

The RuraLift Project

by Daniella Oosthuizen 2013002650

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This dissertation is submitted in partial fulfilment of the requirements for the degree M. Arch. (Prof).

Declaration of authorship:
The work contained in this dissertation has not been previously submitted to meet the requirements for a qualification at this or any other institution of higher education.
To the best of my knowledge, this dissertation contains no material previously published or written by any other person except where due reference is made.

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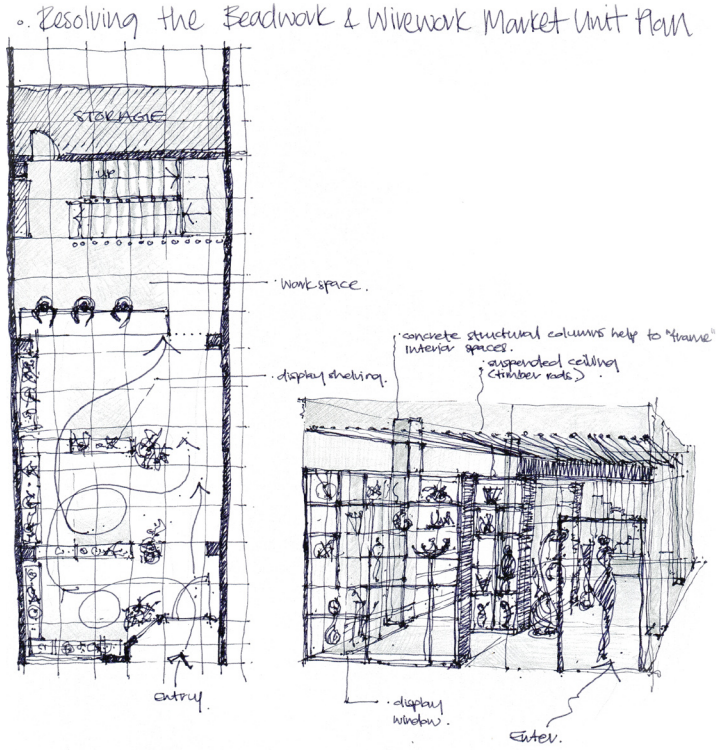



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I would like to thank my loving and devoted parents, Johan and Jocelyn Oosthuizen, for having supported me through the extraordinary times of 2020. Writing an architectural thesis under pandemic conditions proved to be an extremely stressful and uncertain experience – they ensured that I felt as calm and comfortable as possible throughout the lockdown period.

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To my friends and colleagues – I am most grateful for all the love and support they gave when I was far from home – I would not have enjoyed this process as fully as I did, without them by my side.

This thesis was a labour of love and a journey of self-discovery during which I found my passion for community and agricultural development within the framework of architecture.

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The RuraLift Project

Introduction

Project Rationale

The essence of this project revolves around the development and architectural interpretation of the well-known proverb:

"Give a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime"

The original influence of this proverb came from the 12th century Spanish philosopher, Maimonides, who was investigating The Eight Degrees of the Duty of Charity. In 1826, the eighth degree of charity was discussed in his journal, The Religious Intelligencer (Quote Investigator, 2020: online);

"Lastly, the eighth and most meritorious of all, is to anticipate charity by preventing poverty, namely, to assist the reduced brother, either by a considerable gift or loan of money, or by teaching him a trade,…" -Maimonides, 1826 ("The Religious Intelligencer").





Figure 1

Figure 1: Map of South Africa depicting the location of Cathcart on the N6 route from the Eastern Cape to the Free State (Oosthuizen, 2020: own illustration).

In 1885, the author of the novel “Mrs Dymond” - Anne Isabella Thackeray Ritchie – wrote a modern adaptation of the concept (Quote Investigator, 2020: online);

“He certainly doesn’t practise his precepts, but I suppose the Patron meant that if you give a man a fish he is hungry again in an hour. If you teach him to catch a fish you do him a good turn.” (Thackeray Ritchie, 1885).

It was from this quote in “Mrs Dymond” that new translations formed over the following years.

Given that the *RuraLift Project* design incorporates aquaponic agriculture – where fish are the vital organ of the system – the opportunity to further develop the aforementioned proverb, presented itself, creating the following adaptation to the second half of this proverb;

‘Teach him to use the fish industriously, and he will feed himself and his community’

Based on this personal adaptation, the proposed project will be developed to investigate the possible ways that an architectural intervention could catalyse, support, and maximise the sustainable cultivation of food in underprivileged communities.

In addition, the incorporation of the Shoprite Checkers (Pty) Ltd and Small Enterprise Finance Agency initiatives to empower black South Africans , will push the project towards the encouragement of food security, economic stability, and tourism activity, while promoting de-urbanization and the economic upliftment of economically disadvantaged areas. This in turn will provide locals access to goods priced similarly to those in larger centres.

Design Proposal

The RuraLift Project proposes the establishment of a micro-mall and aquaponic fresh produce supplier, at the Southern entrance to the town of Cathcart in the Eastern Cape Province of South Africa, shown in *Figure 1*. This centre would form part of a potential network of several other similar centres - all located alongside the main trucking routes through smaller settlements, making them easily accessible to delivery trucks.

The proposed Aquaponic Micro-Mall will focus on job-creation and aquaponic agriculture.

A ‘mini-Checkers’ branch will act as a retail anchor on the Southern side of the centre, selling basic household supplies and food items which will not be sold by any of the local traders in the market space.

A restaurant offering traditional dishes will act as a second retail anchor on the Northern side of the centre, to encourage lingering pedestrian activity and tourism, for the benefit of the other market stores run by locals from the neighbouring settlement.

These local entrepreneurs could team up with other members of their community who wish to produce and trade their craftwork in the same area such as wirework, beadwork, pottery, and so on. These entrepreneurs could approach the micro-mall management team to rent a retail unit for their trade. Should these groups collectively not have enough funds to spearhead their businesses, they could be advised by the management team to approach the Small Enterprise Development Agency (SEDA), or the Finance for Small Businesses Agency, with a business plan, to obtain funding.



As part of the proposed planning of the site, public gathering spaces could also provide buffering zones by using planted areas. These planted areas will thus have a dual purpose; to buffer noise, and create a continuity of the surrounding natural landscape.

One of the primary goals of this design is to uphold and promote sustainability. Solar panelling generating solar energy, and rainwater tanks for water conservation are therefore incorporated into the economical design of the centre.

Research Methodology

The research for this project focusses on global concerns regarding food security, the implications of food scarcity, and why the lack of food availability justifies a need for innovative solutions, such as aquaponics.

A comprehensive understanding of aquaponics is imperative to inform the design process in terms of area and spatial requirements, together with other design detailing which benefits the feasibility of the system.

Other important aspects of research addressed include, spatial preferences that are influenced by the dominant Xhosa culture in the surrounding area, and tourism. In addition, certain insights regarding the Xhosa culture draw attention towards their local arts and crafts. The public spaces, the approach to light, and the materiality of the design, portrays the craft sensibility of the Xhosa people.

Research Question

In which ways can an architectural intervention catalyse, support, and maximise the sustainable cultivation of food in underprivileged communities?

Theoretical Aims and Focus

The theoretical chapter responds to the research question, by studying the importance of food security.

The Shoprite Checkers small business empowerment programme is then expanded on, to explain the logic behind its involvement in the project.

A discussion of aquaponics follows, where the agricultural method is broken down, and explained. This description of the method explains its selection, as a suitable resolution for food insecurity. As the chapter unfolds, the influences of culture and arts and crafts on architecture are discussed.

Upon gaining a deeper understanding of these aspects, the discourse finally turns to the topic of the local architecture, arts, and crafts, where the design and materiality begin to take shape. Aquaponics serves as the dissertation catalyst, where the main objective is the empowerment of the community and its wellness; ultimately aiming to create an architecture of opportunity.

Client and Users

This centre aims to attract tourists, and provide employment for the locals, while supplying fresh produce from the aquaponics wing to the major branches of Checkers.

On their way between major branches, the Checkers trucks could unload the ordered goods to stock the micro Checkers store. The space now available on the trucks, could then be used to convey the fresh aquaponics produce, as well as any other produce, manufactured under contract with Checkers, in the satellite kiosks managed/owned by the locals. This process will be explained in greater depth in Part 2 of this document.





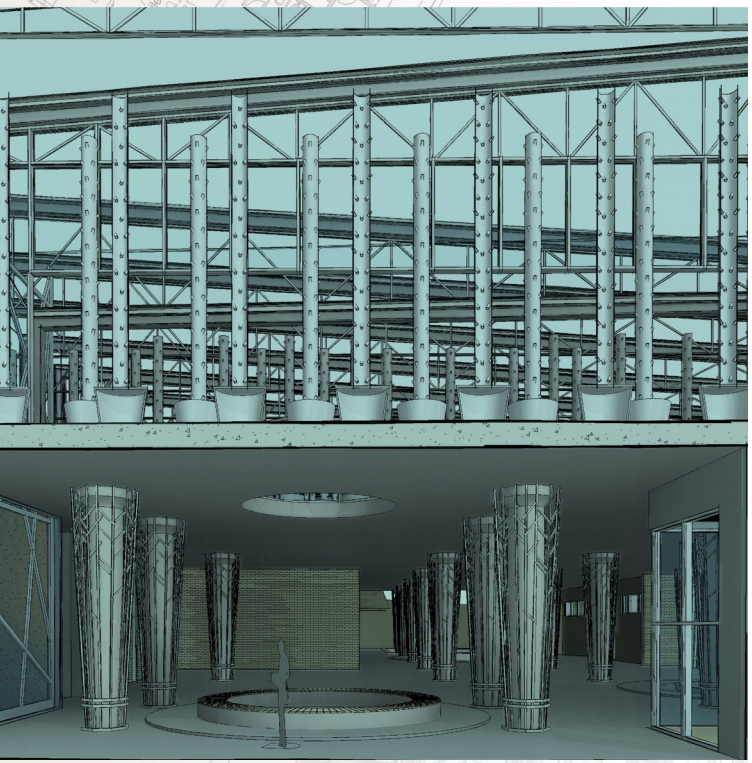





YITIA TRADING SUPERMARKET
TAMESTOWN









Part ONE

Site and Contextual Investigation

"One of the great beauties of architecture is that each time, it is like life starting all over again." - Renzo Piano

Macro Analysis

Site Location and Context

The chosen site is located just outside Cathcart, in the Eastern Cape province (South Africa) - shown in *Figure 2* and *Figure 3* - adjacent to an expanding, previously marginalised settlement known as Rocklands (*Figure 4*). The Rocklands community experiences a high rate of unemployment with few economic opportunities.

Cathcart, like many other small towns, relies primarily on agriculture and forestry to sustain its economy, which is why it could serve as a suitable platform for the *Ruralift Project*. This town is one of a few towns that interrupt the main route between the cities of Bloemfontein and East London. Travelling south on the N6, the site is located on the left, (*Figure 5*), making it easily accessible to



Figure 2



Figure 3

Figure 2: Map of South Africa depicting the location of Cathcart on the N6 route from the Eastern Cape to the Free State (Author, 2020: own illustration).

Figure 3: Map of Cathcart depicting the location of the site on the N6 route (Author, 2020: own illustration).

Figure 4: Map of Cathcart depicting the location of the site relative to the Rocklands settlement and town layout (Author, 2020: own illustration).

Figure 5: Map of Cathcart depicting the location of the site relative to the surrounding streets, plots and N6 (Author, 2020: own illustration).

goods vehicle traffic.

Checkers goods trucks travel along this route between these cities for deliveries to their various branches. This creates the opportunity to introduce the concept of ‘mini-Checkers’ stores in small towns, such as Cathcart.

These stores could serve as stops for the Checkers trucks to deliver supplies, simultaneosly collecting freshly packaged produce from the aquaponics branches as well as other goods produced by the locals. These goods could in turn, be transported to supply the Checkers outlets in the larger cities.

It is envisioned that the mini-Checkers will be administered as a community-private sector partnership in which both the locals and Checkers mutually benefit. Checkers is renowned for its enthusiasm to empower small businesses, as evident in their highly successful small enterprise funding and development programmes. The intention is to create substantial economic growth that would have minimal disruptive effect on spaza shops.



Figure 4



Figure 5



Figure 6



Figure 7

Climate

The town of Cathcart is situated 1164m above sea level with an overall warm and temperate climate (*Figure 6* and *Figure 7*) and significant rainfall throughout both the driest and wettest months of the year, which allows for the incorporation of landscaping and planting around the building.

The maximum temperature does not exceed 25.9°C in the summer months, and the minimum temperature does not reach below 3.3°C in the winter season (AM Online Projects – Merkel, A: online).

Although in an overall temperate climate, the design will need to focus on insulation and counteracting the heat or cold through the use of higher ceilings, and timber flooring, respectively.

Micro-Analysis

Analysing the Site

The Cathcart site RE/468 is situated on the outskirts of the town, between the expanding Rocklands settlement (*Figure 8*), and the farmland areas. The aim is to use this site and the proposed design, as a catalyst for urban renewal, empowering the less privileged groups while complementing the landscape.

The proposed *RuraLift Project* design morphology and material use draws from the Rocklands settlement shelters (*Figure 9*) in order to make the building more relatable to the local inhabitants.

Figure 6: Photograph of the rainy and misty conditions of the Cathcart area (Oosthuizen, 2020: own photograph).

Figure 7: Photograph of early morning mist dispersed over the Cathcart landscape. (Oosthuizen, 2020: own photograph).

Figure 8: Photograph of part of the neighbouring Rocklands settlement (Oosthuizen, 2020: own photo).



Figure 8

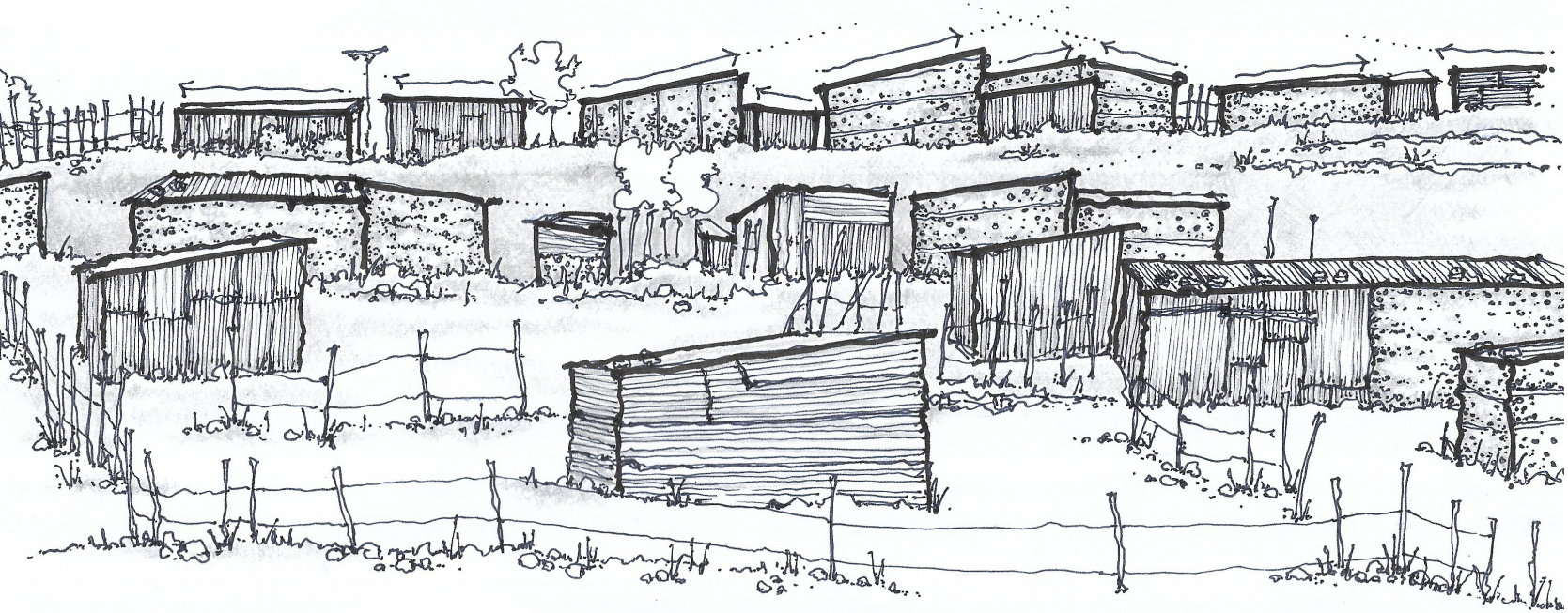


Figure 9

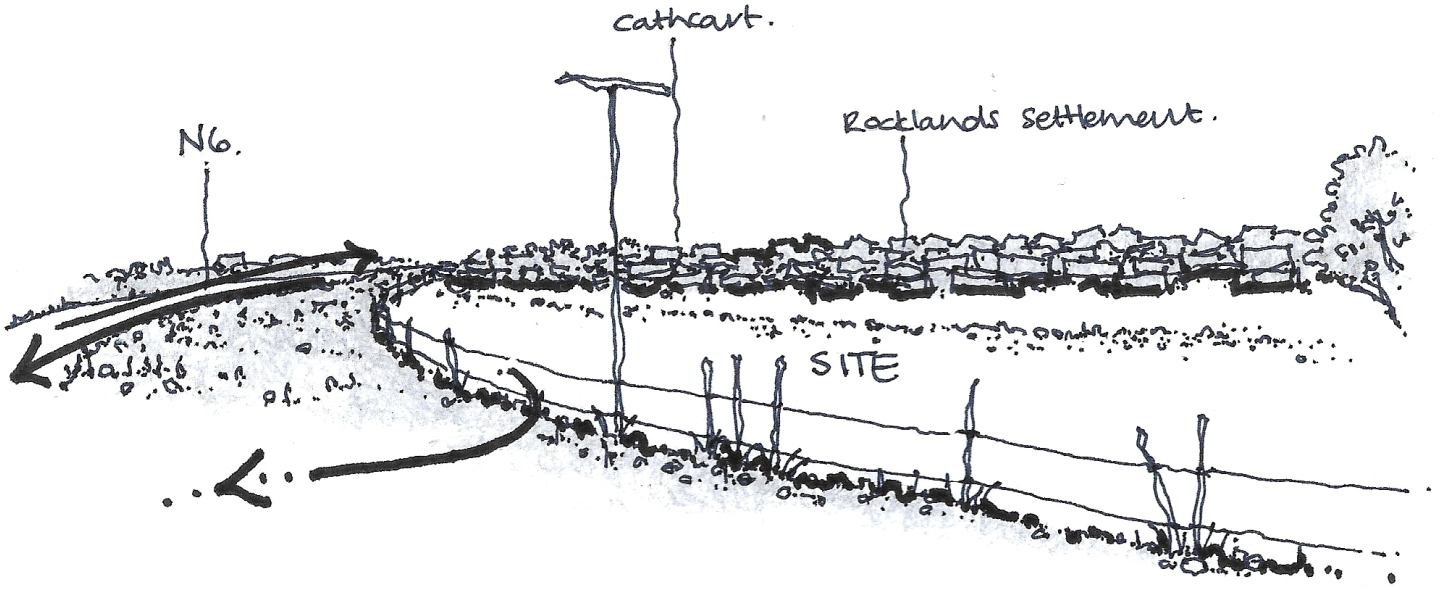


Figure 10

Figure 9: Analytical sketch of the Rocklands settlement shelters – the irregular angles of the shelter roofs, as well as the textural contrasts, inspired the morphological and material decisions in the proposed design (Author, 2020: own illustration).

Figure 10: Analytical sketch of the Rocklands settlement location relative to the site and N6 (Author, 2020: own illustration).

Figure 11: Analytical sketch of the accessibility of the proposed site (Author, 2020: own illustration).

Figure 12: Analytical sketch of the accessibility of the proposed site from the N6 (Author, 2020: own illustration).

Access

There is one main road providing access to the site – the N6, which is managed by SANRAL. Permission would therefore be needed for the insertion of access points, as well as a turning lane, from the authorities.

Four access points would be necessary for both the light customer vehicles, as well as the heavy goods trucks to enter and exit the site with ease. A turning lane would be necessary to accommodate delivery trucks.

Inhabitants from the neighbouring Rocklands settlement will have direct access to the site as they are within walking distance (*Figure 10*). Pedestrian entrances and routes are therefore considered as part of the design.

Entry and Accessibility

The access to the site is non-discriminatory, in that it allows for either pedestrian or vehicular access (*Figure 12, 13 & 14*). This allows for a wide variety of socio economic customer and employee groups. *Figure 11* shows the current prominent pedestrian access route on the long northern side of the site, from the Rocklands settlement, onto the site. The informal fences however, are a more permeable boundary, allowing for general pedestrian access from Rocklands (*Figure 13 & 14*).

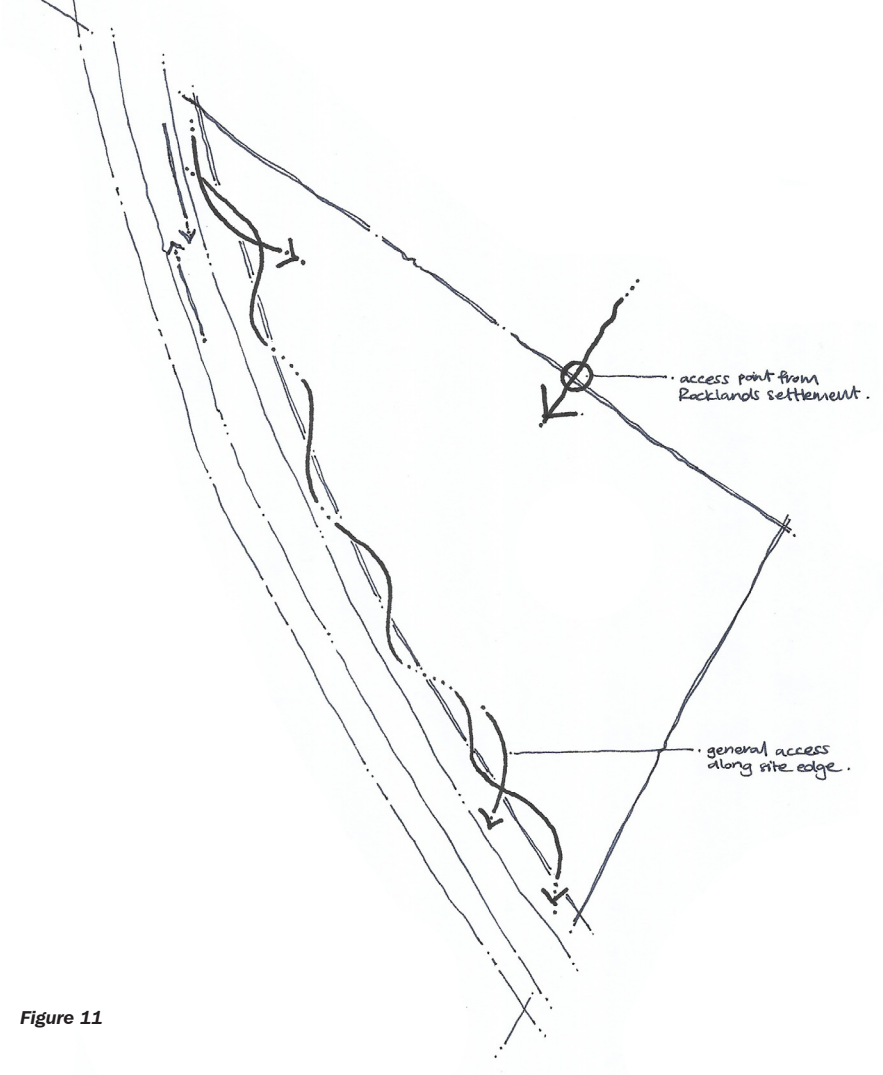


Figure 11

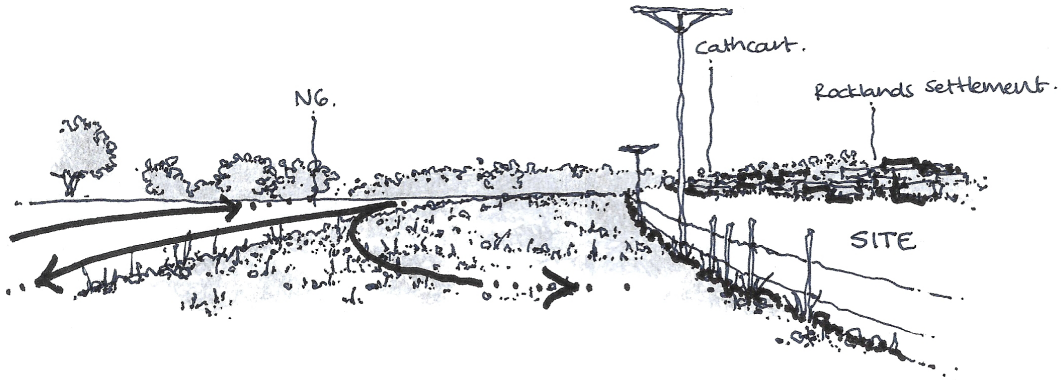


Figure 12



Figure 13

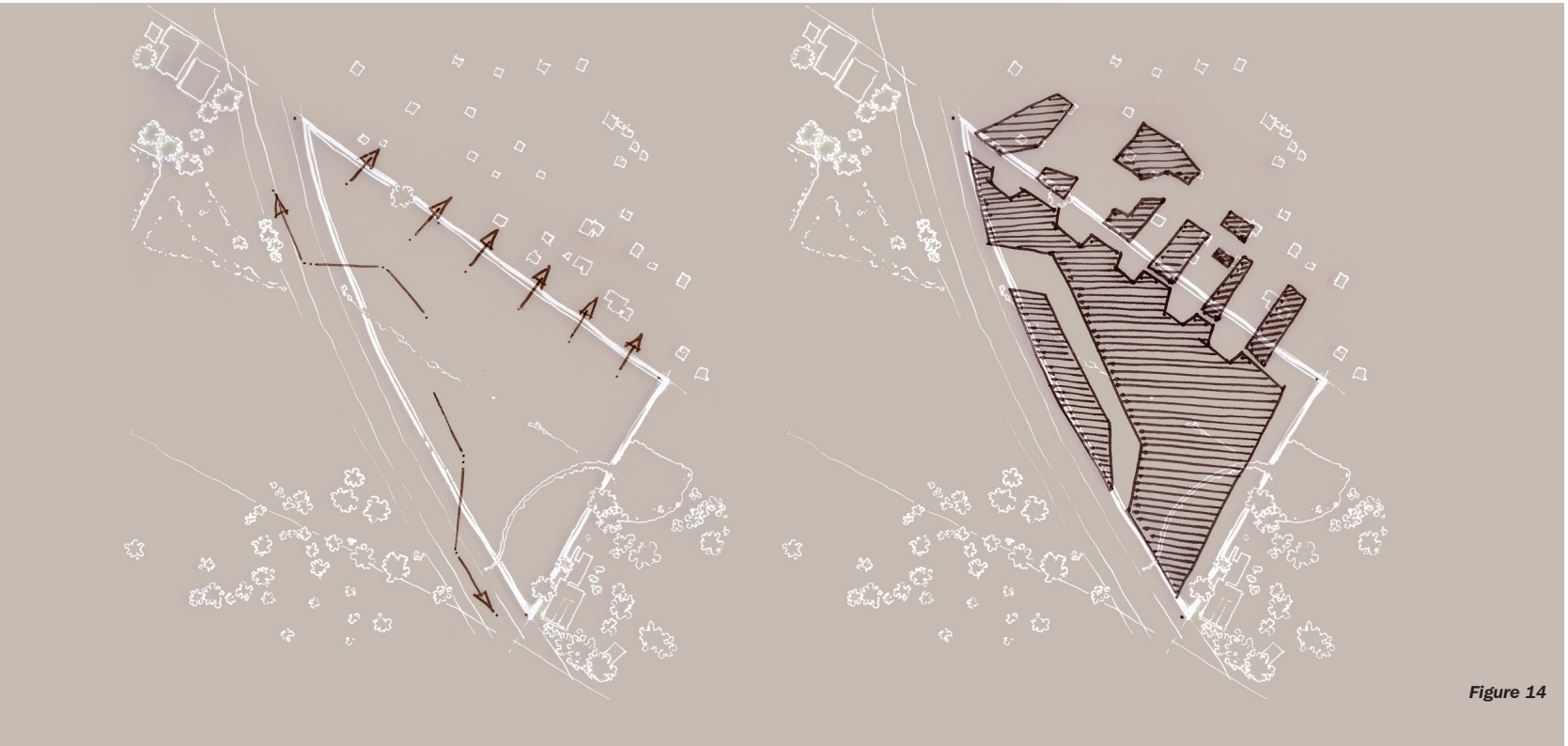


Figure 14

Figure 13: Analytical sketches of the pedestrian and vehicular accessibility opportunities onto the proposed site (Author, 2020: own illustration).

Figure 14: Analytical sketches of the pedestrian and vehicular accessibility opportunities off of the proposed site (Author, 2020: own illustration).

Figure 15: Photograph of the surrounding indigenous Acacia Karroo trees (Oosthuizen, 2020: own illustration).

Vegetation and Surrounding Buildings

Situated within the Amathole Montane Grassland region, the site is grassy and open, with trees clustering around the southern-most tip of the boundary where the neighbouring farmhouse plot is located, as well as on the farm on the Western side of the N6 road.

These trees appear to be predominantly Acacia Karroo, or what are more commonly referred to as, Sweet Thorn ('Soetdoring') and are indigenous to South Africa, shown in *Figure 15*.

The Acacia Karroo has a long taproot and can grow to a height of 12 meters . It has a lifespan of 30 to 40 years.

These trees serve as a useful source of food for domestic animals, such as goats and wild animals. The gum which seeps from the cracks in the bark is an important source of nourishment for Bushbabies as part of their winter diet (Engelbrecht, 2017: online).

The branches of the Sweet Thorn are excellent for firewood and are also used alternatively in the building of kraal fences. Traditionally, the inside of the bark was used to make rope (Engelbrecht, 2017: online).

Acacia Karroo trees are a vital organ in the landscape surrounding the site. Although too large to incorporate into the internal courtyard planting scheme, they can be planted in the outer open spaces surrounding the building – either in groups, or singly.

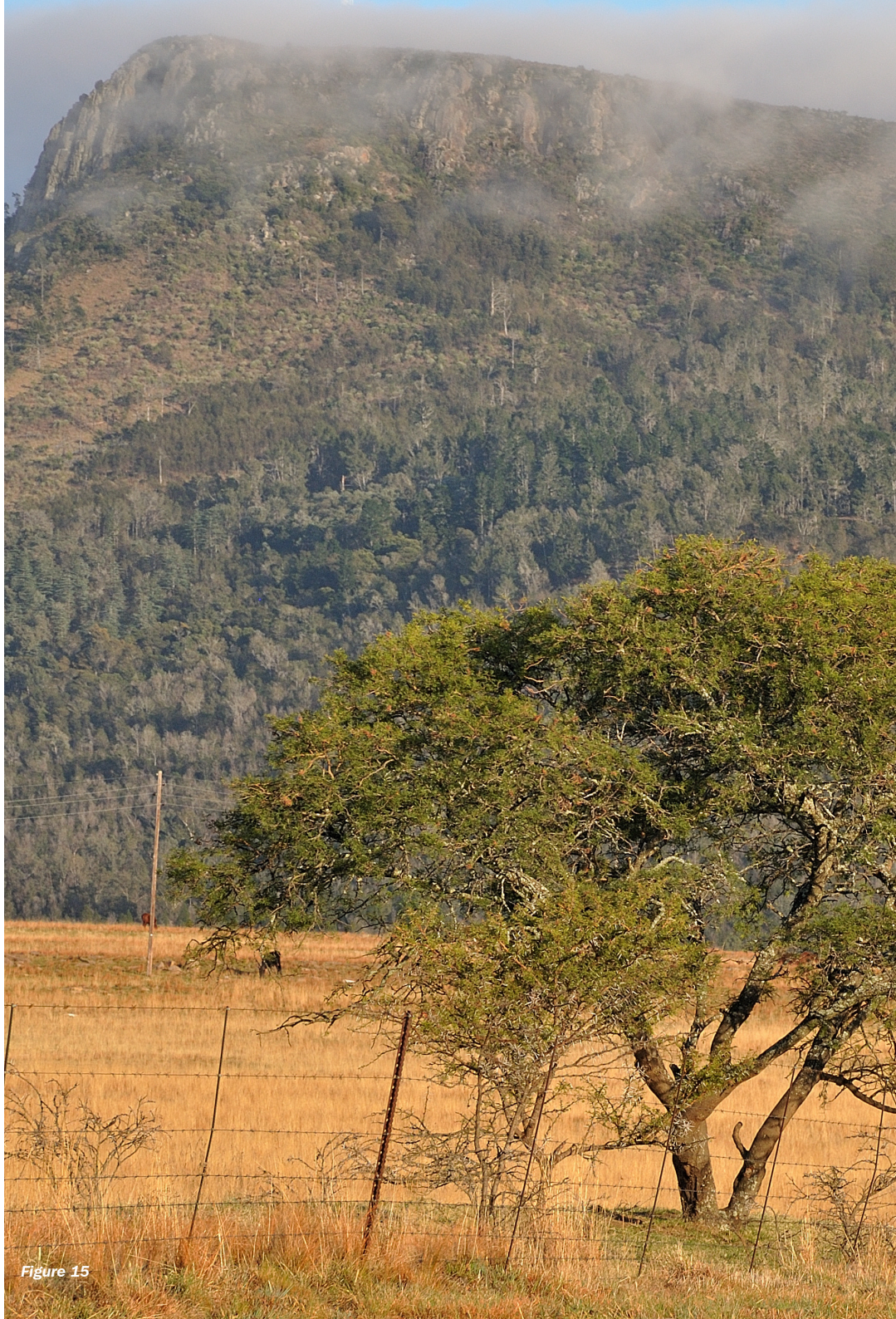


Figure 15

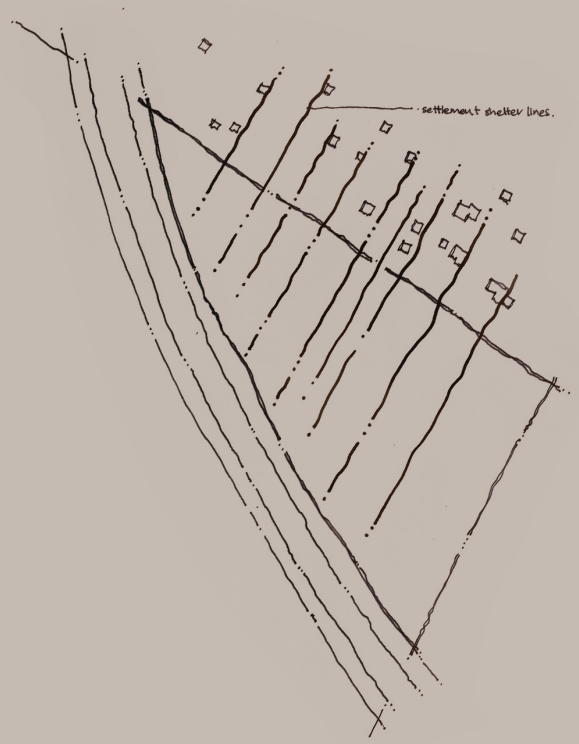


Figure 16

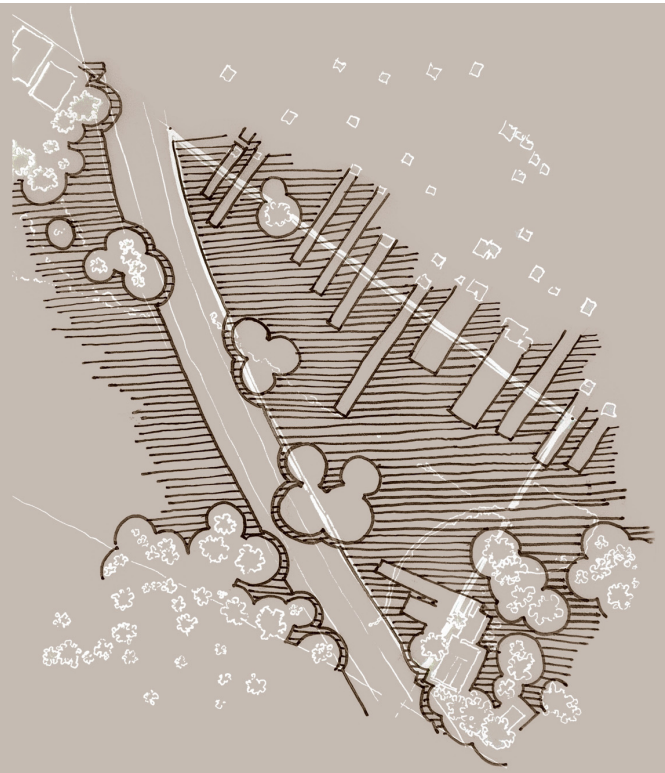


Figure 17

The neighbouring buildings or structures are a combination of the shelters from the Rocklands settlement, and the farmhouses on the two adjacent plots. The Rocklands settlement is the focus of this project, and hence it was the shelters from this settlement that governed the approach to the layout scheme of the design.

Upon exploring the vegetation and structure surrounding the site, strong contrasting elements began to emerge: the informal angular forms from the settlement, and the subdued organic shapes of the vegetation (*Figure 16 & 17*).

Instead of separating these two elements, they should be designed to confront each other on one plane, where a compromise can be made through the language of architecture.

In addition to the observations made around the immediate vegetation and building contextual elements, a few smaller aspects were taken into consideration when finding an ideal morphological approach and material variance to the design, as depicted in *Figure 18, 19 and 20*.

Figure 16: Analytical sketch of the Rocklands settlement shelters governing the layout scheme of the proposed design (Author, 2020: own illustration).

Figure 17: Analytical sketch of the vegetation and surrounding buildings influence on the site (Author, 2020: own illustration).

Figure 18: Analytical sketch of the influential angles and lines from around the proposed site in Cathcart (Author, 2020: own illustration).

Figure 19: Analytical sketch of the influential rock forms from around the proposed site in Cathcart (Author, 2020: own illustration).

Figure 20: Analytical sketch of the influential rock textures from around the proposed site in Cathcart (Author, 2020: own illustration).

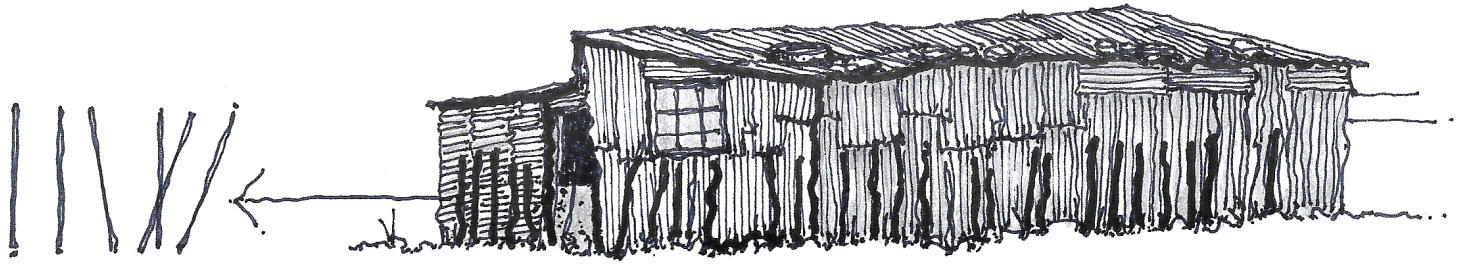


Figure 18



Figure 19

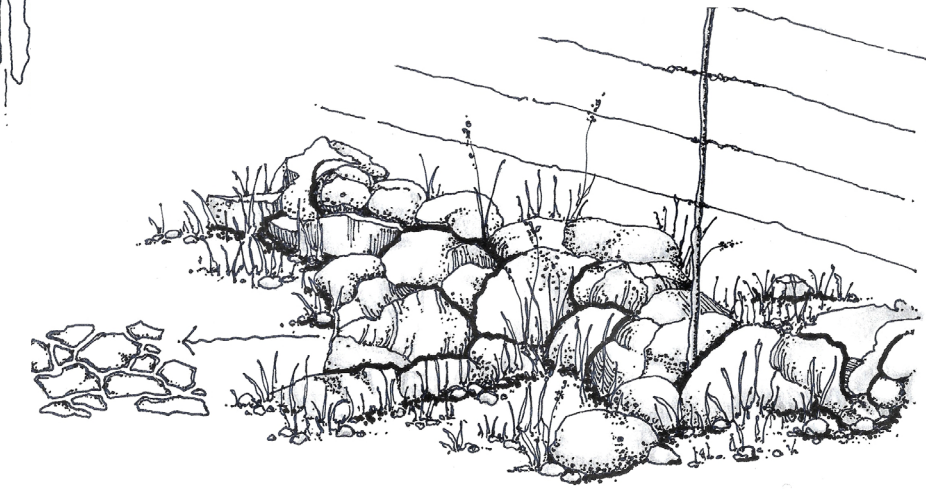


Figure 20

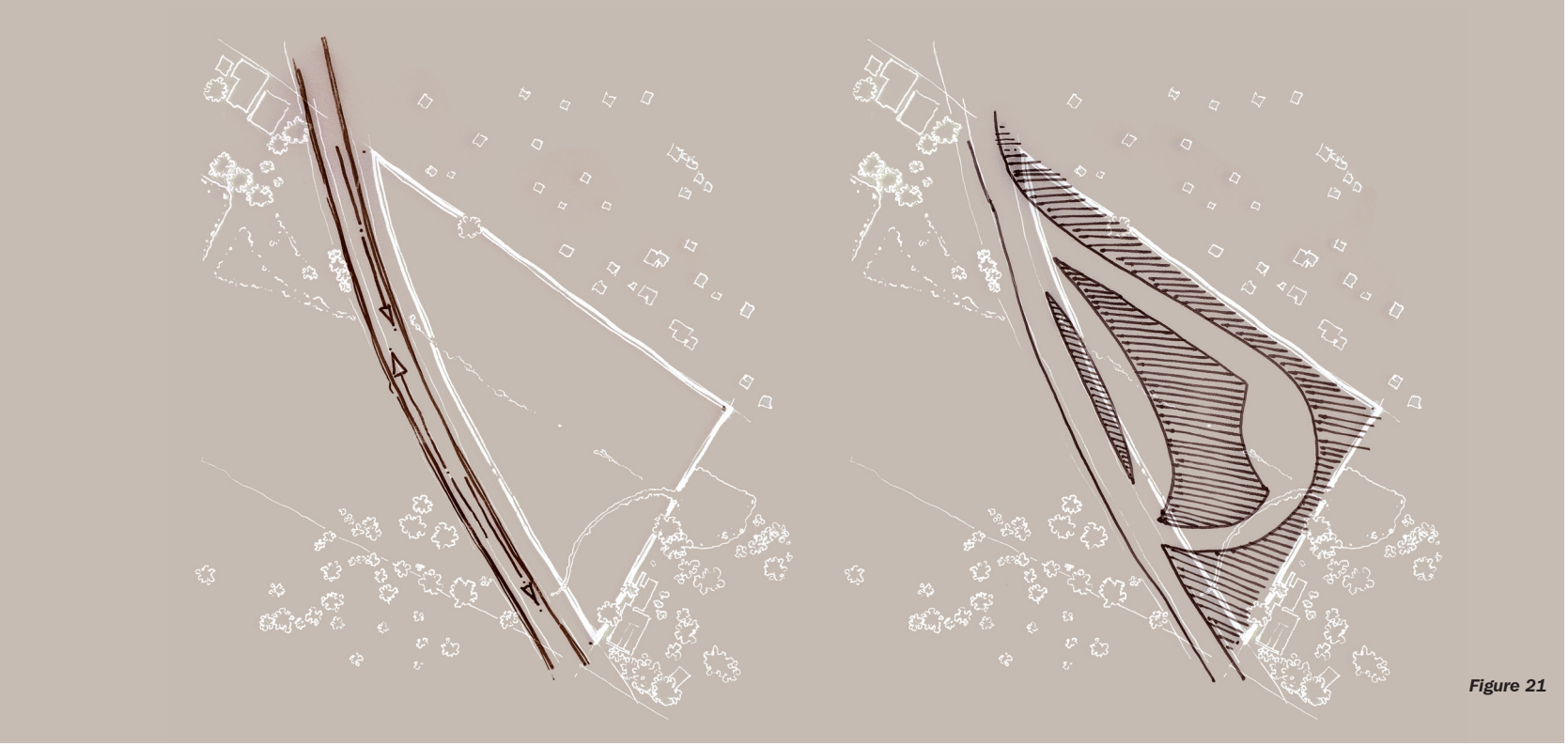


Figure 21

Figure 21: Analytical sketch of the current traffic flow on the N6, and the potential ways in which customer or goods delivery vehicles from the N6 traffic could be drawn through the site, (Author, 2020: own illustration).

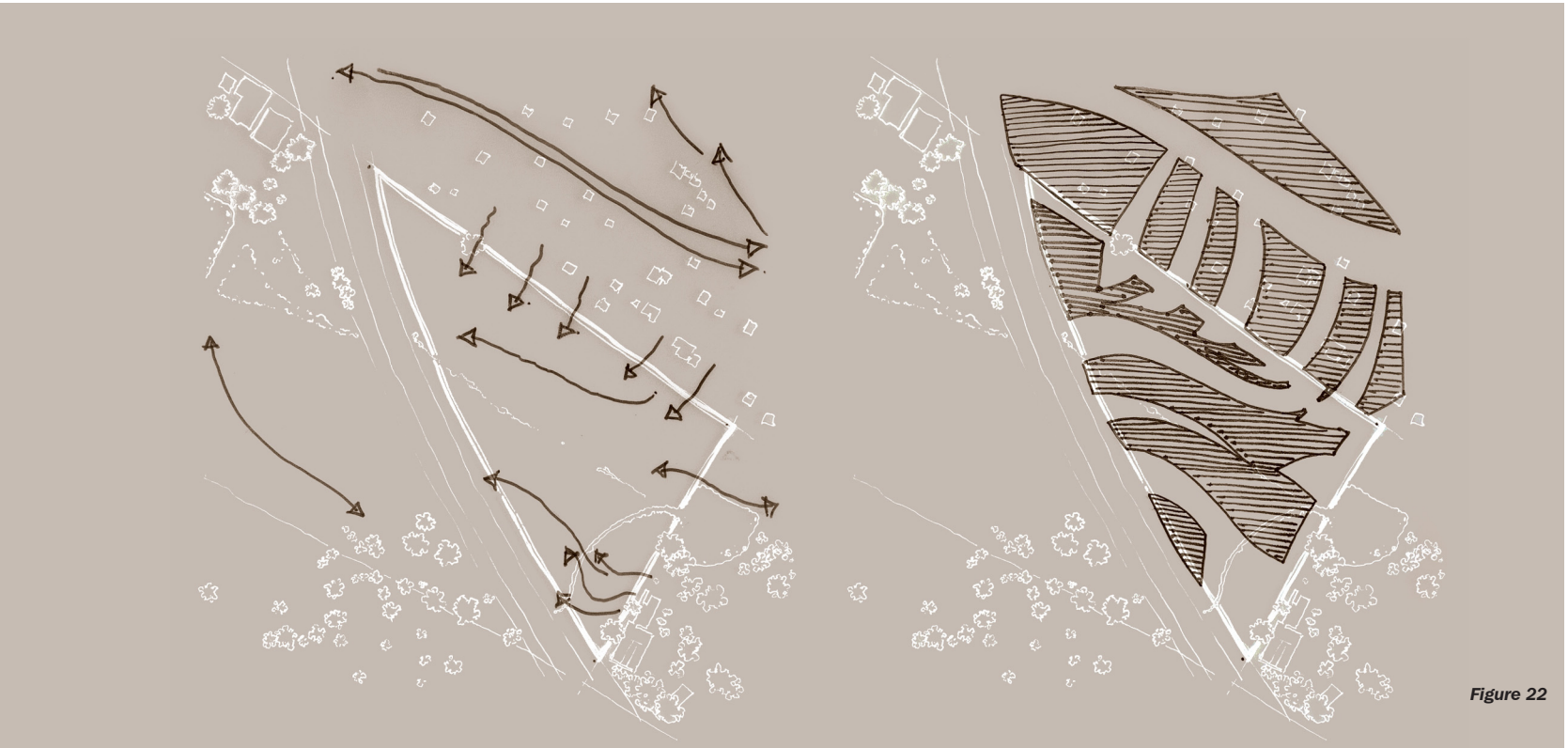


Figure 22

Figure 22: Analytical sketch of the mapped out pedestrian routes through and around the proposed site, (Author, 2020: own illustration).

Traffic Routes

The N6 main road could serve as a main artery from which the delivery trucks and customer vehicles could branch off to enter the site, or exit again (*Figure 21*), assuming that connecting driveways will be permitted.

Pedestrian Routes

Pedestrian routes are most prevalent around the site in the settlement area. The existing routes around the site have been mapped out in *Figure 22*, suggesting areas for potential architectural porosity.



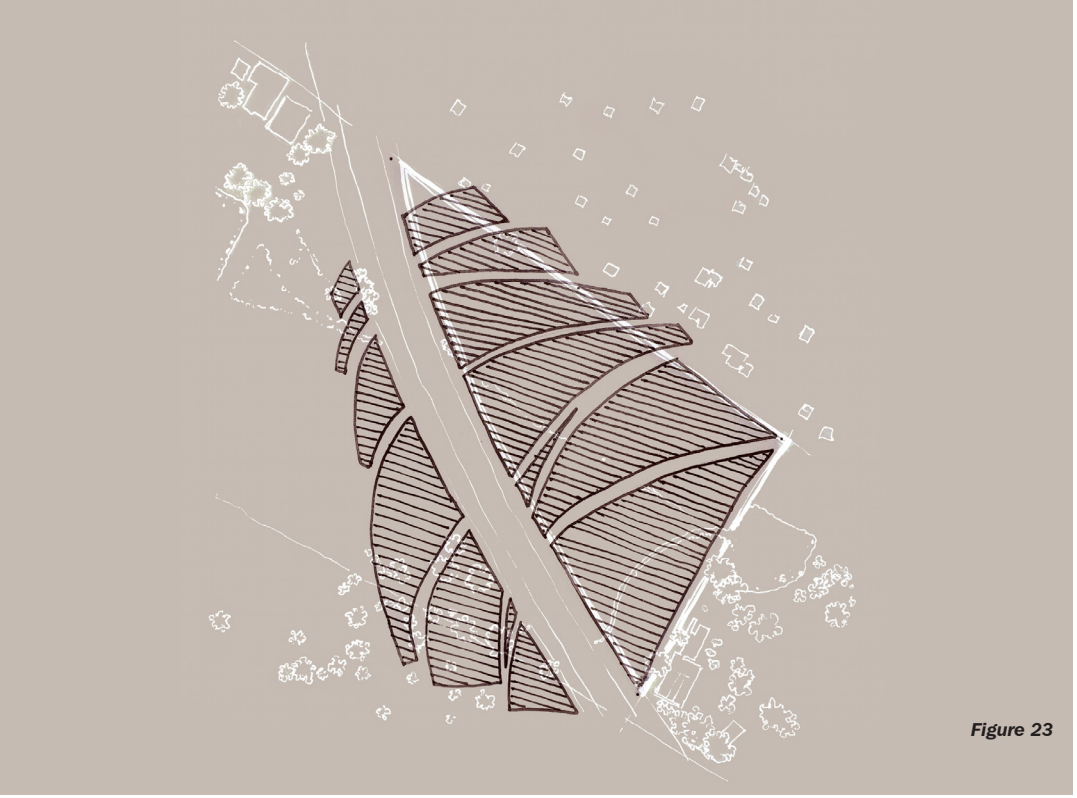


Figure 23

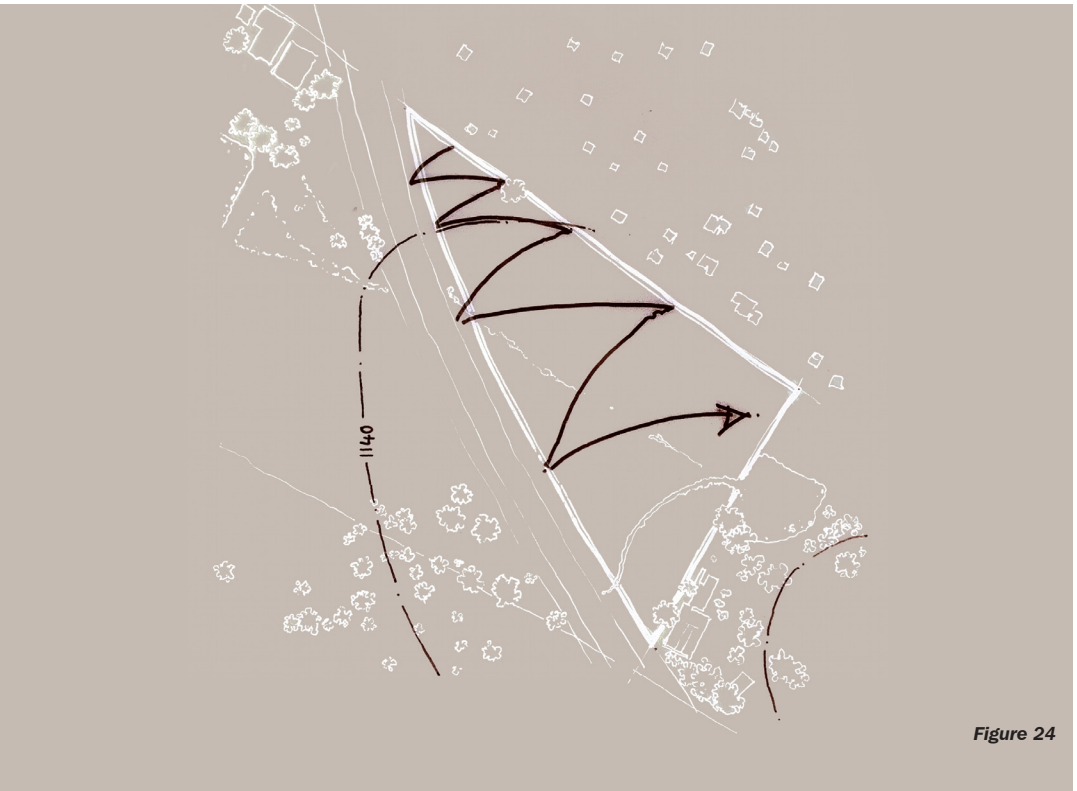


Figure 24

Topography

The slope of the site is very gradual – to such an extent that the terrain appears level. The elevation of the N6 gives the site a basin-like impression, (*Figure 23, 24 & 25*) as it slopes down toward the neighbouring farmhouse plot.

Figure 23: Analytical sketch of the site contours and level interpretation, (Author, 2020: own illustration).

Figure 24: Analytical sketch of the topography interpretation, (Author, 2020: own illustration).

Figure 25: Analytical graphic of the topography around the site (Setplan, 2020: adapted by Author).



Figure 25

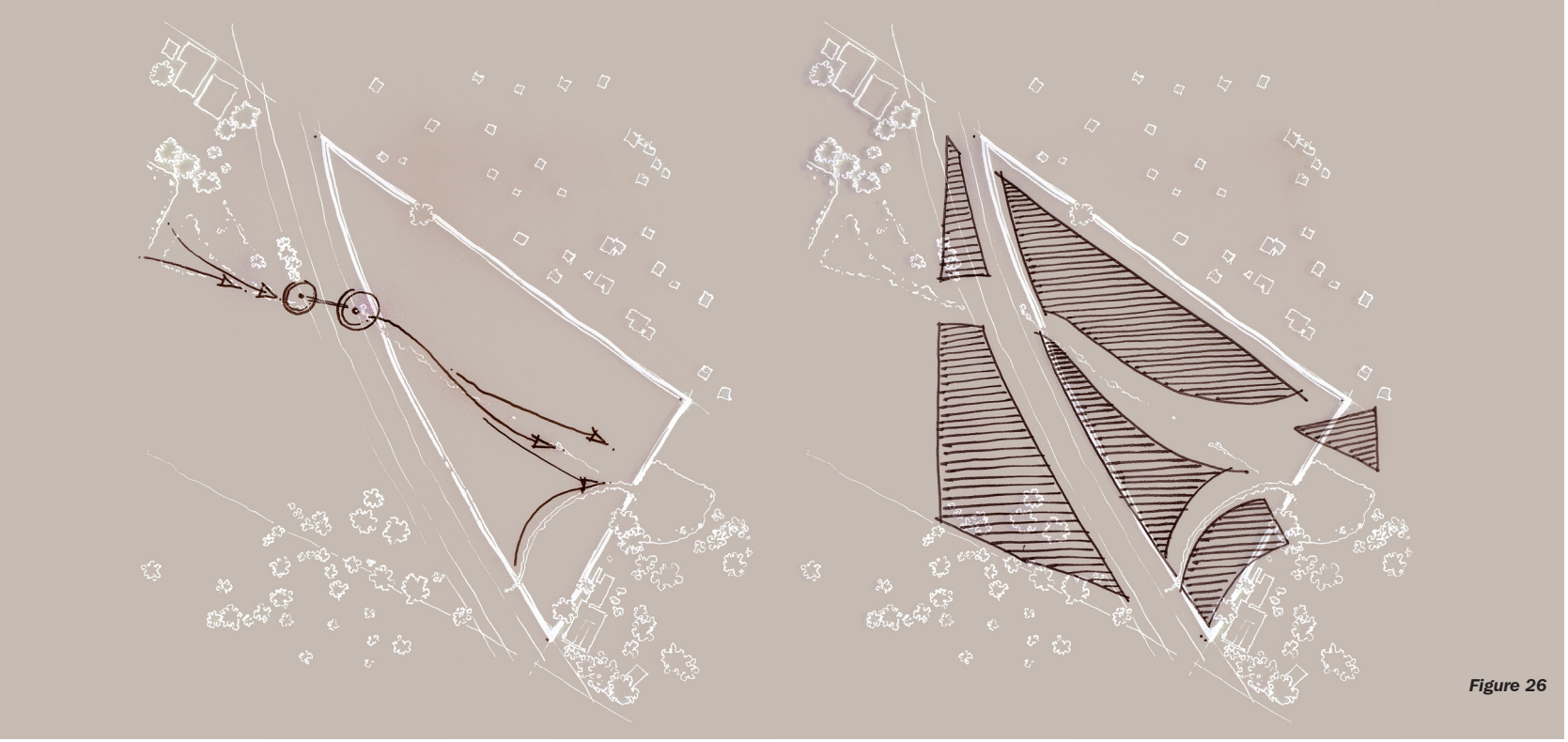


Figure 26

Figure 26: Analytical sketches of the flow of water through the site during the rainy season (Author, 2020: own illustration).

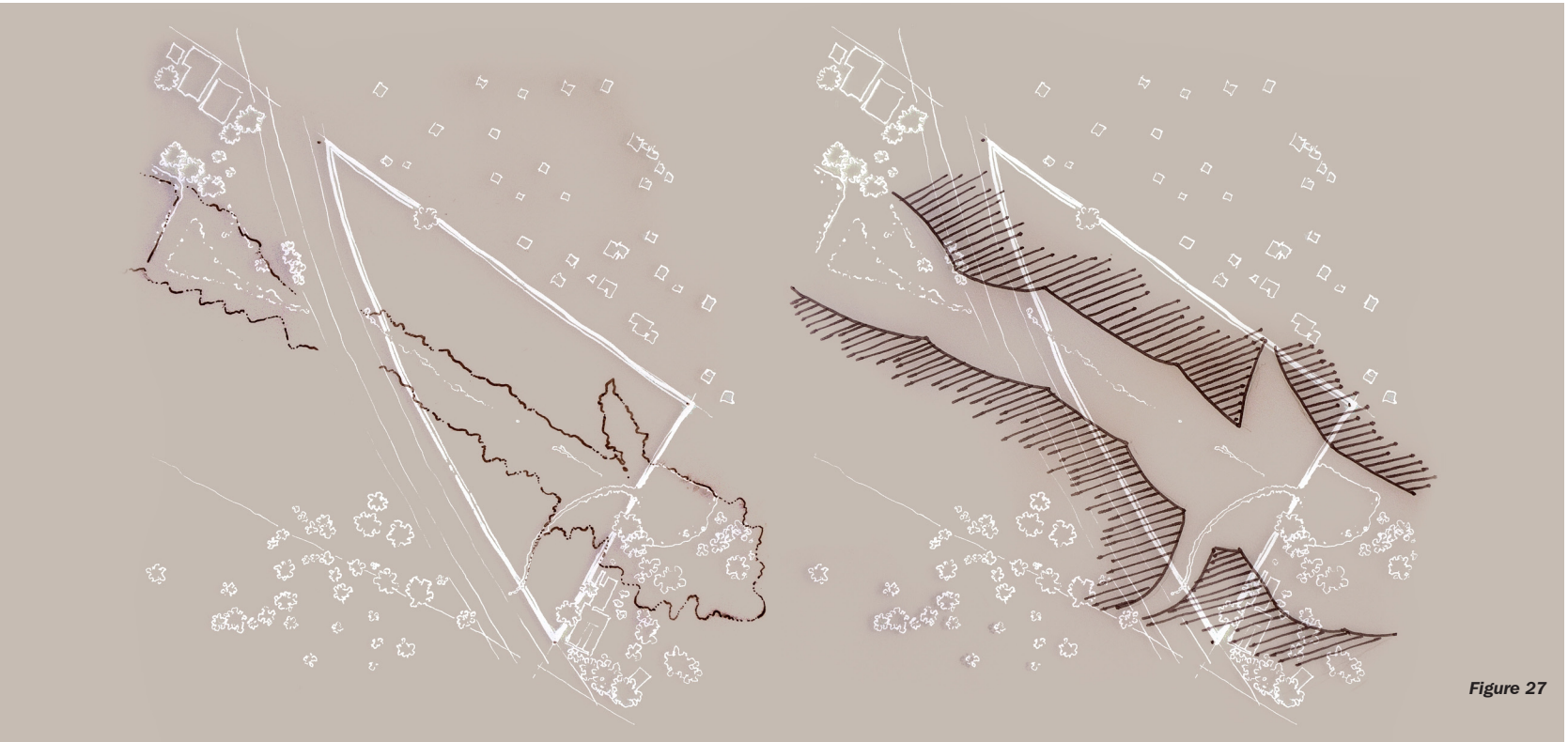


Figure 27

Figure 27 : Analytical sketches of the wetter areas of the site during the rainy season (Author, 2020: own illustration).

Drainage

There are two reservoirs, one on each of the neighbouring farm plots. The northern reservoir is situated on higher ground, relative to the other which lies south-east of the site, touching its boundary. There are exposed concrete pipes which appear to create a culvert for water to pass underneath the N6 (*Figure 26*). The pipe openings are visible on either side of the road. Given the fall of the land, along with the placement of the piping and reservoirs, it would appear that the overflow from the northernmost reservoir travels down the neighbouring plot and drains through the concrete piping, onto the proposed site. This possibly explains the partial wetland conditions on the proposed site.

Wetland conditions

The site occupies a small recurrent stream, which appears to filter directly through it, following the gradual downward slope of the contours. This stream seems to channel the excess water from the northernmost reservoir down to a pond on a neighbouring plot, south of the proposed site. It is only after heavy rainfall that this small stream would flow (*Figure 27*). This stream would need to be redirected along the edges of the site, to avoid compromising the structural integrity of the foundations of the proposed building.

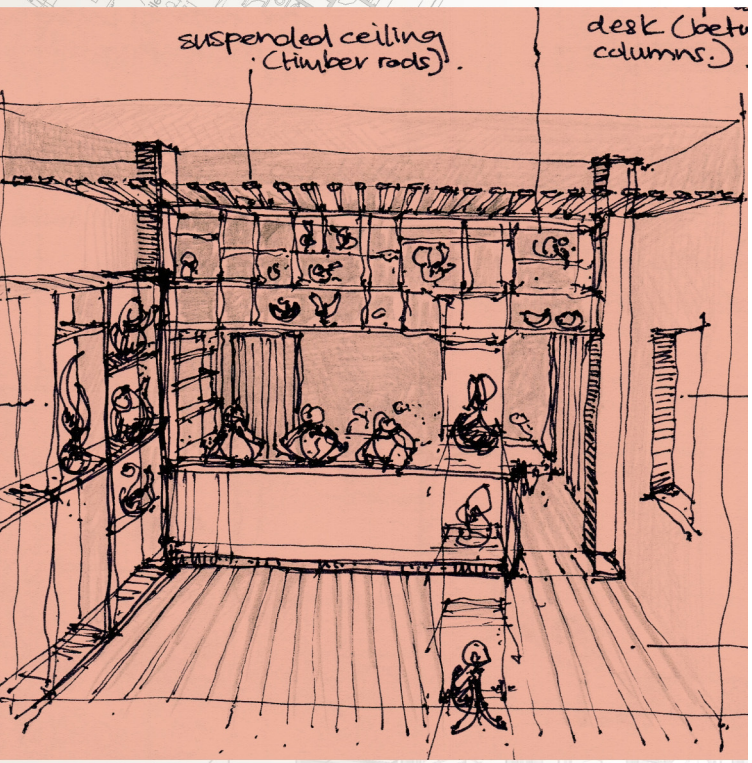














Part TWO

Theoretical Investigation

In which ways can an architectural intervention catalyse, support, and maximise the sustainable cultivation of food in underprivileged communities?

*"**Give** a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime" - Anne Isabella Thackeray Ritchie (Mrs. Dymond)*

*'**Teach** him to use the fish industriously, and he will feed himself and his community' - Daniella Oosthuizen*

This theoretical investigation will break down and discuss the two ideals for feeding hungry people – ***giving*** and ***teaching***. Following the sequence evident in the proverb above, the chapter will begin with the ***giving*** component, in its analysis of food security as a hunger eradication initiative.

Food Security – A Hunger Eradication Initiative

According to Dr Francesco Branca, Director of Nutrition for Health and Development at the World Health Organisation (WHO), malnutrition is a complex global human issue and a main cause of disease and death. Branca states further that not enough is being done to help people to access healthy and nutritious food, although there may be food consumed, it might not necessarily

have high nutritional value (WHO, 2020: online). Humans need to maintain a healthy lifestyle in order to work efficiently and effectively. Malnourished people will cause a starving economy.

Dr. Branca adds, “For example, Africa has a cereal-centered food system and people there are not enjoying a healthy and sustainable diet because they are not consuming enough fruit and vegetables” (WHO, 2020: online). It was from this deeper understanding of the global issue of malnutrition, that the concept of food security emerged.

About Food Security

Food security is a concept which requires systematic thinking as to what can be done to address and prevent malnutrition. An underlying moral ideology which links to the severity of malnutrition is the international goal of food being a basic human right. Up until the mid-1970s, food security discussions focussed mostly on the increase in the production of food and the improvements of the distribution. The availability of food at a national and global level was prioritised as a primary method to deal with malnutrition (Fraanje & Lee-Gammage, 2018: online).

The concept of food security has broadened considerably over time, currently encompassing a wide variety of factors which could affect all forms of malnutrition, such as some applications including the recognition of the importance of food in the social and cultural role that it plays. Food security is currently understood to incorporate four main components: *availability; access; utilisation* and *stability*. For a state of food security to exist, all four components must be successfully implemented (Fraanje & Lee-Gammage, 2018: online). These components are shown in *Figure 28*.

The four components needed to establish a state of food security are broken down as follows:

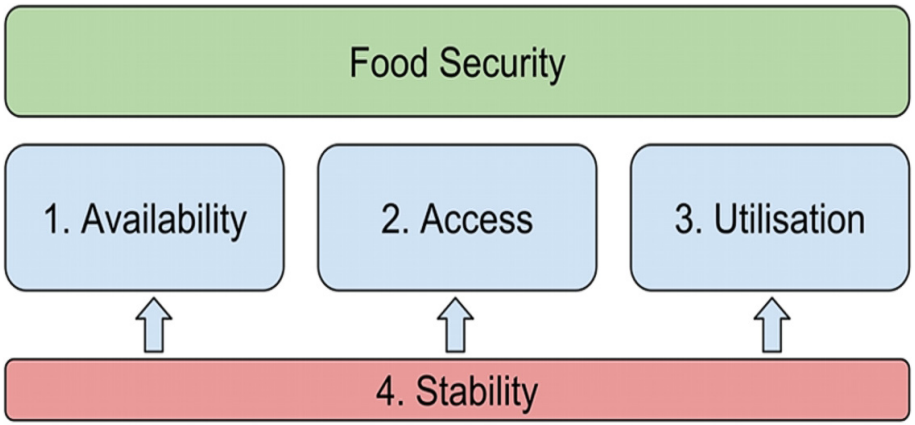


Figure 28: The four components of food security (Fraanje & Lee-Gammage, 2018: online).

i. **Availability of Food:** The availability of sufficient quantities of fresh, healthy food of suitable quality that is either imported or supplied through domestic production (*Food Security*. June 2006 Issue 2).

Availability can be influenced by:

- *Production:* Improving the production of food in rural areas, through involving small-scale farmers.
- *Distribution:* Enhancing the supply for fresh, healthy food to disadvantaged groups.

- Investing in and strengthening the rural infrastructure and markets (*Food Security.* June 2006 Issue 2).

ii. **Access to Food:** All members of a community must be able to acquire a sufficient quantity of healthy, nutritious food for them to consume, or have access to sufficient resources needed to cultivate their own food (Fraanje & Lee-Gammage, 2018: online).

Access can be influenced by:

- *Affordability:* The ability that the members of the community have, to afford the price of food sold, or cultivation of it, relative to their incomes.
- *Allocation:* The economic, social, and political mechanisms which determine when, where and how and on what terms food can be accessed by consumers.
- *Preference:* Consumer demand for certain types of food is influenced by social, religious, and cultural norms and values (Fraanje & Lee-Gammage, 2018: online).

iii. **Utilisation of Food:** The members of a community must be able to access safe food of good quality. Effective food utilisation is also determined by the quantity of food which a person consumes as well as how well a person converts that food to energy (*HIV and Food Security: Conceptual and Institutional Framework Chapter 1: Conceptual Framework.* September 2007).

The utilisation of food can be influenced by:

- *Nutritional value:* The nutritional value of the available foods, measured by calories, vitamins, protein, and various micronutrients.
- *Health status:* The impact that disease has on the community's ability to consume, absorb, and metabolise the nutrients of the food.
- *Food safety:* Access to unspoiled food, free from toxic contamination introduced during the stages of production, processing, packaging, distribution, or marketing of the food, and free from food-borne diseases such as salmonella.
- *Preparation and consumption:* The resources, knowledge, and abilities to prepare and consume food healthily and hygienically (Fraanje & Lee-Gammage, 2018: online).

iv. **Stability**: There may be availability and accessibility of food to utilise effectively, however an increase in malnutrition must be avoided to prevent people from feeling insecure. The state of affairs needs to be consistent and enduring, rather than subject to fluctuations. A cultural sensitivity also needs to be taken into account.

Cultural acceptability has been considered to be an important aspect to incorporate within the concept of food security. This is rationalised through how food contributes, not only to the basic needs and well-being of individuals in communities, but to enjoyment; the social, religious, and cultural functions that food fulfils in people's lives. Other stakeholders have argued this perspective, in their belief that it broadens the concept of food security to a point of making it impractical (Fraanje & Lee-Gammage, 2018: online). However, a definition of food security brings clarity to this issue.

A widely accepted definition of an aspirational state of food security was put forward by the United Nations Food and Agriculture Organisation (UNFAO):

"Food security exists when all people, at all times, have physical, social and

economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life." (World Food Summit, 1996) (UNFAO cited in Engler-Stringer, 2014).

The proposed project will be investigating how it can, as an architectural intervention, support and maximise the sustainability of food cultivation. This will be done within the context of a previously marginalised settlement, neighbouring an existing planned town. The above four components of food security serve as yardsticks which the project aims to reach in its outcomes. The building should then be able to provide dignified food *availability* to the neighbouring settlement, as well as other surrounding communities through effective production and distribution methods. The food produced within the building should be *accessible*, in that it should be sold at affordable prices which do not discriminate against economically challenged groups; well allocated during the distribution process and satisfy the preferences of the consumers. This food should be healthy enough and safe enough to be *utilised* by its consumers. The building's function must remain *stable* in its execution of these three processes.

Food Security as a Global Challenge

The global food security challenge is for the world to be able to feed nine billion people by 2050. The demand for food at that stage will be 60% higher than what it is at present. The United Nations has set goals of ending hunger, attaining food security and improved nutrition, as well as encouraging sustainable agriculture as the second of its 17 Sustainable Development Goals for 2030. For these goals to be achieved, a host of issues are to be addressed first. These issues range from gender equality and ageing demographics, to skills development and global warming. *The agricultural sector needs to increase its productivity by adopting efficient business models and creating public-private partnerships. Over and above these much-needed changes, it would also have to become more sustainable by addressing greenhouse gas emissions, water preservation and waste disposal.* The risks however, include, malnutrition, hunger, and conflict in the form of food and water wars (Breene 2020: online).

Reasons Why Food Security is a Global Challenge

Over and above the apparent reasons why people need food, *the complexity of delivering sufficient food* to both a national and global population, indicates why food security is such a high priority for all countries; regardless of their level of development. Food security is no longer only a challenge around food and feeding people, but about all aspects of a society and economy (Breene 2020: online).

How Architecture Can Play a Role in Maximising Food Security

A 60% increase in the demand for food - and hence intensified pressure on the production of it by 2050, will result in *availability* being crucial. Having previously established that the availability of food, is heavily dependent on effective distribution, it is evident that a primary goal for the proposed project would be to ensure even distribution to communities countrywide. It is through the RuraLift project's proposal of stationing Aquaponic Micro-Malls in small towns, that fresh, healthy food could be made available to many communities.

Earth devoid of nourishing resources, cannot provide life for a healthy community. Without a community, placemaking cannot ensue; and without placemaking, the architectural quality will diminish. It is therefore key that all three elements – the *environment, humans,* and *architecture* – continuously work in tandem to care

for each other's well-being.

The *RuraLift Project*, as an architecture of opportunity, should consequently also promote sustainability, in its nourishment of the environment, as well as human prosperity, in cultivating a secure source of food to nourish the surrounding communities.

The Causes for the Need for Food Security

Before settling upon an architectural intervention which could catalyse an initiative for establishing food security, it is paramount that the causes of food insecurity first be identified. This will assist the intervention to have appropriate functions among other aspects, that could help minimise these causes, and maximise positive outcomes.

i. **Population Expansion:** The growth of a population varies considerably across countries. In Africa, the population is expected to double, from one billion to two billion people by the year 2050 (*Figure 29*). The populations in this developing world are becoming increasingly urbanized, with 2.5 billion additional urban residents expected in Africa and Asia (Breene 2020: online).

Rocklands, as an expanding settlement outside Cathcart, is adding to the population density of the town, and hence there are more lives to sustain. Since the census in 2001, there was an increase of 493 people in the Cathcart population, despite the general tendency towards the depopulation of rural areas, leaving the last recorded population size at 7360 in 2011 (Brinkhoff 2020: online).

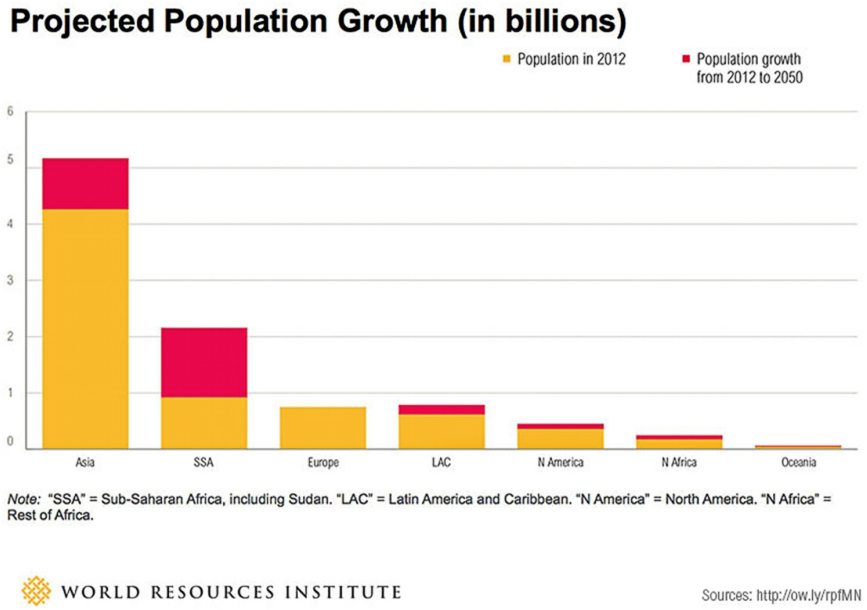


Figure 29: Graph depicting the projected population growth by 2050 in billions (Breene, 2020: online).

ii. **Changing Tastes:** In addition to population growth, our diet is continually changing. As people become wealthier, they begin to consume more processed foods, meat, and dairy. An increase in the production of meat demands higher production of grain (Breene 2020: online).

Given that Cathcart is not as economically established as the larger towns

of the Eastern Cape, currently, the inhabitants' needs are generally basic, and therefore they consume mostly what is nutritious, accessible, affordable, and available. However, the injection of capital to the area by way of increased tourism, job creation and food production, as well as access to lower-priced commercial and more sophisticated products, should influence a shift in the needs and expectations of the locals toward a higher standard of living.

iii. **Climate Change:** About 40% of the world's landmass is currently arid, with rising temperatures turning more land into desert. At the current rate, the amount of food being grown today will feed only half the population by 2050 (Breene 2020: online).

Climate predictions for the Eastern Cape indicate that frequent and severe flooding, as well as higher rainfall, will increase agricultural production (UMHLABA CONSULTING GROUP, 2012: Review Report 1). However, flooding is known to damage crops and cause disease – thus justifying creating a controlled agricultural environment.

iv. **Water Scarcity:** Another impending global crisis affecting food availability is that 28% of agriculture is situated in water-stressed regions. Approximately 1 500 litres of water are needed to produce a single kilogram of wheat, and an additional 16 000 litres of water to produce a kilogram of beef (Breene 2020: online).

Due to the high annual rainfall predictions in the Eastern Cape region of between 600mm and 800mm, it would be worthwhile to use the excess rainwater as a medium for an appropriate agricultural production method. Rainwater storage tanks should be included in the proposed design to assist such a cultivation method (Umhlaba Consulting Group, 2012: Review Report 1).

v. **Troubled Farmers:** Less than 2% of the population in developed countries grow crops or breed animals. Fewer people choose farming as an occupation, and food prices are rising, arable land is being lost to urban sprawl. In addition, soil is being increasingly degraded fue to over-farming (Breene 2020: online).

These dwindling numbers in farming, together with the loss of arable land, indicate that the future of agriculture may need to rely on alternative cultivation methods less dependent on soil, and within safer and more contained environments.

Although the five aforementioned issues all contribute to the global challenge of food scarcity, they also impact on a variety of other socio-economic problems. Addressing these five issues through an architectural intervention will not only relieve a country of food insecurity pressure, but will also add to the improved livelihood of its people. Architecture should by any standard, be moulded in the image of care – for both humans and the environment. So often we focus on the concept of agriculture being a separate entity to the retail component of the urban landscape, but this perception could be what is robbing us of opportunities for improved food security.

The Guarantee for Food Security - a Complex Issue

In India, agriculture accounts for 18% of the economy's output and 47% of its workforce. India's production of fruits and vegetables is the second largest in the world. Ironically, the Food and Agriculture Organisation of the United Nations has identified about 194 million Indian citizens that are malnourished - the highest number of malnourished people in a single country. Another estimated 15.2% of the Indian population is too undernourished to lead normal lives. A third of the world's malnourished children are living in India (Breene 2020: online). One is left questioning why a country, which is the second-largest producer of fruits and vegetables in the world, would struggle to feed its people. The food is available, but not being utilised, which then leaves the accessibility in question. The economic

implications of hunger and malnourishment thus need to be explored.

In order to address the issue of hunger and malnourishment in an economy such as India's, the equitable distribution of fresh produce in the agricultural sector would need to be improved, in particular for smallholder farms. It is the rural and farming communities in India which typically experience a greater occurrence of poverty and hunger (Breene 2020: online). This implies that the fresh produce being cultivated in the farming regions is being funnelled to the urban sector and thereby sapping the rural and farming communities of the nutritious food which they so desperately need.

Although this particular case regarding equitable food distribution, is specific to India, it remains a complication in all parts of the world. The food production industry can easily become focussed on providing for the wealthier urban sectors, while neglecting the rural. This is however complicated further by the fact that the food production industry needs to generate profits to sustain and develop itself. This problem could be counteracted through the involvement of more rural communities in innovative agricultural production programmes – creating jobs and improving the equitable distribution of food. Yet, this is not the only complication.

Another complication to the food security concept is that agriculture needs to remain sustainable. The agricultural sector accounts for 30% of greenhouse gas emissions and 70% loss in freshwater, which is why attention must be drawn to energy and water use in farming. Added to this, is the problem of waste, with an estimated one-third of food consumption, and some $750 billion lost in value (Breene 2020: online).

Based on these complications, it would be beneficial to investigate possible alternative cultivation methods which could use water and energy more effectively and sparingly. These innovative alternatives for agricultural food production could be further enhanced through architectural systems put in place to increase the sustainability of such cultivation schemes.

The World Economic Forum Proposals

For the duration of the year 2007, and the first half of 2008, food prices increased sharply globally, creating social unrest and riots in both developing and developed countries. This prompted the World Economic Forum to define a New Vision for Agriculture in 2009, which is to achieve a 20% improvement in food security, environmental sustainability and economic opportunities till 2050, through market-based public-private approaches (Breene 2020: online).

The action portfolio compiled by the World Economic Forum, of locally driven public-private partnerships under the New Vision for Agriculture, has mobilised over $10 billion, with some $1.2 billion already invested, reaching almost nine million smallholder farmers (Breene 2020: online).

The Forum has altogether launched five targeted initiatives which intend on bringing together farmers, government, civil society, and the private sector, in facilitating partnerships at regional as well as country levels, while encouraging the exchange of knowledge (Breene 2020: online).

The RuraLift Project is an initiative which supports the development of these goals, as well as the economic empowerment of rural communities, through architectural interpretation and intervention, in the malnourished regions of South Africa.

Food Security in South Africa

Food security has developed into an increasingly large necessity in South Africa ever since land expropriation without compensation became a national focal area. Naturally, such a change could potentially harm the farming activities in

South Africa, and ultimately threaten the country's state of food security (South African Market Insights 2019: online).

In 2002, the Department of Agriculture identified five key food security challenges which South Africa was faced with:

i. **Inadequate Safety Nets:** Households where there are more dependants than income earners, generally have a poorer lifestyle. These households often depend on migrant remittances or social security grants which makes them susceptible to malnutrition and food insecurity.

ii. **Weak Support Networks and Disaster Management Systems:** A structured system, which will help South Africa cope better with the impact of food security disasters, is lacking. These disasters such as droughts and floods frequently occurring pose a large threat to the food security position of agriculture-based households.

iii. **Inadequate and Unstable Household Food Production:** Since many household producers struggle to feed their families from a narrow production base, hunger, and malnutrition result from insufficient and unstable food supplies. Government assistance, therefore, becomes a main source of income.

iv. **Lack of Purchasing Power:** Many South African households struggle financially to purchase food. This limited purchasing power is yet another spin-off from limited income opportunities, particularly in rural areas.

v. **Poor Nutritional Status:** One in four children, under the age of six, are prone to stunted growth and development due to chronic malnutrition. Therefore approximately 1.5 million children are not receiving enough food with high nutritional value (Food Security Initiative n.d.: online).

The following discussion, measurements, and statistics on food security in South Africa is based on a report published by Statistics South Africa, integrated with supporting information gathered by the South African Department of Agriculture.

The subject of household food and nutrition security issues has progressively become a larger focus area worldwide, due to the impacts of climate change and strenuous economic conditions that have placed additional stress on food systems.

The South African government has worked hard to promote food security and hence keep control over the international indicators on the issue. It is through their monitoring of the development of various appendages of the state, that government plans to eradicate food insecurity.

The South African government has developed an inter-ministerial National Food Security and Nutrition Plan, coordinated by the Presidency. The country's National Development Plan also recognises agricultural production, as well as rural development, as essential priorities for job creation, economic growth, reduction of poverty and tackling food security in South Africa (Maluleke 2019: online).

Section 27 of the South African constitution states that all South African citizens have the right to safe, nutritious food at all times. However, for this goal to be achieved and sustained, South Africans need to work together. As previously discussed, food should be available, accessible, and sufficient for all citizens, without discrimination, for the human right to food, to be met (Food Security Initiative n.d.: online).

To ensure that South Africans are able to cultivate and produce their own food and thereby reduce food insecurity, the Department of Agriculture, Forestry and

Fisheries is responsible for the development agricultural policies and initiating support programmes for this to become a reality. Following the Food and Nutrition Security Policy is imperative for the achievement of the objectives set out for the National Development Plan as well as the Sustainable Development Goals (SDGs). The SDGs have set the year 2030 as the target for putting an end to hunger, achieving food security, improving nutrition, and promoting sustainable agriculture. It is therefore vital that the collection, processing and analysis of food and nutrition security data, be carried out thoroughly, to then inform the decisions on government initiatives for reducing food insecurity and malnutrition in South Africa (Maluleke 2019: online). Such data is presented by way of various graphics and data recordings.

The following graphs and data recordings form part of a series of reports compiled by Statistics South Africa. Their purpose is to shed more light on the state of food and nutrition security in South Africa, especially on the information regarding the effects on households as well as their involvement in agricultural activities (Maluleke 2019: online).

Figure 30 indicates how the percentage of South Africans living below the food poverty line has been rising since the year 2011 and was last recorded at 25,2% in 2015.

The graph in *Figure 31* gives a clear indication of the number of households actively involved in agricultural activity, whether for personal consumption or making a living

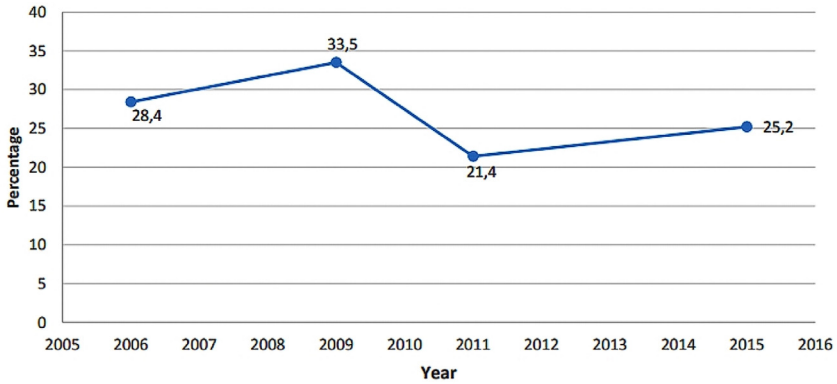


Figure 30: Graph depicting the proportion of South Africa's population living below the food poverty line (Maluleke 2019: online).

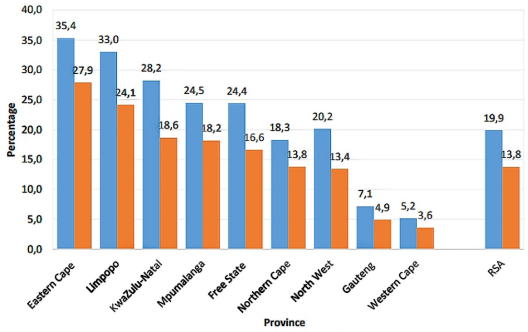


Figure 31: Graph depicting the proportion of the population involved in some form of agricultural activity per province (Maluleke 2019: online).

According to the pie chart in *Figure 32*, the Northern Cape had the smallest percentage of households involved in agricultural activities. Following this was the Western Cape and then the Northern West (Maluleke 2019: online).

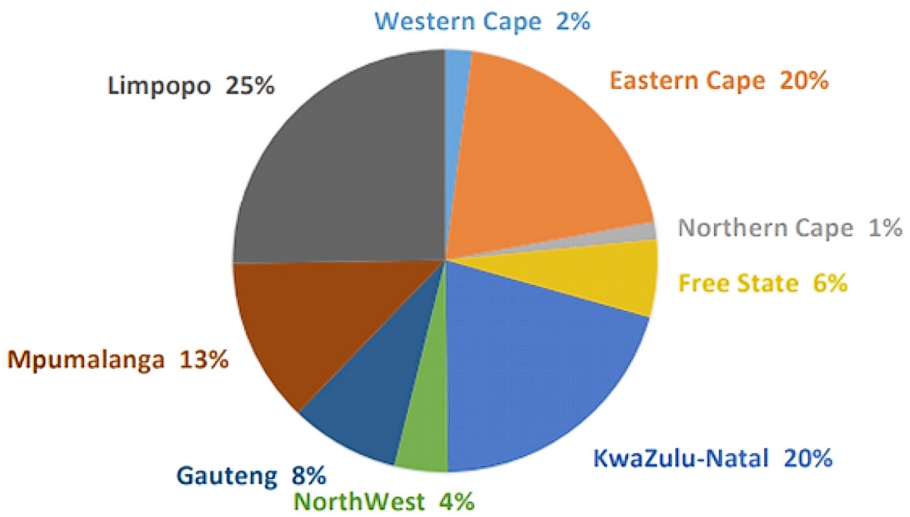


Figure 32: Pie chart depicting the percentage of households, per province in South Africa involved in agricultural activities (Maluleke 2019: online).

Judging by the report, the highest percentages of households practising agricultural activities, are found in the predominantly rural provinces - with high poverty. Limpopo leads with 25% of its households, followed by the Eastern Cape and KwaZulu-Natal with 20% of their households (Maluleke 2019: online).

This implies that inhabitants of South African rural communities have more ready access to agricultural resources than the average city-dweller. These rural communities would thereby have a deeper understanding and appreciation for cultivation activities.

The following summary, indicates the percentage of households per province showing the involvement in agricultural activities as a *main* source of food:

- Gauteng: 18.1%
- Northern Cape: 15.2%
- Free State: 13.6%
- KwaZulu-Natal: 9.4%
- Mpumalanga: 9.3%
- **Eastern Cape: 6.5%**
- Western Cape: 3%
- North West: 2.7%
- Limpopo: 1.8%

In the whole of South Africa 7.5% of households are involved in agricultural activities for their main source of food. This is an indication of some of the absolute poverty that exists in South Africa (Maluleke 2019: online).

Based on these observations, it is evident that an architectural intervention should provide a platform for nurturing agricultural activities, as well as promoting employment in less privileged communities.

South African citizens need to work together to achieve a state of food security, therefore, such an architectural intervention must focus on human upliftment through skill collaboration. Food production, has however, taken on different forms.

Food production initiatives have taken various forms over the years - each with benefits and loopholes. However, one factor remains constant; the need for these initiatives to be sustainable. When selecting the most sustainable method of cultivating nutritious food, it must also be borne in mind that this method could be refined when incorporating architecture.

Alternative Approaches

Before moulding a place for sustainable cultivation of food, methods and alternative approaches for food cultivation need to be considered. The selection of an appropriate choice plays an important role in the architectural approach to the proposed project. Five agricultural programmes have already been implemented in South Africa to help eradicate food insecurity. These five programmes were implemented by Food & Trees for Africa (FTFA), a small delivery agent that operates between small scale farmers and sponsors or investors. The first of these five programmes is community market gardens.

i. **Community Market Gardens:** This income-producing, vegetable production initiative is highly suitable for the South African agricultural landscape (Food & Trees for Africa 2020: online).

This programme helps to bridge the gap for those small-holder producers who have surpassed the threshold of sustainable agriculture but have not reached production on a commercial farming scale. The community market gardens do however still have the potential to produce a substantial amount of food (Food & Trees for Africa 2020: online).

This production of food increases the food security of the surrounding community while providing the smallholder with a sustainable livelihood. These market gardens can also be referred to as micro-farms - producing cash crops such as vegetables, herbs, and fruit. The crops are often either sold directly to a community retailer or aggregated and sold to fresh produce markets. Community market gardens play a particularly important social and business role in South Africa. They serve as small hubs where activities such as socialising, agro-processing, and other small unrelated business dealings can take place. These gatherings are often characterised by groups of women who take responsibility for larger plots of land, either individually, in pairs or as a group (Food & Trees for Africa, 2020: online).

ii. **School Food Gardens:** This concept is one of the best ways to supply healthy meals to learners. The nutrition from the fresh herbs and vegetables improves a learner's concentration and performance abilities considerably. The approach is to "start small and grow big" (Food & Trees for Africa 2020: online).

iii. **FEED Africa:** FEED is the acronym for Farmer Eco-Enterprise Development. In its simplest form, this programme focuses on the development of four hectares of land, for four emerging organic farmers. These projects are scaled up as they progress over time, and given support in terms of management, training, mentorship, and marketing (Food & Trees for Africa 2020: online).

This programme enables emerging farmers to form part of the mainstream agricultural economy - prioritising the local markets and retail prices. The farmers could later use this business model as a strategy to replicate it on a larger scale.

iv. **Homestead Gardening:** This initiative can have a significantly positive impact on food security in communities. These gardens have a slightly different focus as it uses permaculture guild theory. Fruit and nut trees are typically included, as well as medicinal plants and herbs, as a base. Vegetables and legumes are also

cultivated. The aim is to supply the household nutrition with a diversity of plants during as much of the year as possible.

This initiative is similar in its design to that of the Trees for Homes programme, where community educators receive training to then aid the households in establishing and maintaining their gardens (Food & Trees for Africa 2020: online).

v. **The EduPlant School Gardening and Nutrition Programme:** This programme began in 1994 and has become the largest, most impactful programme in its category in Southern Africa. EduPlant focuses on schools, learners, and the surrounding communities, by developing school-linked food security clusters in the under-resourced communities and townships. Using mainly permaculture, the programme achieves far more than growing food and improving nutrition, it promotes sustainable practices and environmental ethics, as well as whole systems thinking, creating strong social and food security community networks.

While the *Homestead Gardening* initiative proves to be less community-driven, the *Community Market Gardens* appear to focus more on the nurturing of both communal and economic development through agricultural activity. This project, although smaller than the proposed Micro-Mall, proved how the involvement of a community in a progressive project, can result in the development of socialisation and gathering activities. Later in the design process, it was found that the concept of community involvement could be incorporated not only through the agricultural activities, but through arts, crafts and poiesis.

The *School Food Gardens*, as well as the EduPlant School Gardening and Nutrition Programmes, alternatively concentrate on the provision of healthy, nutritious food to children within a learning environment. It was upon investigating this method of sustainable agriculture, that the proposed project took on a new function, namely, to educate. This project is not a job half done to merely fill communities' stomachs, but rather a job well done to feed their minds as well. A tourism and learning sector was included in the proposed functions of the design, where schools or inquisitive tourists could come to learn about sustainable farming methods.

On a larger and more commercial scale, the FEED Africa initiative deals with providing emerging organic farmers with the opportunity to expand their skills and develop their careers. The upliftment and provision of career expansion opportunities for the emerging farmers in this initiative, gave rise to the idea of using the proposed micro-mall as an architectural catalyst for the upliftment and empowerment of the surrounding underprivileged community in Cathcart, providing them with an opportunity to develop their skills and begin profitable careers. The site conditions for the proposed *RuraLift Project* in Cathcart, are unfortunately unsuitable for the cultivation of healthy crops, which ruled out the option of soil-based farming methods and redirected the investigation towards soilless farming techniques.

In addition to the aforementioned sustainable agricultural programmes, another project in South Africa is investigated. This project deals with soilless cultivation methods, namely hydroponics.

vi. **Tshwaraganang Hydroponics Cooperative:** This project began in Windsorton, in the Northern Cape province of South Africa, when Edwin Mabotsa had, as a matric student in 1997, identified hydroponic agriculture as a sustainable means for generating fresh food. It was with the help of the joint venture between Shoprite Checkers (Pty) (Ltd) and the Small Enterprise Finance Agency (SEFA), that Edwin's idea was materialised and remains a success (Shoprite Holdings Ltd. 2020: online).

It was the Tshwaraganang Hydroponics Cooperative venture, in particular, that drove the research for this project, towards investigating the sustainability of soilless farming methods. Due to this investigation, it became apparent that a project such as *RuraLift* would need support and funding from a corporation with a similar vision.

Passing the Rod: Shoprite - an Economic Enabler

As part of the chapter on food security, it was established that there are four main components which influence a country's food security status; *Availability, Access, Utilisation* and *Stability.*

It was subsequently deduced that the unemployment rate of a country has an indirect effect on *access* to food through its impact on the *affordability.* As previously discussed, a state of food security cannot exist, should one of the four components be compromised. Hence, a country with a high unemployment rate is a country with financially strained citizens, who will not always be able to afford the food produced within it.

Overcoming the Obstacles - Unemployment

According to Plecher (2020: online), the unemployment rate in South Africa in 2019 was 28.18% - indicated in Figure 33. This was only 5.29% lower than the unemployment rate spike of 33.47% in 2002, when the ripple effects of the Twin Tower crash in September 2001 negatively affected the South African economy. The following graph indicates how, despite that increase appearing relatively nonthreatening, there has been a gradual, but fairly consistent rise in the unemployment rate in South Africa, since 2008 (Plecher, 2020: online). Given the global economic impact of the COVID-19 pandemic in 2020, the unemployment rate of South Africa has spiked once again.

It is during such difficult economic times that smaller towns and communities suffer the most. As a result, citizens from these small outer-lying communities are forced to seek employment in the larger cities. This results in increased urbanisation, leaving the small towns drained of human resources and opportunity.

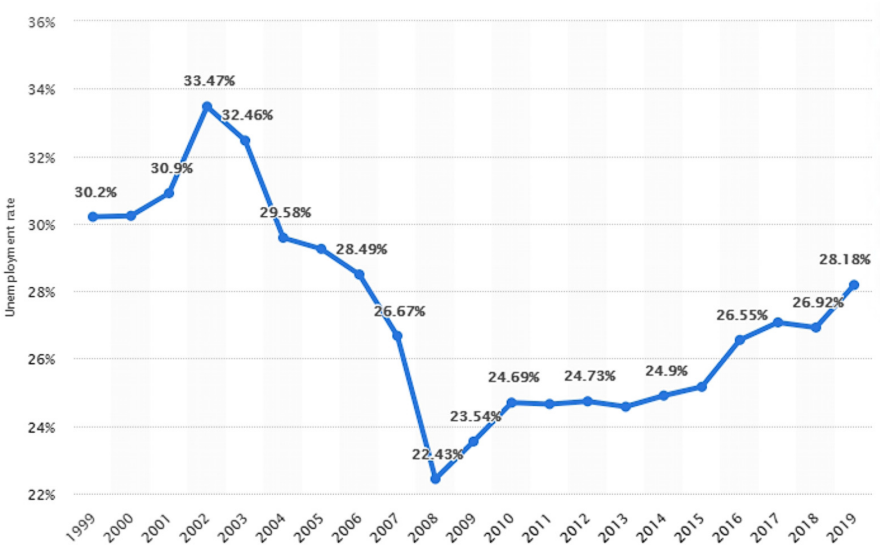


Figure 33: Graph depicting the South African unemployment rate fluctuations from 1999 to 2019 (Plecher 2020: online).

According to the Amahlathi Local Municipality which governs Cathcart, as well as many other towns in the surrounding area of the Eastern Cape, the employment status of the Amahlathi area indicates that only 23.8% of the working-age population is employed (*Figure 34*). The 2007 community survey of the Amahlathi area, recorded an estimated population size of 112736 people, of which 96.4% are black, 0.5% are coloured, 0.3% are indian or asian, and 2.8% are White.

The last recorded census in 2011 reveals a population size of 7360 in Cathcart, of which 93.4% are black, 1.97% are coloured, and 4.29% are White (Brinkhoff 2016: online).

The abovementioned statistics and figures, indicate that the town of Cathcart, as well as its surrounding areas, need a catalyst for economic growth and development.

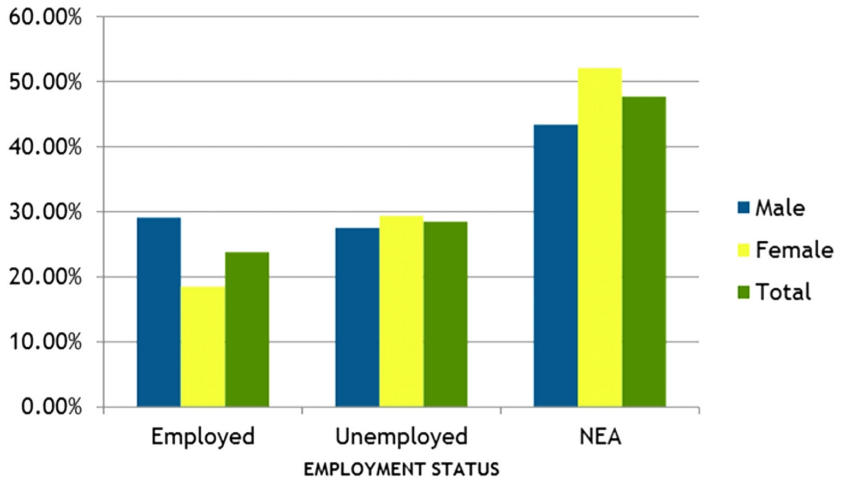


Figure 34: Graph depicting the recorded community survey in 2007 of the Amahlathi LM Employment Status – the percentage of inhabitants who are employed, unemployed, or not economically active (NEA) (Umhlaba Consulting Group 2012: Review Report 1).

Shoprite Checkers – Passion for progression

In November 2015, the 'OK Franchise' division of the South African private company, Shoprite Checkers (Pty) Ltd, entered into a joint venture agreement with the Small Enterprise Finance Agency (SEFA). As part of this agreement, the two parties committed to working together on the empowerment of previously disadvantaged South Africans, in owning their own franchise business (FASA Admin 2016: online). A mentoring and training initiative was devised.

OK Franchise agreed to mentor and provide the necessary training for entrepreneurs while sharing their expertise and stock pricing structures with them as guidance. SEFA in turn agreed to fund each SME Business with a maximum of R5 000 000, provided that they meet the criteria and vision – to fund black owned franchises that wish to trade in retail space, as per the opportunities provided by OK Franchise. The criteria further stipulate that:

- The franchisee must be a South African citizen with a SA ID as proof.
- The individuals must possess the necessary contractual capacity.
- The franchises owned by the individuals must maintain a fixed permanent address.
- The company must be at least 51% black-owned and run by South African citizens.
- The franchises may only be operated within South Africa.
- The individuals must have a business plan or proposal which motivates the franchise and proves that the owners have had experience in retail.
- The franchisee may be required to contribute; however, this is not necessarily an obligation.
- Concerning credit record, should a judgement, notice, and default be issued against the applicant, a letter or document must be provided, as proof that the account has been settled.

- Partial or no contribution to the financing of the franchise, depending on the Steering Committee assessment.
- The franchisee, as the owner, must manage the franchise and remain on the business premises.
- The franchise must meet some of the SEFA developmental targets, such as the youth, women, disabled, rural or semi-rural.
- The individuals must have some retail industry experience or have the potential to become a franchisee with the help of training and monitoring.
- A competitor, as well as local industry analysis report for the franchise must be identified (FASA Admin, 2016: online).

It was as a result of a previous agreement between Shoprite Checkers and SEFA, that they were able to launch three flourishing franchise businesses, which in total, provided permanent employment for 107 people. They were also able to meet community demands for shopping convenience as well as affordable prices (FASA Admin 2016: online). Subsequent to the agreement between OK Franchise and SEFA, further job creation followed.

In 2016, following the launch of the agreement between OK Franchise and SEFA, an additional 34 permanent jobs were created through the establishment of another franchise business.

This agreement provided for the purchase of existing retail franchise businesses, through the establishment of new and/or the upgrading of existing retail businesses under the brands of OK Foods, OK Mini Mark and OK Express.

Tshwaraganang Hydroponics Cooperative

As previously discussed, food security is one of the highest priorities both in South Africa as well as the rest of the world. Over and above achieving food security, one of the greatest obstacles for South Africa, in particular - is unemployment.

The Tshwaraganang Hydroponics Cooperative Project helps establish a strategy for the elimination of food insecurity, as well as unemployment in South Africa and inspired the *RuraLift* study.

Edwin Mabotsa (*Figure 35)* - was filmed and interviewed about his journey to success with Tshwaraganang Hydroponics Cooperative, and how Shoprite Checkers helped him realise his dream (Shoprite Holdings Ltd. 2020: online).

Mr Mabotsa (Founder of Tshwaraganang Hydroponics Cooperative) and Madaleen



Figure 35: Edwin Mabotsa in the Tshwaraganang Hydroponics Greenhouse (Amphibic Design 2020: online)

Castanho (Buyer for Shoprite) are quoted from the following interview:

Edwin: Windsorton is a semi-rural area. You will find the community along the banks of the Vaal River. The area becomes very hot in summer and very cold in winter. Mining was the heartbeat of the town many years ago. I realised that mining was going to become a problem as I could see that the miners were not investing back into the community. So, at the present moment many young people are unemployed. The idea of hydroponic farming started when I finished matric in 1997. Once the idea was born we approached the municipality during that time for the land. The Department of Agriculture did infrastructure funding and NDA did funding for the operational cost. Hydroponics was a new thing in South Africa. At one stage I wanted to give up, but given there was no hope in Windsorton, I had to stand up and prove that something like this can happen. There was a shortage of cucumber farmers in the country. Shoprite was struggling to get cucumbers. They



Figure 36: Birds-eye view of the semi-rural area of Windsorton (Shoprite Group 2018: online).



Figure 37: Photo of the people of Windsorton (Shoprite Group 2018: online).

requested that I do cucumber production for them (Shoprite Group, 2018: online).

Figures 36, 37, 38, and *39*, show scenes from within Windsorton, and the poor living conditions of the people in the town, which inspired Edwin Mabotsa to investigate an alternative sustainable and economically feasible method of food production.

Madaleen: Shoprite is really focussing on trying to get local suppliers. We saw a market for English cucumbers, and we were able to help Edwin set it all up.



Figure 38: Photo of the people of Windsorton (Shoprite Group 2018: online).

Edwin: Without Shoprite it was going to be very difficult. Running a greenhouse is a high investment operation. They workshopped me about the specs of fruit that needs to be on the shelf; the length and width. Without them I don't think we could have made it to this date (Shoprite Group, 2018: online).

On the following page, *Figures 40, 41,* and *42*, show photographs of Edwin's setup in Windsorton of Tshwaraganang Hydroponics Cooperative, as well as the Shoprite trucks



Figure 39: Photo of the people of Windsorton (Shoprite Group 2018: online).

which collect the fresh produce from the greenhouses.

Madaleen: English cucumbers is not the easiest produce to grow so what he is achieving here is amazing. In 10 years, Edwin has grown from delivering a few crates a week, to becoming a national supplier.



Figure 40: Shoprite truck travelling to and from Tshwaraganang Hydroponics Cooperative (Shoprite Group 2018: online).

Figures 43, 44, 45, and *46* all show the agricultural and administrative processes which take place within Tshwaraganang Hydroponics Cooperative.

Edwin: The programme employs 14 permanent workers, 80% are women. Tshwaraganang has changed our lives in the sense that it helps within our homes because there is a salary



Figure 41: Tshwaraganang Hydroponics Cooperative greenhouses (Shoprite Group 2018: online).

that comes on a monthly basis. We can budget for food, making a difference in our homes (Shoprite Group, 2018: online).

Madaleen: Tshwaraganang really demonstrates how we are getting behind the government's initiative to create jobs and uplift communities. Although we are South Africa's biggest retailer, we not just concentrating on the big farmers, but we are helping



Figure 42: Birds-eye view of Tshwaraganang Hydroponics Cooperative (Shoprite Group 2018: online).

Figure 43: Edwin Mabotsa tending to the greenhouse crops (Shoprite Group 2018: online).



Figure 44: Edwin Mabotsa and Madaleen Castanho walking through the hydroponic greenhouses (Shoprite Group 2018: online).

small scale farmers to grow their businesses (Shoprite Group, 2018: online).

Figures 47 and *48* indicate how the fresh and packaged produce is distributed from Tshwaraganang Hydroponics Cooperative.

Edwin: When the customer buys our products from Shoprite Checkers, it empowers us, it creates hope. Everybody who is involved at the enterprise is being empowered because we know that there is a continued market that will be buying production from us (Shoprite Group, 2018: online).



Figure 45: Edwin Mabotsa and employee tending to administrative work (Shoprite Group 2018: online).



Figure 46: Edwin Mabotsa monitoring the outgoing crates of fresh produce (Shoprite Group 2018: online).



Figure 47: Tshwaraganang Hydroponics Cooperative fresh produce distribution room (Shoprite Group 2018: online).



Figure 48: Checkers truck travelling from Tshwaraganang Hydroponics Cooperative, after having picked up the crates of fresh produce (Shoprite Group 2018: online).

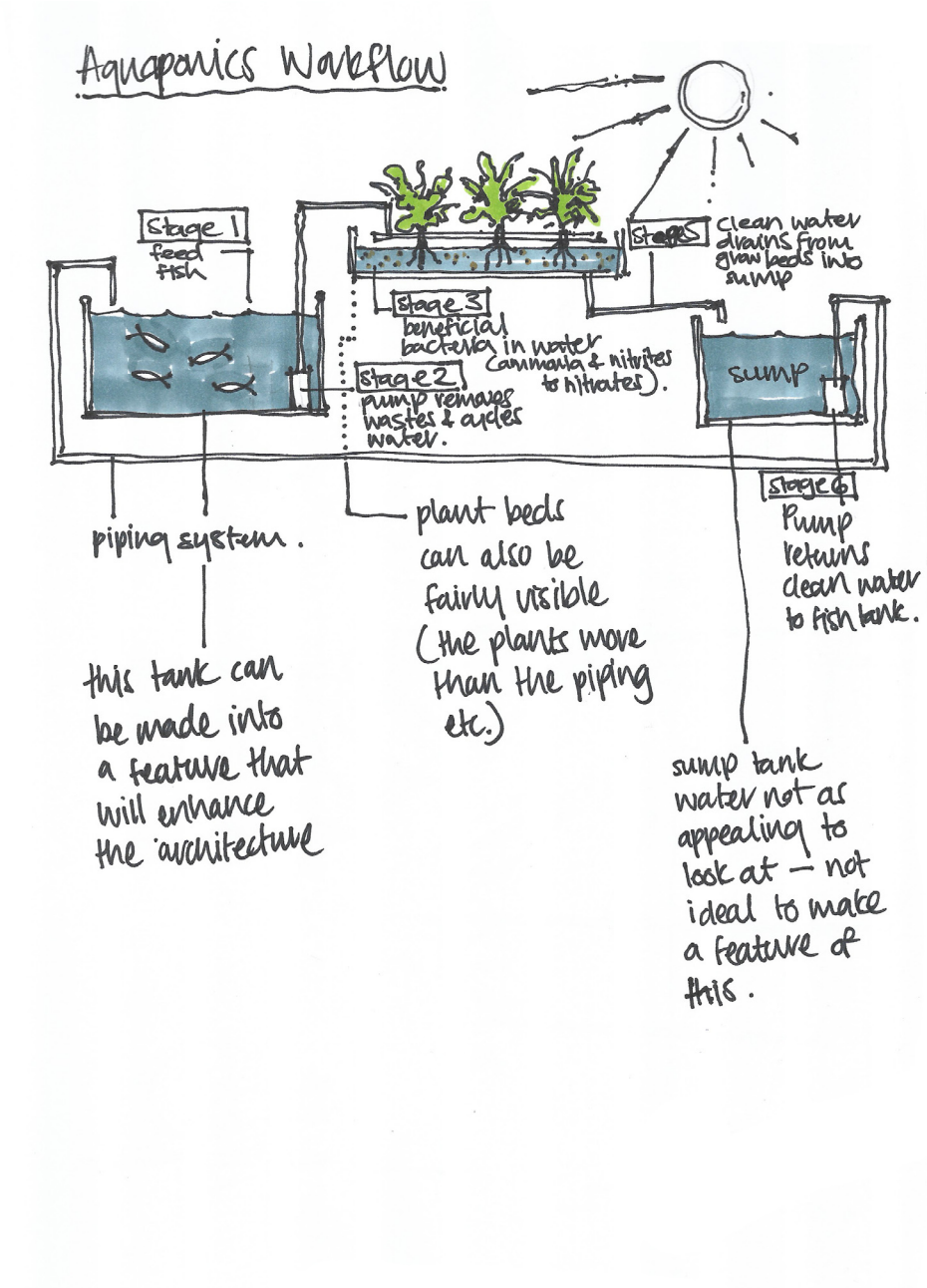


Figure 49: Sketch of aquaponic system process (Author, 2020: own illustration).

Using the Fish Industriously: Aquaponic Food Production

Having explored the dire need for a secure and effectively distributed supply of nutritious food to communities all around the country, it became clear that an innovative method of food production is crucial. Through researching current sustainable agricultural programmes which have been successfully implemented in South Africa, the agricultural farming method of choice for the proposed project is hydroponics. This method proved to be sustainable through its climatic versatility as well as its dependable supply of food and productivity. Building on the success of the hydroponics method, an innovative opportunity presents itself to empower malnourished communities, while upholding the philosophy of the proverb;

"Give a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime" – Anne Isabella Thackeray Ritchie (Mrs. Dymond)

However, during further investigations regarding the success of hydroponics, an even more innovative development of this method has come to light namely, ***aquaponics.*** In this particular system the use of fish is employed, setting fishing rods aside and using the fish industriously instead.

What is Aquaponics?

Aquaponics is defined as; *a system of growing plants in water used for the cultivation of aquatic organisms* (Merriam-Webster 2020: online). The word 'Aquaponics', as well as the concept of it, is derived from the combination of the terms 'Hydroponics' and "Aquaculture", hence, the incorporation of fish in a water-driven plant cultivation method (GeaSeeds 2020: online).

In simpler terms, aquaponic agriculture can be described as a soilless method of growing plants, built on two main elements, namely – water and fish. *Figure 49* shows a diagram illustrating this process.

The waste produced by the fish element in an Aquaponic system serves as the ideal fertilizer for nourishing plant growth. Given that aquaponics mimics a natural ecosystem, it has proven to be highly successful through its implementation in various parts of the world. The method represents the eco-systemic relationship between water, aquatic life, bacteria, nutrient dynamics, and plants which all thrive together in waterways in nature. It is through the exchanging of the waste by-product from the fish as a food source for the bacteria, that it can be converted into ideal fertilizer to for improving the plant growth. It is through this process that the water is cleaned and can be returned to the fish tank for the cycle to begin again. Aquaponic agriculture is a combination of all the most successful growing techniques, in that *it uses the waste produced by one element, to feed and nourish the growth of another*. The benefits of aquaponic agriculture are numerous.

The Benefits of Aquaponic Agriculture

The proposed *RuraLift Project* has focussed on the implementation of aquaponic growing techniques for several reasons, including the fact that it will be produce a safe and reliable supply of healthy food to citizens around the country. The following benefits further justify the use of aquaponics as a progressive means of cultivating food:

- Aquaponic gardening is mostly done at waist-high level, which eliminates weeds and the discomfort of back strain when tending to the plants. Gardening at this height also prevents small animals from accessing the plants.
- The aquaponic process uses nutrient-rich water that is continuously recycled, with no toxic run-off.
- Aquaponic systems use a tenth of the quantity of water used in soil-based

gardening, and even less than what is needed for a hydroponic or an aquaculture system.
- Harmful petrochemicals, pesticides or herbicides are unnecessary in this cultivation method, as it functions as a natural ecosystem.
- Garden maintenance is either reduced dramatically or eliminated, leaving the aquaponic grower to focus on more enjoyable tasks, such as feeding the fish and harvesting or tending to the crops themselves.
- Aquaponic systems are versatile, provided that they have exposure to natural sunlight or grow-lighting. They can function indoors, outdoors, in a greenhouse, or a basement.
- These systems can be adjusted in size to fit the most manageable budget.
- Both plants and fish can be harvested from the system.
- The fish effluent is highly nutritious for the plants, which eliminates the need for soil or toxic chemical solutions. The plants, naturally occurring bacteria and the media in which they grow, all contribute to the natural purification of the water, which eliminates the need for water to be discharged and wasted. The water can be circulated through the system indefinitely and only topped up when it has been lost through transpiration and evaporation (The Aquaponic Source 2020: online). Aquaponic agriculture has several techniques to choose from.

Aquaponic Agriculture Techniques

Before implementing aquaponic agriculture into the design, it is important to obtain a comprehensive understanding of a few of the primary successful cultivating techniques which are more commonly used. These techniques are listed below:

- **Deep Water Culture (DWC)**

This method can also be referred to as *a raft based growing technique*, where foam rafts float in fish effluent water from which solid waste has been filtered. The plants are placed individually in holes in the foam raft, to allow their roots to dangle freely in the water.
This method is most appropriate for fast-growing, relatively low-nutrient plants such as salad greens, and is more commonly used on a large commercial scale (The Aquaponic Source 2020: online).

- **Media-Based Aquaponics**

Here the growing technique involves cultivating plants in static planting media, which can. include expanded clay pellets or shale and which provides the biological filtration (ammonia converted to nitrates) as well as mechanical filtration (solid waste removal) needed in the system.
These systems can allow cultivation of a wide range of crops and are ideal for small scale cultivation, such as home or hobby setups. Plants which bear large fruits grow particularly well in media-based aquaponic systems, as well as leafy greens, herbs and other varieties of vegetables (The Aquaponic Source 2020: online).

- **Nutrient Film Technique (NFT)**

Such systems employ the process of feeding nutrient-rich water through narrow troughs or PVC piping. Similarly to the foam raft system, holes are drilled into the PVC piping for the placement of the plants, allowing their roots to dangle in the water flowing through the pipe, illustrated in *Figure 50*.
Plants that do not require much support, such as strawberries and herbs, grow well using this technique. This method is ideal for using otherwise ‘wasted space’, as the system can be suspended above other growing areas (The Aquaponic Source 2020: online).

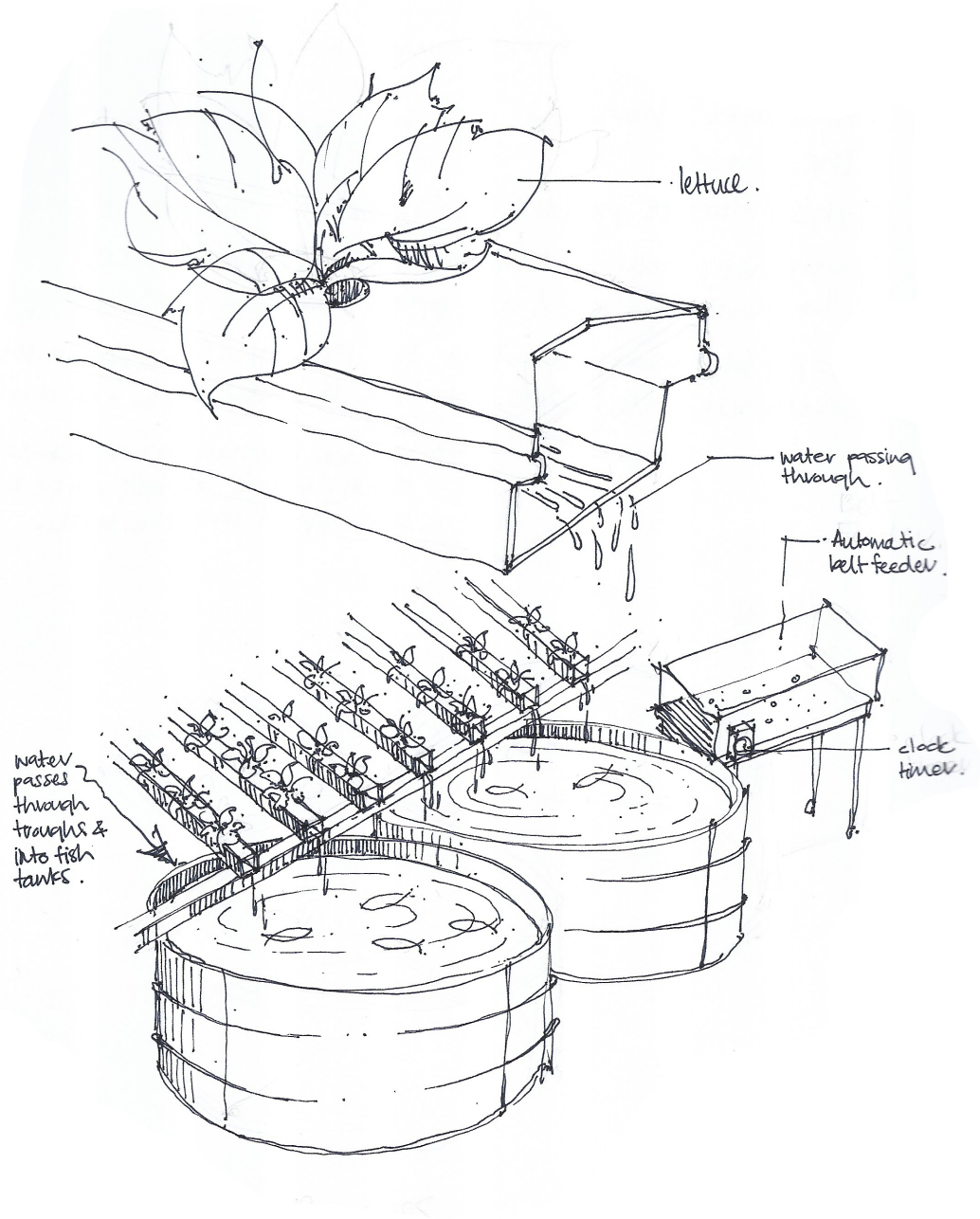


Figure 50: Sketch of NFT system (Author, 2020: own illustration).

- **Vertical Aquaponics**

Vertical aquaponics (*AquaVertica*) is a method requiring the plants to be stacked on top of one another in tower systems, allowing even higher crop densities to be cultivated in limited space. Water is fed into the top of the tower and passes through a wicking material from which the roots of the plants absorb the nutrient-filled water. This water will either fall directly back into the fish tanks, or into a trough which will then carry it to the tanks.
Crops which do not require support, such as leafy greens and strawberries, grow best in these systems (The Aquaponic Source 2020: online).

Types of Cultivated Fresh Produce Using Aquaponics

A wide variety of plants can be cultivated using aquaponics, but more importantly, fruit, vegetables, and herbs can be grown as a source of food. Carrots, Brussel sprouts, cabbage, celery, radish, broccoli, lettuce, basil, parsley, organum, thyme, chives, mint, rosemary, cucumber, squash, zucchini, eggplant, tomato, amongst others are suitable for cultivation.

Specifications and Requirements for an Aquaponic System

Aquaponic systems cannot function successfully if stipulated ratios are unbalanced or if aspects of the process are lacking. Therefore, there are a few basic principles which all aquaponic systems need to follow, for good results. The following general requirements had to be taken into consideration throughout the design process of the proposed building:

General Requirements:

i. **Water Quality**

There are three factors which contribute to the success of an aquaponic system: temperature; pH; and flow rate. These factors must remain constant and be monitored closely throughout the duration of the system. The water temperature and pH level affect the health of the fish, while both the plants and the fish are dependent on the flow rate. The flow rate affects the successful distribution of water to all the grow beds and plant towers and keeps the fish tank water aerated.
Given that the water quality in the aquaponic system is extremely sensitive to change, the water must be kept out of the reach of the public in the design. The water cannot be contaminated in any way, and its temperature may not fluctuate.

ii. **Fish**

When introducing the fish element into the aquaponic system, three main factors have to be considered; breeds, diet and temperature. The ideal breeds of fish to use are Koi or Tilapia, both species known for their resilience.
In this particular proposed project, Tilapia will be used as they require less tank space than the Koi, less dissolved oxygen, and adapt well to their environment. Tilapia have an omnivorous diet and would therefore also not feed off one another. Unfortunately, this breed of fish reproduces quickly and has a fast growth rate, which could lead to overcrowding issues in the tank; however, this can be counteracted through harvesting. The Tilapia thrive in water that has a pH of between 6.5 and 9 and at a temperature of between 28°C and 30°C. The temperature that has to remain consistent, even when situated in colder climates (Go Green Aquaponics 2019: online). The stocking density of the tank should amount to 0,5kg of fish per 20 – 26l of water (Bernstein & Lennard 2020: online).

iii. **Substrates**

There are various types of substrates which have been subjected to special processing and can range from organic to mineral origins.

Examples of substrates which have undergone processing are; peat, perlite, and vermiculite.

Organic substrates alternatively can be derived from waste or by-products from agricultural, industrial, or urban activities. Organic substrates such as manure and straw are obtained from agricultural activities, while industrial activities produce substrates from the by-products of the timber industry, amongst others (Aquaponic Food Production Systems, 2019: online).

The town of Cathcart is located approximately 64km from Kubusi Sawmill - a Large Log sawmill in Stutterheim. This sawmill could therefore supply the aquaponic greenhouses for the proposed project, with the necessary untreated by-products from the manufacturing and processing of the pine logs.

iv. **Crops**

The types of crops which will be cultivated in the proposed aquaponic greenhouses will be dependent on the stocking needs of Shoprite Checkers.

The growing techniques that will be accommodated in the greenhouses of the proposed project, will incorporate; Deep Water Culture (DWC), and Vertical Aquaponics. These techniques will also determine the types of crops which could be cultivated.

v. **Sunlight**

Natural sunlight passing through the glass panels of the greenhouses will provide the light for photosynthesis to occur throughout the day, while LED Grow Lights can be used on days when sunlight is limited, or for part of the night, ensuring steady growth.

vi. **Greenhouse Atmospheric Temperature**

The ideal atmospheric temperature for the greenhouses ranges from 24°C to 27°C.

vii. **Ventilation**

The aquaponic greenhouses will need ventilation to keep the atmospheric temperature well regulated. Hydraulic vent systems in the glass roof panels of the greenhouses, will open or close depending on the system-monitored temperatures.

viii. **Glass**

The glazing used for the construction of the greenhouses needs to assist in providing the plants with the ideal spectrum of light which they need to flourish. Therefore the glass would need to reflect harmful ultraviolet (UV) rays and allow Photo-synthetically Active Rays (PAR) to pass through (Arcadia Glasshouse: Greenhouses & Conservatories, 2020: online).

ix. **Weather Station**

A solar-powered weather station will monitor weather conditions both inside and outside the greenhouse, and provide the supervisor, as well as the laboratory technicians, with comprehensive data on both temperature and humidity levels (Greenhouse Accessories, 2020: online).

Architectural Design Opportunities for an Aquaponic System

Aquaponic systems are very successful in a greenhouse context. Greenhouses can be constructed from glass, fibreglass, and polycarbonate, amongst other materials.

Given its aesthetic appeal, it was decided that the use of *glass* for the greenhouses would be the most appropriate in the proposed design. The zigzag profile of the greenhouse roofing provides a platform for design opportunity, in terms of reflective surfaces and pattern in form. This profile could be repeated or celebrated throughout the structure.

The *water* and *fish* components of an aquaponic system are equally appealing, in that both create visual interest and invoke a state of psychological calm within the mind of the observer. It would therefore be advantageous to the spatial atmosphere of the design to display these elements in a more public space, rather than conceal them in the greenhouses. Fresh produce is another element that could be incorporated into the design.

Incorporating the cultivation of fresh produce as an element into the aquaponic greenhouses, is yet another element which could prove to be beneficial for the design. The greenery cultivates an atmosphere of health, abundance, serenity, intrigue, and hope. The surroundings play an essential role in the wellbeing of humans therefore acknowledging the dramatic impact of the interplay of space and culture needs to be considered.

Space and Culture: Feeding the Community

In the book, *Local Architecture: Building, Place, Craft, and Community* by Brian MacKay-Lyons and Robert McCarter (2014) MacKay-Lyons discusses the ideas of Juhani Pallasmaa on sustainable metaphors in the chapter, *Architecture and Human Nature: A Call for a Sustainable Metaphor.* MacKay-Lyons further develops these ideas in the piece “The Marvellous Human Brain”. It is in this piece that MacKay-Lyons exposes how surroundings have a dramatically large impact on human beings. Expanding on this statement, MacKay-Lyons went on to credit the discovery of the neurologist, Semir Zeki, in *Inner Vision: An Exploration of Art and the Brain.* It was in this book that Zeki suggested that the theory of aesthetics was biologically based, and that a culture that was losing its sense of beauty was on a path of decline. Zeki stated further that art is an extension of the functions of the visual brain, in search of essentials (MacKay-Lyons. 2014). Bearing Zeki’s assertions in mind, the aquaponics micro-mall aspires to not only pay attention to the value of aesthetics and visual experiences, but also to provide economic opportunities for a previously disadvantaged community.

The proposed aquaponics micro-mall serves as a place of nourishment, and economic opportunity. The micro-mall aims to generate a large supply of healthy, affordable food for both Cathcart and the Eastern Cape Province, while providing a previously disadvantaged community with a platform from which they can trade and thereby generate enough money to sustain healthy lifestyles. Yet, the wellbeing of humans encompasses much more.

Within the framework of nourishment and health, the wellbeing of humans arises not only due to their financial stability and their ability to access healthy food, but also due to a process of self-actualisation; while experiencing a sense of belonging in their workplace. This project therefore meets the needs of people thus making it socially responsible.

In striving for socially responsibility, the aquaponics micro-mall provides spaces of comfort and cultural familiarity for the Xhosa people of Cathcart, while drawing attention to the tourism market. This does not solely depend on the morphology of the overall design, but also requires careful attention to detail in the decorative approach to finishes, as well as the empathetic planning of spatial organisation.

Together, with sensitively crafted finishes, natural light will be used to the atmospheric advantage of both the public and retail spaces. These elements will create intrigue, accent, inspiration and comfort for both the visiting tourists, as well as the entrepreneurs working within their market units. Reflective surfaces are

used to manipulate or redirect natural lighting though more dimly lit areas of the building. Such attention to the ambience of the surroundings continues to grow into the landscaping of this aquaponics micro-mall.

The landscaping and gardening around the proposed micro-mall, follows the natural growth of the surrounding Cathcart landscape: needing little maintenance, and increasing in beauty over time, progressively complementing the building as the site evolves. This approach to the gardening is again based on the natural aesthetic appeal of settlements out in the landscape – building with it, rather than against it. Although cultural sensitivity needs to be adhered to in terms of the natural and built environment; this needs to be taken further.

Despite the sensitively executed spaces and finishes creating a nurturing and culturally familiar environment for the employees and tourists; this is still not enough. To provide the underprivileged community with these attributes is not sufficient to generate the desired community spirit which this project aspires to create. A person who has not contributed to the construction of a final product will lack a deeper connection with it. They will not appreciate its value and meaning due to not having experienced the labour and care invested in moulding the finished product. Throughout this process it is crucial that the community feel respected and valued.

It is pivotal that the community in Cathcart feel respected, valued, and included in the process of construction. Addressing these values will create a unification of their pride as a community in what they have created together. This process of achieving unity through making can be realised through Participatory construction methods.

Participatory Construction

The participatory construction approach to building methods encompasses the active involvement of the end-users in the construction process. This method can prove to be complex, as there are no set guidelines on how to involve the participants appropriately. It is the responsibility of the architect to establish where and how the skills and labour of the participants could be used most effectively while ensuring that all input is treated with respect and given equal representation. Participation of the end-users will result in a meaningful experience.

Using this approach will benefit the community involved, in that, rather than imposing a new building upon them; it will allow the participating end-users to feel that they are a meaningful part of its production. This approach will benefit both the end-user and the architect.

By employing this approach the architect will learn and understand the end-users' needs, regarding the use of spaces and overall design decisions and how this affects them (Hurst: 2000). Participatory construction thus has a positive effect on the end product.

According to the community design specialist, Henry Sanoff (2000), participatory construction has a positive effect on the end product, in that the end-users are included in the design process. Not only do they feel that their needs have been met, but they also feel that they have influenced the decisions made in the process. In addition, to this positive spin-off, is the creation of a sense of accountability for the consequences of decisions made (Sanoff: 2000). Community involvement is a key factor in this construction process.

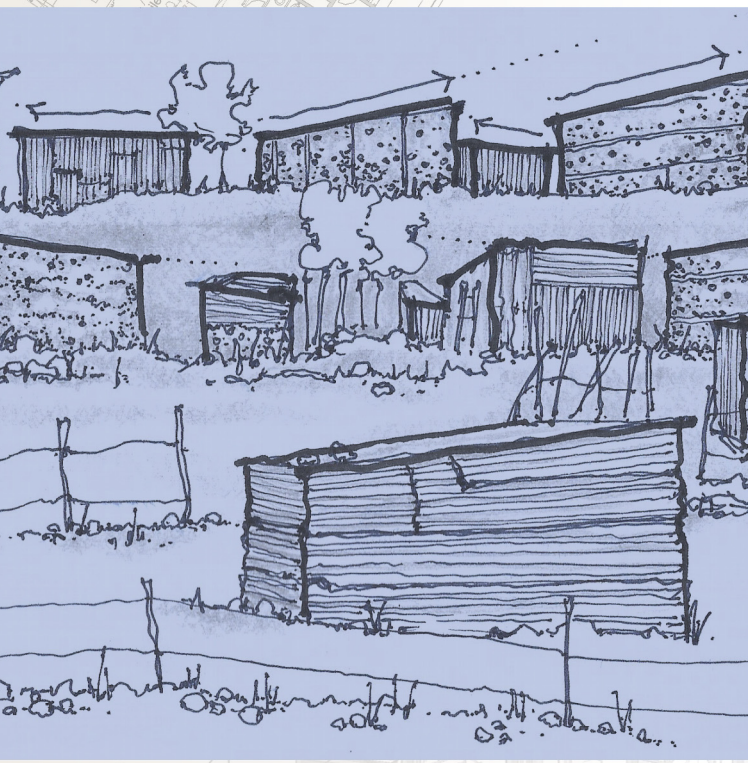
The proposed aquaponics micro-mall aims to involve the surrounding disadvantaged Xhosa community in the construction process. Either their physical labour can assist the progress of construction, or the utilization of their arts and craft skills can be incorporated into the refinement of the finishes of the building.

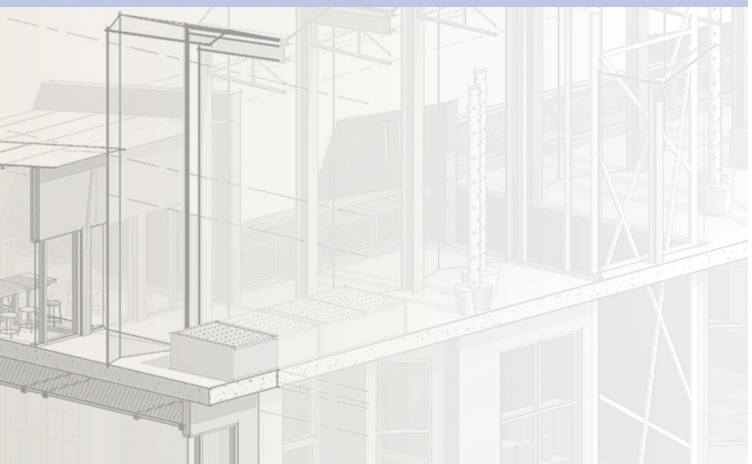












Part THREE

Precedent and Case Studies

"Architecture is the thoughtful making of space." - Louis Khan

The aquaponic micro-mall is inspired primarily by socio-economic needs, rather than a specific type of pre-investigated functional architecture. As a result, sourcing a building which encompasses a similar network of functions is challenging. This chapter deals with the various types of designs, structures, and concepts which spark the inspiration for sections of the proposed aquaponic micro-mall design.

Theoretical Precedent Study

The theoretical underpinnings of this project focus on the physical and psychological fulfilment of people, particularly underprivileged communities, through architecture.

TIn the previous chapter, participatory construction methods are introduced. As established, employing this method, while developing this project, would, amongst other social needs, address creating work opportunities. This will be possible by involving the members of the community in the construction process. An example of such collaboration is the construction of the *Library of Muyinga Burundi.*



Figure 51: Photograph of the Library of Muyinga (Archello 2020: online).

Figure 52: Compacted Earth Blocks (CEB) to be laid (Archello 2020: online).

Library of Muyinga, Burundi by BC Architects
Completed: 2012

Analysis

The *Library of Muyinga* - depicted in Figure 51 - forms part of a prospective, inclusive school for hearing impaired children. This building is constructed predominantly from compressed earth blocks – shown in Figure 52. Although the materials and structural resolution for this project differ from that of the proposed *RuraLift Project*, it is the process of construction which is most intriguing.

Prior to the commencement of the construction process, BC architects spent two months doing fieldwork in the region and neighbouring provinces surrounding Muyinga. This experience inspired design decisions, giving the architects insight into the use of local materials, the application of techniques, and the implementation of building typologies.

Based on their two months of fieldwork, the BC Architects have been able to successfully conduct the participatory construction process for this library. Photographs depicting this process can be seen in *Figures 53, 54, 55* and *56*.

Lessons Learnt

Given the uniqueness of the proposed *RuraLift* aquaponic micro-mall, alternative and more commercial construction methods will need to be used. The ground floor structure of the micro-mall bears the heavy load of the aquaponics greenhouses, including the prefabricated structural elements. However, in terms of the building's core functional value, it must nurture the arts and craft skills of the Xhosa community. In the same way that field research proved to be necessary and enlightening for the BC Architects, so too will such research be necessary for the *RuraLift Project* in Cathcart. Field research will



Figure 52



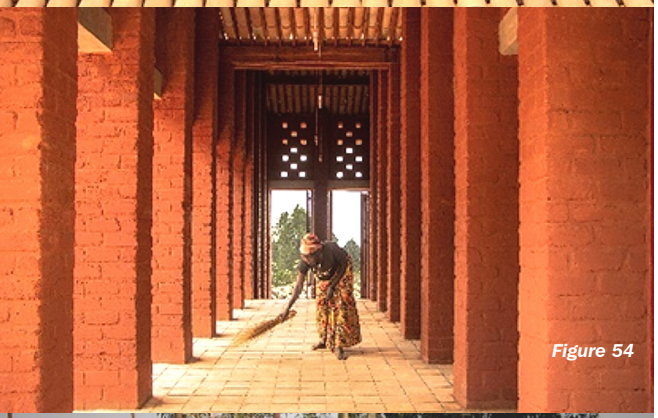






Figure 53: Photograph of the community members involved in the roof construction process (Archello 2020: online).

Figure 54: Photograph of a woman from the community assisting in the finishing process (Archello 2020: online).

Figure 55: Photograph of the community members involved in the construction process (Archello 2020: online).

Figure 56: BC Architects team members discussing the library construction on site (Archello 2020: online).

Figure 57: Photograph depicting the library at night, with lights glowing (Archello 2020: online).

serve to inform and generate an insight into the cultural norms and values of this Xhosa community. By being fully briefed with this information ensures that the building is constructed in such a manner that caters respectfully, for the specific needs of those people who will be making use of the retail spaces.

Principles Identified

The *Library of Muyinga* focuses on social integration, as a community project, where the hearing-impaired children of the community are given a place of belonging in which they can be included in stories, access and exchange of information, and education. Hearing-impaired children had previously often been isolated or excluded due to their disability. As a result, the Library of Muyinga is therefore not only a product of the successful collaboration between intercultural dialogue and participatory processes, but also a platform for the strengthening of social interactions, giving the building both value and deeper meaning to the community. Added to this, is the implementation of educational processes through the construction of the library. The educational institutions which benefited from, and contributed to the construction of this project, are: LUCA Architecture University in Brussels; Zevenkerken High School; and architecture internships. Students and interns from these institutions were given the opportunity to visit the site to assist in the construction process, while simultaneously learning from it (BC Architects 2020: online).

The *RuraLift Project* will, similarly, be focused on the inclusion of the disadvantaged Rocklands community members who continue to struggle to support themselves. Although the proposed process of building will not actively involve students or interns, the completed micro-mall will present opportunities for tourist attractions, as well as educational opportunities for visiting educational institutions about aquaponic cultivation methods. Landscapping additions to the

school of Muyinga, serve as further inspiration for the *RuraLift Project*.

The future additions to the school of *Muyinga*, plan to utilize the remainder of the site for the creation of playgrounds and courtyards while accommodating the existing surrounding slopes and trees (BC Architects 2020: online). These landscaping additions help to 'stitch' the autonomous building into the surrounding context – an approach which inspired additions of a similar nature to the *RuraLift Project*.

The photograph in *Figure 57* depicts the effective use of light in the library design, generating a warm and comforting atmosphere synonymous with a beacon of hope in the darkness. The *RuraLift Project* draws from this concept, by making the greenhouses a glowing feature at night. Case studies concerning design and materiality are investigated



Figure 57



Figure 58

Design and Materiality: Case Studies

The investigation and analysis of the two precedent studies, the *Ubuntu Center* and *The Mapungubwe Interpretation Centre* has influenced aspects of the design process and materiality of the proposed aquaponics micro-mall. This analysis addresses the overall design in terms of morphology, path, and functionality. Beginning with the *Ubuntu Center* by Field Architecture, is situated in South Africa. This building serves as a model for sustainable development.

Ubuntu Center, Port Elizabeth, South Africa by Field Architecture Completed: 2010

Analysis

The *Ubuntu Center* is a health and social services complex located in Port Elizabeth, in the Eastern Cape, South Africa – shown in *Figure 58*. The building design is a model for sustainable development - beginning with the environment and extending towards the preservation of life and community well-being. The *Ubuntu Center* houses a multi-functional hall for education, concerts and shelter when needed. There is an additional empowerment wing with career guidance and a computer; along with a fully equipped paediatric HIV/TB testing and counselling clinic (livinspaces 2016: online).

According to Stan Field, the *Ubuntu Center* is built in the place of a post office which was burnt down during the apartheid era. The replacement of the post office with a health and social services complex is symbolic of the surrounding community's transformation (Pearson 2012: online). Growth and development are the focus areas in the designing of the *Ubuntu Center.*

Lessons Learnt

The *RuraLift Project*, similarly to the *Ubuntu Center*, focusses on the growth and development of the surrounding underprivileged communities. When forming a path approach to the *RuraLift Project's* spatial layout, it is the distribution of the mass of the *Ubuntu Center* which allows for pedestrian walkways to continue, through the building, motivating a similar sensitivity in the *RuraLift's* path design. The voids between the masses in the *Ubuntu Center* act as a continuation of the township pathways in this surrounding context. See *Figure 59* (livinspaces, 2016: online).

The degree of sensitivity given to the *Ubuntu Center's* context, with the design aspect of continuing pathways (see *Figures 60* and *61*), creates a critical sense of community ownership, thus allowing this building to survive within a township context (livinspaces 2016: online). The *RuraLift Project* draws from this effective approach, in order to 'knit' itself into the existing Rocklands community structure as depicted in the analytical sketch.

The analytical sketch in *Figure 62* illustrates the investigation of the treatment of paths and spaces for gathering and movement through the *Ubuntu Center*. These spatial resolutions are taken into account when generating paths within the *RuraLift Project* design.

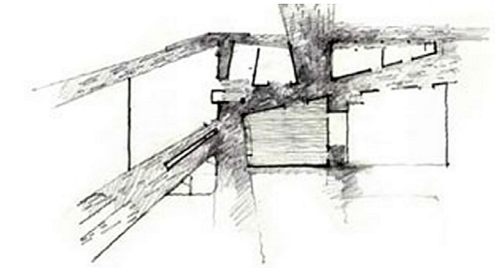
The *Ubuntu Center's* landscaping (*Figure 63*) makes use of low-maintenance succulent, vegetation such as aloes and a variety of other plants, with large natural rocks scattered in between. The landscaping of the *RuraLift Project* uses this same approach to create a warm, dry, African atmosphere around the building. The concrete forms in the Ubuntu Center design are of the *Principles Identified.*

Figure 58: Exterior façade of the Ubuntu Center (livinspaces 2019: online).

Figure 59: Conceptual and spatial sketches by Field Architects (Pearson 2012: online).

Figure 60: Spatial allocation floor plan of the Ubuntu Center (Archidatum on Livinspaces, 2016: online).

Figure 61: Conceptual and spatial sketches by Field Architects (Pearson 2012: online).



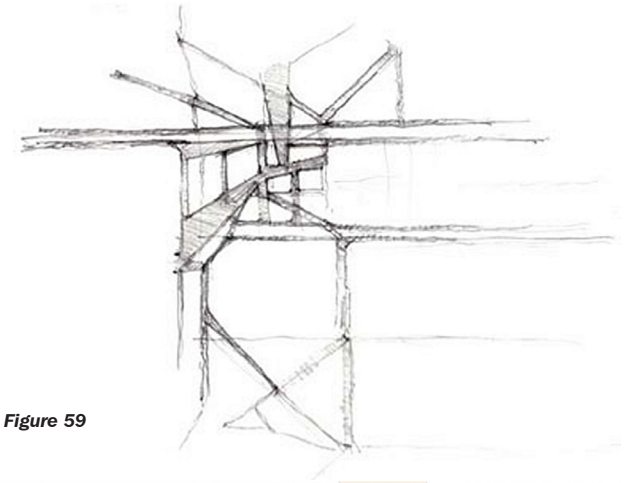


Figure 59



Figure 60



Figure 61

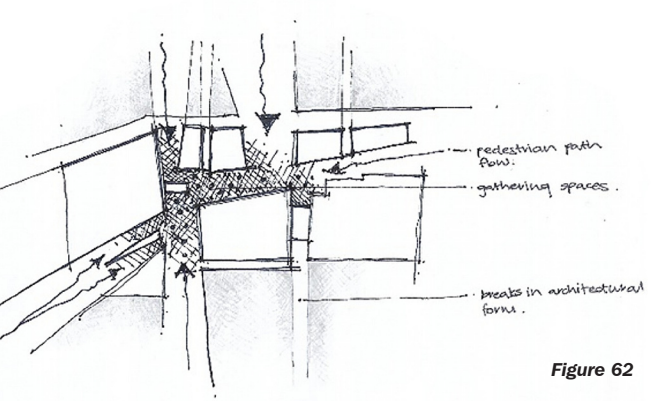


Figure 62

Figure 62: Spatial arrangement sketch, indicating the voids and masses, which influenced the proposed RuraLift Project design (Author, 2020: own illustration).



Figure 63

Figure 63: Exterior view of the landscaping for the Ubuntu Center (Archidatum on Livinspaces, 2016: online).

Figure 64: Sketch, illustrating the influential leaning forms of the masses, which influenced the proposed RuraLift Project design (Author, 2020: own illustration).

Figure 65: Materials, textures and connections used in the Ubuntu Center (Archidatum on Livinspaces 2016: online).

Figure 66: Materials, textures, light, and surfaces in the interior of the Ubuntu Center (Archidatum on Livinspaces 2019: online).

Figure 67: Organic rooftop garden of the Ubuntu Center (Archidatum on Livinspaces, 2016: online).

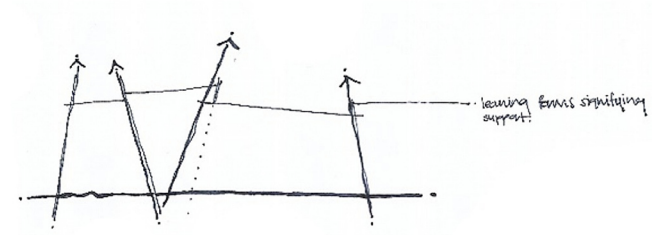


Figure 64

Principles Identified

The folding concrete forms in the Ubuntu Center design, are read as independent volumes which lean against each other for support thus supporting the theme of *Ubuntu* - 'I am because you are' (livinspaces 2016: online). These leaning forms indicate support, and community strength, inspired by the concept of solidarity, giving rise to the influence on the *RuraLift Project's* form-giving (*Figure 64*).

These concrete, folding forms initially influenced the market unit designs on ground level, but this idea reforms to accommodate the structural viability of the micro-mall. The raw concrete forms of the *Ubuntu Center*, and the repetition of the timber louver systems, give an honest, earthy aesthetic appeal to the façade of the structure. This characteristic is applied in the *RuraLift Project*. The use of warm natural tones, textures, and materials, in the *Ubuntu Center* (*Figure 65* and *Figure 66*), fosters the Genius Loci of the African communities. Inviting and comforting the users of these spaces, in their material and textural familiarity. The organic rooftop garden and neighbourhood gardens feeds a large number of students daily.

The organic rooftop garden (*Figure 67*), along with the neighbourhood gardens, feeds 2 245 students daily, while the other facilities provide holistic support for 3 500 clients and their families (livinspaces, 2016: online). Not only is the functionality of the rooftop garden beneficial to the neighbourhood, but it is also visually accessible to the passing pedestrians, spreading awareness of the centre's nutrition programme (ArteFacts, 2020: online). The *RuraLift Project* objectives spiral around food security and ultimately human health and prosperity. The aquaponics greenhouses initially served as the resolution to the achieving of this goal, however, the treatment of this approach to securing food availability and accessibility has become exclusive to some extent. The greenhouses of the *RuraLift Project* becomes physically untouchable, and so begins the concept of stitching the design further into the neighbouring Rocklands community, by including vegetable gardens and social spaces in the landscaping. The principle of bringing about social connectedness and interaction through the cultivation

of healthy food inspired these changes to the *RuraLift Project* design.

Over and above the *Ubuntu Center* feeding the community, it also provides after-school education to 250 students and delivers HIV counselling and testing to 6 000 community members (livinspaces, 2016: online). Although the *RuraLift Project's* functions differ from those of the *Ubuntu Center*, a common thread connects the two – nourishment of human life where it is lacking. This could be either in the form of supplying nutritious food, or education. The *RuraLift Project* includes a tourism centre to teach, not only students but also for those people interested in aquaponics as an innovative approach to the production of fresh produce. The second case study is that of the Mapungubwe Interpretation Centre by Peter Rich Architects, is also situated in South Africa.

Mapungubwe Interpretation Centre, Limpopo, South Africa
by Peter Rich Architects
Completed: 2011

Analysis

*M*apungubwe is located in province of Limpopo, on the South African northern border, with Botswana and Zimbabwe – a land rich with flora and fauna, such as Baobab trees of over 1000 years old, as well as elephants, giraffe, white rhino, antelopes and 400 bird species (Seda 2016: online).

The Mapungubwe Interpretation Centre (*Figure 68*) employs locals from the surrounding communities, to assist in the making process - *Participatory Construction*. These locals are trained in the manufacturing of stabilised earth tiles and constructing timbrel vaults. Excess tiles are utilised by the masons for their own houses in nearby villages (Peter Rich Architects 2020: online). It is the colour scheme and textural quality of the *Mapungubwe Interpretation Centre*, that has influenced the approach to the materials used in the *RuraLift*



Figure 65



Figure 66



Figure 67



Figure 68



Figure 69

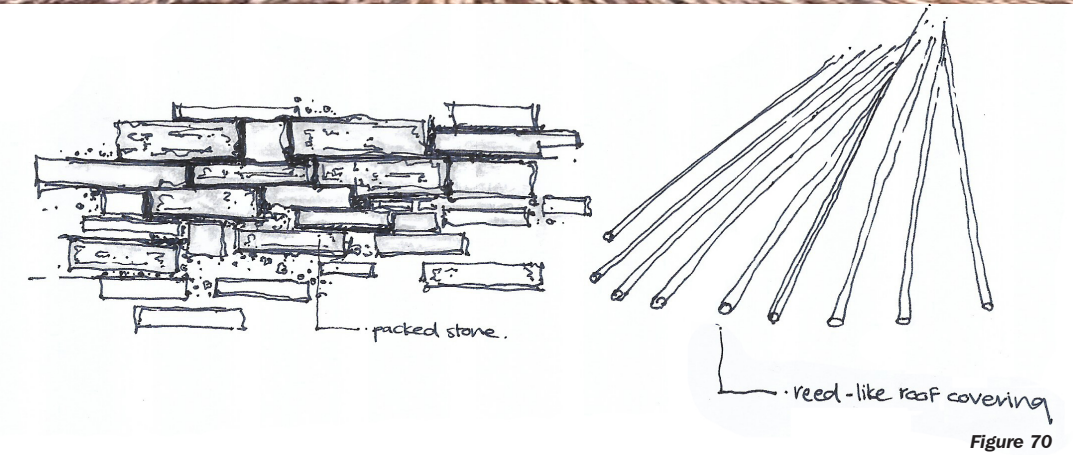


Figure 70

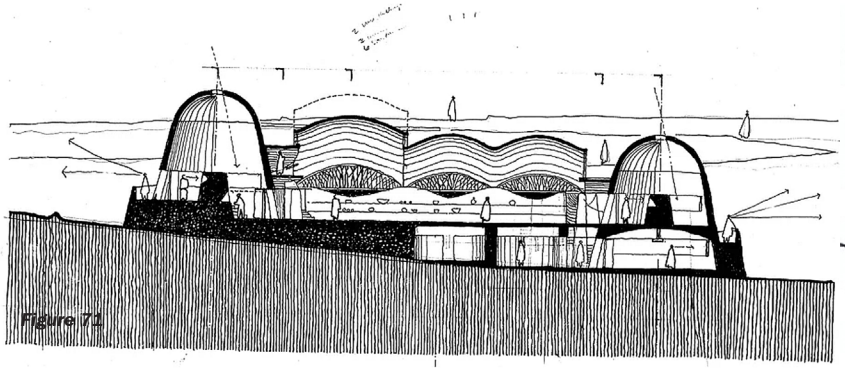
Project by means of packed stone, reed-like timber, hand-applied plaster and masonry work (*Figure 69* and *Figure 70*); thereby, taking on the warm tones of this African landscape. There are however lessons to be learnt from the *Mapungubwe Interpretation Center.*

Lessons Learnt

The connecting of paths and gathering spaces in the *Mapungubwe Interpretation Center,* tell stories of transition, gathering, community and hierarchy displayed in (*Figure 71* and *Figure 72*). These spatial relationships communicate themselves in section, indicating a 'rippling' flow through the building which provides the opportunity for fluctuation of form and integration of landscape (*Figure 73* and *Figure 74*). The *RuraLift Project's* concept of interlacing through structure and landscape, takes from this approach by allowing the building to crack open and lock into the site. Part of the *Principles Identified* in the *Mapungubwe Interpretation Center* is that of employing participatory construction.

Principles Identified

The *RuraLift Project*, like the *Mapungubwe Interpretation Center,* intends on employing the participatory construction approach, where the locals from surrounding settlements are involved in the poiesis of the building. The construction process of the *Interpretation Centre* is thus a labour of love, working upon the principle of building community relationships. This principle was further developed into one of sharing, where the excess materials from the construction process, was given to the locals to use for the improvement of their own shelters or homes in their communities. This principle of sharing could also be incorporated in the participatory construction process of the *RuraLift Project*, where the locals of the Rocklands settlement could benefit from this new architectural intervention. The two buildings referred to as precedent studies are the *Uchi Restaurant*, by Tres Birds Workshop and the *Bemglô Store*, by Vao Architects. These studies begin with structure and materiality.



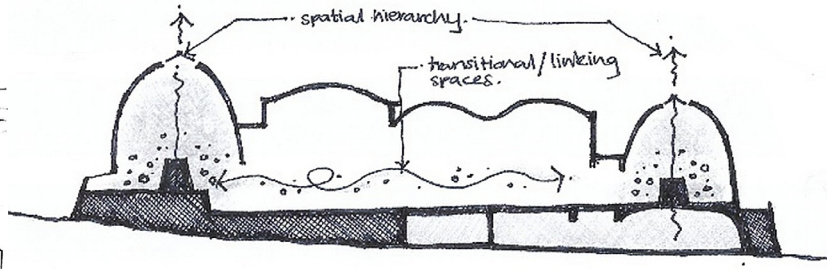


Figure 72

Figure 68: Landscaping and context surrounding the Mapungubwe Interpretation Centre (Architecture in Development, 2020: online)

Figure 69: Materials, textures, light, and surfaces of the Mapungubwe Interpretation Centre (Architecture in Development 2020: online).

Figure 70: Sketch, illustrating the influential material use for the finishes in the Mapungubwe Interpretation Centre (Author, 2020: own illustration).

Figure 71: Floor plan indicating textural diversity and spatial arrangement (Peter Rich Architects 2020: online).

Figure 72: Sketch, illustrating the influential approach to spatial hierarchy in the Mapungubwe Interpretation Centre (Author, 2020: own illustration).

Figure 73: Site plan indicating textural diversity, gathering and path (Peter Rich Architects 2020: online).

Figure 74: Sketch, illustrating the paths and gathering spaces (Author, 2020: own illustration).

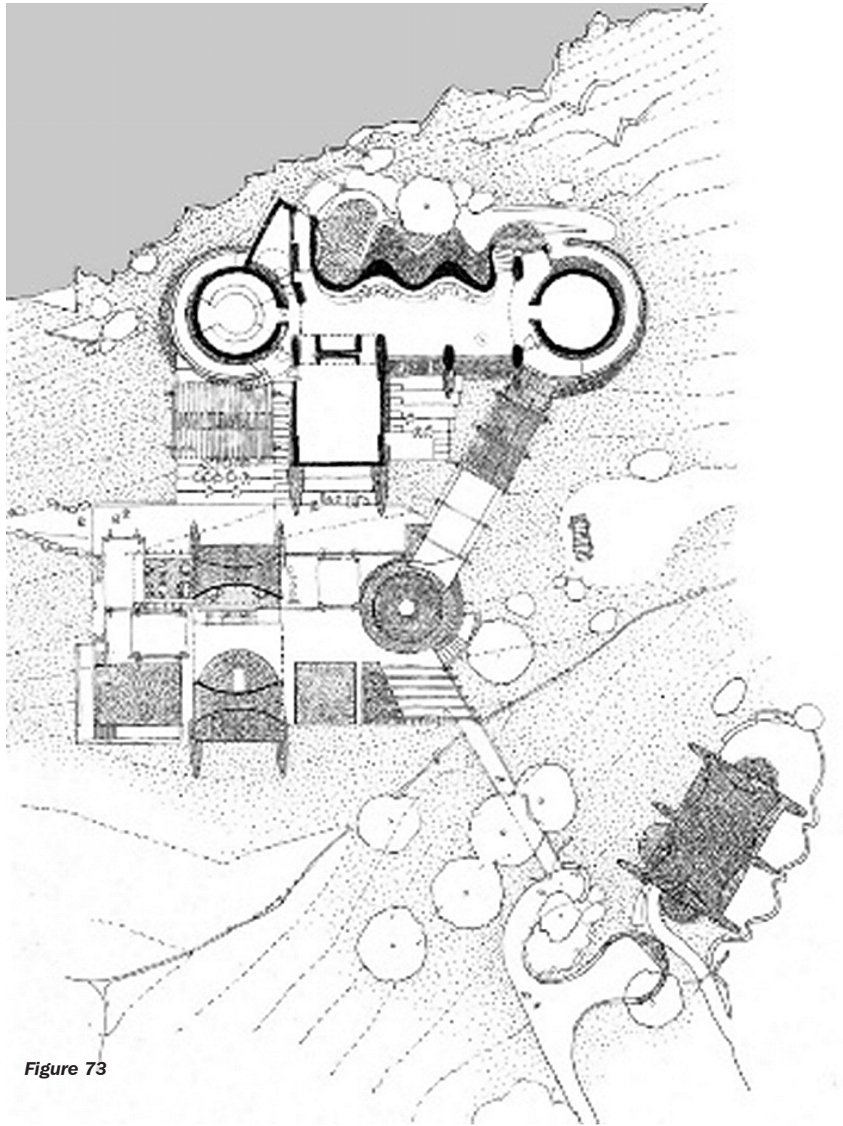


Figure 73

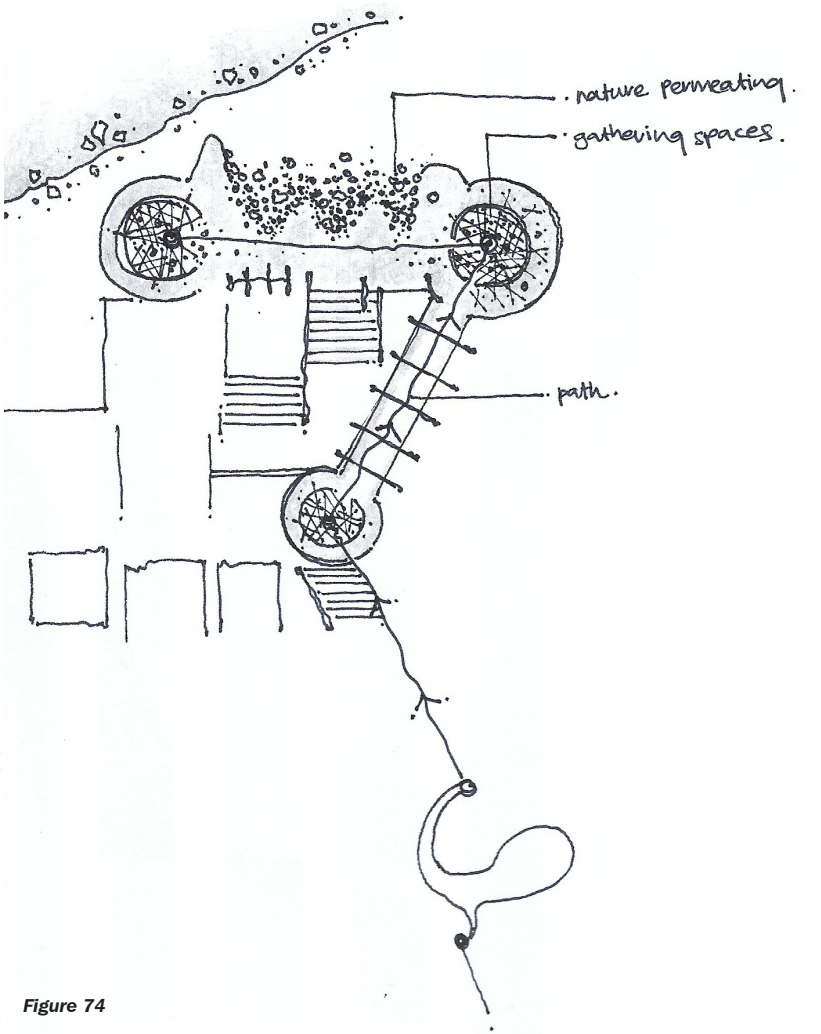


Figure 74



Figure 75

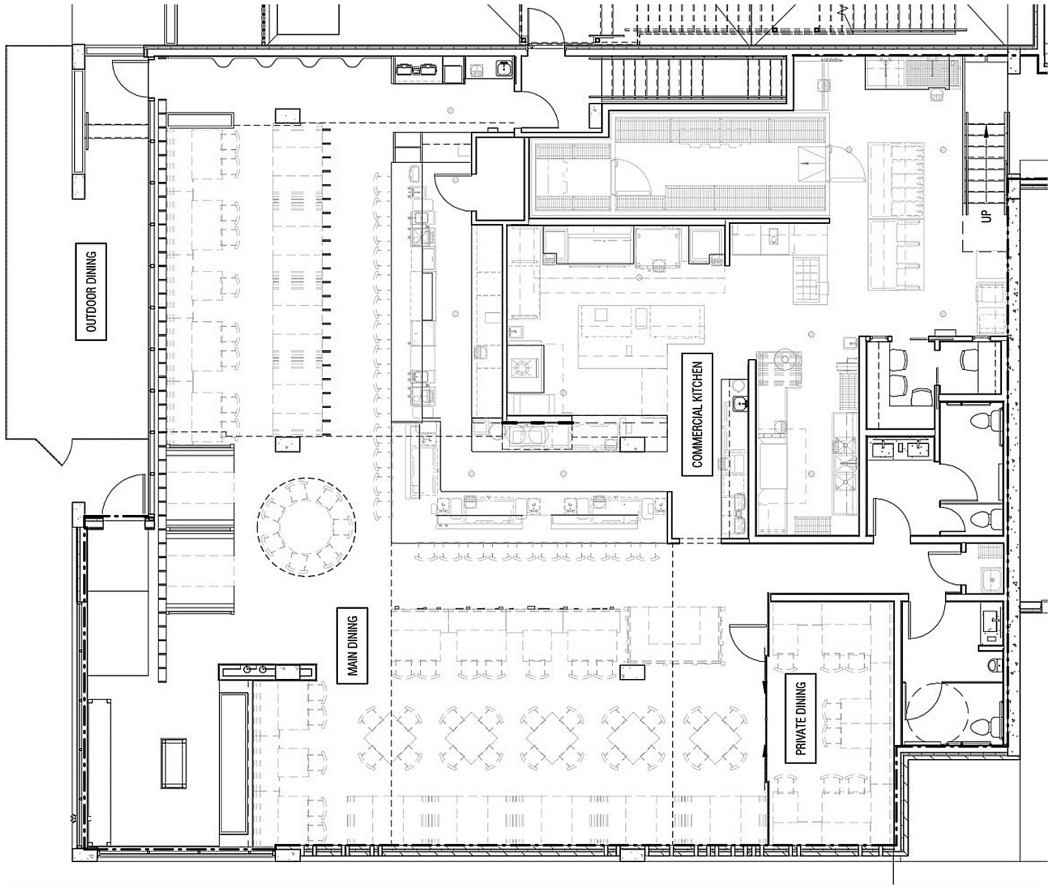


Figure 76

Structure and Materiality: Precedent Studies

The structure and materiality of the market space and greenhouses of the aquaponics micro-mall project are influenced by the findings of the investigations and analysis of two precedent studies; the *Uchi Restaurant*, by Tres Birds Workshop in Denver, Colorado, and the *Bemglô Store*, Jardim Paulista, Brazil by Vao Architects. These analyses address two main functional aspects of the aquaponics micro-mall namely, the aquaponics sector, and the market space. The precedent studies are divided into their structural and material influences for this design, starting with the *Uchi Restaurant's* greenhouse's function.

The Aquaponics Sector and Restaurant

The *Uchi Restaurant* incorporates the use of a greenhouse on its first-floor level. This greenhouse supplies the restaurant on the ground floor level below, similarly to the intended functional flow for the proposed *RuraLift Project*. The function of the *Uchi Restaurant's* greenhouse is examined more closely in an analysis.

Uchi Restaurant, Denver, Colorado by Tres Birds Workshop Completed: 2018

Analysis

This Japanese restaurant is located in Denver, Colorado, and boasts a greenhouse featuring soil-free growing towers for its aeroponic production of fresh produce (*Figure 75*, McKnight, 2019: online).

The *Uchi Restaurant* encompasses a 1 546 square meter ground floor restaurant, encapsulated by a concrete frame with brick in-fill shell, as well as a 209 square meter first floor level of light steel and glass - structured, mechanical space serving as an aeroponic

greenhouse.

Above the eatery (*Figure 76*), is the 650 square meter aeroponics greenhouse on the first floor (*Figure 77*) which Tres Birds created, serves as the restaurant's supply of fresh organic produce throughout the year (McKnight, 2019: online). This spatial arrangement of placing the restaurant below a greenhouse where fresh produce is cultivated influenced the decision to place the *RuraLift Project's* restaurant unit partially beneath the aquaponics greenhouses. Although the RuraLift Project's restaurant does not benefit directly from the aquaponics greenhouse produce, it does allow for customers to visually interact with the green spaces. A creative use of contrasting materials is discovered through lessons learnt.

Lessons Learnt

The *Uchi Restaurant's* use of materials, like the heavy brick and concrete ground floor, contrasts the light steel and glass first-floor aeroponic greenhouse (*Figure 78*). This ideal junction of materiality is what the *RuraLift Project* aspires to achieve.

The glass aeroponic greenhouse plays no functional role by exposing the cultivated produce to the natural sunlight, but it also adds to the aesthetic charm of the restaurant. The aquaponic greenhouse of the *RuraLift Project* borrows from this design approach by making a feature of the fresh, green aquaponic crops instead. The polycarbonate greenhouses of the *RuraLift Project* are, cupped by the brick and concrete market unit forms on ground level as if raising a beacon of green hope to the sky for passers-by to admire.

A 2.4m oculus in the first-floor slab above the ground floor dining area of *Uchi Restaurant* (*Figure 79*) allowing customers to enjoy a view of the greenhouse above. It is this concept that inspires the market space glass fish tanks in the *RuraLift Project* (A'Design Award & Competition 2019: online). The *RuraLift Project's* restaurant's first floor also allows prospective customers to become engaged in the green aquaponic scenery by being able to gaze through windows that look into these greenhouses. This creates a more direct visual connection with the greenhouses than in the case of the *Uchi Restaurant*. On the other

Figure 75: Exterior evening view of the Uchi Restaurant (Tres Birds, 2020: online).

Figure 76: Ground floor plan of Uchi Restaurant (McKnight, 2019: online).

Figure 77: Sketch, illustrating the spatial and functional relationship between the ground floor restaurant and the first floor aeroponics greenhouses - which supply the ground floor functions (Author, 2020: own illustration).

Figure 78: Early evening view of the entrance to Uchi Restaurant (ArchDaily, 2020: online).

Figure 79: Sketch, illustrating the influence of the 2.4m oculus design feature in Uchi Restaurant, on the fish tank design features in the RuraLift Project (Author, 2020: own illustration).

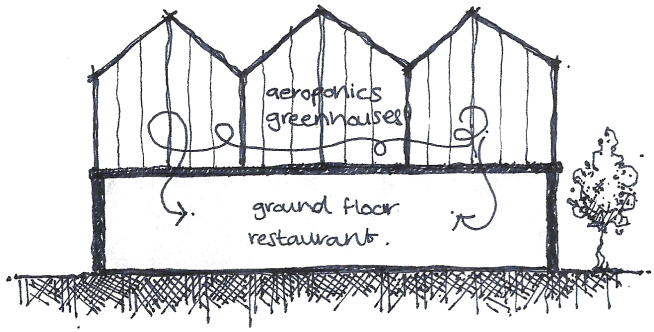


Figure 77



Figure 78

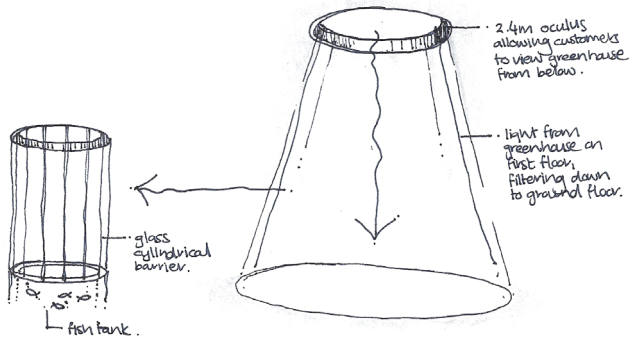


Figure 79

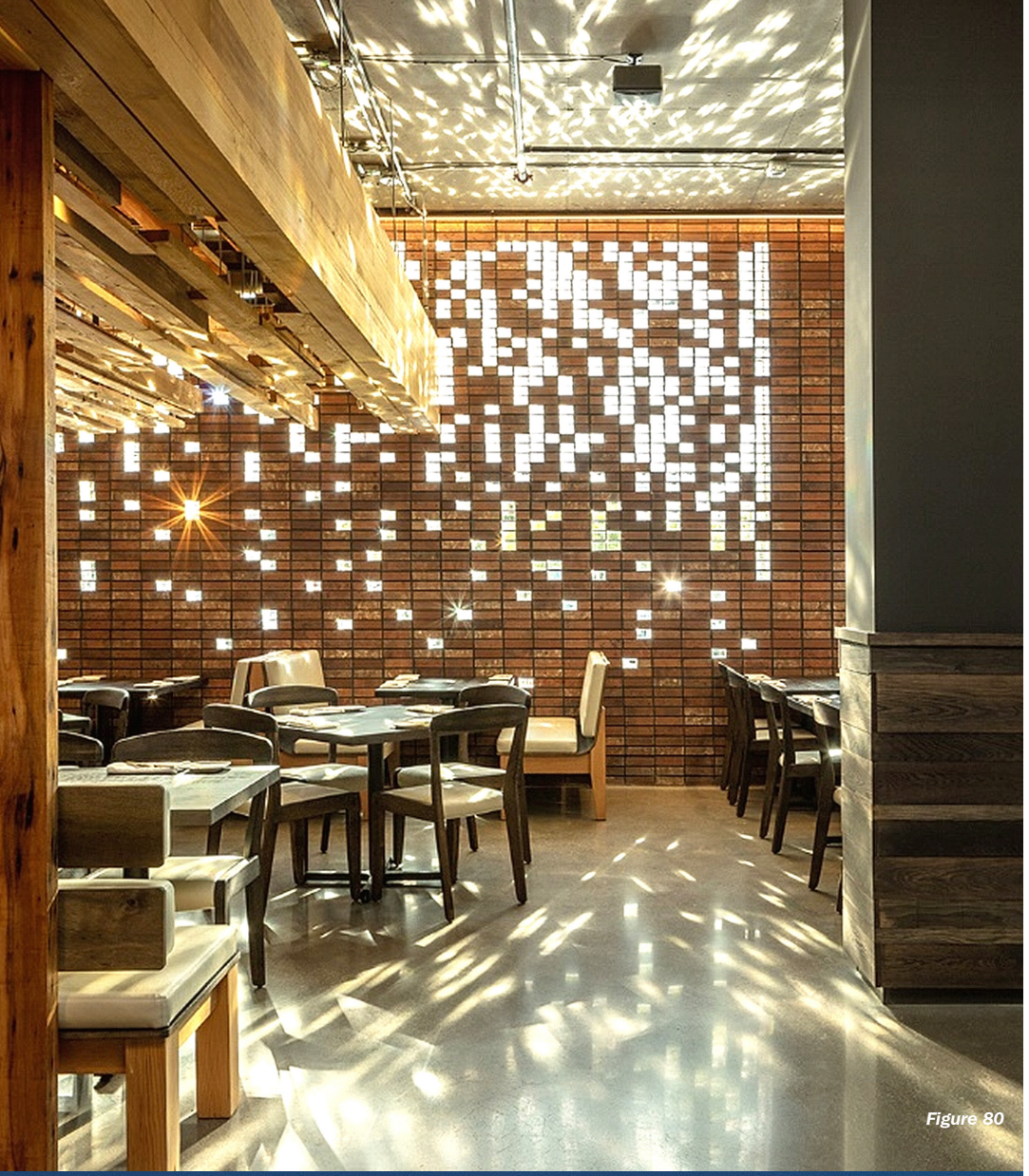


Figure 80



Figure 81

hand, the brick and concrete structures, gives this restaurant, a more solid appeal.

The brick and concrete structure on ground level gives the Uchi restaurant a solid, earthed, appeal, with a clever dematerialisation of the composite brick walls into crystal bricks to allow for an intriguing play of refracted light inside the dining room, shown in *Figure 80* (Tres Birds 2020: online). The greenhouse and growing area are managed by Altius Farms.

Figure 81 and *82* display the greenhouse and growing area on the Uchi Restaurant first floor - incorporating white aeroponic towers - is managed by Altius Farms. The aeroponic towers do not require any soil - the plants cultivated, such as lettuce, herbs, and edible flowers, are regularly misted with nutrient-laden water. The greenhouse conditions are monitored by sensors that help control the temperatures, as well as the opening roof and side vents. This greenhouse urban farm not only supplies the restaurant with fresh produce, but also several other local restaurants and markets (McKnight, 2019: online). However, the *RuraLift Project's* focus is rather on that of the aquaponic growing methods, as opposed to aeroponics such as that of the *Uchi Restaurant*, thereby making a feature of the water and fish components of the system. The use of raw timber planks is another creative and functional element in the restaurant.

Adjacent to the south-western brick feature wall of the *Uchi Restaurant* is a ceiling installation of raw timber planks (*Figure 83* and *84*), repurposed from past projects by Tres Birds Workshop. These timber planks help to diffuse noise while adding to the room's enclosed atmosphere. The darker side of the dining room also utilizes a timber ceiling installation (*Figure 85, 86,* and *87*), this time with a more orderly arrangement. The concrete flooring adds an industrial flair to the interior, counteracting the ample use of timber throughout the eatery (McKnight 2019: online). This interior design approach to the ceilings, spatial divisions (*Figure 85*), and noise diffusions is incorporated into the *RuraLift Project's* market unit designs, including the restaurant's interior. Different atmospheric light is created in the *Uchi Restaurant's* dining room area.

The *Uchi Restaurant's* dining room achieves two different atmospheres. This is achieved by timber screens separating the areas to help articulate the area-specific tones - one being

light and warm, while the other being darker and more private. The crystal blocks refract the natural light entering the spaces (*Figure 88*), creating a dialogue between the comfortable interior of the restaurant, the distant cityscape during the day, the eye of the passer-by and the warm, glowing light within during the night (McKnight, 2019: online). The restaurant of the RuraLift Project is similarly focused on a warmer, darker, and more private dining room area on the ground level, and a lighter dining area interior on first-floor level. Outside the building attention is given to various types of greenery.

The sidewalk surrounding the building (*Figure 89*) is shaded by small trees, introducing the initial green character of the restaurant. This shaded sidewalk encourages pedestrian activity around the restaurant, creating an inviting and peaceful atmosphere around the building. This inspired the parking area for the *RuraLift Project*, softening the area by the incorporating plants along pedestrianised paths and in and around gathering spaces. Although the *RuraLift Project* site is located in a more informal setting, the parking area should not overpower the natural beauty of the surrounding landscape.

The *Uchi Restaurant* identifies the value in cultivating fresh produce rather than depending on the costly delivery of suppliers. This principle is also identified in the *RuraLift Project*.

Principles Identified

The *Uchi Restaurant* focuses on the cultivation of fresh greens, to supply to their ground floor kitchen with the healthiest produce for high-quality cuisine. The restaurant identified that waiting for fresh produce to be transported to the restaurant, was wasting time, money, and reducing product value. The aeroponic greenhouse makes the restaurant self-sustaining and promotes urban farming. This principle is used on a larger scale in the *RuraLift Project* – increasing the effective distribution of fresh produce to various parts of the Eastern Cape, simultaneously assuring food security. The market space of the *RuraLift Project* is influenced by the precedent study of the *Bemglô Store* in Brazil.







Figure 80: Southern wall composed of reclaimed red bricks and custom-made crystal blocks (Tres Birds, 2020: online).

Figure 81: First floor level of western entrance facade, showing aeroponic greenhouse (Tres Birds 2020: online).

Figure 82: Uchi aeroponic greenhouse interior (ArchDaily 2020: online).

Figure 83: Interior view of the lighter side of the eatery area, with raw timber plank ceiling for diffusing sound (Tres Birds 2020: online).

Figure 84: Interior view of the lighter side of the dining area with natural light passing through the crystal blocks in the southern brick wall (Tres Birds 2020: online).

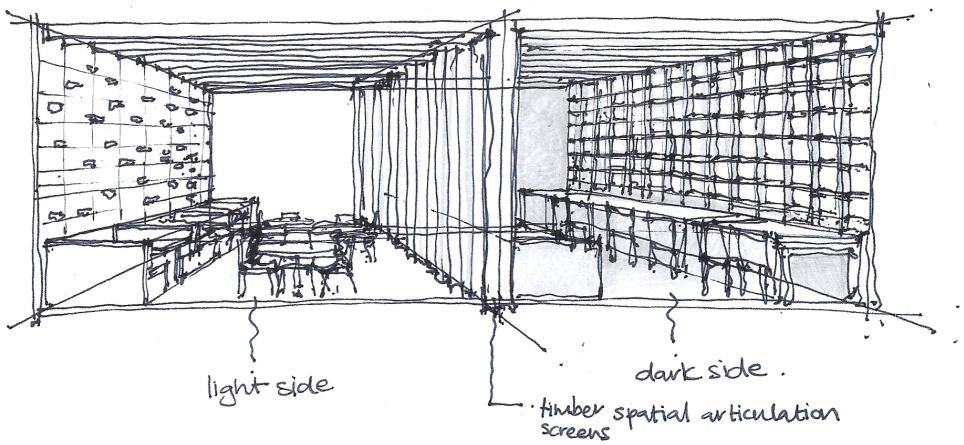


Figure 85



Figure 86



Figure 87

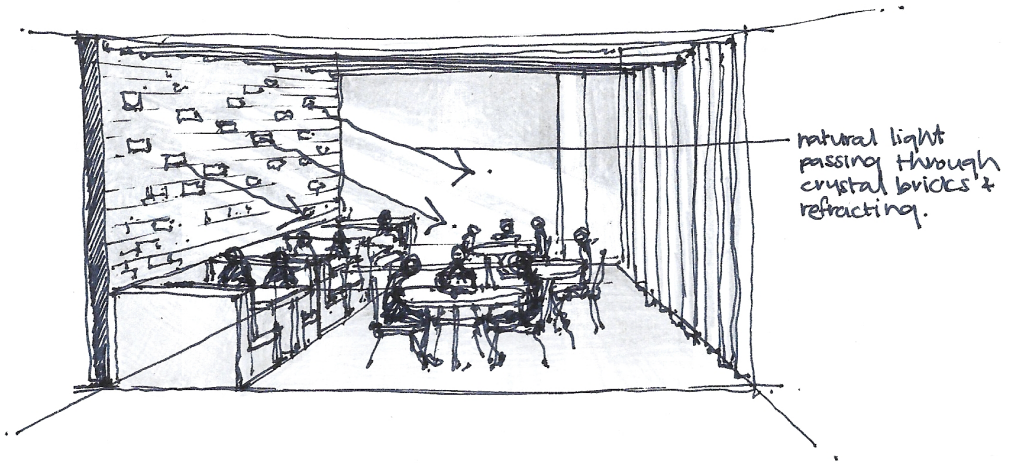


Figure 88

Figure 85: Sketch, illustrating the lighter and darker atmospheres (Author, 2020: own illustration).

Figure 86: Interior view of the darker side of the dining area with more orderly arranged timber ceiling installation (Tres Birds 2020: online).

Figure 87: Interior view of the darker side of the eatery area, with timber screens articulating the area-specific tone (Tres Birds 2020: online).

Figure 88: Sketch, illustrating the light passing through the crystal blocks (Author, 2020: own illustration).

Figure 89: Site plan of Uchi Restaurant (McKnight, 2019: online).

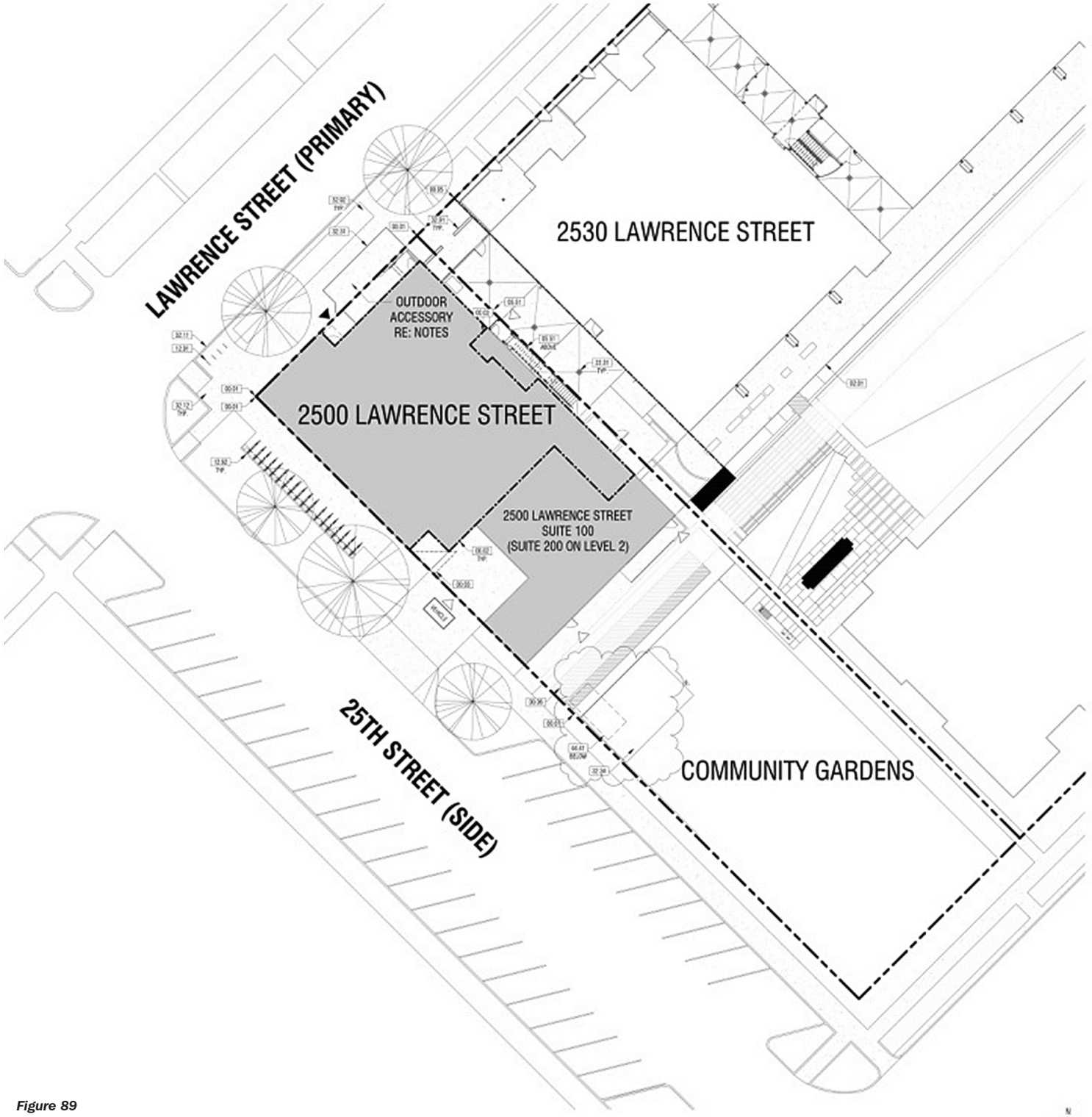


Figure 89

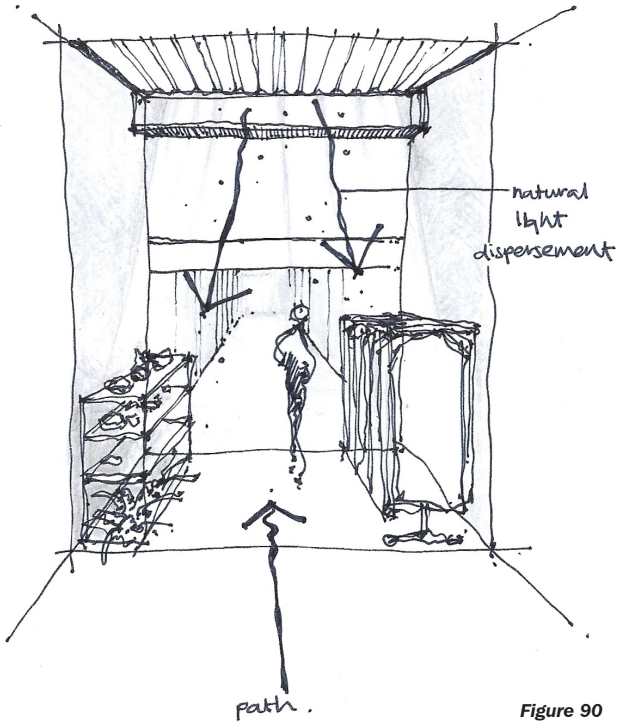


Figure 90

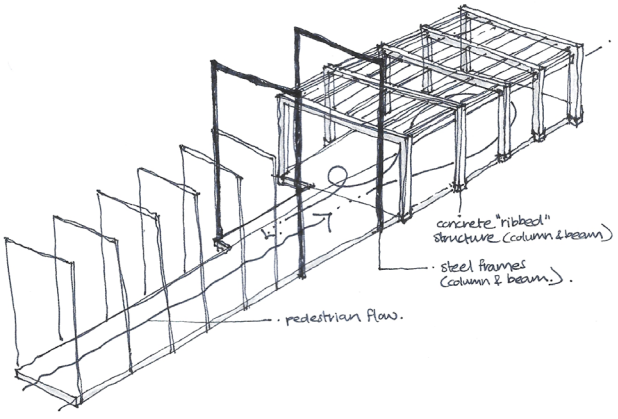


Figure 91

Figure 90: Sketch, illustrating the higher ceiling of the Bemglô store, where products are on display (Author, 2020: own illustration).

Figure 91: Sketch, illustrating the lighter and darker atmospheres (Author, 2020: own illustration).

Figure 92: Floor plan of the Bemglô Store (Pereira 2020: online).

Figure 93: Section through the Bemglô Store (Pereira, 2020: online).

Figure 94: Sketch, illustrating the lighter and darker atmospheres (Author, 2020: own illustration).

The Market Space

The following precedent incorporates the use of market space functions on ground level. This market precedent makes use of raw as well as repurposed materials in an aesthetically pleasing and culture-specific manner, similarly to the intended design approach for the arts and crafts market space in the proposed aquaponics micro-mall project. The use of colour, texture and natural light in this precedent, as sparked inspiration for the handling of the decorative approach to the proposed micro-mall. The market space of the *RuraLift Project* aims to achieve an African market atmosphere, with warm earth tones and textures accompanied by an honest structural approach. The tectonics of the design should bring about a down-to-earth character while maintaining a tasteful and upmarket finish. There will ultimately be a play between the honest, earthy materiality of the market space on the ground level, and the high-tech, polished finish of the aquaponics sector on first floor.

Bemglô Store, Jardim Paulista, Brazil by Vao Architects Completed: 2019

Analysis

This project focuses on the transformation of a half-buried garage, located in one of the most commercial streets of Jardim Paulista - into the first physical store of the multi-brand e-commerce Bemglô (Pereira 2020: online). The renovated market is a concrete column and beam structural system with supporting steel elements, which serve to bear the exhibition system on the exterior of the brick walls.

Lessons Learnt

The *RuraLift Project*, although not a renovation project such as the *Bemglô Store*, draws from the sensitivity of the material use and approach to interior design. When creating the physical identity, the architects focussed on remaining true to the original concept of *Bemglô* - sustainable, artisanal, and national production. This explains the use of natural land ink on the vertical plans, and the terrazzo that reuses glass fragments in place of small stones on the horizontal plans (Vão 2020: online). The *RuraLift Project* similarly aims to remain true to the Rocklands settlement Xhosa culture when incorporating appropriated textures, patterns, and materiality in the finishes of the market space design. The *RuraLift Project* market units need to achieve a rich cultural atmosphere which celebrates the rustic character of Rocklands while maintaining a tasteful and sophisticated edge.

Under the highest ceiling of the *Bemglô Store*, is a garden which complements the environment visually and thermally (*Figure 90*). This garden space is also used for the exhibition of products through glass shelves, floating amongst the plants (Pereira, 2020: online).

The market units of the *RuraLift Project* alternatively open up visually to the public, by way of large glass shopfront windows, exposing timber 'printer's tray' display shelving. These display shelves are lit up from behind by the natural light spilling into the market units through windows and skylights.

The structure of the *Bemglô Store* operates much like a brick, plaster, and corrugated iron tunnel (*Figure 91*), leading the customer into a concrete ribbed belly toward the bottom of the site (Pereira 2020: online).

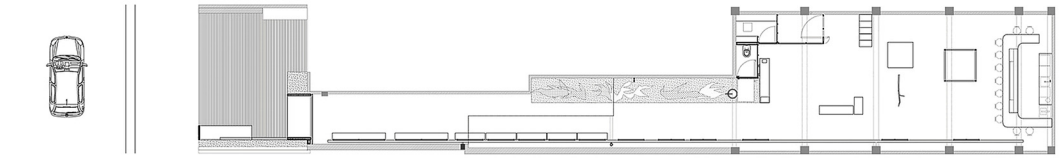


Figure 92

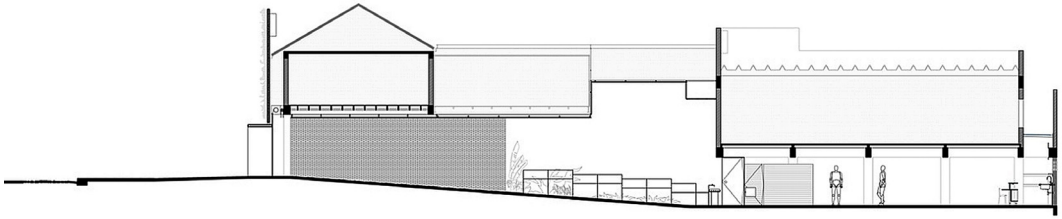


Figure 93

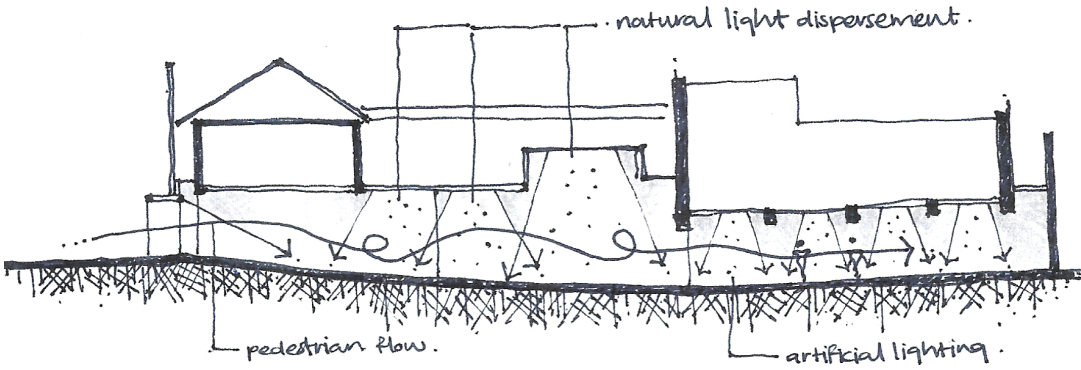


Figure 94



Figure 95

The *RuraLift Project* structural approach differs slightly from the 'tunnel' concept of the Bemglô Store (*Figure 92* and *93*), although the structural materiality of brick skin and concrete column grid-like framework, remains similar.

To counteract the dark interiors of the *Bemglô Store*, natural light is redirected into the spaces to give the illusion of larger areas and to attract the public to enter the store. Fibreglass roof tiles over the transparent roof, follow the length of the 25m ramp path, scattering filtered light throughout the hall (*Figure 94* and *95*).

Built-in artificial T5 lamps were added on the interior to add general lighting and a spot trail for light focus near products (Superfuture 2020: online).

The market space of the *RuraLift Project* is covered by the floor slab of the aquaponic greenhouses on first floor. This, therefore, reduces the filtration of natural light into the public spaces, making the atmosphere dark and unwelcoming. It is the extrusion of the glass cylindrical fish tanks on ground level that allows the natural light from the greenhouses to pour into the previously darkened ground floor spaces.

Taking from the *Bemglô* concept of an interior garden (*Figure 96*) to highlight space, rocks and rustic sculptural elements are positioned around these fish tank 'light-shafts' to increase visual interest in the public market zone, creating an interior-exterior relationship with the surrounding natural context.

Principles Identified

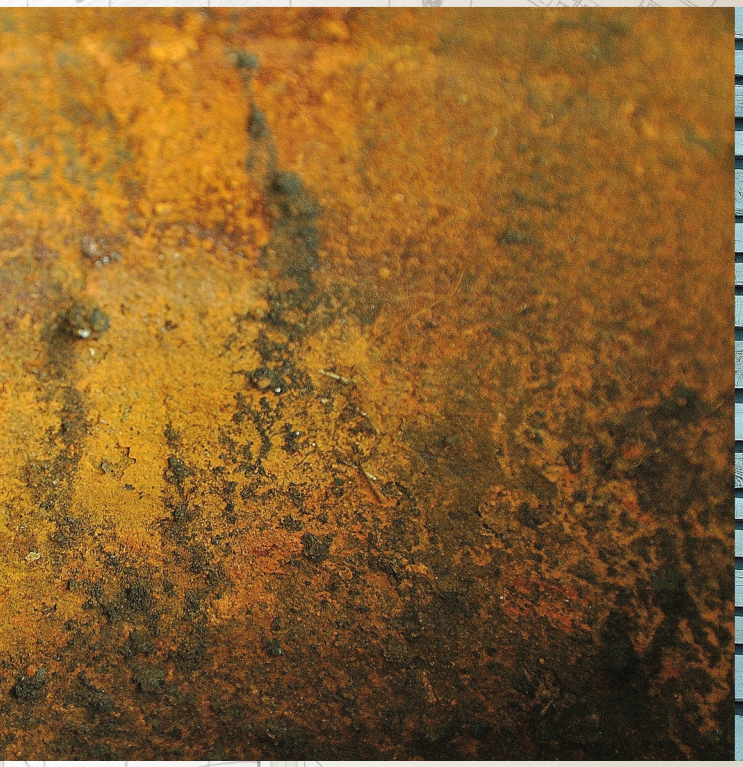
The *Bemglô Store* works upon the principle of creating an interactive, welcoming, and culturally sensitive market space, bathed in natural light. The store manages to successfully transform previously dark spaces into uplifting and inspiring volumes of light and colour, lined with intriguing displays of merchandise. The *RuraLift Project* market space, although directly beneath a first-floor slab, adopts the *Bemglô Store's* innovative approach to the redirection of natural light, through material use, surface colour and textural quality.

Figure 95: Interior photograph of the well-lit hallway with fibreglass roof tiles, and product display (Superfuture 2020: online).

Figure 96: Interior photograph of product display in the well-lit hallway with higher ceiling and fibreglass roof tiles (Superfuture 2020: online).



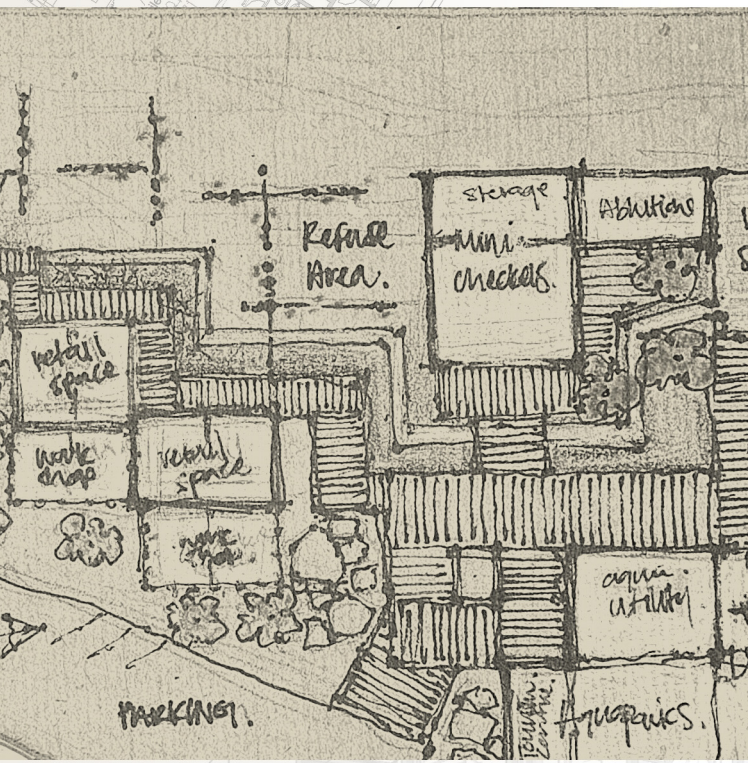
Figure 96













Part FOUR

Brief and Accommodation Schedule

"Form ever follows function." – Louis Sullivan

Brief

As discussed in the project rationale of this dissertation, the theoretical framework of this project is built upon the interpretation of the philosopher Maimonides's proverb. The interpretation is thus, teaching the skill of fishing to someone who is in need of obtaining food and resources. This dissertation has adapted this proverb making the 'fish' both the input and catalyst in the process, rather than the output. It is in this sense that the fish no longer becomes a desired objective, but a means to an end; this being to be used industriously by supplying food to more than one person indefinitely. The *RuraLift Project* functions as a micro-mall and aquaponic fresh produce supplier, at the southern entrance to the town of Cathcart in the Eastern Cape Province. The center provides a platform for social and cultural integration and trade, where a mini-Checkers branch will act as a retail anchor, selling basic household supplies and food items not sold by any of the local traders in this market space.

A Chesa Nyama branch, making traditional dishes will play the role of a second retail anchor on the Northern side of the centre.

Market units must be available for the local entrepreneurs and other members of the Rocklands community who wish to trade and produce in the same area craftsmanship – be that wirework, beadwork, pottery, and so on.

This centre needs to be able to attract tourists, and provide employment for

the locals, while supplying fresh produce from the aquaponics wing to the major branches of Checkers.

It is the social responsibility of this proposed project, to provide spaces of comfort and cultural familiarity for the Xhosa people of Cathcart while drawing attention from the tourism market. Achieving this, does not solely depend on the morphology of the overall design, but also requires careful attention to detail in the decorative approach to finishes, as well as empathetic planning of spatial organisation.

Accommodation

Site (21 033.62sqm)

Aquaponics Wing

Ground Floor (333.97sqm)
- filtration pump room
- staff ablutions (universally accessible toilet, ladies' & men's toilets)
- staff locker room
- staff kitchen & break room
- cleaning & maintenance storeroom
- packaging & distribution room
- service elevator shaft

First Floor

Administration (126.75sqm)
- testing laboratory
- waiting lounge
- board room
- offices
- archive

Greenhouses (1 323.25sqm)
- Northern greenhouse (299.8sqm)
- centre greenhouse (425.1sqm)
- Southern greenhouse (450sqm)

Chesa Nyama Restaurant (210.45sqm)

Ground Floor (210.45sqm)
- kitchen
- ablutions
- dining area

First Floor (175.51sqm)
- dining area

Market & Trade Space

Wood Carving Market Unit (69.61sqm)
- trade space
- workspace
- storage room

Beadwork & Wirework Market Unit (121.95sqm)

Ground Floor (88.67sqm)
- trade space
- storage room

First Floor (33.28sqm)
- workspace

Basketry Market Unit (91.53sqm)
Ground Floor (61.81sqm)
- trade space
- storage room

First Floor (29.72sqm)
- workspace

Art Studio Market Unit (47.83sqm)
- trade space
- workspace
- storage room

Pottery Craft Market Unit (86.7sqm)
- trade space
- workspace
- storage room

Tourism Center (172.44sqm)
- reception
- lecture/ multifunctional room

Mini Checkers (351.2sqm)
- retail space
- storage area
- break room
- staff toilet
- branch manager's office

Ablutions (100.98sqm)
- male ablutions
- female ablutions
- universally accessible ablutions
- baby change room

Service Rooms (75.9sqm)
- cleaning staff room
- mall maintenance room
- security staff room
- security manager office

Refuse Removal Service Area (72.26sqm)

Public/ Social Space (*undefined area*)

Parking (555.75sqm)
- 21 customer parking bays, of which, 1 x universal access parking bay
- 16 staff parking bays
- 1 x drop-off/ loading zone









Part FIVE

Design

“Beauty perishes in life, but is immortal in art.” - Leonardo da Vinci

Site Choice

Addressing socio-economic issues such as food security and poverty can prove to be challenging in that there is no single central geographical position as an ideal reference. Hence, the *RuraLift Project* proposes to form a network of several micro-malls situated in, or on the outskirts of, smaller towns which are located along main trucking routes.

The selected site for this particular proposed micro-mall, is situated entering the town of Cathcart in the Eastern Cape Province of South Africa. The location of this site is convenient for truck, delivery vehicle, or customer traffic flow, in that the curvature of the site follows the adjacent N6 route. In addition, the site does not interfering with any of the residential areas of Cathcart.



Figure 97: The location of the proposed site relative to the surrounding streets, plots and N6 (Author, 2020: own illustration).



The Eastern Cape Province is a province with one of the highest unemployment rates in South Africa; making the selection of such a site, in this region, all the more suitable. Although it is impossible for one such development to address *all* socio-economic issues around the country, it is possible to initiate development from such a position that would prove to create a conspicuous, potential precedent for the future.



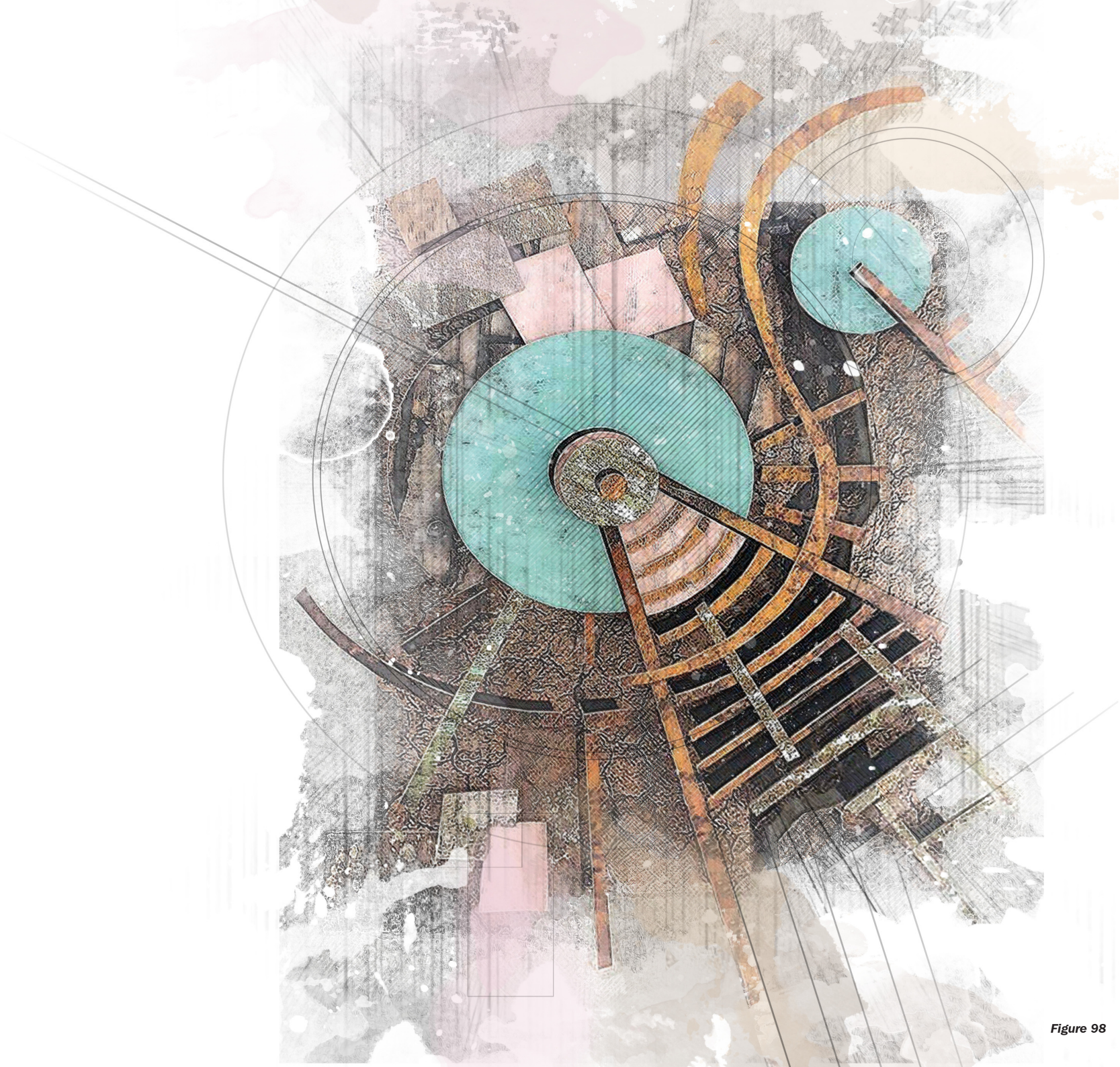


Figure 98: Touchstone (Author, 2020: own model graphic).

Figure 99: Touchstone (Author, 2020: own model).

Figure 98

Touchstone

The design touchstone is a three dimensional experience. It focuses on perceiving the concept two-dimensionally when looking at a position from one perspective, simultaneously experiencing the third dimension of it, while regarding it from another perspective. This third dimension only begins to emerge through the unveiling of social and economic issues specific to its place.

The availability of raw materials which are clearly visible surrounding the proposed site of the Rocklands community, are used to create the two-dimensional, 'face-value'-perspective, layer (*Figure 98*). This 'face-value' layer forms the 'artwork' is apparent even while touring through the town of Cathcart, past the Rocklands community as a visitor to this area, having no comprehension of the underlying socio-economic strengths or strains.

These strengths and strains compose the layers of the two-dimensional artwork, creating place for aspects of the existing, to expand and flourish. This can be seen through the unrestricted extension of lines which break through the borders of the original two-dimensional artwork's frame (*Figure 99*). The message conveyed here is that the town of Cathcart will remain two-dimensional, bereft of its potential, if not properly understood and worked with.

The Rocklands community is therefore a two-dimensional layer which needs to be pushed and pulled in those areas necessary for stimulating growth and development.

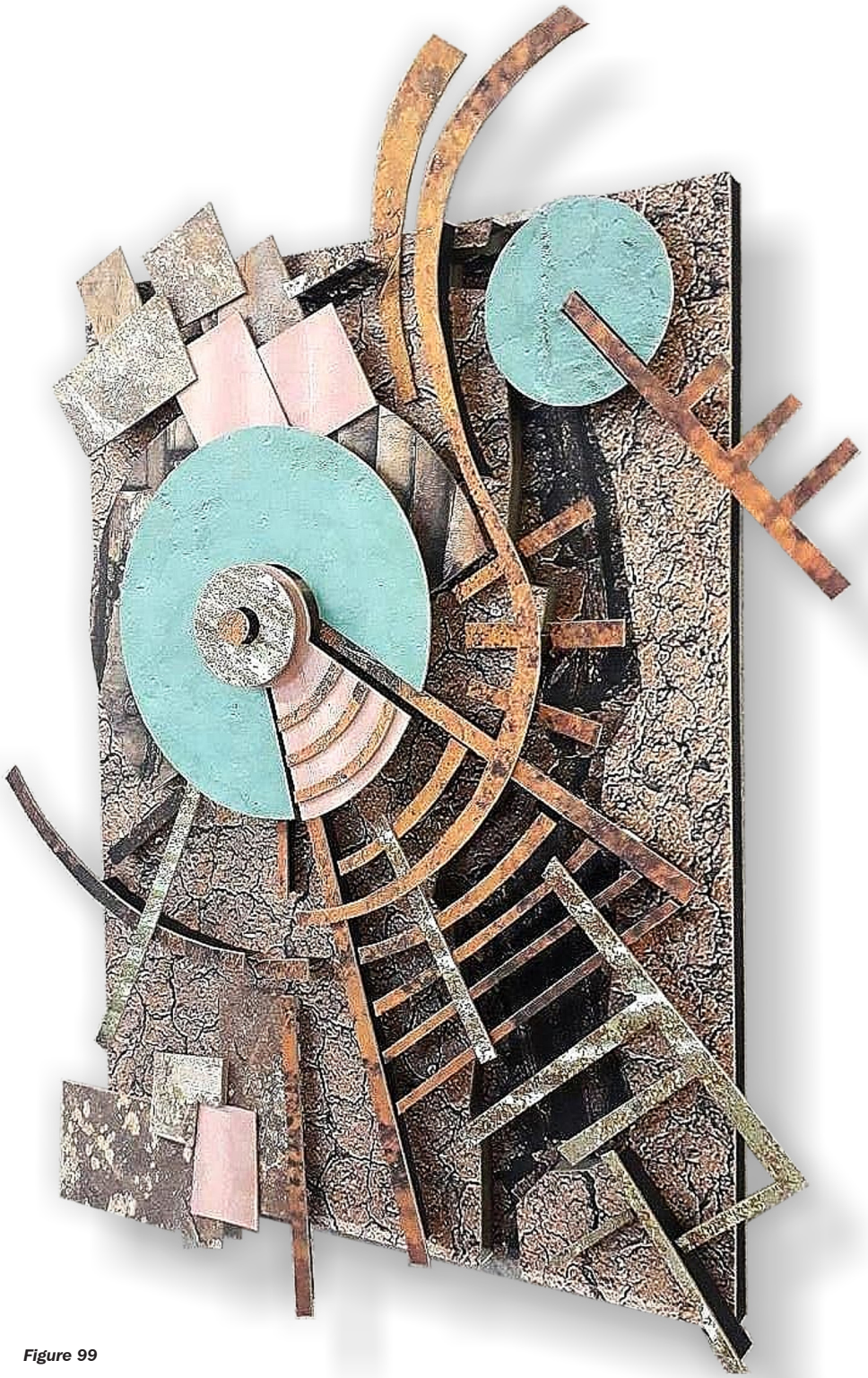


Figure 99

Concepts

It is of central importance that this proposed project discovers a resolution for the authentic unification for the place making of the Rocklands community. This process needs to be set in motion through the use of the progressive cultivation technologies of aquaponic food production – a meeting of two worlds.

In order for there to be a meeting of two such worlds, an integrated form of layering has to take place – cultural, natural, economic and social. For an integrated architectural layering to be successful, cognisance needs to be taken of the cultural, natural, economic and social context. It is between these layers of the touchstone, that the plethoras of opportunities within the Cathcart socio-economic structures present themselves.

These multi-layered artworks of opportunity birthed three main concepts on which the foundation of the proposed design was built: ***Interlace; Symbiosis;*** *and* ***Junction****.*

Interlace

Landscape, economy, skill, structure.

The built environment expands, weaving into the ***landscape***.

From the landscape, emerges opportunity for ***skill*** to take flight and breathe life into a struggling ***economy***.

As skill develops and channels through the hands of a community, a ***structure*** is molded to make place for economy and making.

Symbiosis

Aquatic, flora, earth, cycle.

Aquatic nature takes its course, and so like the ***flora***, it intertwines and dissipates, in its ***cycle*** of being born to die, to be born again.

Beautifying and nourishing the ***earth*** through both life and death.

Junction

Community, path, craft, culture.

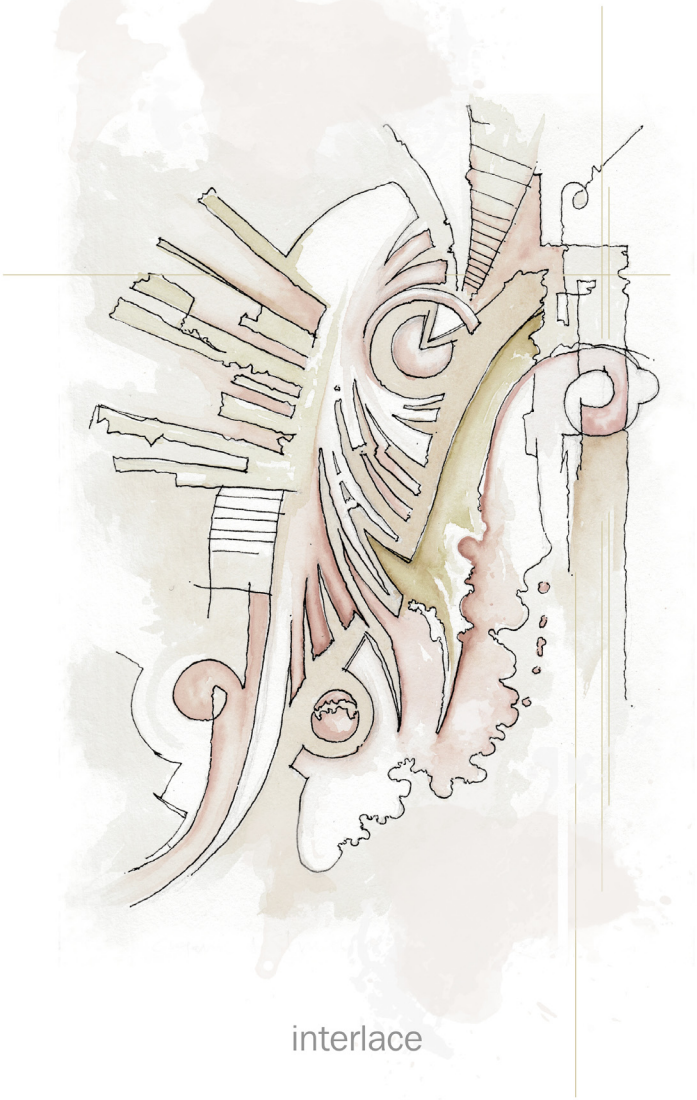
The ebb and flow of ***craft*** through the ***culture*** of a ***community***; tightening and loosening its grip on its ritualistic ***path*** to make way for progressive change.

Drawing individuals from different worlds together with a common interest in nourishment through the vibrance of arts, socialisation, or cultivation of nature.

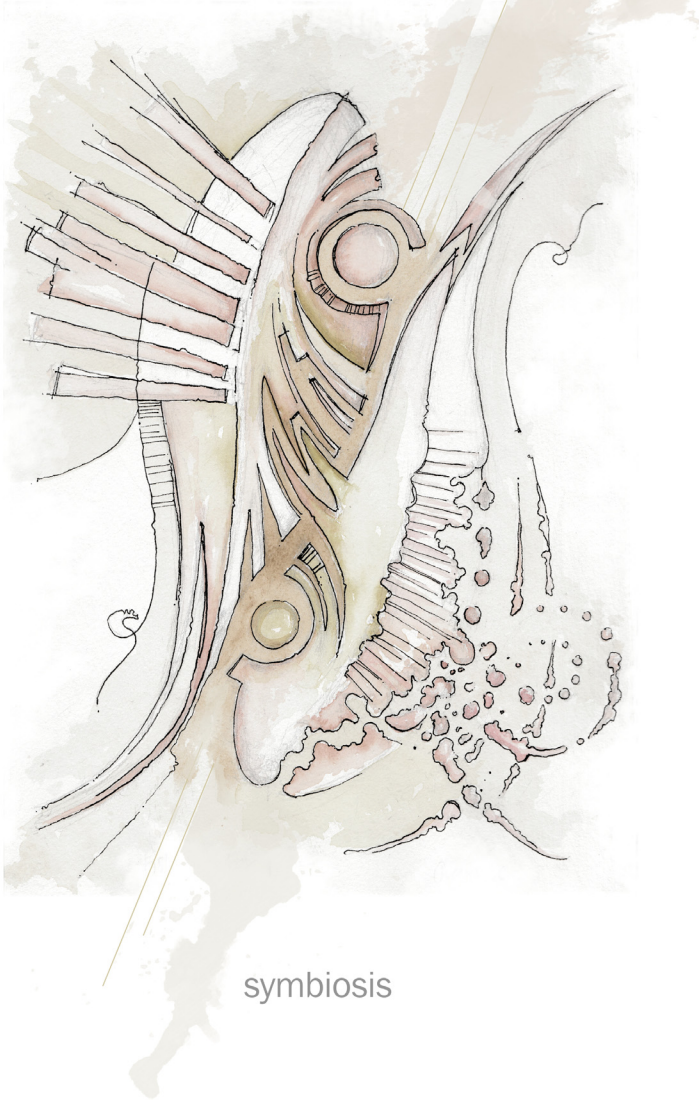
Figure 100: Interlace concept (Author, 2020: own drawing).

Figure 101: Symbiosis concept (Author, 2020: own drawing).

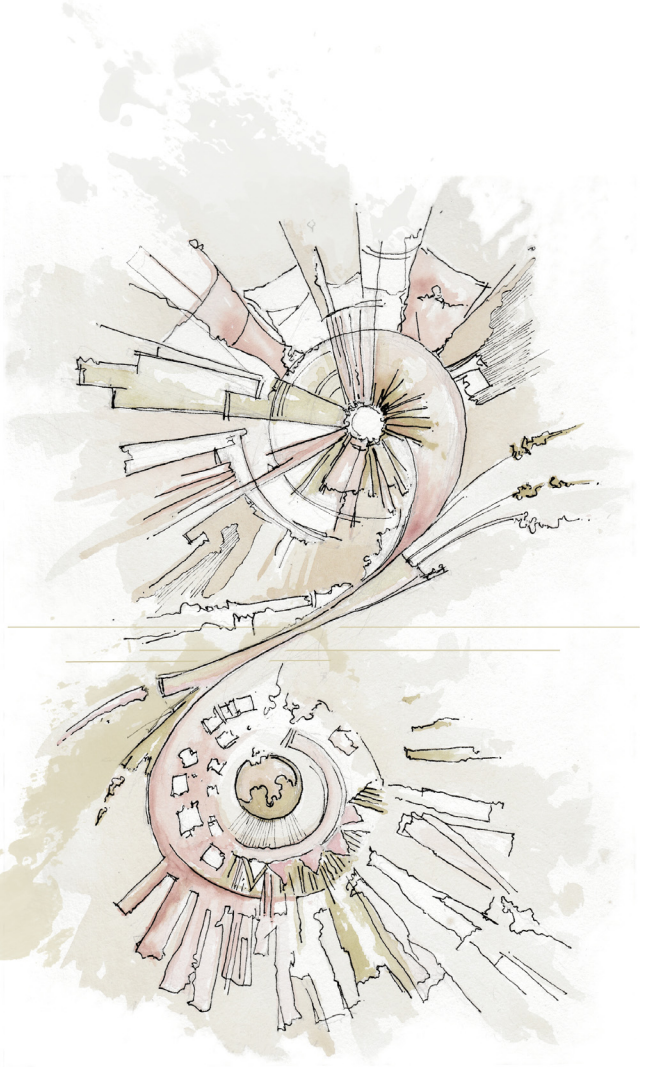
Figure 102: Junction concept (Author, 2020: own drawing).



interlace



symbiosis



junction

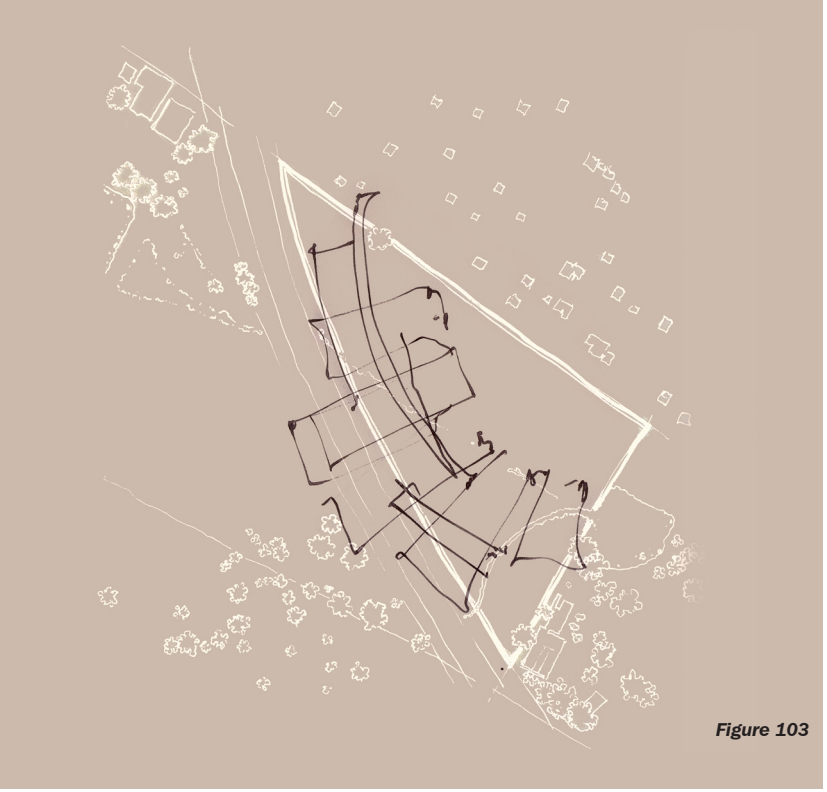


Figure 103

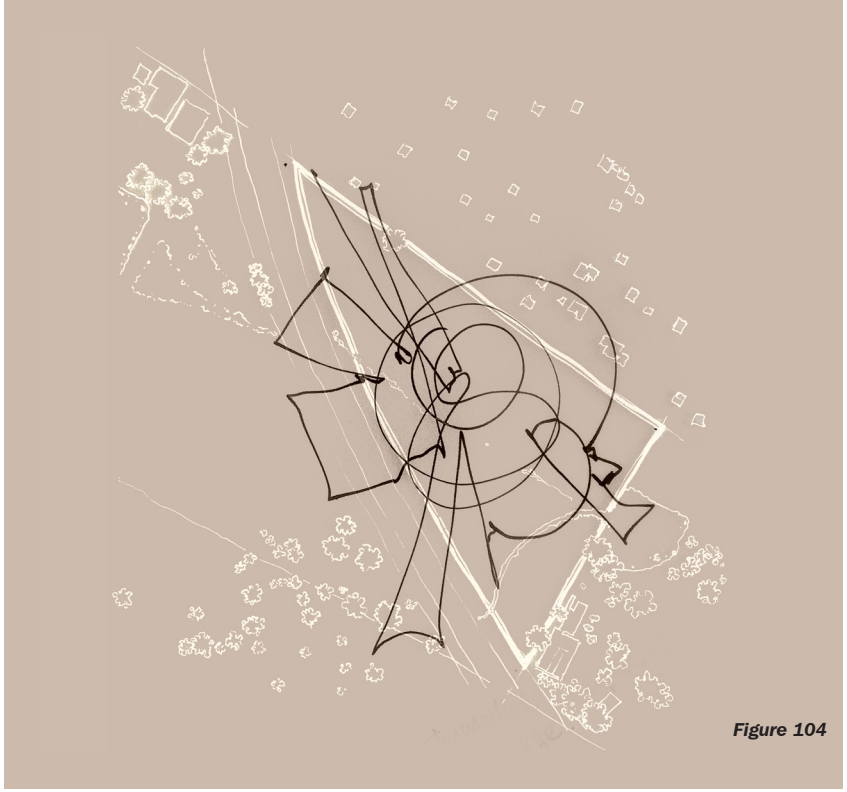


Figure 104

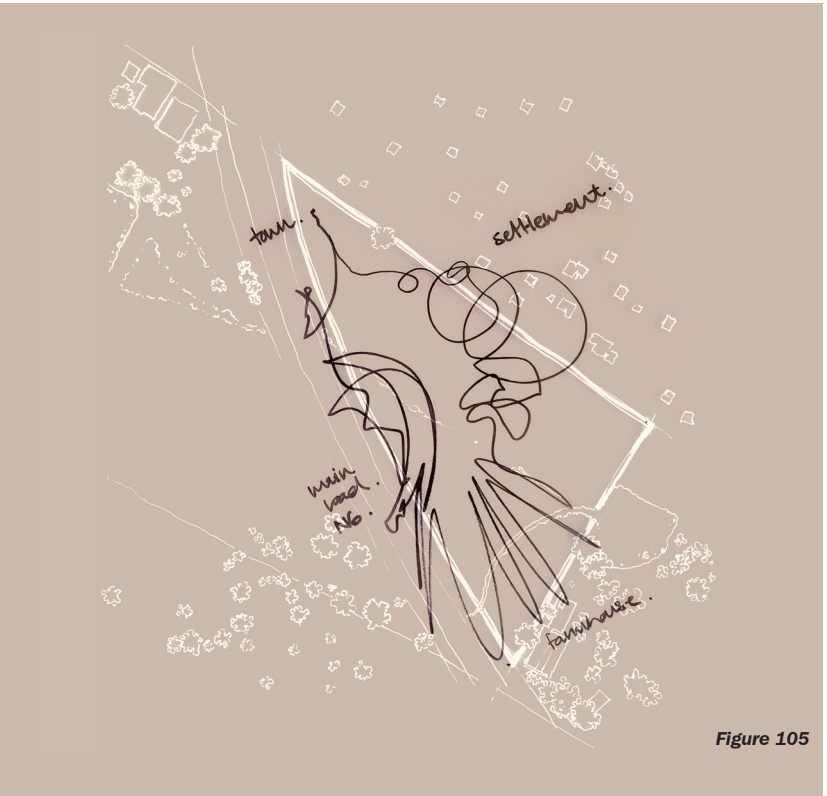


Figure 105



Figure 106

Figure 103: Site response sketch (Author, 2020: own drawing).

Figure 104: Site response sketch (Author, 2020: own drawing).

Figure 105: Experiential response sketch (Author, 2020: own drawing).

Figure 106: Experiential response sketch (Author, 2020: own drawing).

Figure 107: Development of conceptual sketches (Author, 2020: own drawings).

Figure 108: Development of conceptual sketches (Author, 2020: own drawings).

Figure 109: Conceptual sketch incorporating possible functions (Author, 2020: own drawing).

Design Development

Immediate Sketch Form Responses to the Site

The *Figures 103* and *104* are immediate single line sketch site responses generated after a visit to the proposed site. These responses are inspired by feelings, site shape and orientation.

Visiting the site allows for the gathering of personal impressions, forming a connection with the context in order to generate empathetic and informed design decisions.

Experiential Site Sketches

Over and above the production of immediate single line sketch responses to the site, additional experiential sketches (*Figure 105* and *Figure 106*) are documented to assist possible planning at a later stage of the design process.

Conceptual Sketch Development

Figure 107, *Figure 108* and *Figure 109* illustrate how the conceptual form developed in the early stages of the design. *Figure 108* and *Figure 109* depict the possible spaces for the incorporation of suitable functions.

Given that the proposed project is community oriented in its function, these conceptual development sketches focuses on communicating spaces of communal gathering linked by pathways.

The circular forms aspire to achieve an atmosphere of community by embracing and uniting all people through sociocultural norms and values namely, food, arts and craft and recreation.



Figure 107

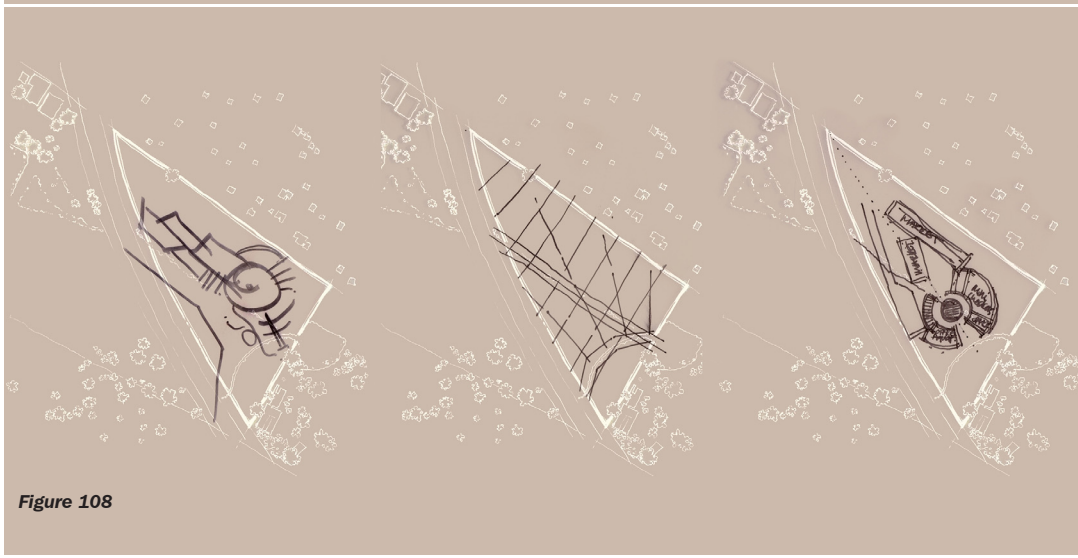


Figure 108

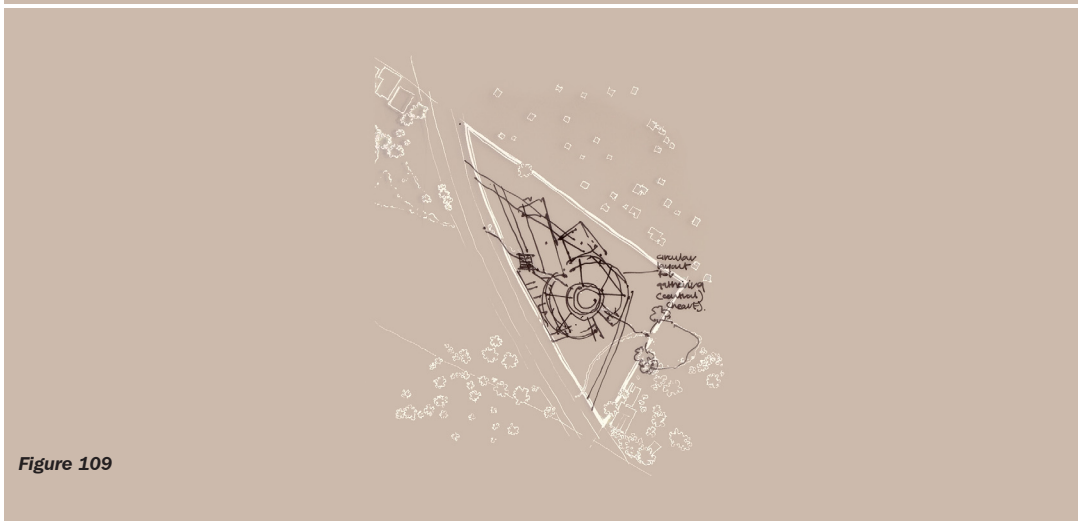


Figure 109

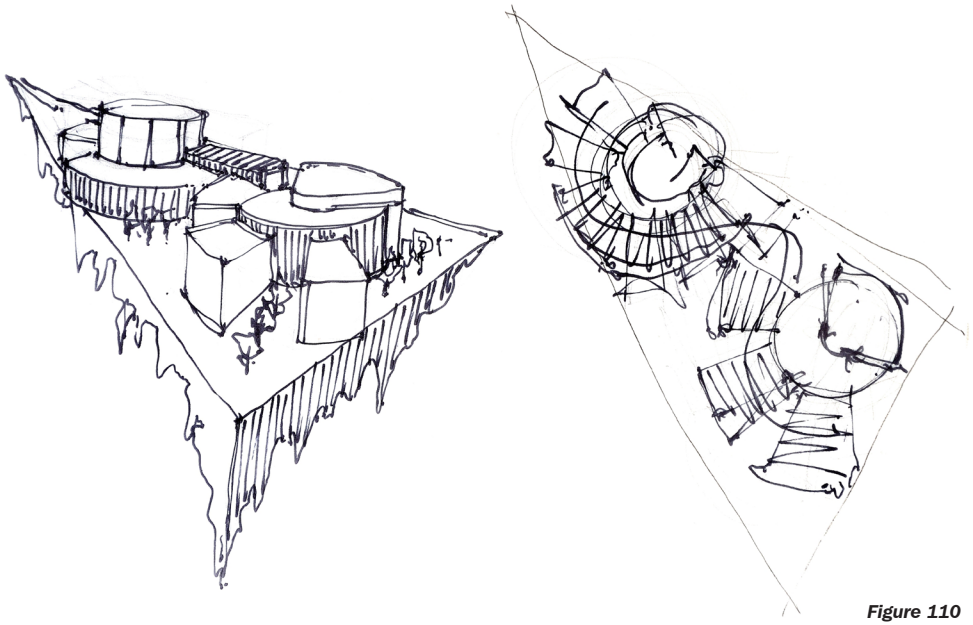


Figure 110

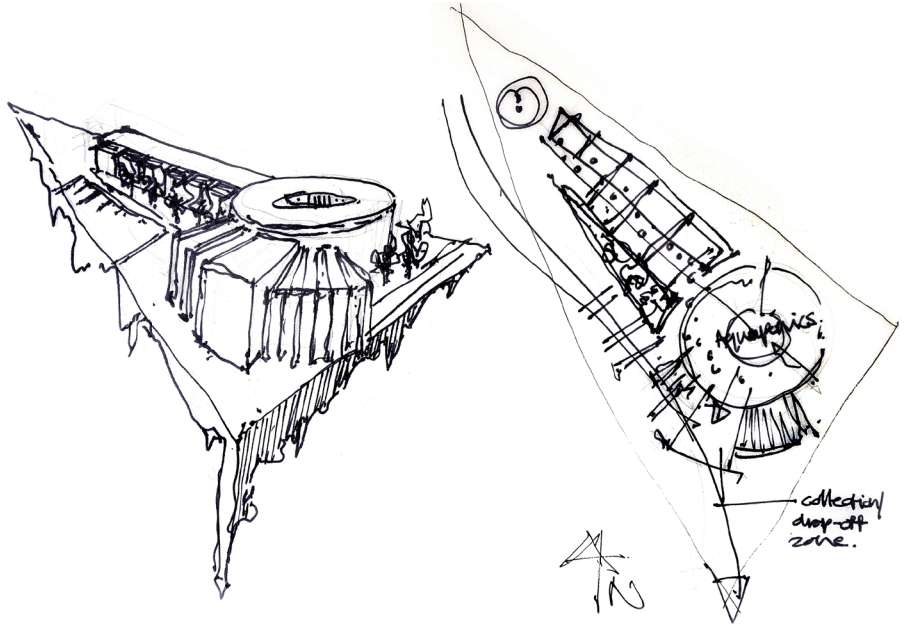


Figure 111

Conceptual Morphological Exploration

Figure 110, *111, 112* and *113* show further design development sketches which accommodated possible future functions. These sketches are extruded from their two-dimensional plans to reveal optional three-dimensional forms

Figure 113 and *Figure 114* broke away from the dominant circular trend and instead followed the Rocklands settlement lines to develop a more linear form.

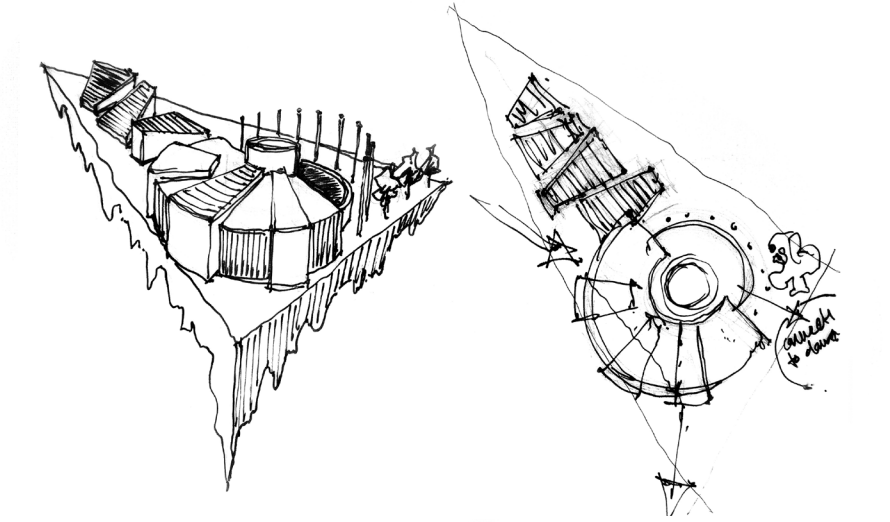


Figure 112

Figure 110: Conceptual sketch accommodating possible functions (Author, 2020: own drawing).

Figure 111: Conceptual sketch accommodating possible functions (Author, 2020: own drawing).

Figure 112: Conceptual sketch accommodating possible functions (Author, 2020: own drawing).

Figure 113: Conceptual sketch accommodating possible functions (Author, 2020: own drawing).

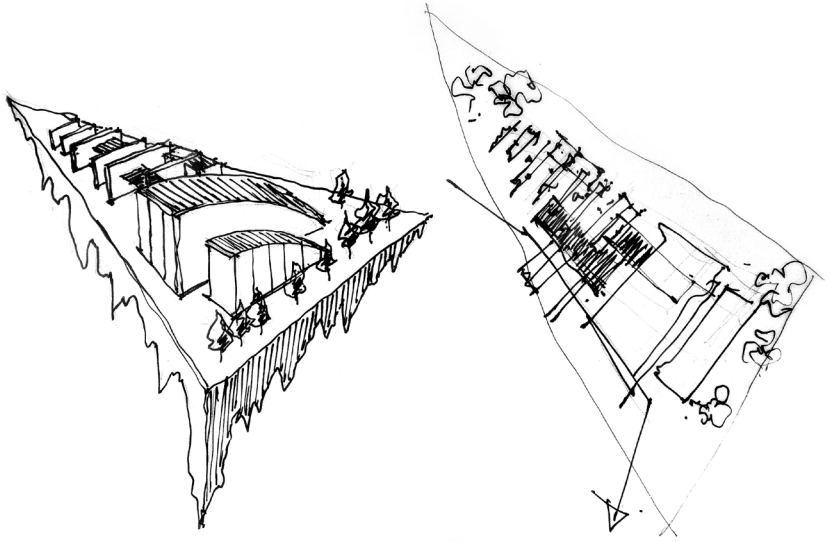


Figure 113

Figure 114: Conceptual sketch accommodating possible functions (Author, 2020: own drawing).

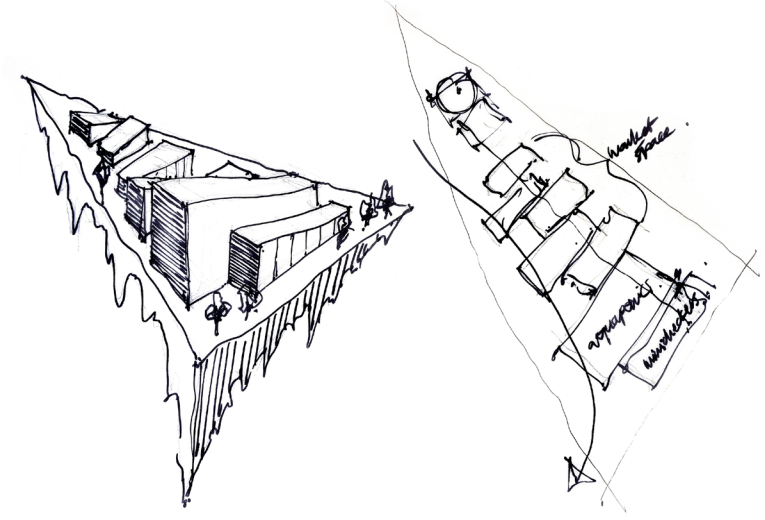


Figure 114

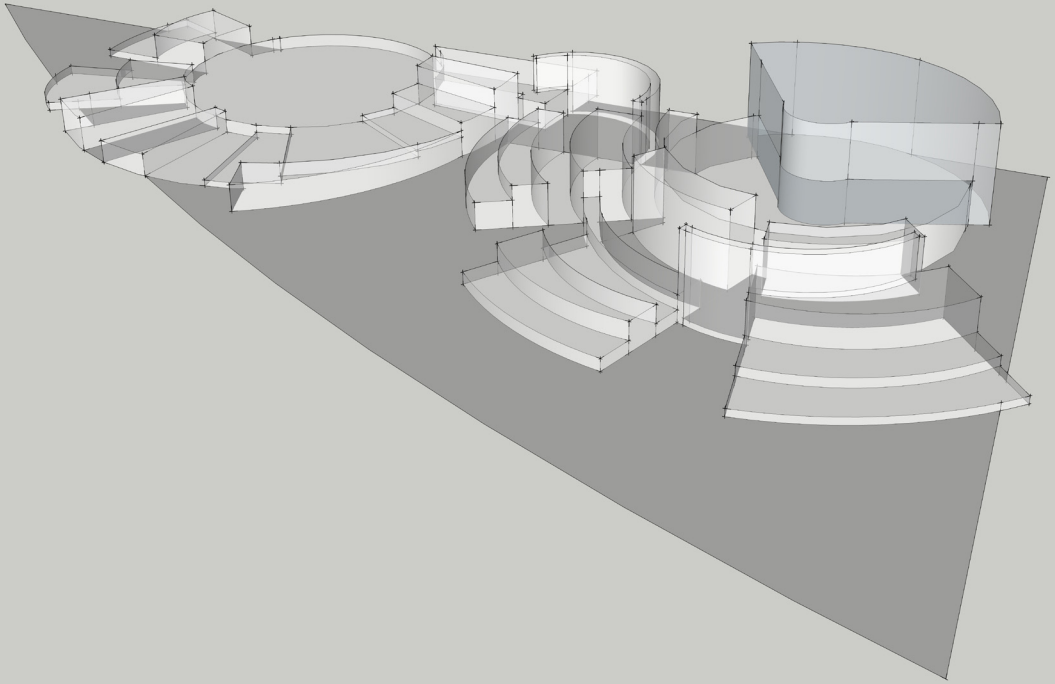


Figure 115

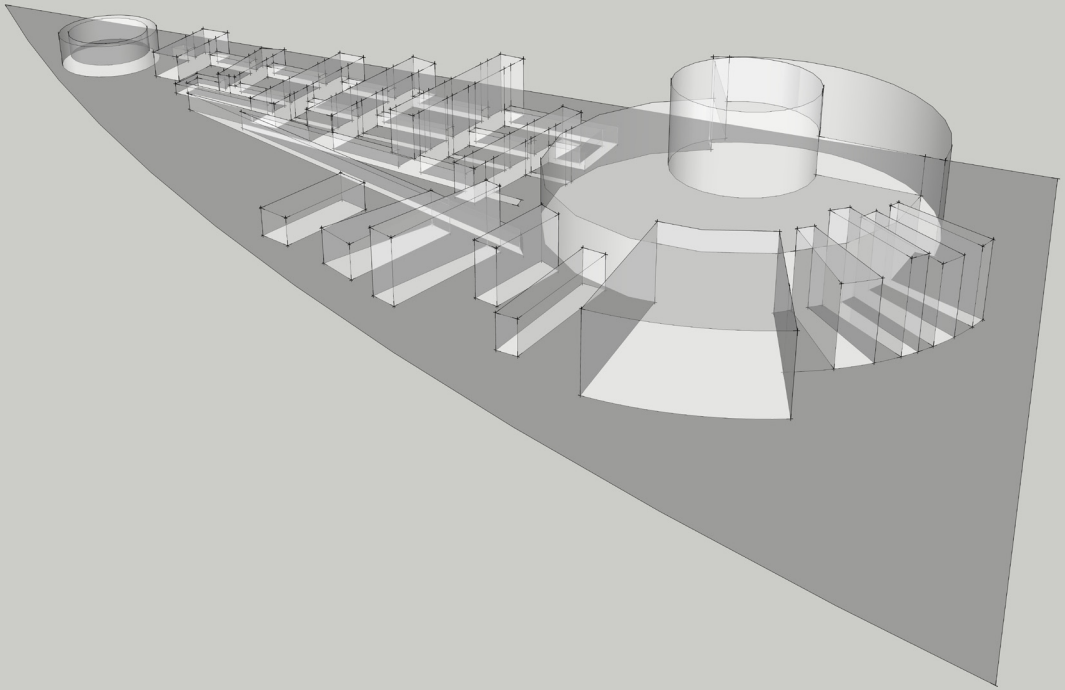


Figure 116

Figure 115: Conceptual sketch morphological interpretation (Author, 2020: own drawing).

Figure 116: Conceptual sketch morphological interpretation (Author, 2020: own drawing).

Figure 117: Conceptual sketch morphological interpretation (Author, 2020: own drawing).

Figure 118: Conceptual sketch morphological interpretation (Author, 2020: own drawing).

Figure 119: Conceptual sketch morphological interpretation (Author, 2020: own drawing).

Morphological Exploration Models

Figure 115, 116, 117, 118, and *119* are digitally generated concept models which were moulded from the two-dimensional conceptual sketches in *Figure 110, 111, 112, 113, and 114*.

The belly of the site is used as a place of spatial hierarchy in each conceptual morphological interpretation. This hierarchal space is devoted to the aquaponics and mini-Checkers functions, creating a hive of productivity.

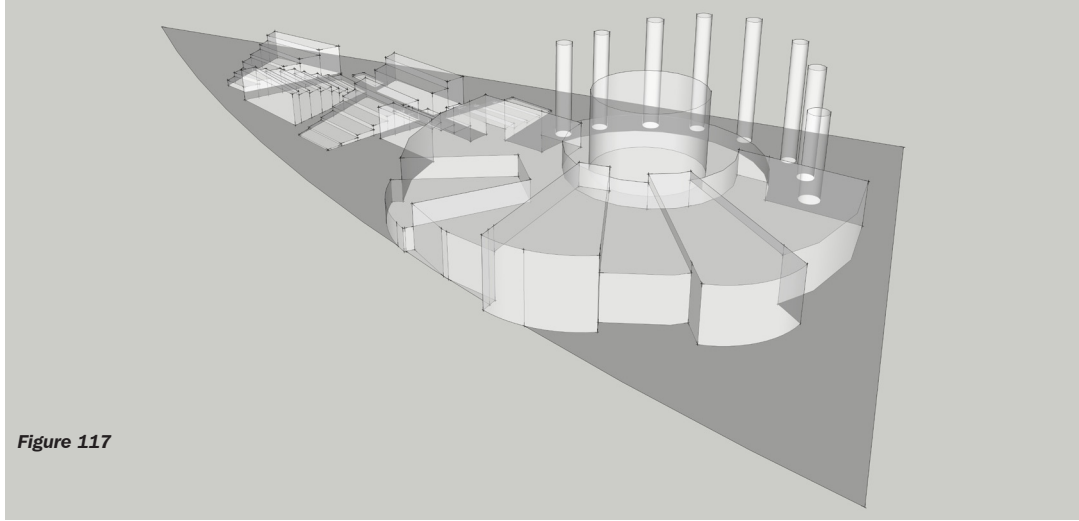


Figure 117

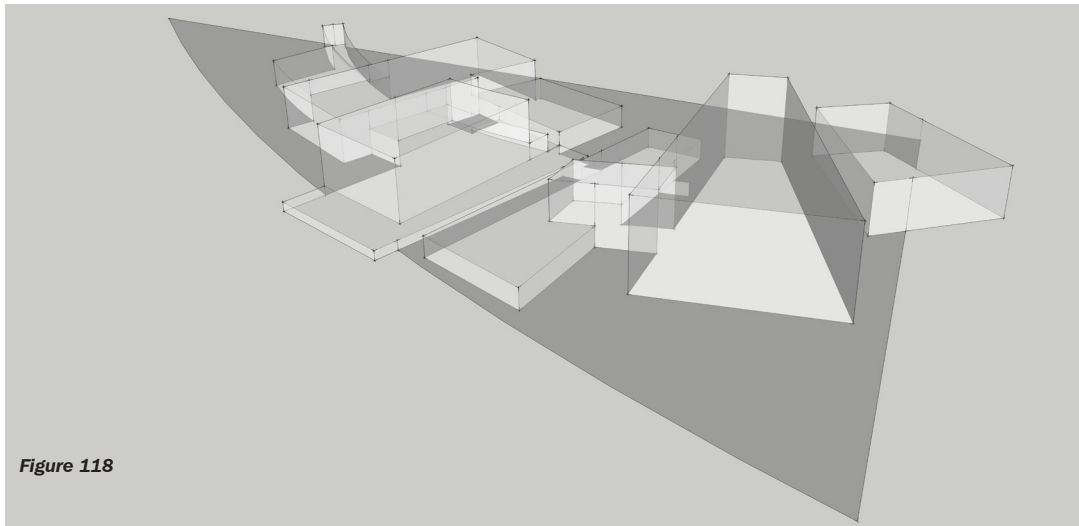


Figure 118

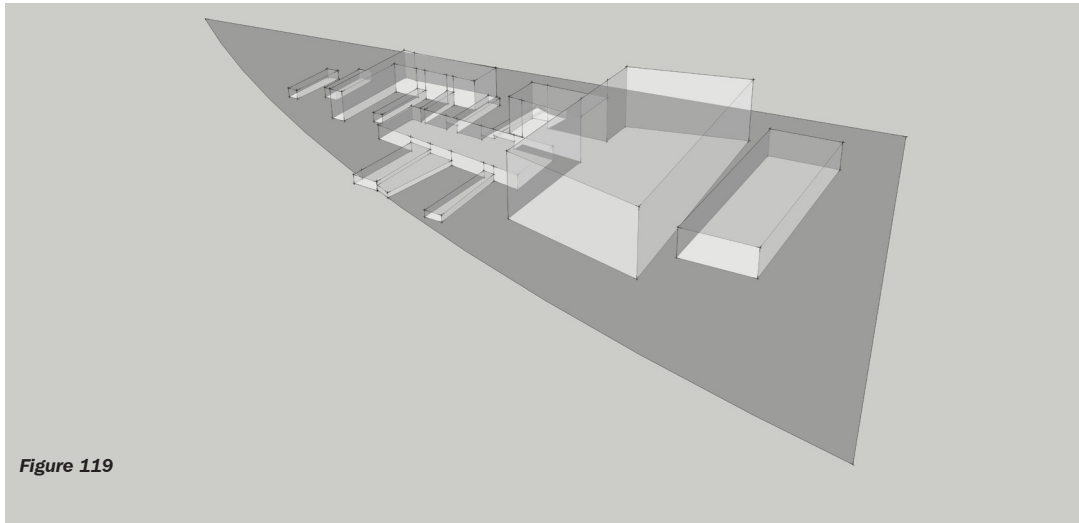
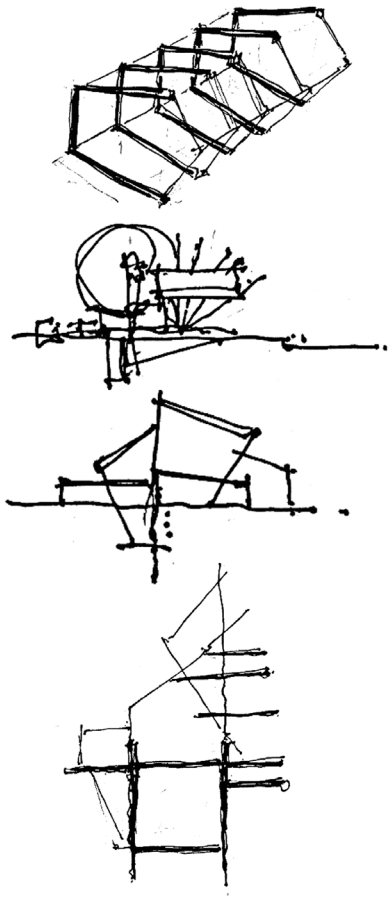


Figure 119



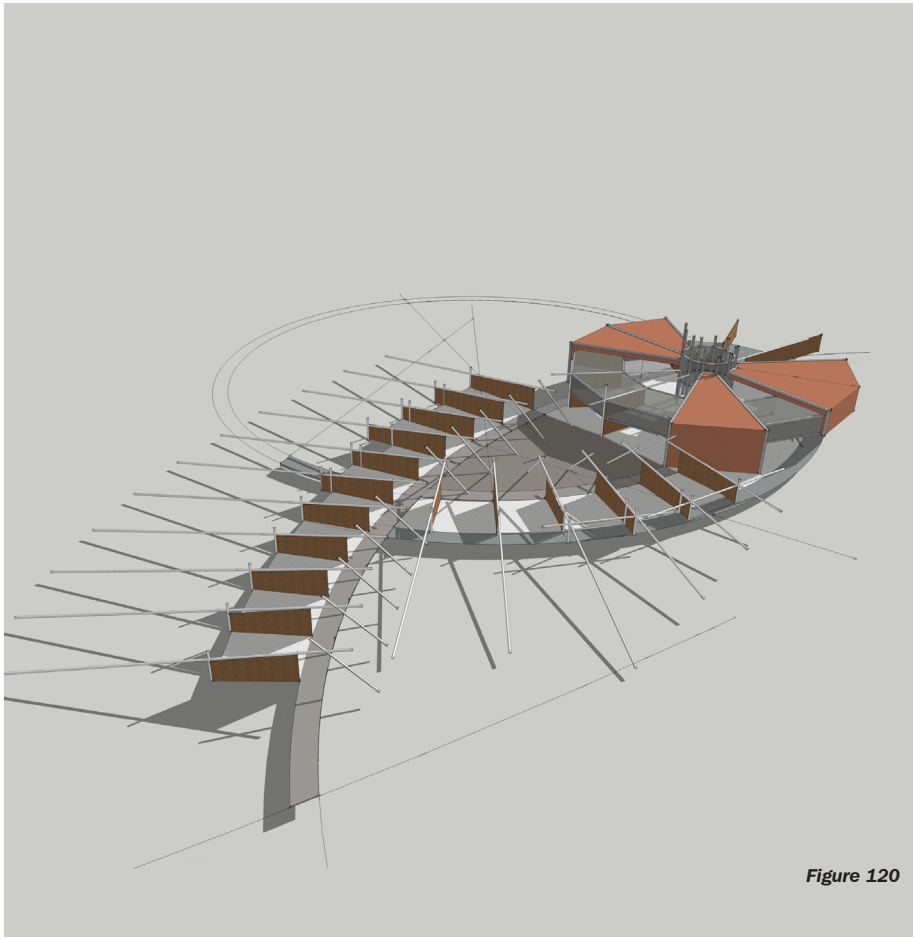


Figure 120

Figure 120: Structural touchstone illustrating possible form and plan layout (Author, 2020: own drawing).

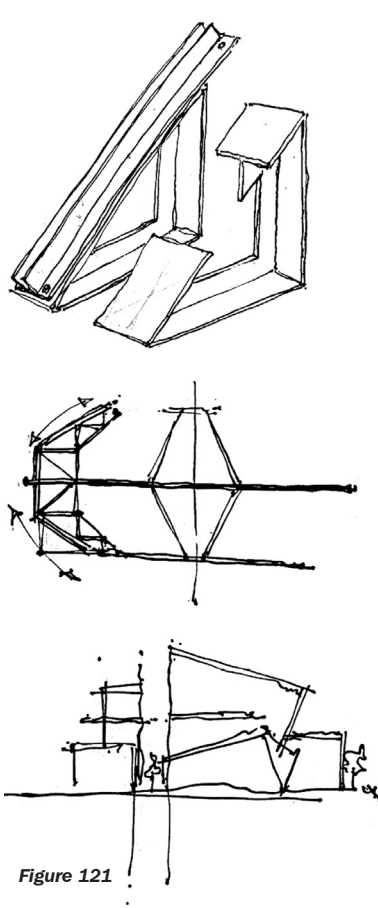
Figure 121: Structural touchstone illustrating possible materiality and plan layout (Author, 2020: own drawing).

Structural Touchstone

The initial form of structural touchstone was influenced by the recurring circular elements in both the design touchstone, and conceptual sketches. *Figures 120* and *121* communicate a heavy repetitive, structural, skeleton for the market space component on ground level. This skeleton is comprised of steel framing and brick infill. The heavy ribbed structure of steel and brick infill is held in place by a concrete spine slab.

The circular component of this structural touchstone echoes first and foremost the gathering and spatial hierarchy concept of the design development sketches. It communicates as a strong and unique form in this model. However, it is an intrusive element when considering the nature of the surrounding context. This particular component is made up of a circular steel frame, upholding a glass ring-like passage, which in turn is clasped by a partial shell of light steel and roof sheeting

The sketches accompanying the model images in *Figure 120* and *Figure 121*, illustrate the exploration of possible appropriate structural connections and systems. Although this touchstone form does not share a strong morphological connection with the final design, it does inspire the thought processes leading to the final structural resolutions of the proposed aquaponics micro-mall.



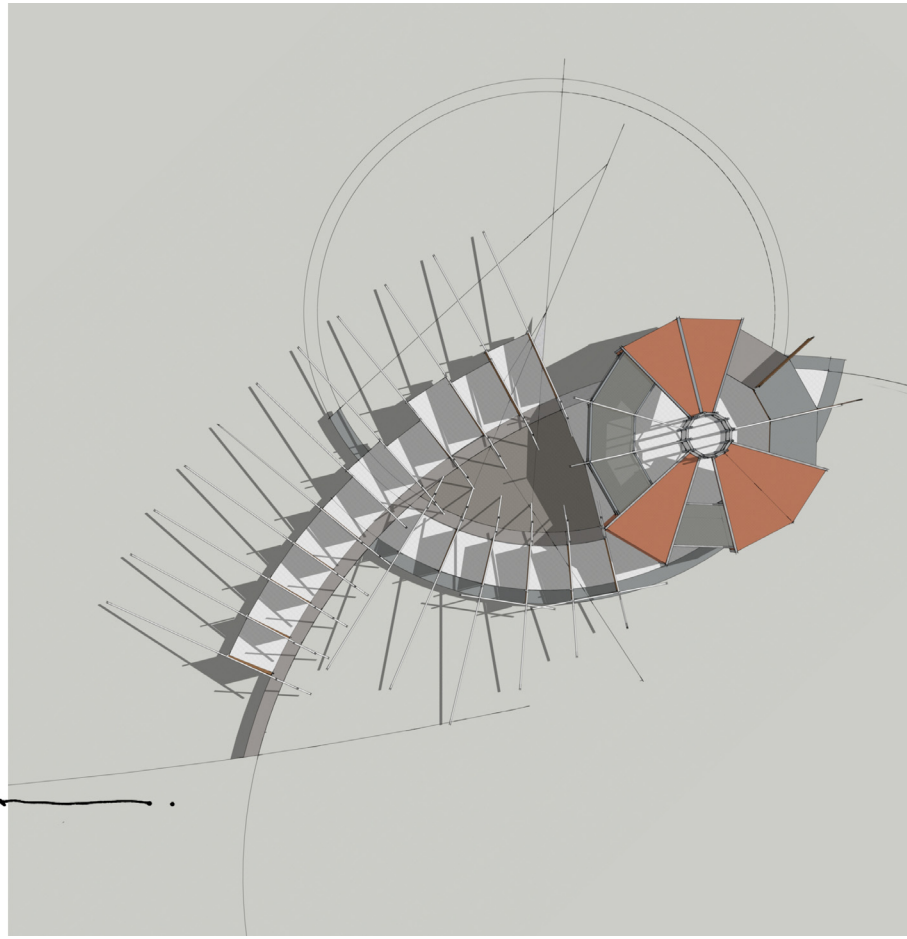


Figure 121

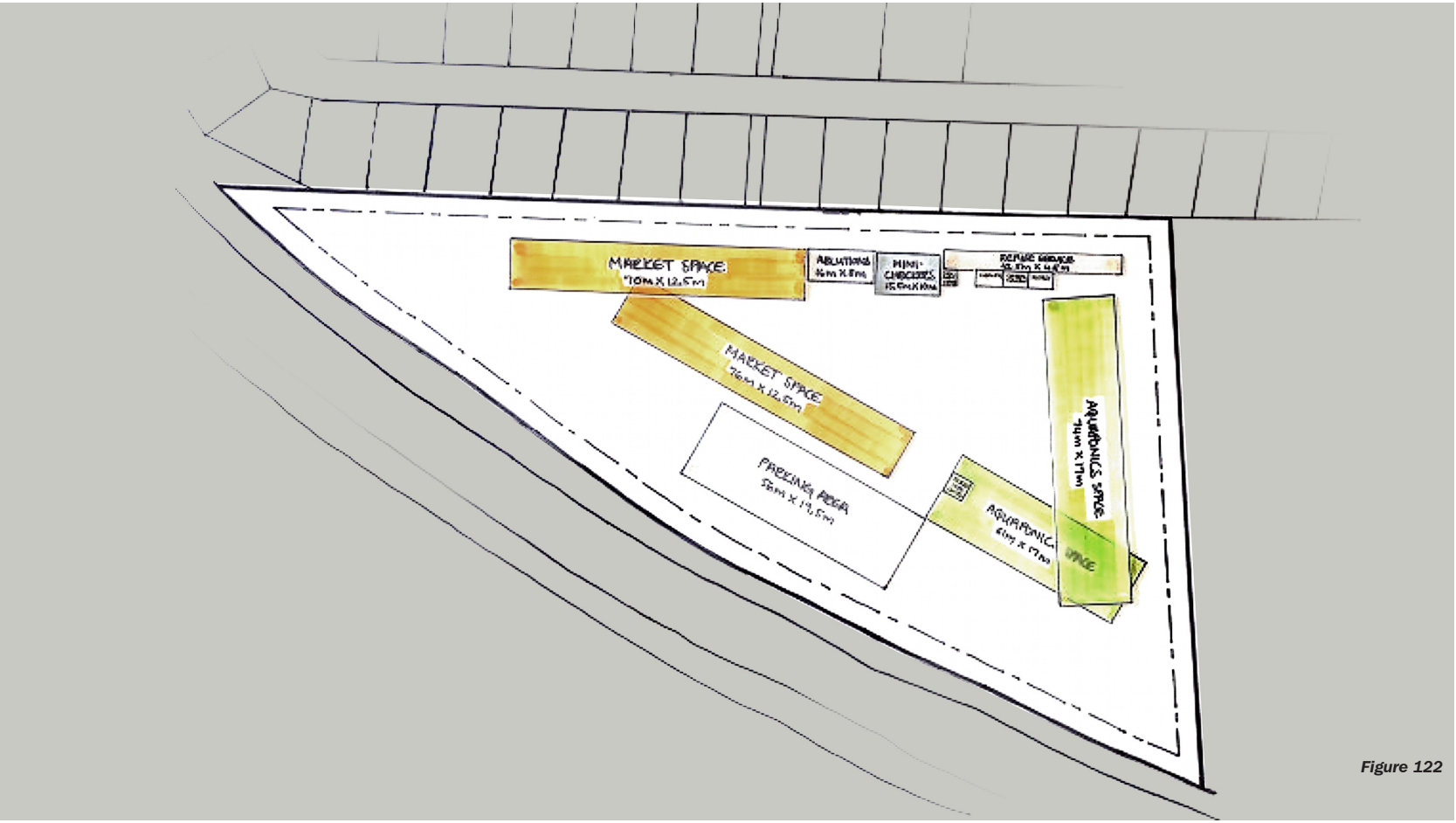


Figure 122

Figure 122: Exploration of zoning options using coloured function blocks (Author, 2020: own drawing).

Figure 123: The mapping of an employee's daily needs and routine (Author, 2020: own drawing).

Figure 124: The mapping of a customer's daily needs and routine (Author, 2020: own drawing).

Function Occupation and Spatial Zoning

The structural touchstone *brings* to light the need for a reassessment of the zoning of the necessary functions in this project. Floor areas of these functions are approximated, cut to an appropriate scale, and arranged on a corresponding site plan (*Figure 122*). This process works in tandem with the mapping process of the daily needs and routines of both employee and customer respectively (*Figures 123 and 124*).

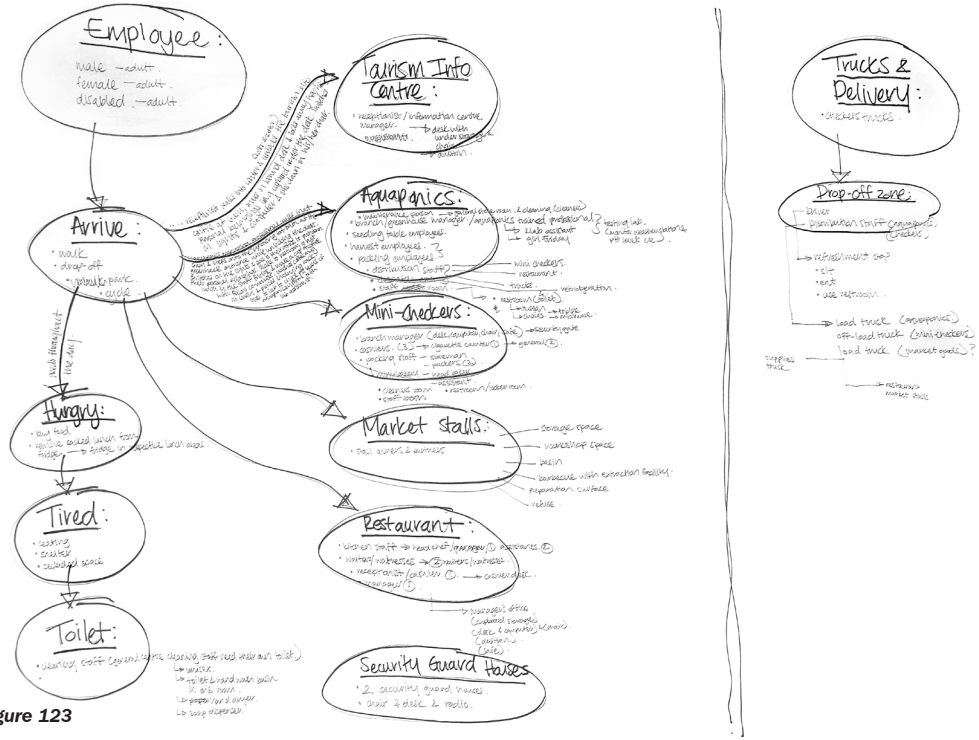


Figure 123

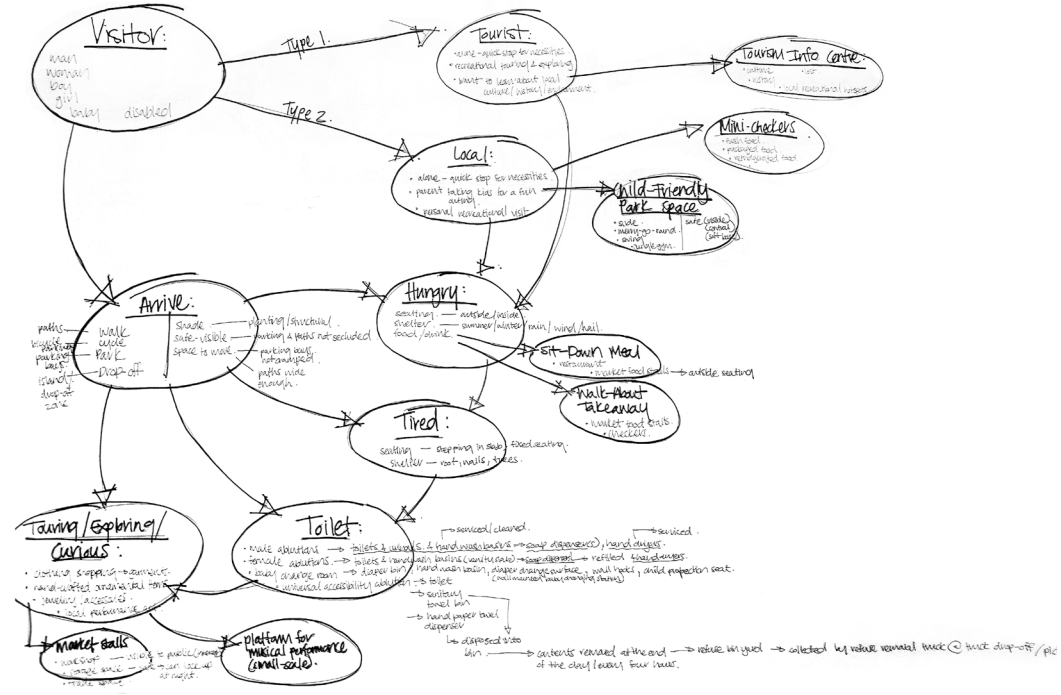


Figure 124

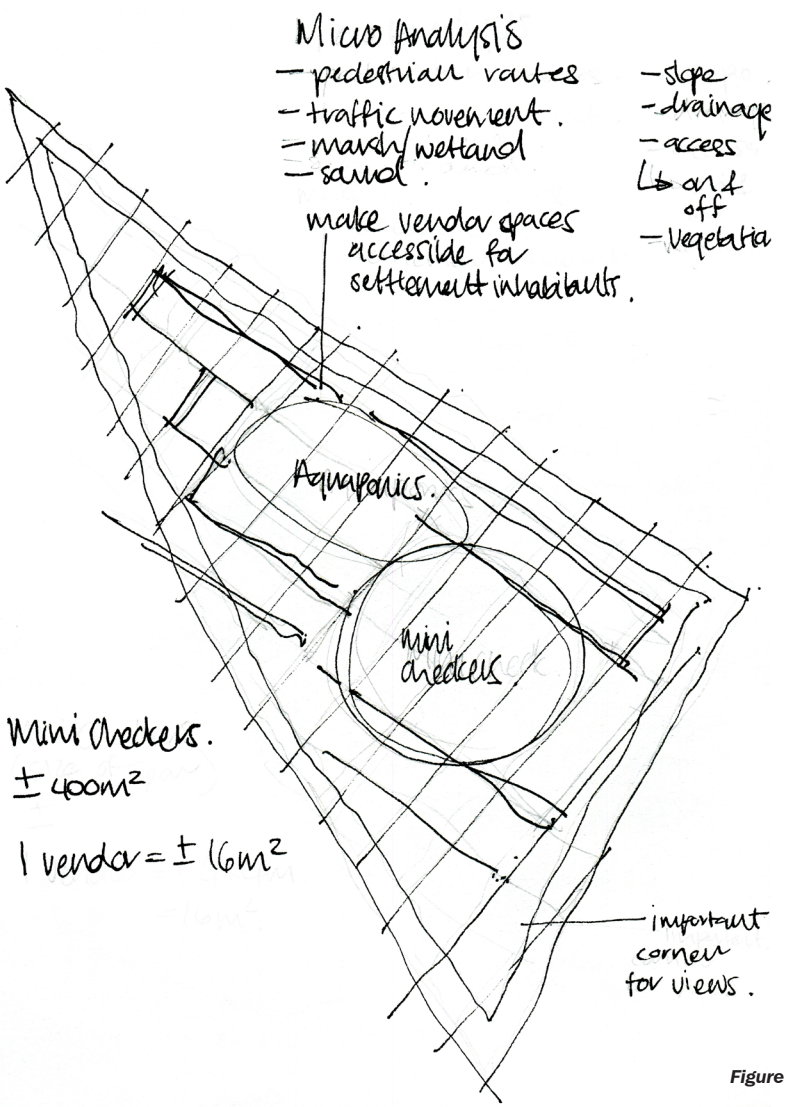


Figure 125

Functional and Spatial Planning Development

Figure 125 and *Figure 126* illustrate the further development and arrangement of the functional spaces on the site. *Figure 125* moves in a more linear direction, while *Figure 126* re-assess the incorporation of the circular form from the previous concepts.

It becomes increasingly difficult to break away from the preconceived circular conceptual forms of previous sketches. For this reason the early planning stage is revisied again in an attempt to approach the layout with a fresh and objective outlook.

Figures 127 and *128* attempt to explore a geometric and organic morphological form on plan; while *Figures 129* and *130* keep to a linear, geometric form approach.

Figures 130 and *131* reach the most suitable planning conclusion. This being, the squared forms responding best to the morphological language of the surrounding living units in the Rocklands settlement.

Figure 125: Spatial and functional planning, incorporating Rocklands settlement informal grid lines (Author, 2020: own drawing).

Figure 126: Spatial planning, with more developed incorporation of functions (Author, 2020: own drawing).

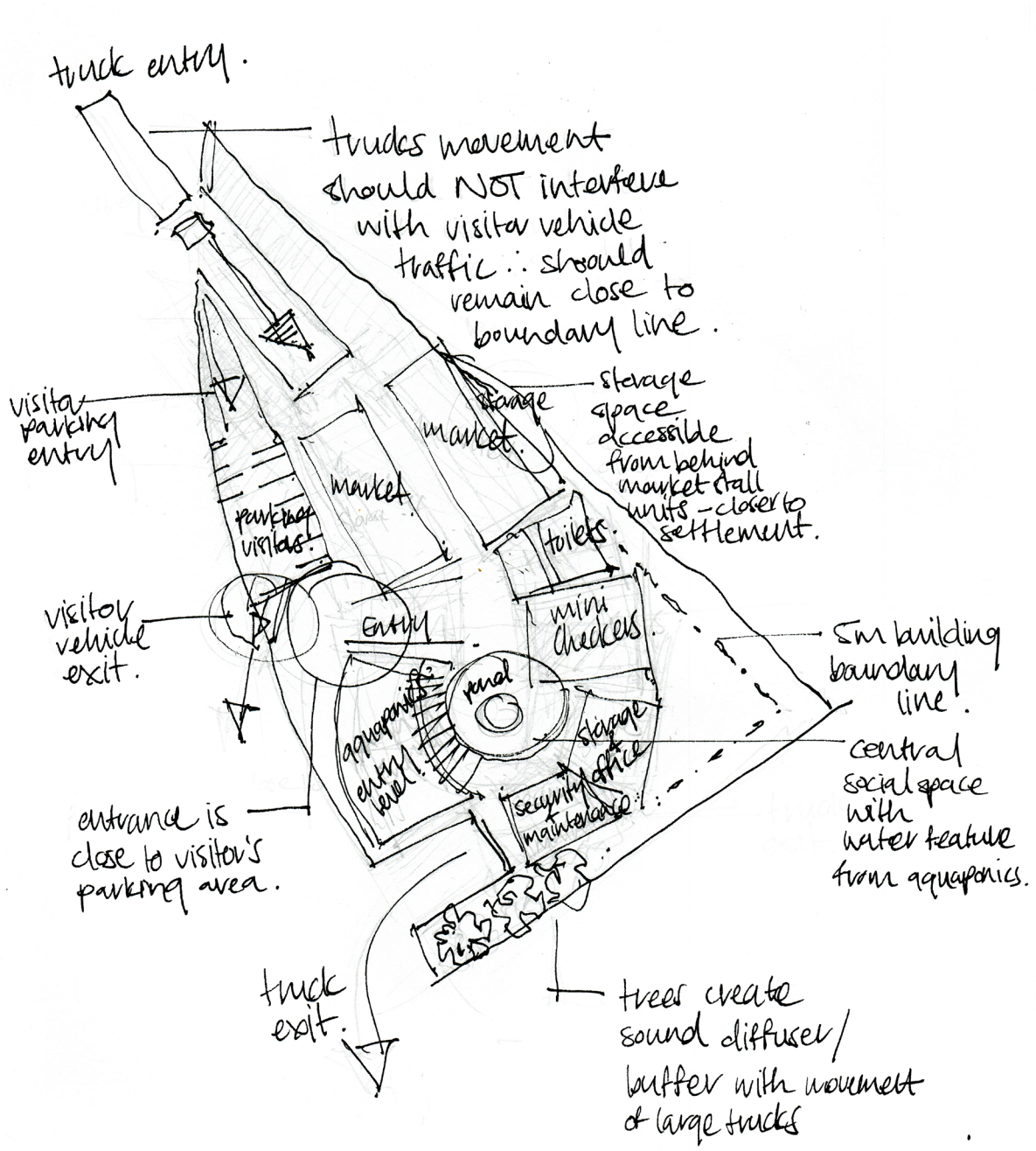


Figure 126

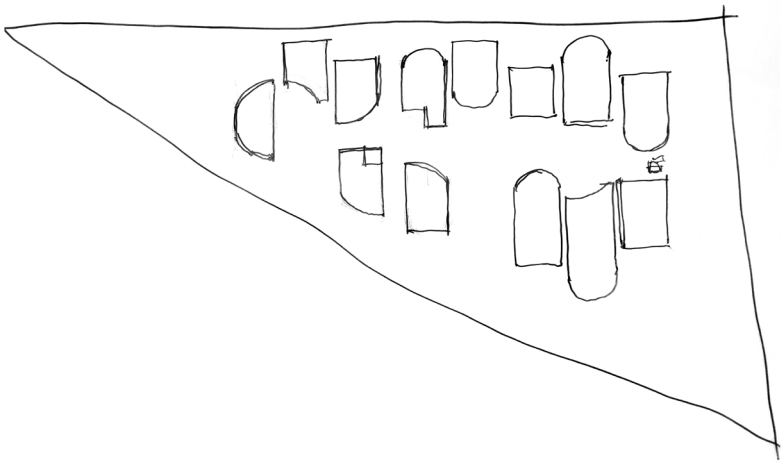


Figure 127

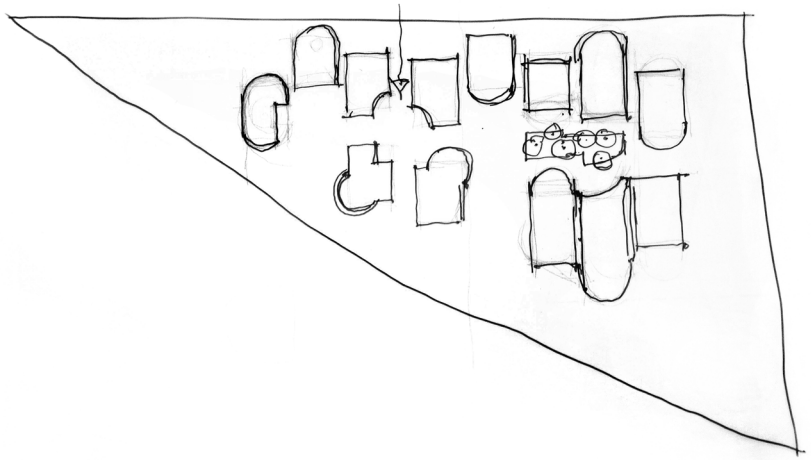


Figure 128

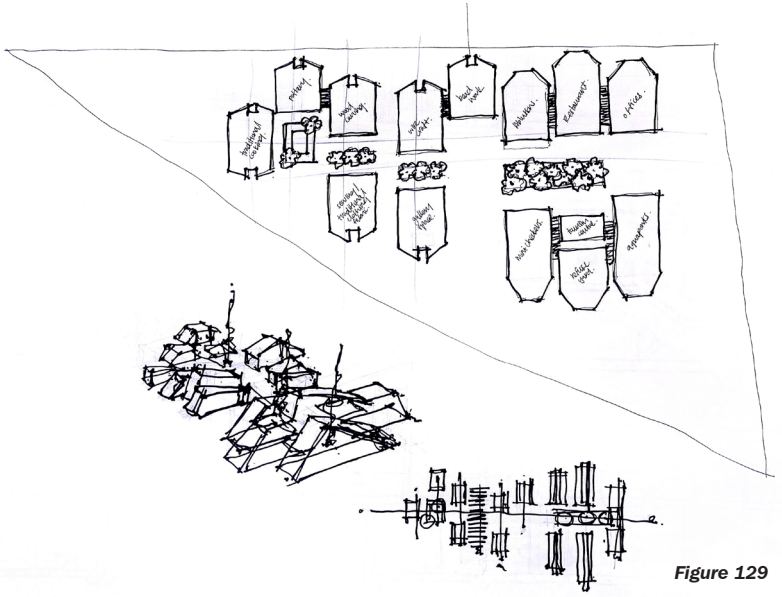


Figure 129

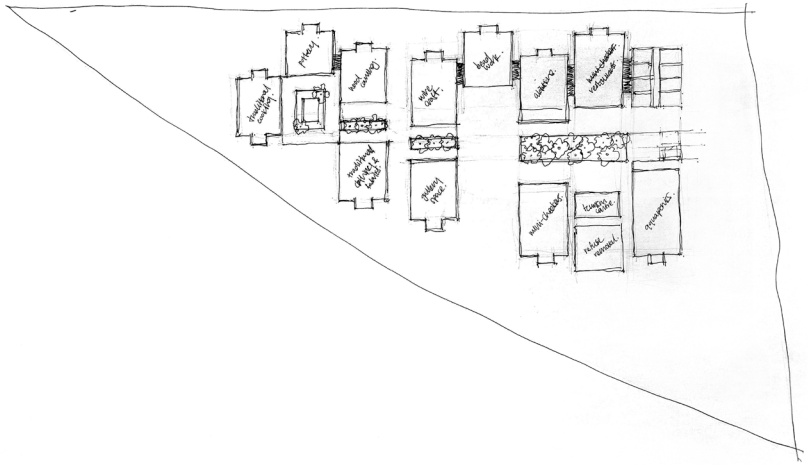


Figure 130

Figure 127: Re-evaluation of plan development (Author, 2020: own drawing).

Figure 128: Re-evaluation of plan development (Author, 2020: own drawing).

Figure 129: Re-evaluation of plan development with the incorporation of functions (Author, 2020: own drawing).

Figure 130: Re-evaluation of plan development with the incorporation of functions (Author, 2020: own drawing).

Figure 131: Re-evaluation of plan development with the incorporation of functions and feature spaces (Author, 2020: own drawing).

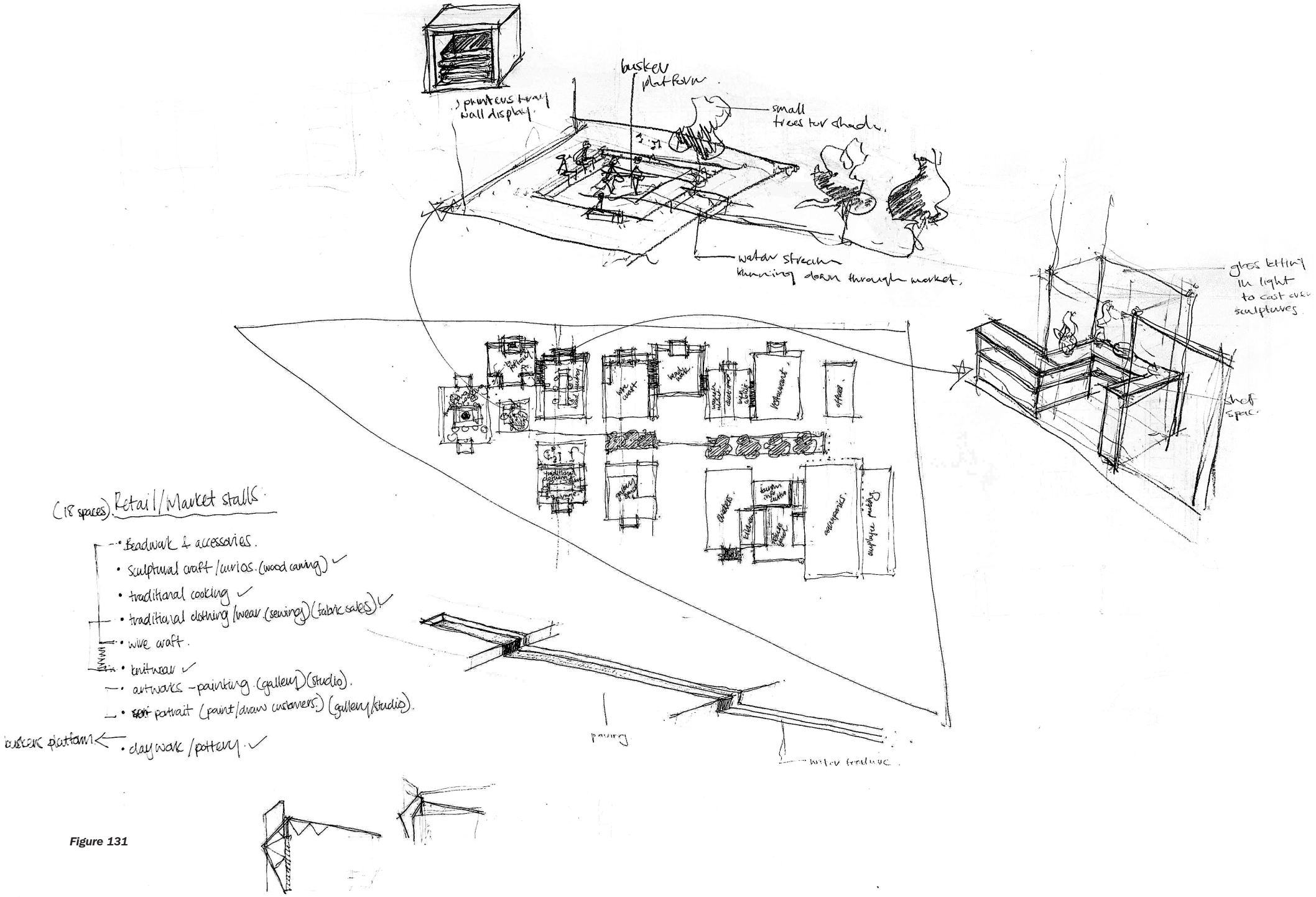

busker platform
printers tray/ wall display.
small trees for shade.
water stream running down through market.
glass letting in light to cast over sculptures.
shelf space.
(18 spaces) Retail/Market stalls
beadwork & accessories.
sculptural craft/curios. (wood carving)
traditional cooking
traditional clothing/wear (sewing) (fabric sales)
wire craft.
knitwear
artworks - painting (gallery) (studio).
portrait (paint/draw customers) (gallery/studio).
busker platform
clay work/pottery
paving
water feature

Figure 131

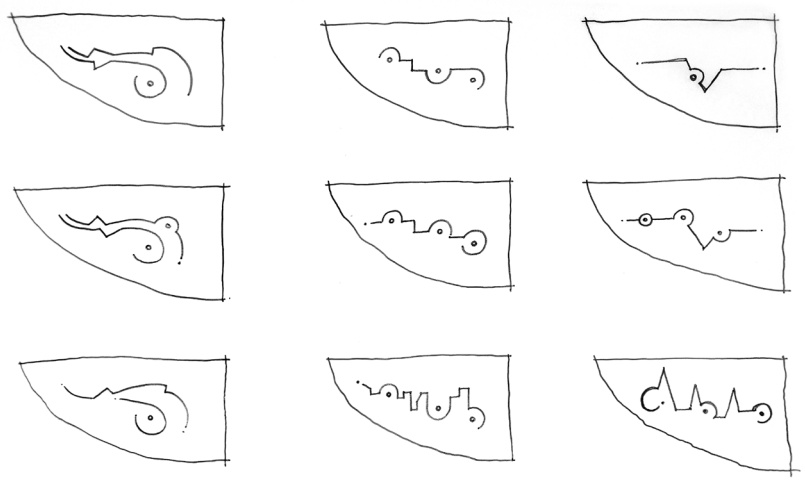


Figure 132

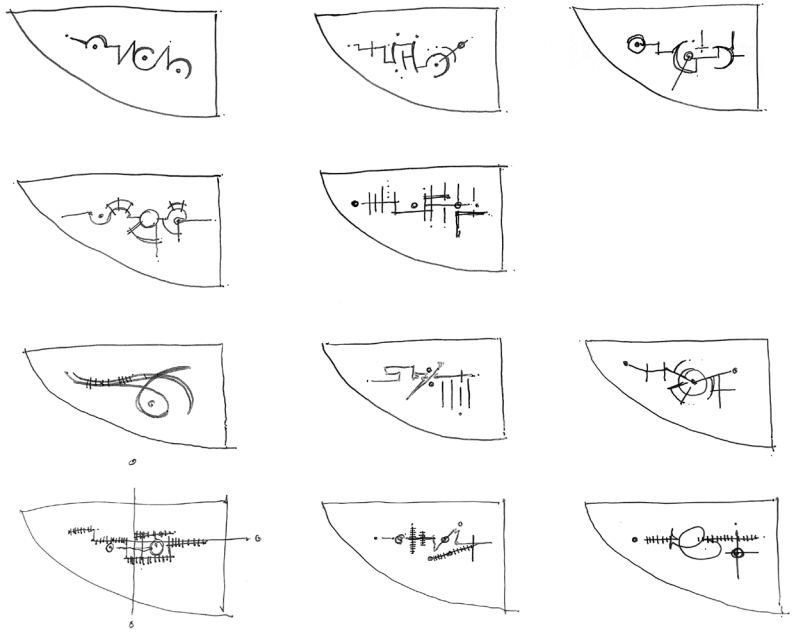
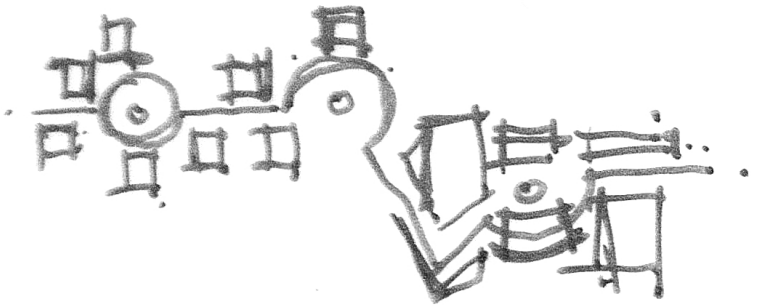


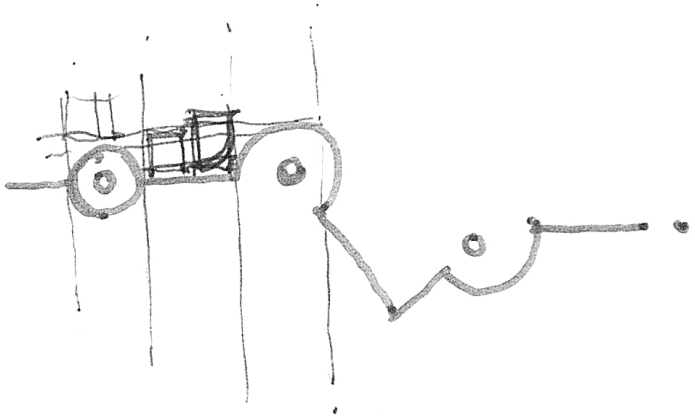
Figure 133

Path Development

On exploring fresh ideas for the functional layout plan, it is realised that a suitable resolution needs to be sought for the linking of spaces. It is for this reason that a variety of options are explored for the development of a main path through the micro-mall. This path needs to communicate entry and exit points, as well as gathering spaces or places of rest. These gathering nodes would need to punctuate points of hierarchy within the building's accommodation of its most important functions. *Figure 132* and *Figure 133* illustrate the variety of path development options explored during the design process.

A path design is selected from the options shown in *Figure 132* and *133,* and is developed further in *Figure 134*, working harmoniously with the functional layout plan.





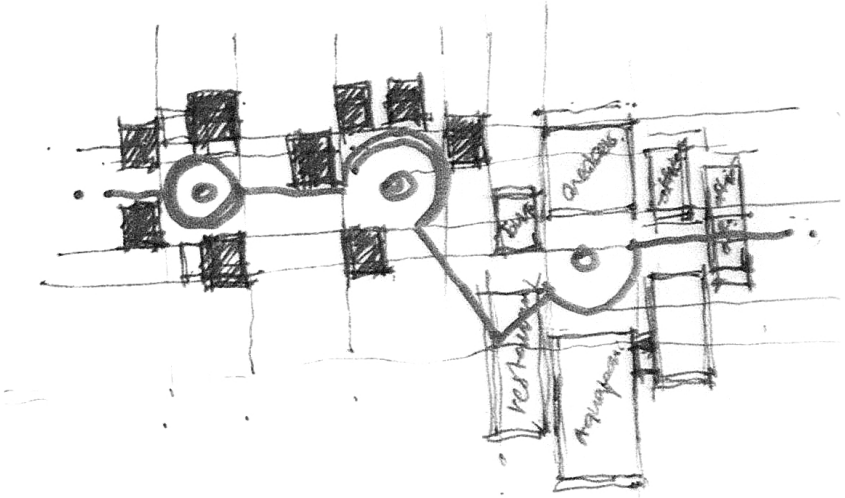


Figure 132: Path and gathering space relationship exploration diagrams (Author, 2020: own sketches).

Figure 133: Path and gathering space relationship exploration diagrams (Author, 2020: own sketches).

Figure 134: Diagrammatical development of most appropriate path and gathering space combination (Author, 2020: own sketches).

Figure 134

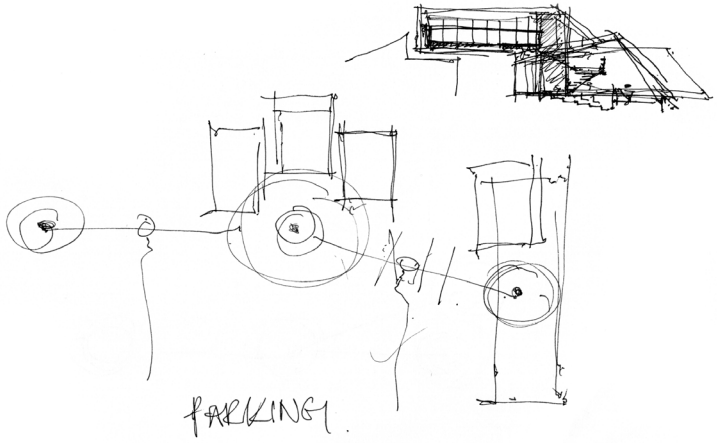


Figure 135

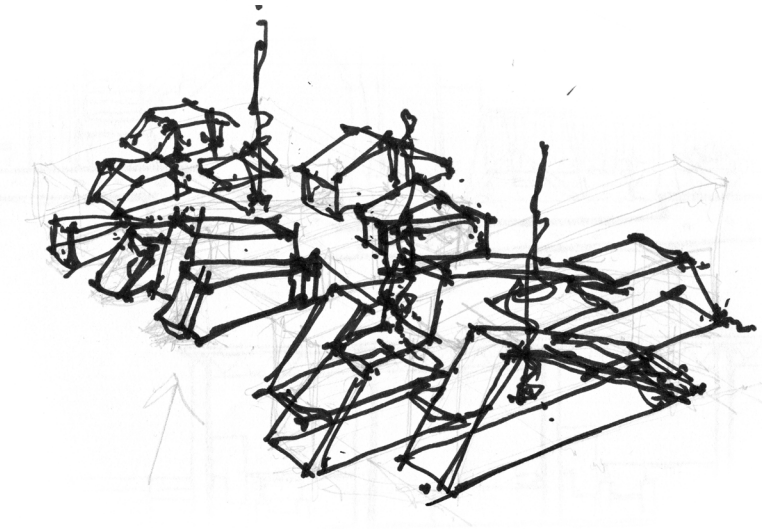


Figure 136

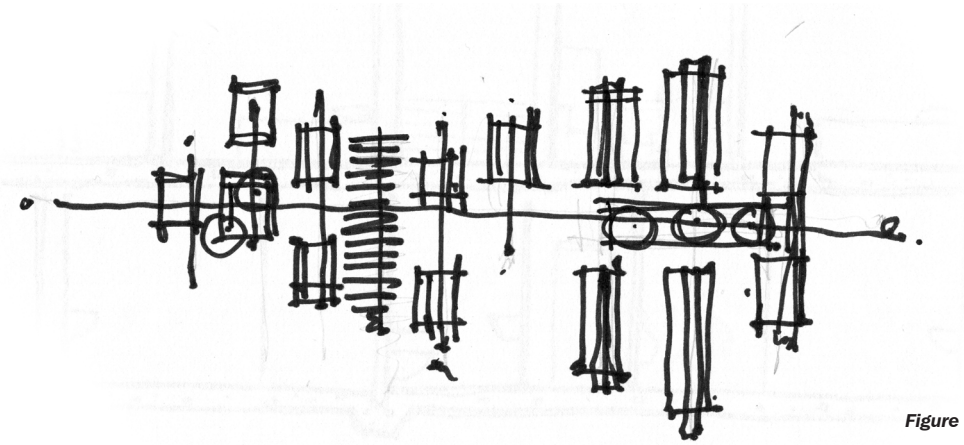


Figure 137

Plan and Form Development

Figure 135, 136, and *137*, depicts the process followed in order to find a suitable morphological outcome for merging the new path design with the resolved functions.

Figure 136 is a spontaneous, rough sketch recording the ultimate vision of what the final design desires the form to achieve, while bearing in mind the path orientation and function placement.

Figure 138 is developed further from *Figure 137*, where the spacing between the ground level functions is compacted to improve on the overall form, making it more tractable on both plan and elevation.

Figure 139 illustrates the development of the plan in *Figure 138* on section, finding a means by which hierarchy could be created through the linking of the mini-Checkers with the aquaponics center. The mini-Checkers acts as a step on which the first floor greenhouse of the aquaponics centre rests. In theory, the Checkers objective is focussed on the upliftment of the aquaponics farming method, making this sectional resolution more appropriate.

In *Figure 140*, the footprint of this buidling is laid out in its basic form, while the connecting paths are developed in terms of material use and textural contrasting. Each material tells a story of movement that subconsciously dictates how the spaces should be utilised.

The concept in *Figure 139* is explored further and refined in *Figure 141*, where the tourism centre is linked to the aquaponics greenhouse by means of a staircase and lift shaft. Creating accessibility to tour groups interested in learning about aquaponic farming methods. The greenhouse atmosphere must however, not be contaminated by visiting tour groups. To prevent such contamination, an exterior glass viewing passage is designed to box-out from the main structure and latch onto the side of the greenhouse. This passage

Figure 135: Resolving the building-path relationship (Author, 2020: own sketches).

Figure 136: Sketch illustrating a possible 'sliced-up' morphological approach to the new building-path relationship resolution (Author, 2020: own sketch).

Figure 137: Development of the new building-path relationship on plan (Author, 2020: own sketch).

Figure 138: Improving the plan forms, entry points and gathering spaces (Author, 2020: own sketch).

Figure 139: Sectional exploration of possible interlocking load-bearing structural forms (Author, 2020: own sketches).

Figure 140: Developing the building forms, paths, and landscaping on plan (Author, 2020: own drawing).

Figure 141: More detailed sectional development of the possible interlocking structural forms of the mini-Checkers and the aquaponics centre (Author, 2020: own sketches).

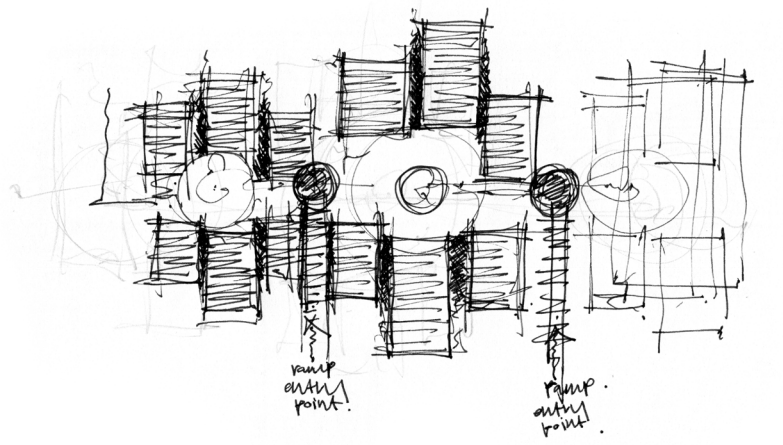


Figure 138

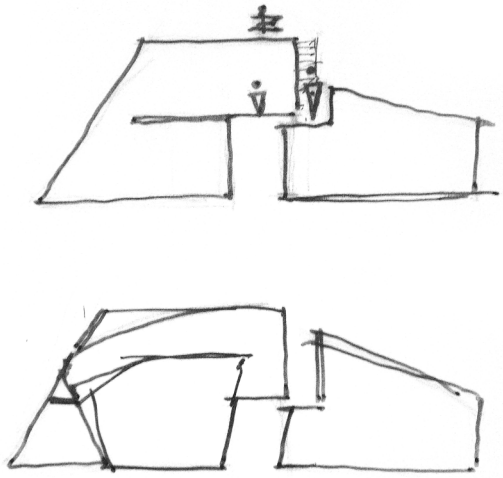


Figure 139

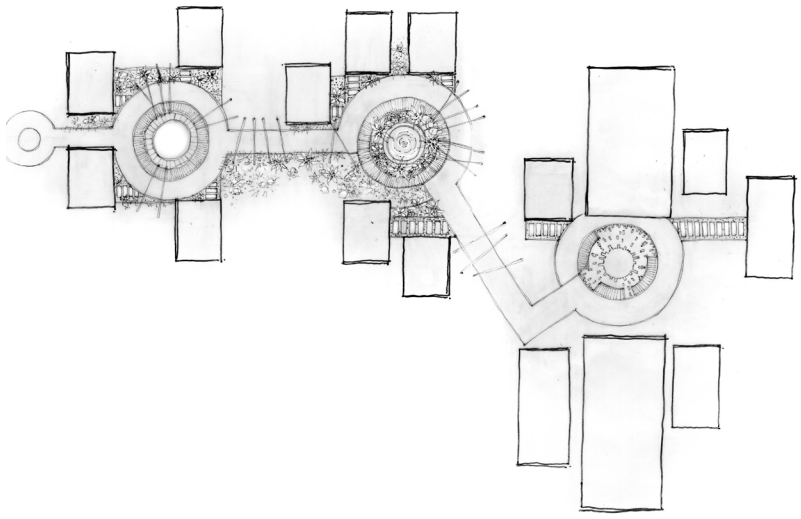


Figure 140

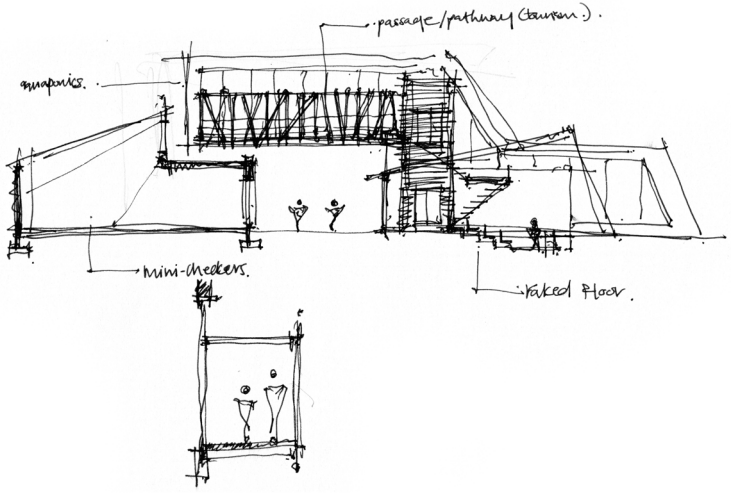


Figure 141

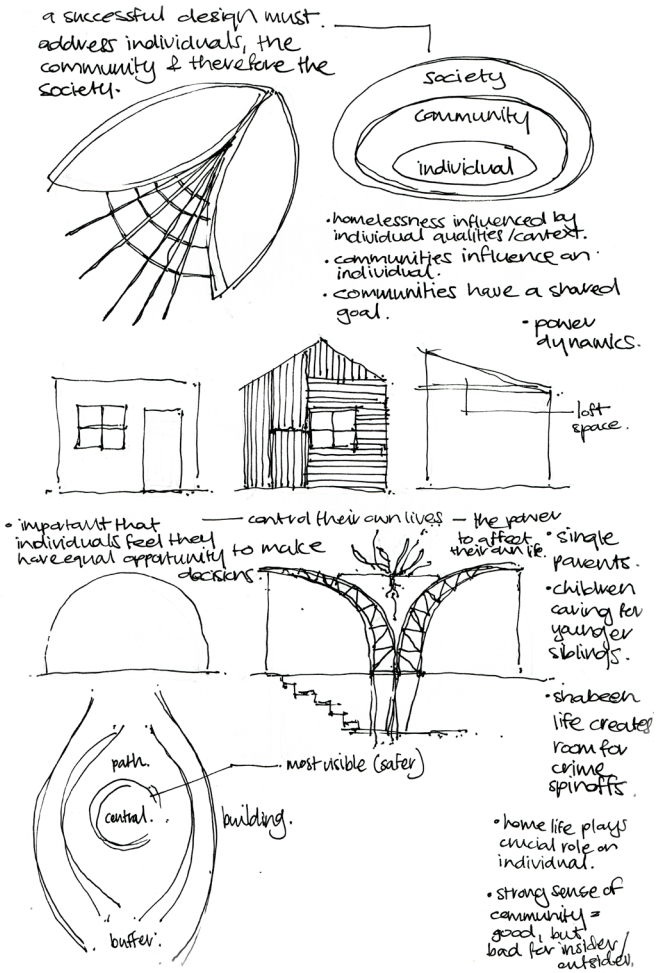


Figure 142

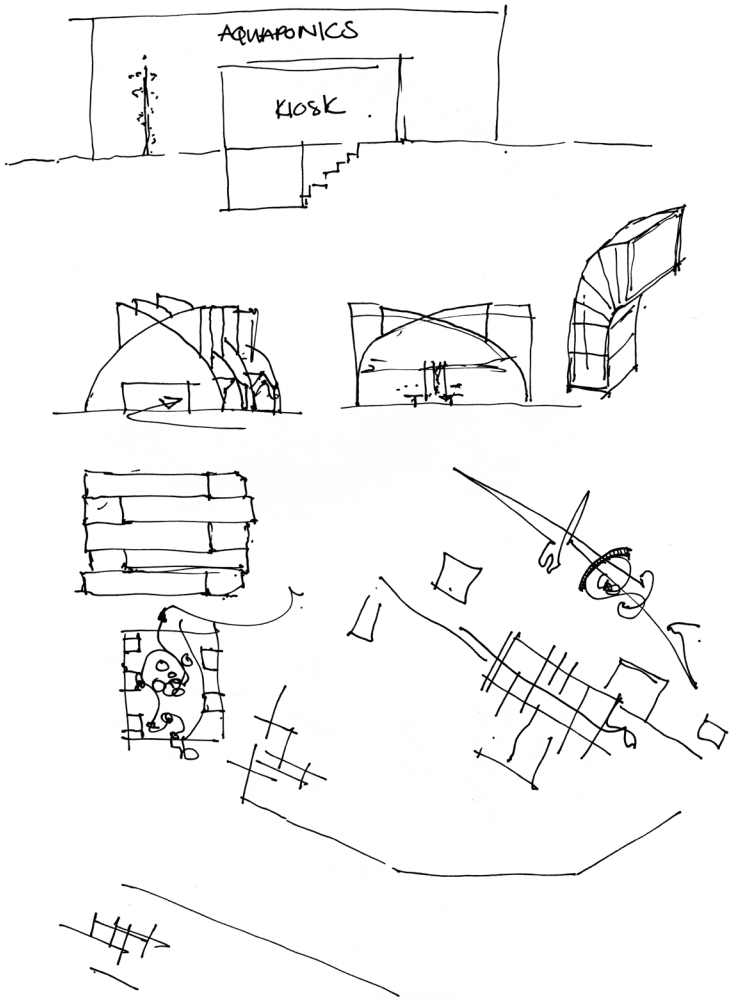


Figure 143

Figure 142: Exploring possible structural forms, connections, materials and spaces (Author, 2020: own sketches).

Figure 143: Exploring possible forms, path connections, and spatial relationships (Author, 2020: own sketches).

Figure 144: Exploring possible forms, patterns, intersections, and spatial relationships (Author, 2020: own sketches).

allows for the tour groups to view the running of the aquaponic system from a protected distance, keeping the greenhouse atmosphere hygienic.

Figures 142, 143, and *144*, exhibit abstract and conceptual sketches of patterns, objects, textures or forms which motivate the form-giving and flow of the final design. A conversation between the organic and the geometric – where they are willing to compromise, and how. This is possibly the most desperate stage of the design process – a search for a particular moment of morphological and structural harmony.

As part of the desperate search for harmonious communication between form and structure, the investigation of spatial relationships surfaces once again. This design should not only accommodate people from a socio-economic perspective, but also from a experiential perspective. Here the person must not feel limited to exist only within one spatial level, but instead to have visual access to other levels. This interaction is investigated in *Figure 145*.

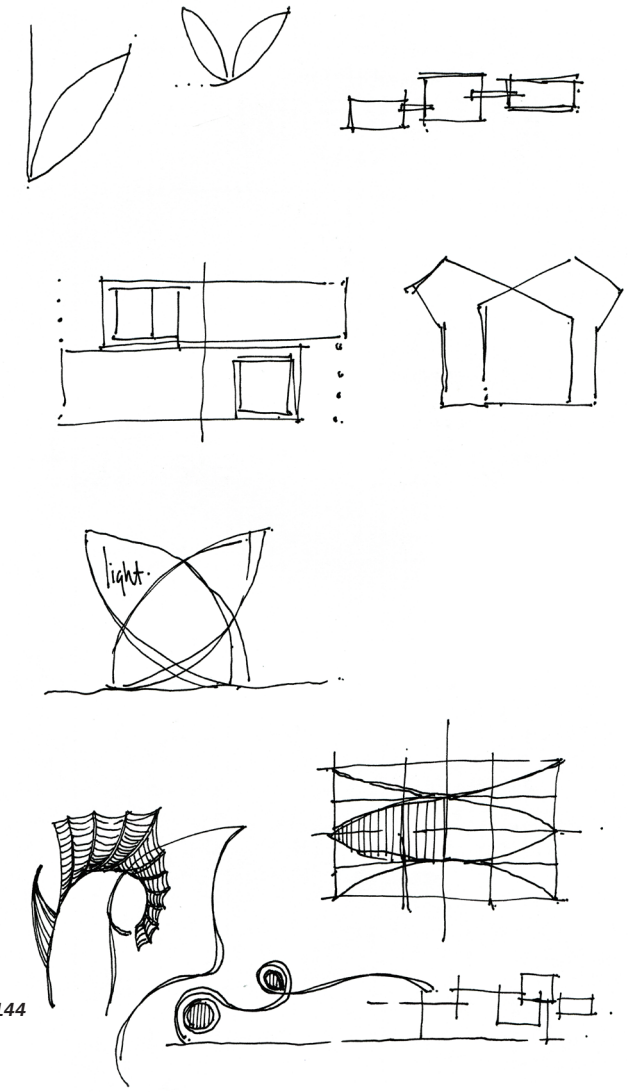


Figure 144

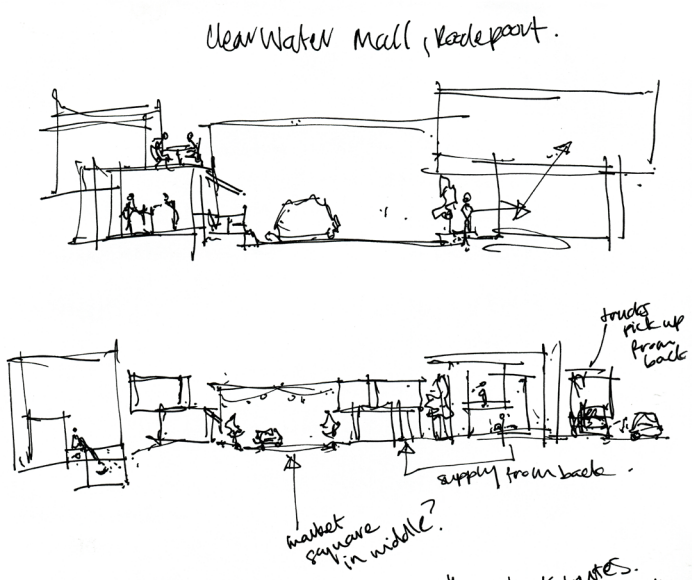


Figure 145

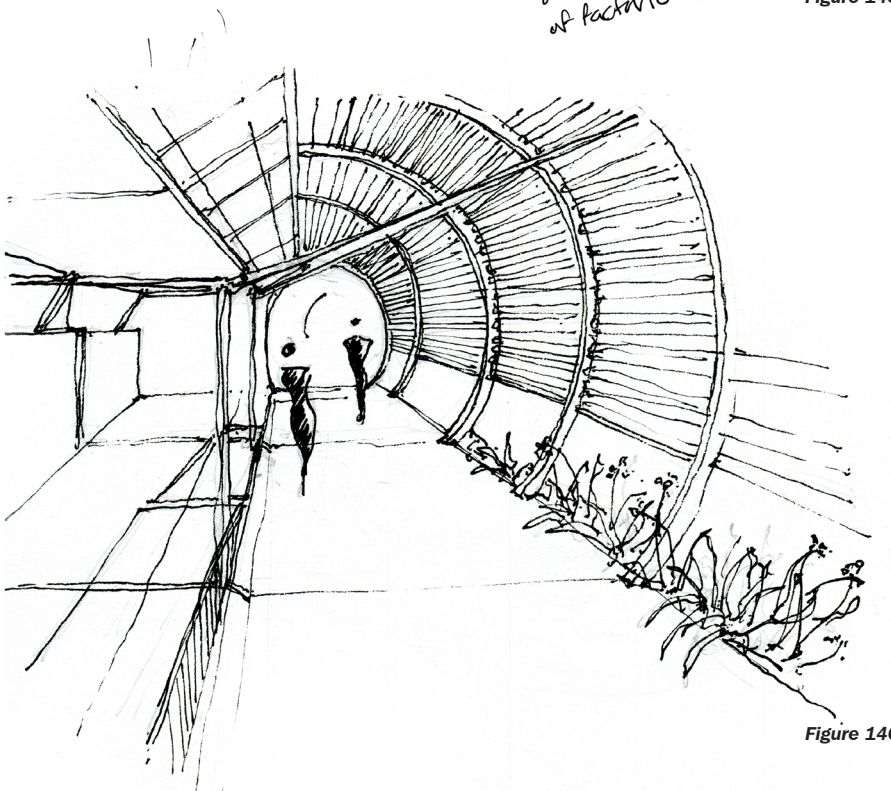


Figure 146

Figure 146 illistrates the exploration of space through path and material use. A more conclusive design for the framing of paths is reached in *Figure 147* – the angular lines which echoed the lines of the Rocklands settlement shelters.

The furniture and finishes of the building interiors are designed and developed with the Xhosa arts and crafts methods in mind. *Figure 148* and *149* illustrate this investigative process.

Figure 145: Processing envisioned linking of levels and spaces for improved human interaction (Author, 2020: own sketches).

Figure 146: Developing ideas for material use and structural moments through path (Author, 2020: own sketch).

Figure 147: Designing the potential outdoor path design features – framed arches with lights installed (Author, 2020: own sketches).

Figure 148: Designing furniture options and decorative column skins (Author, 2020: own sketches).

Figure 149: Designing other possible decorative steel column skins (Author, 2020: own sketches).

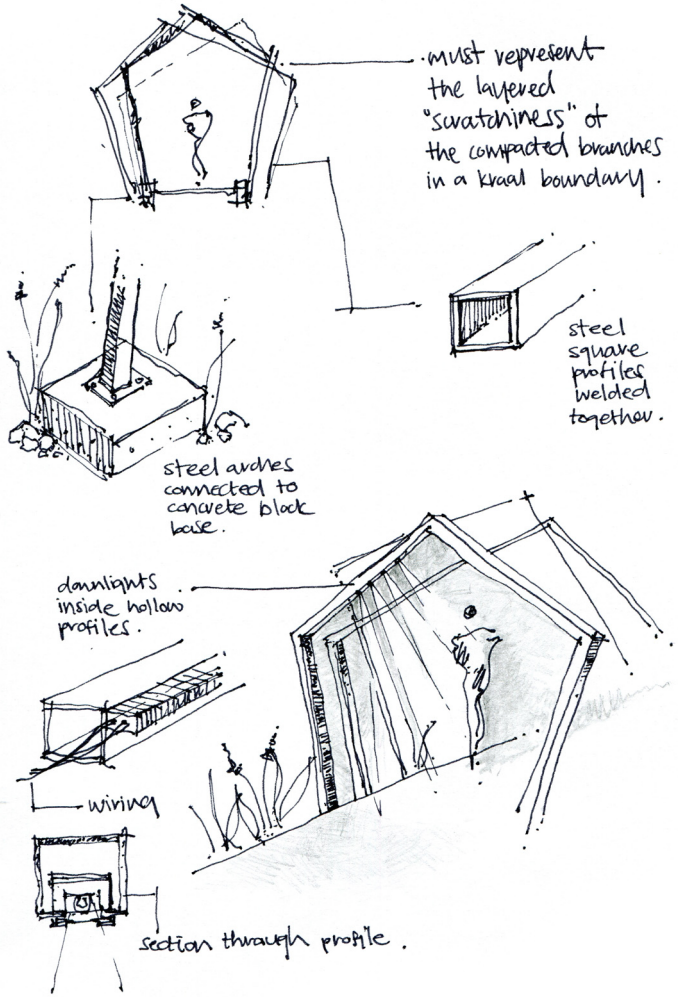


Figure 147

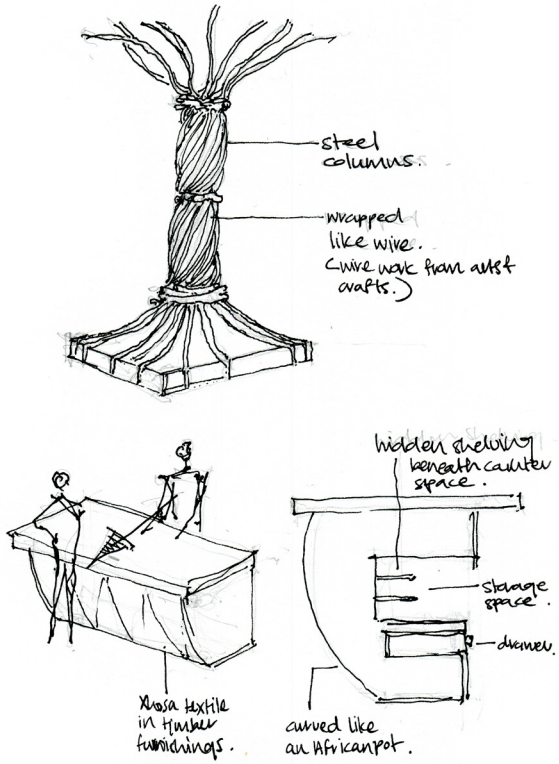


Figure 148

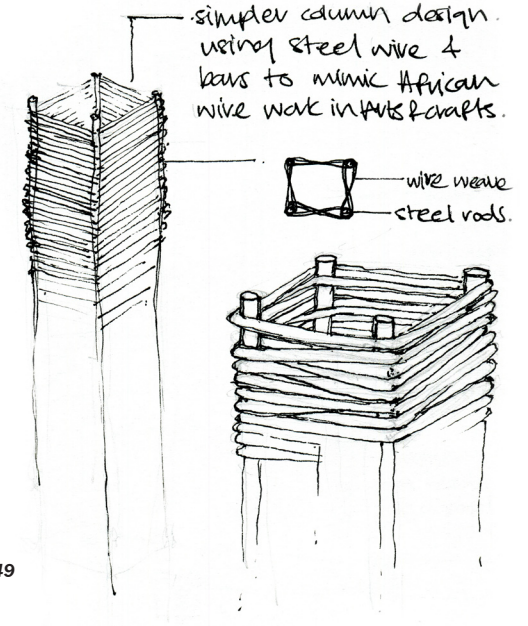


Figure 149

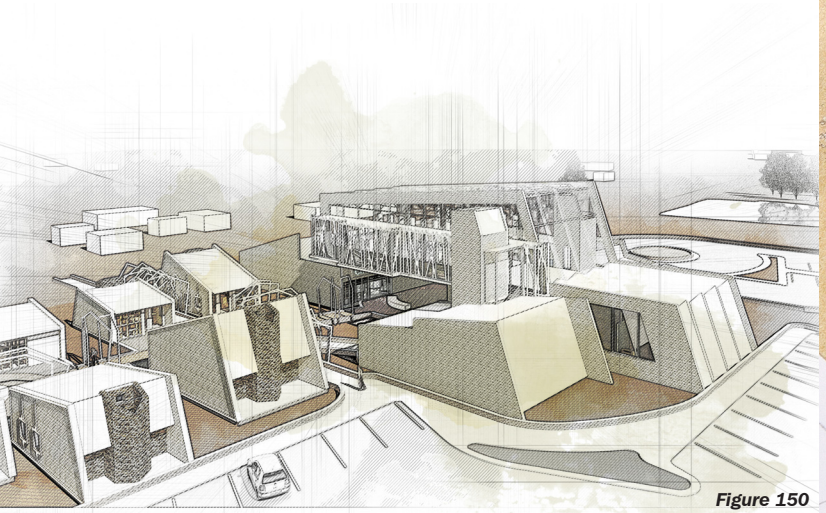


Figure 150

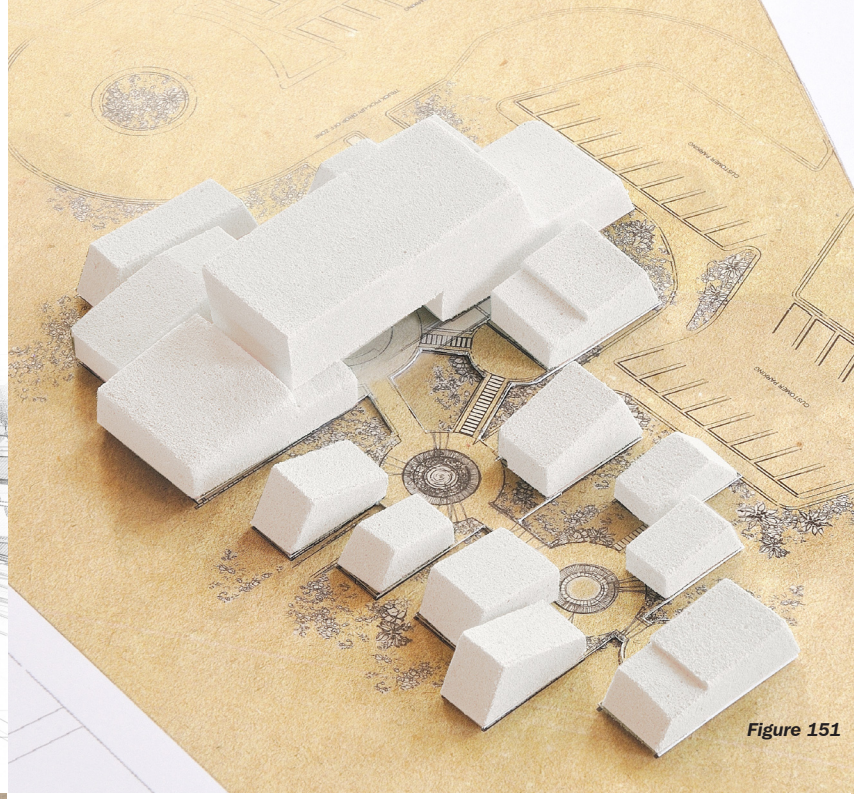


Figure 151

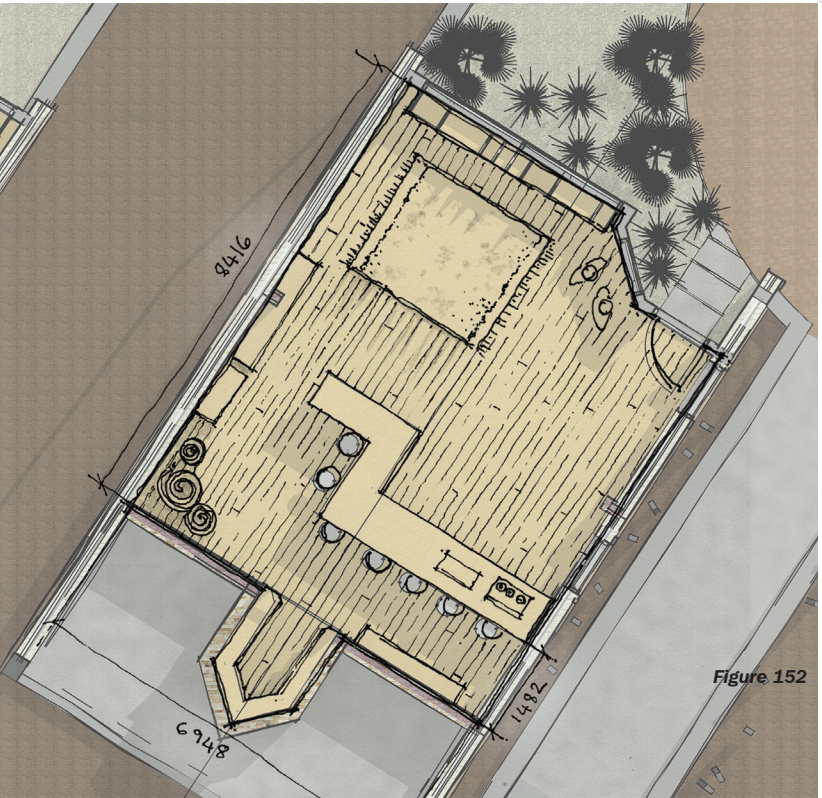


Figure 152



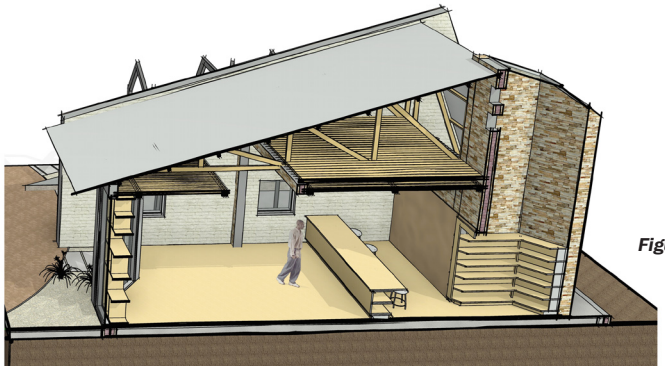


Figure 153

Figure 150: View from the North-Western side of the proposed re-adjusted design (Author, 2020: own Revit model graphic).

Figure 151: Concept model showing general massing and morphology of the re-adjusted design (Author, 2020: own concept model).

Figure 152: Resolving the floor plan of a single market unit – indicating material use and furniture layout (Author, 2020: own graphic).

Figure 153: Sectional development of a single market unit – indicating volume, material use and spatial relationships (Author, 2020: own graphic).

Figure 154: Interior perspective of a single market unit – showing texture, light and colour (Author, 2020: own graphic).

Figure 150 and *Figure 151* show the next stage of the proposed design morphology emerging from this explorative process.

Figure 152, *153* and *154* illustrate the sectional and spatial development of a single market unit in this stage of the design proposal.



Figure 154

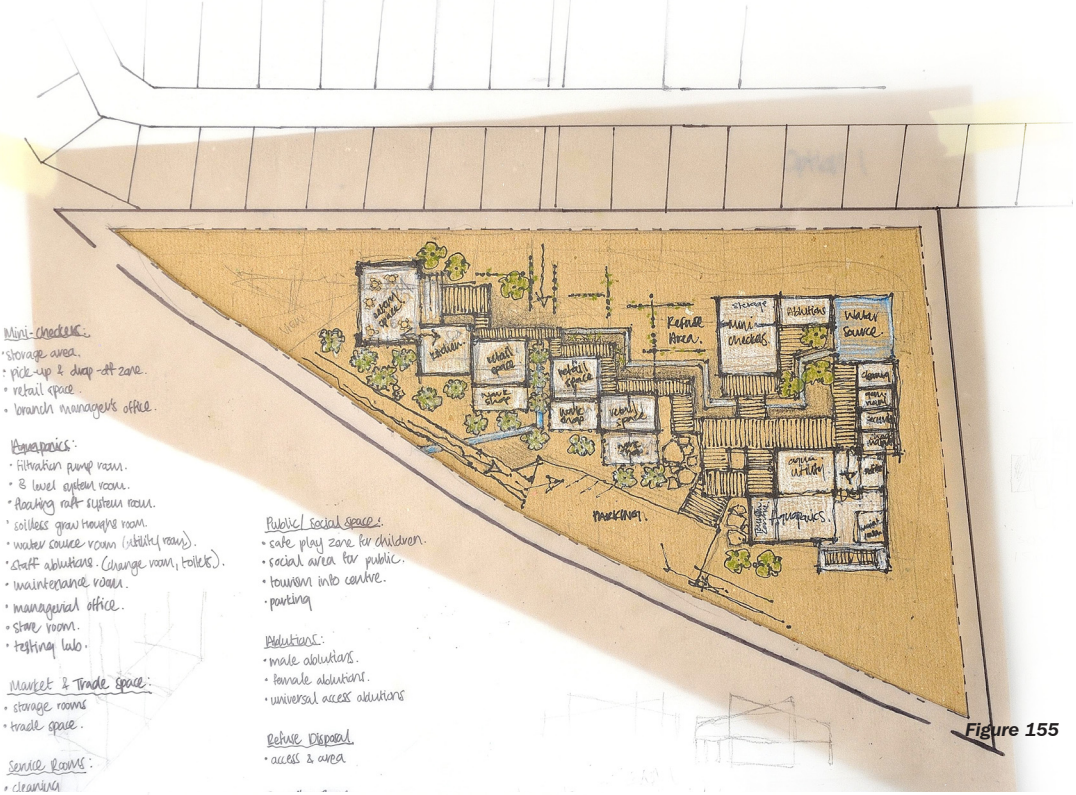


Figure 155



Figure 156

Compacting the Design and Extending the Aquaponic Function

Although the design comes into a character of its own, it is still lacks a common structural thread to pull the the three main elements of the mall together - the market units, mini-Checkers, and aquaponics centre.

Until this point in the design process, the aquaponics greenhouse is limited to occupying one area above the aquaponics administration and mini-Checkers block on ground level. *Figure 155* to *Figure 166* show the development and exploration of possible ways in which the aquaponics greenhouse can act as the common structural thread throughout the building. Each figure shows, first a ground floor layout and, secondly, a corresponding first floor shape.

Figure 155: First option for the development of the ground floor interior spatial layout (Author, 2020: own drawing).

Figure 156: First option for the development of the first floor greenhouse structure (Author, 2020: own drawing).

Figure 157: Second option for the development of the ground floor interior spatial layout (Author, 2020: own drawing).

Figure 158: Second option for the development of the first floor greenhouse structure (Author, 2020: own drawing).

Figure 159: Third option for the development of the ground floor interior spatial layout (Author, 2020: own drawing).

Figure 160: Third option for the development of the first floor greenhouse structure (Author, 2020: own drawing).



Figure 157

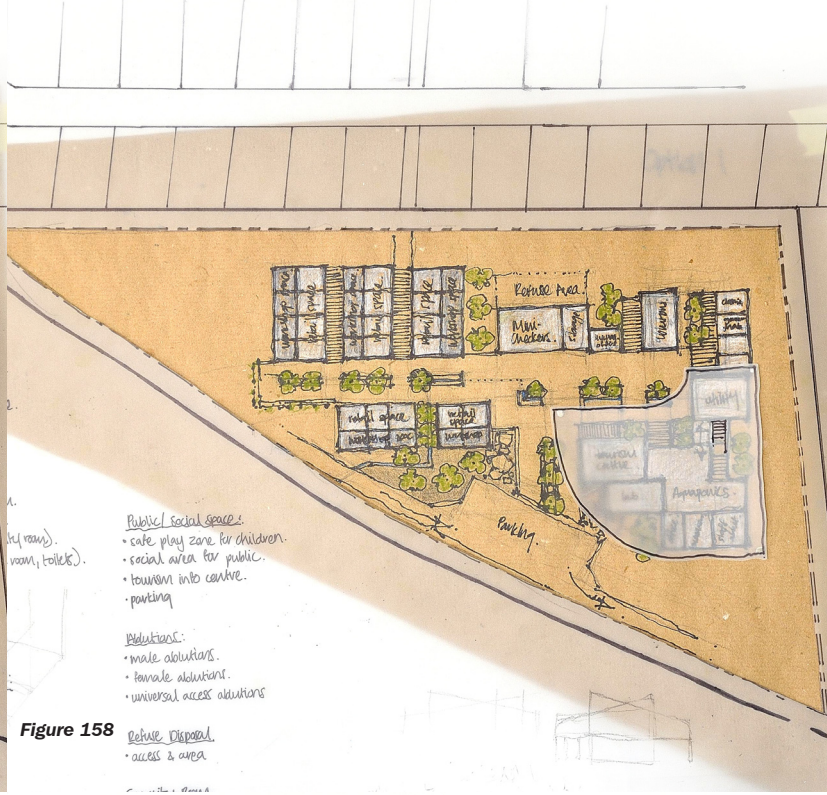


Figure 158

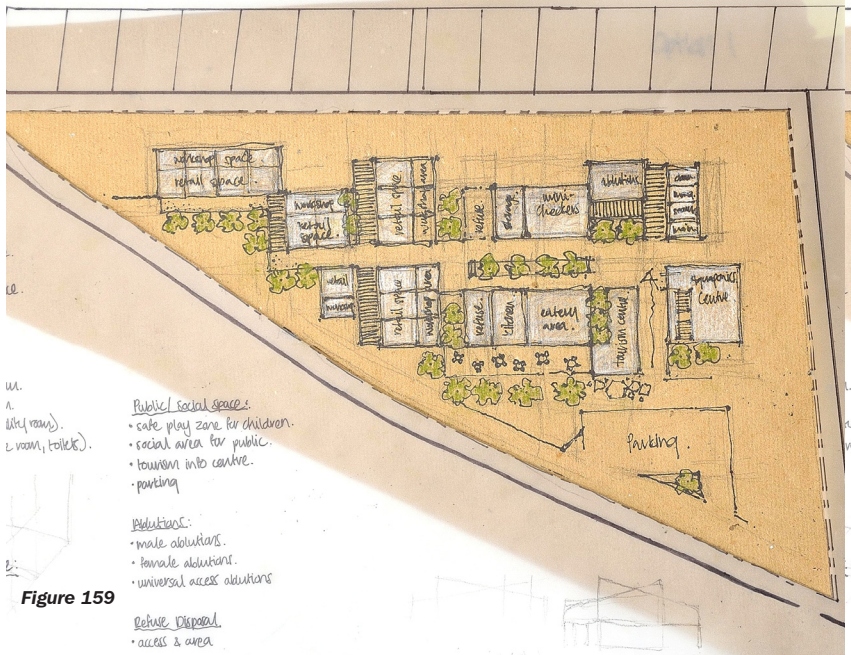


Figure 159

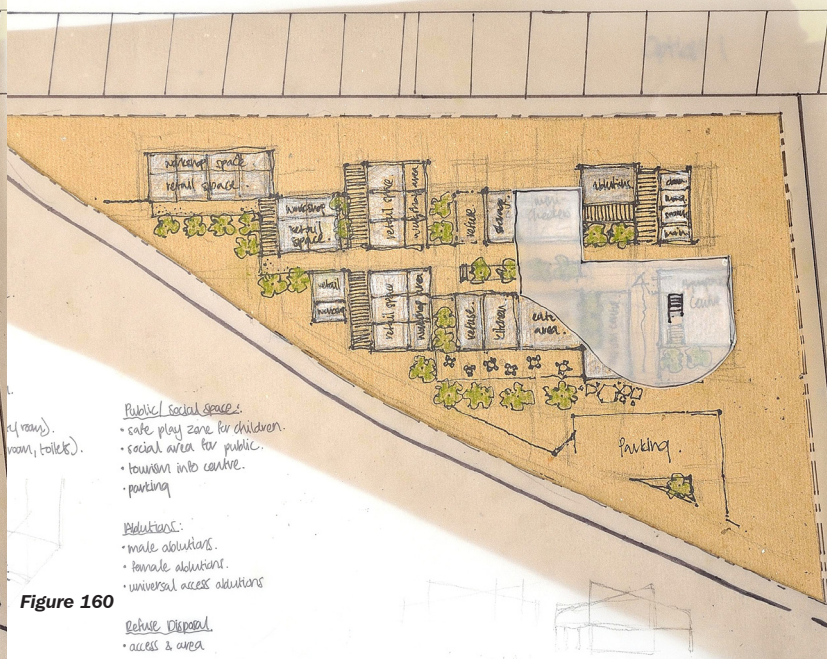


Figure 160

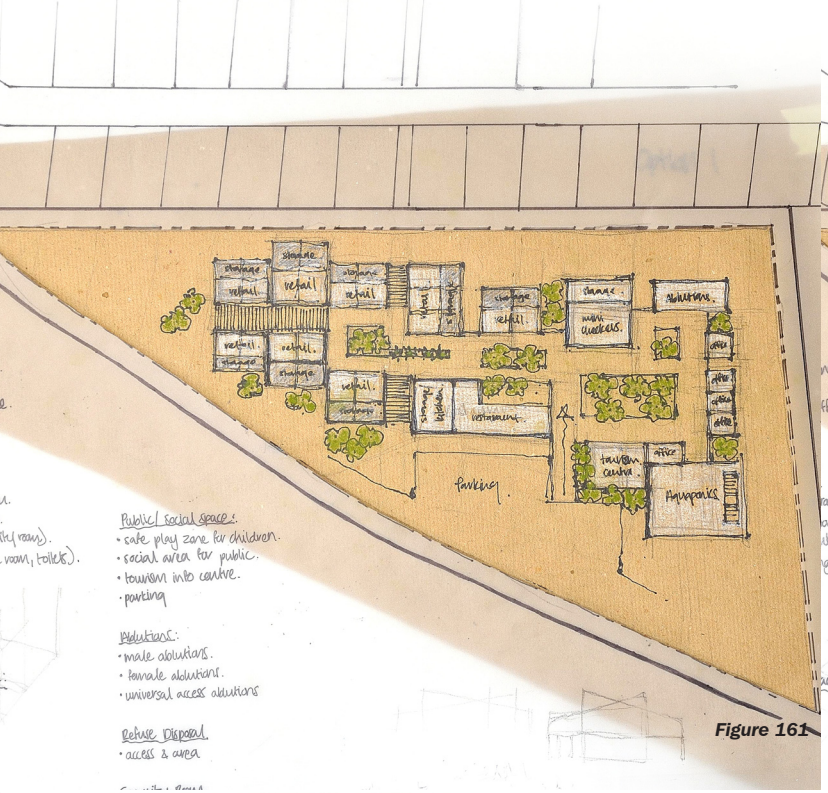


Figure 161

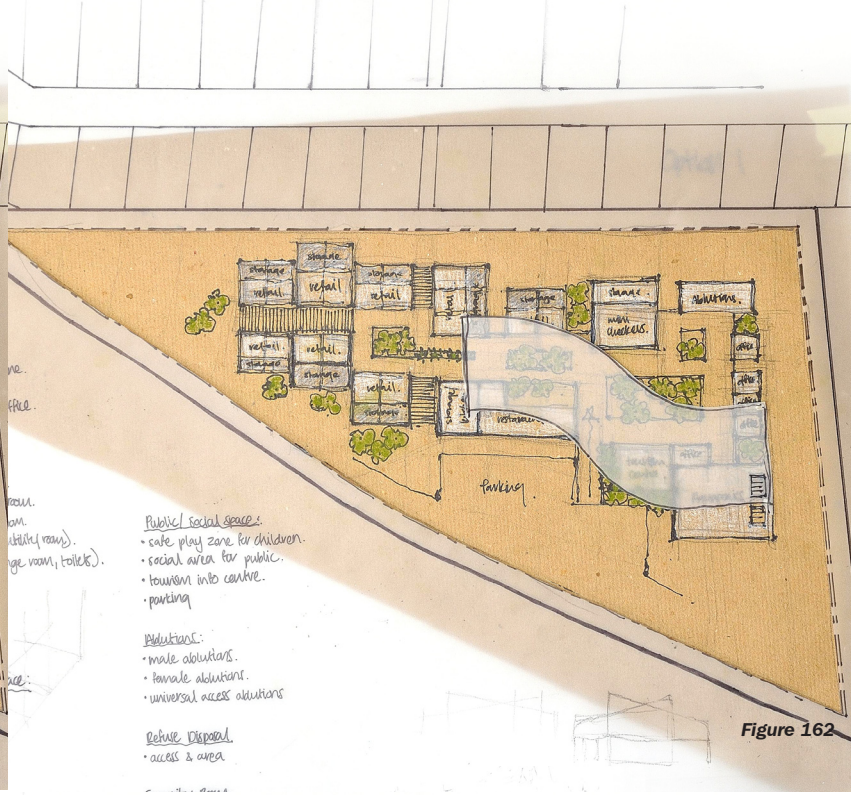


Figure 162

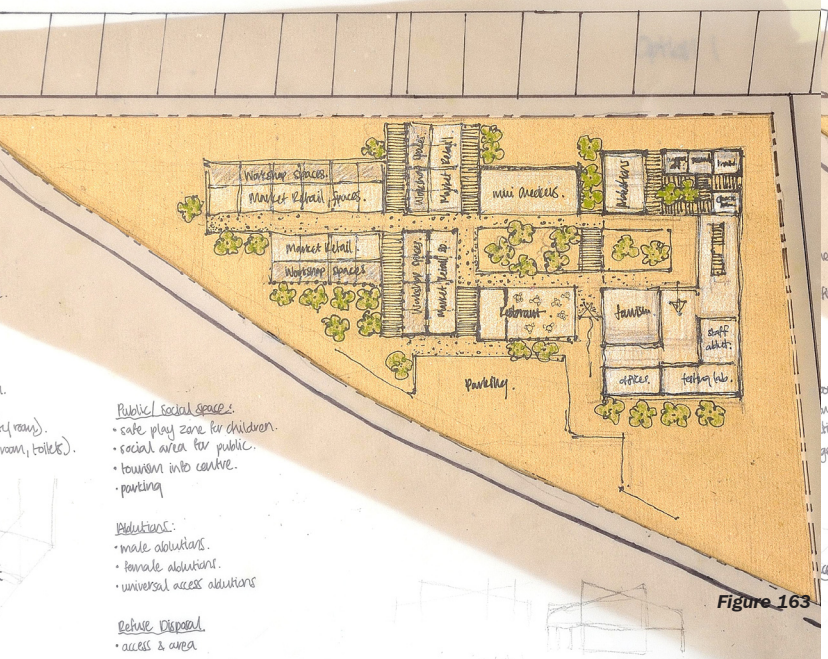


Figure 163

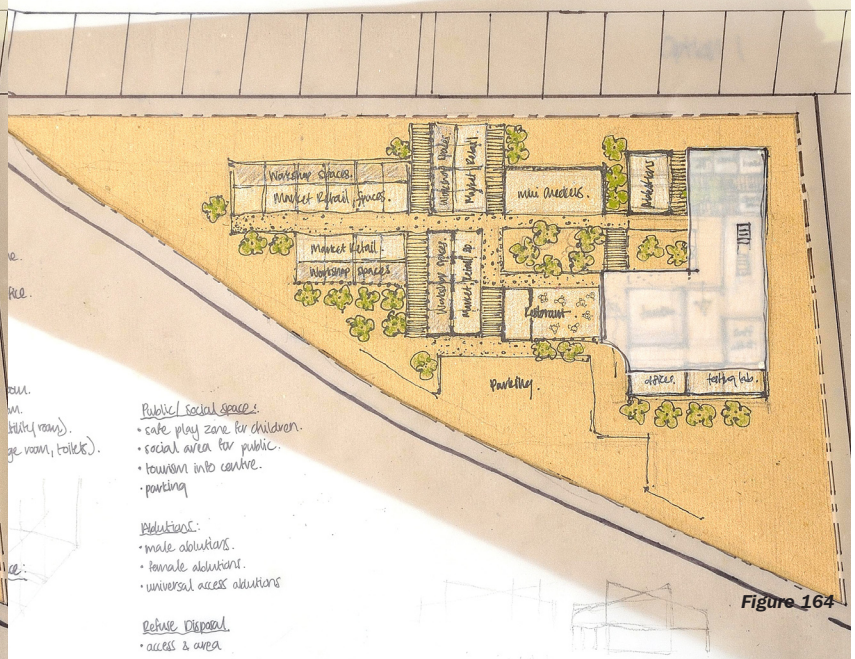


Figure 164

Figure 161: Fourth option for the development of the ground floor interior spatial layout (Author, 2020: own drawing).

Figure 162: Fourth option for the development of the first floor greenhouse structure (Author, 2020: own drawing).

Figure 163: Fifth option for the development of the ground floor interior spatial layout (Author, 2020: own drawing).

Figure 164: Fifth option for the development of the first floor greenhouse structure (Author, 2020: own drawing).

Figure 165: Sixth option for the development of the ground floor interior spatial layout (Author, 2020: own drawing).

Figure 166: Sixth option for the development of the first floor greenhouse structure (Author, 2020: own drawing).

The sixth option, *Figure 165* and *Figure 166* is selected as the final direction for the proposed design floor plans. These plans are further refined and developed.

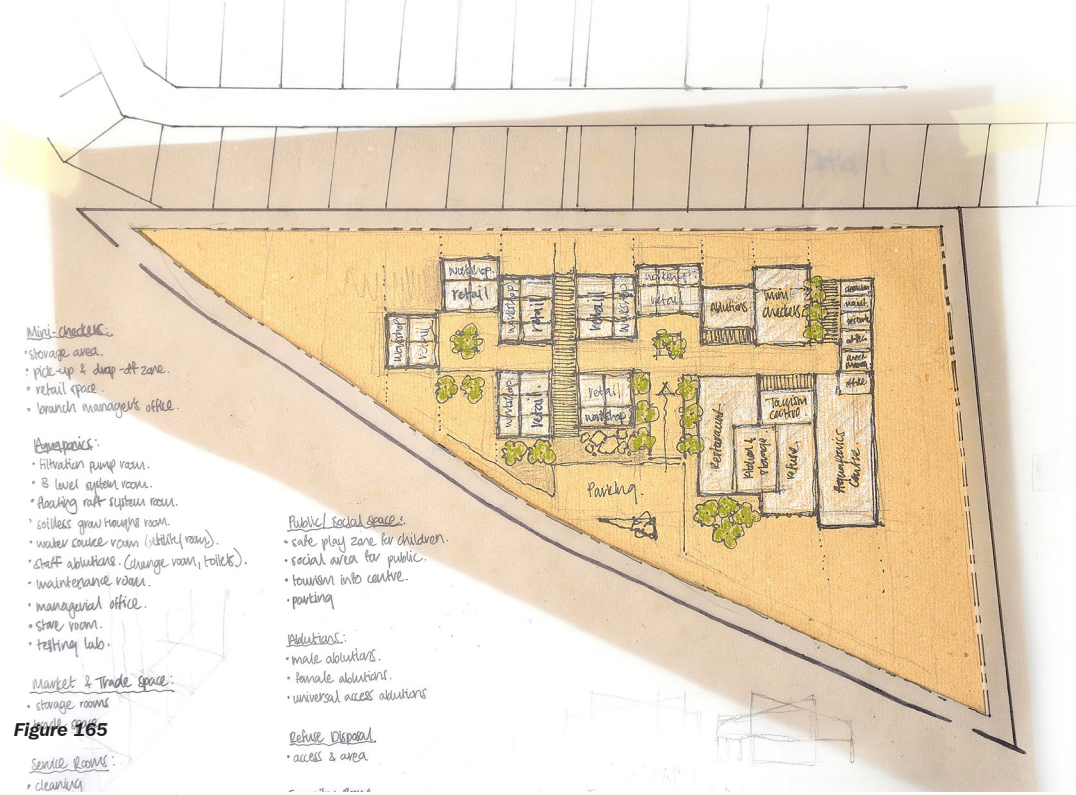


Figure 165

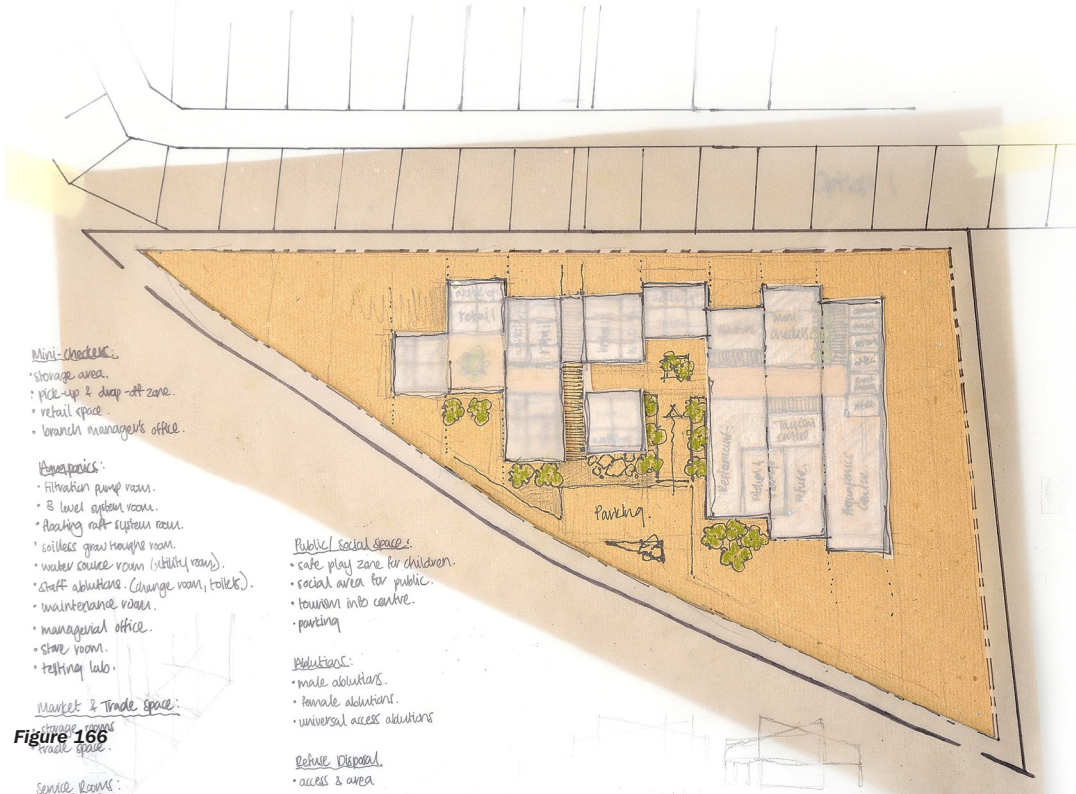


Figure 166

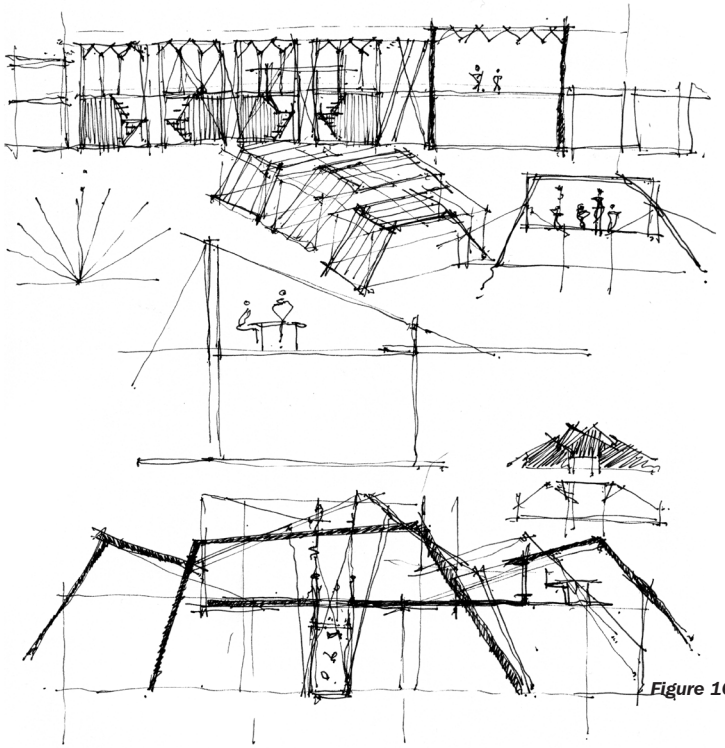


Figure 167

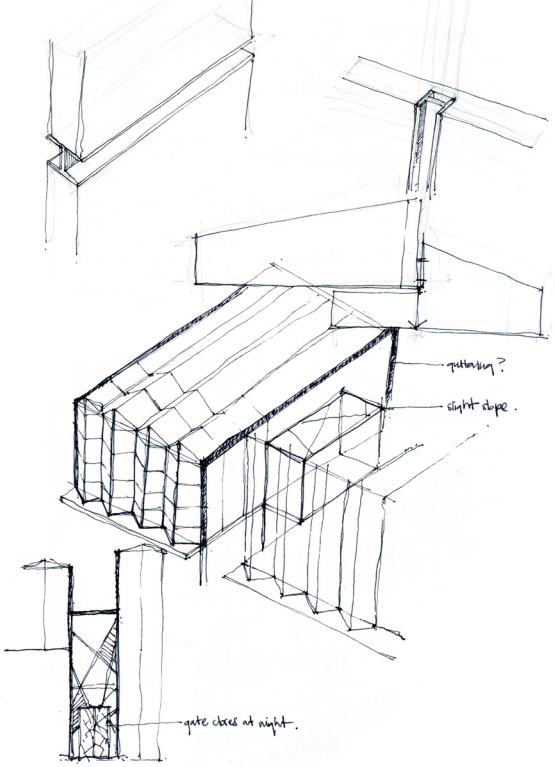


Figure 168

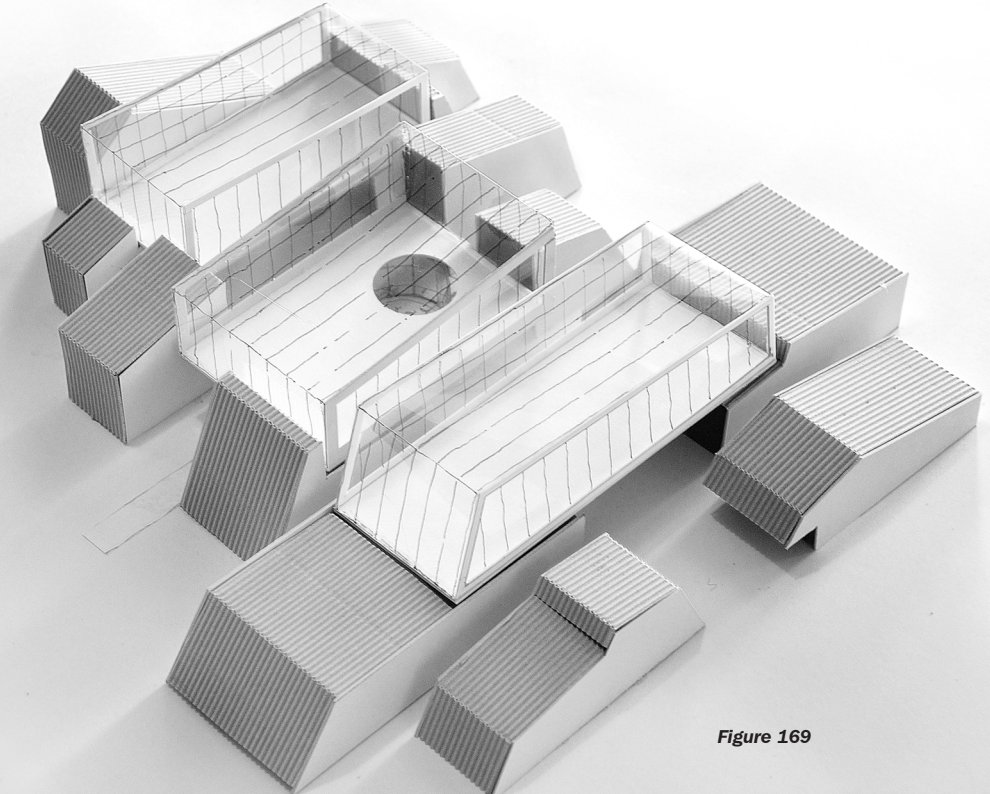


Figure 169

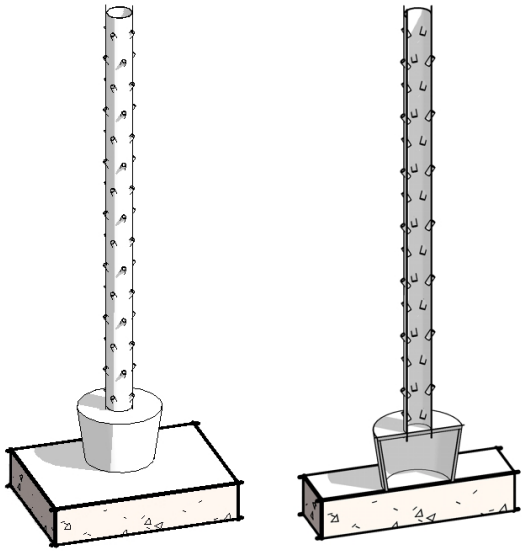


Figure 170

Figure 167: Resolving the morphology and spatial relationship between the greenhouses on first floor and the market spaces on ground level (Author, 2020: own sketches).

Figure 168: Resolving structural details for the greenhouse design (Author, 2020: own sketches).

Figure 169: Concept model of the final design approach (Author, 2020: own concept model).

Figure 170: Modelled PVC aquaponic growing tower, shown both full and in section (Author, 2020: own Revit model).

Figure 171: Sectional details illustrating how the PVC aquaponic growing tower system operates (Author, 2020: own sketches).

Figure 167 shows the sectional and morphological development of the design based on the chosen option in Figure 165 and 166, for the final layout resolutions.

Figure 168 illustrates the investigation of the greenhouse morphological and structural details and connections, achieving a rippled surface.

The final design approach concept model is depicted in *Figure 169*, indicating the chosen morphological approach.

Figure 170 and *Figure 171* show the investigation and construction of the aquaponic growing tower design on section.

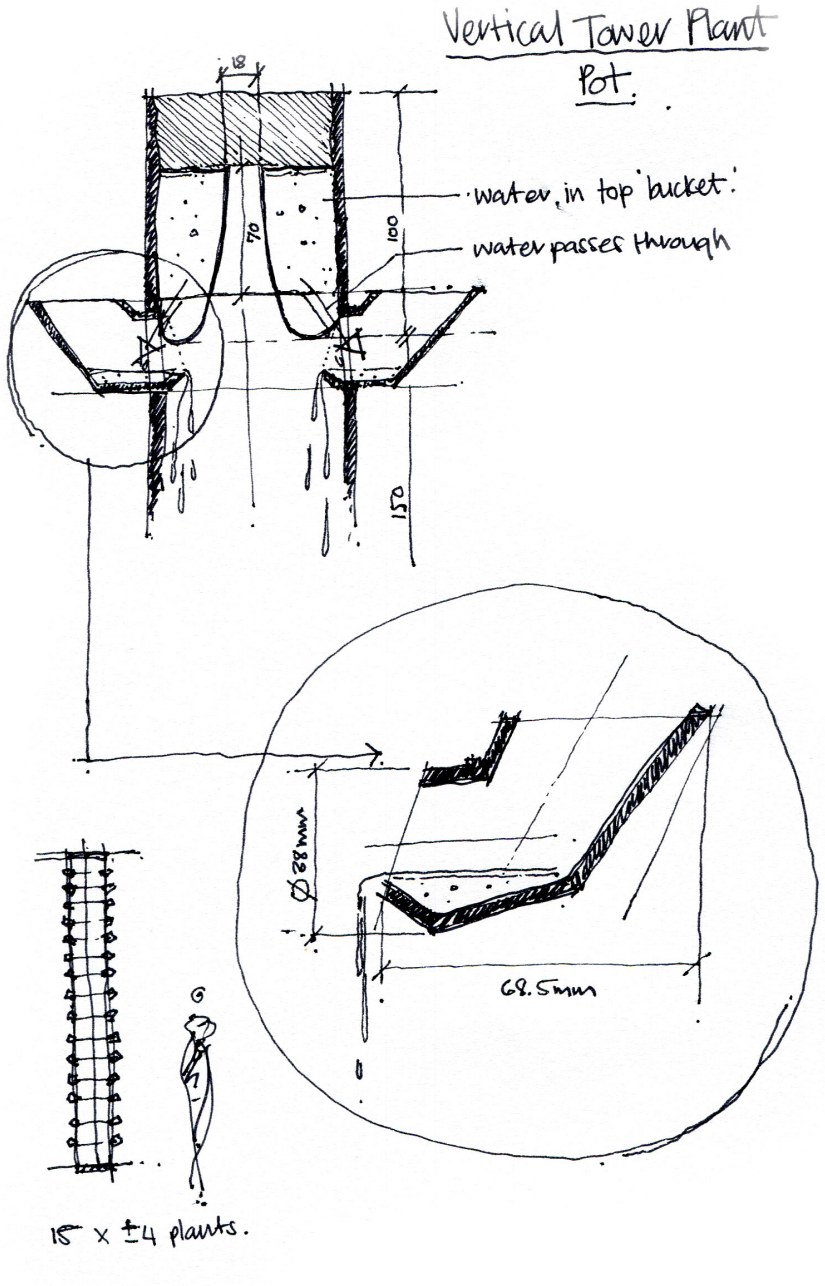
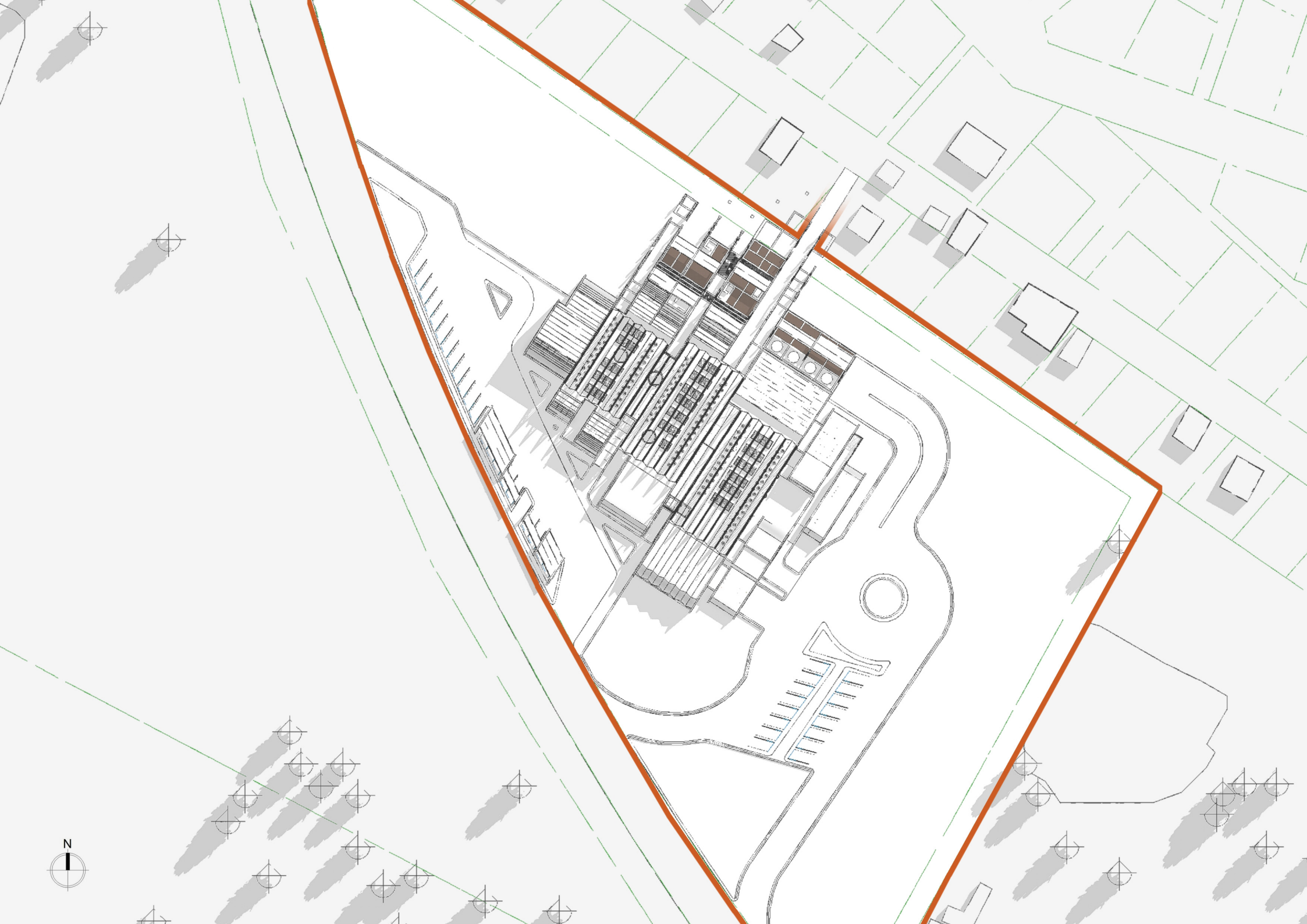


Figure 171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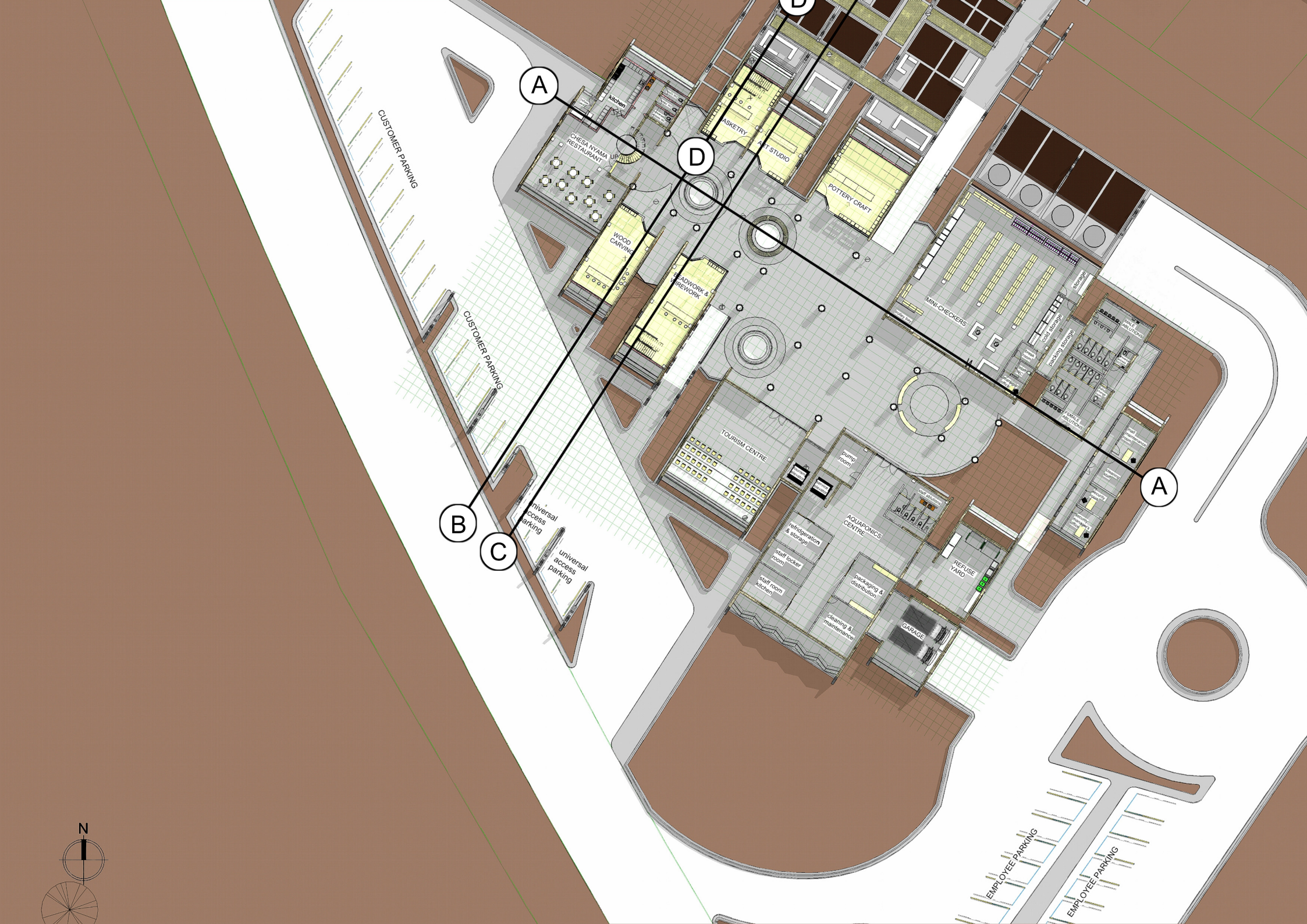
Final Design Resolutions

Site Plan



Figure 172: Site Plan (Author, 2020: own Revit model drawing).
Scale 1:1000

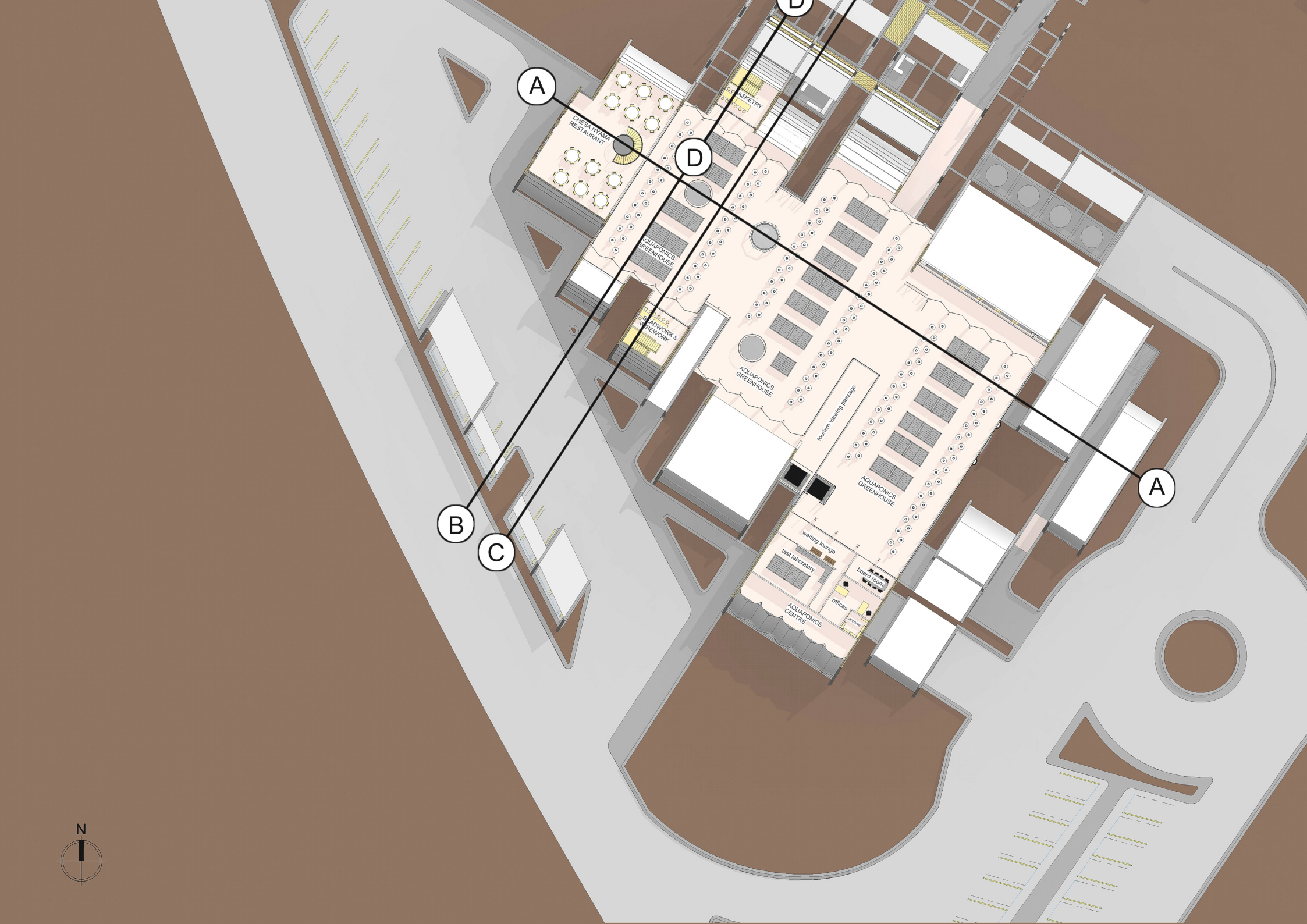

A
B
C
D
CUSTOMER PARKING
CUSTOMER PARKING
universal access parking
universal access parking
kitchen
CHESA NYAMA RESTAURANT
UP
ASKETRY
ART STUDIO
POTTERY CRAFT
WOOD CARVING
BEADWORK & FREEWORK
MINI-CHECKERS
storage
cold storage
packing storage
LADIES ABLUTIONS
GENTS ABLUTIONS
TOURISM CENTRE
pump room
AQUAPONICS CENTRE
refrigeration & storage
staff locker room
staff room kitchen
packaging & distribution
cleaning & maintenance
GARAGE
REFUSE YARD
EMPLOYEE PARKING
EMPLOYEE PARKING
N



Floor Plans

- ***Ground Floor***

Figure 173: Ground floor plan (Author, 2020: own Revit model drawing). Scale 1:500


A
B
C
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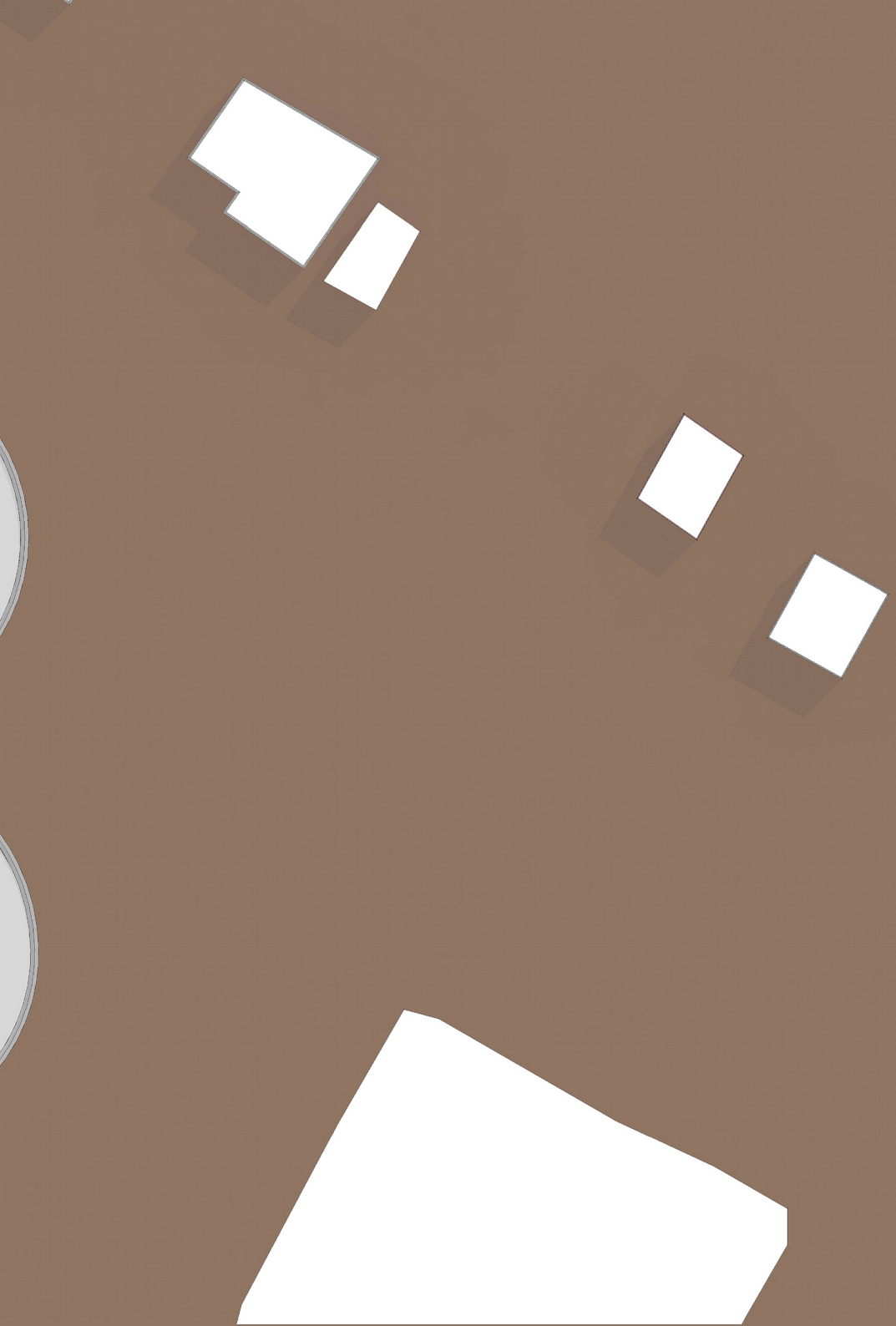
D
A
CHESA NYAMA RESTAURANT
BASKETRY
AQUAPONICS GREENHOUSE
BEADWORK & WIREWORK
AQUAPONICS GREENHOUSE
tourism viewing passage
AQUAPONICS GREENHOUSE
waiting lounge
test laboratory
board room
offices
archive
AQUAPONICS CENTRE
N



- ***First Floor***

Figure 174: First floor plan (Author, 2020: own Revit model drawing). Scale 1:500



Elevations

- ***North-Western Elevation***

Figure 175: North-Western elevation of the proposed aquaponics micro-mall in Cathcart (Author, 2020: own Twinmotion rendering).
Not to scale



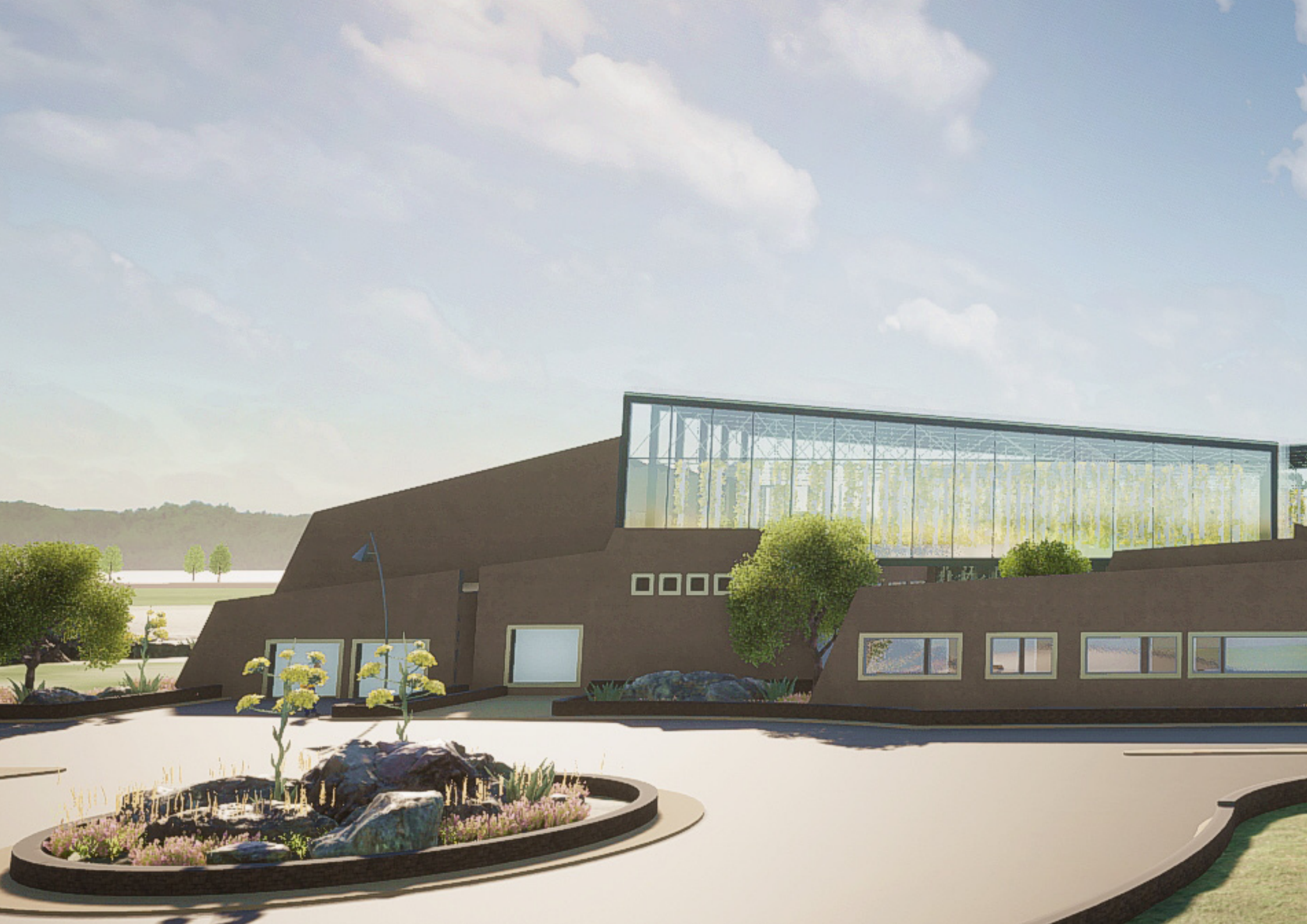
Figure 175





- ***North-Eastern Elevation***

Figure 176: North-Eastern elevation of the proposed aquaponics micro-mall in Cathcart (Author, 2020: own Twinmotion rendering).
Not to scale





- ***South-Eastern Elevation***

Figure 177: South-Eastern elevation of the proposed aquaponics micro-mall in Cathcart (Author, 2020: own Twinmotion rendering).
Not to scale

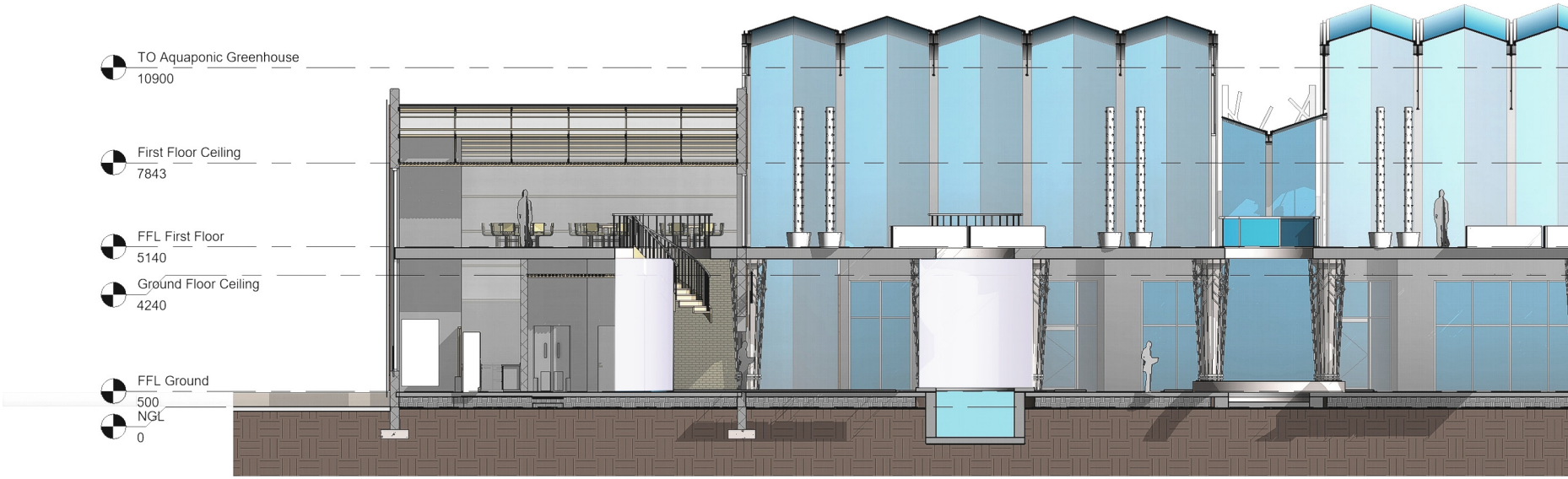




- ***South-Western Elevation***

Figure 178: South-Western elevation of the proposed aquaponics micro-mall in Cathcart (Author, 2020: own Twinmotion rendering).
Not to scale

Figure 178


TO Aquaponic Greenhouse
10900
First Floor Ceiling
7843
FFL First Floor
5140
Ground Floor Ceiling
4240
FFL Ground
500
NGL
0

Sections

- ***Longitudinal Section A-A***

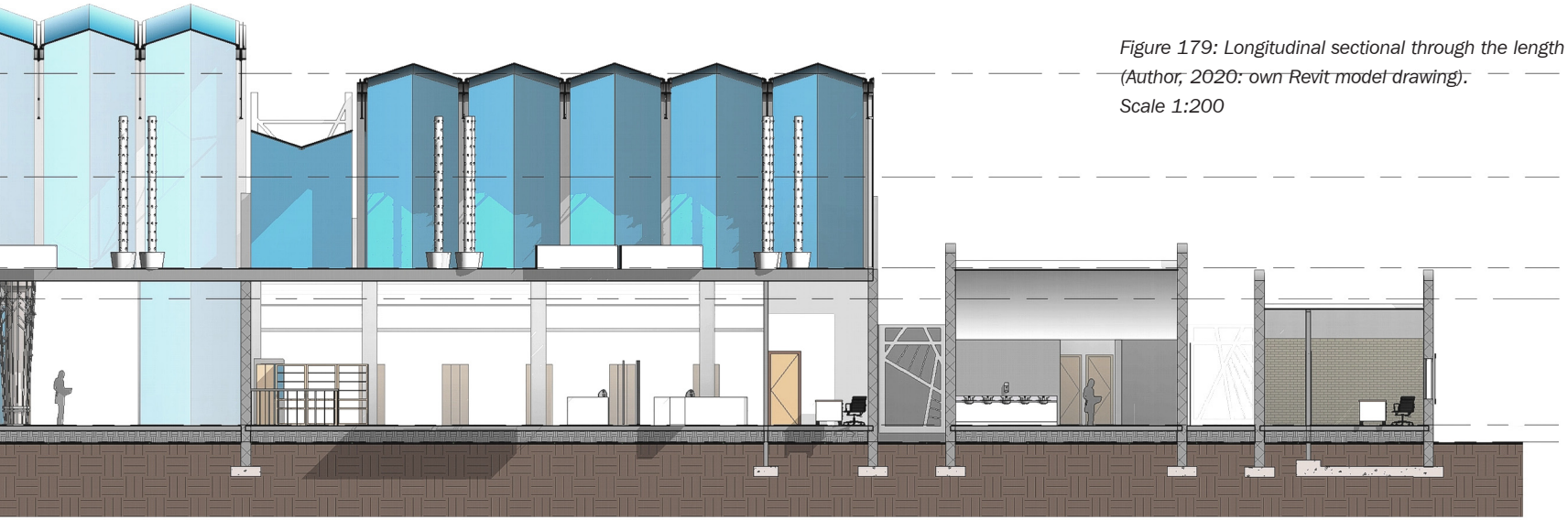
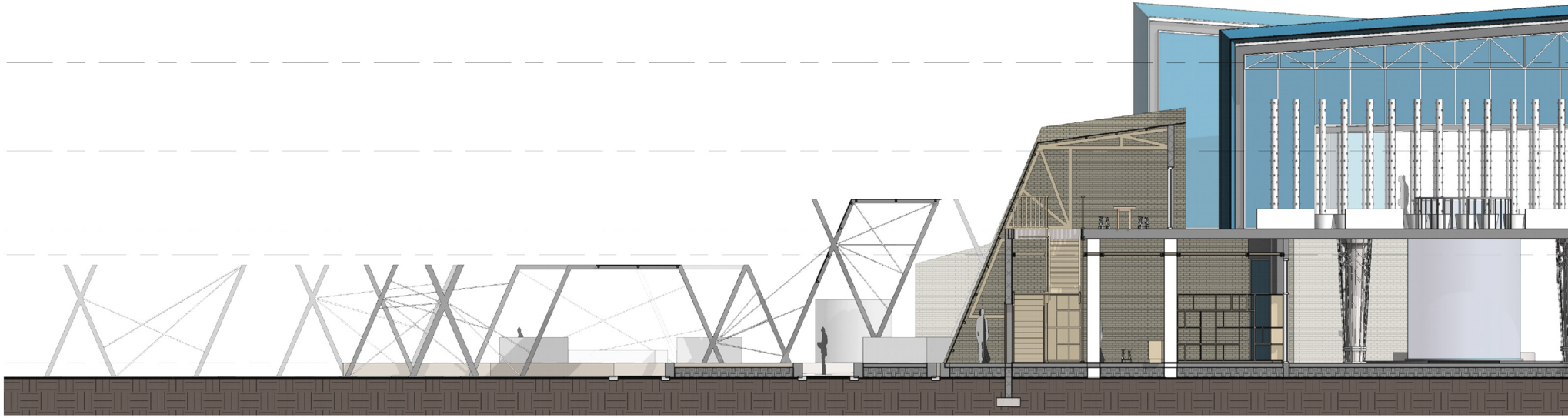


Figure 179: Longitudinal sectional through the length of the proposed aquaponics micro-mall (Author, 2020: own Revit model drawing).
Scale 1:200



- ***Cross Section B-B***

Figure 180: Cross section through the Basketry market unit, the aquaponic greenhouses, and the Wood Carving market unit (Author, 2020: own Revit model drawing). Scale 1:200

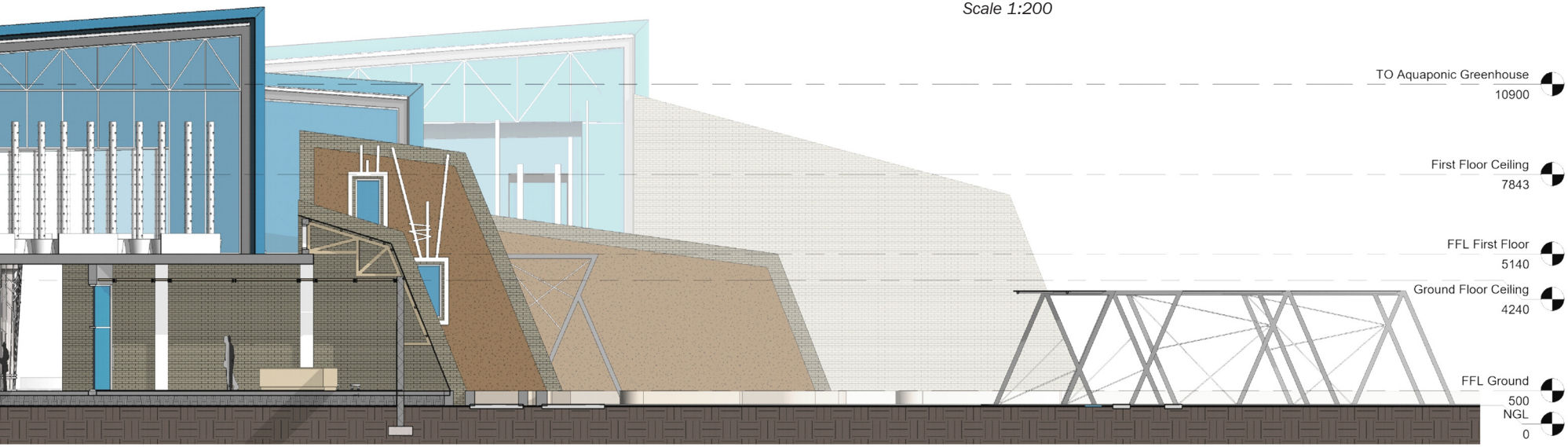
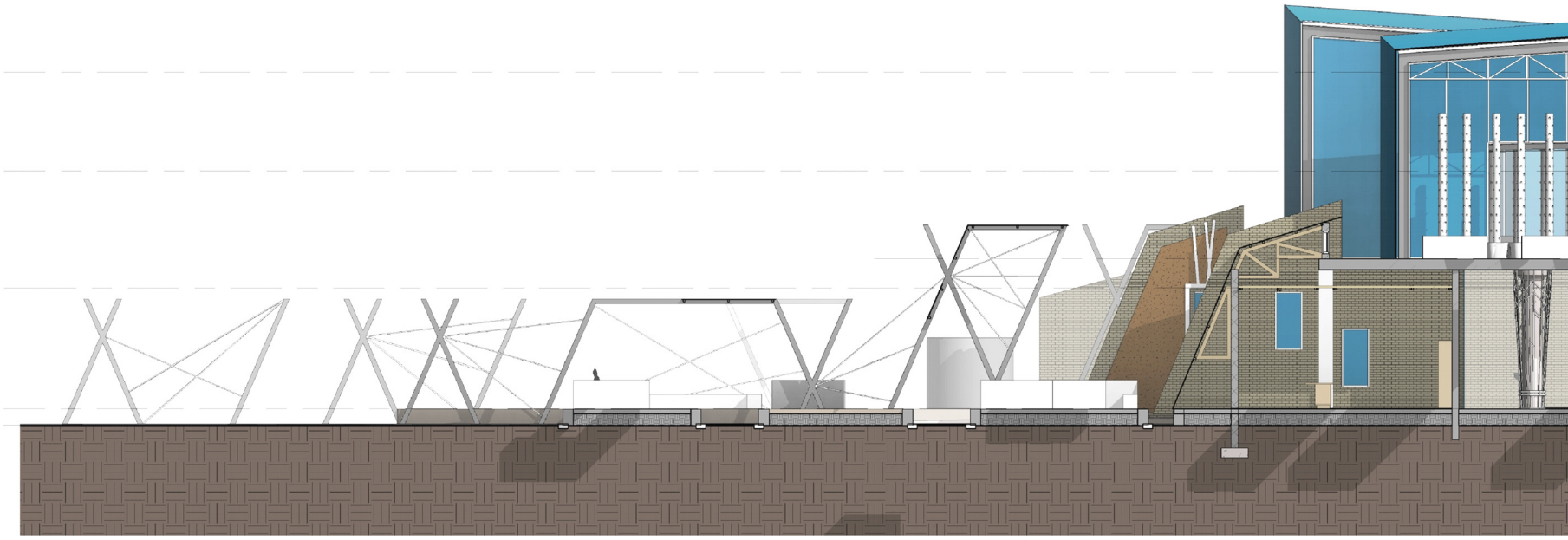


Figure 180



- ***Cross Section C-C***

Figure 181: Cross section through the Art Studio market unit, the aquaponic greenhouses, and the Beadwork & Wirework market unit (Author, 2020: own Revit model drawing). Scale 1:200

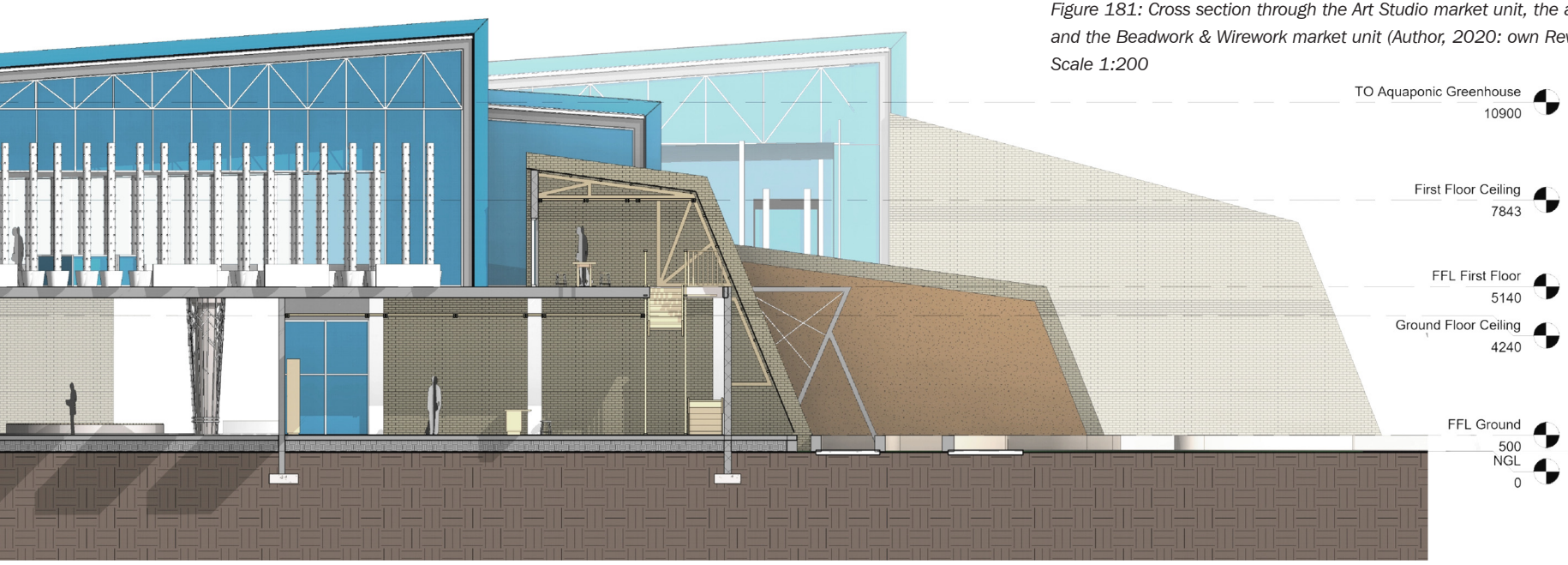
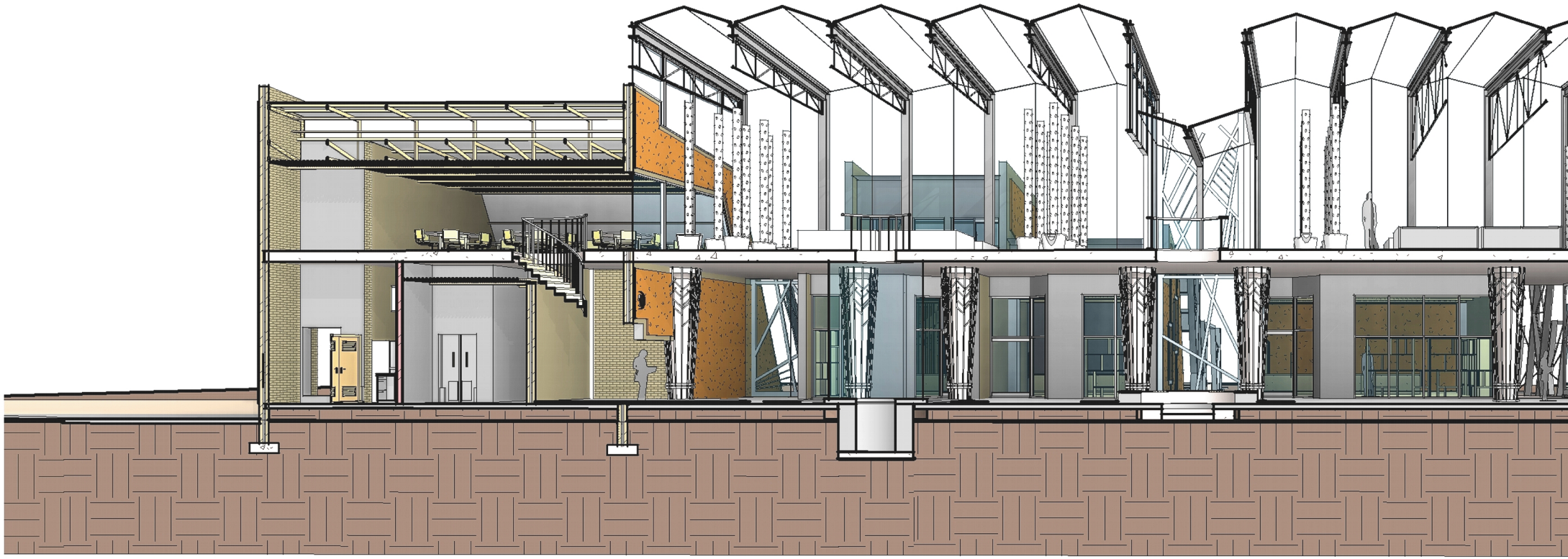


Figure 181



Sectional Perspectives and Buildability

- ***Longitudinal Section A-A***

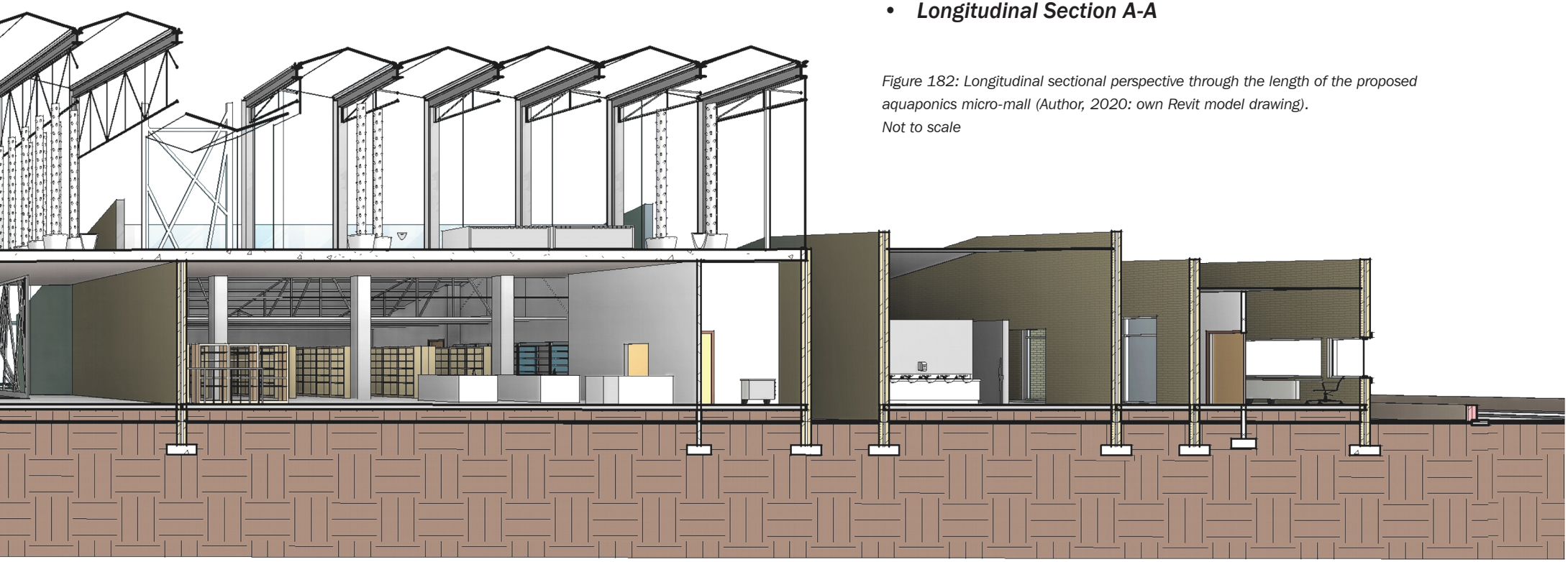
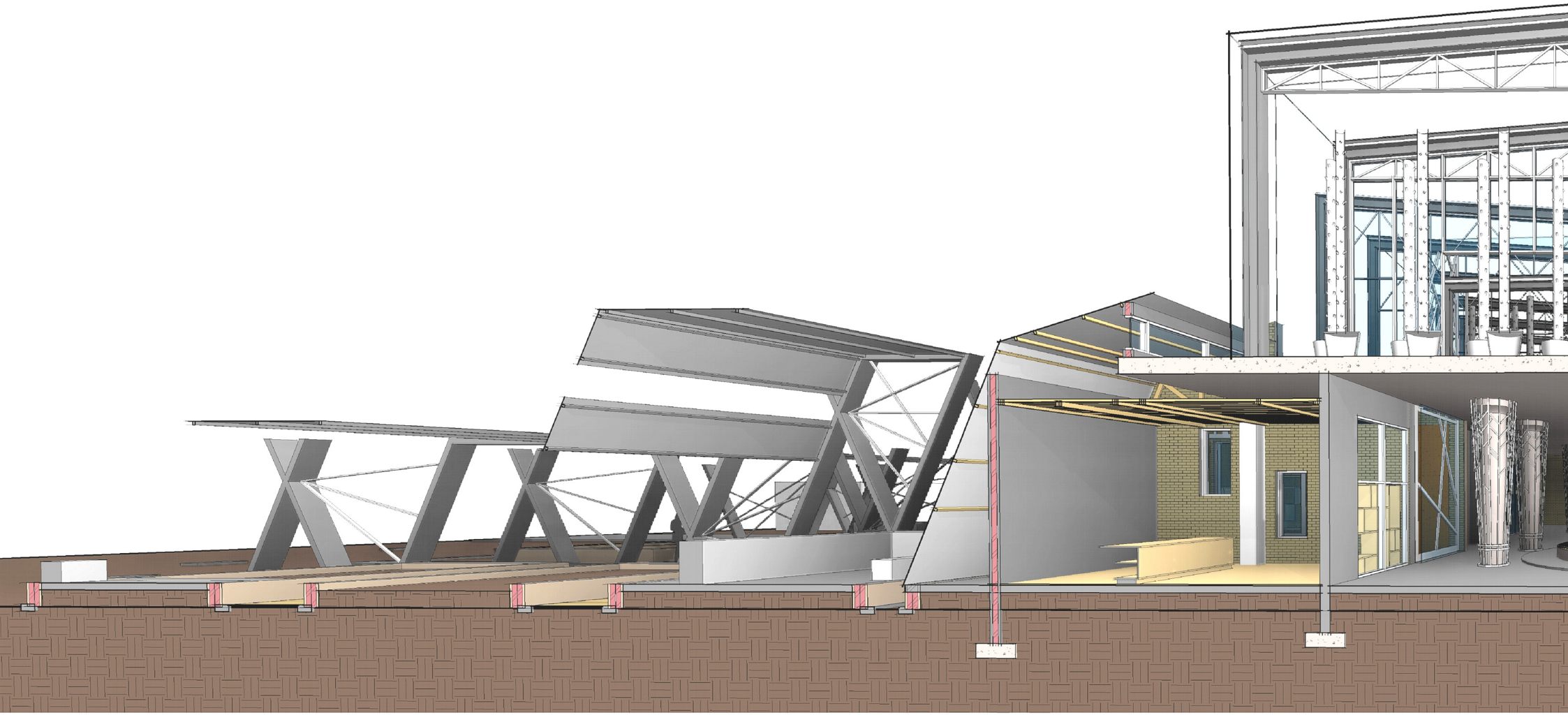


Figure 182: Longitudinal sectional perspective through the length of the proposed aquaponics micro-mall (Author, 2020: own Revit model drawing).
Not to scale



- ***Cross Section C-C***

Figure 183: Cross section perspective through the Art Studio market unit, the aquaponic greenhouses, and the Beadwork & Wirework market unit (Author, 2020: own Revit model drawing).
Not to scale

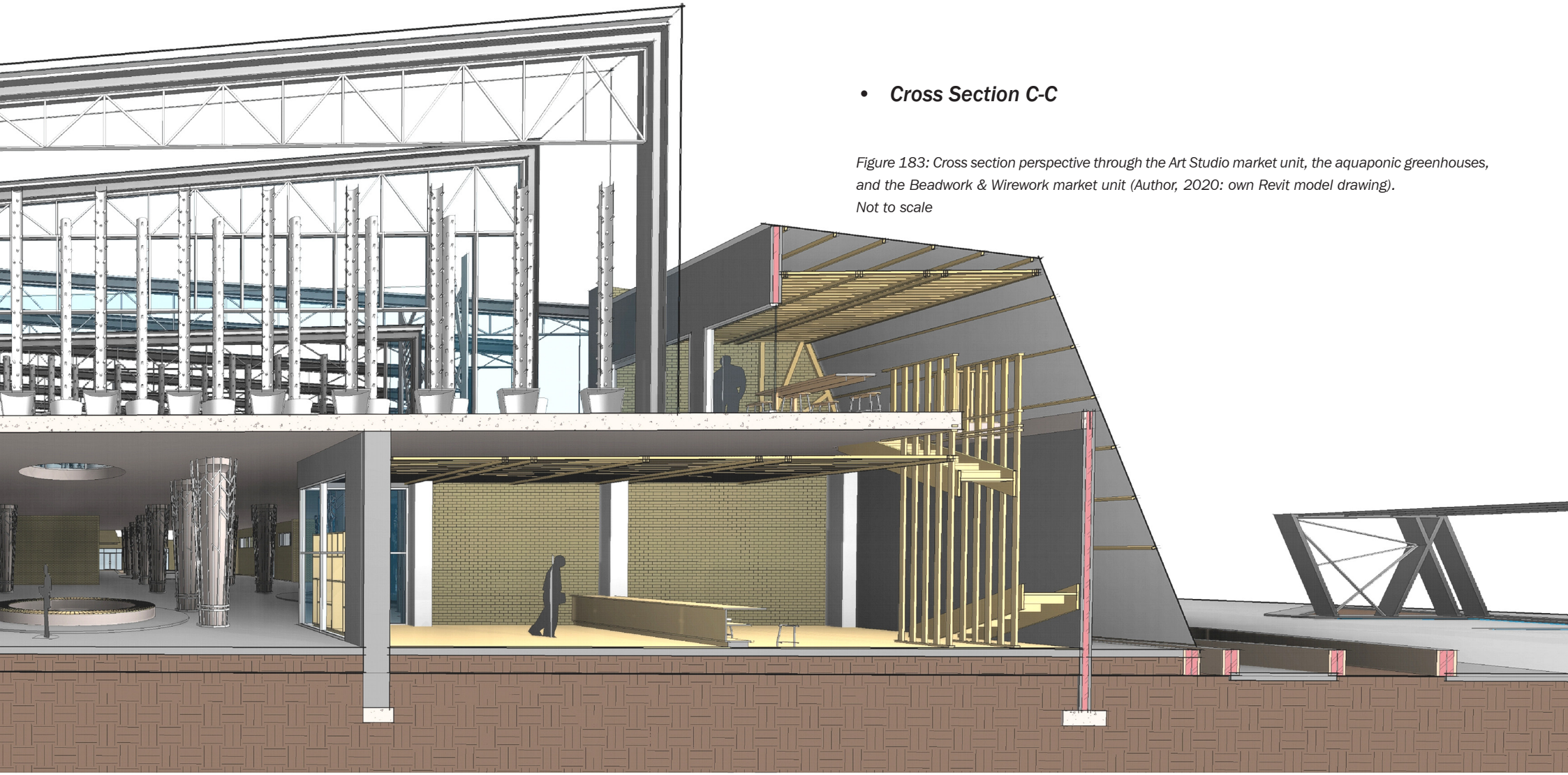
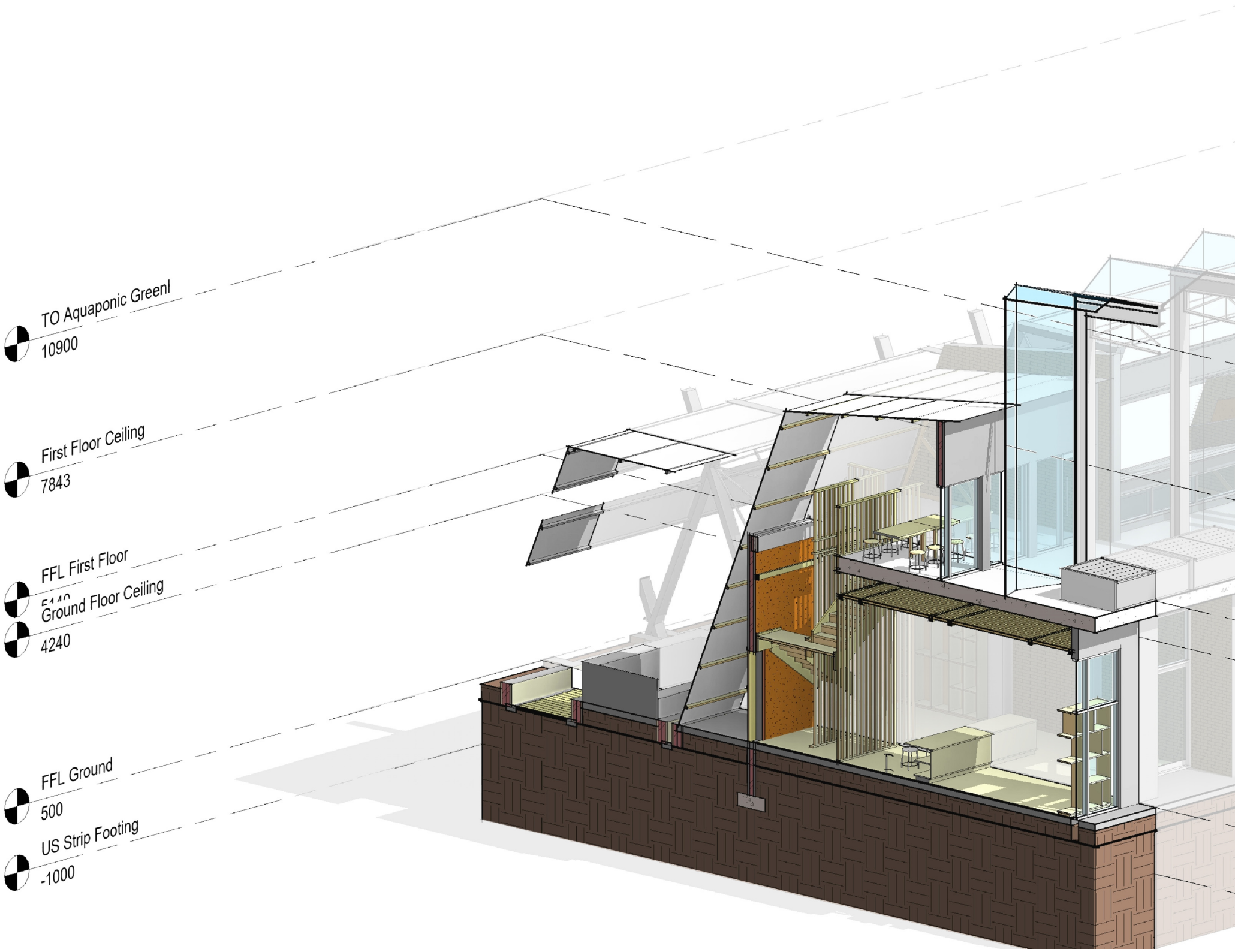
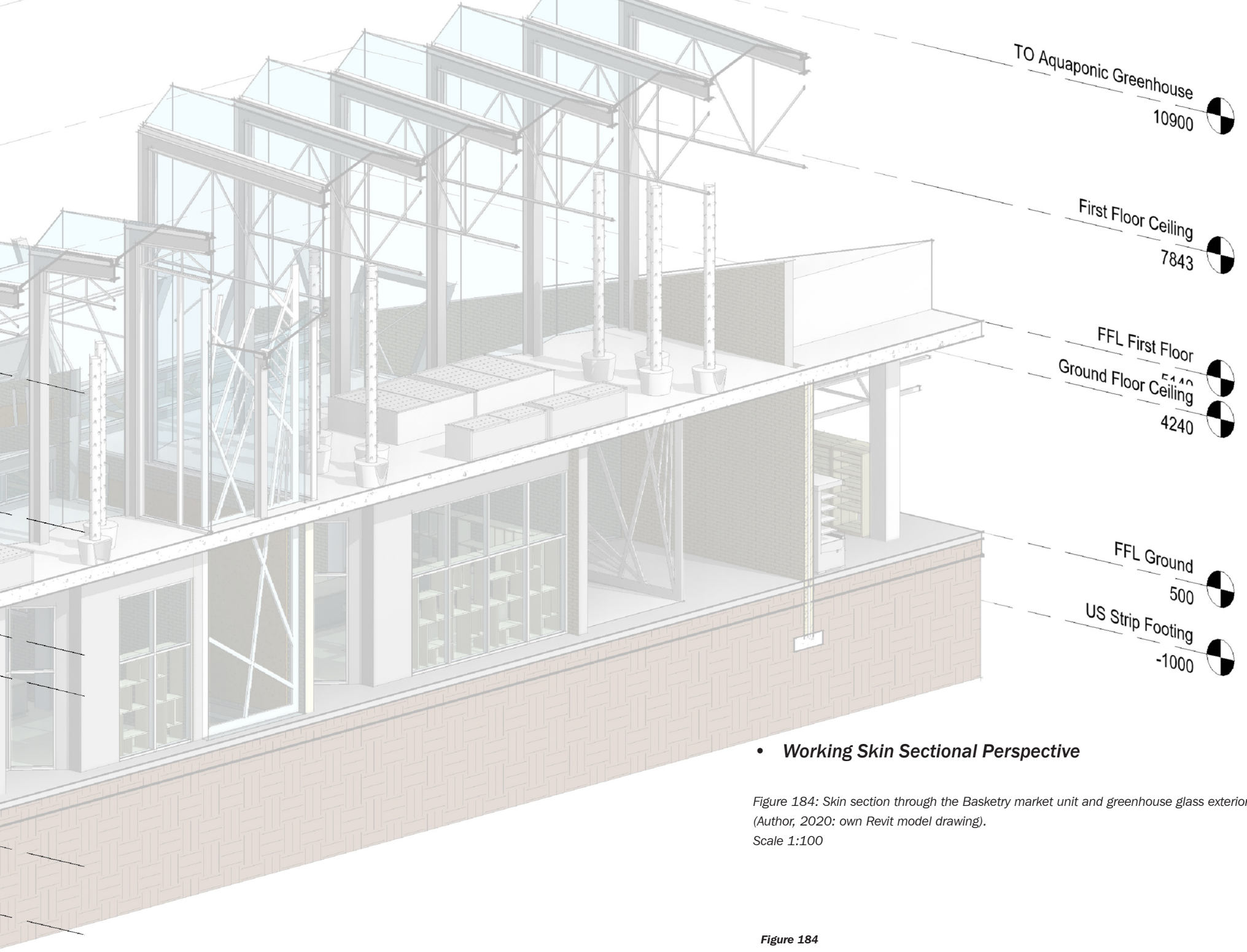


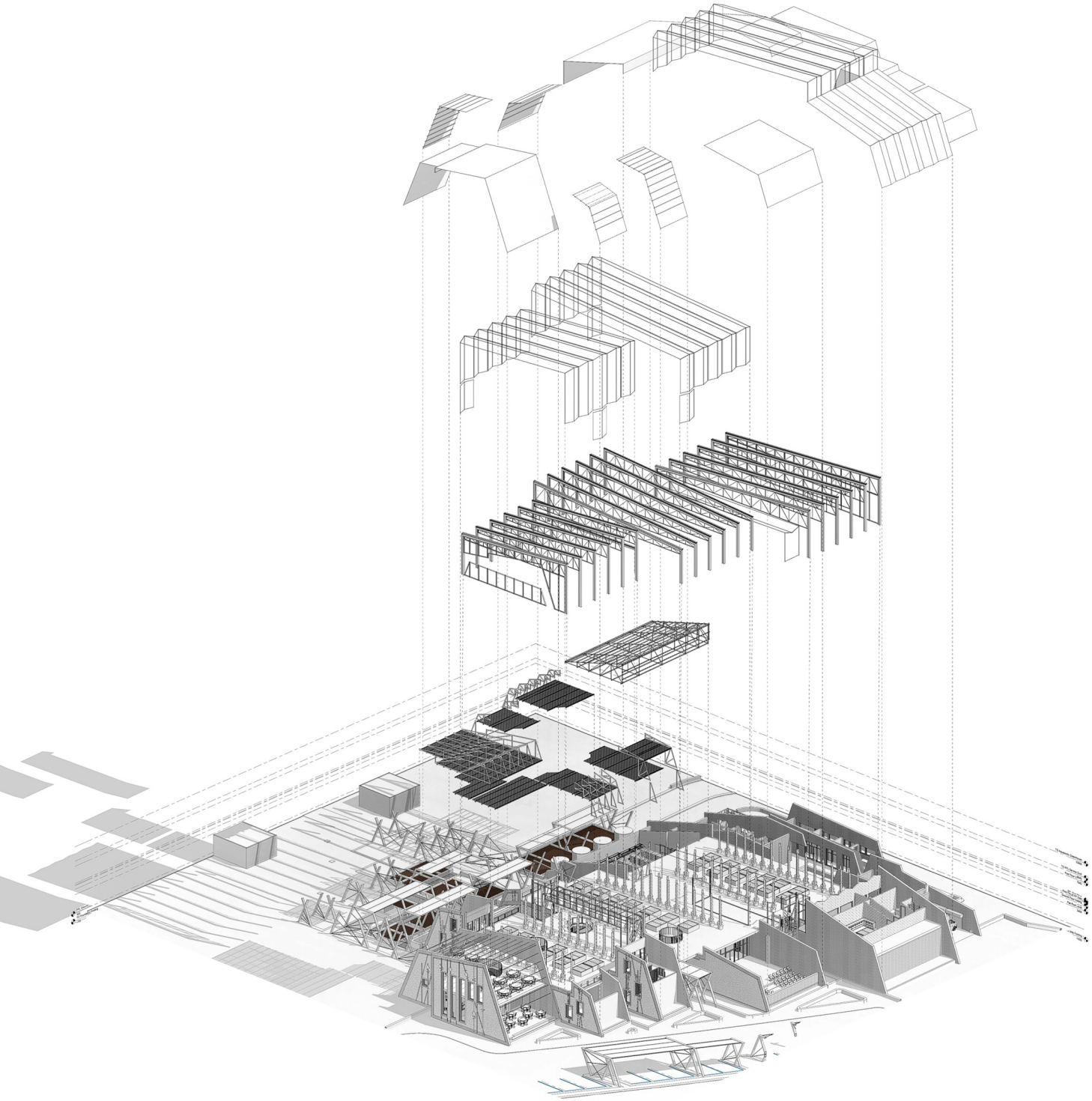
Figure 183


TO Aquaponic Greenl
10900
First Floor Ceiling
7843
FFL First Floor
Ground Floor Ceiling
4240
FFL Ground
500
US Strip Footing
-1000



- ***Working Skin Sectional Perspective***

Figure 184: Skin section through the Basketry market unit and greenhouse glass exterior (Author, 2020: own Revit model drawing).
Scale 1:100



- ***Exploded View***

Figure 185: Exploded view of the proposed aquaponics micro-mall (Author, 2020: own Revit model drawing).
Not to scale

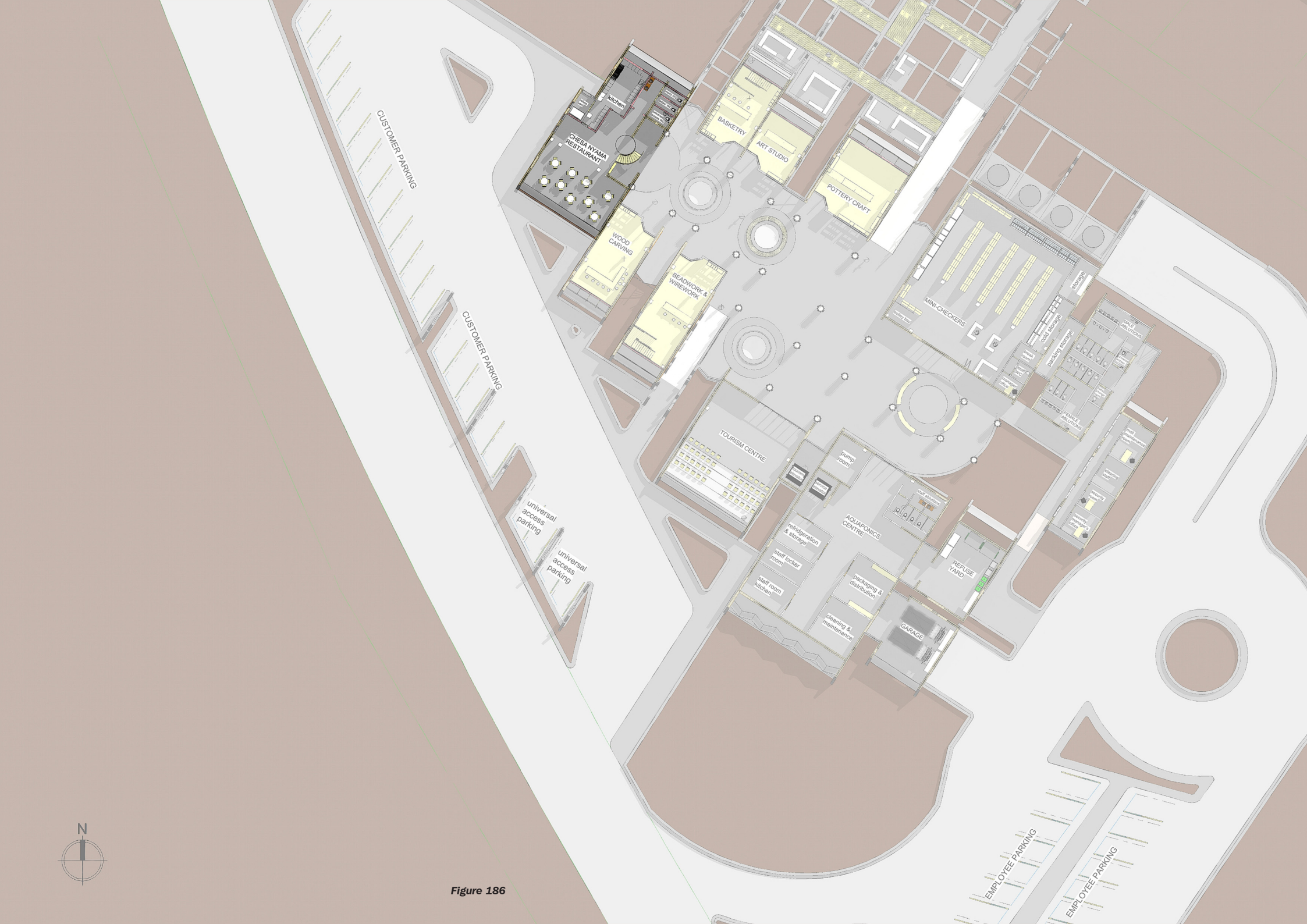
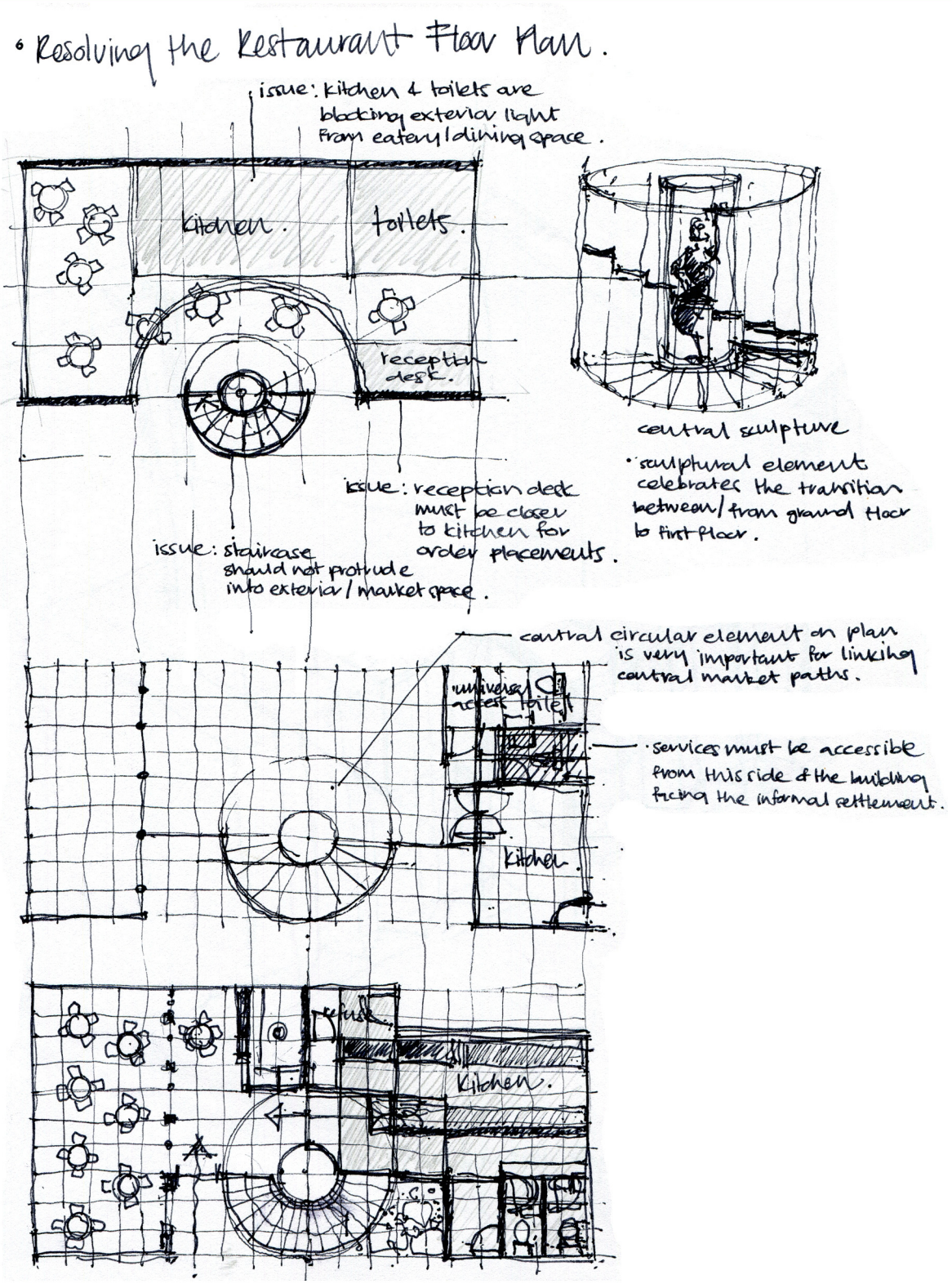

CUSTOMER PARKING
CUSTOMER PARKING
universal access parking
universal access parking
CHESA NYAMA RESTAURANT
kitchen
BASKETRY
ART STUDIO
POTTERY CRAFT
WOOD CARVING
BEADWORK & WIREWORK
MINI-CHECKERS
storage
cold storage
packing storage
FEMALE ABLUTIONS
MALE ABLUTIONS
TOURISM CENTRE
pump room
AQUAPONICS CENTRE
refrigeration & storage
staff locker room
staff room kitchen
packaging & distribution
cleaning & maintenance
REFUSE YARD
GARAGE
EMPLOYEE PARKING
EMPLOYEE PARKING
N

Figure 186



Chesa Nyama Restaurant

Figure 186: Main Floor Plan 1:500 (Author, 2020: own Revit model drawing).

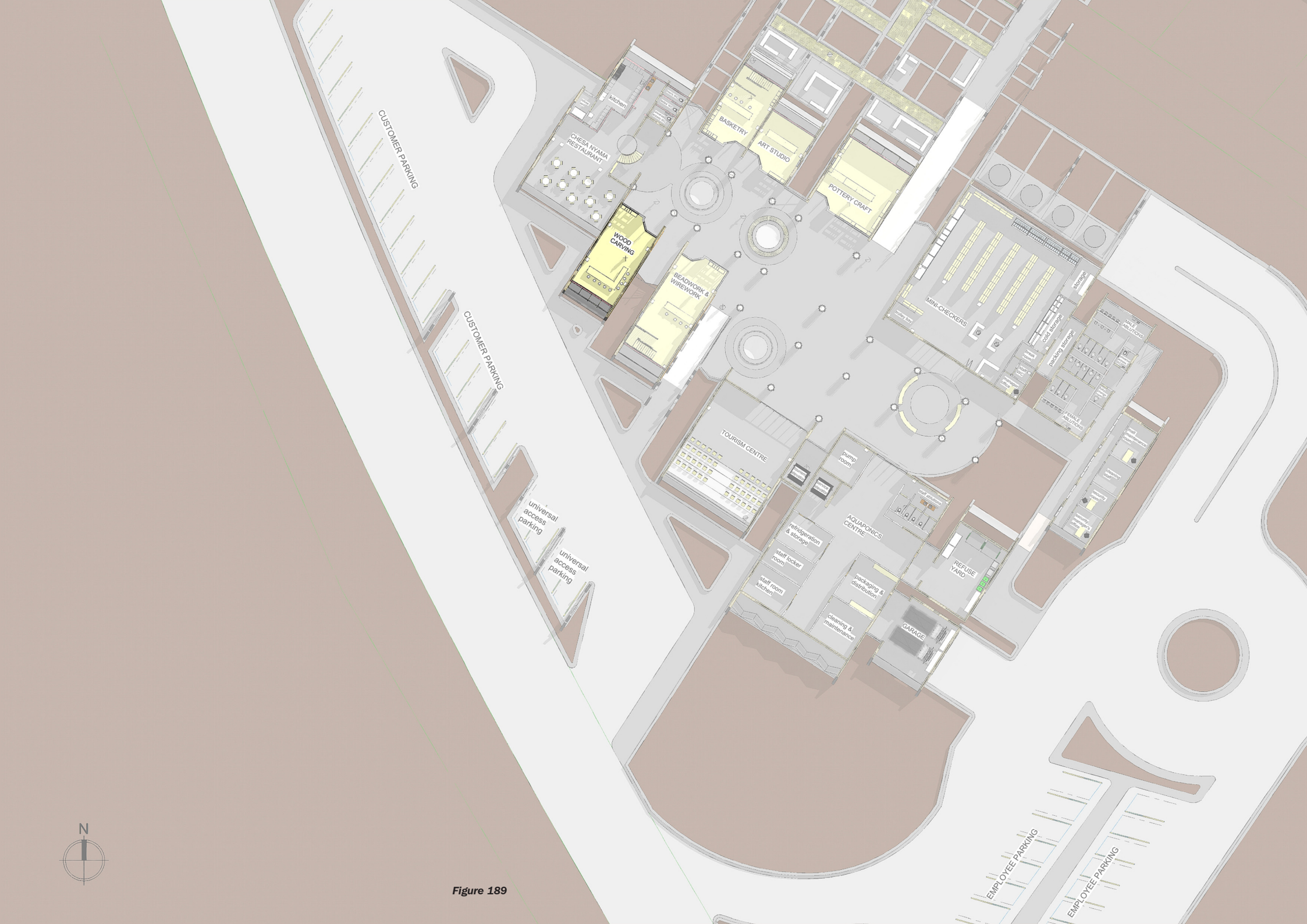
Figure 187: Restaurant ground floor planning 1:200 (Author, 2020: own sketches).





Chesa Nyama Restaurant

Figure 188: Restaurant first floor interior – looking out into the aquaponic greenhouse jungle and creating a calm, healthy and rejuvenating green atmosphere of growth for customers as they enjoy their meal (Author, 2020: own Revit model


CUSTOMER PARKING
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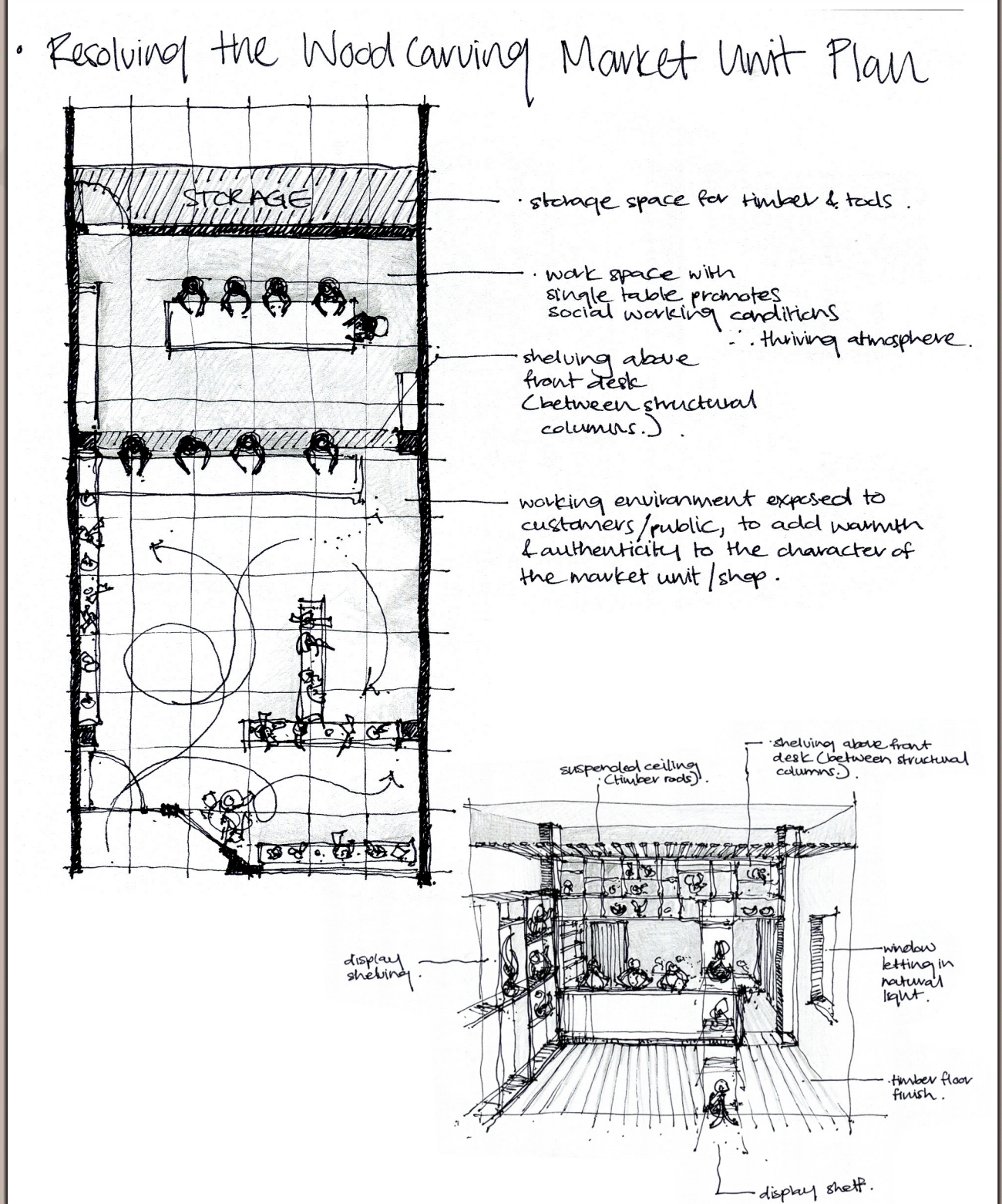
universal access parking
universal access parking
kitchen
CHESA NYAMA RESTAURANT
BASKETRY
ART STUDIO
POTTERY CRAFT
WOOD CARVING
BEADWORK & WIREWORK
MINI-CHECKERS
storage
cold storage
packing storage
MALE ABLUTIONS
FEMALE ABLUTIONS
TOURISM CENTRE
pump room
AQUAPONICS CENTRE
refrigeration & storage
staff locker room
staff room kitchen
packaging & distribution
cleaning & maintenance
GARAGE
REFUSE YARD
EMPLOYEE PARKING
EMPLOYEE PARKING
N

Figure 189



The Market Space

- ***Wood Carving***

Figure 189: main floor plan 1:500 (Author, 2020: own Revit model drawing).

Figure 190: market unit ground floor plan and interior sketch 1:100 (Author, 2020: own sketches).

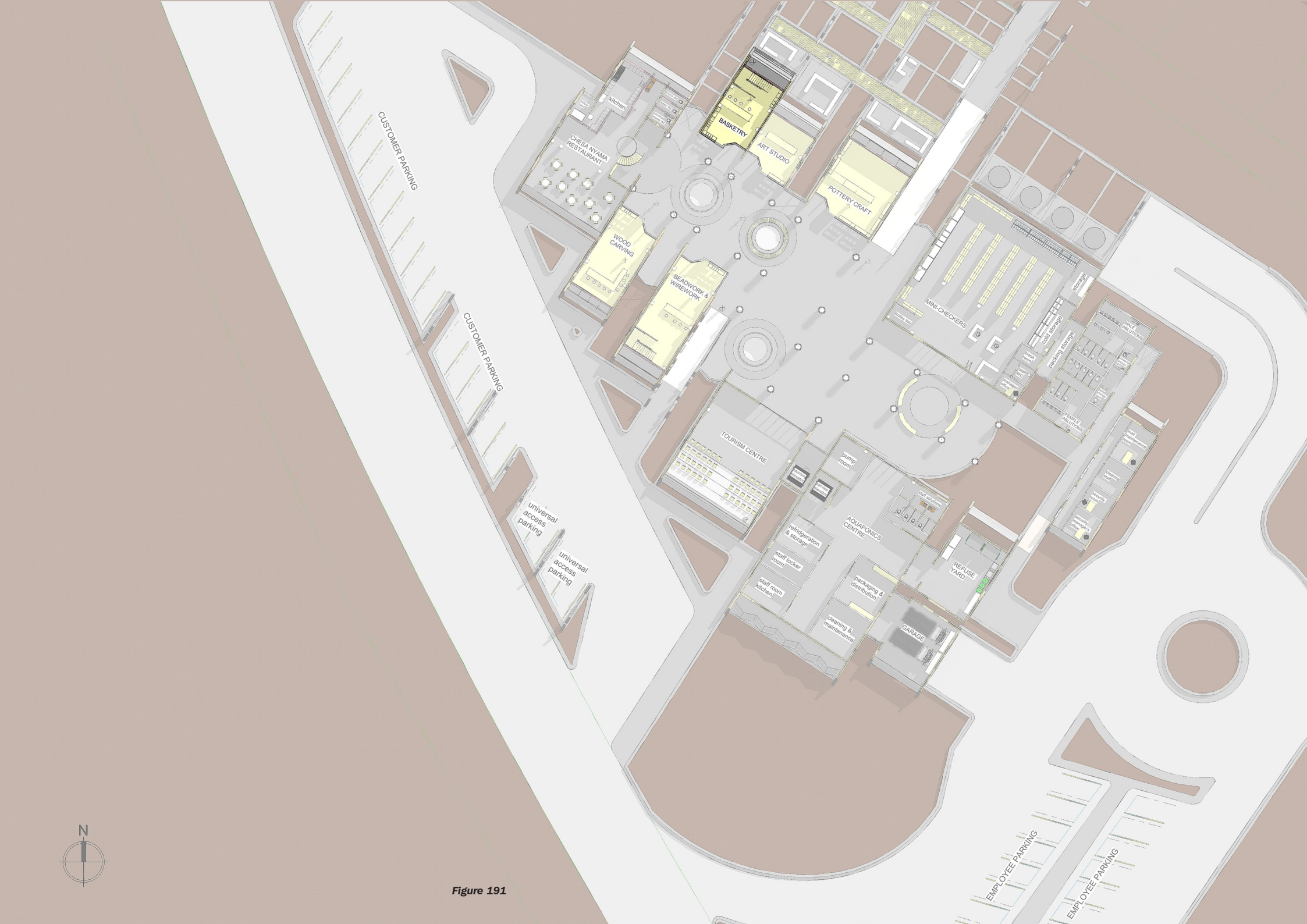
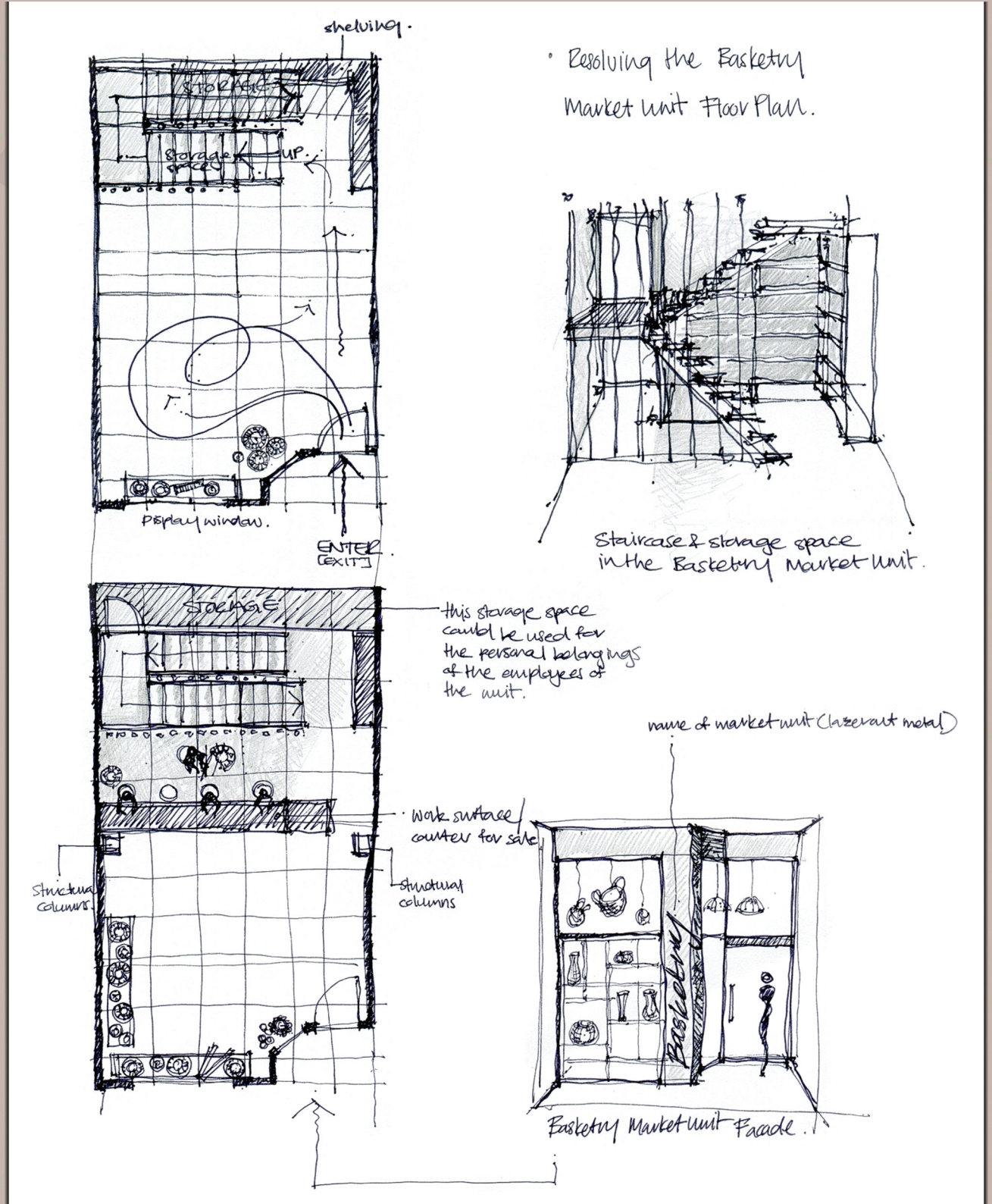

CUSTOMER PARKING
CUSTOMER PARKING
universal access parking
universal access parking
kitchen
CHESA NYAMA RESTAURANT
BASKETRY
ART STUDIO
POTTERY CRAFT
WOOD CARVING
BEADWORK & WIREWORK
MINI-CHECKERS
storage
cold storage
packing storage
MALE ABLUTIONS
FEMALE ABLUTIONS
TOURISM CENTRE
pump room
AQUAPONICS CENTRE
refridgeration & storage
staff locker room
staff room kitchen
packaging & distribution
cleaning & maintenance
REFUSE YARD
GARAGE
EMPLOYEE PARKING
EMPLOYEE PARKING
N

Figure 191



- ***Basketry***

Figure 191: main floor plan 1:500 (Author, 2020: own Revit model drawing).

Figure 192: market unit ground floor plan and interior sketch 1:100 (Author, 2020: own sketches).



Figure 193: Basketry market unit interior – timber staircase (Author, 2020: own Revit model rendering).

Figure 193

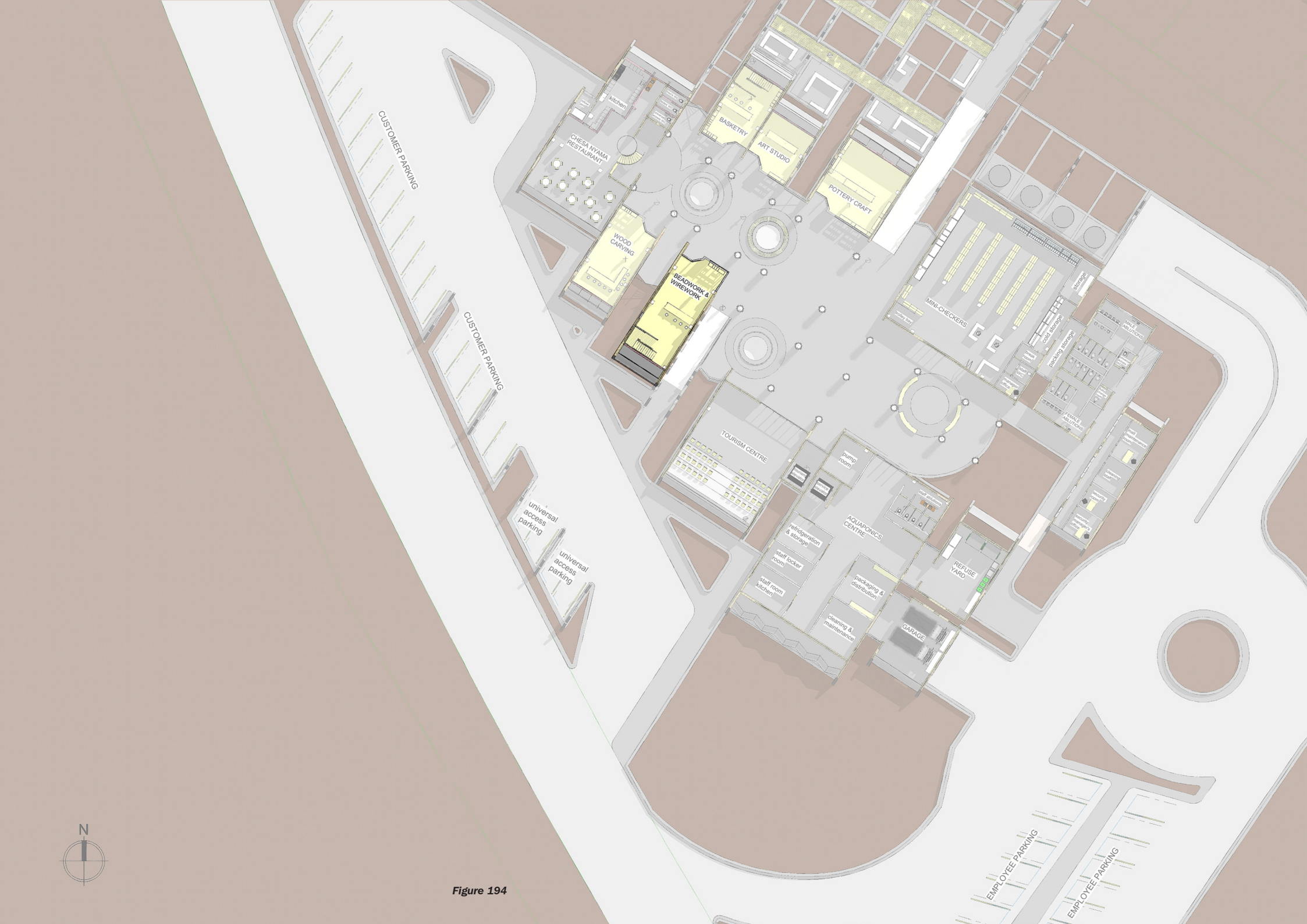

CUSTOMER PARKING
CUSTOMER PARKING
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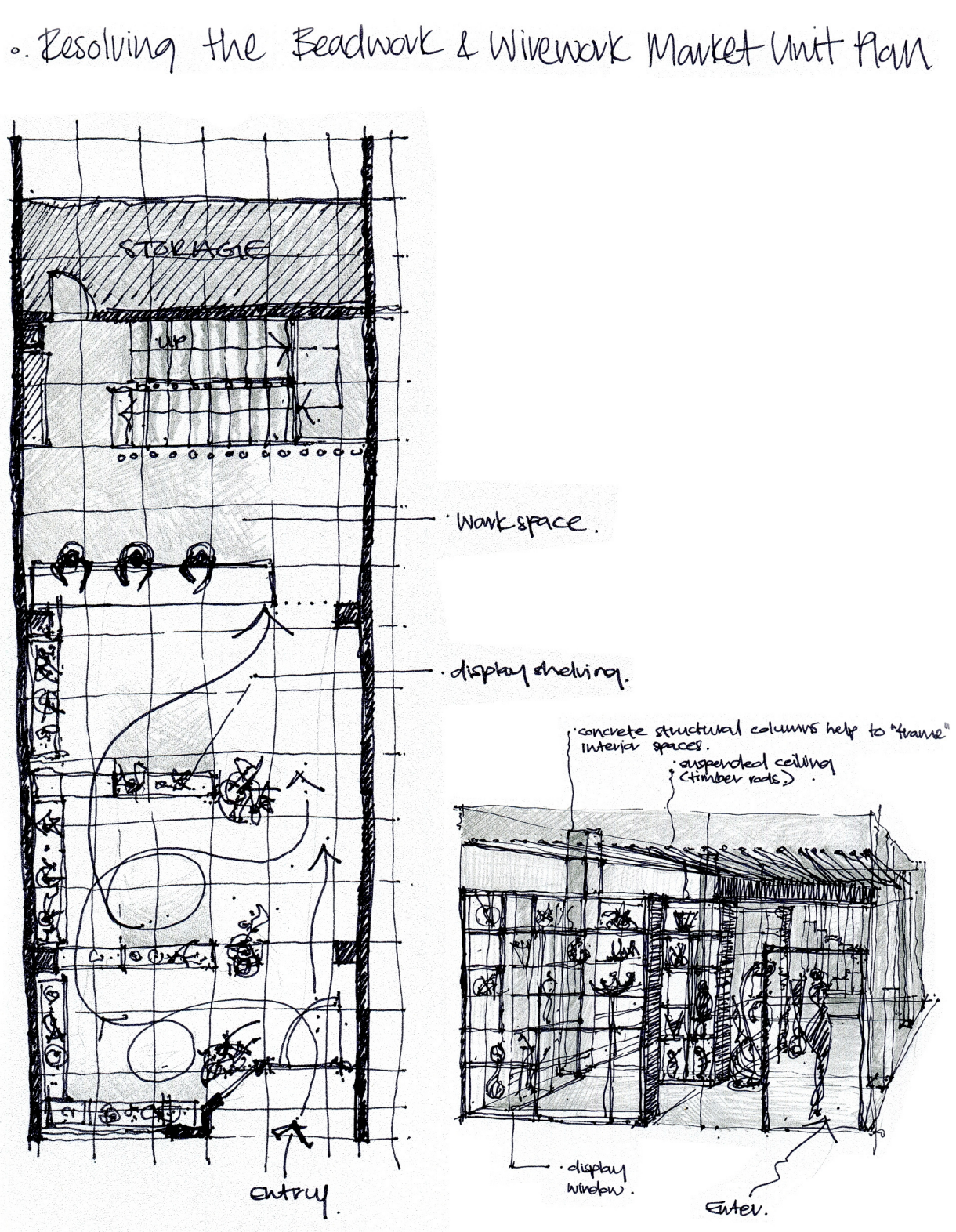
Figure 194



- ***Beadwork and Wirework***

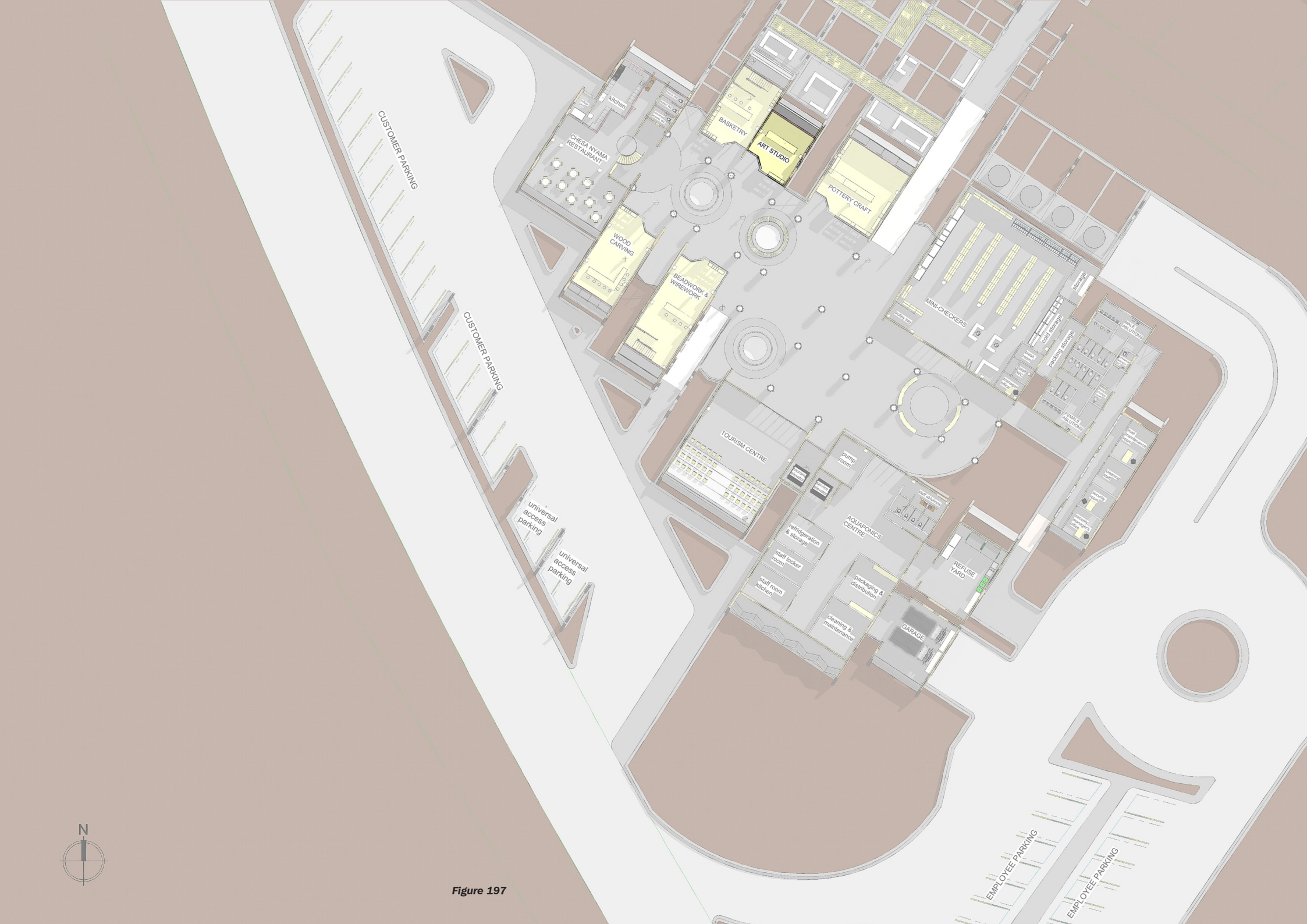
Figure 194: main floor plan 1:500 (Author, 2020: own Revit model drawing).

Figure 195: market unit ground floor plan and interior sketch 1:100 (Author, 2020: own sketches).





Figure 196: Beadwork & Wirework market unit interior – looking from the staircase to the front of the market unit (Author, 2020: own Revit model rendering).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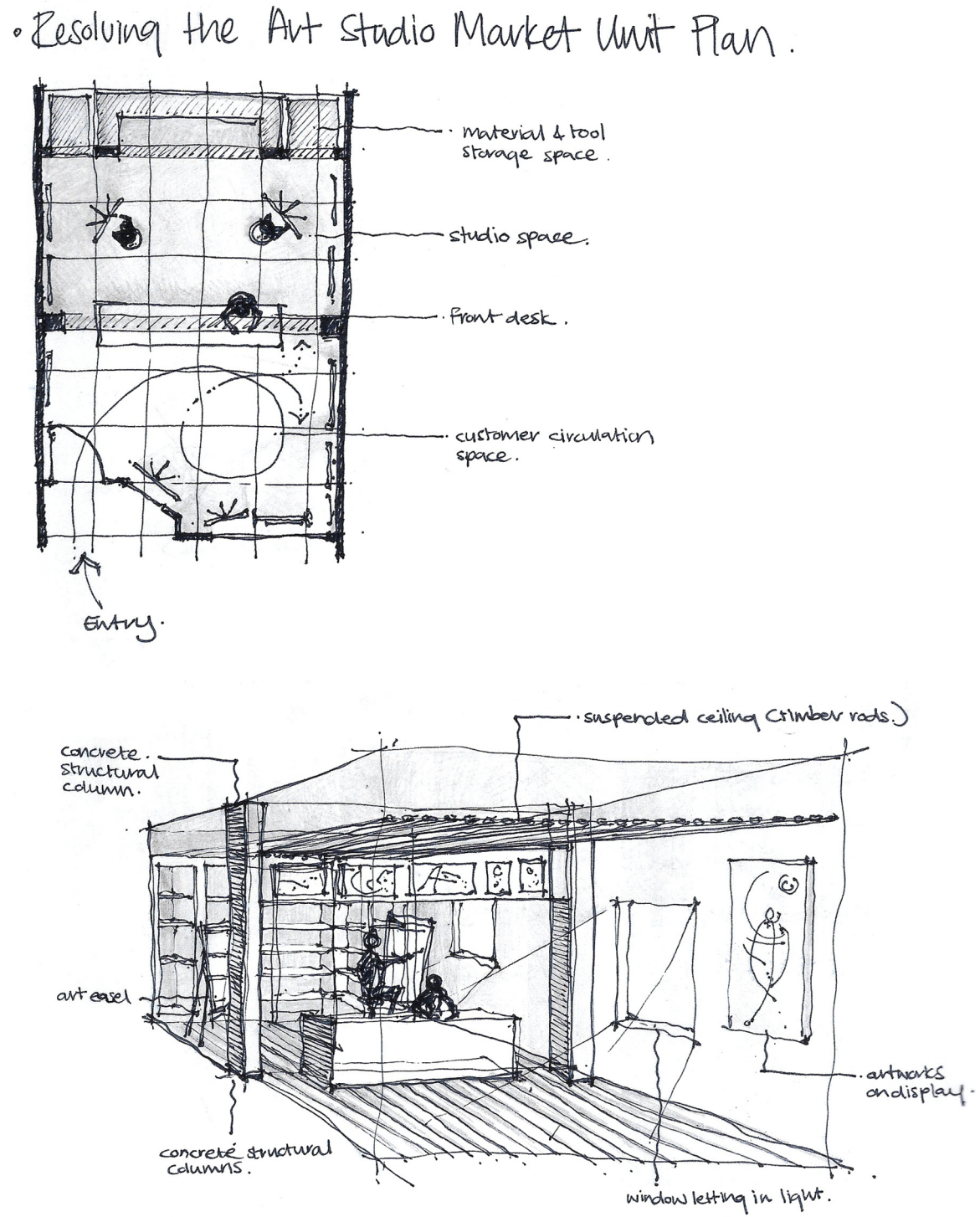
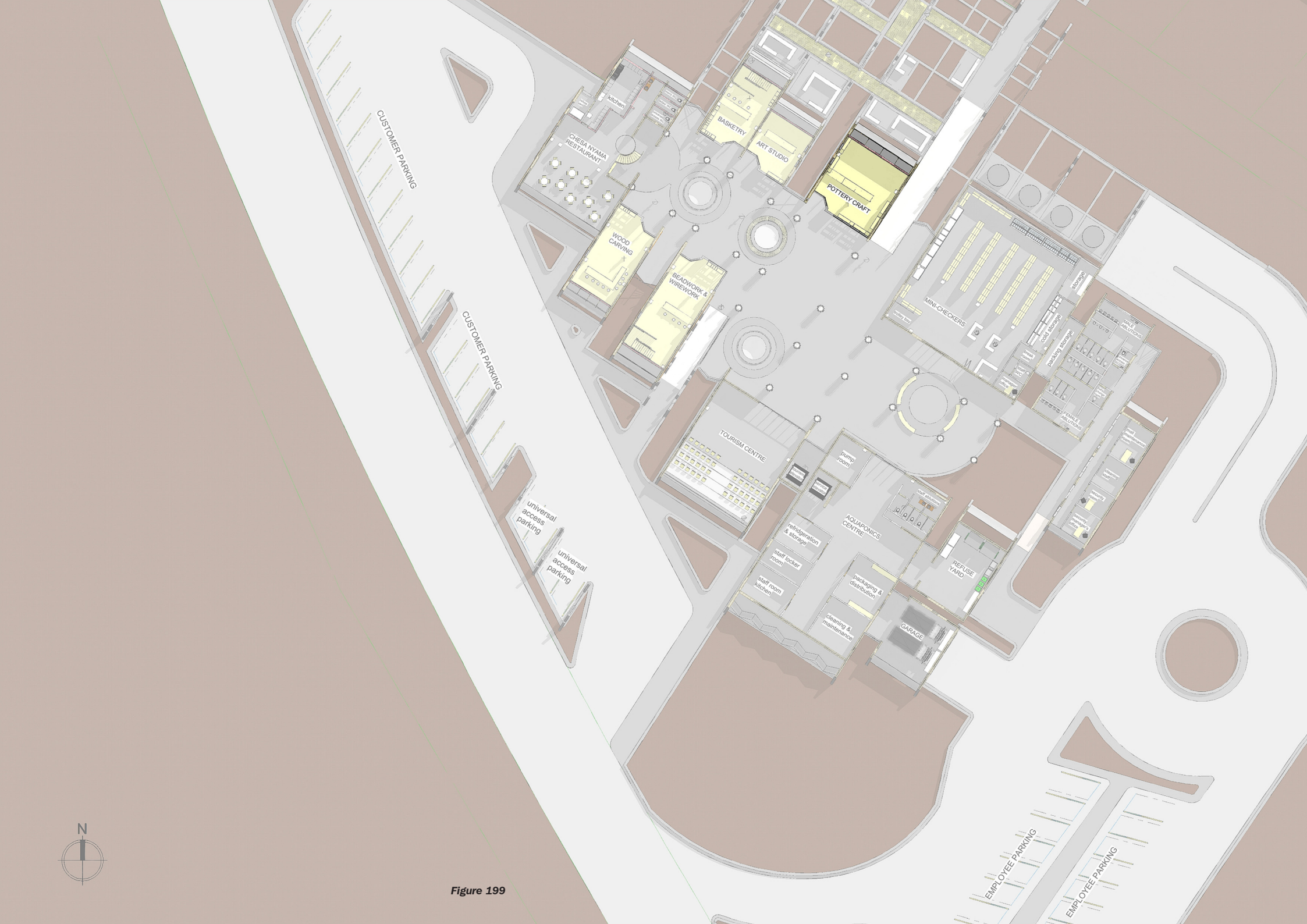


- ***Art Studio***

Figure 197: main floor plan 1:500 (Author, 2020: own Revit model drawing).

Figure 198: market unit ground floor plan and interior sketch 1:100 (Author, 2020: own sketches).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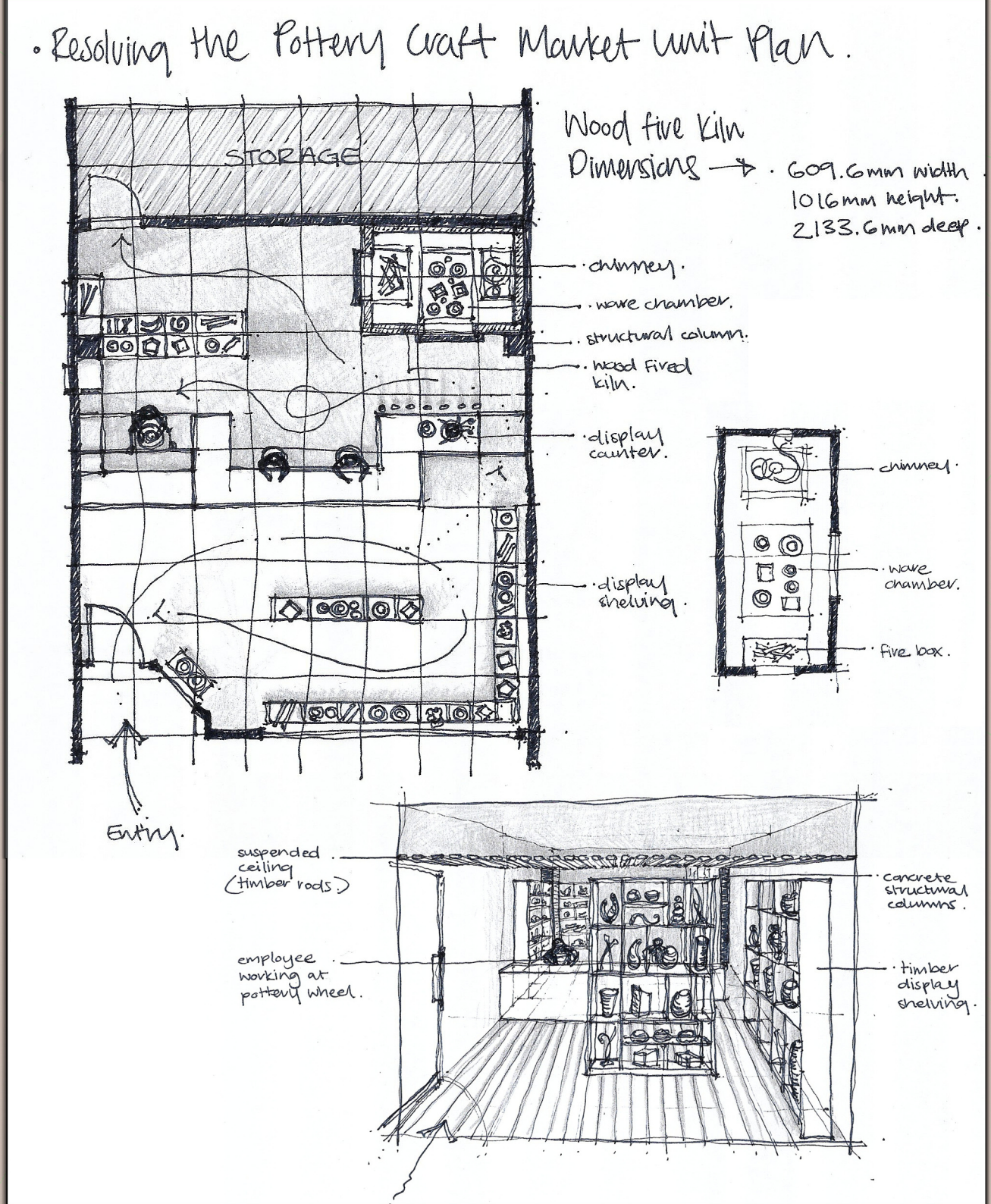

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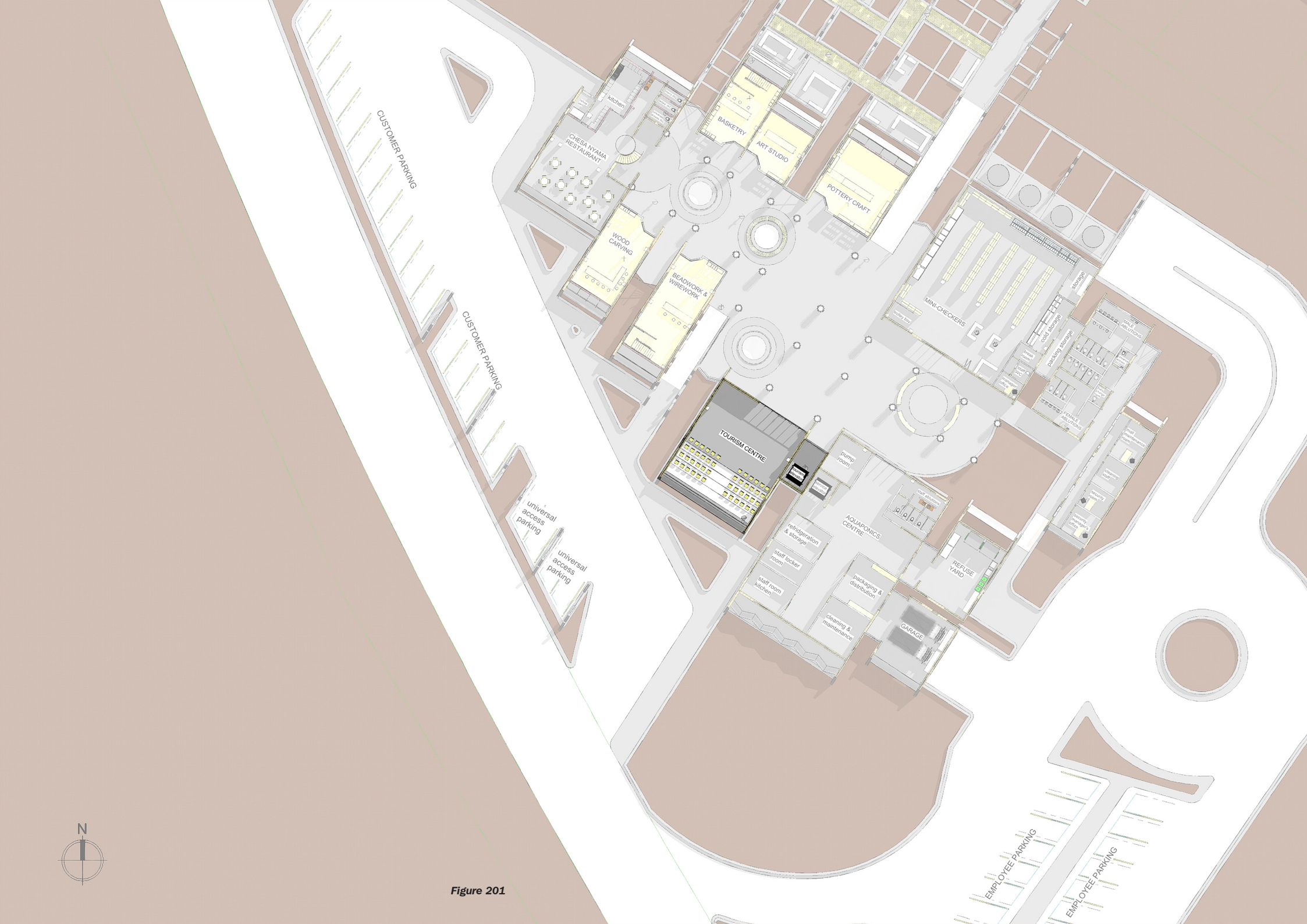
Figure 199: Main floor plan 1:500 (Author, 2020: own Revit model drawing).

Figure 200: Market unit ground floor plan and interior sketch 1:100 (Author, 2020: own sketches).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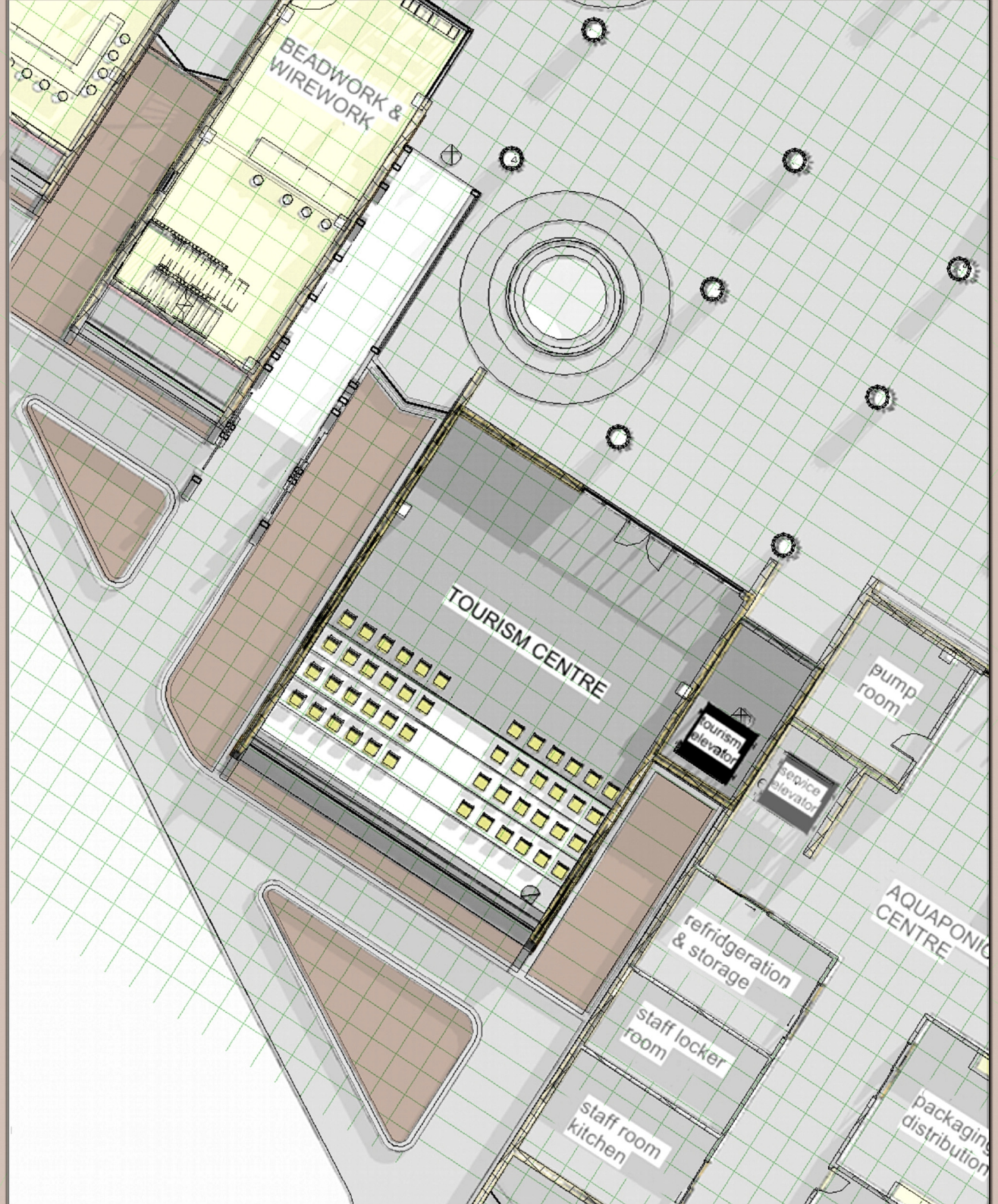
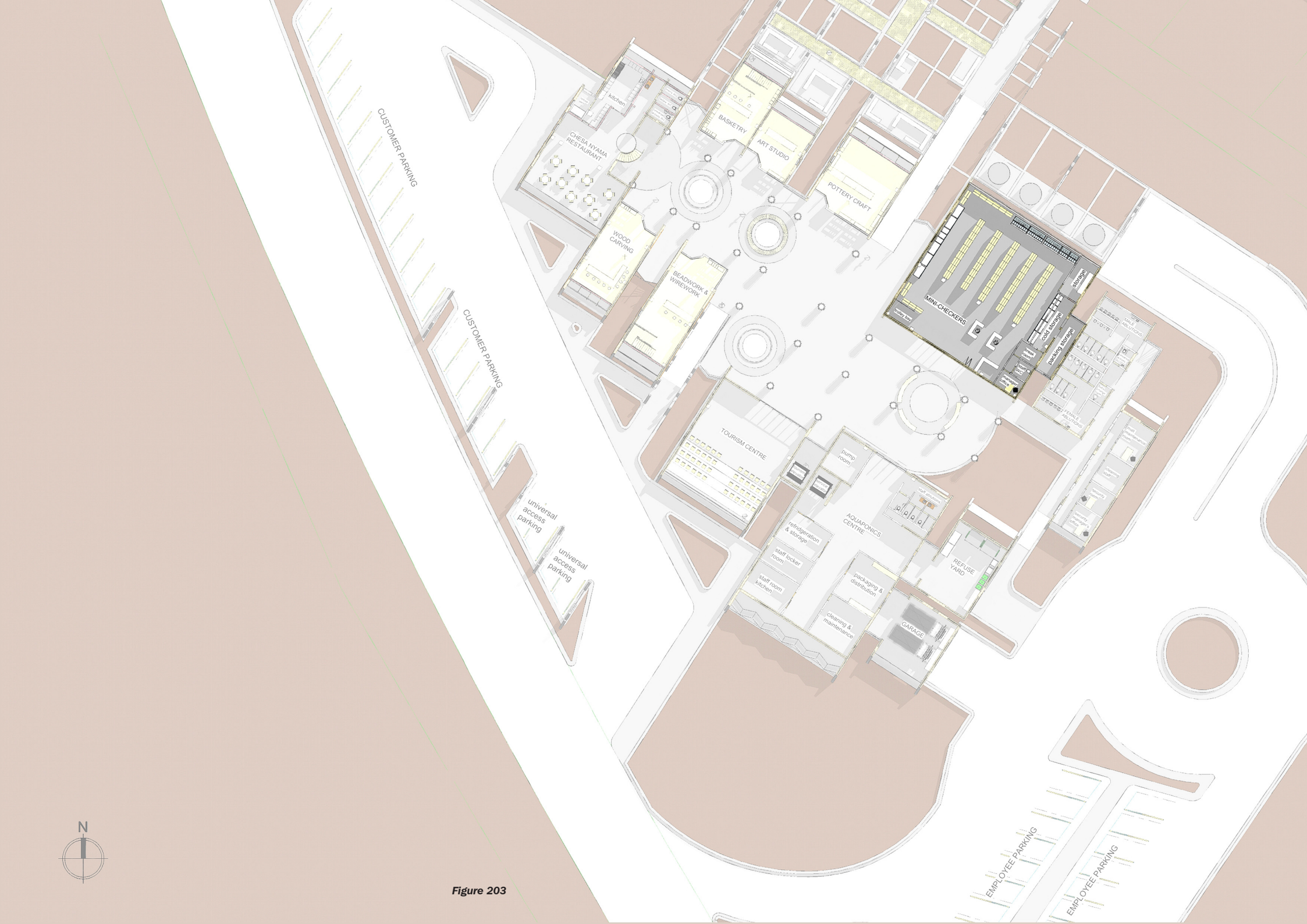


Tourism Centre

Figure 201: Main floor plan 1:500 (Author, 2020: own Revit model drawing).

Figure 202: Tourism unit ground floor plan 1:200 (Author, 2020: own Revit model drawing).

Figure 202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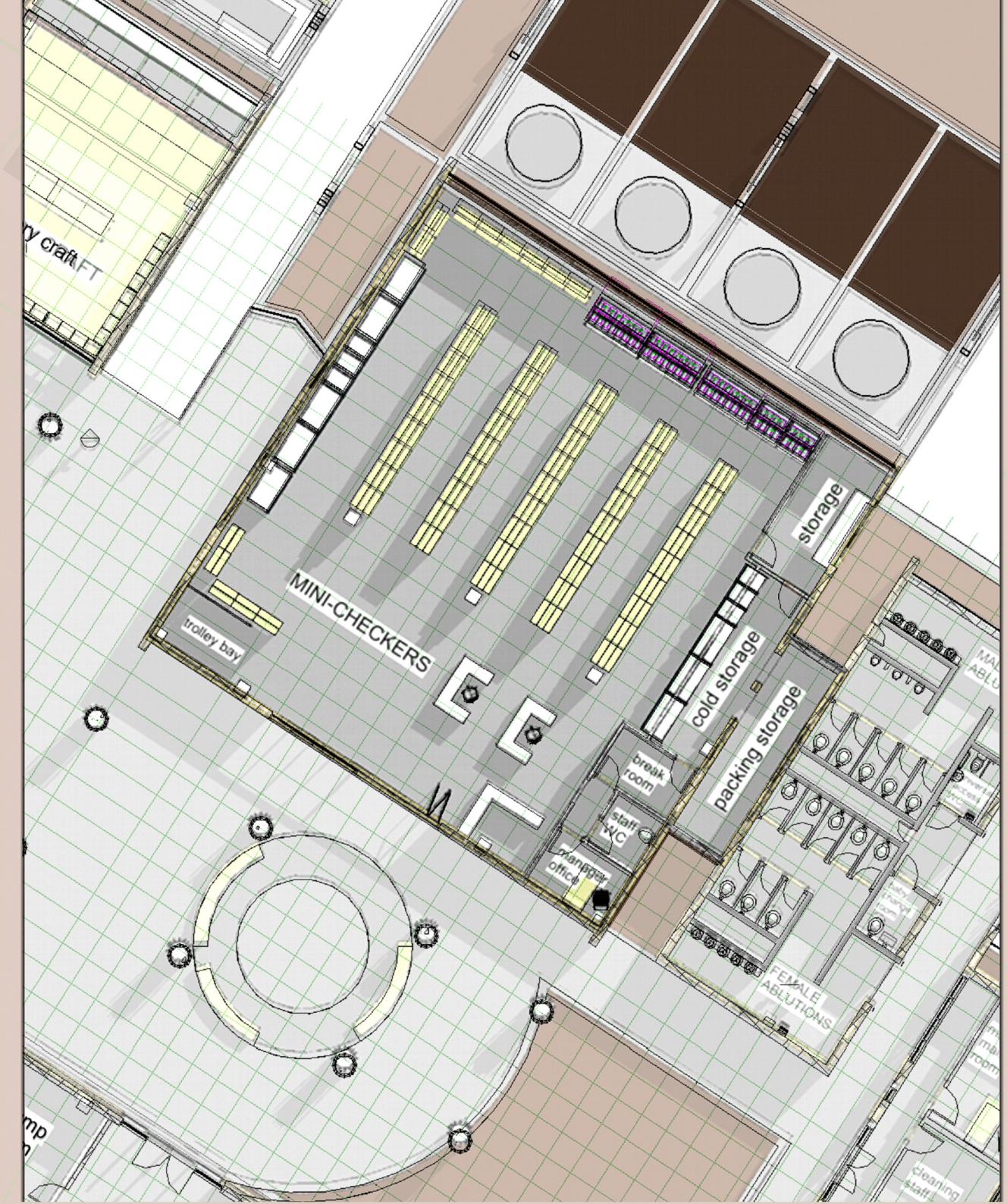
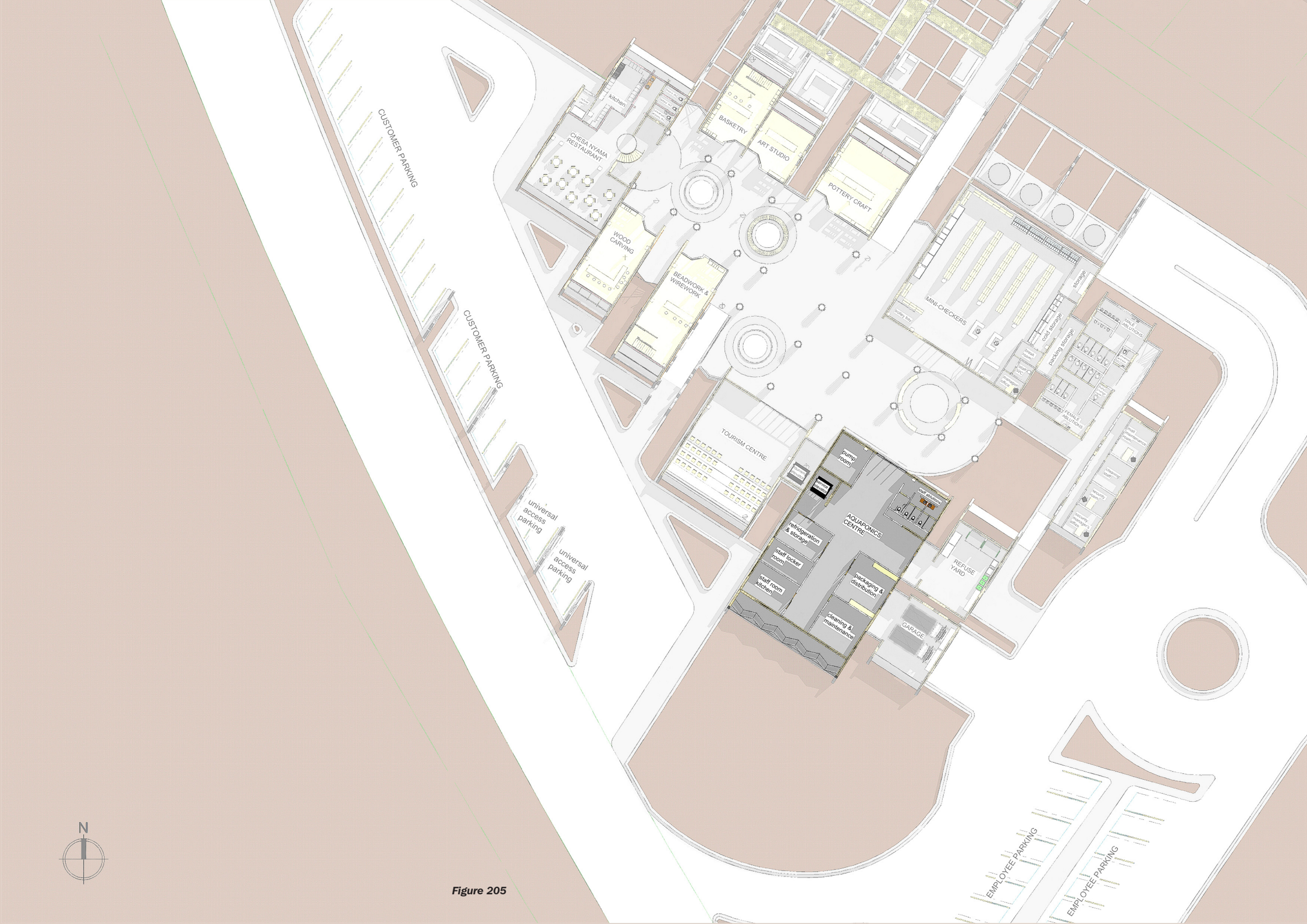


Mini-Checkers

Figure 203: Main floor plan 1:500 (Author, 2020: own Revit model drawing).

Figure 204: Mini-Checkers ground floor plan 1:200 (Author, 2020: own Revit model drawing).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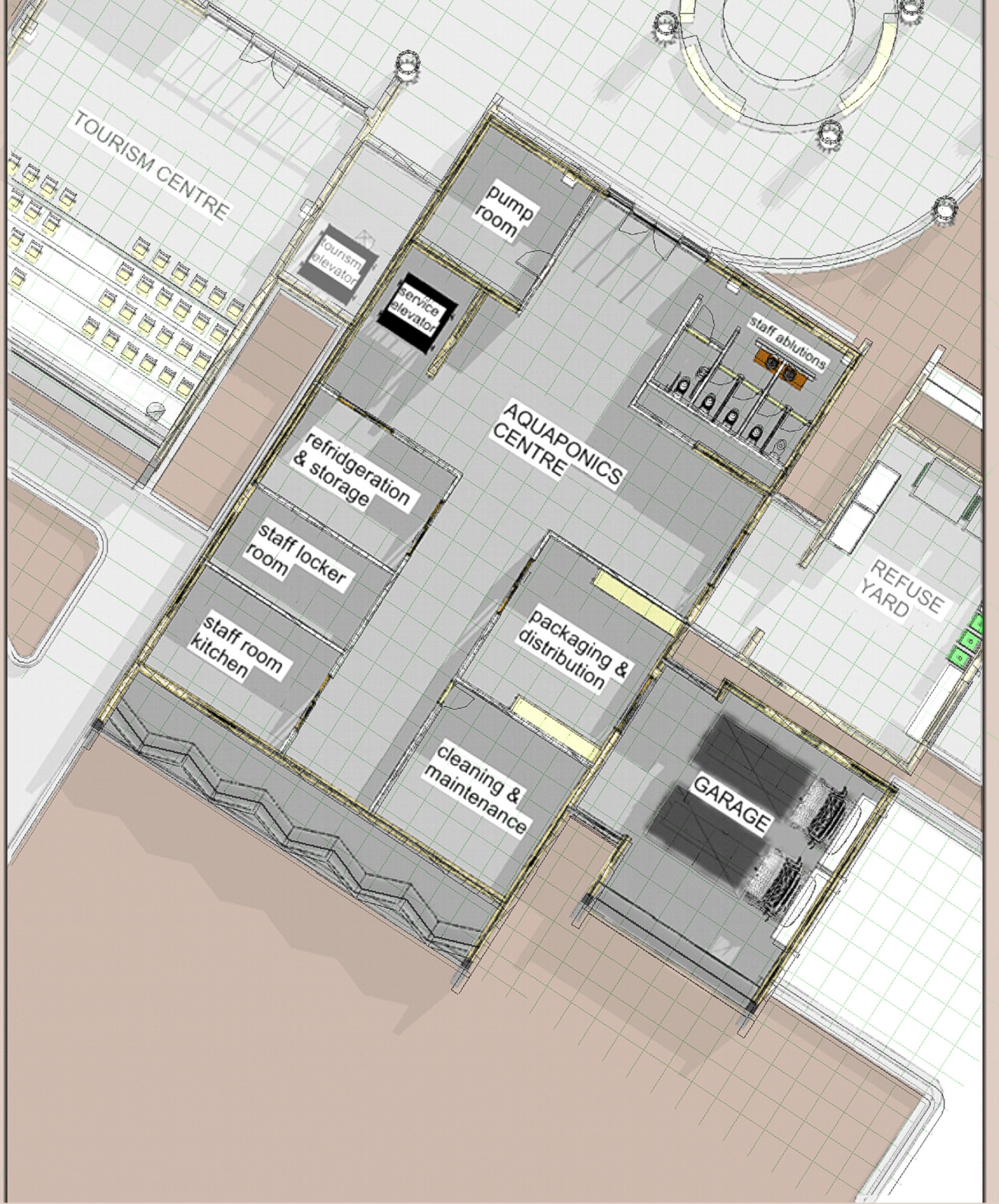

Aquaponics

Figure 205: Main floor plan 1:500 (Author, 2020: own Revit model drawing).

Figure 206: Aquaponics ground floor plan 1:200 (Author, 2020: own Revit model drawing).


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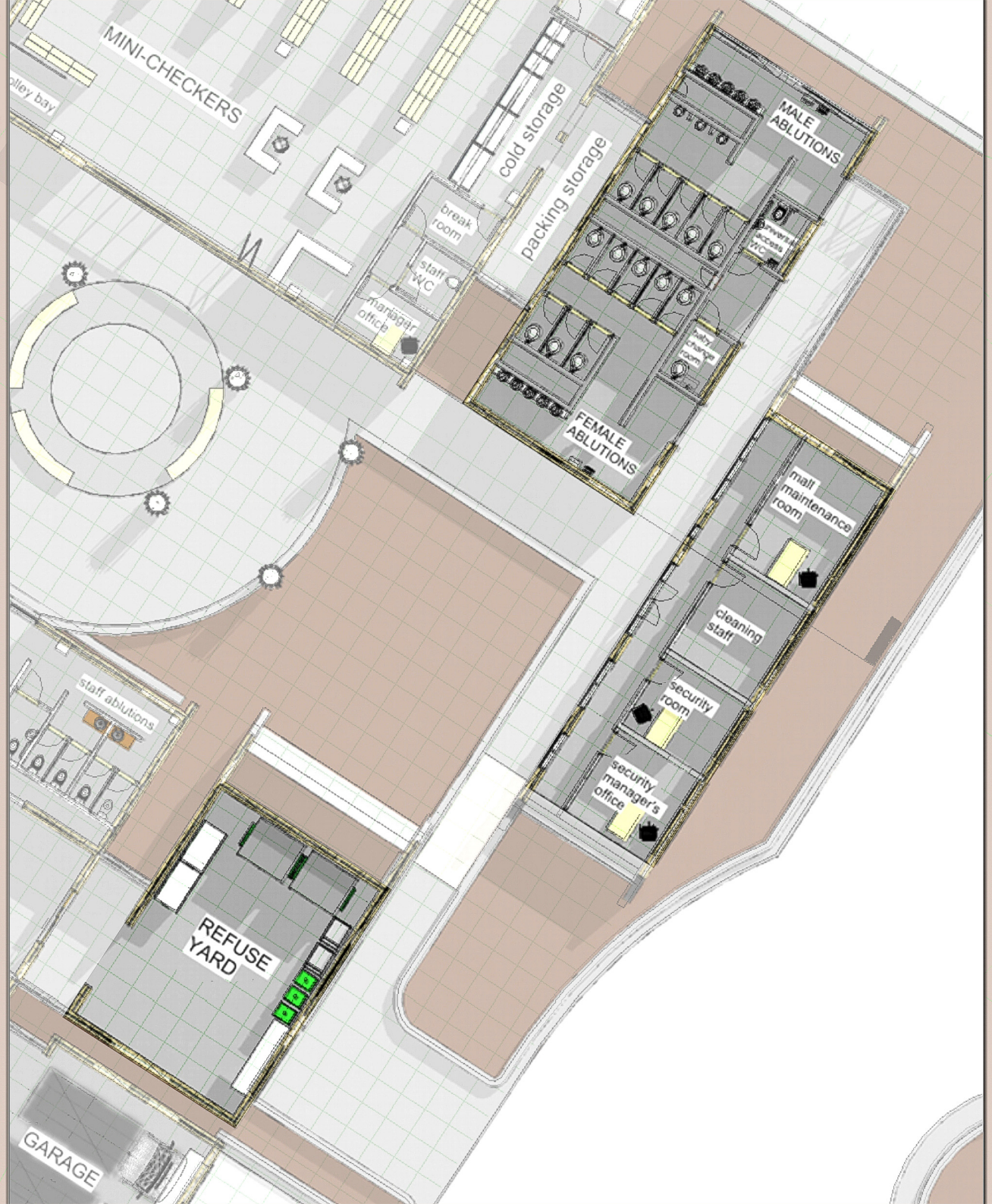

Administration and Utilities

Figure 207: Main floor plan
1:500 (Author, 2020: own Revit model drawing).

Figure 208: Offices, ablutions and refuse removal ground floor plan – these functions are grouped near the back end of the building, for easy service access and making the access as inconspicuous as possible. The ablutions are placed between the mini-Checkers and the maintenance/ security offices, to maintain a buffered, safe area for people to move.
1:200 (Author, 2020: own Revit model drawing).
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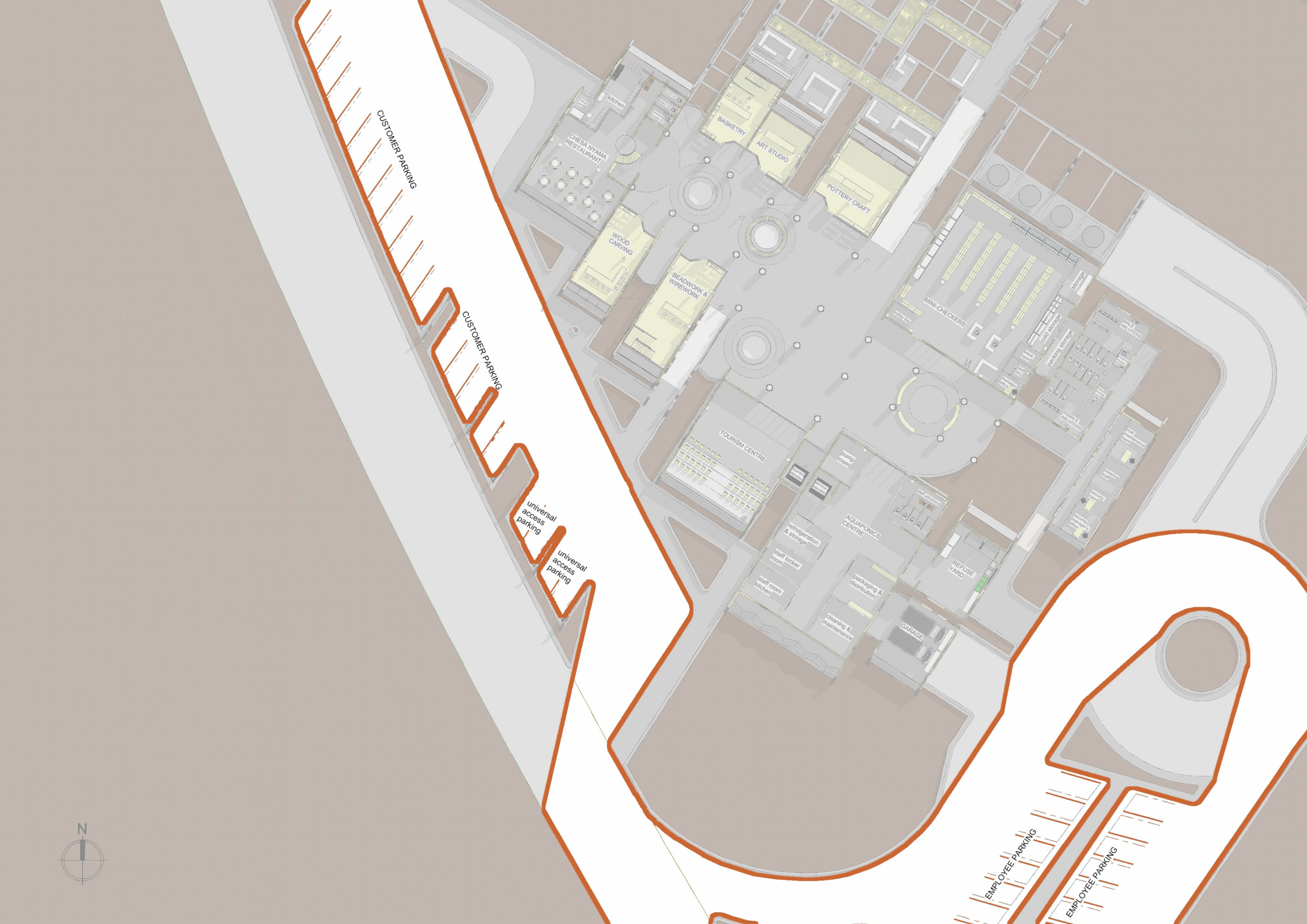
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Access

- ***Parking***

Figure 209: Customer and employee parking and access route plan 1:500 (Author, 2020: own Revit model drawing).

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- ***Refuse Removal***

Figure 210: Refuse removal access route plan 1:500 (Author, 2020: own Revit model drawing).

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Figure 210


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- ***Truck and Delivery Access***

Figure 211: Truck and delivery access route plan 1:500 (Author, 2020: own Revit model drawing).

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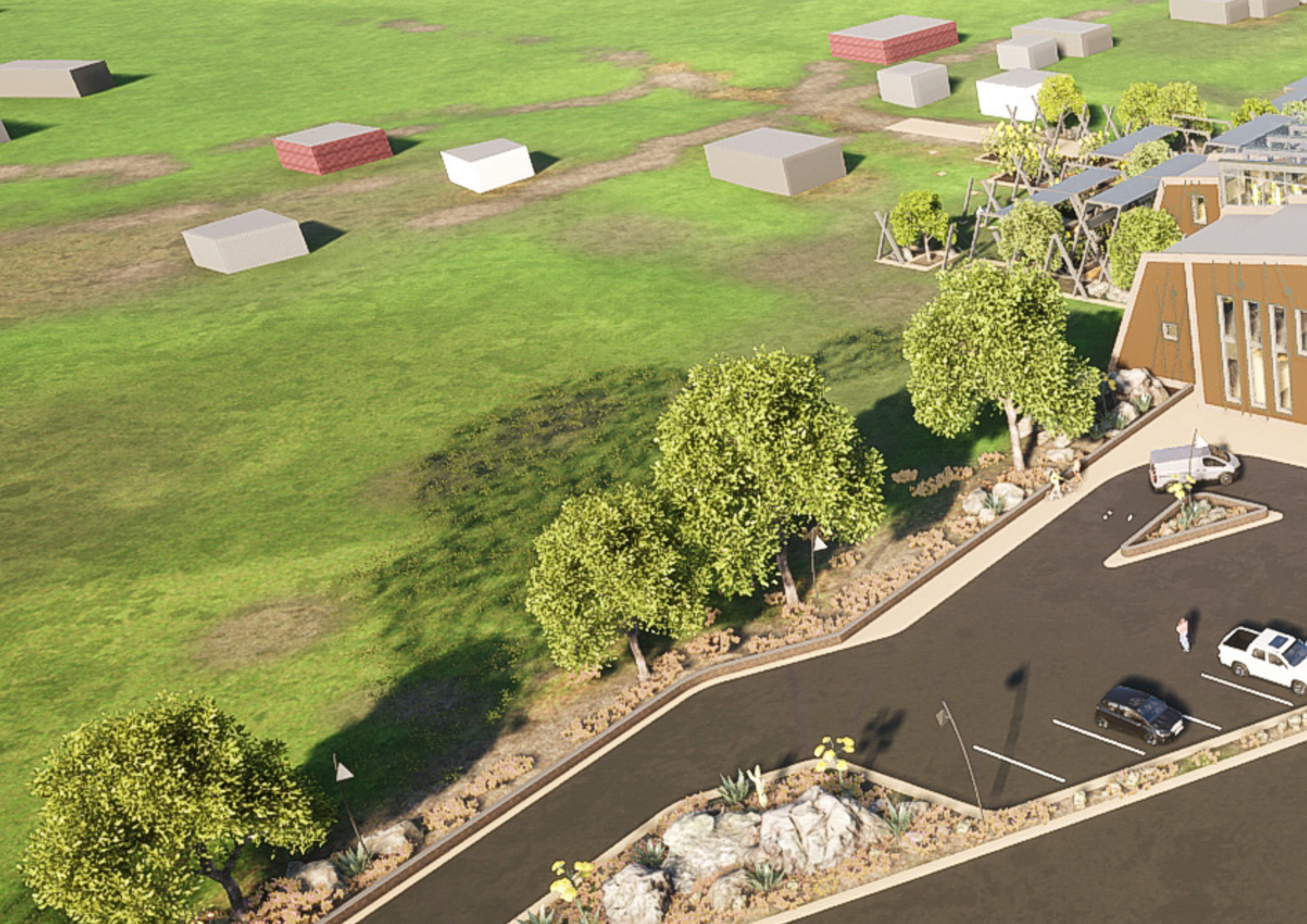
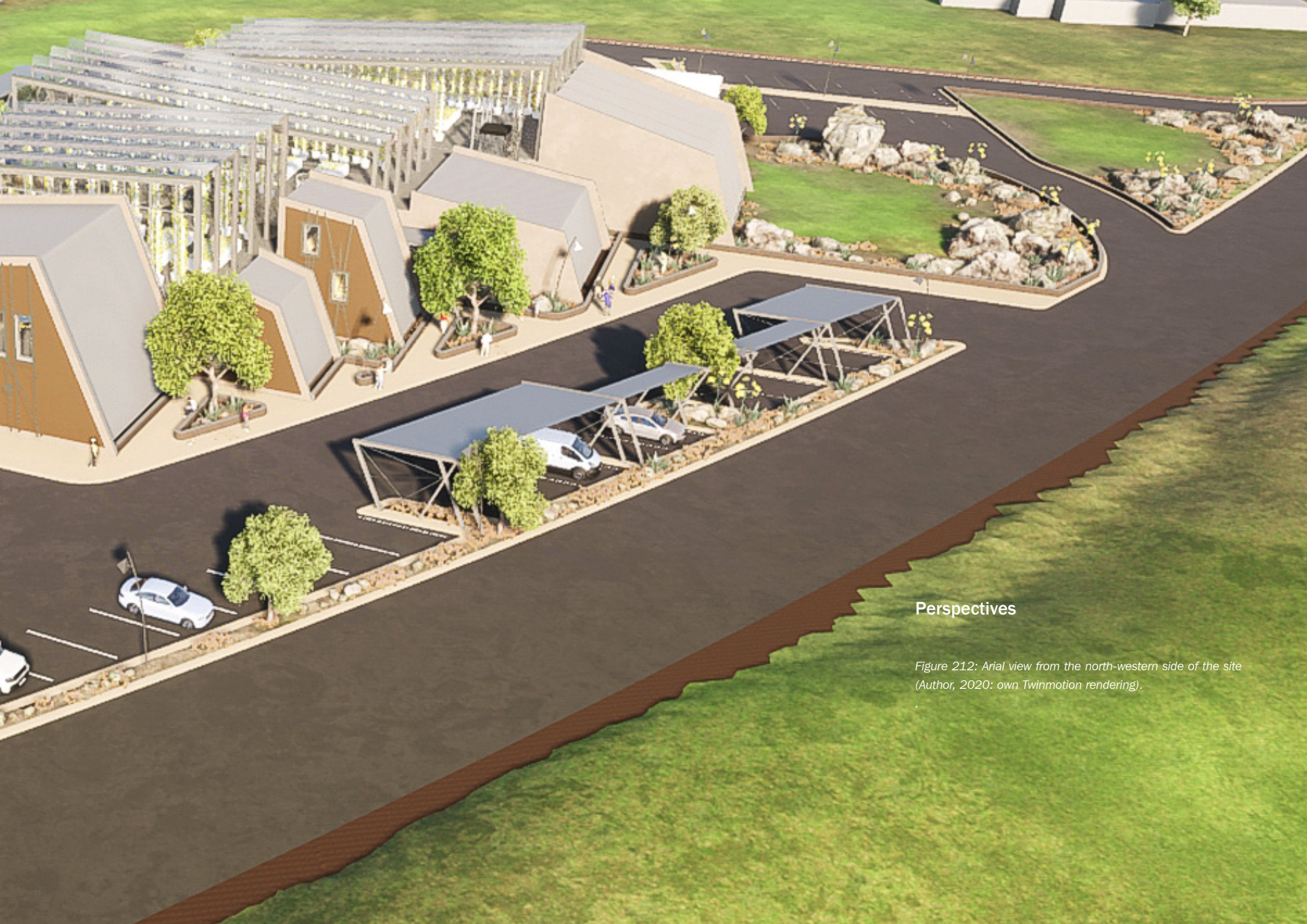
Figure 211





Perspectives

Figure 212: Arial view from the north-western side of the site (Author, 2020: own Twinmotion rendering).

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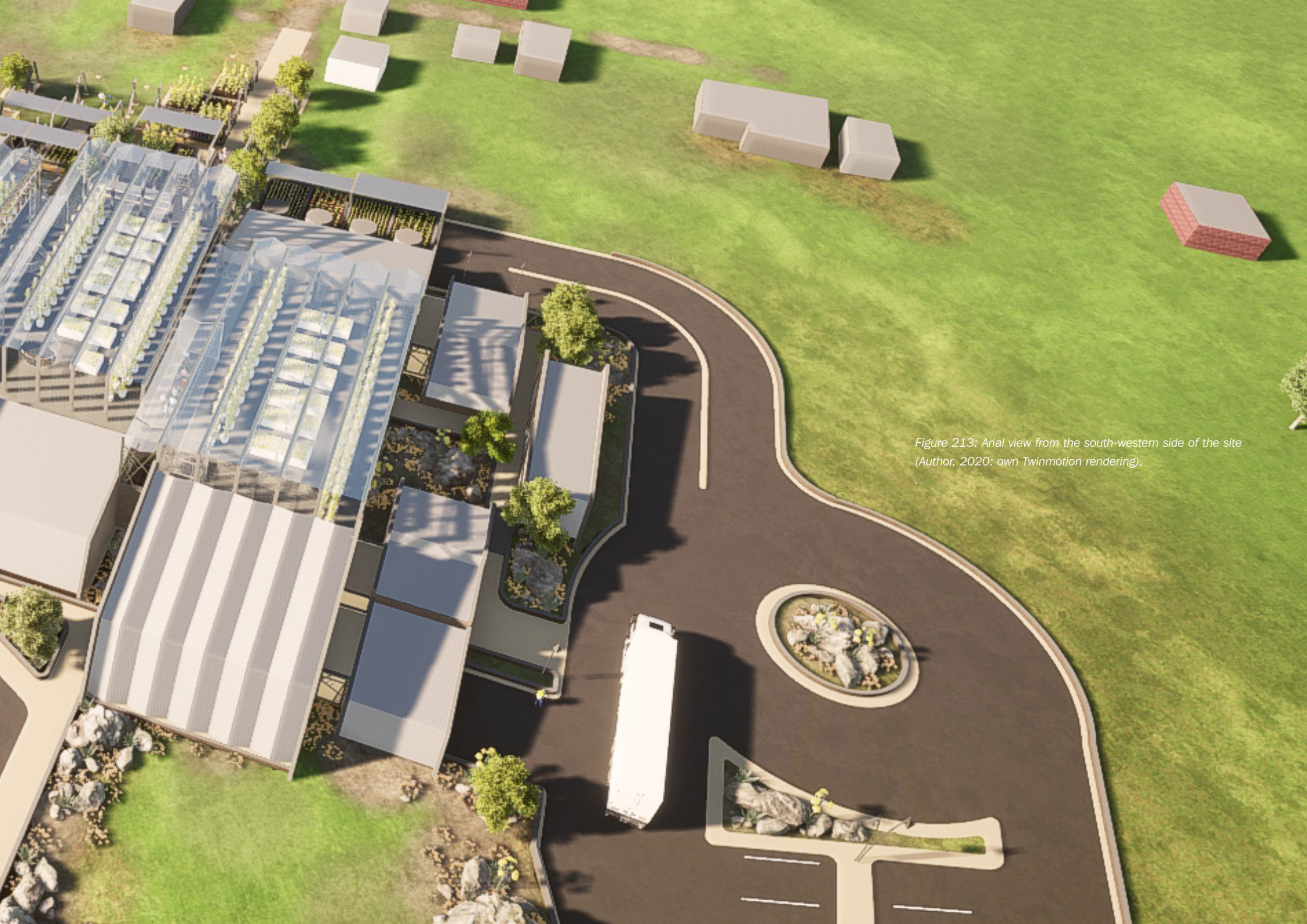

Figure 213: Arial view from the south-western side of the site (Author, 2020: own Twinmotion rendering).

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Figure 214: Arial view from the northern side of the site (Author, 2020: own Twinmotion rendering).

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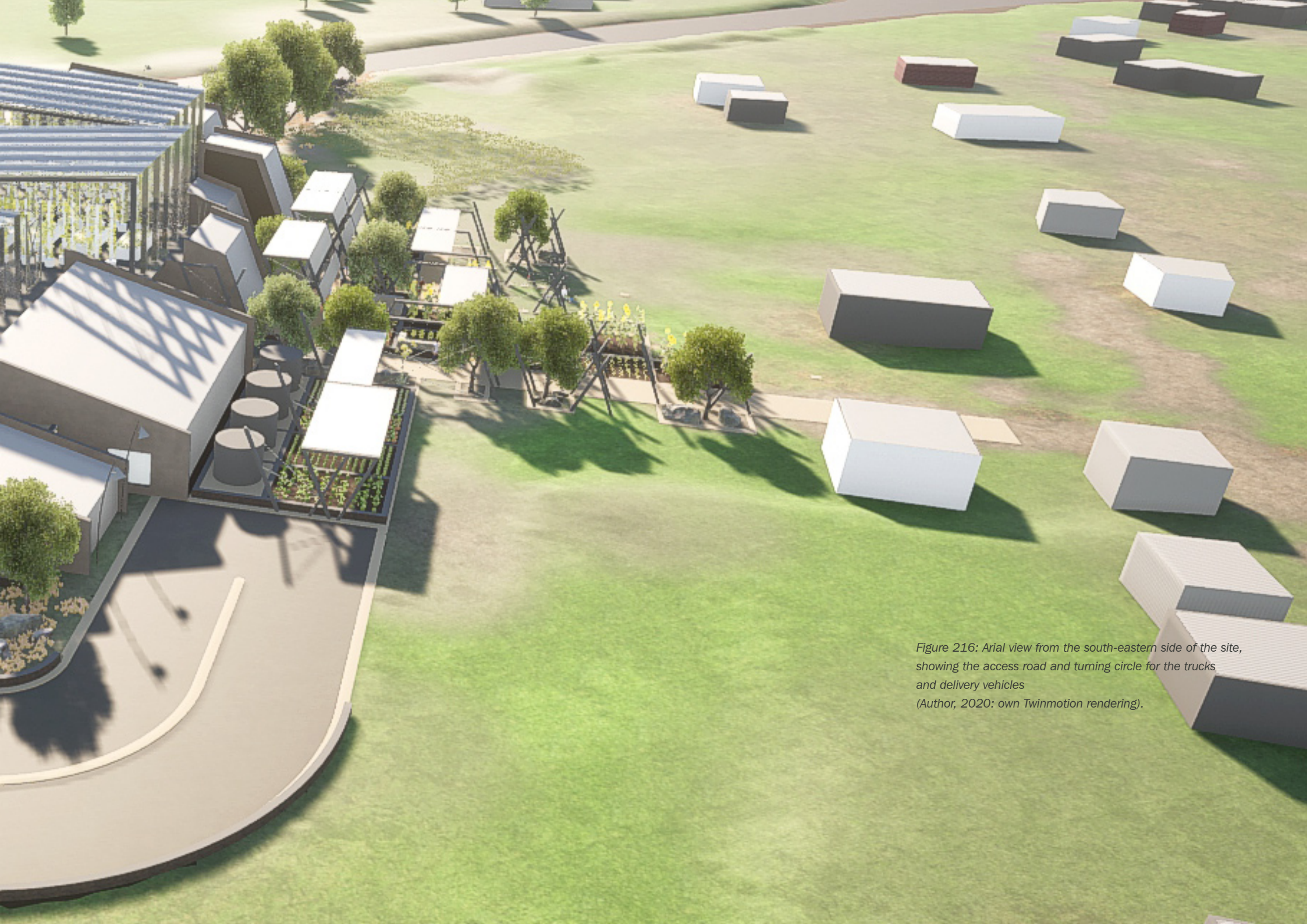
Figure 215: Arial view from the northern side of the site (Author, 2020: own Twinmotion rendering).





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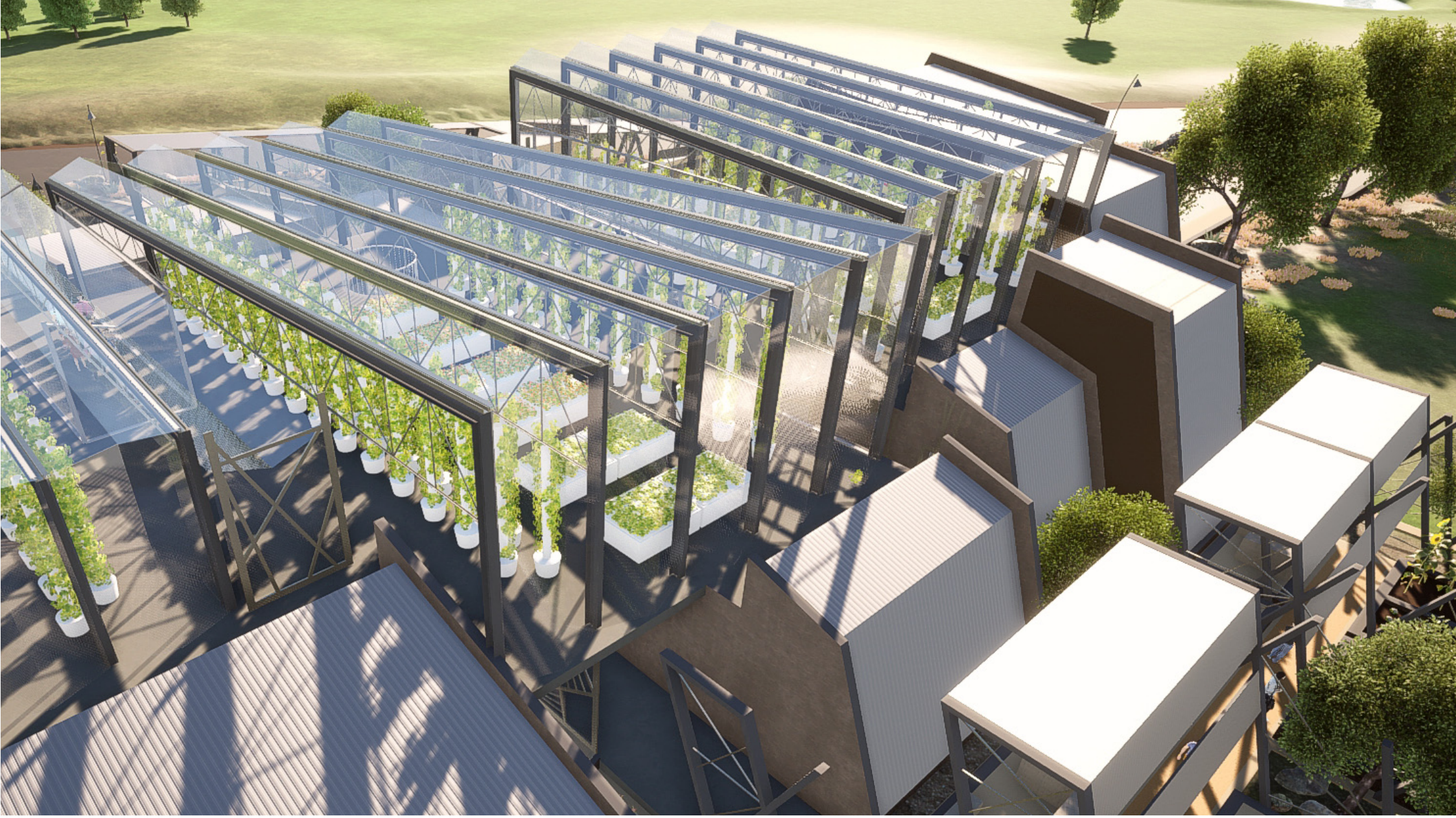

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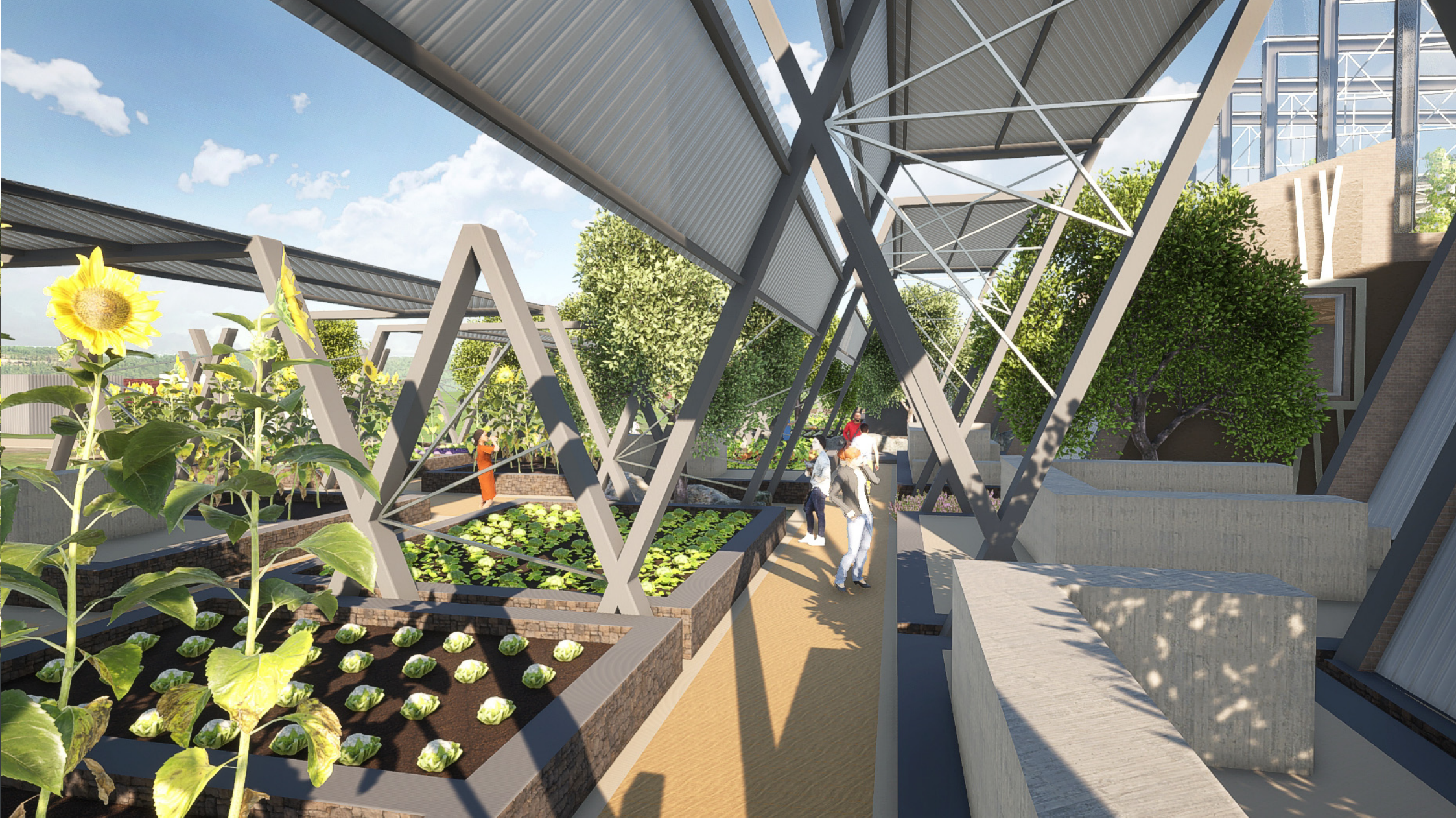

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Figure 223: View of the path extending from the micro-mall to the Rocklands community – illustrating the play of light through both structural and natural textures (Author, 2020: own Twinmotion rendering).



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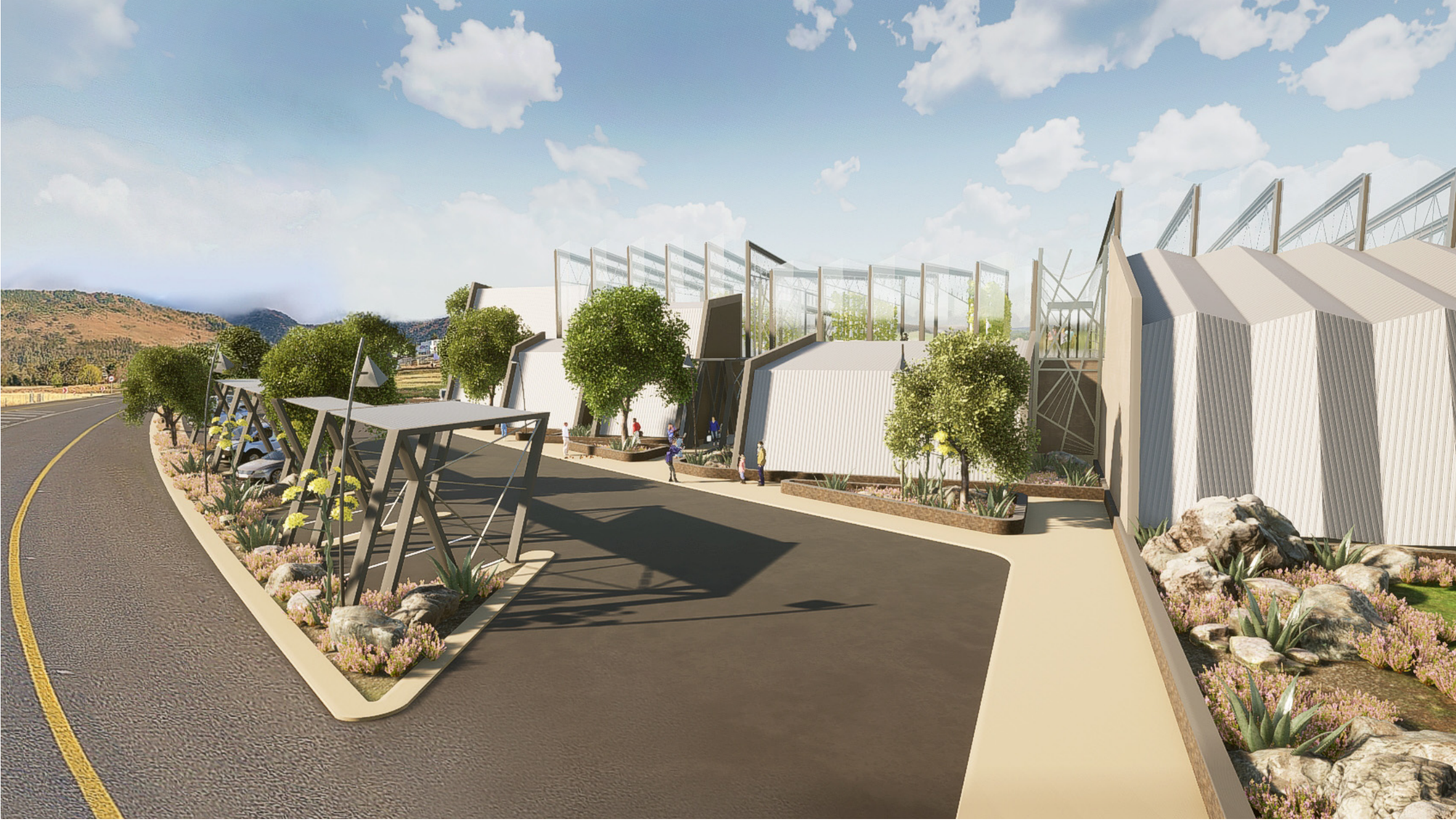

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Reflection

This dissertation concerns an architectural intervention namely, The *RuraLift Project.* This project aspires to identify ways in which architecture can catalyse, support, and maximise the sustainability of food cultivation in one of the poorest provinces in South Africa, the Eastern Cape. The proposed design focuses particularly on developing the economically disadvantaged Rocklands community, experiencing a high rate of unemployment and an increasing population. This community is situated on the outskirts of the town of Cathcart. One of this community's many socio-economic challenges is food security.

The *RuraLift Project* proposes the development of an aquaponics micro-mall, where fresh and nutritious produce could be cultivated and dispatched, thereby maximising food security within the Eastern Cape. In so doing, the members of the Rocklands community are presented with an opportunity to support themselves economically. This could be done by means of the provision of a market platform where the community's arts and crafts are made and sold to tourists passing through, en route to bigger cities. Field research will be advantageous to the success of this design.

Although this design succeeds in incorporating a wide range of functions promoting socio-economic and agricultural development, field research will be beneficial to the success of this design. Gathering valuable first-hand information about the Rocklands community will assist in developing an insight into their cultural norms, values and creativity. A good comprehension of the social and cultural context will undoubtedly influence the design decisions and sensitivity towards detailing and finishes.

It is the ambition of this project that it be developed in the future. Aiming at blurring the boundary lines between the commercialised building and community shelters will harmonise the landscape while subliminally uplifting the disadvantaged. The aquaponics micro-mall thus provides a structural framework for such a development.

The grid, on which the aquaponics micro-mall is designed, is structurally extruded to form the external community market gardens. This concept could in time provide a structural framework for the development of a new and uplifted Rocklands community.

The *RuraLift Project*, with its ever-extending structural root framework, could prove to be an innovative approach to design. Offering hope instead of despair for those socio-economically disadvantaged communities ensnared by food insecurity.

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