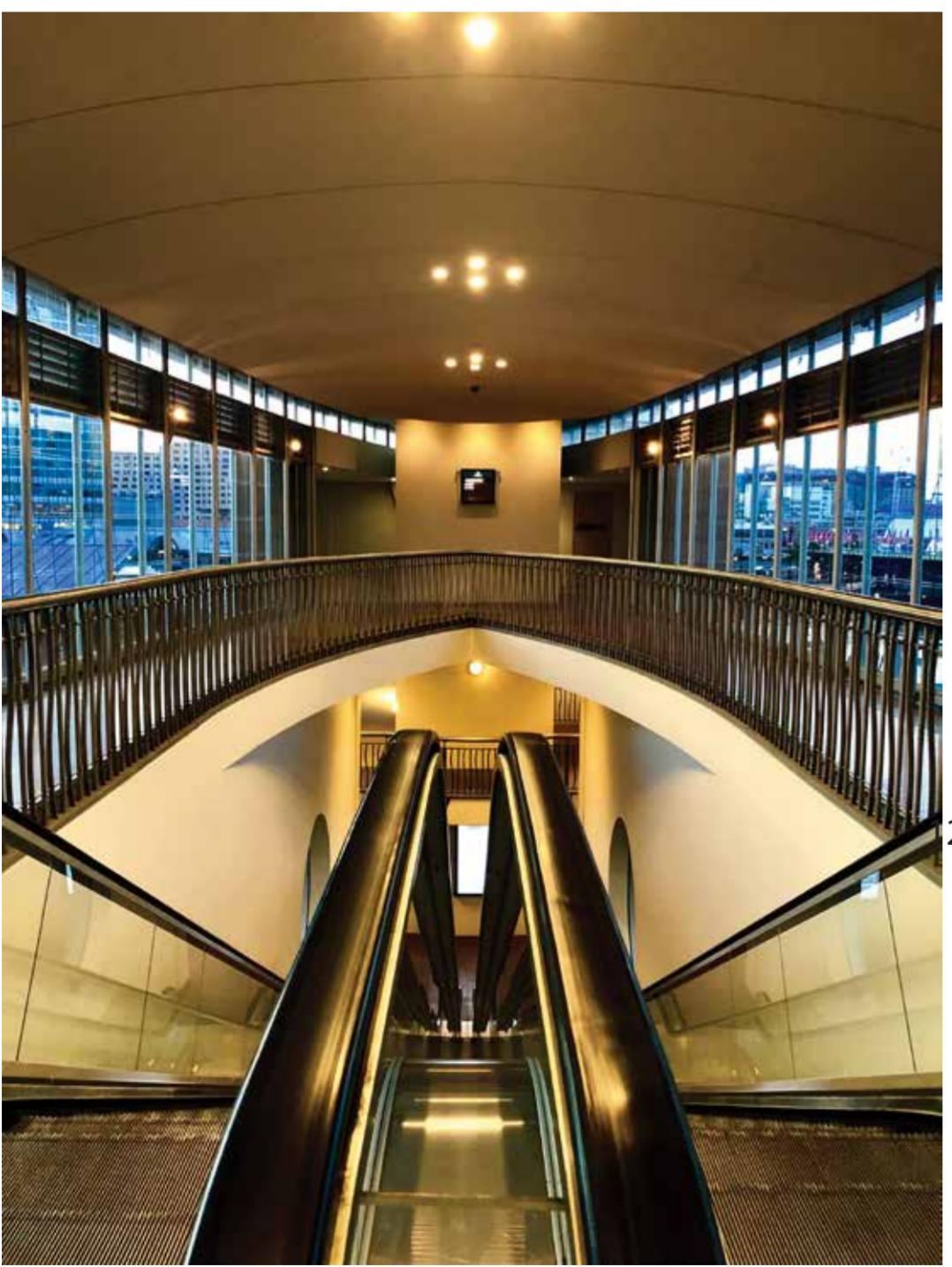
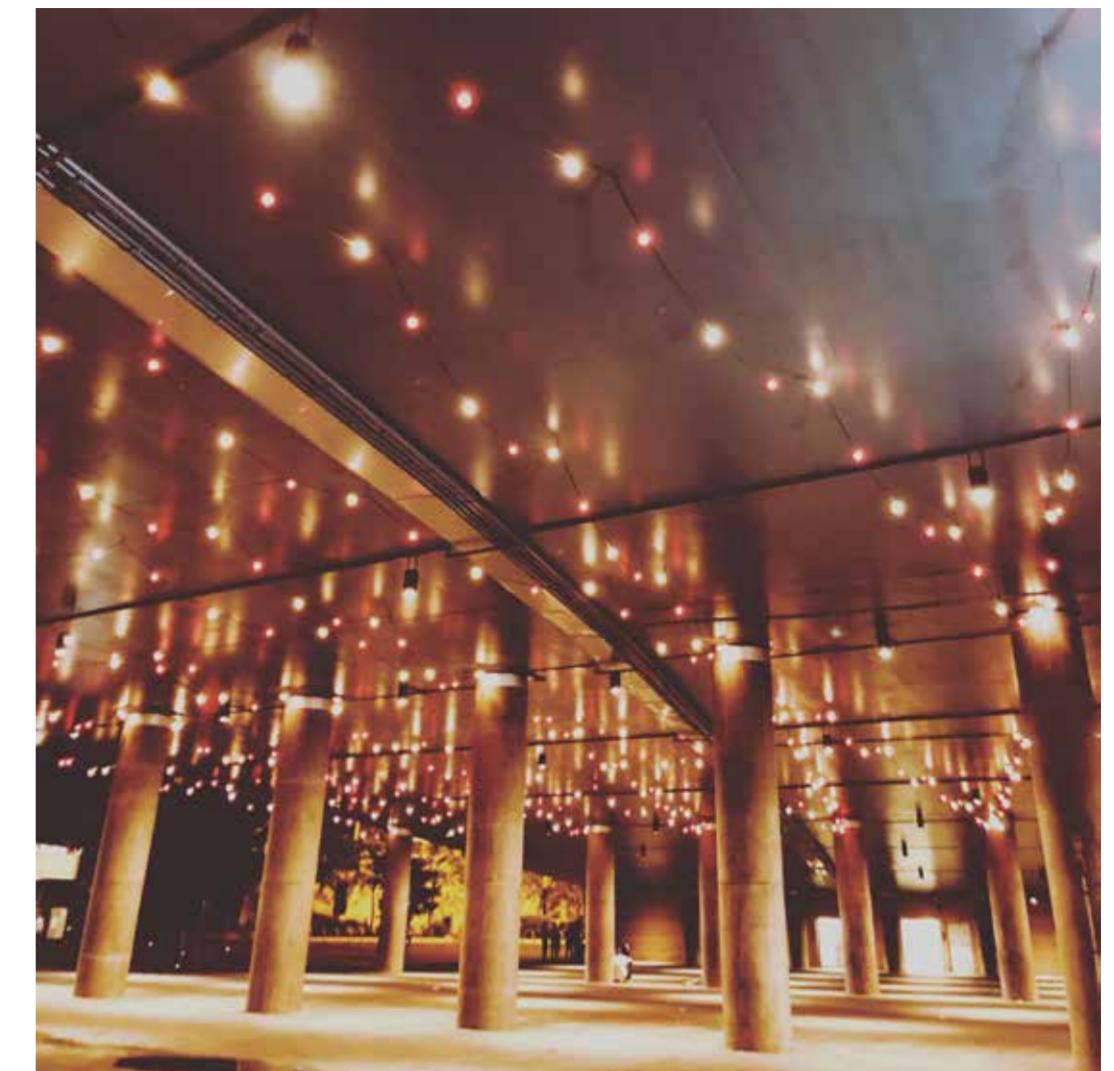
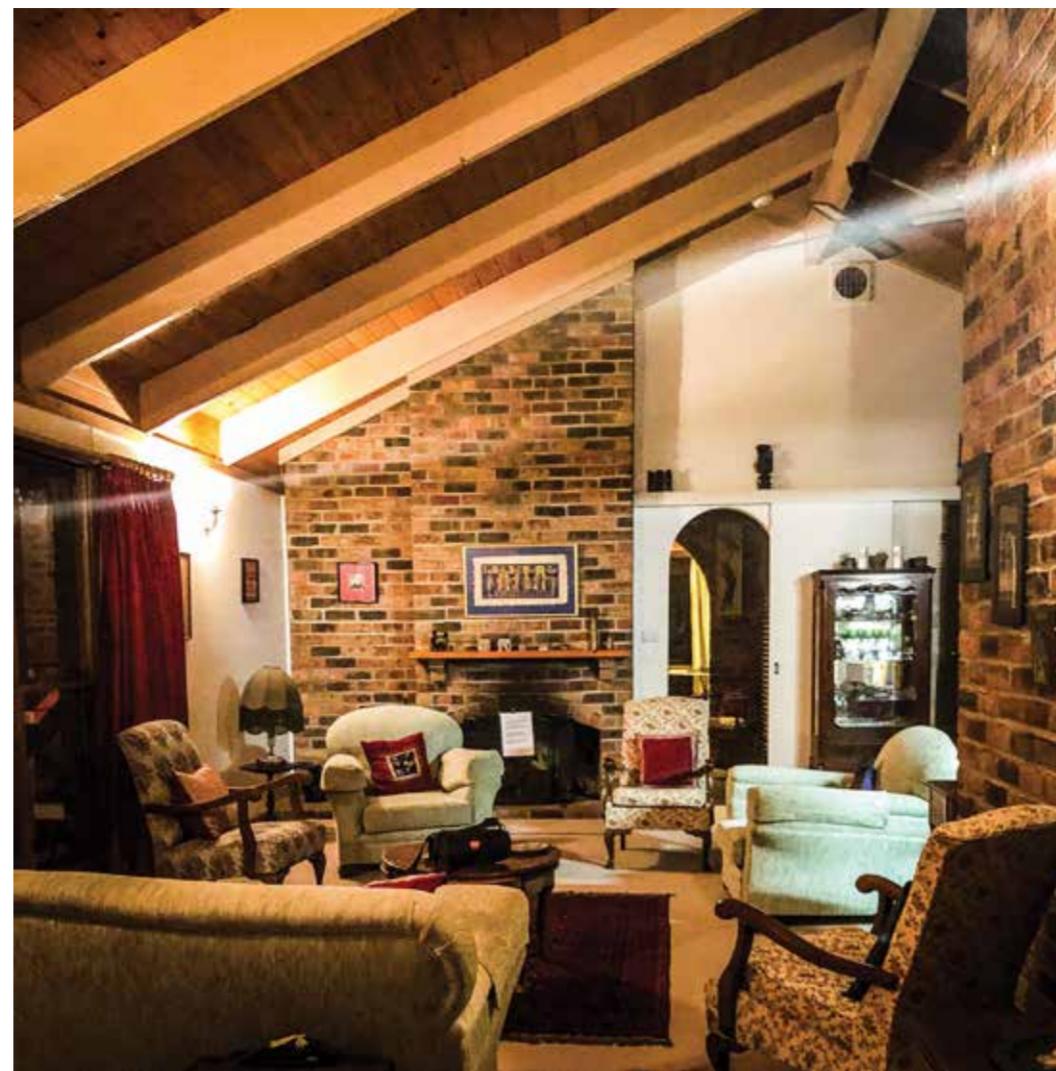
TOTAL OF 3 UNITS:  
3.12.07, 3.13.07, 3.14.07

## Photography

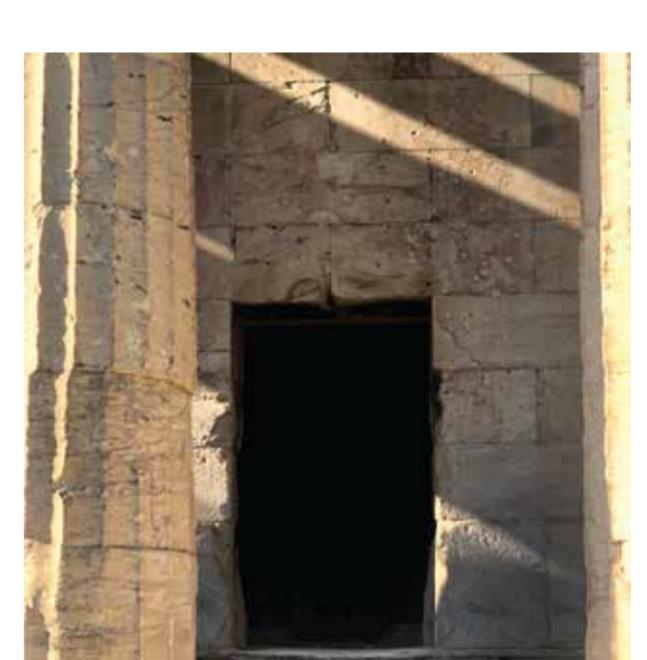
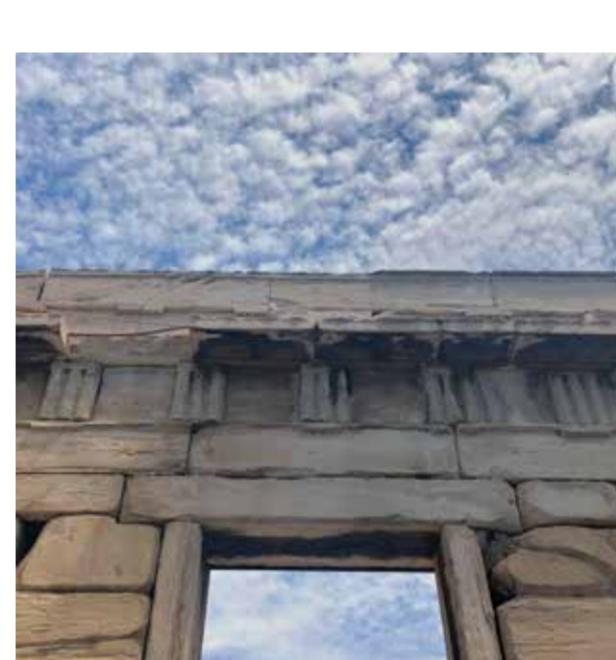
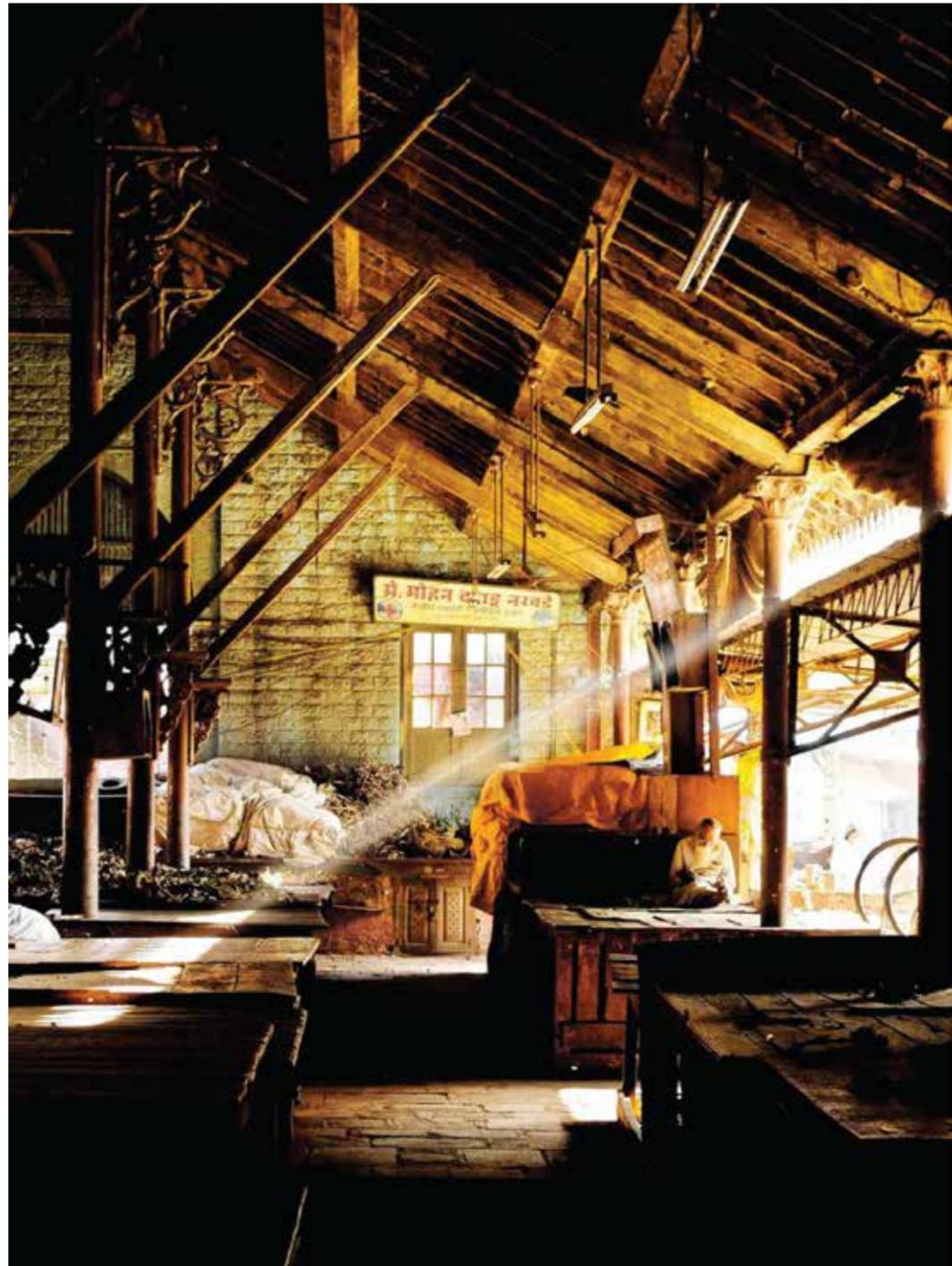
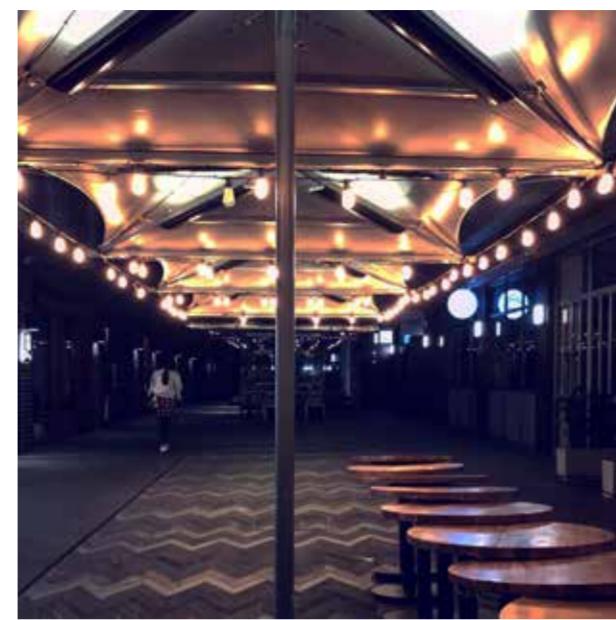


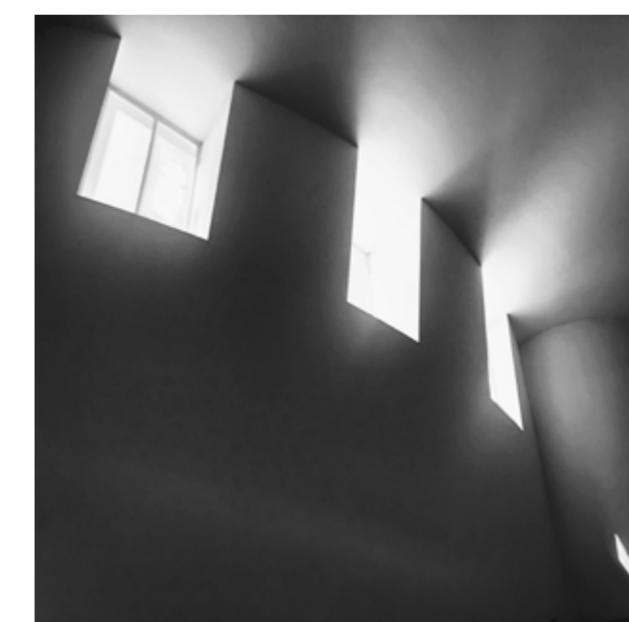
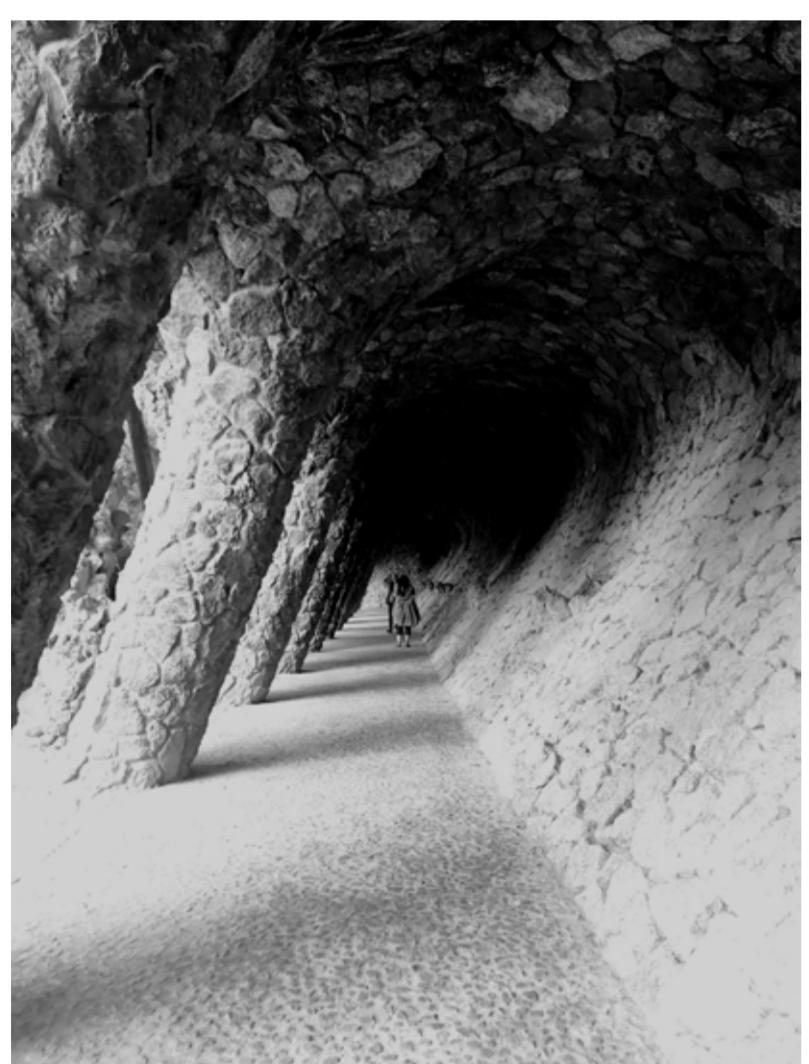
Architects need good photographers to capture their design in order to promote their work to attract new clients and even spread awareness. As such, I love capturing architecture in different perspectives, to experiment with the scale. I am also working towards my aim to show a city in a different light and not how most people have perceived it.

The pictures shown in the following slides are captured in beautiful places like the Darling Harbour, La Perouse Beach and Heron Island (GBR) in Australia, and some in Greece, Spain, Portugal and India. I also like visiting different countries to relish the work of great architects.



22-132





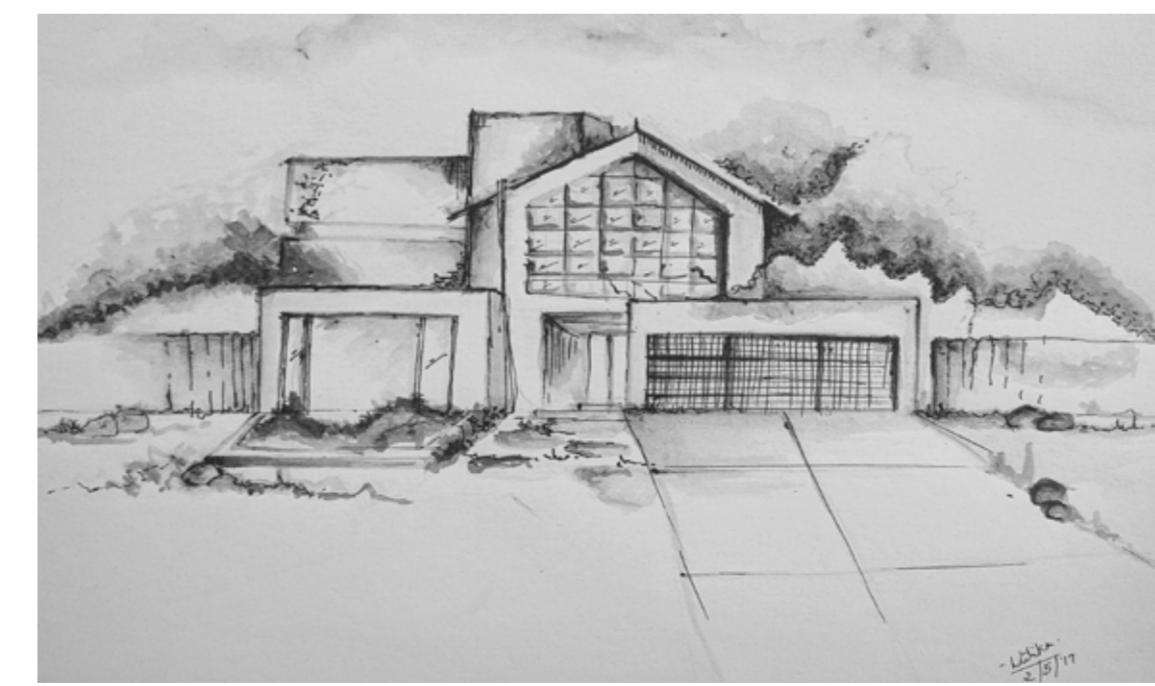
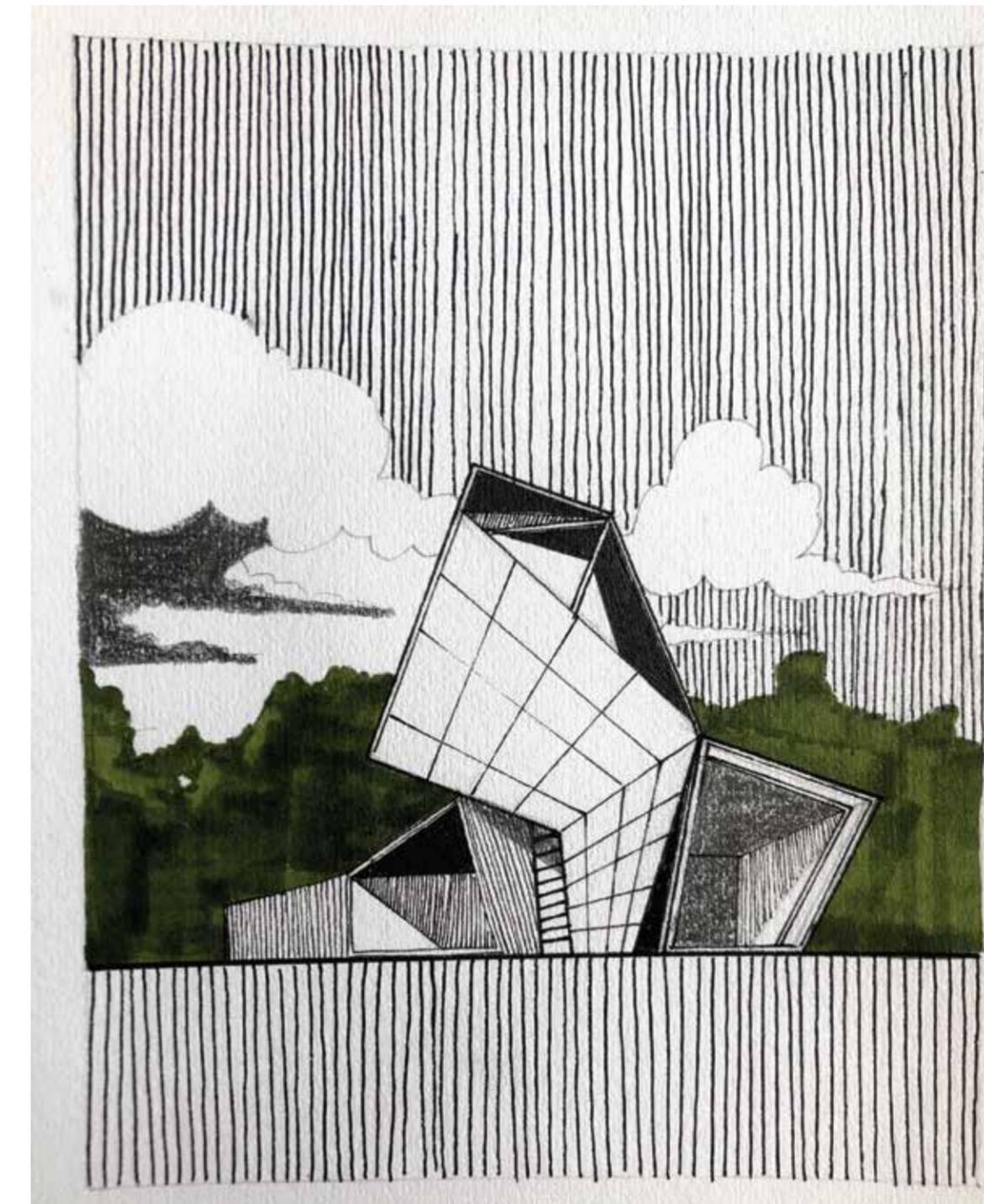
## Extra-Curricular



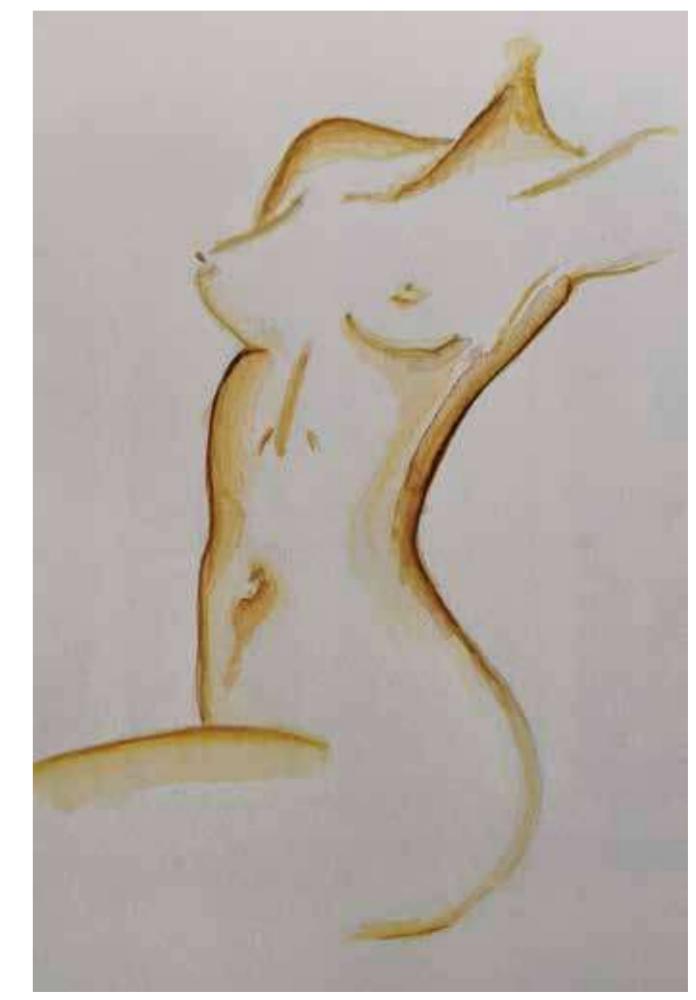
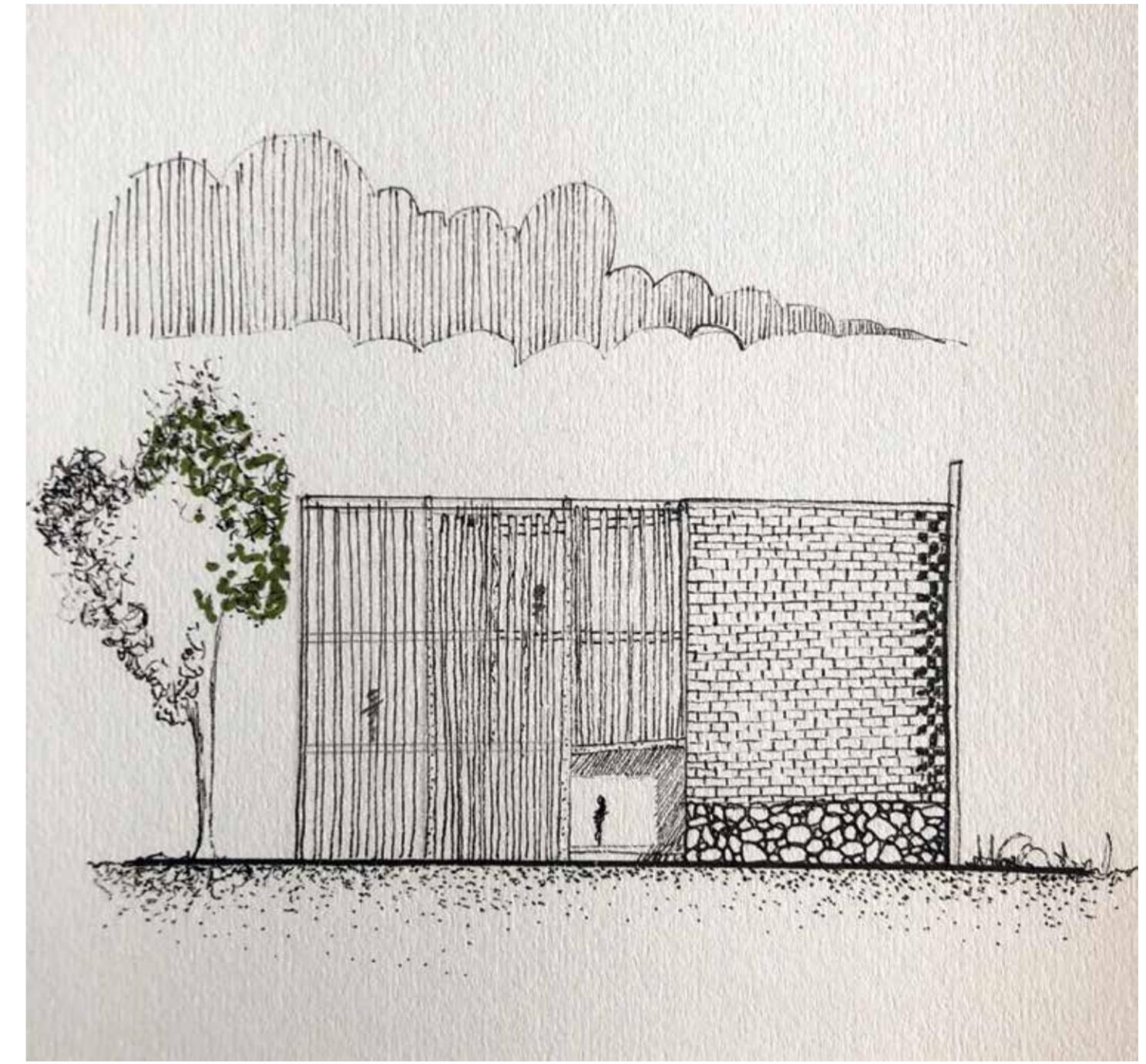
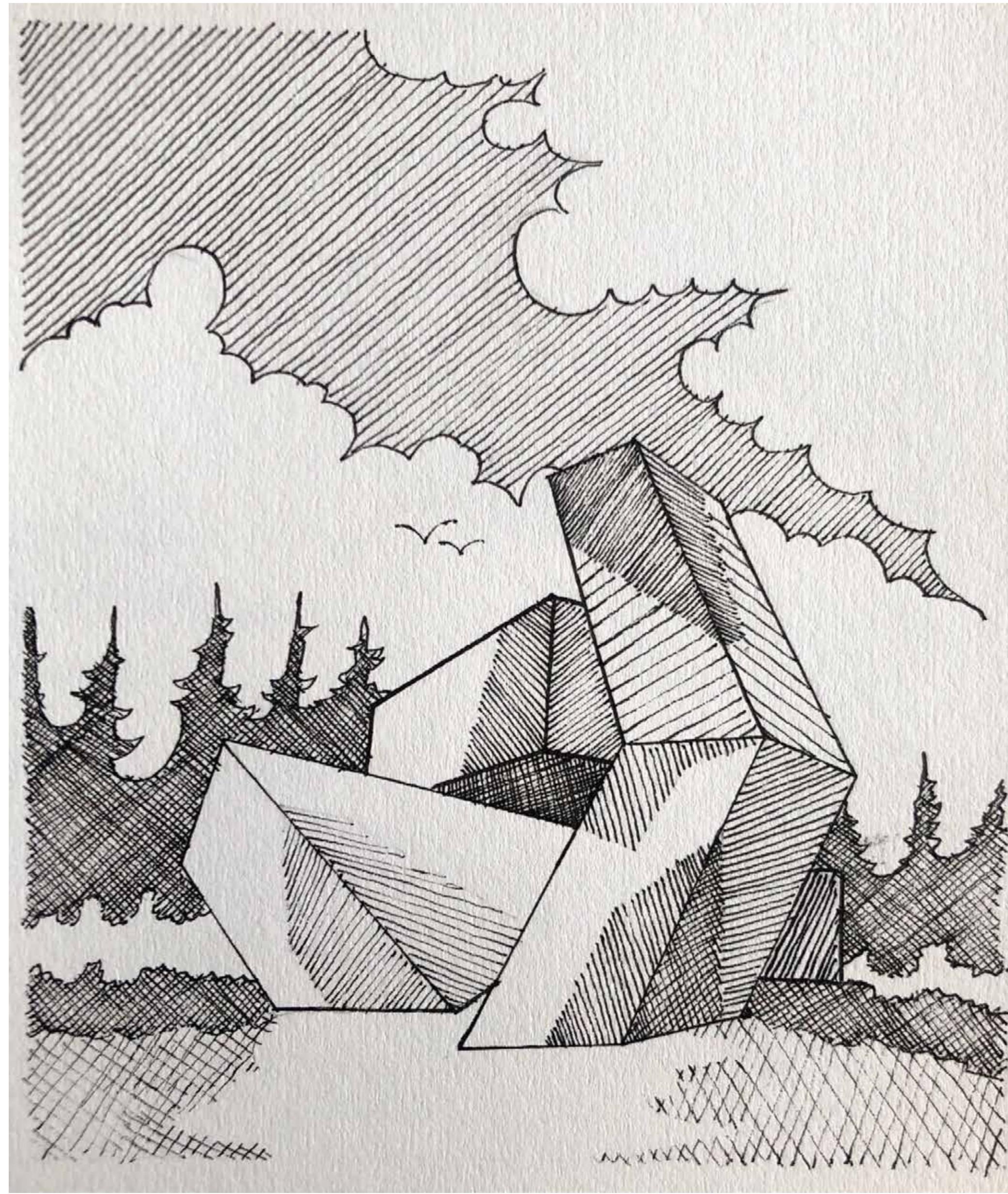
Yes, I love coffee as we can see here. This is one of my favourite paintings which I made in an hour. I really love watercolours; it brings a different depth to a painting at the same time making it look simple.

Different mediums are used for the sketches shown in the following slides like pen and ink, stippling and pen wash. I sketch and paint specially to lighten my mood, it is therapeutic for me. I have also shown some renders from my work while working at a firm.

## Sketches



Paintings



## Renders



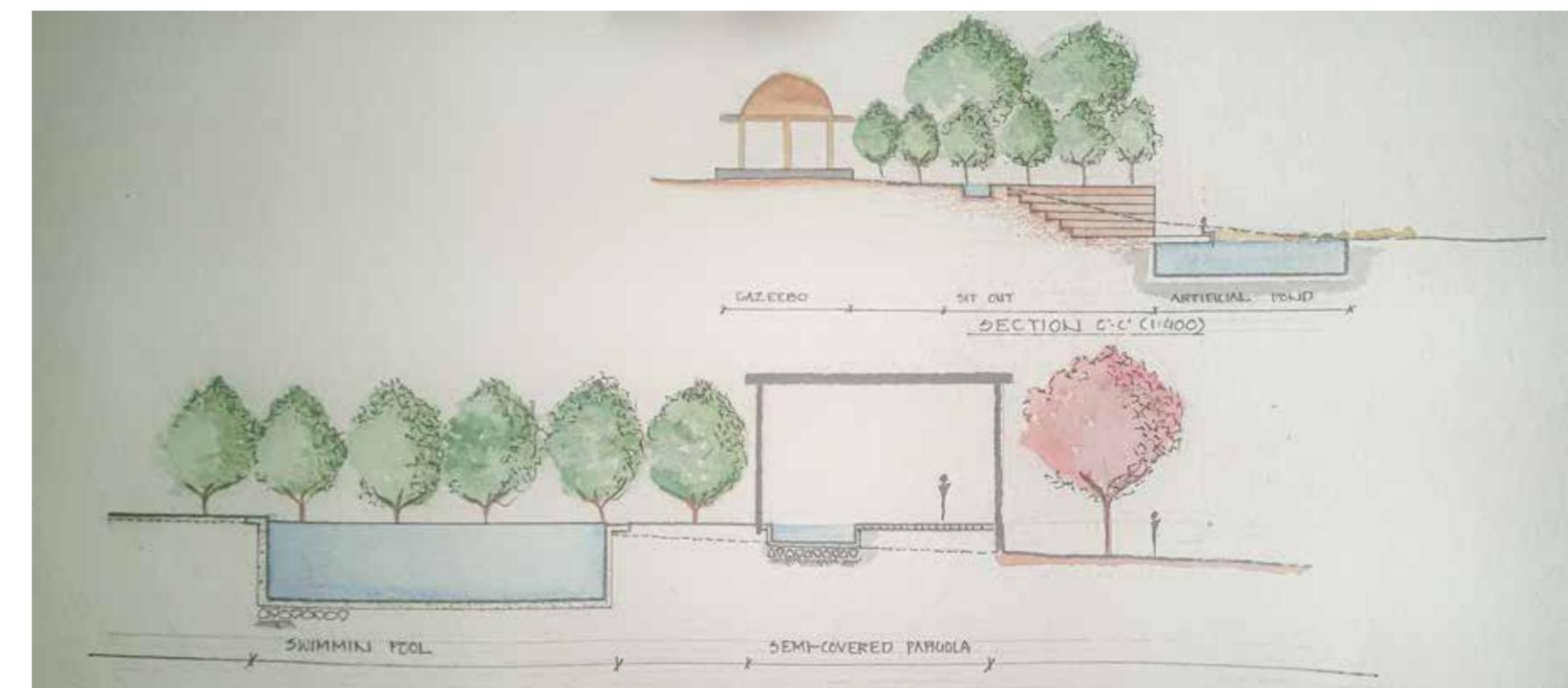
## Hand drafted drawings



Hand drawing is an intimate way to bring architecture to life. In the recent decade, architectural drawings and renderings are being produced by computer aided drawing, an invention - while useful - has fundamentally changed the way we feel and see architecture. Computers can never replace the intricacy with which we capture design detailing with hand.

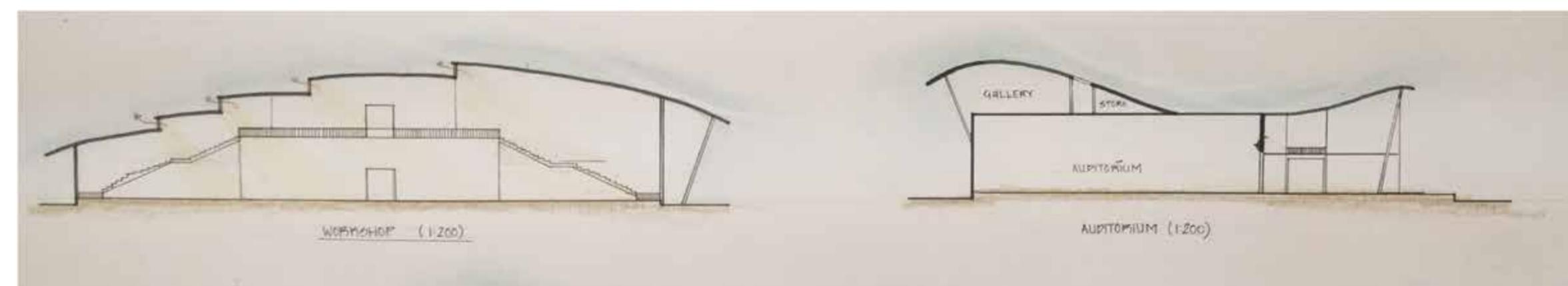
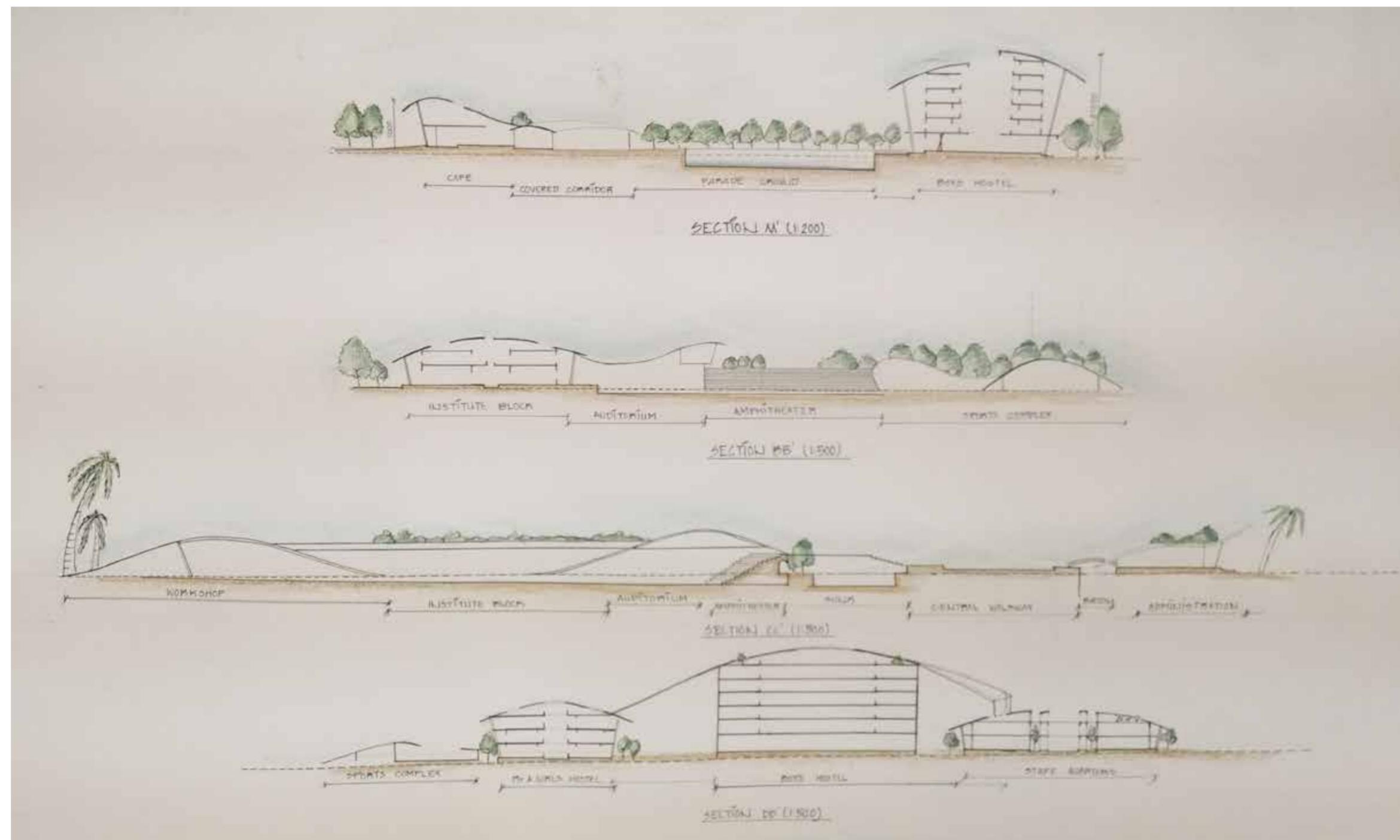
These are a series of drawings I did during my Bachelor of Architecture. All of them were measured and drawn by hand. The process of choosing the correct sheet to express the design in the best way possible followed by choosing the right rendering technique is a unique experience. The options were limited to pencil colours, water colours, pastels, and stippling. It even makes one think about and practice printing fonts by hand. But the most important aspect is understanding the details of the design, makes you imagine the space better.

## Heritage Resort



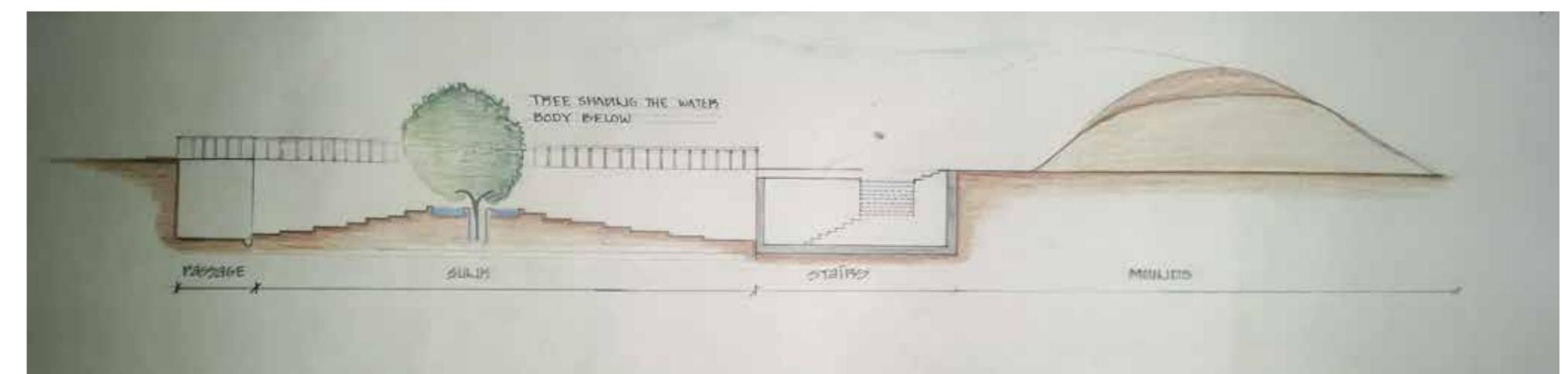
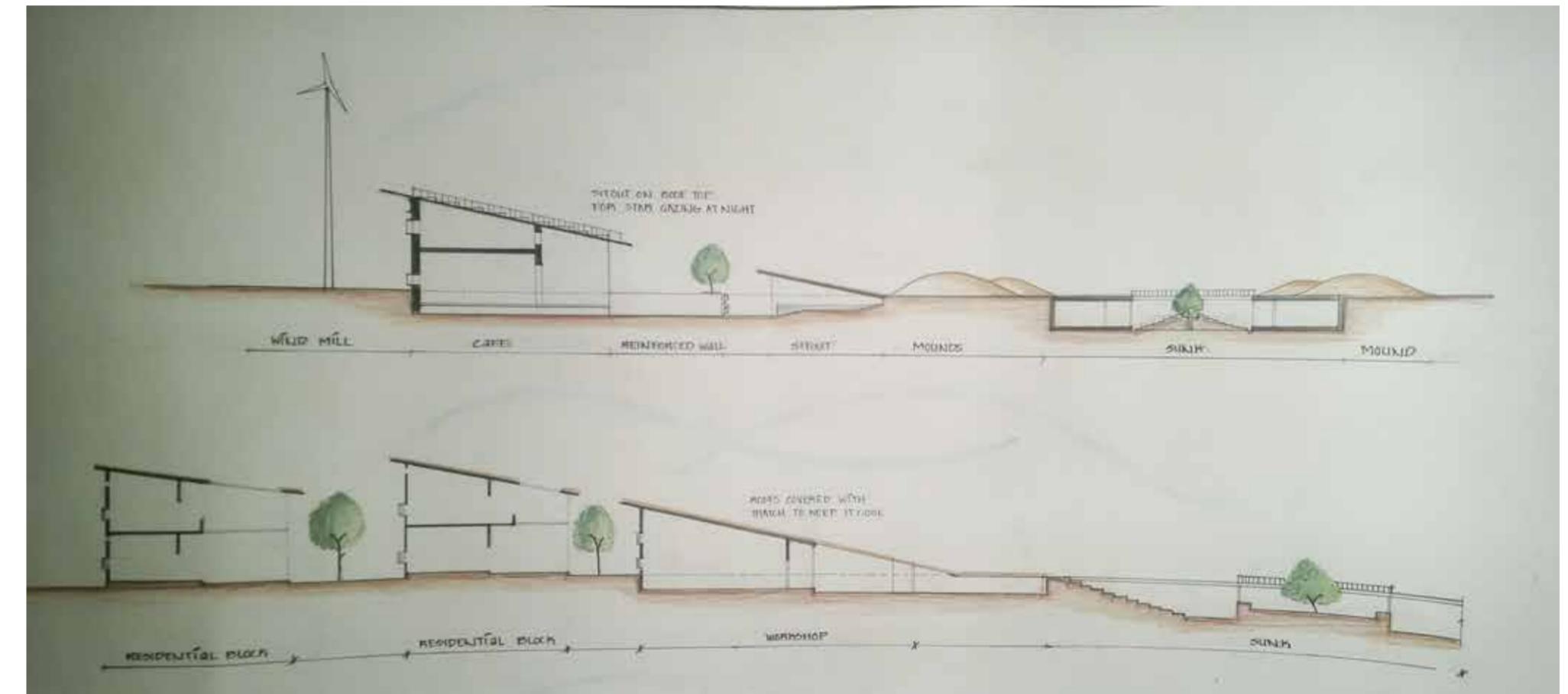
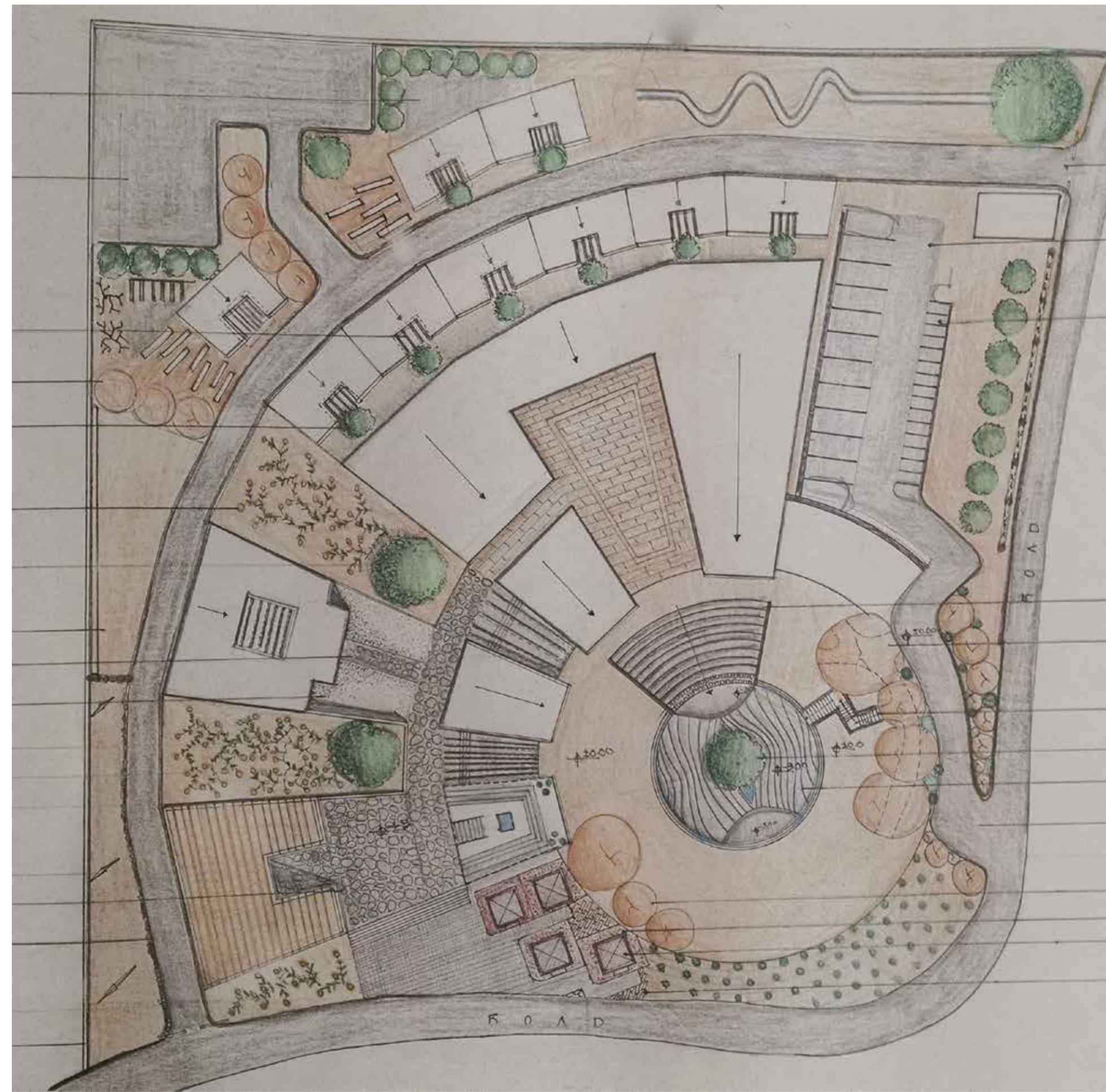
Elevations and Sections





Elevations and Sections

Cultural Center located in a dessert



Master Plan and Sectional elevations

NITIKA  
DUGGAL