

Saving Face: Future proofing Tāmaki Makaurau through facade adaptations.

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fulfillment of the requirements for the degree of Master of
Architecture (Professional) (March(Prof)).

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I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor used artificial intelligence tools or generative artificial intelligence tools (unless it is clearly stated, and referenced, along with the purpose of use), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Date 12/05/2026

Abstract

Our daily effect on climate change may feel minute, but when multiplied by eight billion, the results become much more tangible. Inherently the way we live, work and travel is flawed, as cities advance across natural environments, in search of new places for growing populations to live and work. The fabric of our urban environments creates separation between human and non-human communities, impacting historical and cultural spaces. Roads and urban sprawl split environments, reducing natural habitats and dissolving natural systems, while the glass boxes of our skyscrapers create pockets of isolation. A change is needed to reconnect our communities to our culture and history by reconnecting with the landscape, and reintroducing nature into our lives and cities to create holistic regeneration. Our buildings can hold the key to our future through the application of green architecture and passive design principles that can vastly reduce our carbon footprint and improve our resilience to climate change.

This evolution in the built environment is beginning to happen, supported by a slow change in mindset brought on by the now relevance of our impact on the world. Companies search for solutions to reduce their carbon footprint, and countries look to create data sets to find answers and solutions to curb the steady rise of our world's temperature. However, change needs to happen now and at a greater level to address the challenges associated with climate change to provide an immediate solution supported by long term initiatives. Saving Face looks to produce a complex architectural and ecological solution to this problem by producing an immediate and sustainable response to cities impacts on climate change. Through an application of past ecologies in a new vertical streetscape language, a regeneration of Auckland City Tāmaki Makaurau can occur.

Positionality Statement

I am a fifth-generation Pākehā settler of New Zealand with my family travelling over from Scotland by boat in search of more profitable futures. They settled in Wellington, where they were engaged in military commitments and in Hawkes Bay, where they felled large tracts of the seventy-mile bush to produce farmland that my family continues to reside on.

Auckland is the city where I was born and have spent most of my life exploring and living within. The city to me offers opportunities to connect to nature by travelling outside of the built environment to our national parks. I have spent lots of my life enjoying tramping, cycling and swimming in the west through the lush bush of the Waitakere and the rough west coast beaches, to the islands in our harbour and the Hunua ranges in the East. Between these two points lies the city, connected naturally by our volcanic cones, but disconnected unnaturally by the built environment which imposes on our isthmus. I have seen, or grown to acknowledge, the undesirability of our CBD as a place to live. While also experiencing Auckland's seemingly unchecked urban sprawl. Year by year, the border of the city spreads out in search of land. Every day as I ride to work, I see lines of cars stuck in traffic, travelling into the central city to work, and then retreating to our living spaces, hours in each direction.

My connection to the outdoors feels tainted by the way we live as a society, with normalised choices seeming to decide the way we live our life and local council planning feeling ten years behind the needs of our communities. With my thesis I want to explore the possibility of responding to these challenges, firstly by creating positive change by improving the CBD as a destination, a location and a habitat. By creating opportunities for people to engage with an integrated natural and urban environment, I can positively drive change. Working with Council plans, I aim to produce an architectural catalyst to promote a new holistic built environment. This change will allow our city to meet our clean green kiwi identity, an identity which we cherish but seldom act upon. By focusing on the rejuvenation of ngahere within our urban environments, I respond directly to my ancestor's arrival to New Zealand and the felling of the bush that was required for them to settle the land in Hawkes Bay.

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Chapter Summary

1: Literature Overview: Ecologies in Urban Environments

This chapter reflects on the state of the world specifically on urban spaces and connected ecologies. Climate change is affecting our world today, with an increase in severity and frequency of extreme weather events and a global rise in temperature. This change puts pressure on vital ecosystems who are struggling already from the loss of habitat from human activities. A change is required to create a joint urban and ecological framework where all communities can live alongside one another. Globally we see a trend towards green architectural solutions; backed by council support, these architectural propositions could change the image our cities now to create a future for all lifeforms of Earth.

2: Methodology

Saving Face is not producing a new set of principles and ideas but rather producing bold architectural solutions in response to previous plans and methodologies. The project responds directly to the City Centre Masterplan and builds on elements not achieved by that plan, while producing solutions to imperatives outlined in the Auckland 2050 Plan and Net Zero carbon act. These plans help to guide the methodology of the project, further specified by global Ecosystems services ideas, the Living Building Challenge as an appropriate architectural guideline and the Mauri Ora Compass as an Auckland based-guideline, to produce an appropriate architectural solution within the historical, cultural and ecological environment of Auckland City.

3: Auckland City

Auckland City, Tāmaki Makaurau, is the site for my project. A rich fertile land nestled between volcanic maunga (mountains) has grown into the largest city in Aotearoa, sprawling against the geography of the isthmus which it now dominates. Queen Street, one of the main streets in the city, sits neglected, while new growth happens far away on the outskirts of the city, as residents chase individual home ownership. This site combines social, cultural and strong ecological issues, which when tackled can produce regeneration in the heart of the city. This chapter covers the site and connected council plans.

4: Nature in Cities

This chapter focuses on sustainable design in cities through design tools and case studies. Sustainable design tools are evolving around the world with many key tools being internationally renowned and accepted. These tools, alongside learnings from international case studies, will provide design frameworks to compare design against. The framework and design combine global and local ideas to ensure appropriate and considered design.

5: Dissolving of Facades

The design work on this project will be produced through a mixed method, practice-based methodology, prioritising sketching and modelling for design iterations. This work will be supported by quantitative testing from modelling and calculations to meet requirements outlined in the methodologies section. This testing will incorporate material, form and function testing based on site to produce architectural solutions to the issues illustrated in the literature review and site analysis.

6: Discussion

This design work will then be collated and analysed against original ideas and highlighted issues to conclude design findings, testing real world elements such as flood reduction and carbon footprint reduction through the project's application. The appropriateness and feasibility of this project will be discussed, including key findings and concepts, as well as potential further issues and the limits of the design findings, concluding in the project's response to the current and future states of architecture in New Zealand.

7: Conclusion

Literature Overview: Ecologies in Urban Environments

Globally the change in human lifestyle from hunter gatherer to city-based lifeforms has created large change for the world. The Anthropocene represents a tiny slither of time relative to the earth's own timeline (Ren, 2016) in which human activity has caused significant climate change. The Emissions Gap Report of 2022 found we have failed to meet the requirements to reduce our global temperature rise by 1.5 degrees Celsius by 2050, with a likely rise to 2.5 degrees Celsius (UNEP, 2025).

Cities are now the natural habitat for humans with over half of the global population residing within them (Boakes et al., 2024). City and human design are responsible for environmental and atmospheric degradation as well as chemical pollution and contamination (Kellert et al., 2008) cities are a key area to challenge current negative climate effects. (Betsill & Bulkeley, 2007). Alongside pollution and habitat loss, cities create the urban heat island effect. Through reduced permeable surfaces and an increase in thermal mass in buildings and roads, heat is trapped in this mass and subsequently increase the heat in the surrounding area (Marselle et al., 2021). These impervious surfaces further increase the strain on ecosystems through increased flooding, by reducing the sponginess provided by porous natural surfaces. In shoreline cities, this overland flow can damage marine environments by depositing sediments and waste into seas and rivers (Chithra et al., 2015). Climate change is directly affecting our communities now, with an increase in storms and their severity, increased likelihood of droughts and rising global temperatures (MfE, 2018). Habitats with reduced size and biodiversity through pollution and clearing of forests become further at risk as they lose their complexity and, with that, the ability to respond to these climate changes. The result is further loss of ecosystems, creating a compounding negative effect by our lifestyle on the climate.

As urban populations continue to rise, our cities convert green spaces into contained sterile units. These units act on an exploitative model, providing no benefit to natural systems while carting in energy, materials and food from external sources. A change is required as this unresponsive program fails to align with ecological imperatives necessary for the ongoing future of our linked ecosystems, the required change through architecture is not only climatic but also related to a change in lifestyle from rural to urban (Bay & Ong, 2006). This change can happen through master planning and urban redevelopment by council legislation and through the application of green architecture and the joining of ecosystems and built environments.

Creation of Green Architecture

With the increased change in environmental conditions, humans have begun to change our building philosophy to replicate natural systems and reduce the imbalance between built and natural environments. This green architecture mitigates the negative environmental impacts of buildings, while also improving interior and exterior conditions to mimic the original ecosystems of place, improving comfort for human and non-human occupants. Ken Yeang's work is regarded as one of the foremost designers in the green architecture movement (Yeang & Lehmann, 2010). His designs reverse the established model of hermetically sealed towers and instead create integrated vertical green spaces (Hart, 2011). Biophilic design integrates natural elements into architectural practice, fostering psychological well-being and ecological responsiveness (Kellert et al., 2008). This work goes beyond the inclusion of planting within a building and instead considers how buildings might mimic natural systems for improvements in our lifestyles. Nina Maroe Lister's work on Sustainable Large Parks (2008) highlights decision making which focuses on relationships with ecologies and realizes the strength of connected ecologies throughout our cities, while Yeang advocates for vertical integration of ecosystems within architectural forms. For the modern architect, environmental and climatic conditions must be considered. Green architectural solutions help to create balance by returning ecosystem habitats.

Green Architecture in Modern Cities

Yeang is most famous for the vertical extrusion of ecosystems that he produces by means of external ramps which wrap the plants of the site up and around his building, creating an extension of the green space. Much of his work significantly improved the square meterage of green space compared to the amount of ground removed by the building's footprint (Yeang & Powell, 1999). The EDITT Tower in Singapore uses a ramp to create a continuous vertical exploration of the tower, with amenities on the first six floors providing increased human habitation (Yeang & Powell, 1999). This verticality and continuation of the street acts to break down the stratification of floors seen in skyscrapers (Yeang & Powell, 1999). Vegetation provides active cooling of the building, and rainwater recovery is aided by water recycling throughout the building, while solar generation provides onsite energy generation. The project works effectively by reproducing organic mass in the zero site, devoid of natural ecosystems, providing ecological rehabilitation through the density of vegetated matter covering the building (Yeang & Powell, 1999). The EDITT Tower utilizes passive and mixed mode servicing, with the application of natural and mechanical ventilation, demisters and the application of wind walls (Yeang & Powell, 1999).

The skyscraper is not an ecological building, requiring more functional and embodied carbon than other building types (Yeang, 2007). This is due to the scale and height of the building and the process and energy required to construct and hold it upright. However, the skyscraper is built prolifically, as it meets the demands of modern cities with a small footprint and large floor area. Yeang (2007) believes that the skyscraper will never truly be a green building, but with eco services we can reduce the negative environmental impacts of these buildings. The key here is the integration of ecological processes and spaces into our own built environment to produce harmonious living systems. Yeang argues that eco design is not the application of smart systems onto one singular building but rather integrating built and natural environments (2007). Yeang advocates for introducing horizontal and vertical planting systems to link the building to wider ecologies. This reduces boundaries between built and natural environments and improves habitat resilience and biodiversity (2007). His famous ecosystem mapping is completed by means of sieve mapping. Sieve mapping is a process of layering GIS data maps on top of each other to understand site based relationships and constraints which appear through this data layering process (Rani et al., 2022). Yeang used these processes to understand scope and relationships of ecological zones before planning buildings.

Cities are noticing increased flooding in built environments, due to climate change and through a vast increase in impervious surfaces (Deng et al., 2023). Sponge city elements have been successfully implemented in Changde City, China, to reduce these strains (Deng et al., 2023). Sponge cities focus on replicating nature's ability to control water and pollution runoff, especially in large climate events (Ji & Bai, 2021). This can include rain gardens, green roofs and walls. The application of green roofs is greatly increasing (Chen, 2013) as they can provide many positive effects to mitigate climate change, including the mitigation of the urban heat island effect, air and noise pollution reduction, carbon sequestration and reduce peak stormwater loads (Rowe, 2010). Research into the state of green roofs within New Zealand found our urban development's lack application of green roofs (Avery et al., 2022), stating a lack of connection between green roofs and other green spaces within our cities.



Note. Figure 2: Photograph- Auckland domain turned into a lake in heavy flooding.

Zoë Avery herself had previously produced, in conjunction with Whangarei District Council, documentation for the appropriate use of green roofs in a New Zealand context. Projects like the highline in New York can offer the same ecological benefits through ecosystem gain, while also offering human scale amenities creating connections across these two communities (Lang & Rothenberg, 2017). The application of green architectural solutions like green roofs and vertical vegetation help to reconnect our built and natural environments to produce holistic design globally. The application of these processes across New Zealand could produce similar positive change.

Aotearoa Application

Globally, we are seeing a trend towards responsive and green architecture which can help to mitigate this separation of our lives from the natural environment, benefitting our mental and physical health, and providing natural solutions to issues we have generated with our modern cities. This connection to nature and the land is specifically important to New Zealand, as it forms the basis of our international reputation. Many regenerative projects within Aotearoa can work with the Māori practice of kaitiakitanga or stewardship, a concept that meets the needs of the community through place-based thinking and ecological regeneration but is challenged by western urban environments (Walker et al., 2019). Projects such as Tahi, which has regenerated a plot of land in Northland to reintroduce ecological complexity and create a bio living lab, demonstrate how the negative impacts of our current explorative lifestyles can be reverted. Tahi work with a toolkit to ensure biodiversity metrics are hit, understanding the larger picture that indigenous biodiversity requires a protection of habitats and ecosystems to maintain all species (Brake & Peart, 2013).



Note. Figure 3: Photograph- Tahi, lake regeneration.

Auckland City is not immune for the impacts of climate change, with loss of native vegetation, increased non permeable landcover and a seaside city we see increased temperatures, habitat destruction, flooding and severe weather events and possible land loss through sea level inundation. The Auckland region is now considered a subtropical zone with an increase in global temperatures (Auckland Council, 2020). Auckland cities population is growing by 3.3% annually, with more housing required to meet these demands, urban sprawl is one of the factors responsible for ecological decline of our ecologies and habitat loss (Infometrics, 2024). Auckland CBD has as little as 2.2% exotic tree cover, with large tracks of native podocarps forest felled for land and timber (Infometrics, 2024). Humans are responsible for the loss of native species, with many more endangered. The application of appropriate architectural solutions through the revitalization of complex ecological habitats within our built environment could reduce the negative impacts of this urban sprawl and help to curb climate change through a reduction in urban heat island effect, carbon sequestration and reduction in functional carbon through passive design systems and shading. However large-scale planning is required to make union between separate architectural solutions to produce a vast and complex ecosystem. Auckland council is aware of the severity of our situation (Auckland Council, 2020) and preparing for action with both the 2020 climate change plan and Auckland's 2050 plan which includes carbon reduction policies alongside human elements with an aim at providing more connected and less reductive lifestyles.

Chapter Two: Methodology



Note. Figure 4: Rendered model image of *Saving Face*.

Saving Face

Research Aims

The aim of this thesis is to provide an example of future design for Auckland City, to provide effective facade design incorporating biophilic principles and responsive applications. The goal is to produce a facade which can provide a comfortable climate internally and externally without the need for conditioning systems and machinery. This facade will also include habitable community spaces to create neighbourhoods within the CBD and develop community resilience, producing a city capable of responding to current and future challenges.

The project works alongside Auckland Councils future plans, the Auckland Climate Plan and the Auckland Plan, by reducing the carbon footprint of our built environment while improving resilience and biodiversity within our cities.

The scope of research is Auckland's CBD, an area highlighted by Auckland's 2012 and 2050 plan, due to its importance for social and cultural growth and current degraded state. Regeneration of the CBD is a key element of these plans. As Queen Street is regarded as the key street of Auckland, my work will be located here for site proposition and mapping. However, a successful programme will allow the learnings from the work to be applied across Auckland's CBD as a kit of parts, allowing the project to be applied to a range of building typologies to suit the environmental and social needs of the area.

Research Objectives

- Increase foliage cover and passive design strategies to reduce urban heat island effect and provide more temperate climates.
- Create new vertical neighborhoods and create closer communities, responding to socio-cultural aspects of the Auckland 2050 and 2012 plans.
- Increase biodiversity through vertical ngahere and complex ground-based ecosystems incorporating principles from the Urban Ngahere Strategy.
- Maintain facade and building integrity during seismic activity, increasing safety for occupants and reducing the risk of falling debris to passersby.
- Implement carbon neutral or regenerative building retrofits to improve the quality of Auckland's built environment.

Research Question

How can facade adaptations be applied to meet the needs of a growing urban environment faced with climate change?

Research Methodology

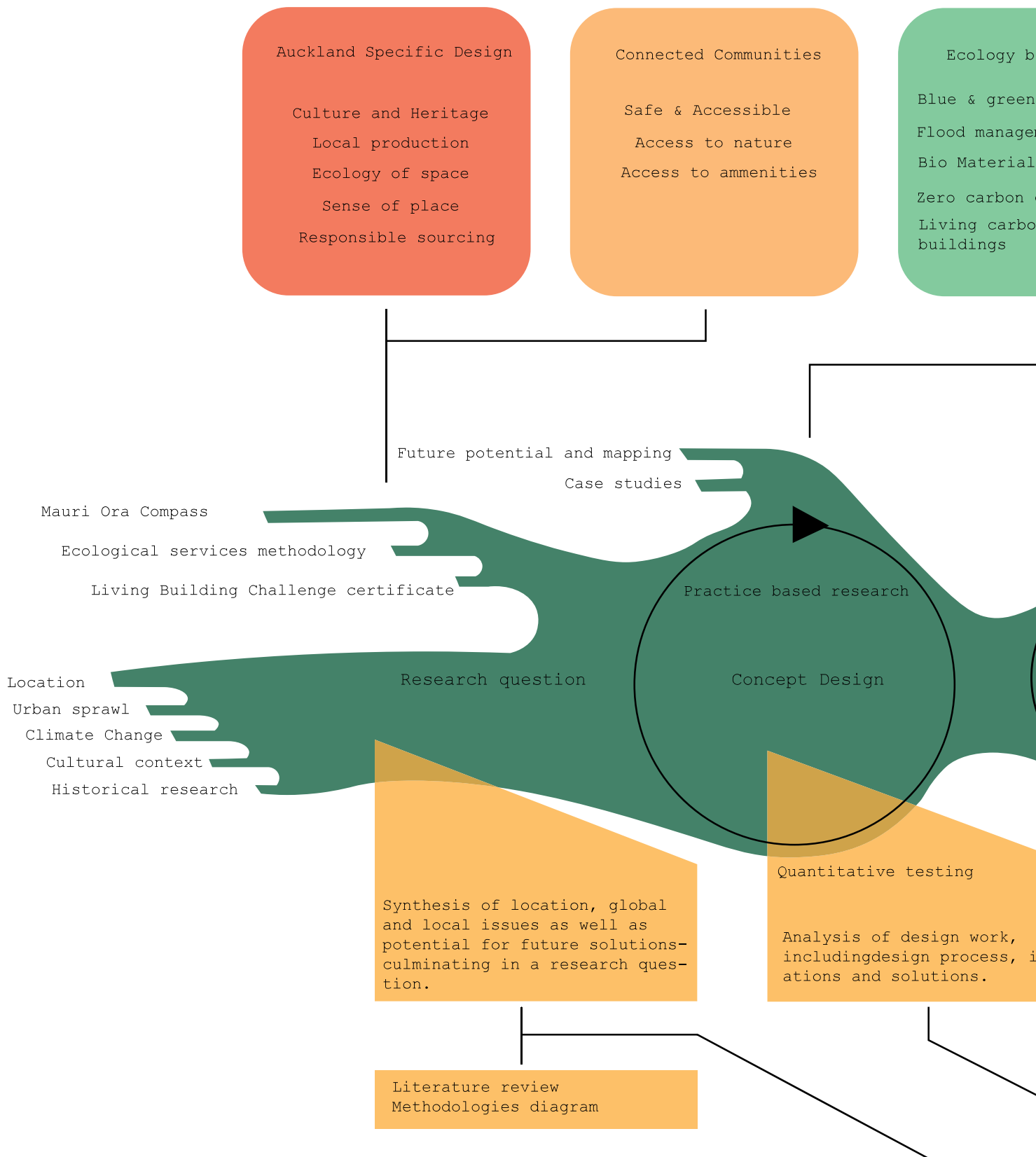
This thesis has been produced using a mixed method, practice led methodology. Design-based work has been produced using qualitative techniques, considering physical and visual comforts and associated emotional experiences. Quantitative analysis has also investigated the performance of solar shading, specifically solar gain and reduction in heat island effect. Based on this, CAD modelling was used to extract information on the effectiveness of the design and adjust parameters accordingly. Design improvements were developed through a practice-led design process, using data derived from these CAD testing. These quantitative assessments started in developed design and continued through into detailed design, working in collaboration with qualitative design elements to ensure a coherent and efficient final design.

It was important that the final product be a synthesis of efficient passive design and ecological improvement while providing pleasant spaces for inhabitants to live and work in. Design options have been selected to positively influence these factors evenly, ensuring a holistic design methodology. The theoretical framework was important to guide design choices by providing a rubric to critically analyse design decisions against, ensuring the design met the specified aims and objectives.

The thesis was conducted using a methodological framework with principles derived from three existing frameworks: the Living Building Challenge (LBC), Mauri Ora Compass and Ecosystems Services. These base frameworks were chosen for their focuses on providing healthy and carbon neutral designs, a unique historical and cultural Auckland perspective and opportunities for improvement of downtrodden ecologies. The elements selected from the LBC will focus on the tangible and emotional parts of the construction, acting as a guideline to ensure we hit carbon negative buildings. Seyrek et al. (2021) found sustainable design requires the application of a wide variety of tools and services to provide effective change. The LBC framework allows for the application of modern tools and multidisciplinary approaches to assess the effectiveness of sustainable design elements. The technical data from this framework will guide my quantitative data gain and help to understand the data within a scope of regenerative building design through passive design features and the application of green architecture.

The methodological framework uses a blend of ideas and methods to create a principle to rationalize design choices and ensure maximum ecological and social benefits of the project. This responds to the issues addressed in the literature review around the future of Auckland City facing climate change. This synthesized framework is divided into five elements which are engaged at certain stages of the design process while informing creative decisions.

Methodologies Diagram

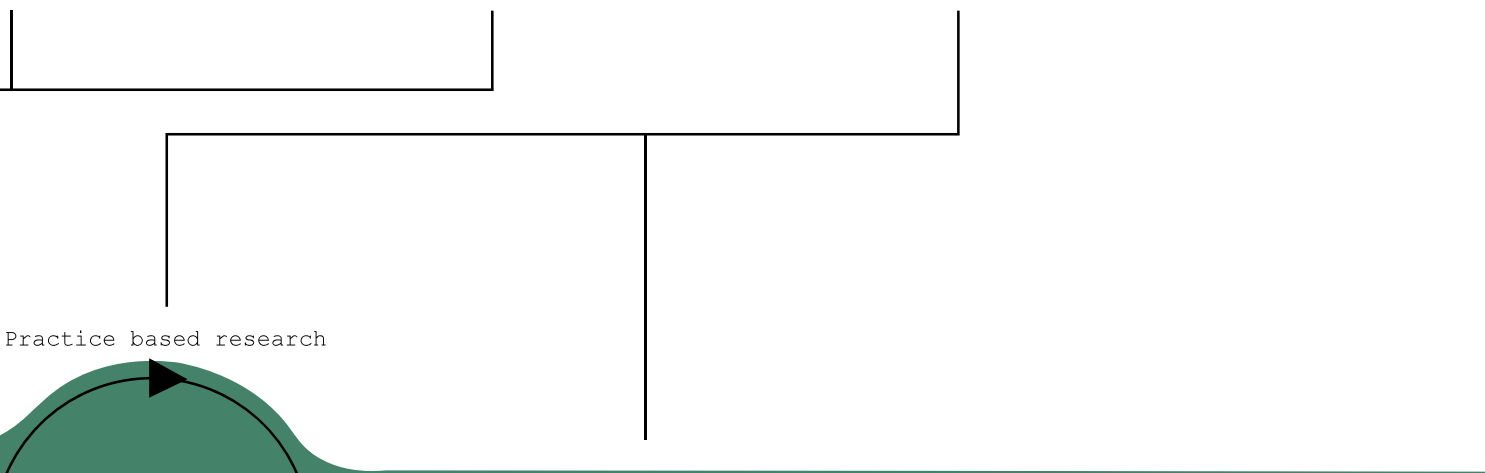


Note. Figure 5: Methodologies diagram.

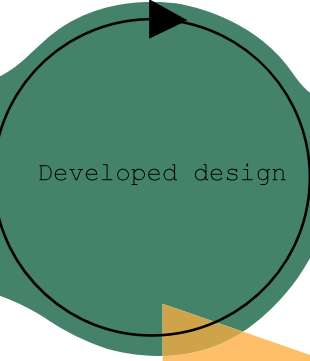
ased design
Infrastructure
ment
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energy
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Futurity
Holistic regeneration
Urban regeneration

Quality built Environment
Quality building envelopes
Healthy interior spaces
Biophilic design principles
Passive design



Practice based research



Detailed design

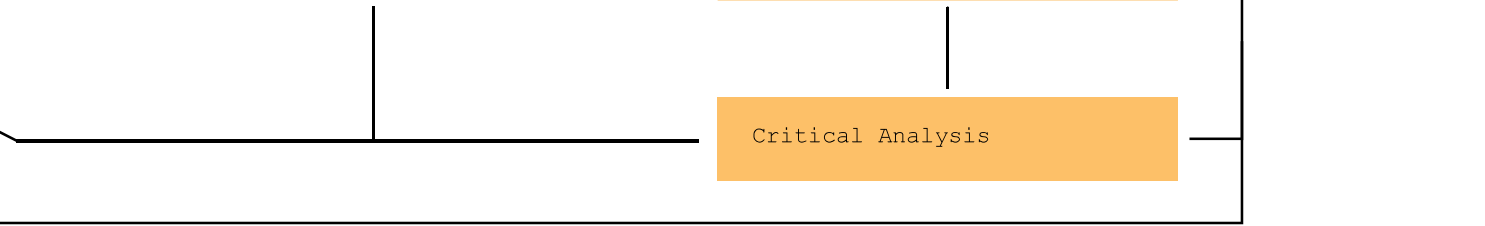
Exegsis

ter-

Quantitative testing
Analysis of design work,
including design process, itera-
tions and solutions. Response
to design methadologies

Application on case study

Critical Analysis



Chapter Three: Auckland City



Auckland City, Tāmaki Makaurau, is built on an isthmus on the North Island of Aotearoa, Te Ika-a-Māui, joining the northern and southern sides of this island. Strong volcanic activity has shaped this land, with prominent maunga (mountains) acting as landmarks and cultural sites for generations (Tūpuna Maunga Authority, n.d.). Aotearoa was first settled by the sea faring Māori in 1350 who navigated south through the Pacific Ocean, and made settlements on the maunga (McClure, 2016). Capt. James Cook was accredited for the mapping of New Zealand in 1769, bringing further European explorers and settlers. The city of Auckland was founded in 1840, with William Hobson appointing it as the capital of New Zealand. Large plots of land were purchased from the local Māori and sold on to international settlers (McClure, 2016). The rich soil provided plenty of food and the presence of the native Māori boosted trade throughout the area. European rules were imposed through the Treaty of Waitangi, which was signed without mutual understanding and interpretation. Religious groups and missionaries converted many Māori to Christianity. Turmoil followed as war raged between the Māori and Europeans, who seized large amounts of land through military conquest during this time (McClure, 2016). Trade with the rest of the world increased as the port of Auckland was made with reclaimed land. Gold in Thames and the timber from kauri trees was extracted and exported, leading to a time of prosperity and the start of the architecture that is visible in our city today (McClure, 2016). European society continued to undermine vital aspects of Māori life, moving them from their homelands and outlawing their native tongue. The Waitangi Tribunal, created in 1975, sought to right the wrongs of the original Treaty. Aotearoa welcomed in a new age (Stokes, 2002), reintroducing vernacular knowledge and te reo into our overtly western lifestyles.

Auckland 2050 Plan & Auckland Climate Change (Zero Carbon) Act

The Auckland 2050 Plan includes regeneration within Auckland's CBD, while the Auckland Climate Change Plan has a major focus on climate change with a goal of net zero emissions by 2050 (Auckland Council, 2020). The six aspects that make up the Auckland 2050 Plan are:

- Belonging and Participation
- Māori Identity and Wellbeing
- Homes and Places
- Transport and Access
- Environmental and Cultural Heritage
- Opportunity and Prosperity

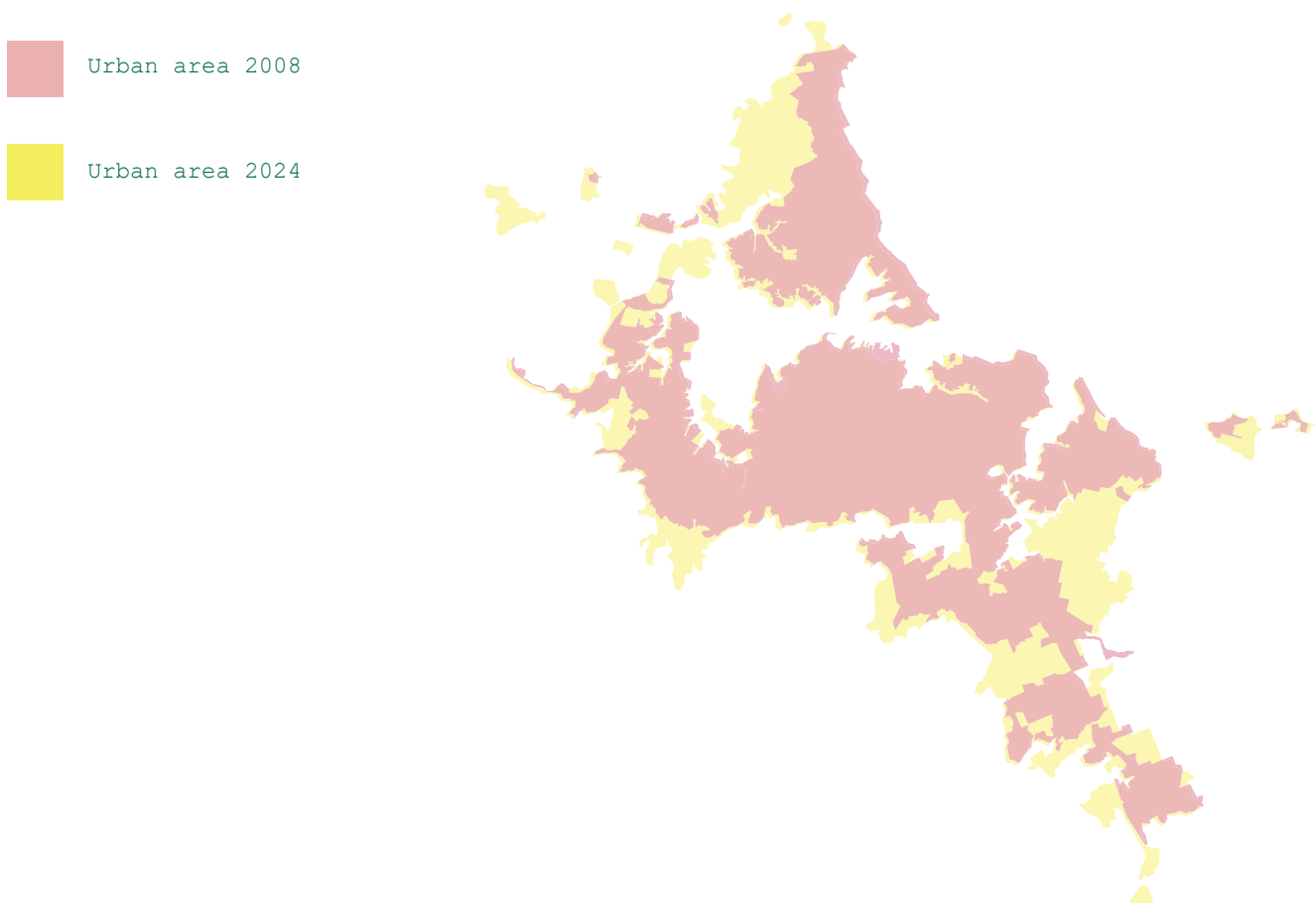
These factors are key for the regeneration of the CBD to improve public image and liveability, improving the experience of working, living and travelling through our city (Auckland Council, 2020). Environmental and cultural heritage are important going forward, to regenerate past ecosystems and create appropriate ecological zones in a connected society. Climate change responses focus on a few key areas: waste and water use reduction, an increase in canopy cover to 30% and the increase of carbon neutral transport, focusing on public transport options (Auckland Council, 2020).

Note. Left. Figure 6: Collage of Queen Street, current day

Urban Ngahere (Forest) Strategy

The Urban Ngahere Strategy looks to improve Auckland's urban forest spaces through connected whakapapa (genealogy) of plants and spaces (Auckland Council, 2019). Habitat fragmentation through urban sprawl creates added vulnerability to our depleted ecosystems, removing their ability to respond to external factors (Brake, Peart, 2023). The Ngahere strategy allows for the cultural significance of our native species through place making connection. For example, the red flowers of pōhutukawa position us on the Aotearoa's coasts through summer, linking space through these native trees. This strategy advocates for an increase in canopy cover across Auckland to one third of all spaces. This will be achieved through connecting native planting and large park spaces within the city with modern techniques such as green street corridors, vertical greenery systems and green roofs. This will not only help to improve the biodiversity of Auckland City but also create connections between pockets of greenery to restore wider ecosystems. The implementation of this strategy will also help to improve the sponginess of urban spaces, by breaking up large impervious spaces and allowing natural processes to reduce flooding potential through precipitation retention (Evans et al., 2024).

Auckland Urban Sprawl



Note. Figure 7: Auckland Urban Sprawl diagram.

City Centre Masterplan

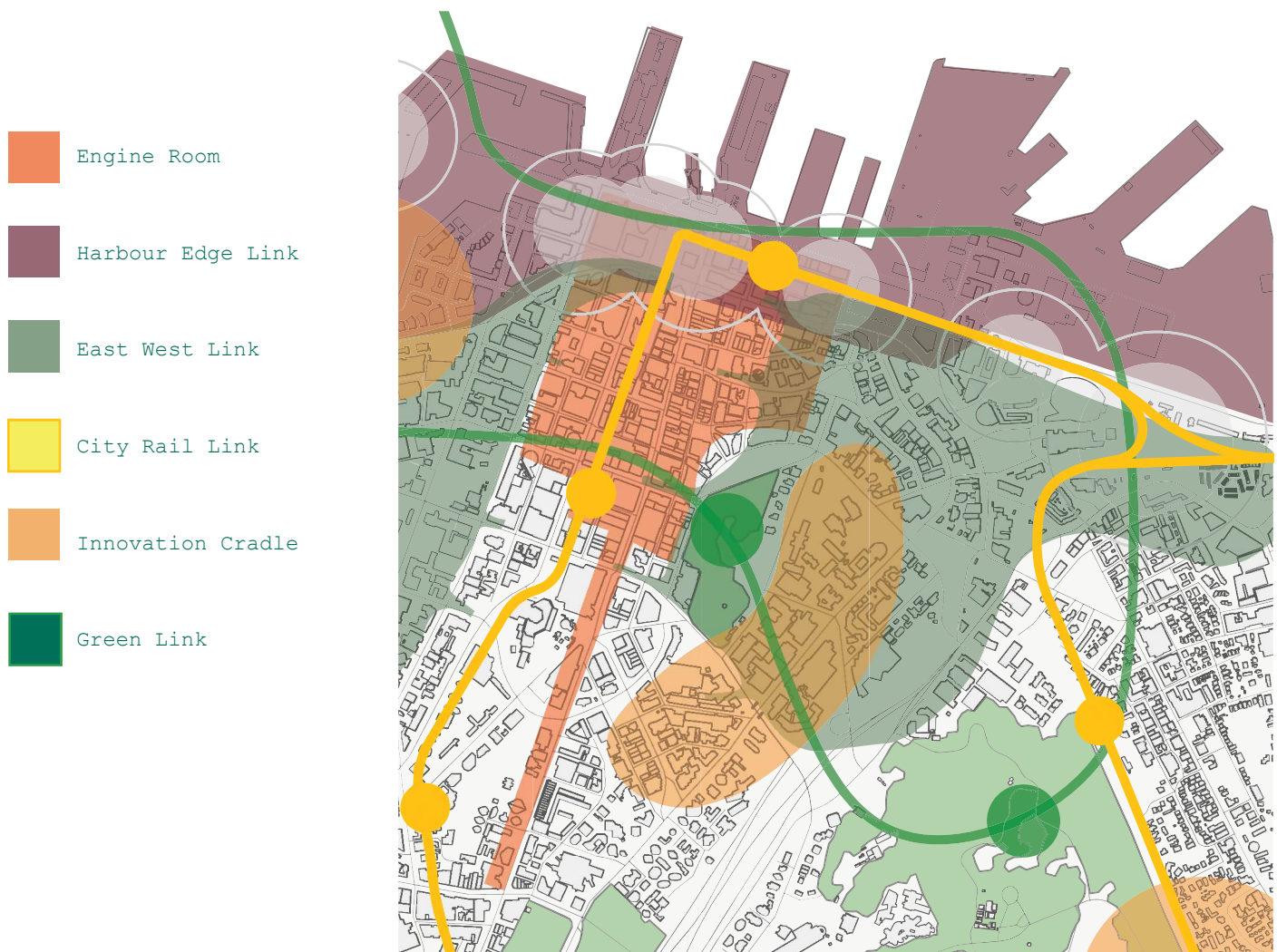
The City Centre Masterplan engages directly with the CBD, as one of the nine areas for growth. This plan sets the direction for growth of our city through Māori social wellbeing, quality urban spaces, improving prospects for our children and committing to improvements in public transport and green growth (Auckland Council, 2012). It focuses on liveability and public image of Auckland, with the aim to produce an attractive central city with high end public space which can support cultural, business and social activities. The plan works through several key features, two of which engage directly with Queen Street:

East West Stitch

The East West Stitch focuses on breaking down the existing barrier of the main roads cutting through the city, by adding greenery, walkways and cycle lanes to produce more accessible outdoor spaces and add movement through the city (Auckland Council, 2012). A green corridor effect connecting Victoria park to Albert Park connects these elements together.

The Engine Room

The Engine Room focuses on the CBD, which houses 60% of Auckland's top 200 businesses; this includes Queen Street as the main centre of attention (Auckland Council, 2012). The Engine Room focuses on the liveability of the street and supporting elements for workers engaging with this area of the city. Workers are provided amenity surrounding their jobs by creating a high-quality public realm, more walkable streets and improving public transport connections.



Note. Figure 8: City Centre Masterplan diagram

Map One: Wider Auckland 1:200,000

The initial site analysis investigated Auckland City, the largest city within New Zealand. This links to the theoretical framework through the Mauri Ora compass which is Auckland specific. Large cities face more flood problems due to impervious surfaces and an overall decrease in canopy cover. Auckland City is faced with urban sprawl and requires programmes to densify the CBD to create a liveable 15-minute city.

Mapping research was conducted into urban sprawl, watershed and flooding, environmental zoning, bird migratory patterns and existing green projects including the East West stitch and the North-West Wild link. Queen Street was chosen as a neighbourhood zone. Queen Street offers many opportunities with connections between local parks and the harbour, as well as links to current and proposed projects including the daylighting of the Waihorotiu stream. It is also viewed as one of the central streets for Auckland, holding historical and social importance. Strong design change along Queen Street has potential to make catalytic change, offering potential for the programme and design principles to be expanded across Auckland and then New Zealand.

Research of this thesis is based on the Auckland isthmus and surrounding native ecologies. Mapping shows a clear separation between the city, which covers the whole isthmus, and the surrounding ecologies. The CBD is flanked by the Hūnua Ranges in the east and the Waitākere Ranges in the west. The Manukau Harbour covers the southern side of the city while the Waitematā Harbour cuts in between the CBD and the North Shore. The predominant wind direction is south-westerly and the rainfall, persistent over the year, is highest through the winter months.

The Council has established green links for birds travelling around Auckland in response to the city's position. This includes the North-West link connecting the Waitākere Ranges to the islands in the harbour and specific planting through the suburbs to allow short jumps for birds across the city.

Urban sprawl is a large issue challenging Auckland City. Ecological features, such as the Waitākere Ranges and the harbours, limit the city's ability to spread in these directions. This then guides the city over land with more gentle typography, which was previously used for food production. The spread over land towards Pukekohe and Clevedon is removing arable land and intensifying a need for personal transport, as homeowners living in the suburbs travel into the city for work.

Note. Figure nine: Wider Auckland map.



Map Two: Auckland CBD 1:20,000

This map examines past ecologies, council plans and flooding from impervious surfaces which are important considerations of this project. This map also illustrates current issues across the area, including flooding through the watershed. We can see water flow down the valley in which Queen Street is situated. This flooding is a direct response to human changes to the space; with the paving over of the Waihorotiu stream, water now flows over the impervious asphalt surfaces, collecting on the artificially reclaimed land near the port.



- Native Bush
- Flood plains
- East West Stitch
- Past ecosystem extent

WF4- Endangered
Coastal broadleaf forest including Pōhutukawa, Pūriri and other broadleaf trees. Important forest for Kererū

SA1- No concern
Mangrove forest and scrubs which fills tidal estuaries. Increased sedimentation from human activities has reduced life in these systems. Many shore birds reside in these ecosystems.

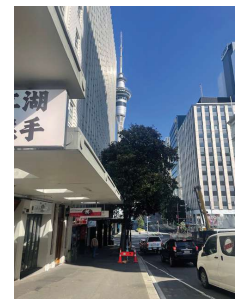
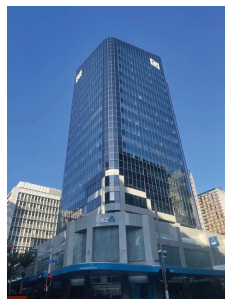
Wf7- Endangered Most of Auckland's CBD is built on existing WF& Pūriri broadleaf forest with Karaka, Kohekohe and Kahikatea once also present.

Wf11- Endangered
Another large component of Auckland's existing forests, dominated by Kauri and other slow growing podocarps.

Note. Figure 10: Map Two: Auckland CBD.

Map Three: Queen Street

The third map focuses on the experiential qualities of Queen Street, as well as building design, while focusing on future potential elements which can be incorporated into the existing built environment, marking out a site for project application and future growth along Queen St. Queen street currently has a mix of high-rise buildings and skyscrapers as well as low-rise buildings. This change in building typology offers opportunities to inhabit certain roofs, creating vertical movement and engagement across buildings. The landscape also has varied typography with Queen Street situated within a valley which was created by the Waihorotiu stream, now covered over. Sea level rise is important due to the city's coastal position. One metre of sea level rise is shown to account for fifty-year predictions, as well as the expected two-metre rise over one hundred years



Sea Level Rise 1:2,000



1m Sea level rise
50 years

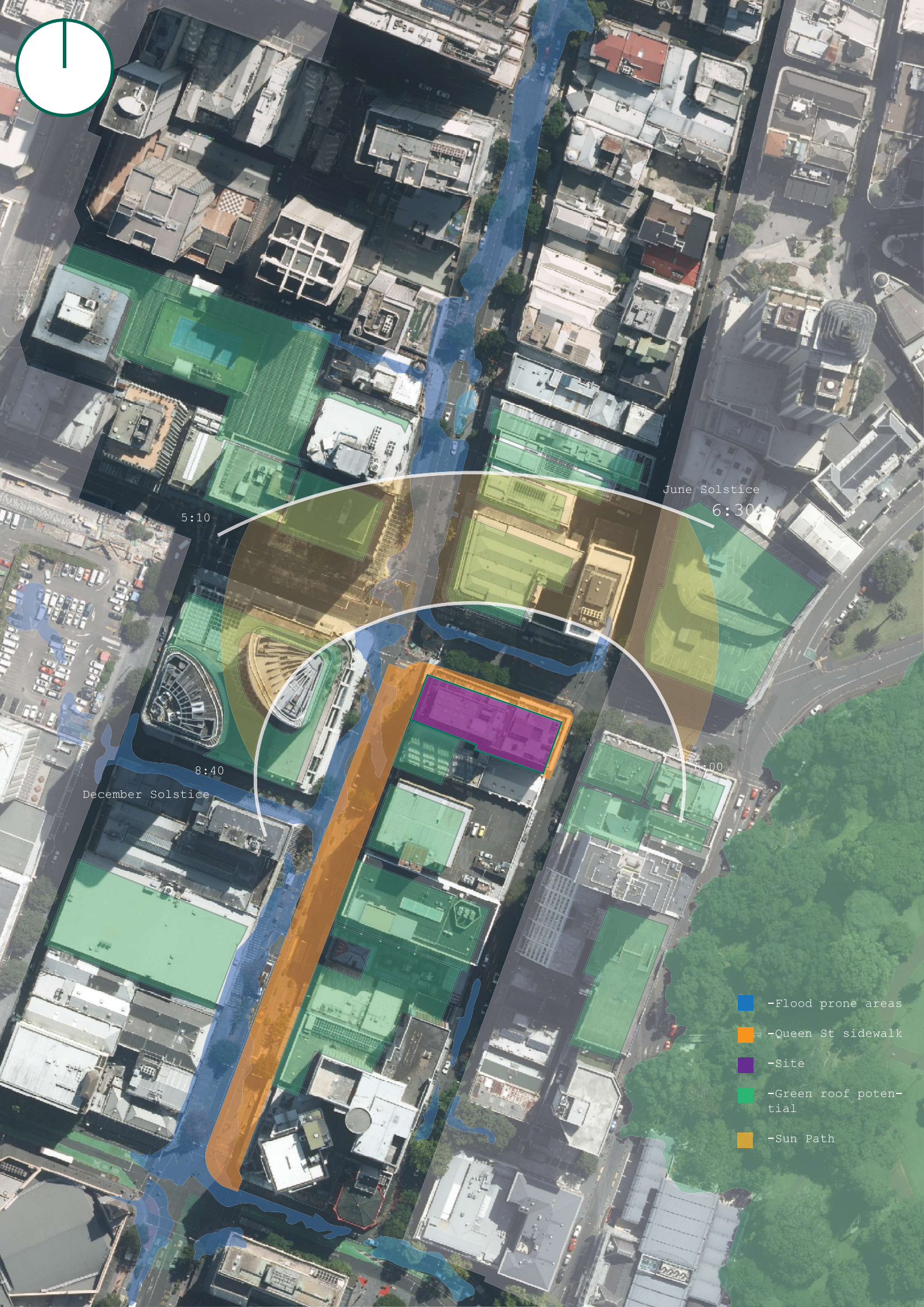


2m Sea level rise
100 years

Note. Figure 11: Photographs Auckland City. Own work

Figure 12: Diagram of Auckland CBD Sea Level Rise. Own work

Right. Figure 13: Queen Street Map. Own work



June Solstice

6:30

5:10

8:40

December Solstice

6:00

- Flood prone areas
- Queen St sidewalk
- Site
- Green roof potential
- Sun Path

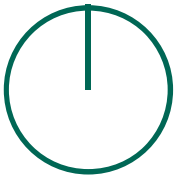
Map Four: Urban Canopy Plan

Map four acts as an aspirational image for the future of Auckland City. This map, set in 2125, is the potential for a complete intertwining of urban and natural environments. This has evolved from a catalytic project deployed along Queen Street one hundred years earlier.

Mapping conclusion

The mapping expressed flooding concerns and green zone systems throughout the Queen Street neighbourhood. The street runs along the top of a stream which has been hidden from public view, but the flooding zones show clearly the extent of the watershed entering the site from the north and flowing down towards the harbour. This overland flow then hits impervious reclaimed land, where it struggles to drain from. The site's ecological zoning has potential for the reintroduction of WF7 & WF11 ecologies. The Domain, Albert Park and Victoria Park all have connection to the site as well as the harbour, which would have connected directly to the stream but now sits adjacent, separated by reclaimed land, which makes up the port and business districts of the city. There is potential on site to maximise planting and reducing impervious surfaces to reduce flooding in this area, while making connections between existing green zones and providing habitats for native wildlife.

Note. right. Figure 14: Map Four: Urban Canopy Plan.



2025



2100

Cosmo Bloor

1km

Chapter Four: Nature in Cities



Note. Figure 15: Render of Saving Face, focusing on facade.

Sustainable design

Sustainable design is a requirement moving forward as our built environment makes up to 20% of our carbon emissions when considering materials, lifestyle and construction (Fisher, B. Vickers, B. 2018). To achieve net zero emissions by 2050, buildings need to be made from regenerative materials and have zero functional emissions. This can be met through sustainable and passive design systems and local renewable material supply. "The most sustainable building is the one that's already built" (Elefante, n.d.). This is why this project focuses on improving the sustainability of our current built environment through retrofit rather than rebuilding.

Sustainable design tools

With the increase in environmental sensitivity on a global scale many programs have been created to guide environmental building design. These programs allow projects to compare themselves against certain environmental or design factors to improve their ecological impact. The growth of these guides promotes and supports the application of regenerative design elements in new and retrofit builds. Some examples of these guides are below, including the LBC and Mauri Ora compass which were used in the methodologies section.

Living Building Challenge (LBC)

The Living Building Challenge created by Living Futures, is an evolving guideline on responsive and regenerative building design. It works towards buildings that are "not extracting, not harming, and not breaking" (Living Future, 2025.p.5). Now in its 7th iteration this code helps to shape and is shaped by the growing desire to design responsible architecture. The tool is designed to act as a philosophy to provide transformative thoughts as well as providing a framework for responsive design (International Living Future Institute, 2024). Projects which meet the highest requirements of the LBC will be rewarded and showcased for their ability to do so. The Core and Petal certifications allow projects to focus on selected LBC criteria. The depth of knowledge available with both customer and designer connection to this standard can work as an educational resource for both parties. This also provides the ability to compare policies and holistic design processes. Tennent Brown architects designed the Ngā Mokopuna building for Victoria University as the University's first LBC building, using the regenerative and sustainable aspects of the criteria to match their own initiative (Tennent Brown, 2024). The project meets LBC criteria while also responding to a traditional Māori idea of a living pā, by providing water, shelter and energy onsite no matter external conditions.

Passivhaus

Passivhaus is an international standard designed to improve the qualities of our houses to create net zero carbon builds and renovations through certification. The Passivhaus criteria aims to provide information to builders, architects and clients to promote sustainable high-quality design. These buildings improve user occupation by providing appropriate interior climates reducing the need for mechanical conditioning devices. They produce six areas for designs to respond to: social and human comforts alongside wellness, climate mitigation and high-quality builds with overall financial benefits.

Mauri Ora Compass

The Mauri Ora Compass is a holistic urban design tool which is Auckland specific. The compass is a transformative action tool which aims to activate and enable social, cultural and ecological wellbeing (Dombroski et al., 2022). The compass is a collective of six concepts which make up Mauri Ora, which will act as design guidelines. This compass responds directly to an Aotearoa context, providing areas of design important to our society and responding to a Māori way of life. This compass emphasises community connections by guiding us to consider how the building is engaged with and how it responds to community and ecological factors surrounding it.

Carbon Credit System

The carbon credit system is a financial incentive programme to promote the capture of CO₂, through the buying and selling of carbon credits. One carbon credit is equivalent to one tonne of CO₂. Businesses that cannot make their work carbon neutral may purchase carbon credits, for example, to offset the carbon footprint of air travel. These credits are created by planting projects, with the owners of these projects receiving money for their sequestered CO₂. This programme will be instrumental in meeting the 2050 CO₂ plan which requires businesses to be carbon neutral by 2050.

Precedent Studies

Singapore is the leading city for high-rise greenery developments, boasting 182 projects in 2018. The architectural fabric has been successfully modelled into a living city creating buildings which are more responsive to the climate of the tropics (Wong et al., 2018). With a global change in climate conditions other cities are now looking at Singapore as a precedent for the integration of ecologies into skyscrapers and high-density suburbs. The want for these green eco-skyscrapers is also led by a consumer desire for companies to provide green systems, backed by government requirements to reduce their carbon footprint. These factors are leading to an increased desirability for green architectural solutions. Two exemplars of such projects were researched, Oasia Hotel in Singapore and One Central Park in Sydney, which both use vertical planting to provide comfortable habitats within the building. These buildings use foliage as a new architectural language, joining built and natural environments. The third exemplar, the Innovation Factory 2.0, was researched for its modern mass timber construction, creating a shell for the interior spaces and allowing modular multi-modal areas within. These three examples were chosen to understand modern solutions for the built environment, from full ecological inclusion to minimalist modern design. These examples hit sustainability factors through different means, providing appropriate responses and allowing modern architecture to respond to climate change.

Oasia Hotel

Architect: WOHA Studios

Client: Far East Organization

Luxury Hotel

Downtown Singapore

27 Storeys, 314 Rooms

Oasia Hotel is a standout hotel in downtown Singapore, building on the green skyscraper imagery the city is known for. The hotel maximises greenspace by the creation of vertical gardens which allow users safe access to greenspace which is uncommon on the ground plane of the city.

Project Successfulness

The hotel uses a second skin of planting to create appropriate shading and climate control. This skin wrapped around the building creates a calm and temperate zone for users of the space. The building performs well on a social scale with various amenities and sky gardens available for populating, providing different inhabitable spaces for people. This maximizes on the limited building footprint by extending these spaces over the height of the building. The hotel is constructed with a red aluminium second skin, providing space for various species of tropical climbing plants. The plants create architectural substance while also providing shading and biodiversity within the city (ArchDaily, 2025). Breaks in this skin allow for vertical habitable greenspaces for human use, providing amenity and increasing valuable space for activities. These spaces also accommodate plants which cannot grow on a vertical surface, promoting growth of shrubbery and small trees on the tower, increasing the biodiversity and providing habitat for birds.

The tower draws connections to Ken Yeang's work, through vertical greenery and the change of skyscraper language from sleek and modern to hairy and engaging imagery. This breaks up the compartmentalized norm of poor spatial continuity to provide modular and expressive design (Yeang & Powell, 2019). The hotel works off Yeang's philosophy of multiplying the potential greenspace of the footprint by extruding it skyward, providing 1110% greenspace compared to the building footprint (WOHA, n.d.). With the cohesive design language of urban spaces intertwined with nature, Singapore can step away from architecture as form making and allow the design of human-centred ecologies (Wong et al., 2018)

Area for Improvement

The hotel is effective at using planting to provide human comforts and to create strong architectural imagery for the project. Greater connection to existing or past ecosystems of the site would allow it to provide more restorative elements and confirm its identity as an eco-skyscraper.



Note. Figures 16, 16.2, 16.3: Photographs of Oasia Hotel.WOHA.

One Central Park

Architect: Oculus

Client: Far East Organization

Mixed-Use Skyscraper

Chippindale, Sydney

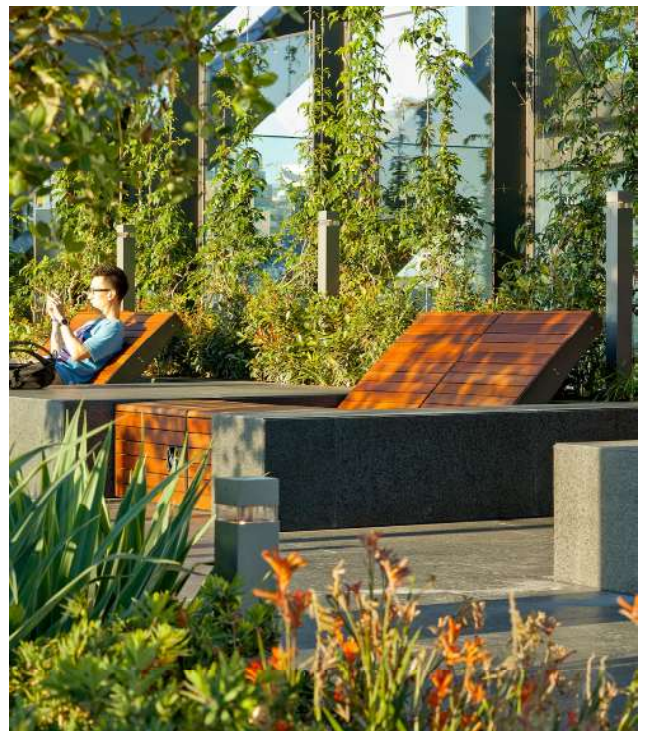
38 Storeys, 623 Apartments, 6 Storeys Retail Spaces

Project Successfulness

One Central Park, designed by Oculus, uses a responsive green facade designed using botanist Dr. Patrick Blanc's hydroponic system (Greenroofs, n.d.). Internal green spaces create a building which acts as the start of Central Park redevelopment. The project is successful for its strong approach to eco-design, achieving a five-star green rating through regenerative processes such as wastewater irrigation and the inclusion of ecologies throughout the building. Green Star is an Australian voluntary accreditation focused on cooling of buildings in hot environments (Roderick et al., 2009). Oculus was able to create effective garden areas through analysis of the facade zones to work out optimal plants for the microclimate when considering effects of light and wind (Oculus, n.d.). Throughout the building a continuous relationship is held between built and natural environments, with all spaces including appropriate vegetation to improve the comfort of the space. The perceived experience of this space is quiet and calming, capturing the Oculus experience. One Central Park combines the amenities of urban living and retail spaces while using natural systems to work for human and non-human communities.

Area for Improvement

As this project was made as the start of the redevelopment of the Central Park area, the infrastructure to support the building was not provided prior. Because of this, the project uses four floors for carparking, which would hopefully be reduced as civil amenity and public transport becomes prevalent in the area. The cantilevered heliostat which is designed to reflect light into the atrium areas has also caused several issues through excessive solar gain, and a more appropriate solution could be designed here to limit further issues. This building provides a step towards ecological integration into our built environment, especially considering appropriate exterior and interior planting. However, the form of the building is traditional and doesn't allow for the planting to inform the design, leaving scope for architectural design which responds to planting.



Note. Figures 17, 17.1, 17.2: Photographs of One Central Park. Oculus.

Innovation Factory 2.0

Architect: Wächter + Wächter Architects

Client: Stadtsiedlung Heilbronn GmbH

2024

Mixed-Use Offices & Workspaces for Startup Companies

Heilbronn, Germany

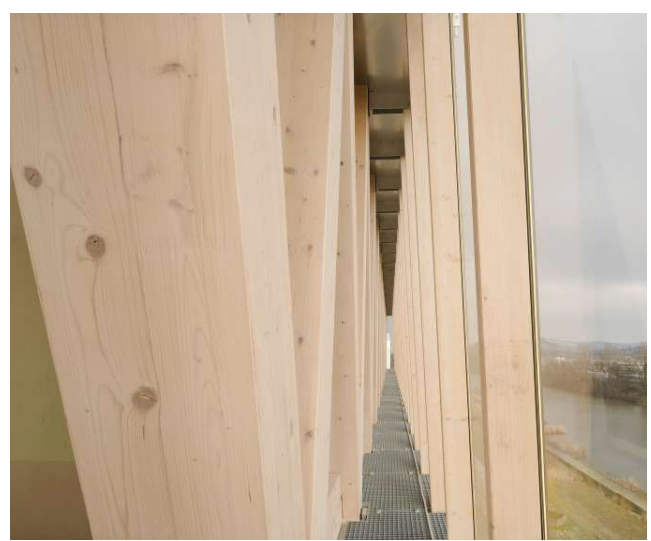
5 Storeys

Project Successfulness

Mass timber construction is experiencing a major uprise across the globe (Schoof, 2018) with exposed wooden beams becoming sought after for aesthetic, structural and carbon footprint reduction needs. The Innovation Factory in Heilbronn is an example of a mass timber building, designed to counteract our current perceptions of factories by creating a new sustainable face for them (Kaltenbach, 2024). The timber skeleton works with transparent cladding allowing spacious interior volumes filled with natural light and connection and interaction through different levels of diffused spaces (Climalevel, n.d.). The prefabricated wooden trusses slot together creating mechanical bonds, reducing the need for steel fasteners, adding to the clean wooden aesthetic and further reducing the building's carbon footprint (Kaltenbach, 2024). The double skin facade of this building provides a shell focused on longevity, so that interior elements may be changed and altered to meet the requirements of its tenants. This enables short- and long-term solutions to get companies up and running. The stripped-back interior aesthetic helps to confirm this, providing functionality as the key driving force behind the design.

Area for Improvement

The Innovation Factory 2.0 provides ecological design through mass timber design, providing a sealed unit which provides carbon zero building but provides no regeneration to surrounding ecologies. Including regenerative design elements, alongside the current building programme, would improve the responsiveness of this project.



Note. Figures 21, 21.1, 21.2: Photos of Innovation Factory 2.0. Wächter + Wächter Architects.

Conclusion

These precedents act to demonstrate adaptive responses happening across the world to produce site-specific green buildings, paving the way for the future of urban architecture. Through understanding relationship to site, past ecologies and future impacts, the designers can produce responsive design. From appropriate biophilic design to ensure human comforts and natural passive climate control systems, to producing carbon zero buildings which can be easily adapted to the needs of its users.

There is scope between these three designs, however, for a new and more holistic design approach, where ecological systems are not merely added on to the exterior of the project but define form and spaces. This will allow natural processes to generate design and produce more responsive architecture. The tectonic language of the Innovation Factory 2.0 with mass timber and a reduction in metal fastenings shows new ways to incorporate more responsible materials into projects. A merger of this thought process with the vertical greenspaces found in both tower projects would allow a new generation of eco skyscraper to emerge, providing a true change to our approach to green infrastructure and allowing responsive design. There is still scope for ecological designs to progress from these projects, either as epiphytic structures which support current buildings or a new approach to vertical density through complete ecological and urban cohesion.

Connection to Case Studies



Oasia Hotel

- Ecological regeneration
- Social spaces
- Vertical greenspaces
- Solar shading
- Passive design strategies
- Green facades
- Multiply footprint greenspace

Limited past ecological connection



One Central Park

- Green facades
- Ecosystem services
- Vertical greenspaces
- Amenity tied into living spaces

- Green star rating
- Car centered transport
- New build



Innovation Factory 2.0

- Mass Timber
- Wooden joints
- Flexible modular spaces
- Natural lighting

Elements to connect with

- Green facades
- Ecosystem services
- Vertical greenspaces
- Amenity tied into living spaces
- Ecological regeneration
- Social spaces
- Vertical greenspaces
- Solar shading
- Passive design strategies
- Mass Timber
- Wooden joints
- Flexible modular spaces
- Natural lighting
- Multiply footprint greenspace

Elements to work on

- Connection to past ecologies
- LBC
- Public transport & walkable cities
- Building retrofit to minimise carbon footprint

<https://www.archdaily.com/551329/one-central-park-jean-nouvel-patrick-blanc>

<https://arquitecturaviva.com/works/centro-de-innovacion-en-heilbronn>

Note. Figure 22: Case Studies Diagram.

Chapter Five: Dissolving of Facades

Concept design

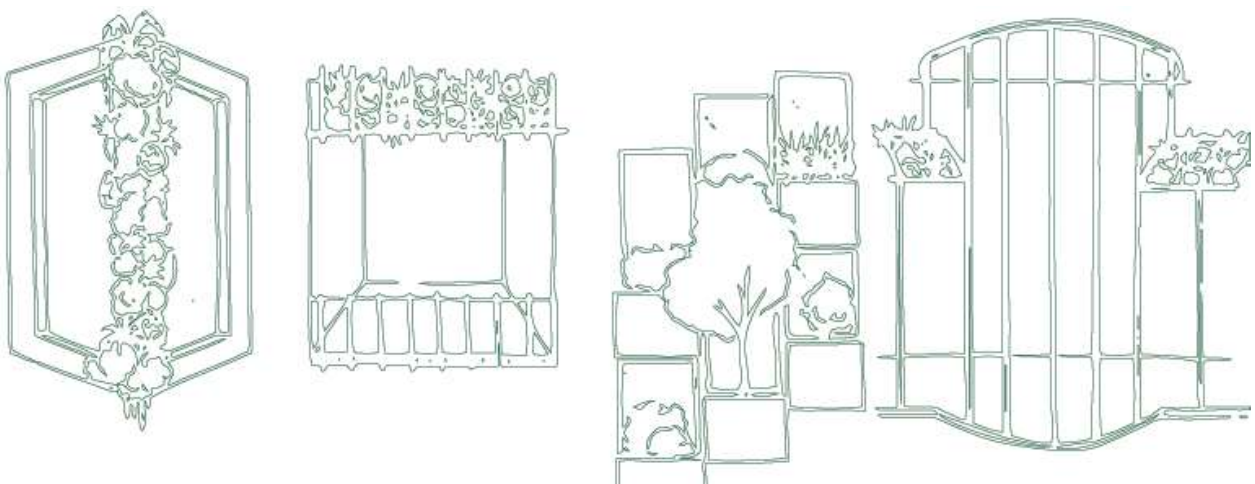
The design has developed through a mixed method, practice-led approach. This iterative process developed from sketching and collaging concepts through to modelling and finally CAD designs. Each design phase was concluded with a design crit where tutors, industry experts and students provided new insight which aided and informed the design. These design process focused on the design as a kit of parts designed to provide a scope of benefits for shareholders. These benefits will include

Vertical greening, a process of applying ecosystems vertically across our built environment to provide natural cooling and filtration of air through plants natural processes, improving health metrics of communities and reducing UHI effect. This process of reintroducing ecosystems increases the potential resilience of the environment by increasing volume and complexity within areas stripped of vegetation.

Second skin application as a new facade typology, which provides passive design strategies through shading and thermal buffer zones. This second skin will be tested and developed to provide inhabitable vertical spaces across building layers which will support a new vertical streetscape for community interactions.

Improved liveability of CBD built environment through passive design strategies, increased social connections, crime prevention through Crime Prevention through Environmental Design (CPTED) principles. Inclusion of 15minute city principles.

Increased health benefits through airflow management, insulation of living spaces. Saving Face will also provide protection in case of seismic activity and ensure safe and clear exits from existing buildings.



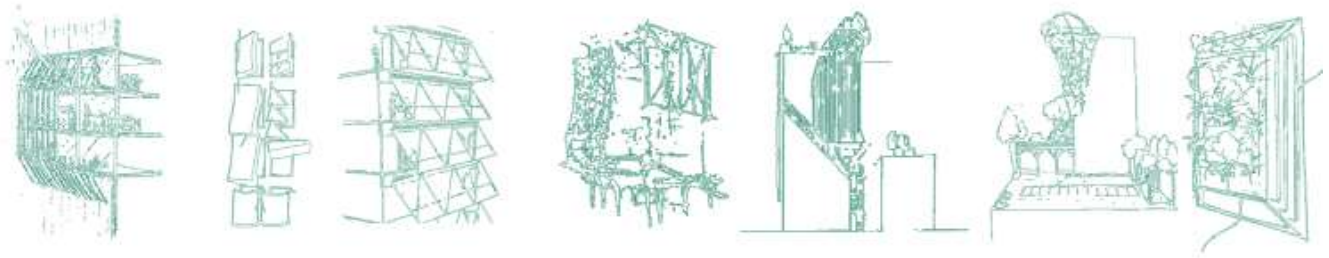
Note. Figure 20: Initial facade concept designs focusing on inclusion of greenery on vertical faces.

Early concept design focused on the application of a second skin, designed to break the glazed impervious facades of current high-rise buildings. These skins could be used to create solar shading, incorporate passive design strategies and create human connections across the whole vertical face of these buildings. Through an initial tectonic and form-based approach concept design, developed an idea of an attached entity clinging to the current built environment. These ideas were experimented with through sketching and modelling, supported by research into current strategies. Experimenting with external elements built out from the building and negative internal spaces, allowed the development of new facade opportunities and styles across a conventional building. This addition and subtraction of spaces would affect the current floor plan and spaces that may already be occupied. It was important in a residential space to ensure the project provided appropriate desirable amenity to residents.



In this phase of design, the idea of parametric facade designs was incorporated into the design as shading opportunities, taking ideas of adaptive shading systems from Doris Sung (2016) with her thermobimetal shading. The work progressed away from this to create, rather than reduce, connectivity through these skins. The scope of design was focused on a future environment with harsher environmental conditions than current conditions. With this work and later tectonic design, there were also ideas which utilised new exterior spaces to promote this vertical habitation. These exterior spaces could create maximum connectivity through multiple strategies.

Note. Figure 21: Concept testing of shading options applied on a building.



The application of vertical greenery was included in concept work taking inspiration from the work of Ken Yeang. The idea of recreating a connection to land was also tested here, with the inclusion of existing and historical ecosystems vertically up the building. Designing for vertical connectivity guided ramps and elevated green spaces in which ecologies could flourish, and communities could directly engage with. These ramp designs included additions to the outside of the building, as well as removing existing building parts to incorporate these ecologies to provide shelter to these plants as they grow. Green roofs were also considered, connected directly to the ground around the building or travelling horizontally across multiple roofs by connected bridges. This planting then became a way in which to also provide solar shading, insulation and improved liveability of these buildings in urban environments which do not have access to these features currently.



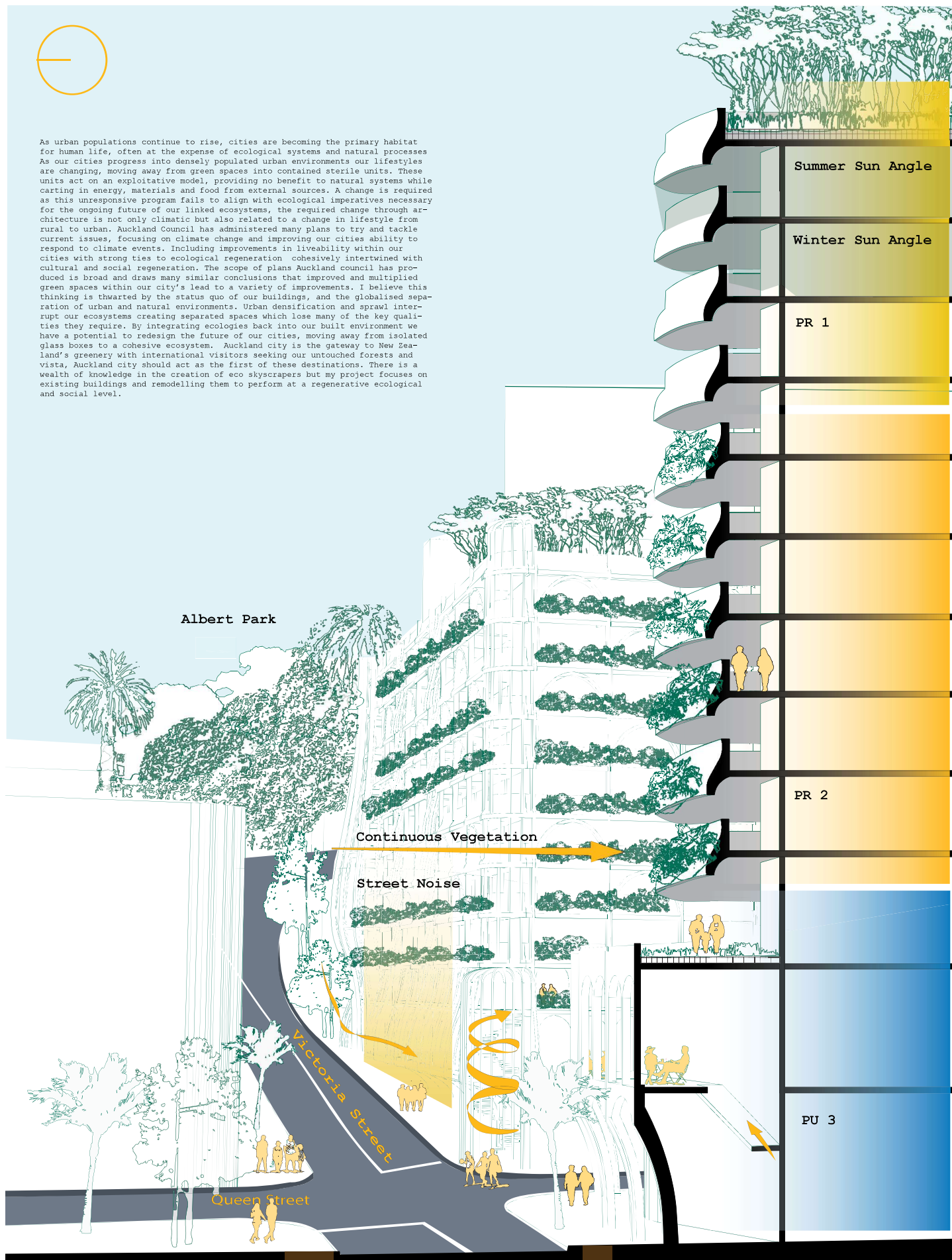
Different facade applications are appropriate for different building orientations, relating to environmental effects and to program. The east facade can focus on morning inhabitation and have programs like cafes, yoga and other morning activities. Western facades can respond to evening activities, including bars, hangout areas or classes. The northern facade must respond most directly to the sun, blocking harsh summer rays and allowing in warming winter rays while reducing urban heat island effect; opportunities for solar energy production are greatest here. The southern facade requires minimal shading but can be used to grow certain varieties of plants which require shade, while also having high insulation.

Note. Figure 22: Initial facade concept designs focusing on inclusion of greenery on vertical faces.

Figure 23: Initial shading options focused on inhabitability of north, south, east and west options.



As urban populations continue to rise, cities are becoming the primary habitat for human life, often at the expense of ecological systems and natural processes. As our cities progress into densely populated urban environments our lifestyles are changing, moving away from green spaces into contained sterile units. These units act on an exploitative model, providing no benefit to natural systems while carting in energy, materials and food from external sources. A change is required as this unresponsive program fails to align with ecological imperatives necessary for the ongoing future of our linked ecosystems, the required change through architecture is not only climatic but also related to a change in lifestyle from rural to urban. Auckland Council has administered many plans to try and tackle current issues, focusing on climate change and improving our cities ability to respond to climate events. Including improvements in liveability within our cities with strong ties to ecological regeneration cohesively intertwined with cultural and social regeneration. The scope of plans Auckland council has produced is broad and draws many similar conclusions that improved and multiplied green spaces within our city's lead to a variety of improvements. I believe this thinking is thwarted by the status quo of our buildings, and the globalised separation of urban and natural environments. Urban densification and sprawl interrupt our ecosystems creating separated spaces which lose many of the key qualities they require. By integrating ecologies back into our built environment we have a potential to redesign the future of our cities, moving away from isolated glass boxes to a cohesive ecosystem. Auckland city is the gateway to New Zealand's greenery with international visitors seeking our untouched forests and vista, Auckland city should act as the first of these destinations. There is a wealth of knowledge in the creation of eco skyscrapers but my project focuses on existing buildings and remodelling them to perform at a regenerative ecological and social level.



Note. Figure 24: Concept programme/ hero image.

Emergent layer

- Human use
- Vertical greenspaces and sportsgrounds
- Solar energy generation
- Reduction in Urban Heat Island effect

Canopy Layer

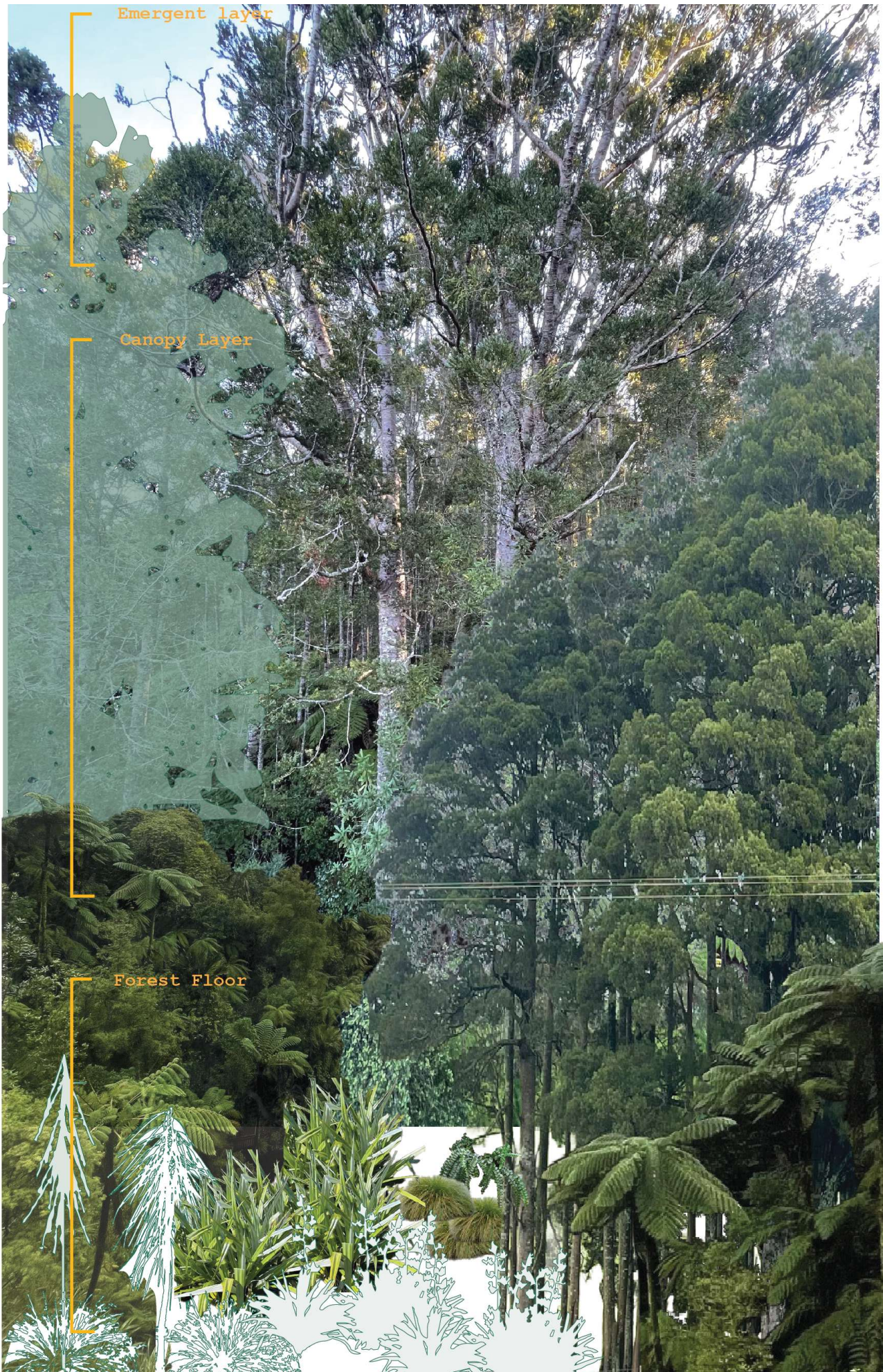
- Human connections
- Vertical ngahere
- Bird habitats
- Air filtration
- Reduction in noise pollution
- New image of Queen St
- Reduction in Urban Heat Island effect
- Passive design strategies

Forest Floor

- Cafes
- Shopping
- Connection to Street on multiple layers
- Human connection
- Pest control
- Flood mitigation
- Ecological regeneration
- Reduction in Urban Heat Island effect

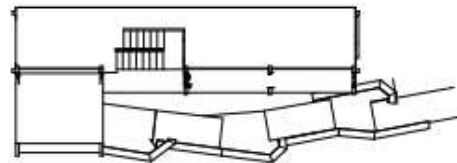
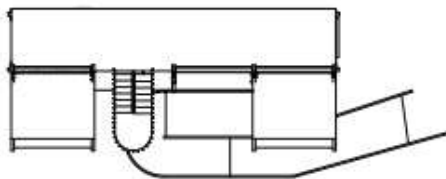
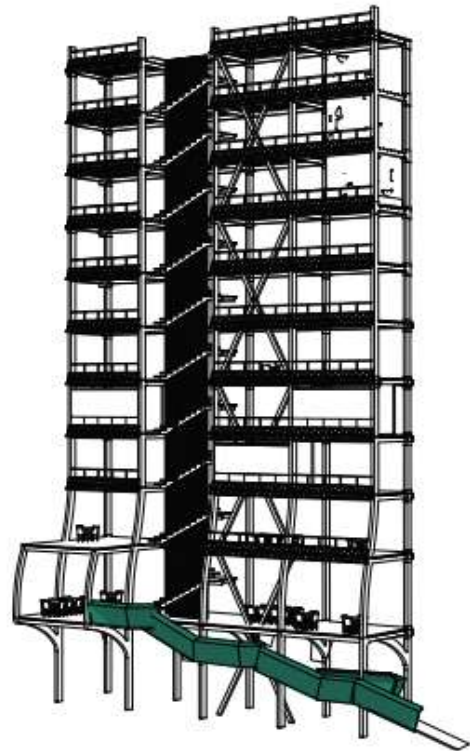
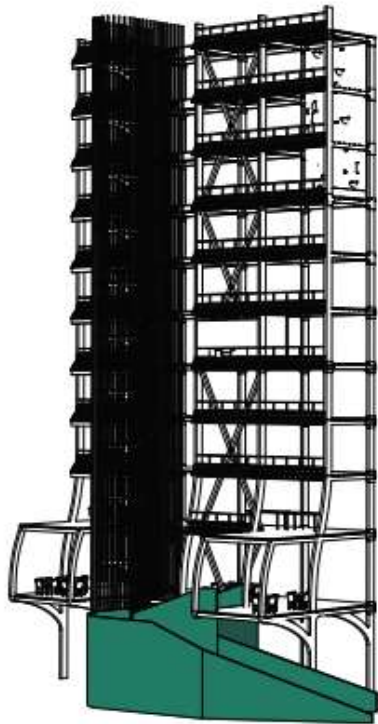


Note. Figure 25: Urban canopy layers landing on building.



Note. Figure 26: Forest canopy layers

Kit of Parts



Cafe & Retail spaces

- two main floors
- easy accessibility from street
- Cafes
- Restaurants
- Eco-conscious retail



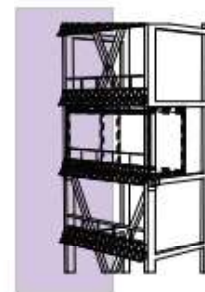
cl Climbing module

- B-Bookable cubicles
- W-WIFI, charging stations, toilets provided
- G-Glass framed for noise control



Market module

- Bookable spaces
- Furniture provided
- Strict hours for safety
- Access to building elevator



o Office module

- B-Bookable cubicles
- W-WIFI, charging stations, toilets provided
- G-Glass framed for noise control



Yoga spaces

- Bookable spaces
- Canopy layer connection



Movement area

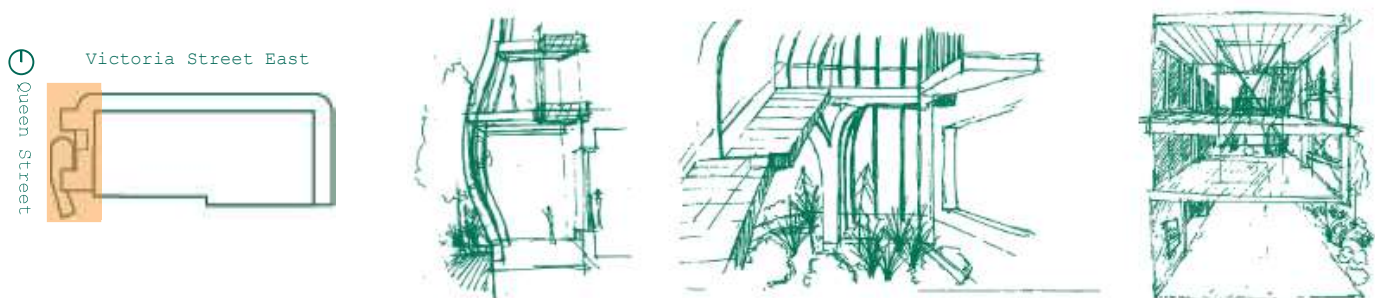
- Cr-Creates street to roof connection
- CPTED requirements
- Supported by internal lifts

Note. Figure 27: Kit of parts diagram

Drawing on the structural principles of a forest, the facade system utilises the different canopy layers to inform the projects layers. The three layers are the forest floor, canopy and emergent layers. The facade system uses this layering principle, as the forest does with the canopy layers, to provide different attributes at each layer. These three layers provide different experiential qualities and are supported by different plant varieties as seen in diagram 59. The forest floor layer includes retail and hospitality spaces, acting as a community hub of the project. Low shrubbery allows visibility and connections, protected by the canopy layers above. The canopy layer focuses on residential spaces, aiding liveability through canopy growth and protection, intermingling human and non-human communities. The emergent layer focuses on protection from harsh elements and human amenity through inhabitable rooftop greenspaces.

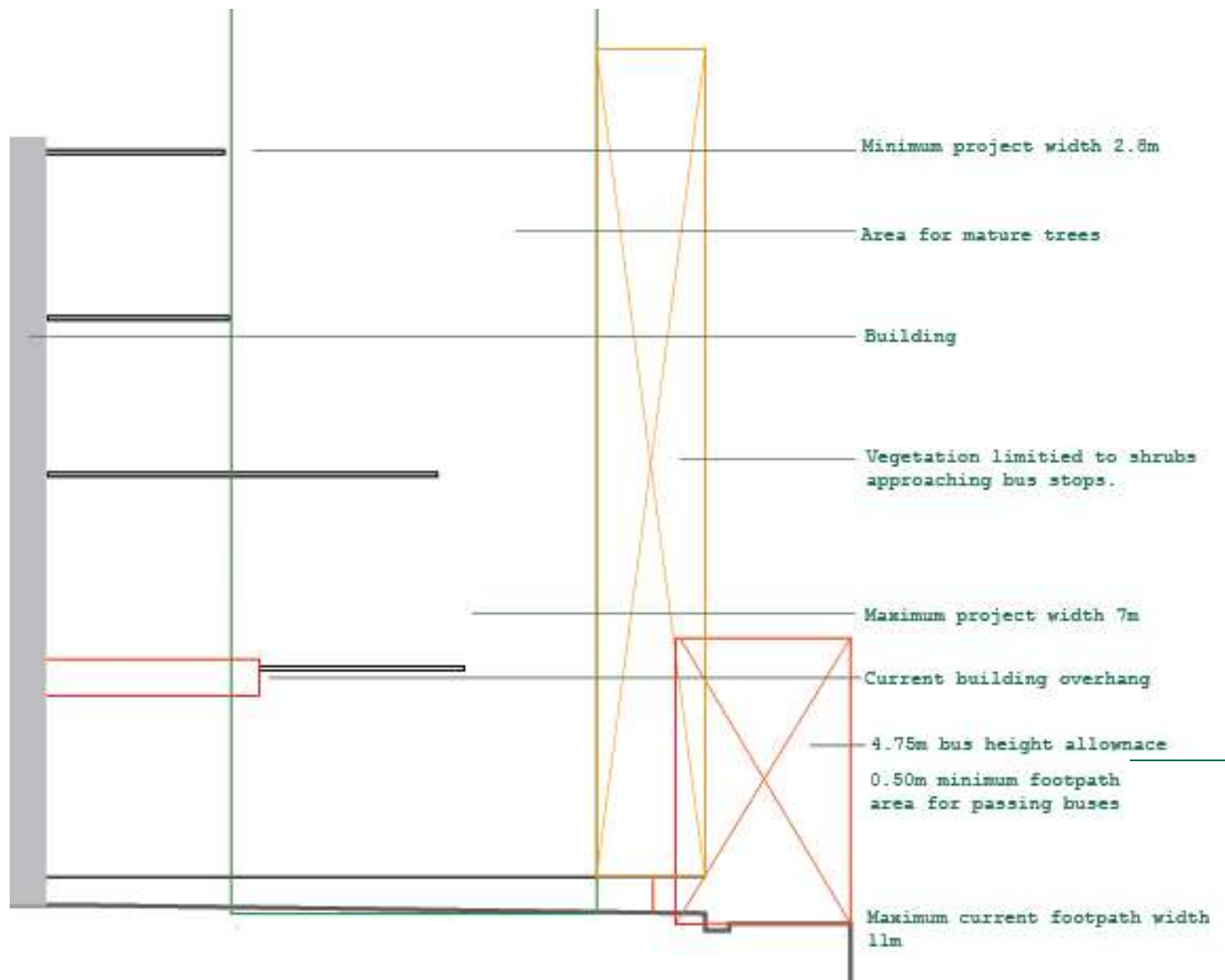
The vertical wooden elements of the project continue the interpretation of a man-made forest system by providing a strong frame able to support ecologies and communities, replicating the large giants of our forest which provide environment for other ecologies. The buttress design is derived from trees located in swampy grounds, providing support to the project through a widening at the base. This form supports deeper areas within the forest floor layer, closer to the footpath, allowing more space for activities and cafes. It also accommodates wider ramps to easily communicate access in and out of the spaces. Through the change in depth of the project, around the buttresses, the project starts to develop zoning of areas, allowing easy interpretation of accessibility through space.

Due to the project's nature, understanding the depth it extends over footpaths and resulting impacts was vital. The limited space available here meant the project footprint is quite narrow. This worked well on the higher levels as optimum solar shading requires overhang to block high summer sun angles but encourages solar gain with lower winter sun angles. Comparatively, very deep deck spaces would impede this winter gain. On the lower floors of the projects space is more important to allow easy movement through and allow a flow out from retail spaces and cafes onto the project. Diagram 29 demonstrates criteria that influenced the project depth.



Note. Figure 28: Drawings testing western facades and ramps.

Limiting factors on project depth over footpath.

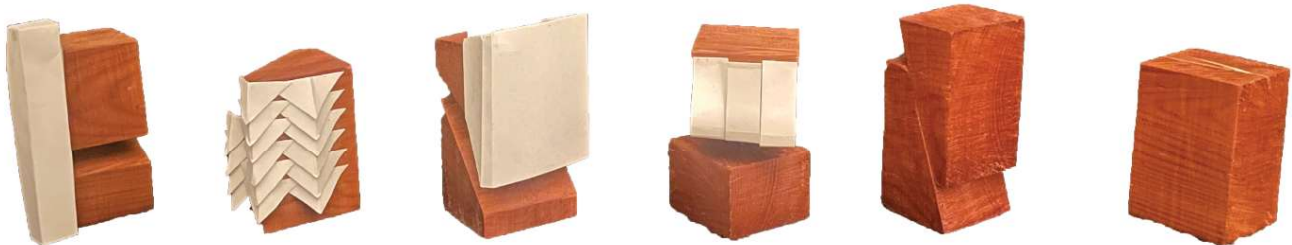


Concept design allowed the generation of ideas around a new vertical streetscape, providing benefits for both human and more than human communities. The testing of these ideas linked directly to research in the literature review, responding to the poor connections between our built and natural environments. Design work through model making and drawing tested current buildings and developed ways in which to make current glazed facades permeable to create human connections across our buildings. This testing of design iterations, although starting with intentions to apply external shading devices, developed with a focus on vertical greenery as the shading device. By applying ecologies in this manner, the project could respond to environmental factors while providing shading potential as one of several passive design strategies. Further development of this design could focus on a new design language as a guide for CBD regeneration. By considering the project as a toolkit we would allow key stakeholders such as council, to provide a kit of parts that building owners could apply to their buildings (See diagram's 43 & 45). As these projects grow, they would link together and form a new vertical streetscape focusing on connections and providing a close-knit community within the city. This would also allow a deeper complexity of ecosystem spreading along the streetscape, improving ecological regeneration and providing new habitats for native birds.

Note. Figure 29: Limiting factors on project depth over footpath.

Model making

Model making was used throughout the project as a medium to enable design-led research. Allen (2020) remarks that an architect's imagination is located in a space of imagination between 2d drawings, models have the ability to provide a tangible quality while still allowing a degree of imagination making them a powerful design tool. Model making can be used as an exploration tool (Surwade et al., 2023) and was used here to conceptualise and evaluate design iterations. These models include concept, programme and form explorations and were valuable to qualify spatial relationships. This was important to understand space, as the limited area to grow out to the streetscape made the project physical space narrow. To enable more depth the original building facade was treated as a permeable layer which people could easily interact through with the project, reaching into these spaces and directly engaging with them.



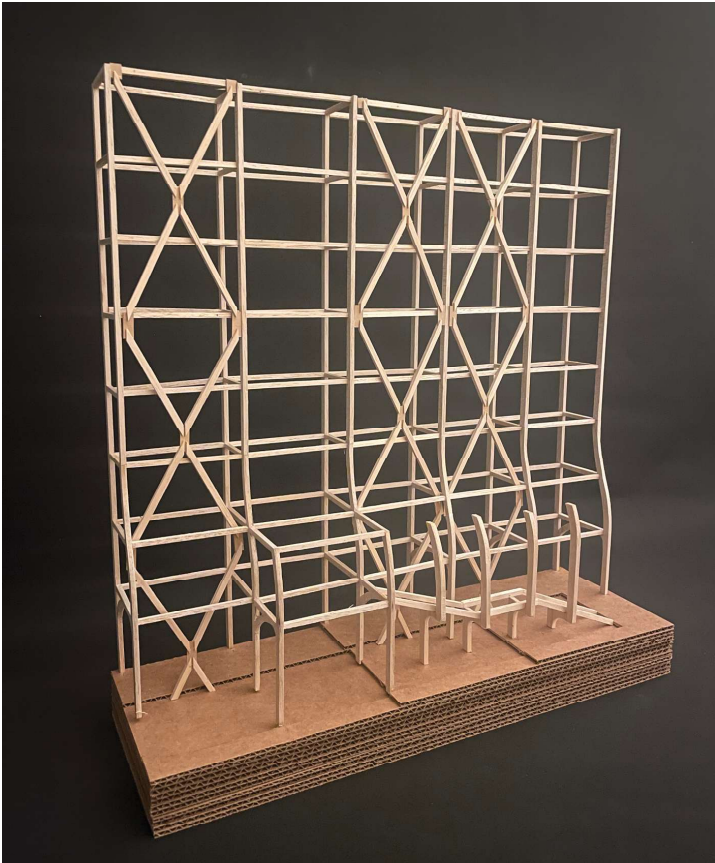
Breaking of the block was a tectonic study designed to directly respond to the typical rectangular blocks which make up many skyscrapers and highrise buildings in Auckland's CBD. As found in the research, sealed boxes reduce human interactions. By splitting these blocks up and reattaching them before adding additions to the outsides, this study questions the form of highrise buildings. Angular spaces open opportunities for ecologies to grow the building and create new exterior spaces for human and non-human communities to enjoy.

Note. Figure 30: Breaking of the Block models.



Note. Figure 31: Initial building model.

Figure 32: Initial solar shading options testing for aesthetic values.



Note. Figure 33 Balsa model testing base form

Figure 34: Seismic isolator joint

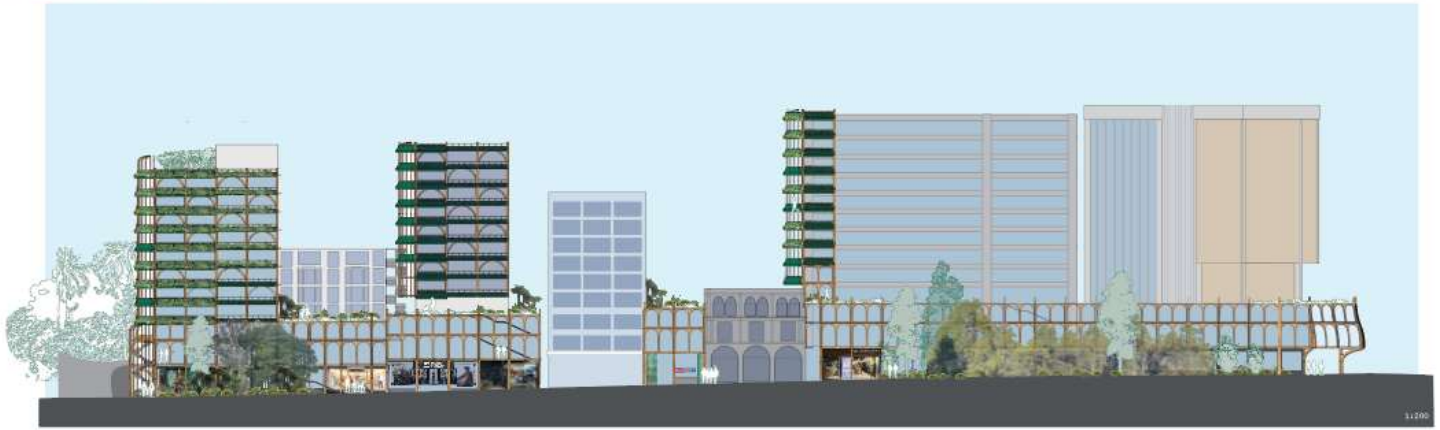
Figure 35: Detailed design model of first four layers

This toolkit would provide building owners the ability to select elements which provide amenities for their specific building users and then populate these elements onto their buildings. For example, a building owner who wished to provide more retail spaces might use the toolkit to provide the first three floors of the project to allow vertical connection to the street and triple the amount of retail space available. Another user with no street access but a northern facade might choose to use the project to provide maximum solar shading, reducing wear to the existing facade and reducing their dependency on expensive air-conditioning systems. This would also provide deck space to their residents, improving the value of the properties to the building owner and tenants. This toolkit engages with the methodologies through the futurity and quality-built environment aspects, by considering and exploring carbon neutral retrofits to existing buildings in an Auckland context.

The application of a toolkit also allows for a wide variety of human scale amenity across the project. Selecting the right elements here were important to engage directly with users and inhabitants. The elements selected aim to support daily life and offer community scale solutions to daily needs. In this instance, providing meeting spaces was a great way for people to engage with the space, creating a calm and pleasant experience which differs from the professional and serious nature of an office room. These programme amenities are designed to provide a new experience option rather than replace existing systems, acting in line with the project as a support element. In diagrams 68 and 69 several applications are shown.

Through designing this toolkit, several issues arose, brought up in presentations and through tutor feedback. The main issues came around concerning users and how this project would become feasible. This led to the creation of the clients and users' diagram (65), outlining what parties would be involved with planning and supplying the project and how this would come about. Key elements, involving financial support through carbon and biodiversity credits and immediate social gain, were key here to highlight how this project could be produced.

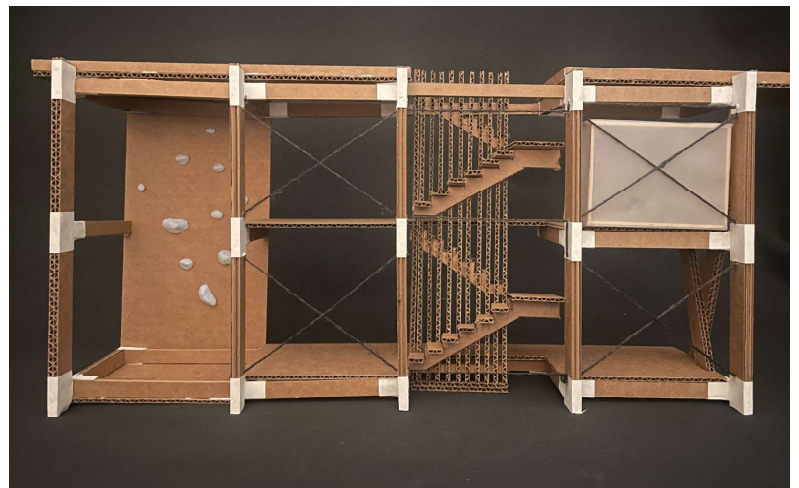
Elevation 0-25 Years



Elevation 25-100 Years



Through two timeline images, the growth of the project was explored, showing the relationship between built and natural environments as they grow together. Queen Street becomes a vertical forest system allowing ecologies to grow vertically while allowing social connections across buildings.



These two consecutive models were used to test the experiential qualities of the form through depth and how different program parts might engage within this space. Through these models we can better imagine the spatial qualities through engaging in the spaces compared to static drawings.

Note. Figure 37: Timeline images of project application

Figure 38: Developed design model testing of programme parts.

The vertical wooden elements are designed to mimic tall strong trunks of trees which act as the structure of a developed forest, acting here as the frame on which the other elements of Saving Face perch. However, strong cross bracing is required for strength and seismic resistance. Originally, the design incorporated arch designs aiming to mimic boughs of trees. This did not land aesthetically as desired and would likely have had poor load qualities. Testing began on a new design aesthetic for these cross beams which could provide structural properties as well. The curved cross beams below added significant stress to the outer wooden frame and eventually the x cross beam design prevailed; this designed allowed metal connection points which improved the ductility of the wood and improved the ability for the project to flex and sway without snapping wooden framing pieces thus improving its ability to handle seismic loads.



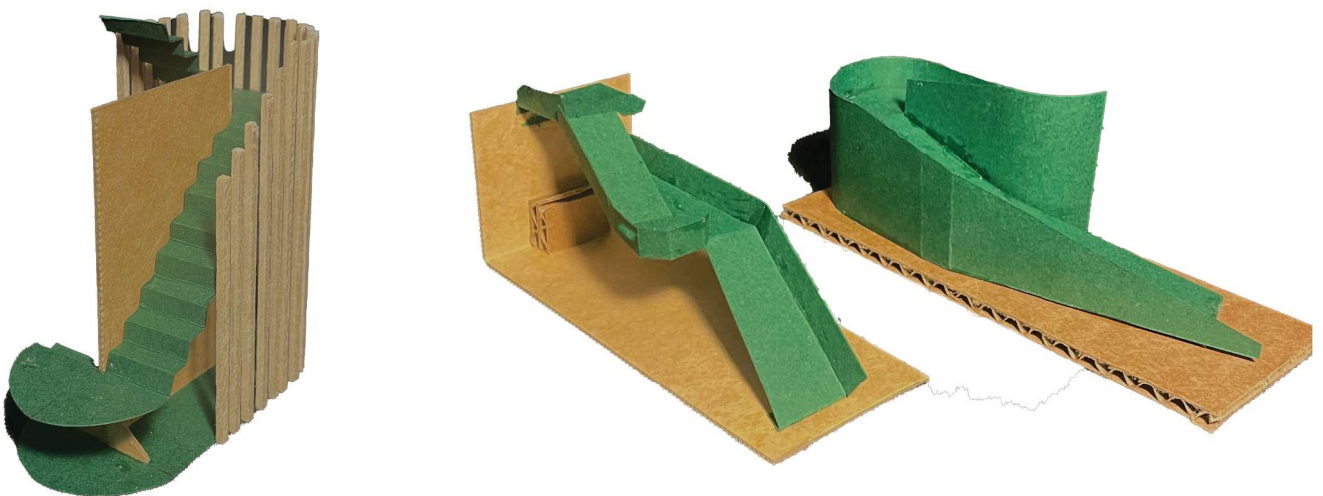
Developed design concluded with a set of images focusing on the form and materiality of the project, specifying detailed elements such as the planter box and connection to the wall through a shear element. However, the renders did not provide a similar level of design thought and showed dark spaces, further adding to the question of the relationship to the street and safety across the project. The renders themselves, not providing street context and the relationship with retail spaces, increased some of these issues. Safety issues and natural lighting will need to be considered in detailed design to provide an engaging and lively space throughout the project, especially considering the main public spaces.

Note. Figure 39: Change of model form from concept to developed design.

Detailed design

Detailed design approached the project from a human centred angle, this work focused on inhabitation and engagement through programme design and work on thresholds, entrance ways and staircases. Detailed design was used to address several issues brought up in developed design about the experiential quality of the project, especially considering how it feels to walk under and onto the project and how people would feel about safety for residents. Ensuring these spaces felt right was important for maximum human engagement with the project, especially drawing people up off the street and onto the deck spaces. This was tested through entrance way design work and CPTED considerations. This work helped to position and quantify the benefits of the project and was generated and supported by modelling work and images.

How people will move vertically through the project were tested through modelling and drawing. These ideas culminated in a selection of options demonstrated in figures 40 and 68. Ramps are primarily used to draw pedestrians up from the street, allowing easy access upwards for all. On the western facade, overhanging spaces draw the eye to people engaging in fitness classes or enjoying a coffee, sparking curiosity. This inviting atmosphere allows new streetscape engagement across multiple stories of the building, promoting through traffic to support businesses located on these floors. Lifts and stairwells are used to bring people further up the building. As the higher floors become residential, the need for ramps reduces due to a decrease in through traffic.

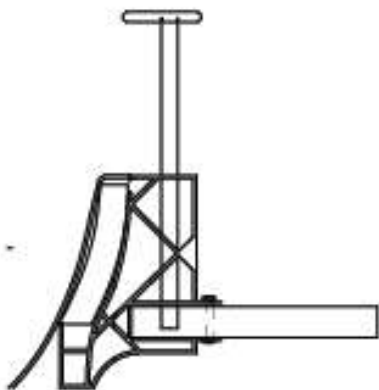


Note. Figure 40: Ramp and stair model tests.

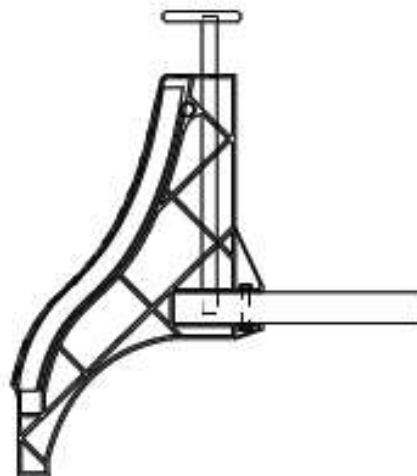
With the project developing, considering experiential qualities and clear movement markers became important for navigation and as CPTED safety factors. This new vertical streetscape opens the face of the building to everyone; this would likely increase risks to residents and so meeting safety elements of CPTED is important to generate safe spaces for everyone. The engagement with the street was prevalent here, considering how pedestrians might walk past or onto the project and what might promote them to engage directly. To enable these, different strategies were designed to allow vertical movement, including ramps, which gently rise from the pavement to traditional lifts and staircase elements. The use of a dark green has been prevalent through the design work and is used here on all ramps, stairs and lifts to allow easy wayfinding.

The facade pieces were adapted here to provide greater visibility and better respond to CPTED factors. This allowed better passive security measures and connection from streetscape to project while retaining solar shading. This included lowering the height of the facade planters to reduce their impact on view outward. A wooden balustrade remained, ensuring this railing met building code. Due to the different solar requirements, facade planters for the northern side remained taller, blocking more sunlight. A smaller facade planter was produced for the western and eastern facades, still supplying passive solar shading, while further increasing safety features and viewpoints out.

Eastern & Western Facade

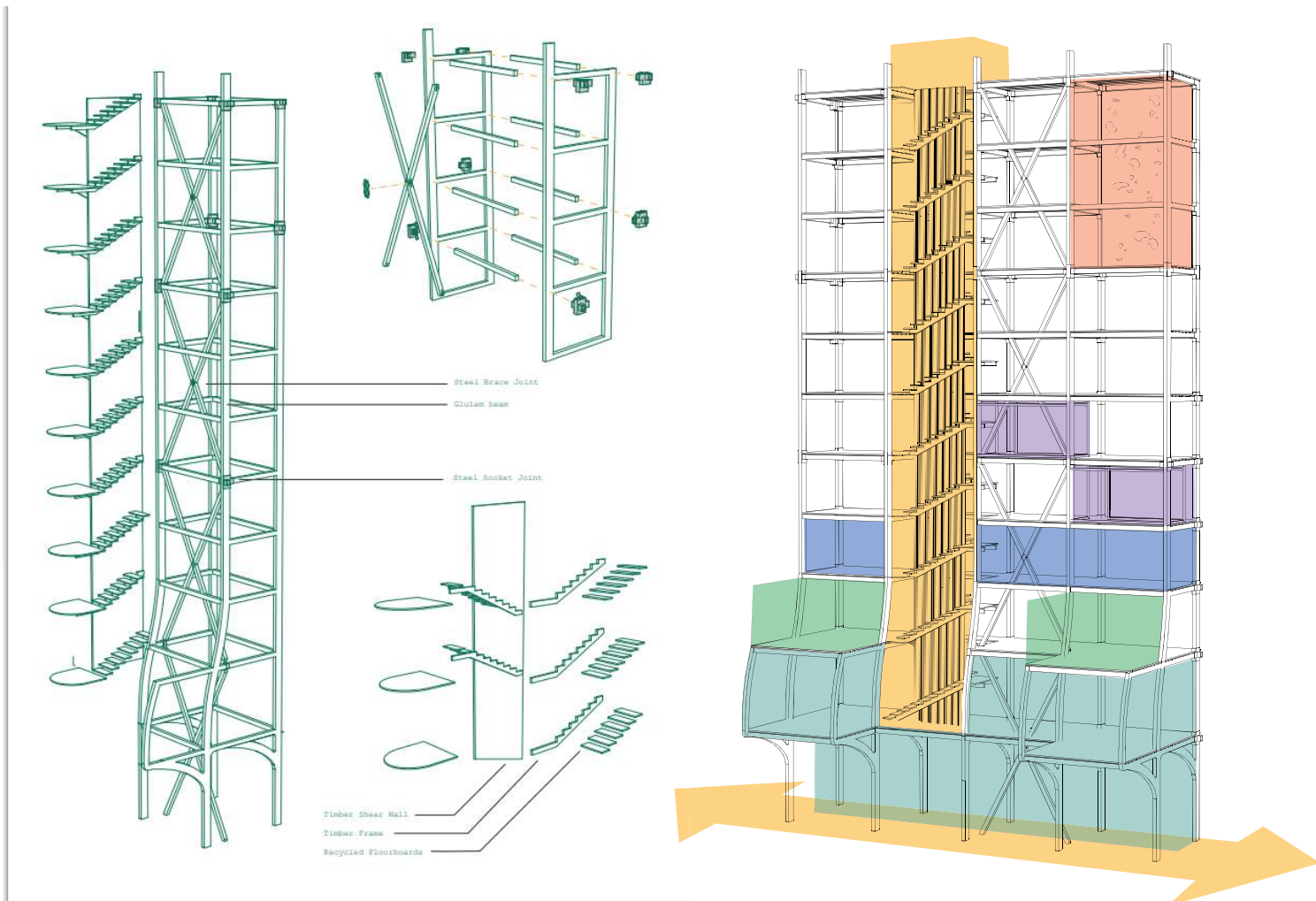


Northern Facade



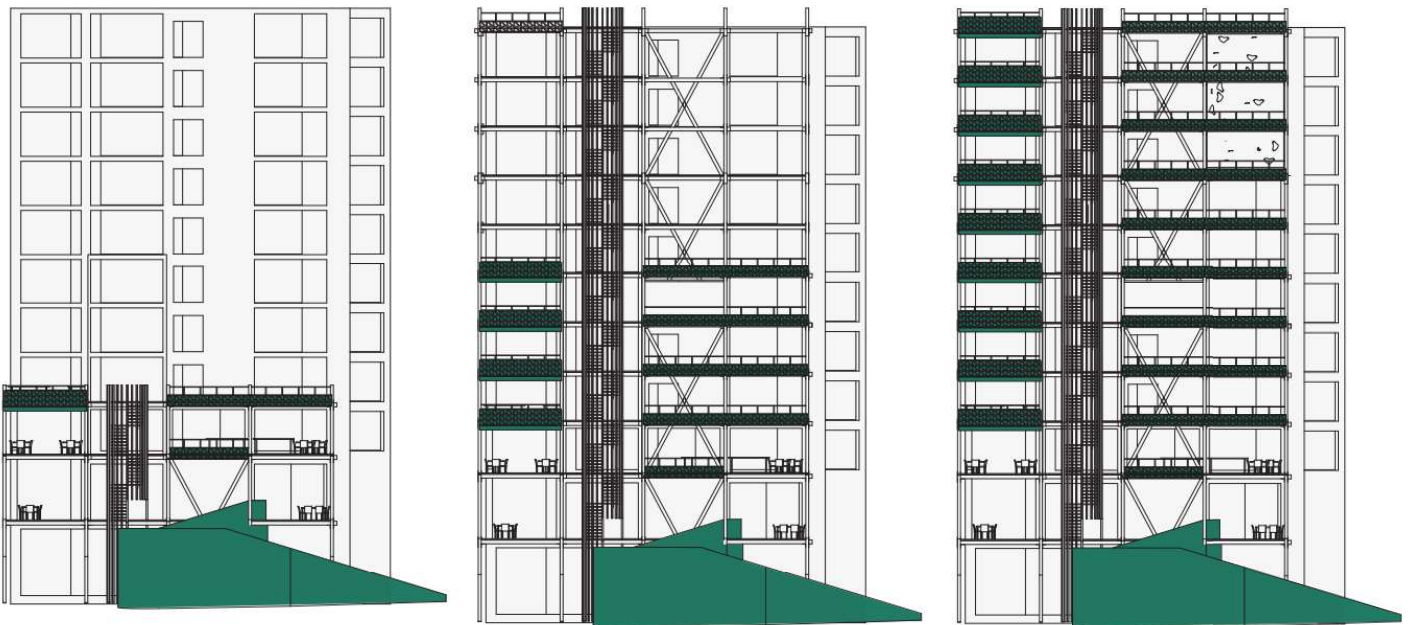
Note. Figure 41: Diagram of facade differences between northern and eastern/western options.

The final detailed design work brought together the learnings of the design work into a final set of drawings and diagrams. Due to the programmatic nature of the project, as a kit of parts, these diagrammatic images provide context of the project and allow an understanding of how it would land within an urban environment. A main element noticed in these drawings is the flatness of the project as it is has developed. Due to the kit of parts nature of the project there should have voids and interjections in the facade responding to different wants and needs of users. The current design work lacks concepts from the Breaking of the Block models which extruded into the building creating new spaces. Further design reflection upon these areas would help to link concept and detailed design. These images located below and in the discussion chapter along with a breakdown of their importance to the aims and objectives of Saving Face.



Note. Figure 42: Technical and seismic elements of building form.

Figure 43: Programme image.



0-10 Years

- First two floors introduced
- Enhanced connection to streets
- Council provides financial support
- Increased retail & cafe spaces

25-50 Years

- Further floors added
- Connection from street to roof
- Carbon & Biodiversity credits come through
- Improved residential spaces

50 Years +

- Complete ecosystem street to roof
- Improved residential spaces
- Carbon & Biodiversity credits
- Increased retail spaces

Note. Figure 44: Hero image showing current, future and an aspirational future of the project.

Figure 45: Kit of parts feasibility diagram.



Note. Figure 46: Render of kids playing soccer with friends on green roof.

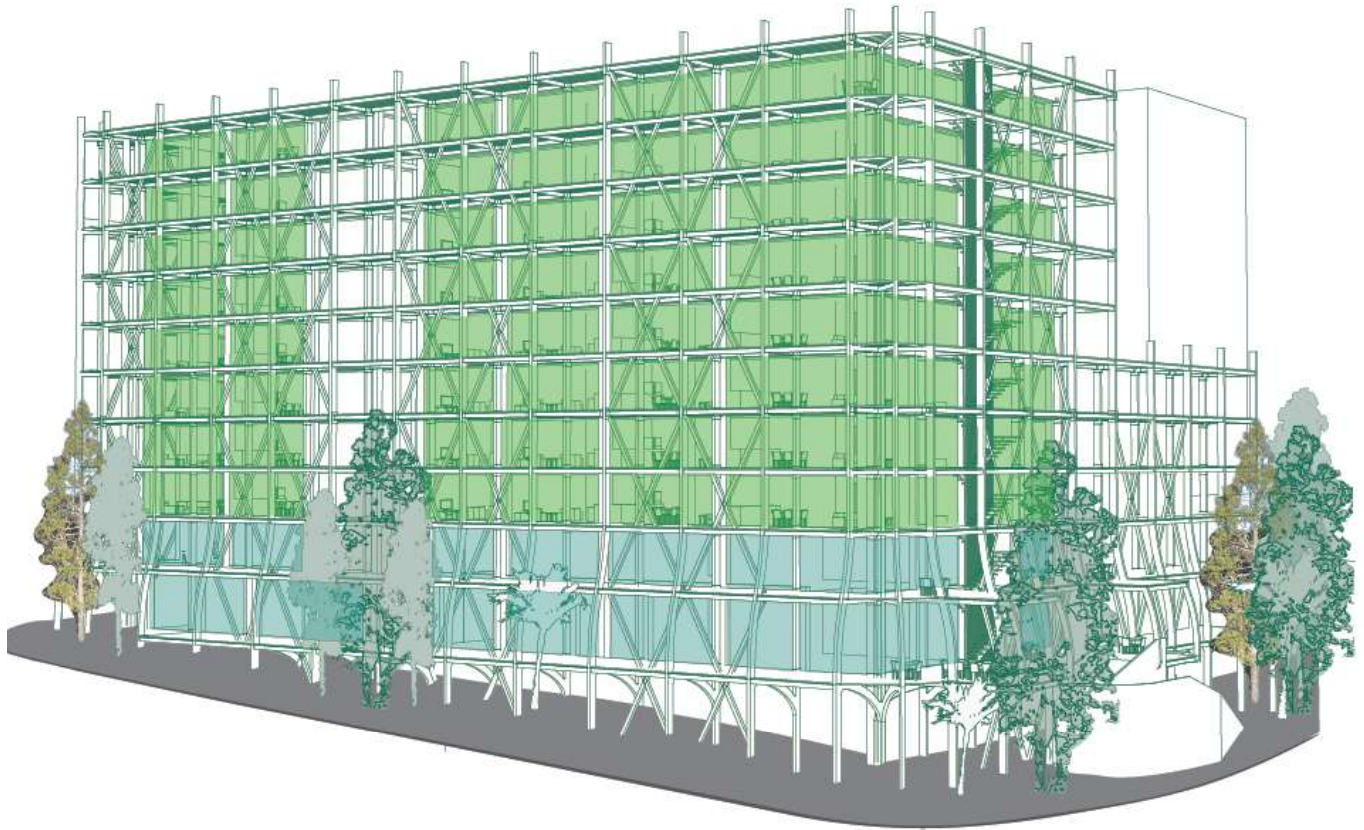
Figure 47: Render of lounge space and connection to deck spaces.
Saving Face





Note. Figure 48: Render of hospitality spaces at night.

Figure 49: Render of facade during the day.

Site



-  Retail spaces
-  Apartments



Note. Figure 50: Programme spaces of test building.

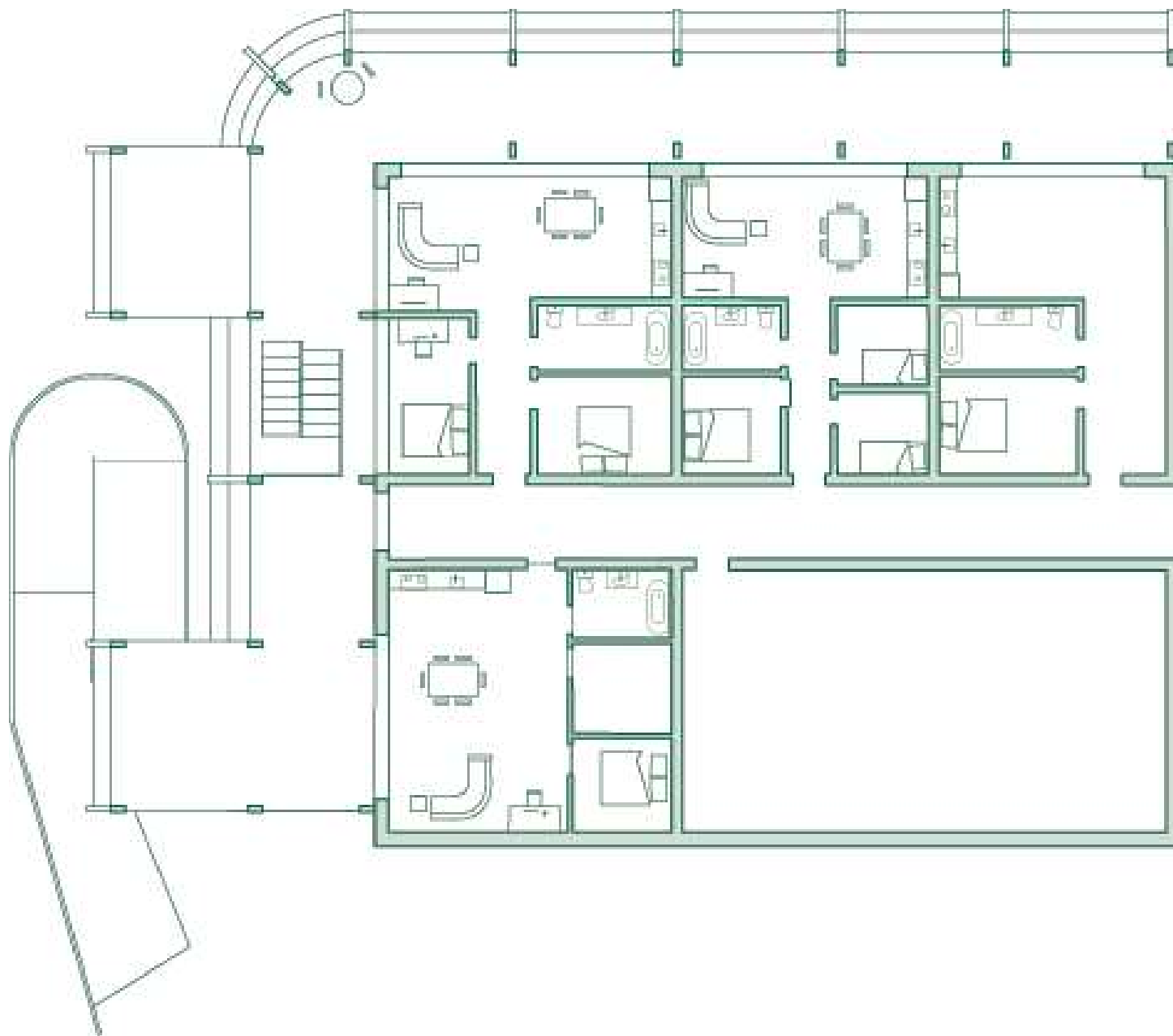
The building which was chosen to test the design on is a tech centre on the corner of Queen Street and Wellesley Street East. This building has a prime location, which is not utilised due to the current programme of the space. Alongside the application of Saving Face to this building, its interior will be adapted to apartments, retail spaces and cafes. Some of the data centre will remain in the building, this will allow utilisation of space by allowing apartments to face the street and data services to fill the interior of the building which gets no natural light. As shown in diagram 53, the heat given off by the data centre can be used to warm apartments in winter through air ventilation, making use of a waste heat generated. The rest of the data centre will need to be relocated.

The new apartment layout is based on joined family units, with four three-bedroom units, two two-bedroom and four single apartment dwellings across floors three to thirteen. Each floor has a communal interior lounge for all residents to use as well as the balcony spaces provided by Saving Face. The lower three levels offer eight retail or hospitality spaces per floor, tripling the volume of these spaces when compared to the original building.

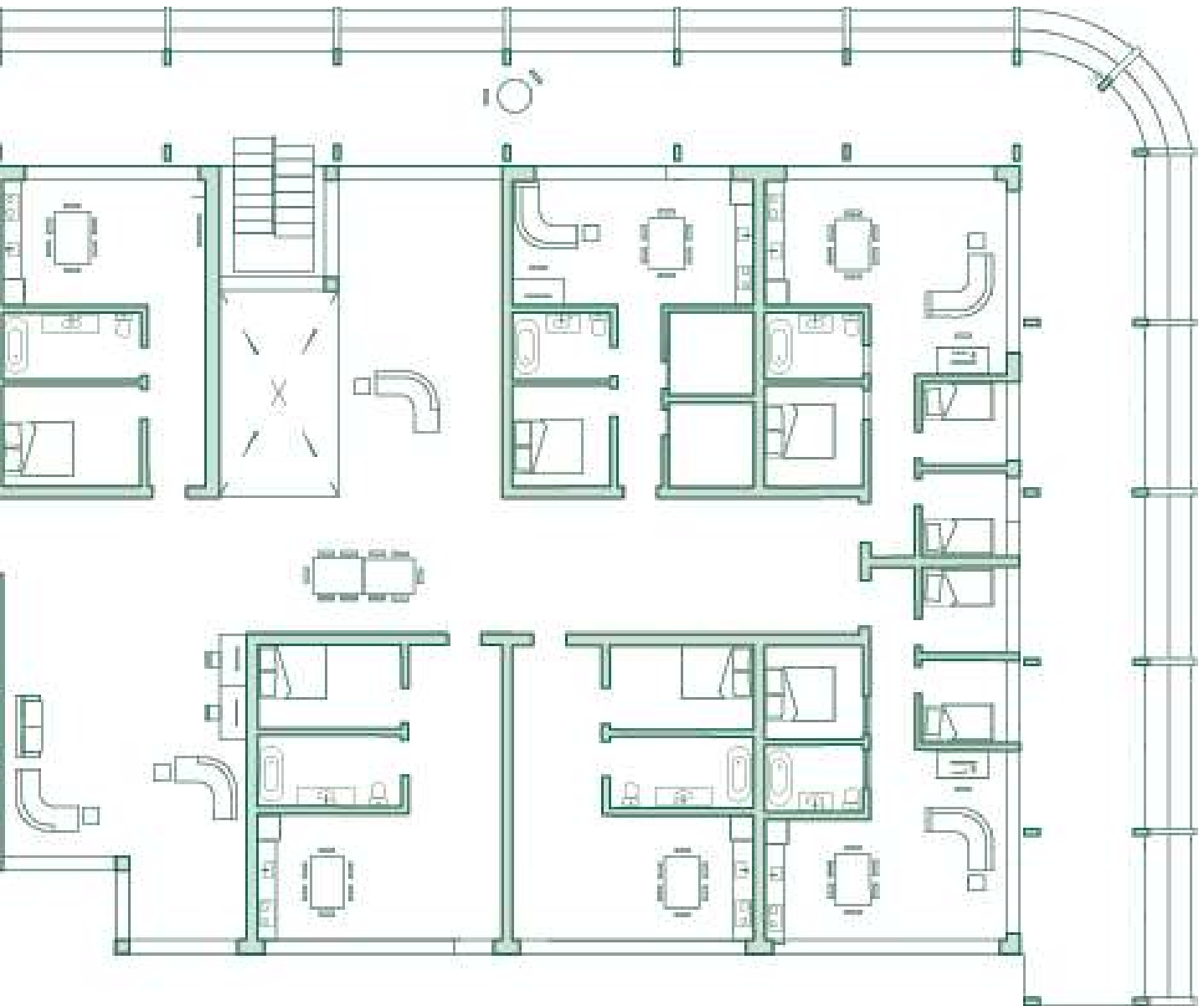


Plan: Floors 3-13

1:200



Note. Figure 51: 1:200 Plan of building remodel.



Chapter Six: Discussion



Note. Figure 52: Detailed design model of first four layers.

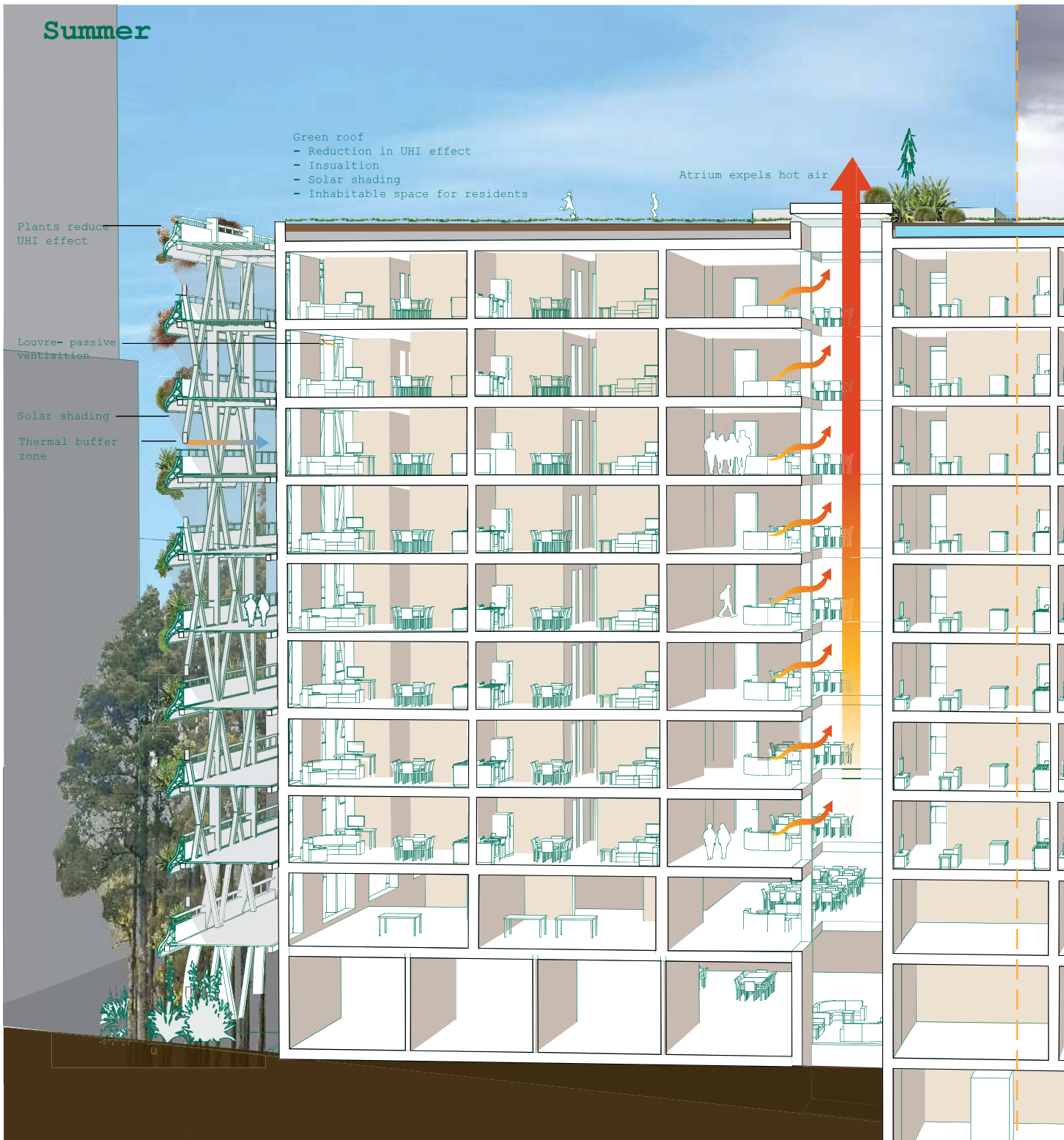
Saving Face looks to improve human relationships within the city, providing sustainable solutions to thermal comfort, air quality and noise pollution. Clearly defining stakeholders and users in this project is important to understand their needs and provide appropriate solutions. Sustainable design elements incorporate a variety of passive design systems to provide comfortable habitats, combining built environments with the natural quality of plants. Saving Face provides an effective response to climate change and the needs of the residents and users of Auckland City through an architectural solution. The complexity of the project comes from meeting a series of design requirements, developed through the methodological framework. This chapter discusses how the project responds to climate change including: the incorporation of passive design principles including solar shading and airflow management systems; carbon footprint calculations, including appropriate material selections; flood water control; and the regeneration of the Wfll ecology along Queen Street (See diagram 57). The chapter also discusses how the project responds to a variety of human scale requirements including: social improvements; Crime Prevention Through Environmental Design; and seismic resistance considering our current built environment.

Climate change

The application of the facade system here responds to the issues of climate change as discussed above, while also increasing liveability and amenity within the CBD. The facade system provides this through new vertical connections between different layers and streetscapes, from footpath to green roofs, allowing for human inhabitation of these spaces. Environmental responsiveness is met within our dense cities by breaking down the external skin of buildings and provides temperature control through planting. This vertical ngahere improves temperature and air quality while reducing road noise through natural systems, reducing glare in the city through a reduction in reflectiveness. This planting is used to reduce wind gusts, which are found to travel down the face of the buildings (Whyte, 1980), improving comfort of passersby.

The reason for retrofitting facades is to prolong and improve the quality of our current built environment, maintaining low embodied carbon through reuse of existing structures. The incorporation of passive design strategies is one of the main ways in which the project meets net carbon zero aims. These strategies allow the building to reduce its functional carbon footprint, helping the project to directly respond to climate change. Diagram 53 explains the relationship between these passive design strategies within the project.

Summer



Passive design

Passive design elements will help to reduce the need for air-conditioning and heating units to be used, reducing the functional carbon footprint of the building. Solar shading will be a large aspect of this, alongside the thermal buffer zone and airflow management.

Solar shading

Saving Face will maximize solar shading by using deep decks with a large overhang to block out sunlight in summer, where it sits much higher in the sky. Vegetation on the face will reduce the Urban Heat Island effect and glare from the facades. In winter, with the lower sun angle, the sun will be able to penetrate the building, heating up interior spaces. This interior warming will be aided by a solar mass in the floor which releases heat slowly into the building after the sun has set.

Note. Figure 53: Passive design strategies diagram.



Thermal Buffer Zone

The thermal buffer zone acts as a barrier between harsh exterior environments and the ideal moderate interior climate that we require. Building systems such as insulation and double-glazing help to support this barrier too, but the application of the buffer zone here will reduce the stress on this system. The buffer zone works by mitigating harsh summer sun, reducing heating on the building facade, and reducing the impact of wind chill by averting the wind from this space and allowing the planting to slow the speed of it. This zone is intended to be habitable by human and bird species as a temperate exterior space.

Airflow management





Airflow management in the building will be produced by mechanical shutters located at the top of windows, allowing removal of hot air in warm summer months through natural venturi effects. A large atrium space which travels vertically up the building allows for control of air temperature in summer through a similar louvre system.

Materials

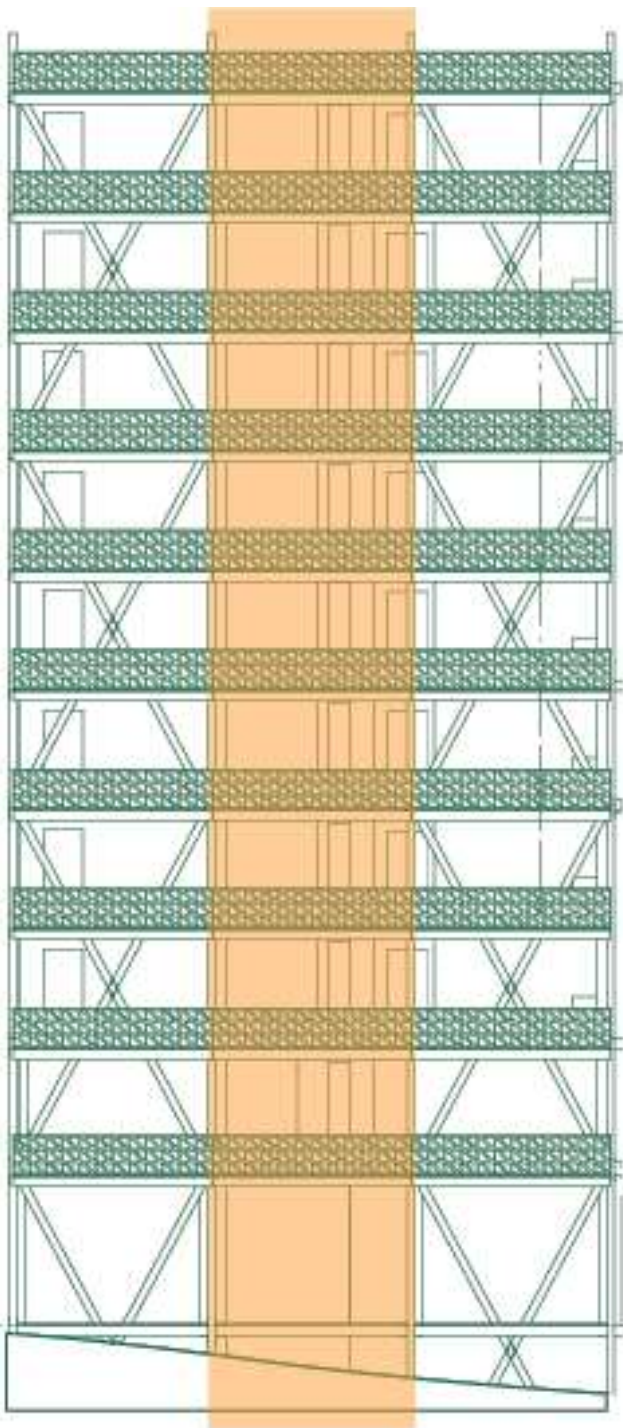
Material selection was important for the buildings carbon footprint. The use of timber as the main material source allows the project to have a negative carbon footprint after construction. The following calculations are focused on one vertical section of the project, allowing easy calculations of project effectiveness as a modular unit. This calculation, multiplied by the number of modules required, will help building owners to quantify the amount of carbon credits which will be generated by applying the project to their building(s). If this project was to be developed in a real-world scenario, engaging with LBC calculations would be key, as outlined in the methodologies section. However, this complexity of reporting was outside the scope of this thesis project.

Metal elements are used on the project as joints for beams, posts and cross beams. Heavy wooden frames require engineered metal joints to add ductility to projects (Tomasi et al., 2018). There are two main options for finishes, galvanized and powder coating. Powder coating can be more environmentally friendly, but its expected life is typically around 10–20 years in building use. As these are main structural elements, full disassembly would be required to recoat the joints and therefore this finish would not be a good solution. Galvanized steel, although less environmentally friendly, should last for one hundred years while in use. This will provide a more appropriate solution. Reducing metal elements where possible will help to reduce the embedded carbon cost of the project.

Wood will provide the main structural element for the project including the large vertical columns. Wood provides high carbon sequestration, low weight and high seismic resistance (Cao et al., 2025). Redstag provide glulam beams, produced in a sawmill in Auckland, from Bay of Plenty forests, which minimises the carbon footprint in transport. Redstag have previously worked on LBC projects across New Zealand and use environmentally friendly processes and renewable energy to produce their timber solutions. Glulam products built offsite allow shaping which ensures accurate construction of the curved buttresses. Alongside the glulam, Redstag will provide structural timber for batons and beams. Working with a local company provides benefits through relationship and product support.

	material	group	impact / m3	volume [m3]	result
1	 Structural steel	metal	5403.2 kg CO2eq/m3	69.03 m3	372,982.9 kg CO2eq
2	 Glulam and cross-laminated-timber CLT	trae	-664.0 kg CO2eq/m3	457.4 m3	-303,713.6 kg CO2eq
3	 Modified wood (heat impregnated)	trae	-441.0 kg CO2eq/m3	270.4 m3	-119,246.4 kg CO2eq
4	 Construction timber	trae	-680.0 kg CO2eq/m3	5.63 m3	-3,828.4 kg CO2eq
					-53,805.5 kg CO2eq

Note. Figure 54: Graph of building embodied carbon. Calculations made from the Construction Material Pyramid based in Denmark are general estimates and may not accurately portray embodied carbon of the same materials in New Zealand. (<https://www.materialepyramiden.dk/>)



Area Calculated

Material embodied carbon

Planting

Area per unit: 5m²

13 stories- 10 w/foilage: 50m²

50m²=0,005h

40,000 scrub stems per hectare %0 trees

40,000x0.005

=200 stems per unit

15 Tonnes of c02 sequestered after 20 years
(2050)

24 Tonnes of c02 sequestered after 50 years
(2080)

29.95 Tonnes of c02 sequestered after 80 years
(2110)

Wooden elements

Vertical elements: 2x 143.18m³ = 286.36m³

Horizontal beams: 28x 3.98m³ = 111.44m³

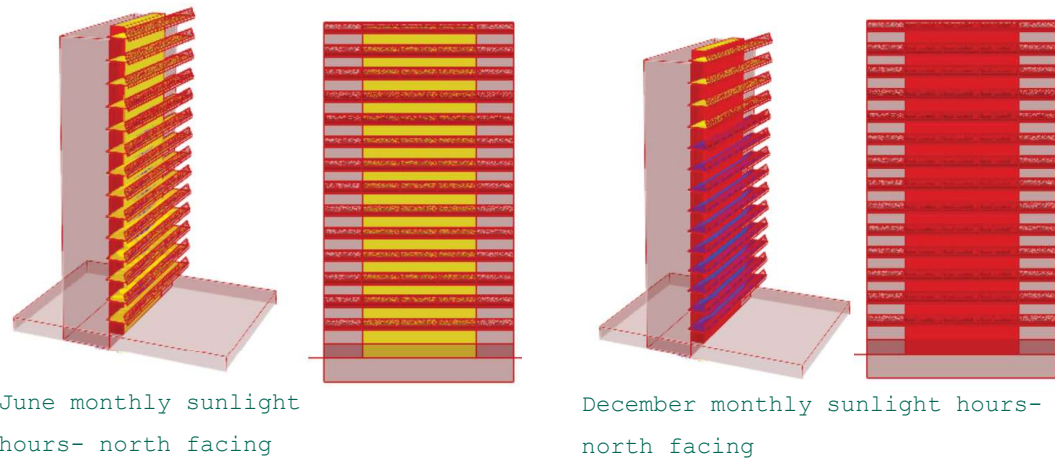
Trus: 4x14.90m³ =59.6m³

Deck batons 7x0.8m³ =5.63m³

Decking: 41.82m³ +39.38m³ +10x(18.92m³) =270.40m³

Metal elements

69.02m³



June monthly sunlight hours- north facing

December monthly sunlight hours- north facing

The Grasshopper programme was used to quantify solar shading as one of the main passive design strategies. Bahri et al. found that most models were effectively tested through computer programming, with the ability for dynamic testing with programs such as Grasshopper (Bahri et al., 2022). Grasshopper testing provided an example of the shading effectiveness of this project in context of surrounding buildings. Testing an Auckland-specific application in both June and December on the northern side of the building. Although this test hit limits due to computing ability, it clearly shows a difference in sunlight hours hitting the building and deck spaces, which affects passive heating.

The December test shows peak summer sunlight hours as shown on the exposed top deck and roof spaces. Summer days are longer and allow more light to hit the building and the sun provides more heat as it sits closer to earth. These high sun hours can overheat many glazed buildings. As the sun sits higher in the sky during summer, we can easily shade the sun from hitting the building, preventing overheating. These tests show through shading, that half the amount of sunlight hits the building in December vs June. This shading allows the winter sun, which sits lower in the sky, to hit the building, allowing passive heating, desired in the cooler months. This is one of the main passives strategies to allow comfortable interior spaces.



June monthly sunlight hours- east facing

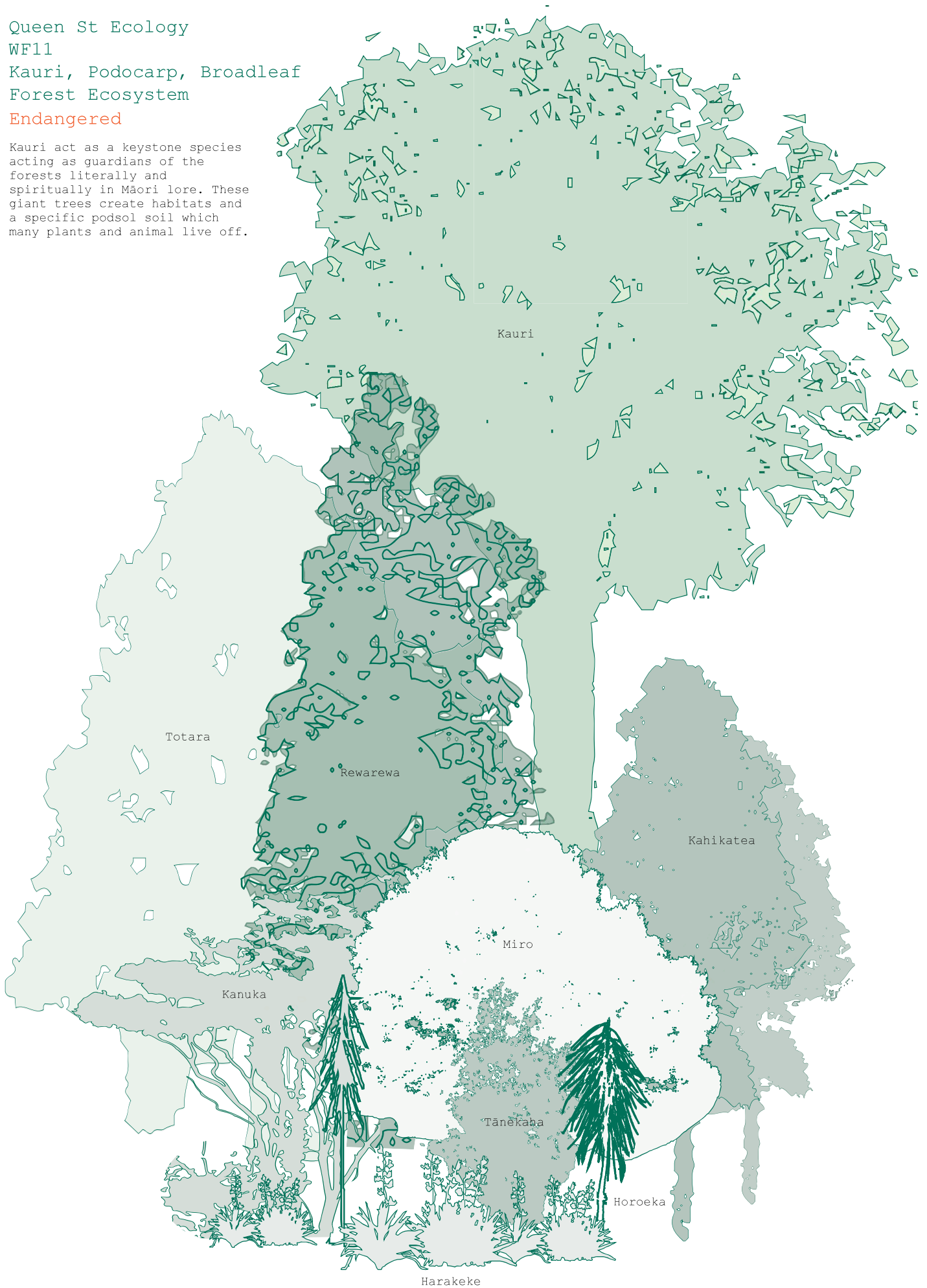
December monthly sunlight hours- east facing

These benefits are less apparent when tested on the Eastern and Western facades. On these faces a less intensive shading element would be required, as harsh westerly light is blocked by surrounding buildings while morning easterly light is desired. It would still allow maximum solar gain during winter but with less focus on peak summer sun as less sunlight hits the building here directly and surrounding highrise building will also help to shade these spaces.

Note. Figure 56: Grasshopper images of solar gain across June and December.

Queen St Ecology
WF11
Kauri, Podocarp, Broadleaf
Forest Ecosystem
Endangered

Kauri act as a keystone species acting as guardians of the forests literally and spiritually in Māori lore. These giant trees create habitats and a specific podsol soil which many plants and animal live off.

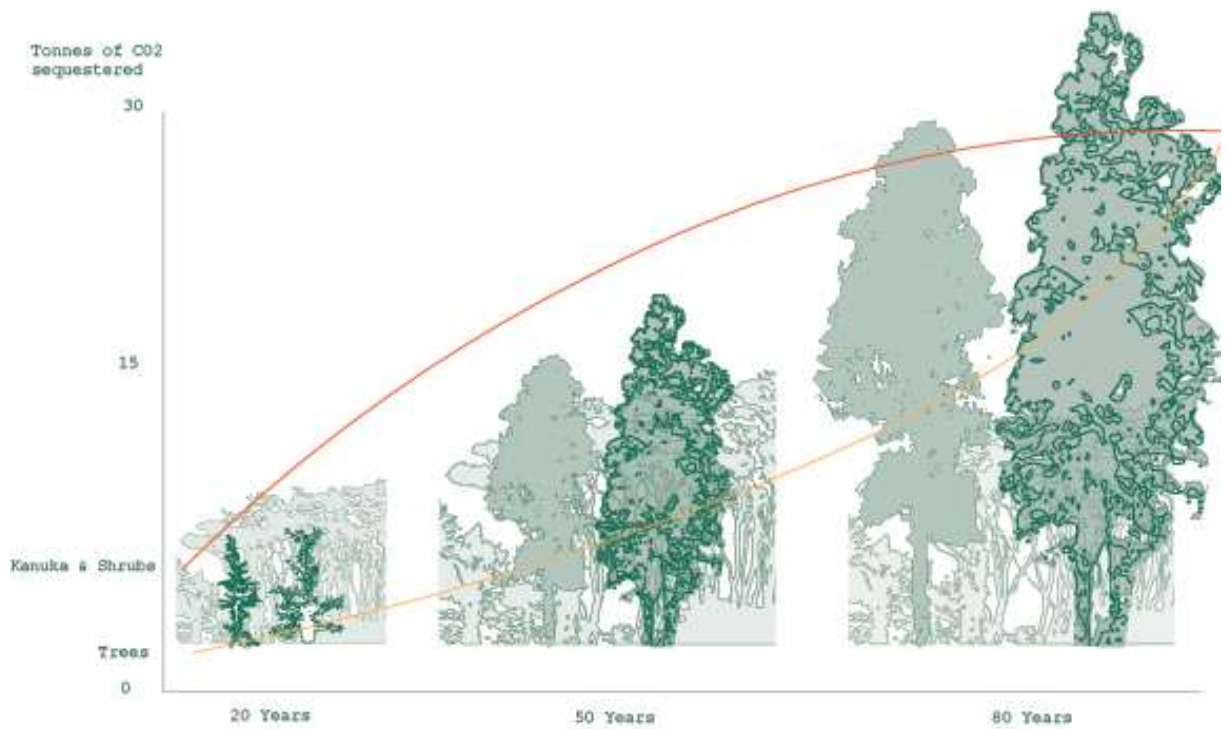


Note. Figure 57: WF11 Ecologies diagram.

Habitat Provision

By reintroducing ecologies into Queen Street through ecological succession we have an ability to return to the complexity of ecosystem we find in the native bush. Through this, we can reintroduce relationships and increase biodiversity to have a positive influence on ecosystems' resilience (Worm et al. 2006). Due to the urban environment, we cannot simply reproduce the forests at the same volume when considering horizontal growth. Through vertical planting, we can vastly increase the surface area available for growing. The reintroduction of native species into these spaces on a certain scale will allow for reintroduction of bird and animal life that rely on these ecologies. The project will act to reinstate Urban Ngahere by creating green corridors the full length of the streets and connecting the current scattered ecosystems, creating a new complex ecosystem across the city. The scale of this project will exceed any street-based solution, its ability to vertically grow up and over existing buildings creating a homogenous layer of greenery from a bird's eye view.

On the streetscape, large areas of bush will allow for mature trees to grow along the street while the vertical planters will allow for bush and shrub varieties to grow. Allowing space for trees on the street is vital to reintroducing the broadleaf forests which once inhabited the area. These trees provide habitat for the keystone species of birds tūi and kererū, while helping to reintroduce endangered ecosystems. Schwendenmann and Mitchel (2014) also found that trees with a larger root mass were responsible for sequestering more carbon from the air. By planting trees on the ground, we can allow them more space to grow this root mass than we could on vertical planters. These varieties will be picked out according to their shade preference, ability to handle harsh sunlight, wind and rain, while also retaining the key components of the previous ecosystems. Research into appropriate plans will be key to the success of this project, both in terms of returning to the existing ecosystems, but also providing maximum benefits and minimal ongoing maintenance. This growth should act like a forest, setting its own boundaries for growth with limited human interference after the initial habitat creation. Lister (2018) found that individual small parks could not sustain themselves, and larger scale parks had this ability due to the complexity in their ecosystems. By connecting many smaller natural areas, we can create a large cohesive ecosystem. By connecting the streetscape planting with vertical planting and multiplying this down the length of Queen Street, we can start to produce a large-scale park area within our urban spaces.

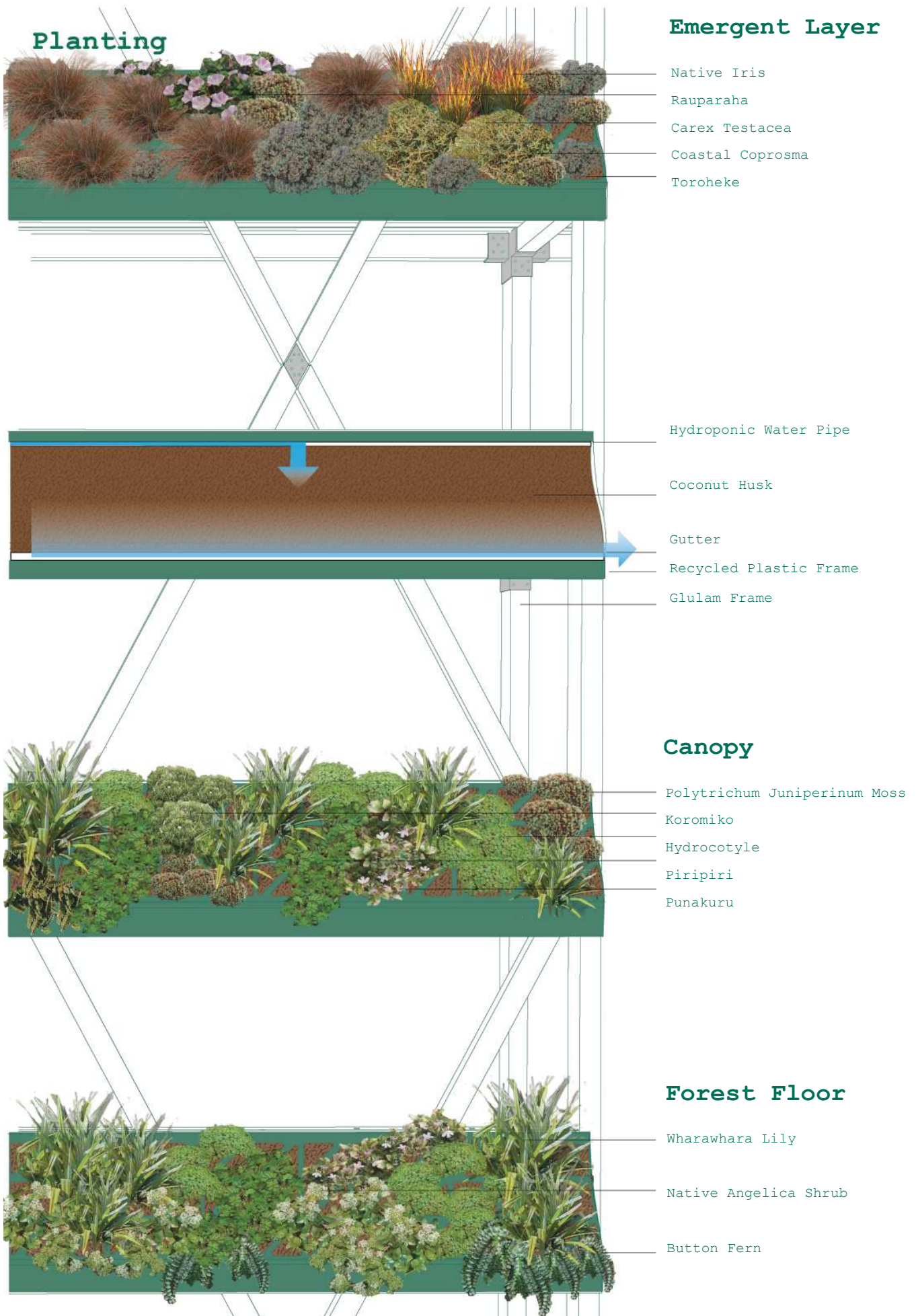


Kānuka act as nurse species on open sites, providing cover within 1-5 years and supporting, through shelter and aiding vertical growth, slower growing tree species such as kauri (Tane, 2001). Large podocarp trees require open spacing 3-10m on the open ground sites, whereas the shrubbery on vertical slopes require .5m spacing allowing up to 40,000 stems per hectare (Tane, 2011). The use of fast-growing planting and nurse trees allows large carbon sequestration, especially in a short time frame. This allows the project to support 2050 climate change requirements. The slower growing podocarp species, although sequestering less carbon initially, continue to sequester for a longer time frame than the faster-growing species, allowing for continual future gains. These trees, as listed before on diagram xx, are also vital for ecological diversity, providing habitat for our native animals and recovering lost ecologies to the site.

Vertical planting will be supported by a hydroponic system. Hydroponics allow a reduction in water requirements by 90% when compared to soil-based planting (AlShrouf, 2017). These systems also require less planting material. Coconut coir will be used for its tested effectiveness as a growth medium (Urayama Et al., 2017). This reduction in material vastly reduces the weight, especially when compared to wet soil, reducing the load on the project.

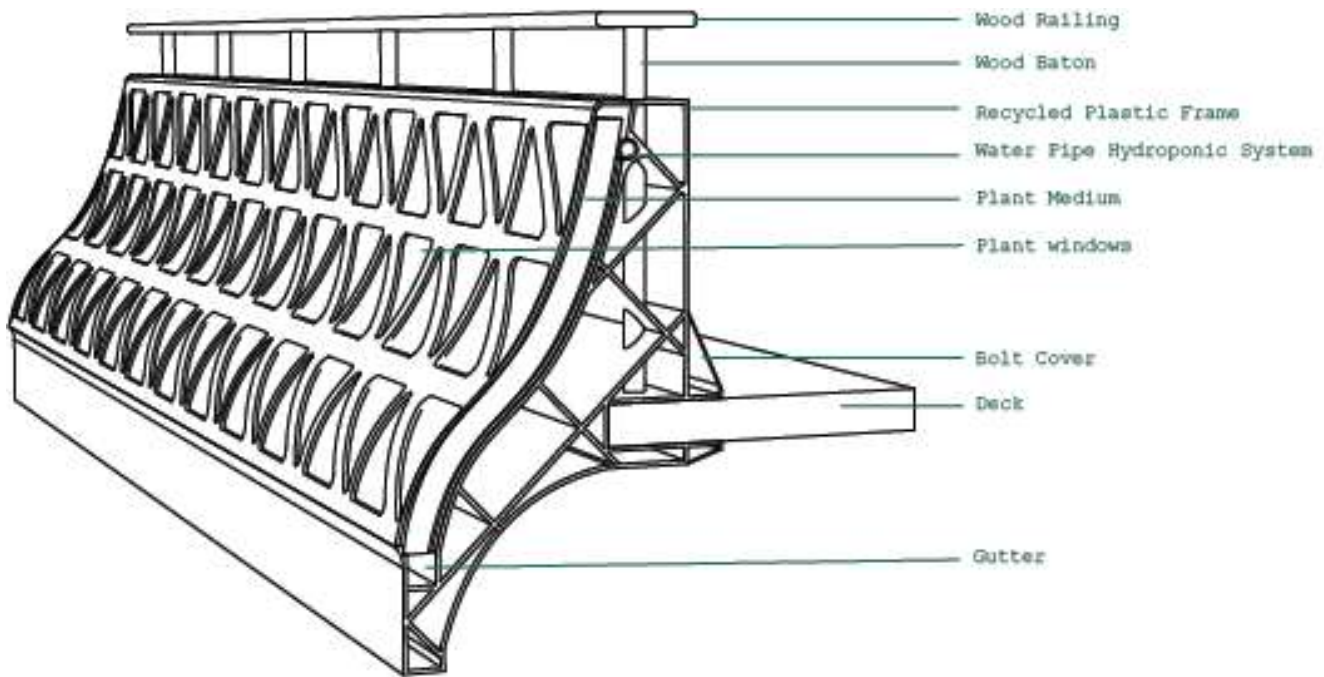
Native plants were selected and categorised in accordance with their ideal sunlight requirements. These categories were then aligned with the three distinct layers in the project, emergent, canopy and forest floor. This categorisation ensures all plants have ideal sunlight hours for maximum plant health and reduces ongoing gardening labour and costs.

Note. Figure 58: Kanuka nurse species diagram.



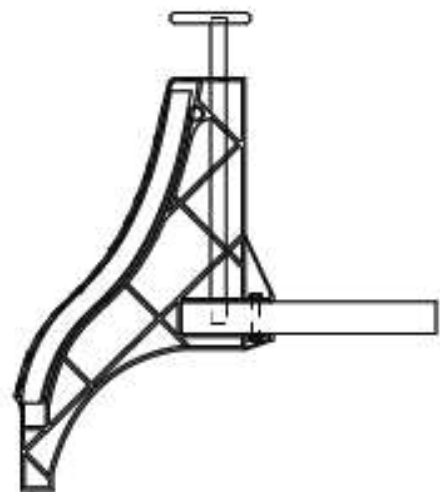
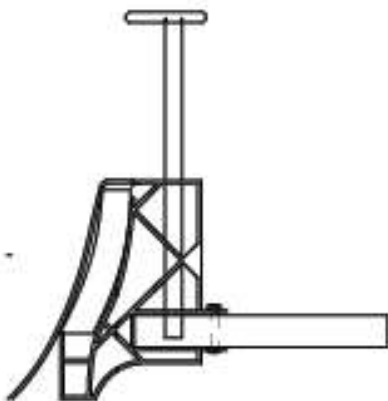
Note. Figure 59: Planting diagram of specific plants on different canopy layers.

The planter boxes need to be lightweight, accurately built and have a long lifespan. Recycled plastic elements are appropriate here as they meet these factors while providing impact resistance and ductility, allowing flexing through the wooden frame to not disturb the planter elements. These planters will be created through extrusion, ensuring accuracy of these elements, which will be clipped and bolted onto the frame. Hydroponic pipes, gutters, internal strengthening and spaces for the coconut coir medium will all be built in.

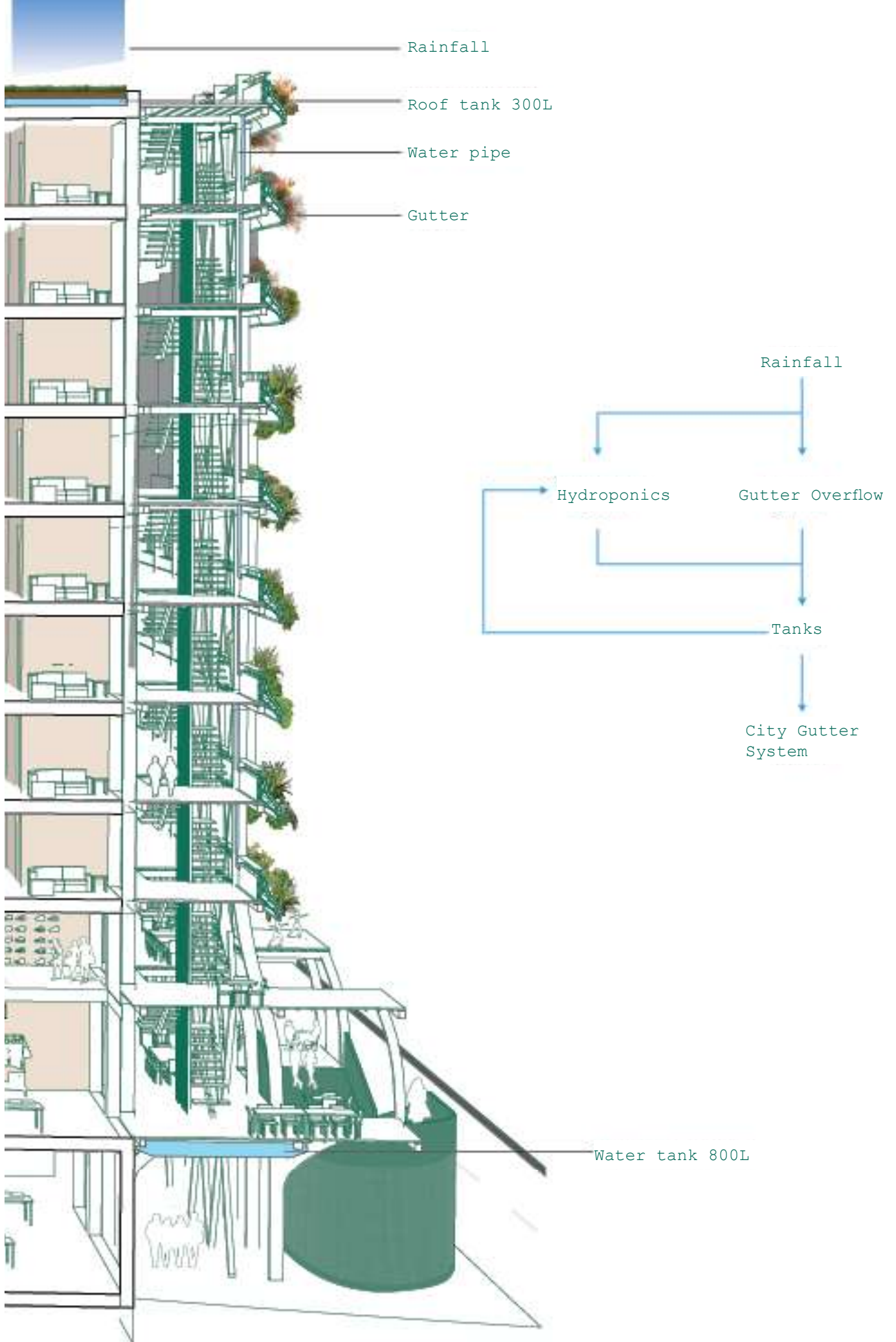


Eastern & Western Facade

Northern Facade



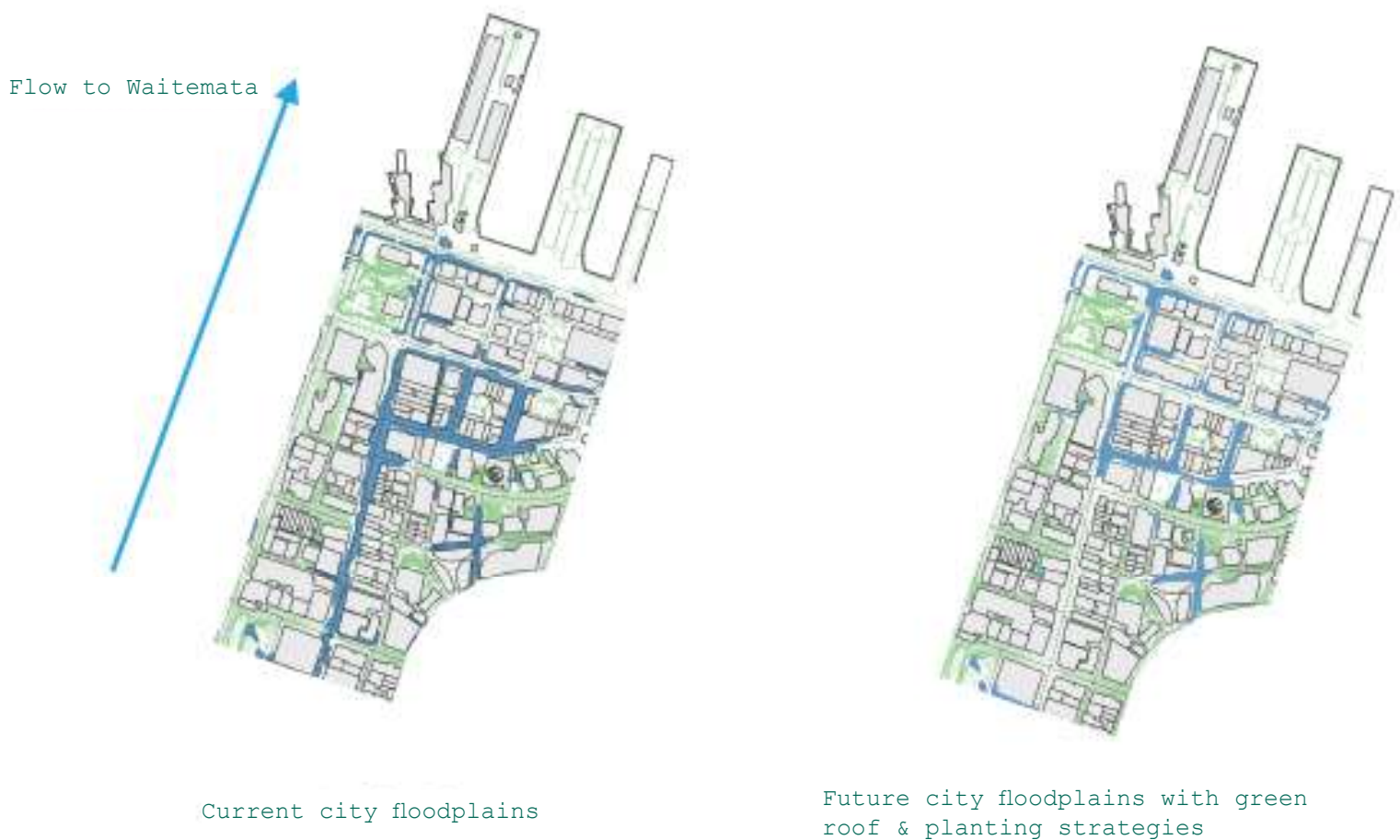
Note. Figure 60: Facade planter details.



Note. Figure 61: Water collection and flood control.

Flood control

Green roofs complete this project, drawing people vertically up through the facade system to relax or play on the top of the city, directly engaging with ngahere from the streetscape to the top of these buildings. A change in landscapes within urban areas creates a large change in the way that water responds to surface conditions. In some areas, urban areas may only retain 33% of water where rural areas might retain 99% (Evans, et al. 2024). As shown in mapping (see figure's 10 & 13) Queen Street is prone to flooding. Avery (2022) found that the application of green roofs could improve the sponginess of Auckland City and improve its resilience to extreme weather events. This project will aim to directly address these issues by slowing down peak water flow in storm events, to then slowly release the water, allowing current flood control strategies to not be overwhelmed. This will be achieved by a reduction in impervious surfaces, as well as green roofs and swales, housing trees, which will soak up water.



Note. Figure 62: Flood control reduction through Saving Face.

Seismic Resistance

Throughout developed design, the idea that this external structure could provide a safety barrier during seismic activity arose. Due to timber's natural ductile qualities, it is highly resilient to seismic loads as they are light, ductile and have slow acceleration (Smith, 2020). Metal joints can provide extra ductility, while wooden finger and dovetail joints would reduce the overall ductility of the wood and reduce strength (Smith, 2020). Post tensioning and shear walls are also necessary to ensure maximum structural stability. Auckland's design guide for earthquake retrofit has four levels of protection:

- Protection against potential fall hazard during an earthquake.
- Improve the stability of walls during an earthquake against toppling type failures.
- Ensure there are adequate connections between all the structural elements, so the building responds as a cohesive unit instead of as individual parts during an earthquake.
- Improve the building configuration issues, such as poor distribution and/or lack of lateral load resisting elements.

(Auckland Council, n.d.)

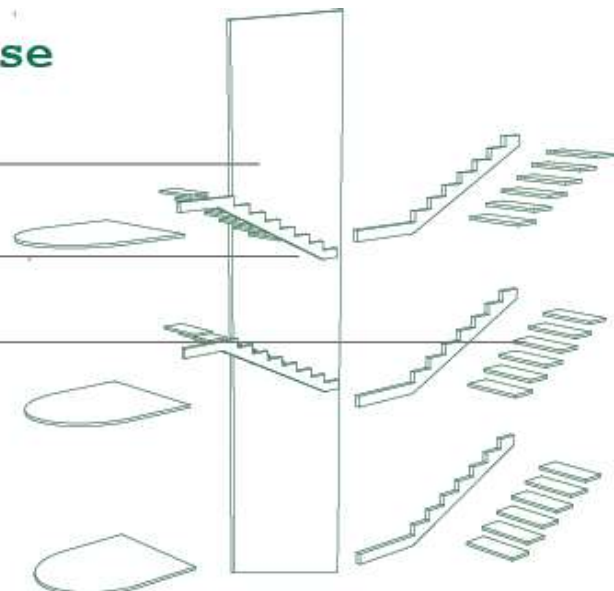
To meet these requirements, a few key ideas were produced. Firstly, the now external timber frame will act as a freestanding structure to provide exits from the main building. This is so that if the building was damaged, people could exit safely to the street through the project. The building and project will be connected through isolated anchor points to allow both structures to move independently of each other. These isolators allow the project to add support through lateral load resistance, by connecting its own lateral load resistance to the building. This resistance will be built in with shear wall elements and cross bracing across the facade. Due to the modular nature of the project, shear wall elements can be included at key areas to support the building and provide distribution of loads as per element four. This will also provide structural strength, allowing the project to help support the building externally, creating a cohesive and consistent external anchor to support the building, meeting elements two and three. The deck spaces will catch any facade pieces which fall off the main building, ensuring they cannot fall onto the street, meeting requirement one of the Earthquake Retrofit Solutions.

Shear Wall - Staircase

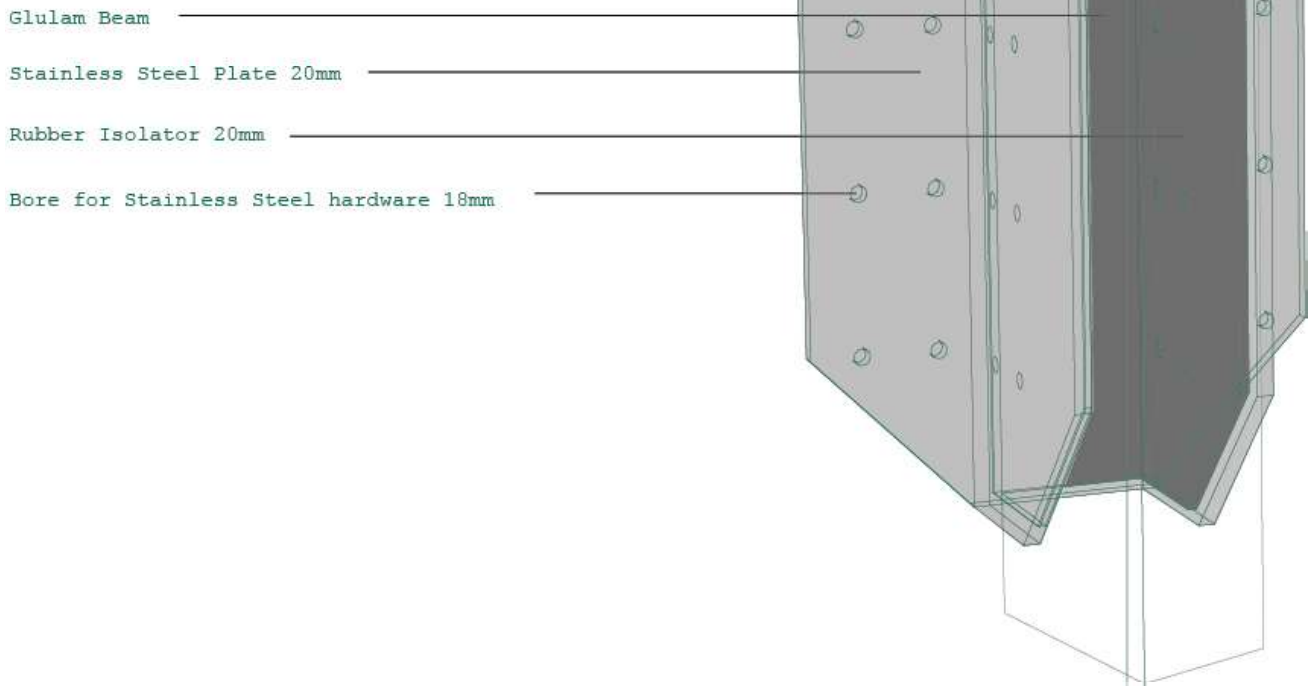
Timber Shear Wall

Timber Frame

Recycled Floorboards



Building Facade Connection



Heritage Buildings

Queen Street has many of Auckland CBD's heritage buildings; these buildings are facing climate and seismic challenges as they fail to meet modern building requirements. One of the possibilities for Saving Face to support these buildings is to provide external seismic support by adding damped mass to support the building foundations and to minimize falling masonry. This reduces the possibility of risk to users or passersby. Typically, these buildings would be reinforced to meet seismic requirements by drilling out internal supports and adding metal inserts to improve strength. This process is invasive and expensive, leaving the building uninhabitable while the work is carried out. An external system would act as a brace, with minimal impact to the interior elements of the building, while keeping the external character, though now housed within a wooden frame.

Note. Left. Figure 63: Staircase and shear wall diagram.

Above. Figure 64: Seismic isolator joint.

Auckland Council produces framework alongside architecture firm and biodiversity experts to improve our CBD and meet climate change requirements.

Council fits framework to several key buildings along Queen Street to demonstrate lifestyle and ecological improvements through the project.

2025

2030

Auckland Council

Input

- Hires architect firm to produce kitset to provide to building owners
- Initial investment in project

Output:

- Flood control and mitigation
- Embodied and functional carbon reduction to meet 2050 plans
- Improved city image and resident happiness
- Improved quality of life- reduces health care costs
- Improved urban biodiversity
- Embodied and functional carbon reduction

Client

Input

- Climate
- Biodiversity

Output:

- Improved

City Centre Masterplan

- Improved Image of Auckland
- attractive central city
- Cultural Growth
- Business Se

Auckland 2050 Plan

- Belonging and Participation
- Māori Identity and Wellbeing
- Homes and Places
- Tra

Auckland Climate Change (Zero Carbon) Act

- Carbon Zero 2050
- 30 Canopy Cover
- Water use reduction
- Carbon-zero Transport
- E

Urban Ngahere

- Place making and Cultural Connection of Native Species
- 33 Canopy Cover
- Improve Biodive

Further building owners approach council to provide the framework to improve their own buildings aesthetic and function, the upfront cost is subsidised by the council and the return through rent, reduced costs, carbon and biodiversity credits make it a credible business venture.

Queen Street becomes a green corridor, allowing maximum efficiency of the framework as it begins to spread throughout the city.

2035

2050

: Building Owner

ent upfront payments

biodiversity & Carbon credits

Improved building resilience and longevity through green roof, reduced impacts to exterior etc

Provides more retail space and desirability of existing spaces

-Reduced Maintenance costs on building

-Reduced electricity bill

-Improves building quality

-Increased value of residential spaces

-Embodied and functional carbon reduction

ector -Social Growth -Green Corridors -Improved Residential Spaces

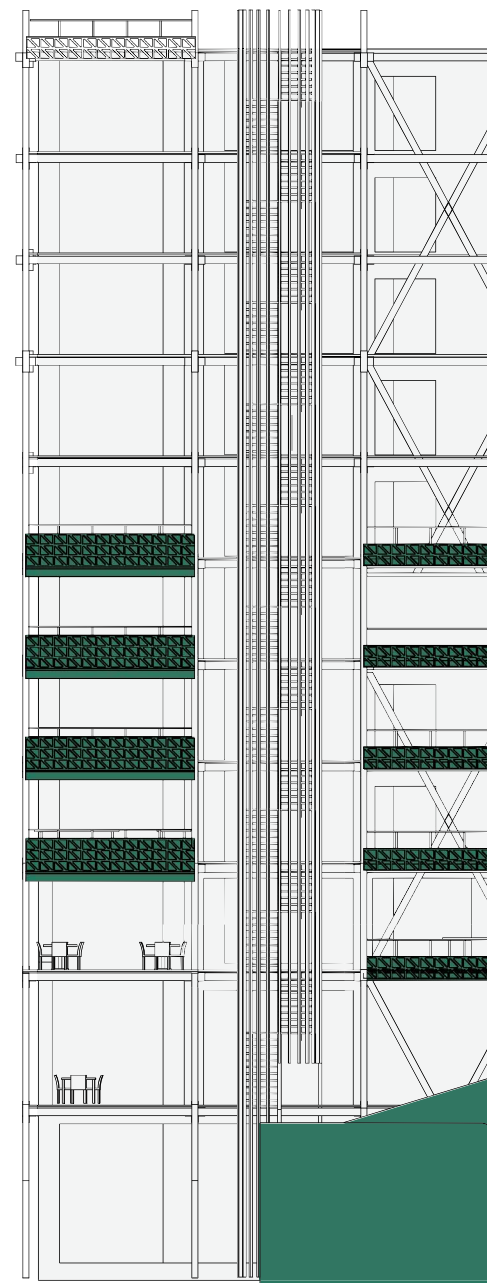
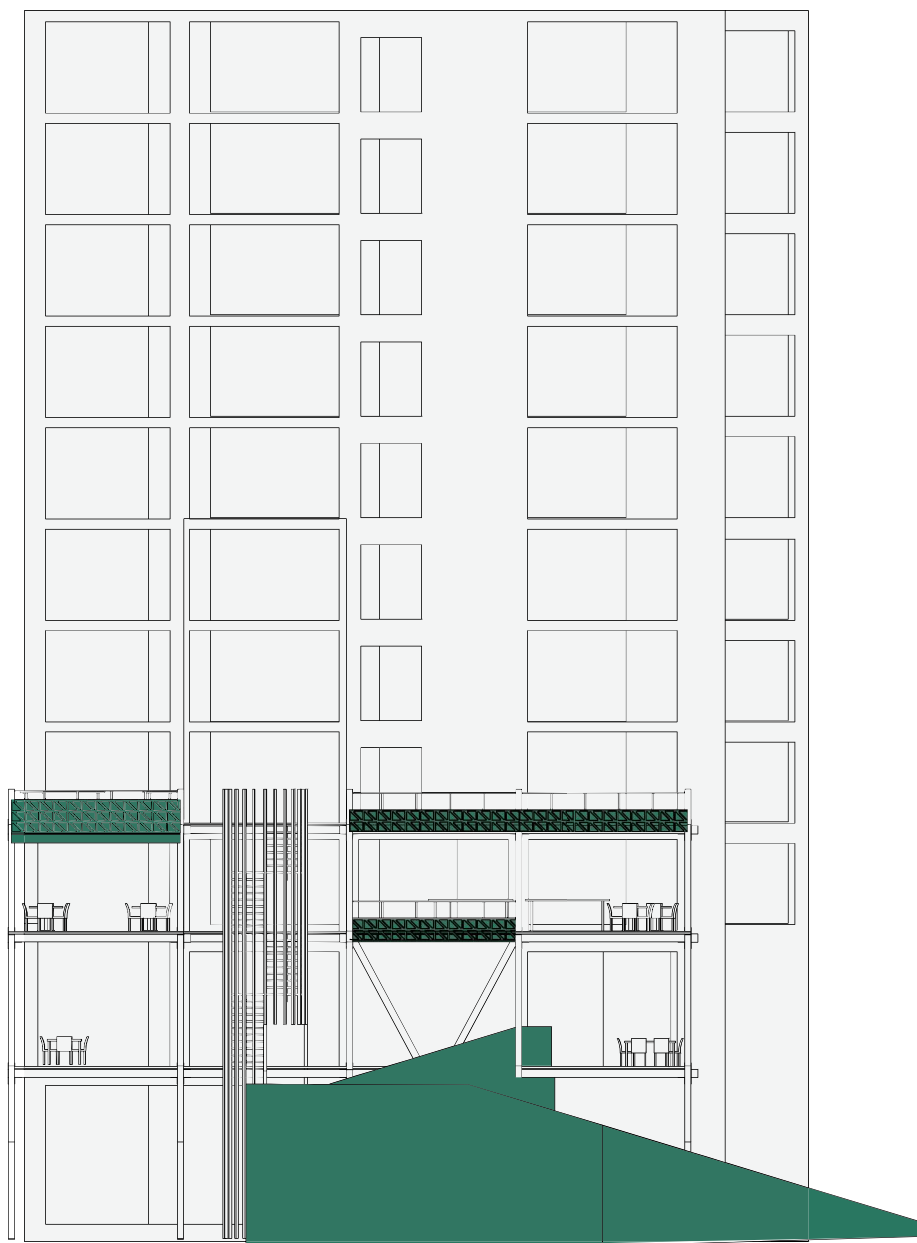
ansport and Access -Enviromental and Cultural Heritage -Opportunity and Prosperity

Embodied Carbon Reduction

ersity -Increase Sponginess of CBD -Green Corridors -Vertical Greenery Systems

Note. Figure 65: Client and shareholders feasibility diagram.

Programme Timeline

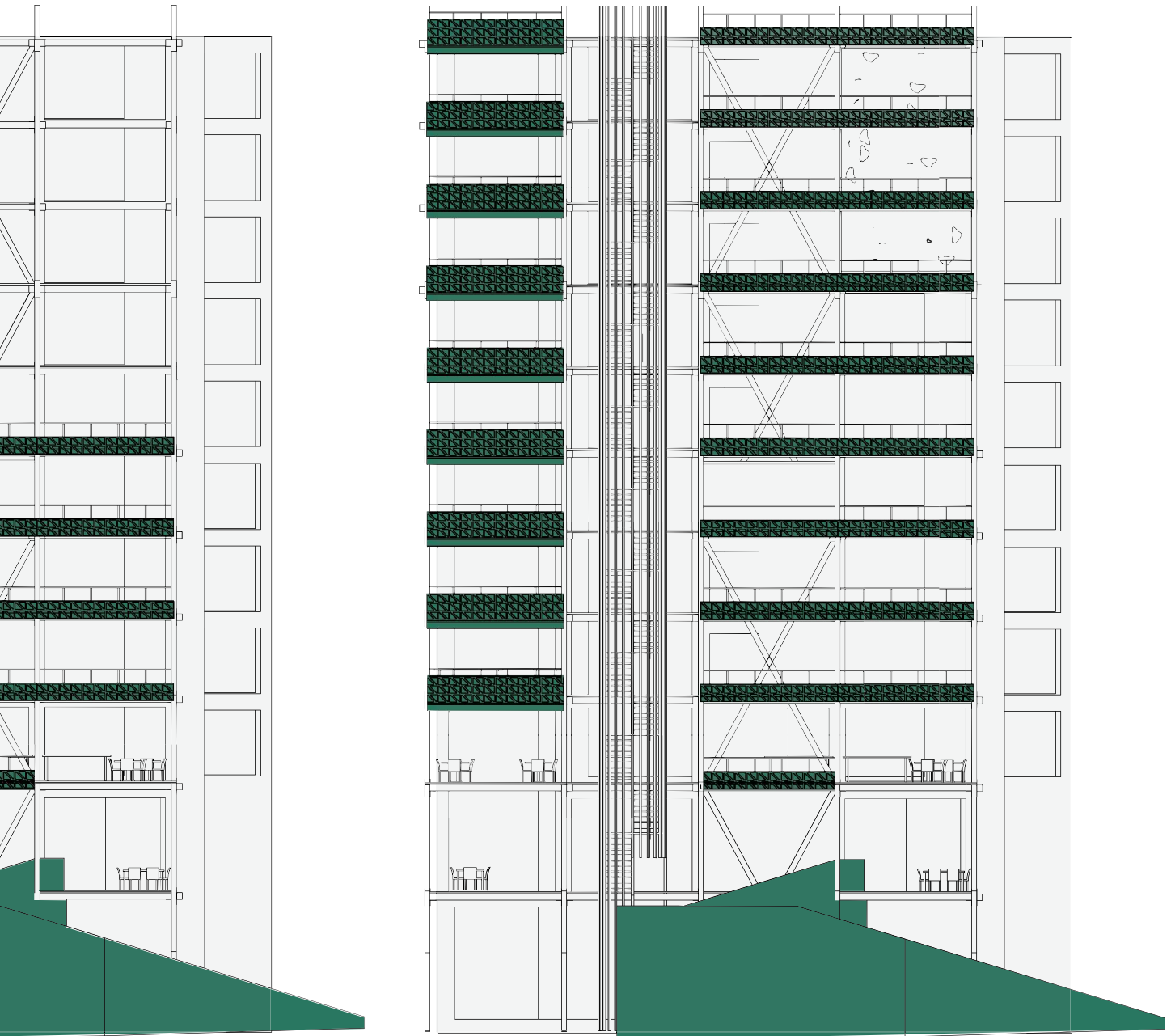


0-10 Years

- First two floors introduced
- Enhanced connection to streets
- Council provides financial support
- Increased retail & cafe spaces

25-50 Years

- Further floors added
- Connection from street to building
- Carbon & Biodiversity credits
- Improved residential spaces



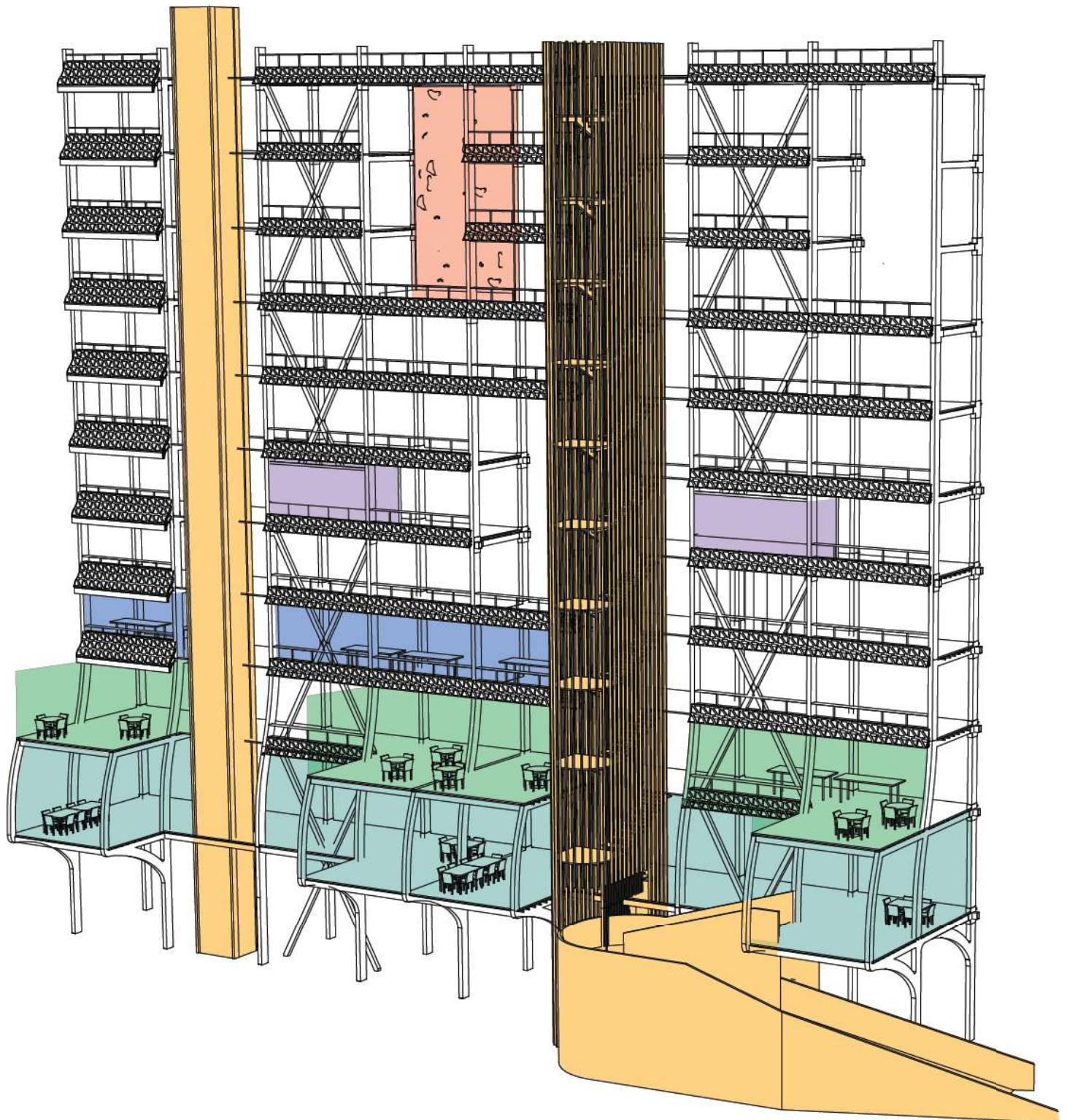
50 Years +

- Complete ecosystem street to roof
- Improved residential spaces
- Carbon & Biodiversity credits
- Increased retail spaces

roof
credits come through
es

Note. Figure 66: Kit of parts feasibility diagram.

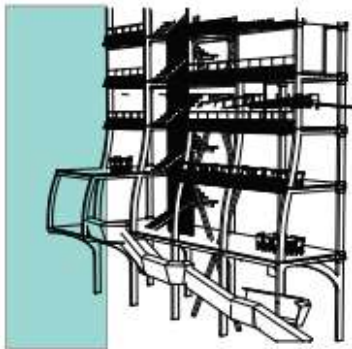
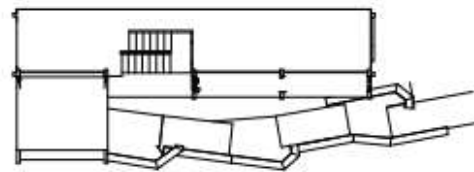
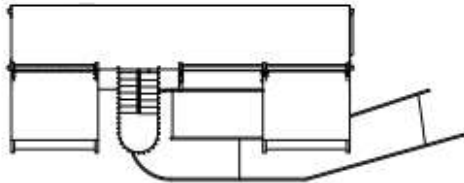
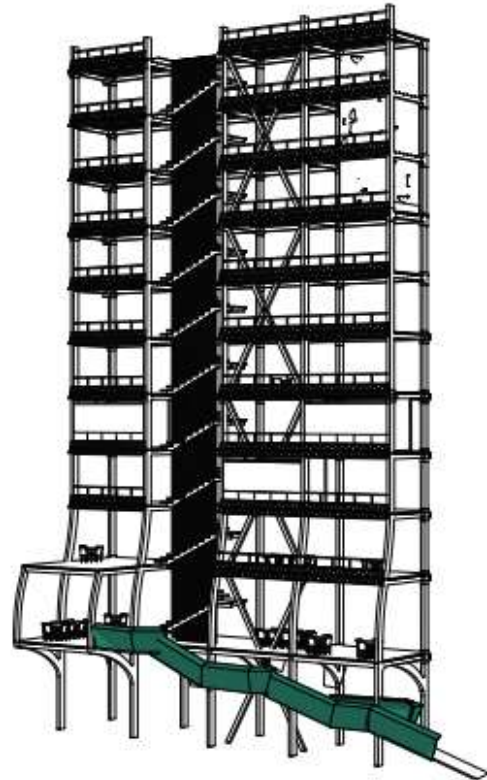
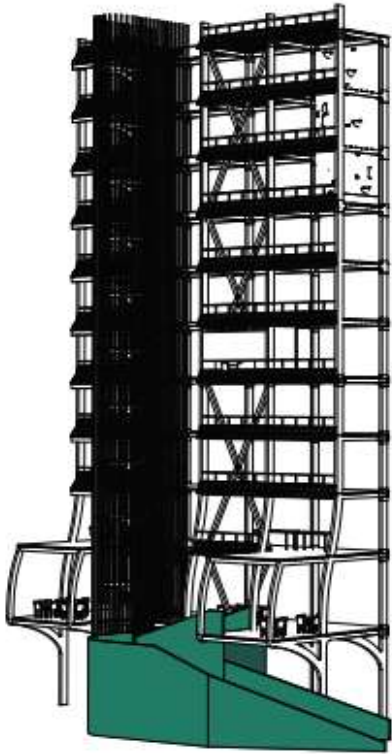
Programme



Note. Figure 68: Programme diagram.

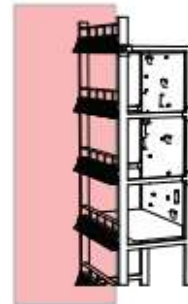
Figure 69: Programme elements.

Kit of Parts



Cafe & Retail spaces

- two main floors
- easy accessibility from street
- Cafes
- Restaurants
- Eco-conscious retail



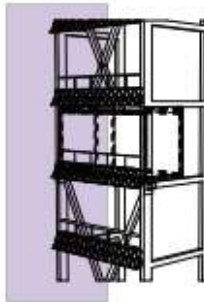
Climbing module

- Bookable cubicles
- WIFI, charging stations, toilets provided
- Glass framed for noise control



Market module

- Bookable spaces
- Furniture provided
- Strict hours for safety
- Access to building elevator



Office module

- Bookable cubicles
- WIFI, charging stations, toilets provided
- Glass framed for noise control



Yoga spaces

- Bookable spaces
- Canopy layer connection



Movement area

- Creates street to roof connection
- CPTED requirements
- Supported by internal lifts

Social improvements

The following social improvements were met through the design methodologies. These included improved safety of urban environments through engaged storefronts, engaged streetscapes and CPTED principles. The 15minute city concept is supported by increased retail amenities by improved shopping spaces. Walkability is improved through new wayfinding across a vertical streetscape, connecting different typologies through ramps, lifts and stairs in cool and covered spaces.

New vertical streetscapes provide opportunities to create a community connection through shared spaces and a neighbourhood environment. This community connection improves liveability of the city for most and creates resilience by connecting people, providing safety nets in times of need. These vertical spaces improve usable areas of city apartments and increase the value of the property by adding decks, or deck extensions, and surrounding green roofs.

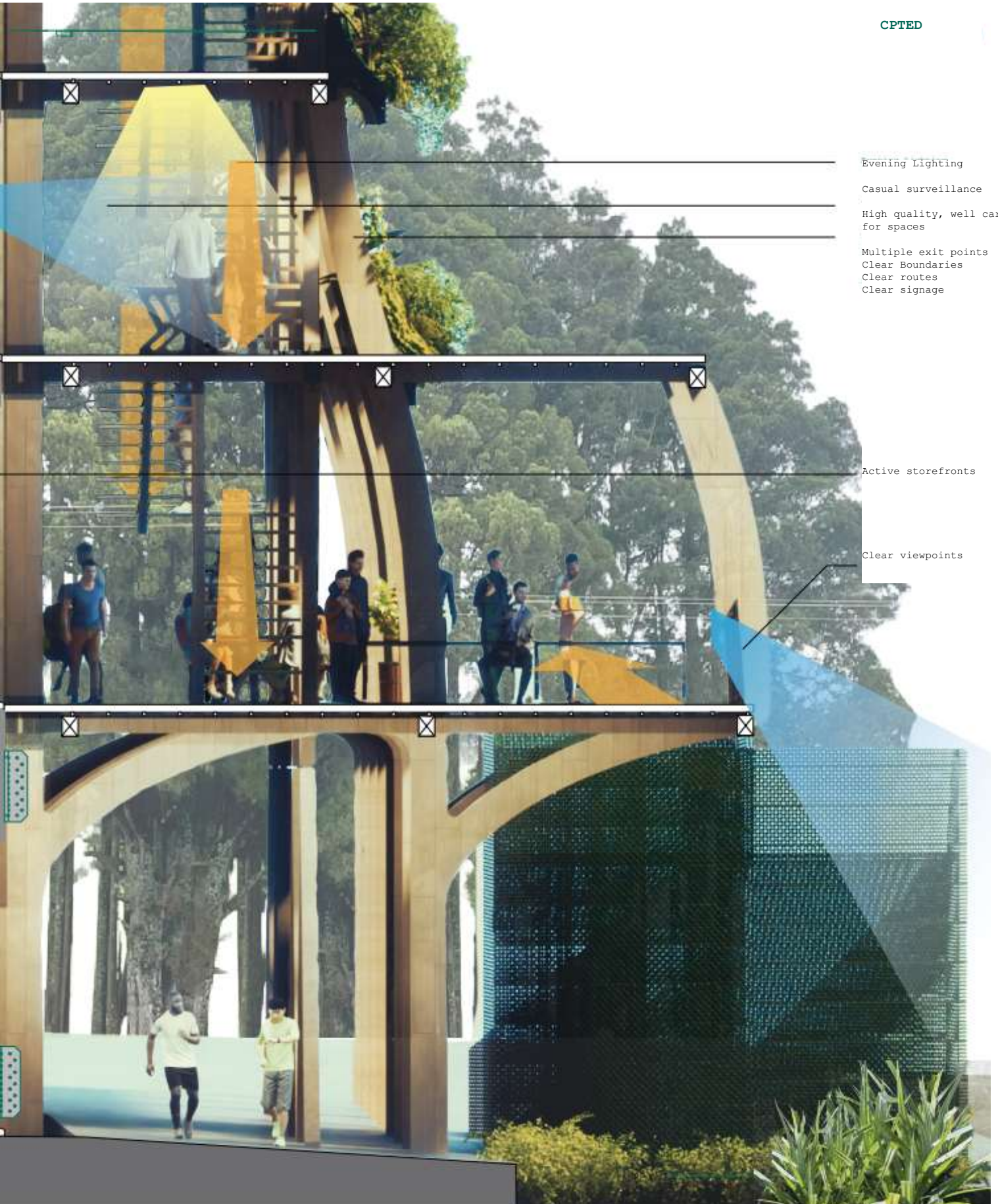
Crime Prevention through Environmental Design in New Zealand (CPTED)

CPTED focuses on security features built integrally into design to provide safety features to users. This is defined by seven qualities by our national guidelines.

1. Access: Safe movement and connections. Places with well-defined routes, spaces and entrances that provide for convenient and safe movement without compromising security.
2. Surveillance and sightlines: See and be seen. Places where all publicly accessible spaces are overlooked, and clear sightlines and good lighting provide maximum visibility.
3. Layout: Clear and logical orientation. Places laid out to discourage crime, enhance perception of safety and help orientation and wayfinding.
4. Activity mix: Eyes on the street. Places where the level of human activity is appropriate to the location and creates a reduced risk of crime and a sense of safety at all times by promoting a compatible mix of uses and increased use of public spaces.
5. Sense of ownership: Showing a space is cared for. Places that promote a sense of ownership, respect, territorial responsibility and community.
6. Quality environments: Well designed, managed and maintained environments. Places that provide a quality environment and are designed with management and maintenance in mind, to discourage crime and promote community safety in the present and the future.
7. Physical protection: Using active security measures.

(MOJ, 2005)

CPTED



Evening Lighting
Casual surveillance
High quality, well cared for spaces
Multiple exit points
Clear Boundaries
Clear routes
Clear signage

Active storefronts

Clear viewpoints

Note. Figure 70: CPTED elements diagram.

Response to Research Question

Saving Face is a test of how facade adaptations could be used to improve liveability of Auckland City while reducing the city's impact on climate change. This was met by an architectural response, combining elements of built and natural environments to enhance the existing built environments, through a carbon negative kit of parts. The inclusion of new exterior spaces allows for passive design strategies, such as solar shading, to be applied to reduce the need for air-conditioning and heating, meeting requirements of aim's one and five. Through native planting the project further filters air and reduces road noise to improve liveability of these spaces.

Key aims and objectives were met by the creation of a new vertical streetscape with human amenity populating these new spaces. These properties, alongside passive safety features through the CPTED principles, change the relationship between city residents, allowing for greater human interactions as they engage with the spaces. This then starts to create community groups across the building as relationships are formed, creating greater community resilience and improving social growth. This growth meets aim two, creating new vertical neighbourhoods in response to the Auckland 2012 and 2050 plans.

Saving Face integrates elements from the Urban Ngahere plan to allow for a reduction in Heat Island Effect by vertical greening. By increasing foliage in the city less solar energy is stored in large thermal masses of reflected into the city, reducing overall temperatures. Selection of native planting across this new vertical ecology and a reintroduction on the WF11 ecology along Queen Street. Rejuvenating past ecosystems and improving ecological complexity within our cities meets elements defined in aim three. Auckland Plan elements were met by an improvement in built environment and a reduction in embodied and functional carbon footprint through carbon negative building materials and passive design strategies.

To provide safety for occupants Saving Face also provides seismic resilience, supporting our current built environment by providing a structure which can remain standing during seismic activity. This allows easy movement of residents out of their building and down onto the street. The solid deck spaces and high planter boxes stop any material from falling onto residents or onto the street, further reducing risks and meeting design aim four.

Chapter Seven: Conclusion



Note. Figure 71: Render Saving Face & Queen Street interaction.

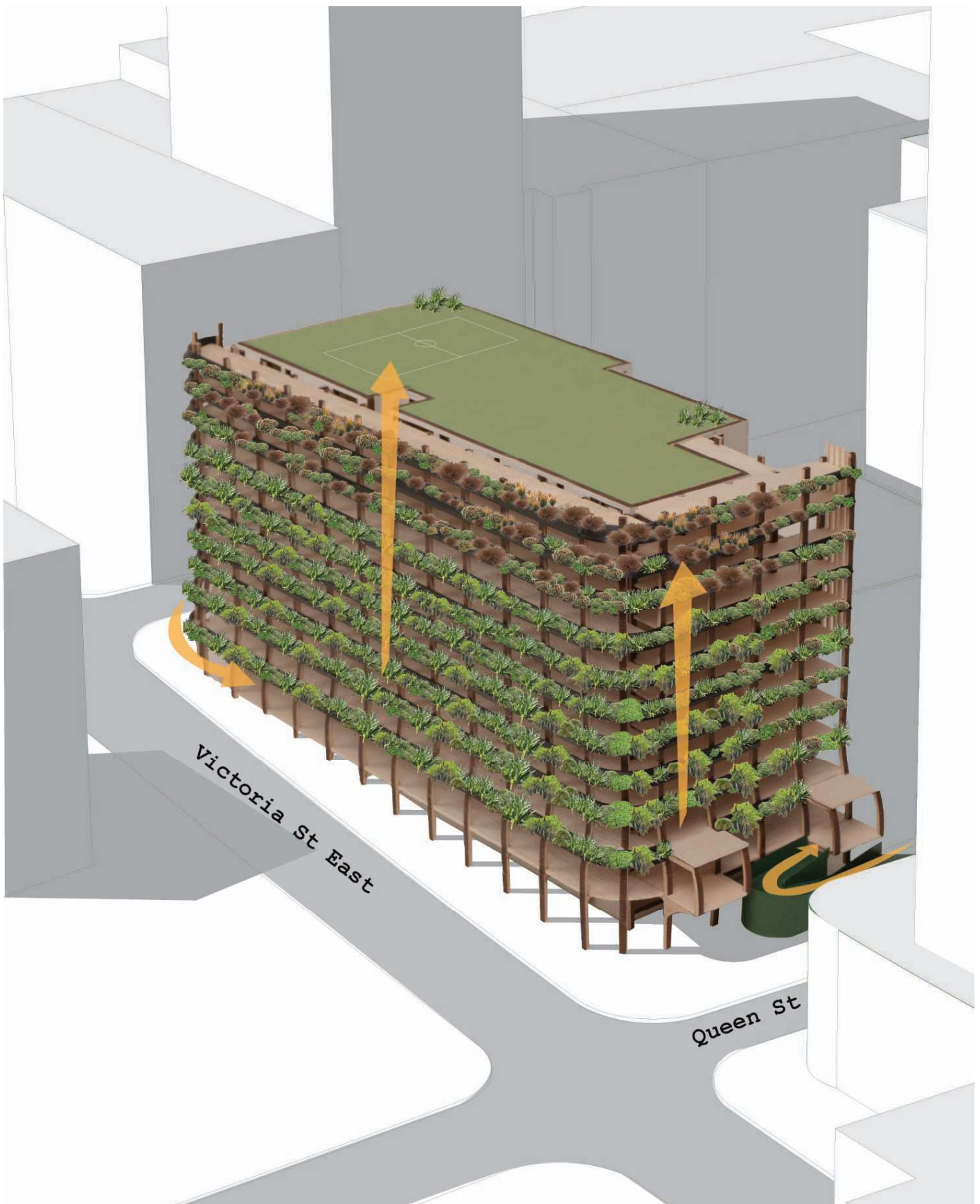
Saving Face provides a bold, but feasible redefined image of Auckland's CBD through the application of a new vertical streetscape which integrates ecological and social functions. Modular clip-on wooden structures provide new amenities to existing buildings through social and retail programme elements, allowing new social connections across the vertical face of the building. This enables space for the regrowth of communities within the CBD. The inclusion of vertical greenery, which is becoming prevalent across cities such as Singapore, creates a new holistic urban and ecological environment to reintroduce complex ecosystems appropriate to the Auckland isthmus. This holistic design language benefits our present and future by improving city environments and reducing our impacts on climate change.

This new design method could be applied within an Auckland context within the next decade if supported by Auckland Council. To achieve the required code changes to allow this new epiphytic architecture, Saving Face aligns itself with specific Auckland and global plans to demonstrate the gains available through the application of the project. With initial Council approval and financial support, the programme can grow across Auckland, creating a new appropriate urban imagery to support the natural imagery of our country.

Saving Face is an example of an architectural solution to enhance the liveability and climate responsiveness of our intensive built environment, working off case studies of projects across the world and providing an Aotearoa-specific solution. Further research and design work would be required to make this achievable with support from ecological, city planning and architectural experts. Testing of native plants in the harsh urban environments would ensure the project works as envisioned. A limitation of the design work was the computing power accessible to run simulations through the Grasshopper programme, which provided only rough solar shading output. Further solar gain testing would also ensure the design provided maximum passive gains.

I see this architectural solution as an answer to the future of our cities as the project is demonstrated within this work, or as a catalyst for future urban ecological design. This project provides a bold solution and demonstrates it in a feasible way, asking questions about a future with connected urban architecture, as a challenge to our current individual collection of buildings.

Final Presentation Images



Note. Figure 72: Contextualised model photo of *Saving Face*

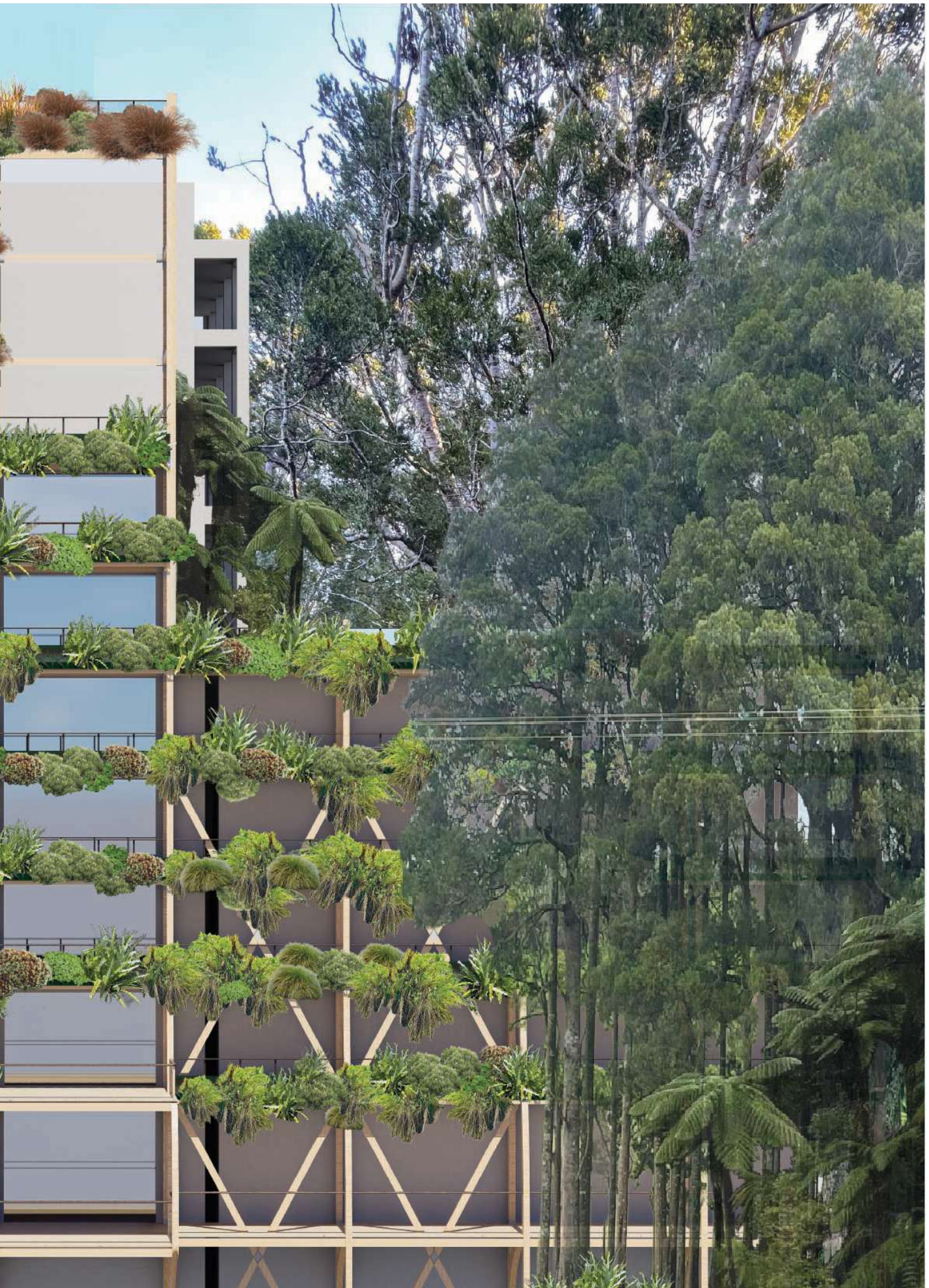


Note. Figure 73: Render interior to deck flow.

Figure 74: Rendered model image of *Saving Face*.

Timeline

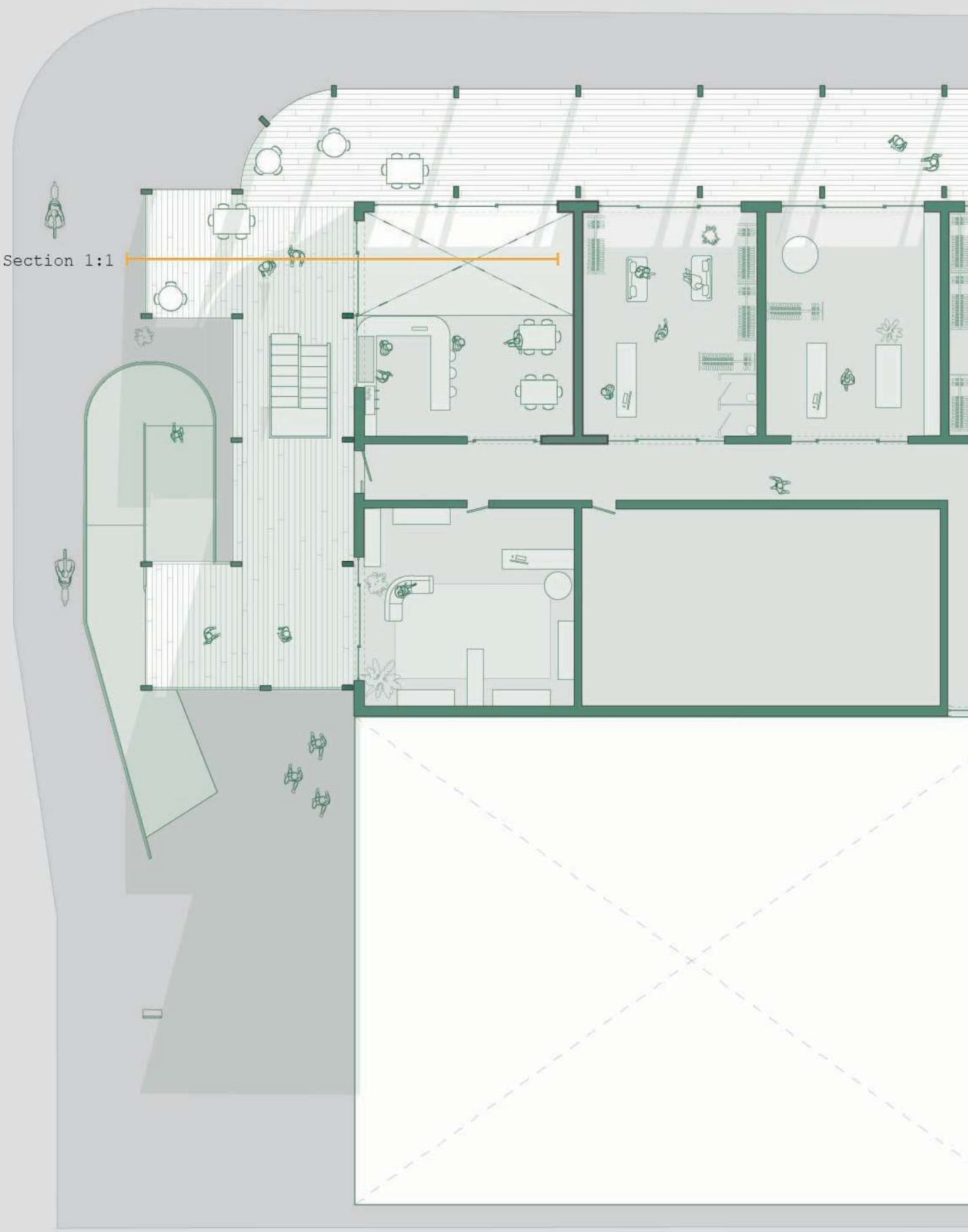


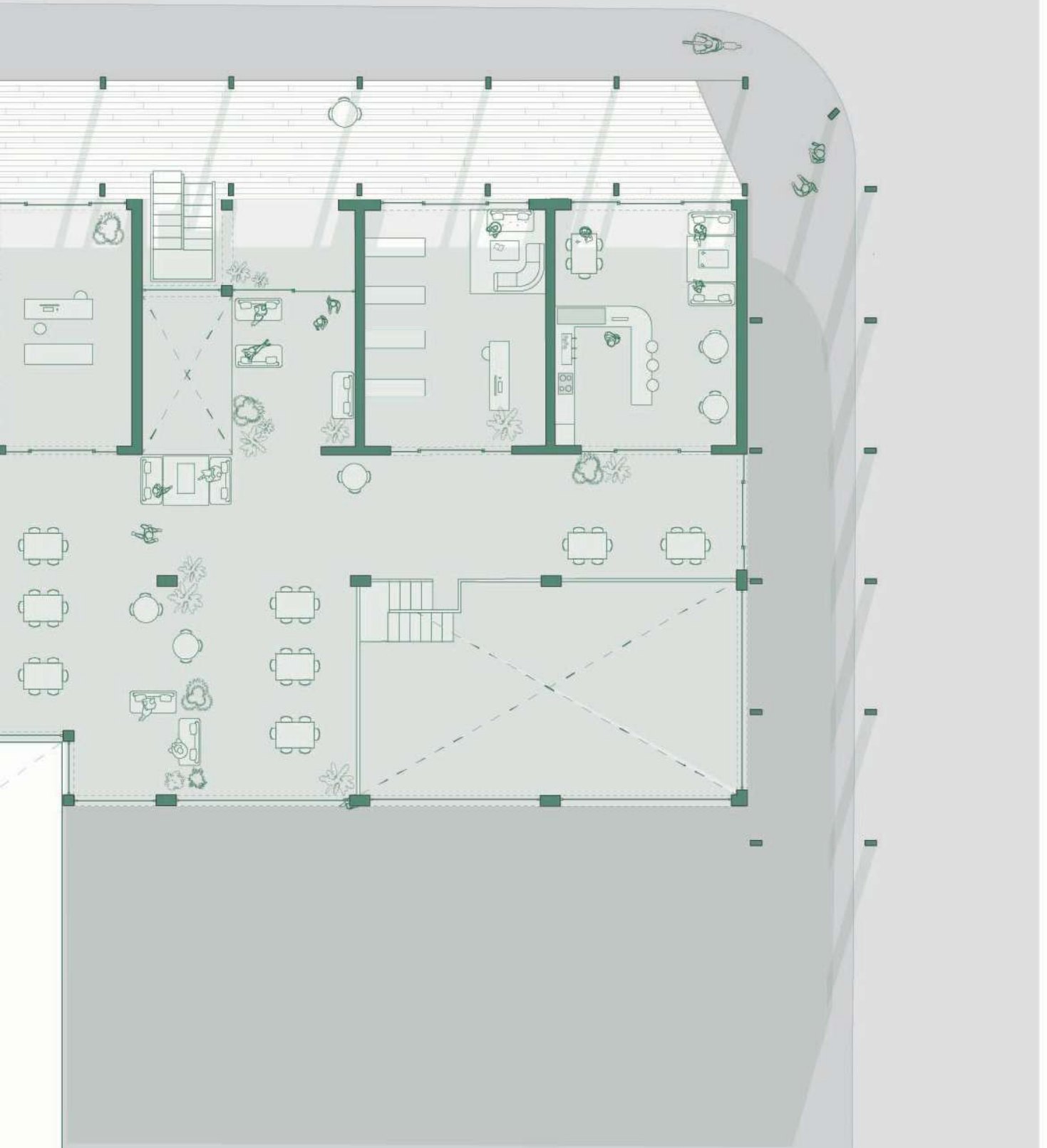


Note. Figure 75: Hero timeline image depicting ecological regeneration along Queen St.



Section 1:1





Plan: 2nd Floor

Saving Face - Inhabitation Plan

1:100

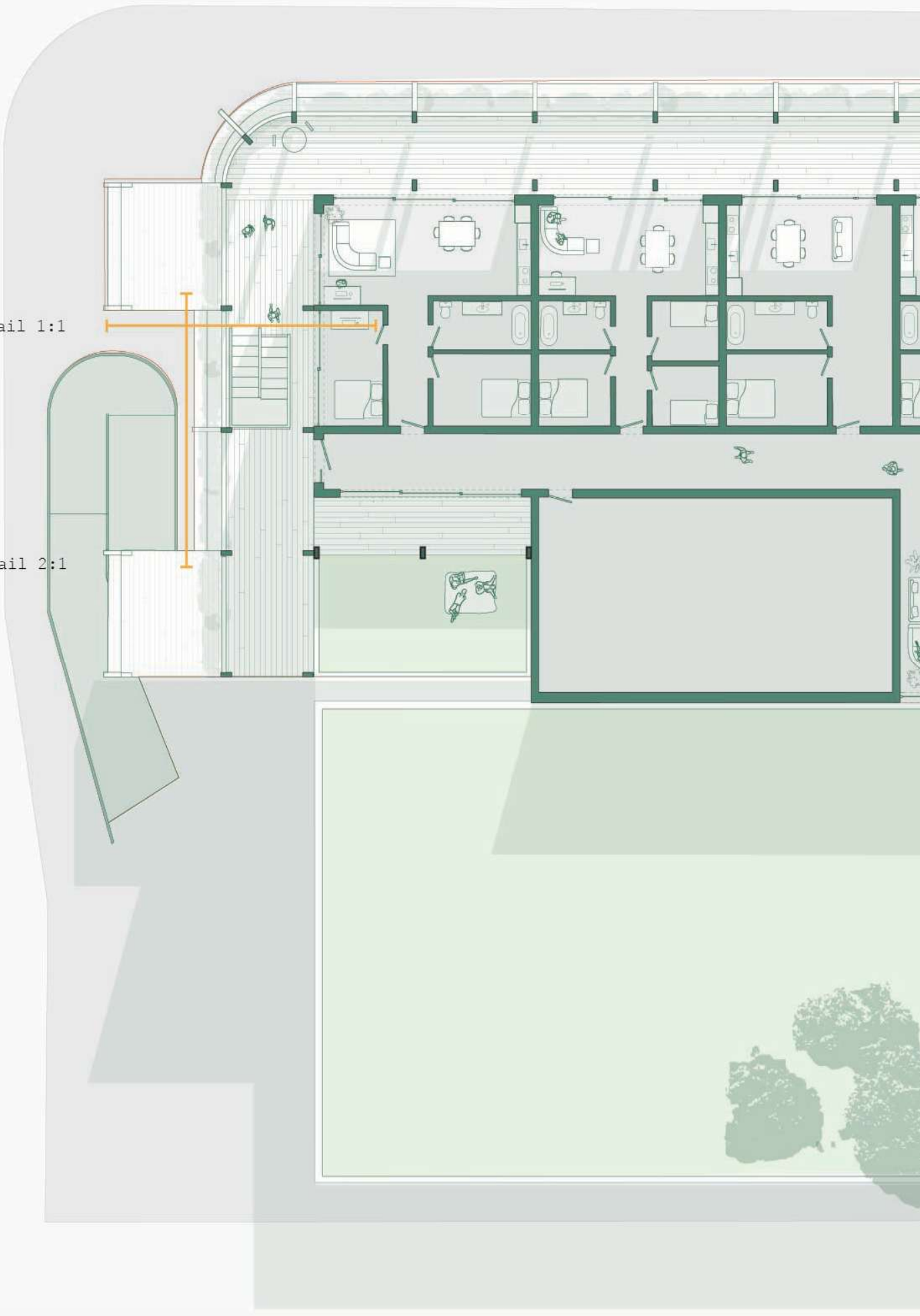
0m 1m 5m 10m

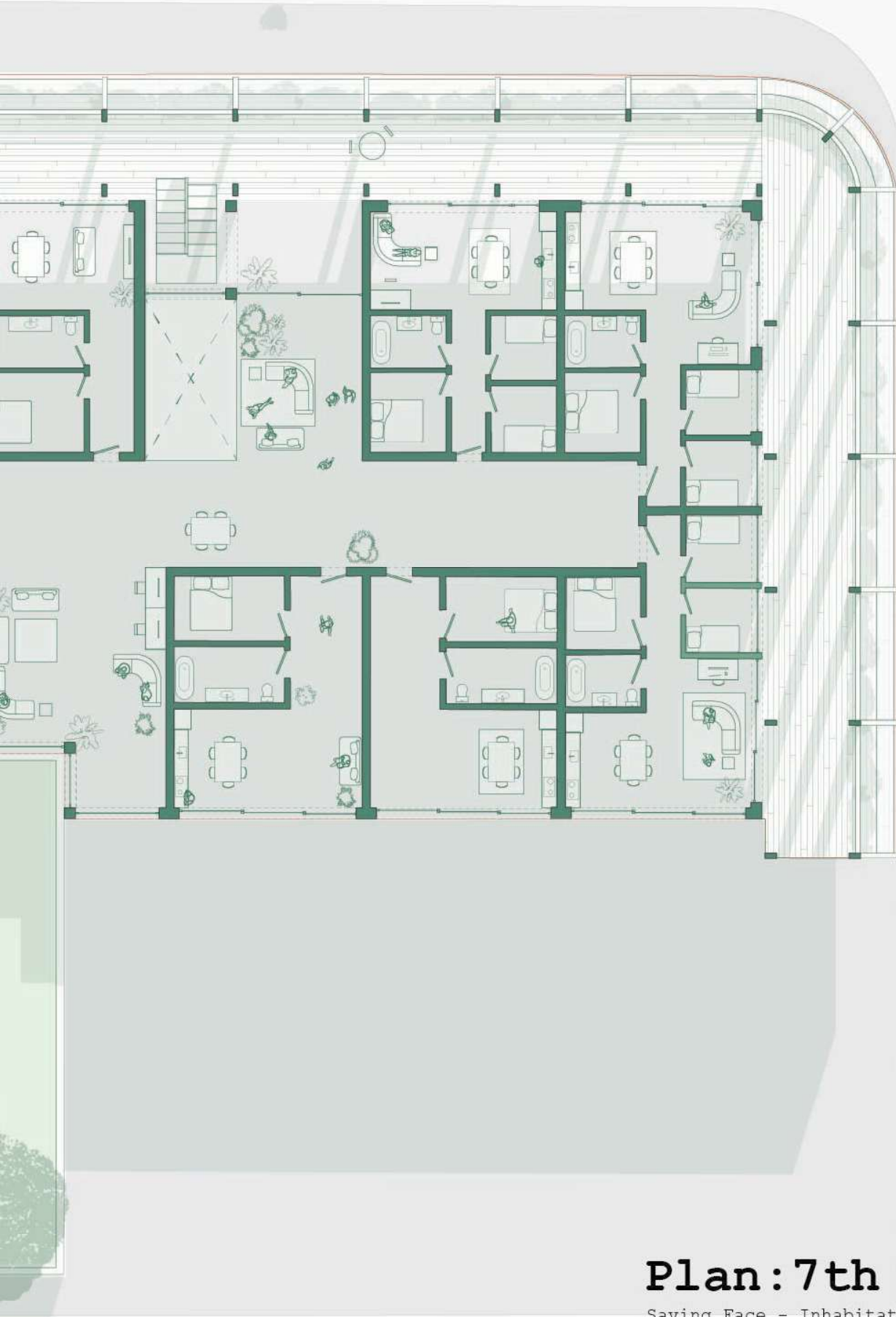
Note. Figure 76: Plan 2nd floor *Saving Face*.



Detail 1:1

Detail 2:1





Plan: 7th Floor

Saving Face - Inhabitation Plan

1:100

0m 1m 5m 10m

Note. Figure 77: Plan 7th floor *Saving Face*.

Detail 1.1

Saving Face - Building
Connection Detail

15mm Bolt GLV- 2mm Steel Washer
80mm Concrete Anchor GLV

15mm Bolt Coach Head GLV-
2mm Rubber Washer
60mm Wood Screw GLV

Steel Frame Anchor- 15mm Steel Plate GLV

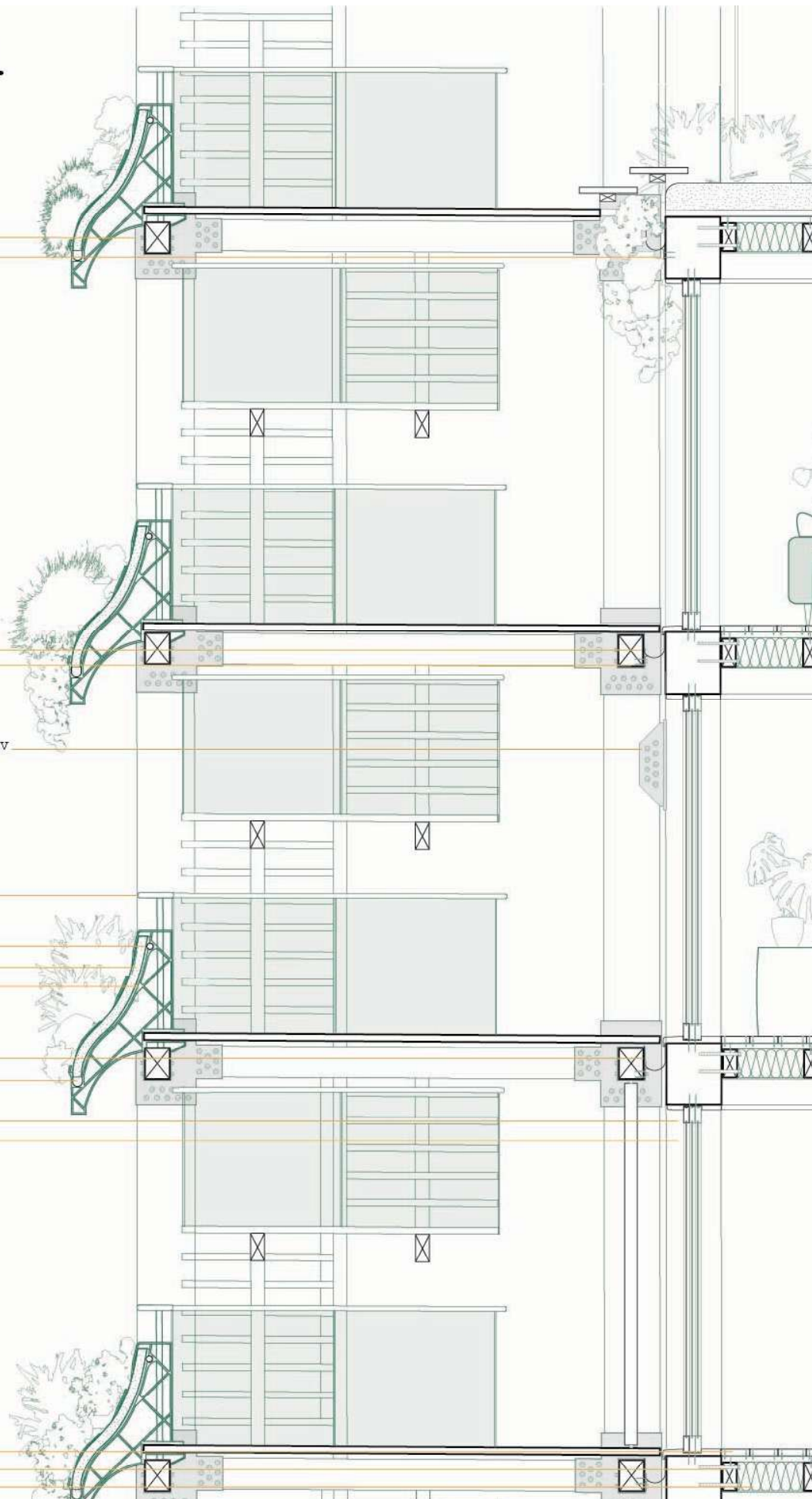
40mm Recycled Kauri Railing

45mm Pipe- Hydroponic Input
70mm Coconut Coir Planting Medium
10mm Recycled Plastic

2mm PVC Gutter
2mm PVC Gutter

45mm Wooden Window Frame
Double Glazed Windows

50mm Wooden Flooring
10mmx200mm Wooden Framing
200mm Solid Insulation





Note. Figure 78: Detail 1.1 focusing on connections between building and *Saving Face*, including planting and gutter elements. Cosmo Bloor

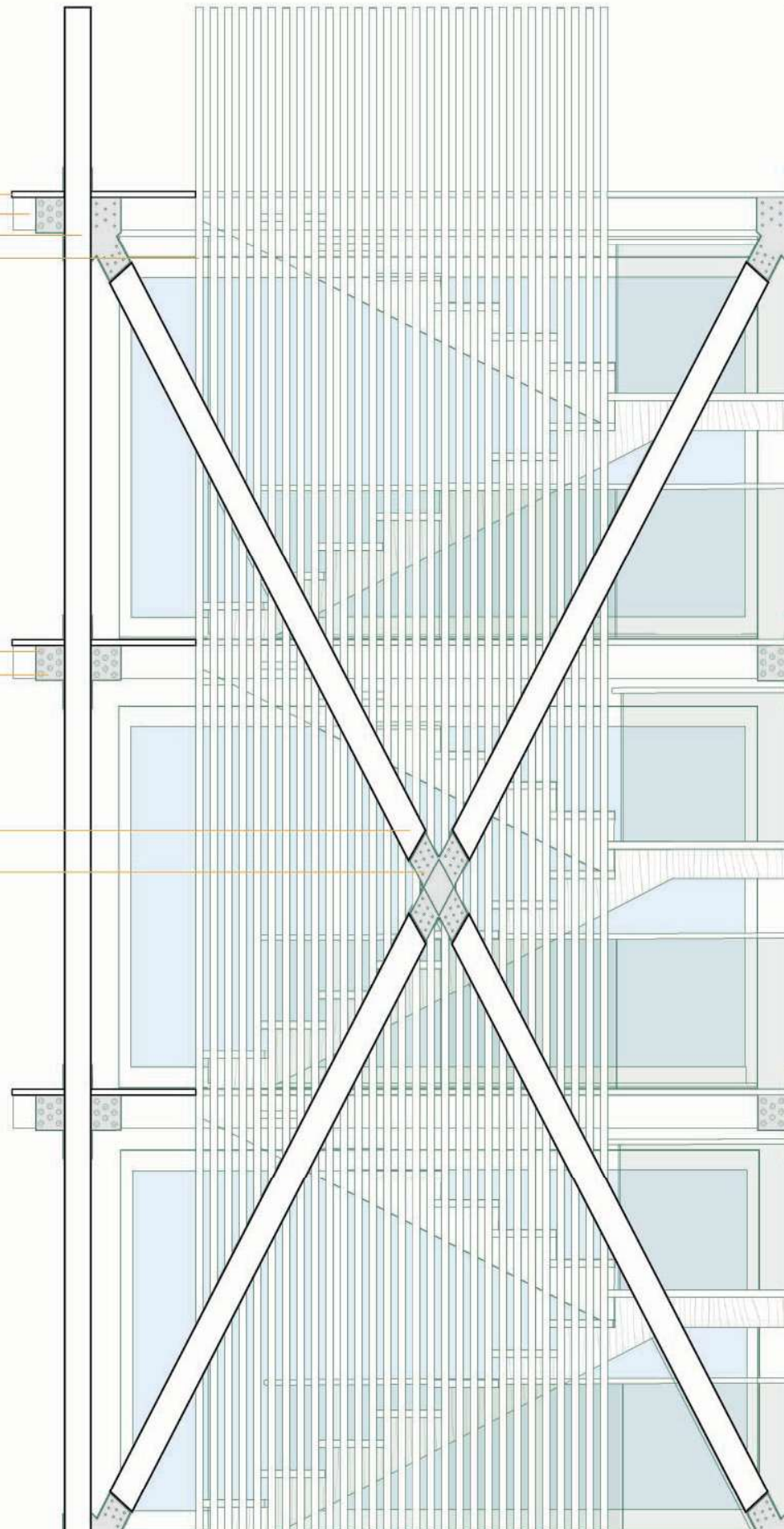
Detail 2.1

Saving Face - Framing Detail

50mm Wooden Flooring
200x150mm LVL Beam
200x400mm LVL Post
50x50mm Wooden Baton

15mm Bolt GLV- 2mm Steel Washer
Steel Joint- 8mm Steel Plate GLV

200x400mm LVL Cross Bracing Post
Steel Joint- 15mm Steel Plate GLV





Note. Figure 79: Detail 1.1 focusing on structural wooden elements of *Saving Face*.

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AI was used in this document for help with structure and spelling through ChatGPT, Word and Scholarly as well as Mendeley for referencing. AI was not used for generation of any design or written material.

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