

Urban Culinary Workshop

Re-emphasizing food in the urban environment

Tom Nomico
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26414466
Final Draft Submission

Urban Culinary Workshop
Re-emphasizing food in the urban environment

Thomas Nomico

Submitted in partial fulfilment of the requirements for the degree
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Department of Architecture
Faculty of Engineering, Built environment and Information Technology
UNIVERSITY OF PRETORIA
Study leader: Gary White
Course coordinator: Arthur Barker (Dr.)

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Re-emphasizing food in the urban environment
Submitted by: Thomas Nomico (Mr.)
Student number: 26414466
Study leader: Gary White (Mr.)
Course coordinator: Arthur Barker (Dr.)
Degree: Master of Architecture (Professional)
Department: Department of Architecture
Faculty: Engineering, Built Environment and Information Technology
University: University of Pretoria

PROJECT SUMMARY

Programme: Culinary workshop, restaurants & market space

Site description: Commercial food district

Site location: Intersection of the Apies river and Walkerspruit between
Pretorius St. and Church St.

Address: Corner of Nelson Mandela Road & Church Street

GPS Coordinates: 25°44'46.23"S 28°12'5.15"E

Research Field: Human Settlements and Urbanism

Client: Tshwane University of Technology

Keywords: Chef School, Restaurant, Food, Shisa Nyama,
Market, Apies River, Walkerspruit Arcadia

"Nowhere is the absence of sensory experience more vivid than in modern buildings that minimize contact with anything natural – whether air, daylight, views, green vegetation, materials, patterns, or color. Modern workplaces are often seas of bland cubicles that isolate rather than integrate people with anything natural – not unlike the cages in the old style zoo."

– Judith Heerwagen

DECLARATION

In accordance with Regulation 4(e) of the General Regulations (G.57) for dissertations and theses, I declare that this thesis, which I hereby submit for the degree Master of Architecture (Professional) at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

I further state that no part of my thesis has already been, or is currently being, submitted for any such degree, diploma or other qualification.

I further declare that this thesis is substantially my own work. Where reference is made to the works of others, the extent to which that work has been used is indicated and fully acknowledged in the text and list of references. The dissertation is 10 769 words long (excluding the scanned items).

Thomas Nomico

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ABSTRACT

The practices that have allowed farming to be separated from the city, with the resultant food security concerns, are being globally challenged.

Simultaneously, low levels of employable skills in South Africa are magnifying unemployment levels in the country.

Concurrently Pretoria has embraced urban programmes to unify urban areas which were previously effectively fragmented by apartheid's Group Areas Act.

This dissertation finds its genesis in this context of multiple concerns where the concurrent issues provide architecture with a unique challenge to interpret and to respond to the revised relationships:

- between farming and the city,
- between citizens and their cities, and
- between unemployment and economic development.

This dissertation undertakes the multi-function of addressing these conditions not only in terms of technical intervention, but more importantly by the examination of the changing urban context and by re-embracing food production within the city.

The situation created by the crossroads in which the world, the nation and the city of Tshwane find themselves provides an unprecedented opportunity for an architectural expression which is influenced by a fresh re-assessment of local, national and global concerns.

This dissertation therefore addresses the proposal not merely as a building but as an active change-generating catalyst.

INTRODUCTION

This dissertation investigates the role of architecture within an urban context which has been separated from nature and food production and how architecture can contribute towards and facilitate the processes of living architecture and of urban food production.

In the theoretical framework the revision of urban design which reconnects with natural elements and farming in the city is investigated.

Gehl's Theory as an enduring model is examined where it is harnessed to create strong interconnections in a separated city.

The need for vocational skills is recognized through the implementation of an autonomous culinary school.

Biophilic design principles and guidelines are analyzed to inform the architectural design approach.

In the design resolution, precedents are studied as generators for environmental, functional and formal influences for the design process.

The urban and site context for the development of the Urban Culinary Workshop are described and analyzed, and the proposed building is documented in preparation for the design.

The technical report focuses on the approach adopted in the realization of a sustainable architecture and how the approach informs the detail resolution of the Culinary Workshop.

1.1 Background

Urban development is understood to have begun during the Neolithic revolution where, through the development of basic tools, people began farming. As farms became more established there was an excess of food which attracted people to settle around the farms and gradually over time the semblance of cities emerged (Mumford, 1956; 328). As the population of the cities grew, agriculture was pushed further away from people and the distinction between rural and urban land was established. By the time of the industrial age, farming comprised large areas of monoculture crops and livestock. Due to the technological enhancements of the industrial age, farming became widely mechanized. This forced farm labourers to move to cities – which increased the urban population greatly – and farming many kilometers from cities, as known today, was established (Mumford, 1956; 328).

1.1.1 City of Pretoria's evolution

The history of Pretoria follows a similar evolution although for very different reasons. During the Great Trek Lucas Bronkhorst settled around Fountains Valley and established the Groenkloof Farm. It had a rich water source which allowed others to settle in the area (Andrews, 1999; 65). By 1853, the British had recognized the independence of the voortrekkers north of the Vaal River (Transvaal) by the signing of the Sand River Treatise (SAHO. 2009). Martinus W. Pretorius bought parts of the Groenkloof and Elandskloof farms (established by other settlers) in the hopes of unifying the western groups of Boers as a central government; this was the birth of city of Pretoria (Andrews, 1999; 65). Though the formal city was created out of a political necessity, it was selected on the grounds that people could provide for themselves through food production. As the city developed, the farms were relocated further out of the city which was assisted by industrialized methods. This led to farms becoming vast areas of monoculture production.

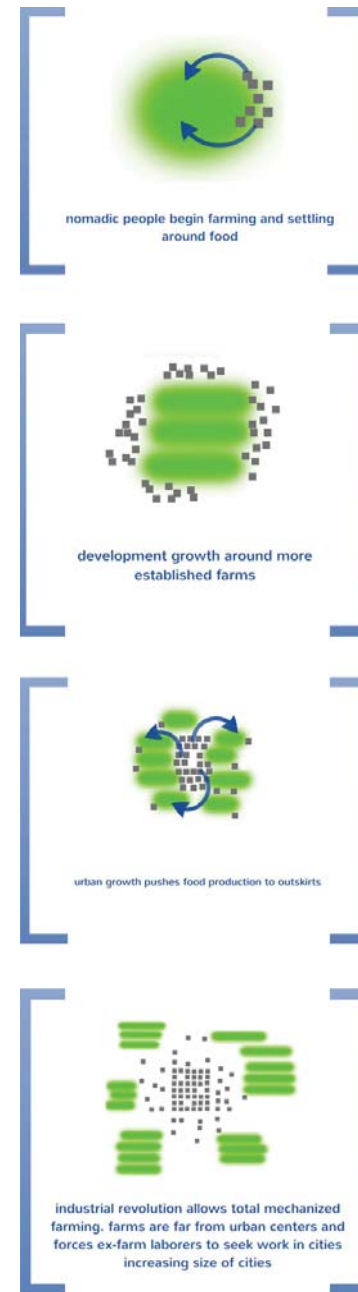


Fig 1: Urban development around food

Fig 2: (Right) Urban development of Pretoria



1.2 Food Security

Definition: "When all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life." (World Food Summit in WHO, 2013)

There are many complex factors surrounding food security and many arguments that both support and refute the notion that food security is an issue. With so much contention, one project cannot satisfy all aspects of the problems that surround food security. This dissertation instead seeks to provide some education about food security and focuses mainly on the importance of food, not as a commodity, but as a sustaining aspect of life from nutrition to social connection.

The World Health Organization states that

"Agriculture remains the largest employment sector in most developing countries and international agriculture agreements are crucial to a country's food security. Some critics argue that trade liberalization may reduce a country's food security by reducing agricultural employment levels. Concern about this has led a group of World Trade Organization (WTO) member states to recommend that current negotiations on agricultural agreements allow developing countries to re-evaluate and raise tariffs on key products to protect national food security and employment. They argue that WTO agreements, by pushing for the liberalization of crucial markets, are threatening the food security of whole communities." (WHO, 2013)

This project does not seek to produce food on a scale to feed each individual home but instead proposes a space in the city where the importance of food is celebrated. The intervention will produce enough food to run a school, and some restaurants, but will need to be supplemented with an additional variety of food products (which cannot be produced on site) such as meat, grains and raw coffee beans. These other products will be sourced from local farmers and fair trade producers who will be given the

opportunity to make a direct connection to their customer base in the market. In this way, food production is localized to a region, farmers have a direct customer base and the demand for quality can be met as the customer is not buying from a faceless corporation.

If food production is only seen as a source of revenue for a country by exporting goods then the importance of food has already been lost. Food needs to be viewed less as a commodity for increasing economic strength and more as a sustaining life force for individuals and communities.

1.3 Problem Statement

Due to defined boundaries like those between cities and food producing areas, Pretoria has been planned with mono-functional intentions. There are separations between activities that take place in the city and even the ways existing features in the city have been adapted to promote mono-functionality. The rivers, for instance, have been channelized so that they are more functional in the urban environment. This means that the natural multifunctional aspects of the original river bank have been replaced with engineered, steep concrete channels which does not allow for natural relationships between life (plants, animals and people) and the water. This approach to the city's development means that there are now mono-functional areas that allow for minimal usage of any one space in the city. The objective of this dissertation is to respond to the existing spaces in a new way to promote and enhance multifunctional activity.

1.4 ISSUES

1.4.1 General Issue

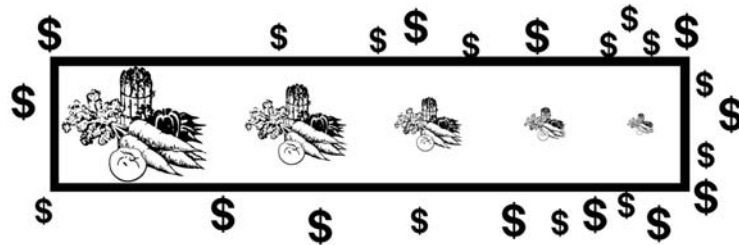


Fig. 3: Food security diagram

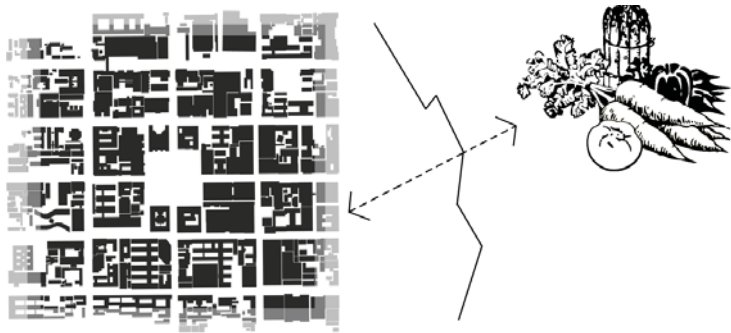


Fig. 4: Divorce from city and food production

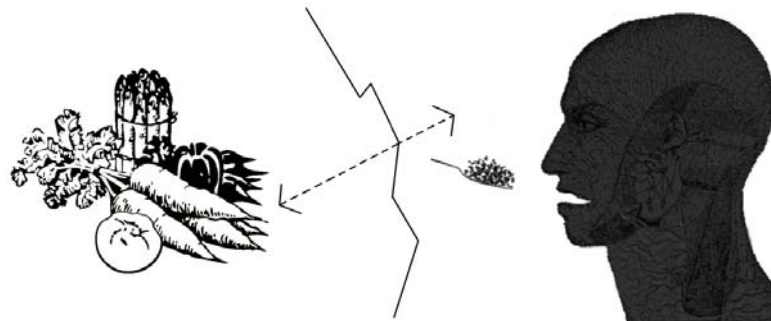


Fig. 5: Divorce between food production and consumption

1.4.2 Urban Issue

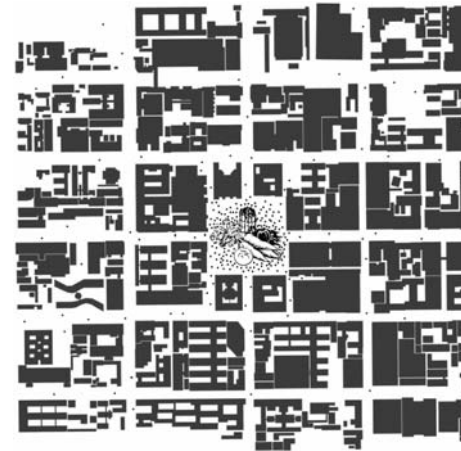


Fig. 6: Limited social activity around food

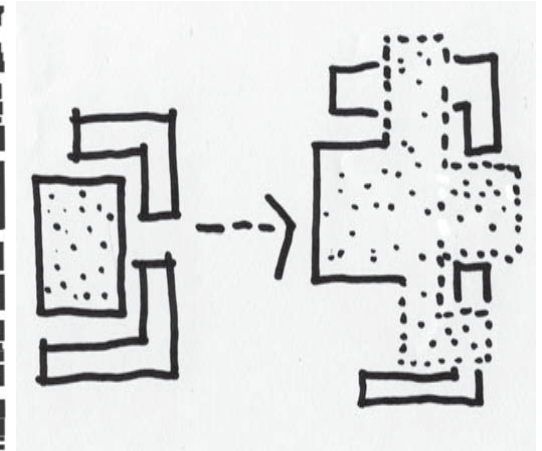


Fig. 7: Divorce between urban open space and buildings

1.4.3 Architectural Issue

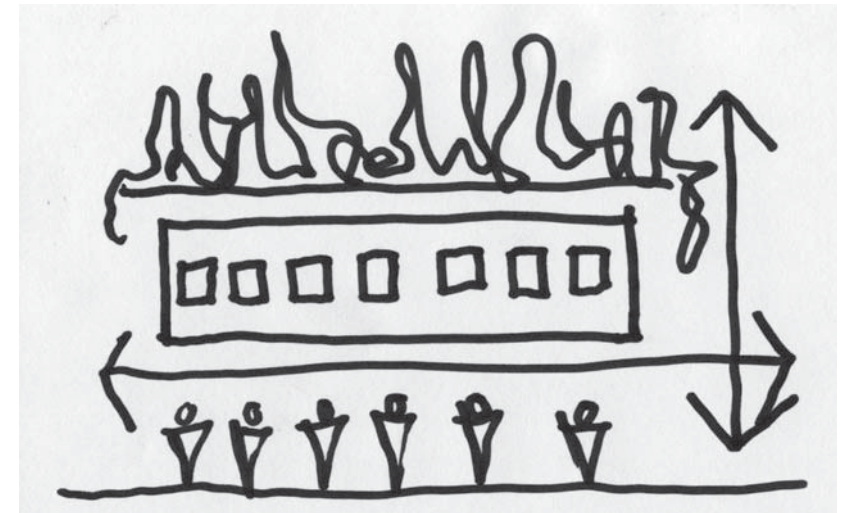


Fig. 8: An architecture that fosters unification of: production to consumption, relationship between public + building & social activity

1.5 Design Hypothesis

This section outlines a number of principles that are imperative to the design of the scheme, namely:

1. Relating design to the everyday living of urban dwellers.
2. The creation of spaces that allow the natural change that comes with contemporary lifestyles.
3. The creation of spaces around people's needs, including social interaction, traversing of the city, experiential qualities and the usability of both public and private places.
4. The need for boundaries in designing spaces for contemporary lifestyles is vital, though boundaries need not be impermeable walls between private and public realms (Van Rensburg & Da Costa, unpublished; 34). Contemporary architecture is often dictated more by consumerism than by site or climate. For example, shopping centers such as Menlyn Park are designed to keep people inside and entice them to buy as much as possible.
5. Surfaces and spaces need to be included in a building where people can sit or rest on a hot day, and where people can stop to greet one another whilst not getting in the way of other users.
6. Buildings should operate like organisms that are part of a greater system. A symbiotic relationship should occur between the users and the building itself. The building should generate facilities that the users need, such as power, water, and food, as well as rehabilitating spaces that allow users to feel good. The users should give back to the building by responding to the function or program in order to prolong the service the building provides. With this relationship between user and building, a healthier and more active city can be produced.

1.6 Research Questions

1. Food security

Due to the fact that farms operate independently from local retail source, produce has to be transported to central distribution centers where either:

- a) retailers purchase the produce which is distributed via street vendors to the public, or
- b) it is transported, again, to retail outlets.

Though this process is efficient in a purely economic sense, it means that as government levies increases in inflation and fuel costs etc., the increasing cost of products and produce is out of the consumer's control.

Due to political change, the concentration of people in city centers for work prospects has led to vagrancy and overcrowding, and put strain on existing facilities. This has had a negative impact on food security.

2. Non-living architecture & urban spaces

The many open spaces of Pretoria allow for a variety of interactions between people; Church Square, Burger's Park, Sammy Marks Square, inter alia. These spaces are utilized every day for meeting, having lunch, and enjoying the good weather. However, none provide city dwellers with anything more than an open space where spontaneous activities are lacking.

Buildings tend to be designed to create stark boundaries between outside and inside, public and private. Public spaces are protected by spikes on walls that are at sitting height and security guards chase people away for lingering. Buildings that provide sociable spaces are lacking – the norm has become introverted, artificially controlled environments.

From the above, the question arises:

Can the dichotomy of urban food security and architecture that promotes public activities provide spaces that enhance social cohesion?

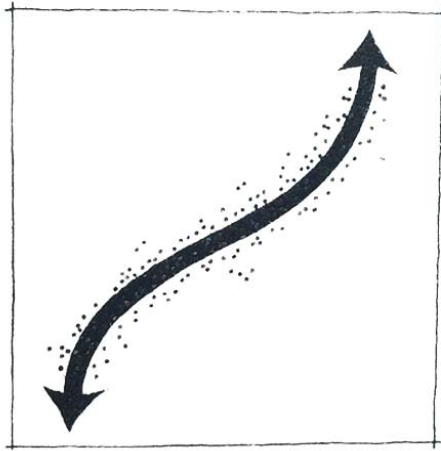


Fig. 9: Assemble or disperse

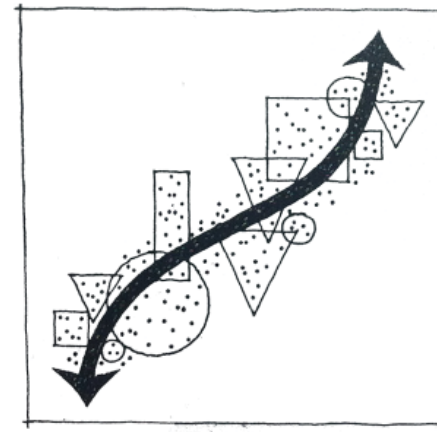
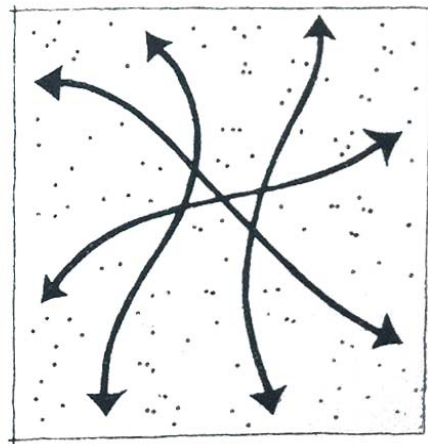


Fig. 10: Integrate or segregate

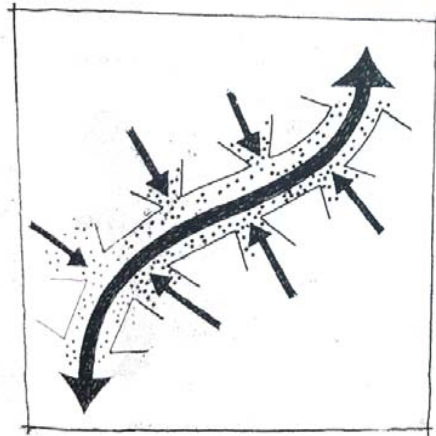
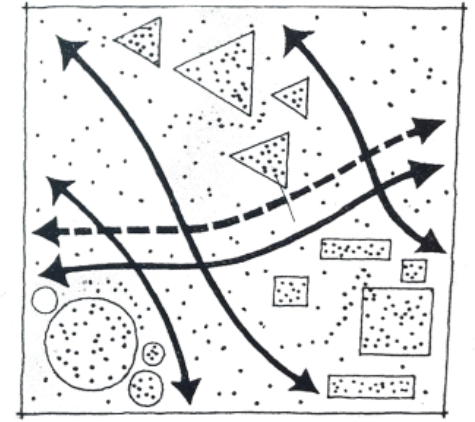


Fig. 11: Invite or repel

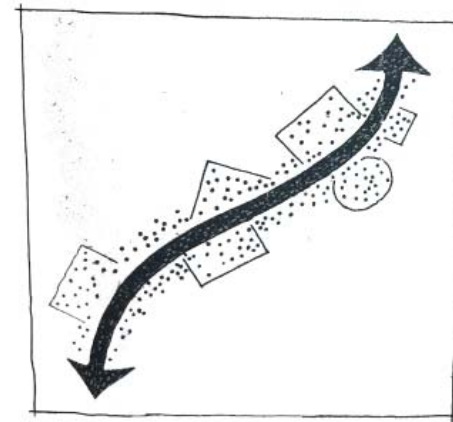
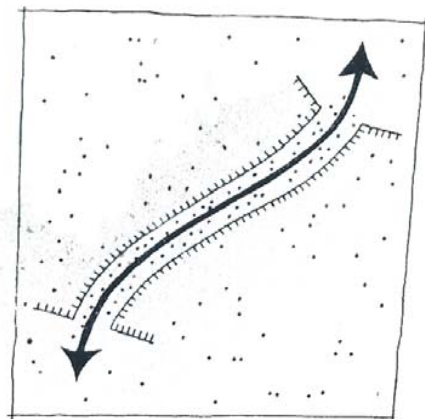


Fig. 12: Open up or close in

THEORY

2.1 Gehl - Life Between Buildings

"To be able to move about easily and confidently, to be able to linger in cities and building complexes, to be able to take pleasure in spaces, buildings, and city life, and to be able to meet and get together with other people – informally or in more organized fashion – these are fundamental to good cities and good building projects today, as in the past." (Gehl, 1987; 53)

The requirements in making space in an urban context are rooted in understanding how people utilize spaces. In this regard, relating design to the everyday living of urban dwellers will generate the creation of space that allows for the natural change that comes with contemporary lifestyles (Van den Burg cited in Van Rensburg & Da Costa, 34).

Gehl's book "Life Between Buildings" sets out to provide the reader with an understanding of how urban design can affect social activity. Gehl breaks down activity into simple acts like walking, standing, sitting, seeing, hearing and talking (Gehl, 1987; 131).

Through understanding of activities, Gehl provides a simple comprehension of the qualities which spaces can provide city dwellers. These spatial qualities include:

Assemble or Disperse: (Fig 09) "If activities and people are assembled, it is possible for individual events, as mentioned, to stimulate one another. Participants in a situation have the opportunity to experience and participate in other events. A self-reinforcing process can begin." (Gehl 1987; 83)

Integrate or Segregate: (Fig 10) These qualities denote two types of spaces that either allow mixing of different types of activities or create spaces that divide into mono-functional areas, i.e. a medieval city where "merchants, craftsmen, rich and poor, young and old, necessarily had to live and work together" as opposed to a "functionalist city structure, in which separation of unlike functions was the goal." (Gehl, 1987; 103)

Invite or Repel: (Fig 11) "Specific spaces in the city and in residential areas can be inviting and easily accessible and thus encourage people and activities to move from the private to the public environment." (Gehl 1987; 115)

Open Up or Close In: (Fig 12) "Contact through experience between what is taking place in the public environment and what is taking place in the adjacent residences, shops, factories, workshops, and communal buildings can be a marked extension and enrichment of possibilities for experiences, in both directions." (Gehl, 1987; 123)

Gehl's theory teaches that spaces in the city must be created for people to live comfortably. This can be achieved by designing spaces which create a harmonious relationship between public and private space in the threshold between the two.

To this end implied discreet design interventions are preferable to physical barriers. For example, a permeable ground floor that provides public space, such as a restaurant, allows the choice of whether people cross through the space or walk around it. Rogers states that by incorporating good social public spaces between private or commercial buildings it allows for growth and bonding in society (Rogers, 1997; 15).

The design of urban spaces where the functions of the city are separated into work, sleep and relaxation is in antithesis with Rogers' approach. Where functions are not mixed the result is a CBD which becomes a ghost town and dangerous after 5pm, while suburbs are empty sprawling developments devoid of life during working hours. In this scenario residents once again need to climb into the motorcar to drive to the nearest cinema or theatre for relaxation and entertainment.

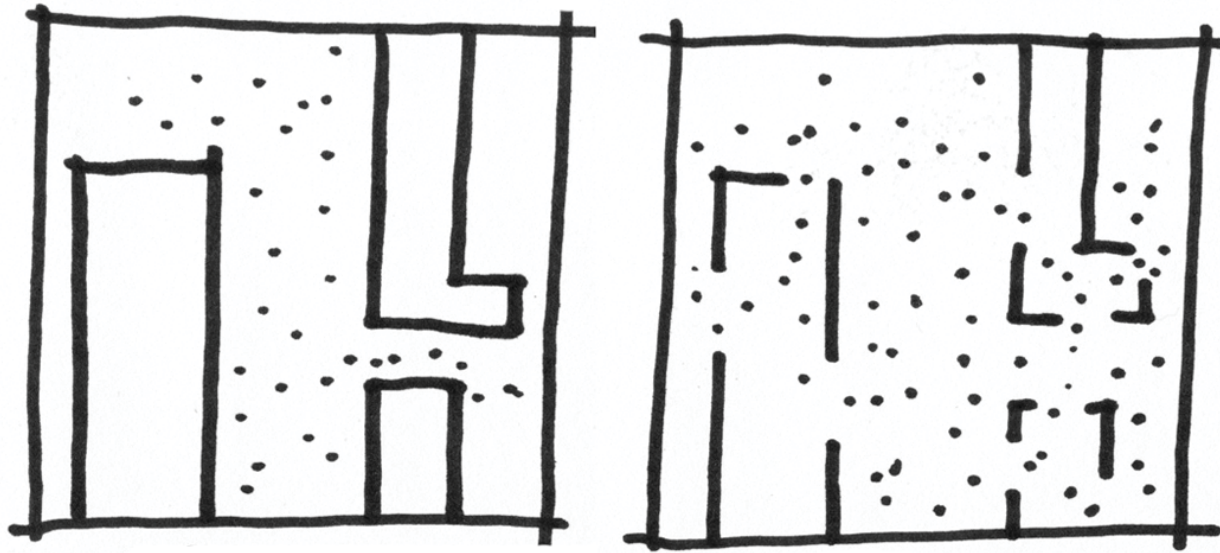


Fig. 13: Life between buildings becomes life in and around buildings

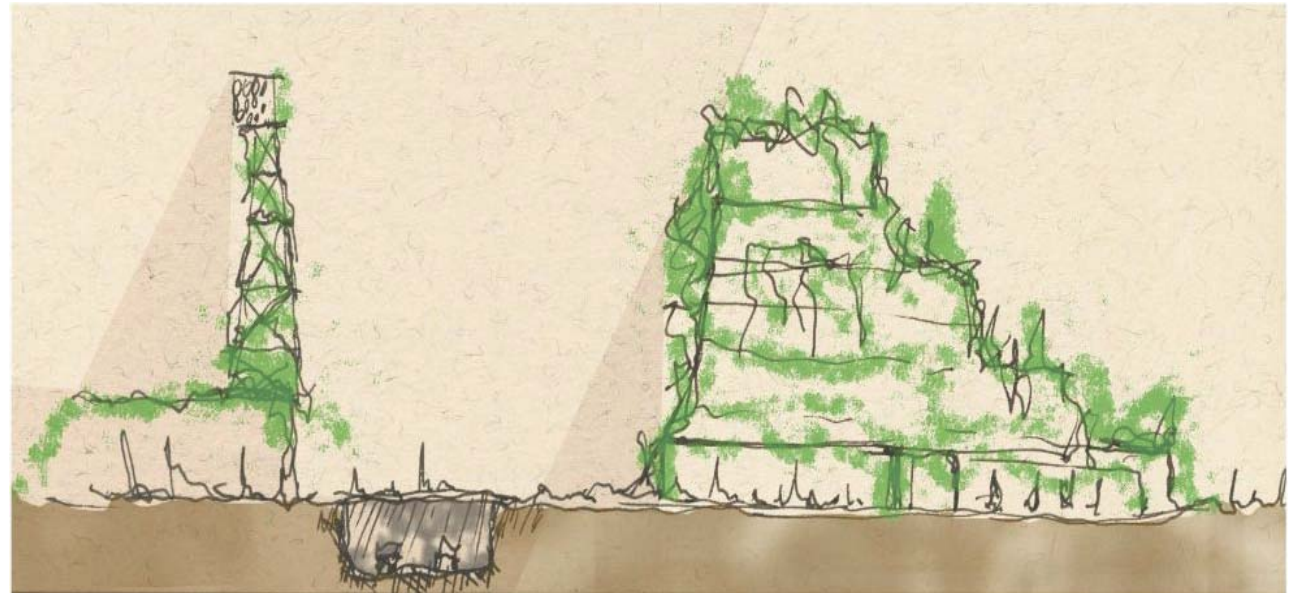


Fig. 14: Section through urban context allowing life to prevail

2.2 Biophilia

2.2.1 Overview

Biophilia is a term first coined by biologist Edward O. Wilson in his book, of the same name, in 1984. Wilson defines the term as "...the tendency to focus on life and lifelike processes" (Wilson, 1984; 1). His theory of biophilia is that human beings have a very close bond with all living things that has been ingrained into us during our complicated evolution (Wilson, 1984; 36).

Biophilic design is thus the practice of incorporating natural elements into the built environment.

"The fundamental objective of biophilic design is to elicit a positive, valued experience of nature in the human built environment." (Kellert, 2005; 124)

Biophilic design should not be confused with biomimicry. Biomimicry is the study of how nature works and the implementation of those systems into the built environment (Biomimicry Institute, 2007). Though biophilic design may incorporate biomimicry principles, the opposite is not necessarily true.

Biophilic design principles therefore aim to improve the built environment by increasing quality of life, as well as levels of health, education and productivity in workplaces.

Biophilia in the built environment has been faceted into many different fields and focuses on sustainability in terms of design, materiality and environmental potential, as well as on the psychological effects of such systems and designs on the inhabitants of buildings.

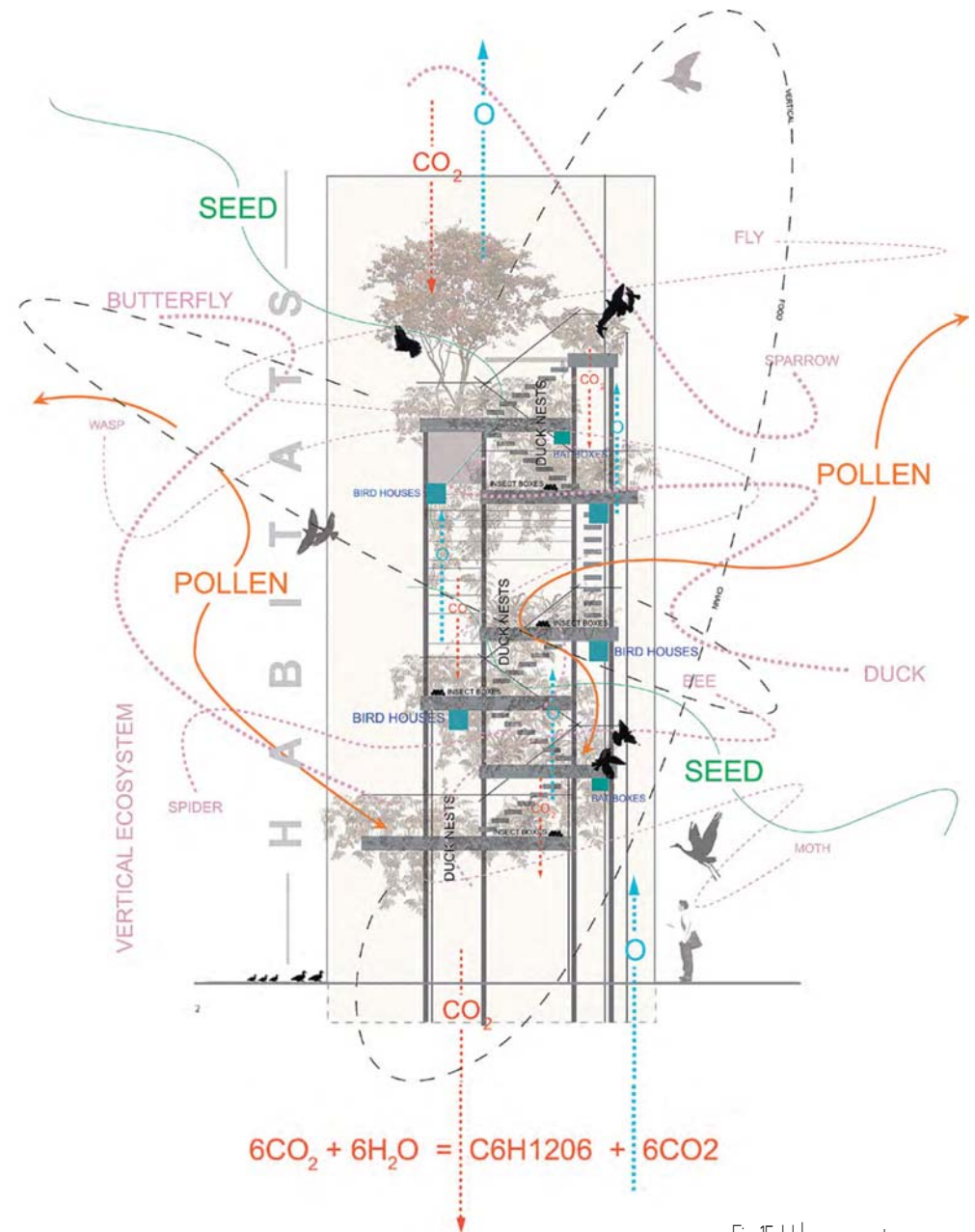


Fig. 15: Urban ecosystem

2.2.2 Benefits of Biophilic Design

Biophilic design is a more holistic view of sustainability. It incorporates processes of design that connect the users of the building with nature. It not only focuses on design materials and systems and processes of design that connect the users of the building with nature but also, in either a direct or indirect way, creates spaces that improve quality of living.

According to Kellert (2004;4), research has been carried out that proves the benefits of biophilic design; the following list indicates the specific fields:

- Passive and direct contact with nature enhances humans' health and physical recovery from surgery.
- Living in or near parks and green spaces reduces health problems, as compared to the health of people with no access to green spaces.
- Stronger communal ties are fostered in areas that are directly exposed to natural green spaces compared to areas that have no exposure.
- Natural lighting and ventilation increases quality of work and decreases stress.
- Cognitive performance on tasks requiring memory and concentration increases in spaces with natural lighting and ventilation.
- In schools, higher test scores and improved attendance has been noted in schools with enhanced natural light as well as greater teacher satisfaction, retention and productivity.
- Contact with nature has been proved to promote a restful state in people who are required to do complex work.
- The functioning of the human brain has been proved to be intrinsically tied to the sensory features and patterns of the natural environment.

In a report by Jeremy Faludi (Faludi, 2006) absenteeism in workplaces can decrease between 15 and 20 percent when biophilic principles are implemented. In retail, sales can increase by 40 percent just by utilizing natural day lighting. In office spaces financial gain is possible as just a 10 percent increase in worker productivity can fund a green retrofit, illustrating that biophilic design is not only an aesthetic concept that allows for people to enjoy spaces more but also a financially practical solution in workplaces and retail spaces alike.

Though the concept of biophilia is not new (the principle dates back to the early eighties), the practice of biophilic design, like sustainability, is only now being explored.

2.2.3 Principles of biophilic design

Guidelines set out for biophilic design include:

- Optimizing site potential and energy use;
- Protecting and conserving water;
- The use of environmentally preferred products;
- Enhancement of indoor environmental quality; and
- Optimization of operational and maintenance practices. (WBDG, 2008)

Although these principles are noble in their intent and will indeed alleviate the impact that the built environment has on the natural environment, in order to preserve the planet, buildings need to incorporate principles that give back to the environment more than that which they take away.

The Hannover Principles set out by McDonough (McDonough, 1999) offer another holistic solution to the problems the environment faces. The Principles emphasize the need to:

- Insist on rights of humanity and nature to coexist
- Recognize interdependence
- Respect relationships between spirit and matter
- Accept responsibility for the consequences of design
- Create safe objects of long-term value
- Eliminate the concept of waste
- Rely on natural energy flows
- Understand the limitations of design
- Seek constant improvement by the sharing of knowledge

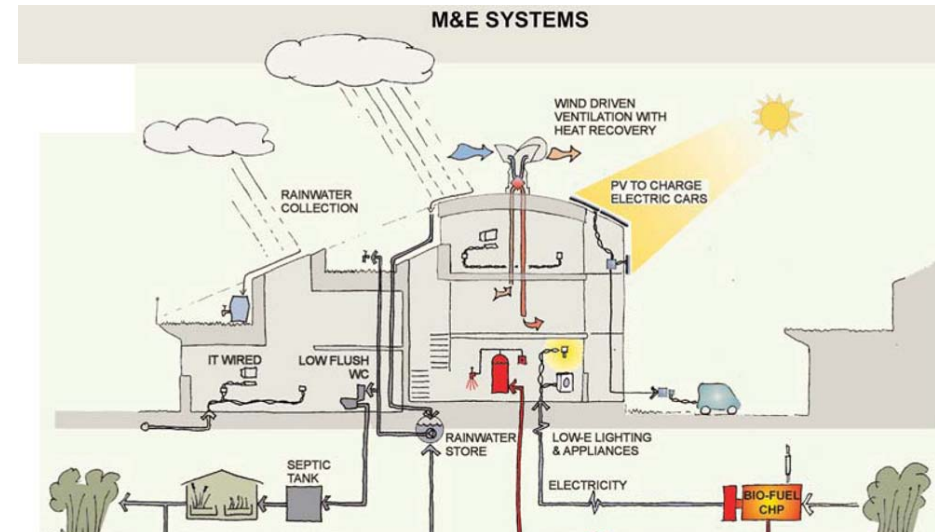


Fig. 16: Section of Beddington Zero Energy Development showing reticulation systems

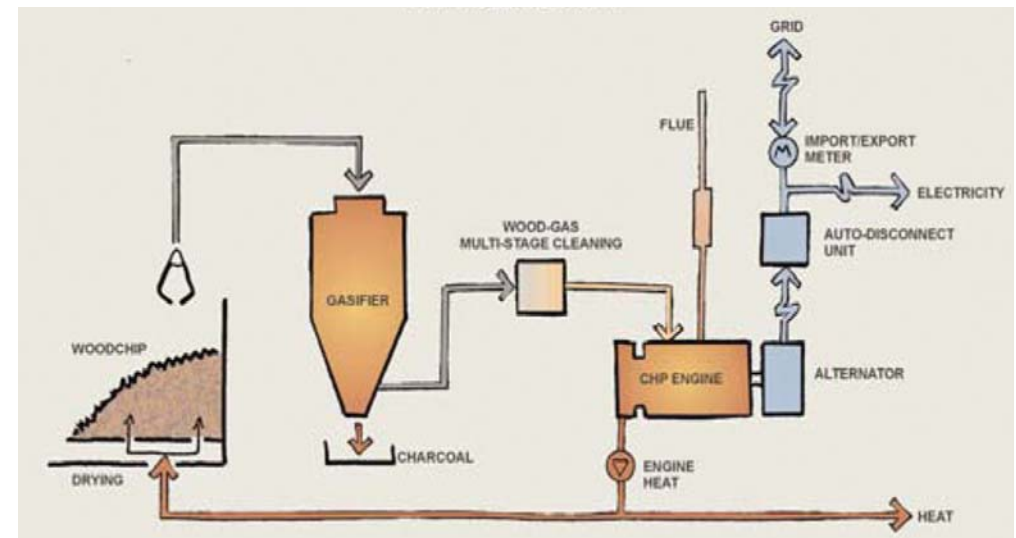


Fig. 17: Beddington Zero Energy Development combined heat and power plant



Fig 18: Site locality



Fig 19: Site panoramic photo from Pretorius Street

CONTEXT

3.1 Site

The criteria for the site selection were based on three key factors relating to the issues previously discussed.

1. **Water:** A source of water will be important for growing food in an urban context. The three options of a source of water within the city of Pretoria are the Apies River, Walker Spruit and the Steenhoven Spruit in Marabastad.
2. **Strong residential community:** There is a general lack of spaces that allow for localised social interaction of the dwellers of the city. For social interaction to be longer lasting, the site needs to be close to a residential area that allows for social interaction during the day and night.
3. **Pedestrian access and movement:** This aspect relates to a traversable city, specifically for pedestrians. The site needs to be located in an area where there is an opportunity to enhance pedestrian movement through the city.

Selection of the site

Three sites were studied and investigated for the suitability of the proposal:

1. Burgers Park
2. Marabastad
3. The corner of Nelson Mandela and Pretorius Street

Conclusion

The corner of Nelson Mandela and Pretorius Street incorporated all three of the site development criteria (i.e. a water source, a strong residential community and availability of pedestrian access and movement).

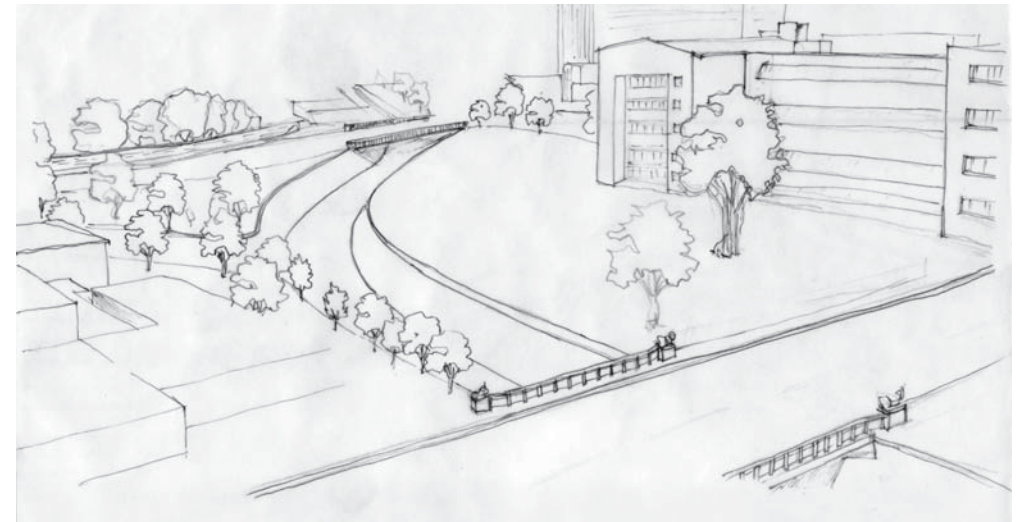


Fig. 20: Site perspective – Birds eye view from Church Street



Fig. 21: Site perspective – From the corner of Nelson Mandela and Pretorius Street

Fig. 22: Site panoramic photo from Pretorius Street



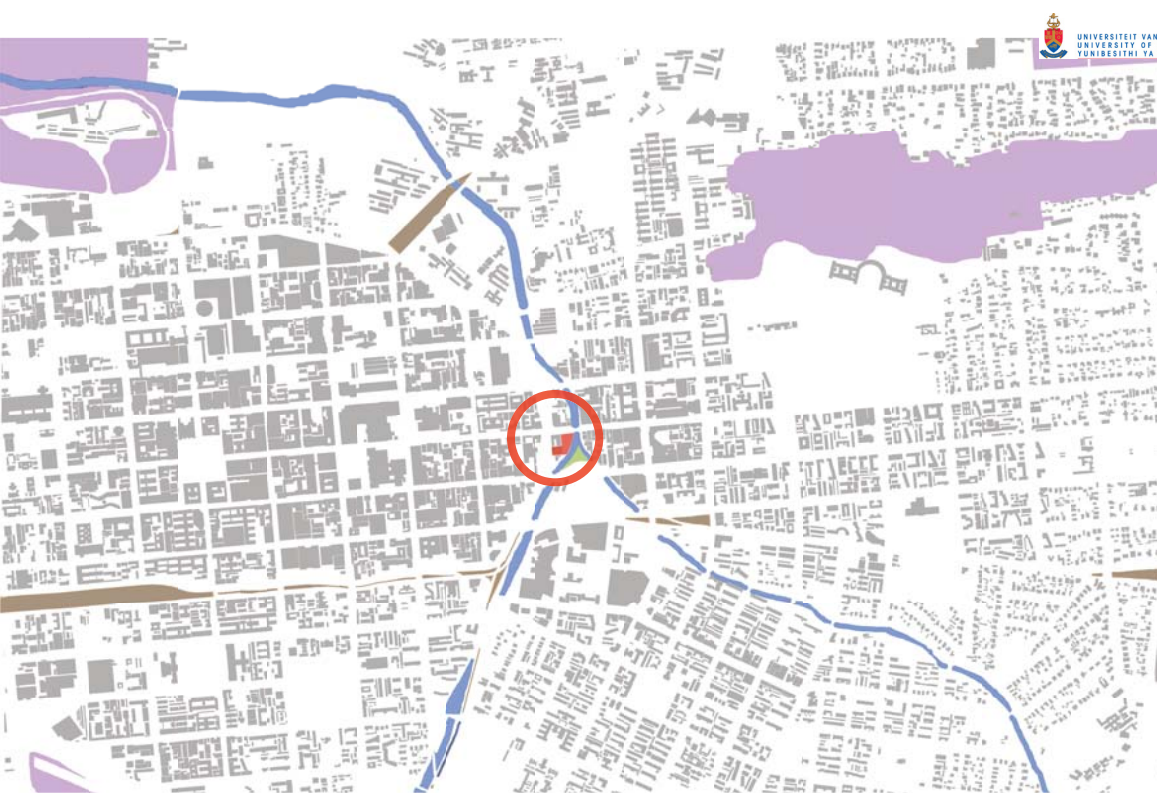


Fig. 23. (above) Municipal undeveloped soft landscapes

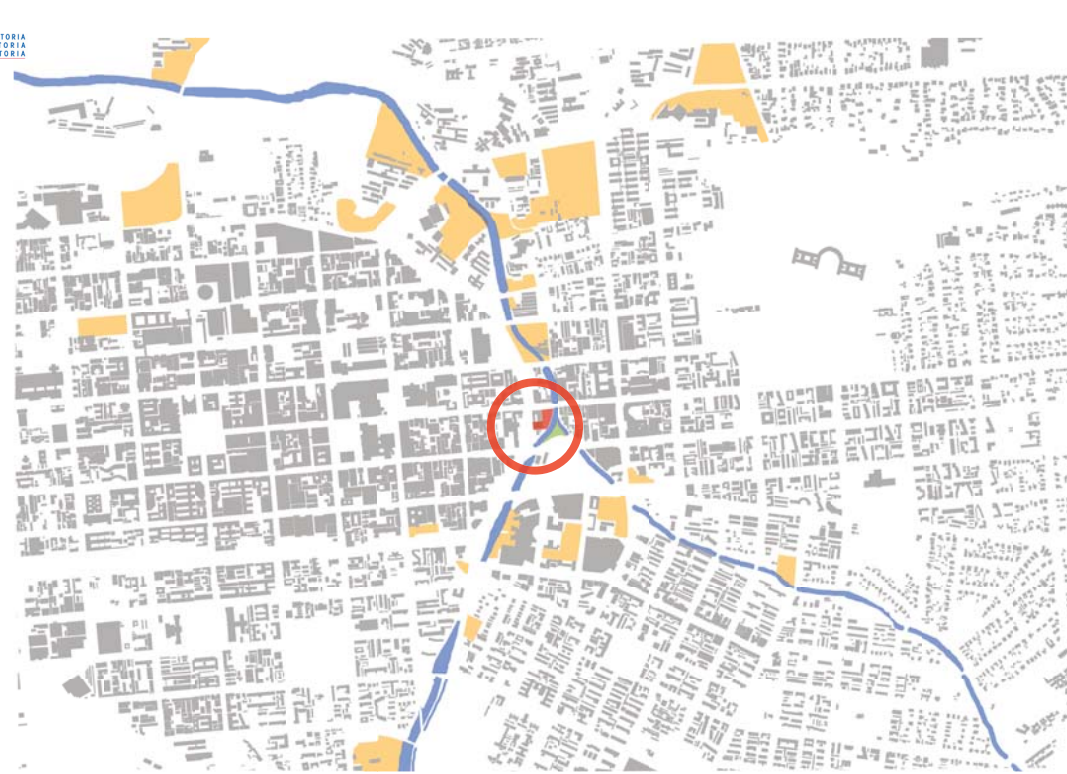


Fig. 25. (above) Private recreational soft landscapes

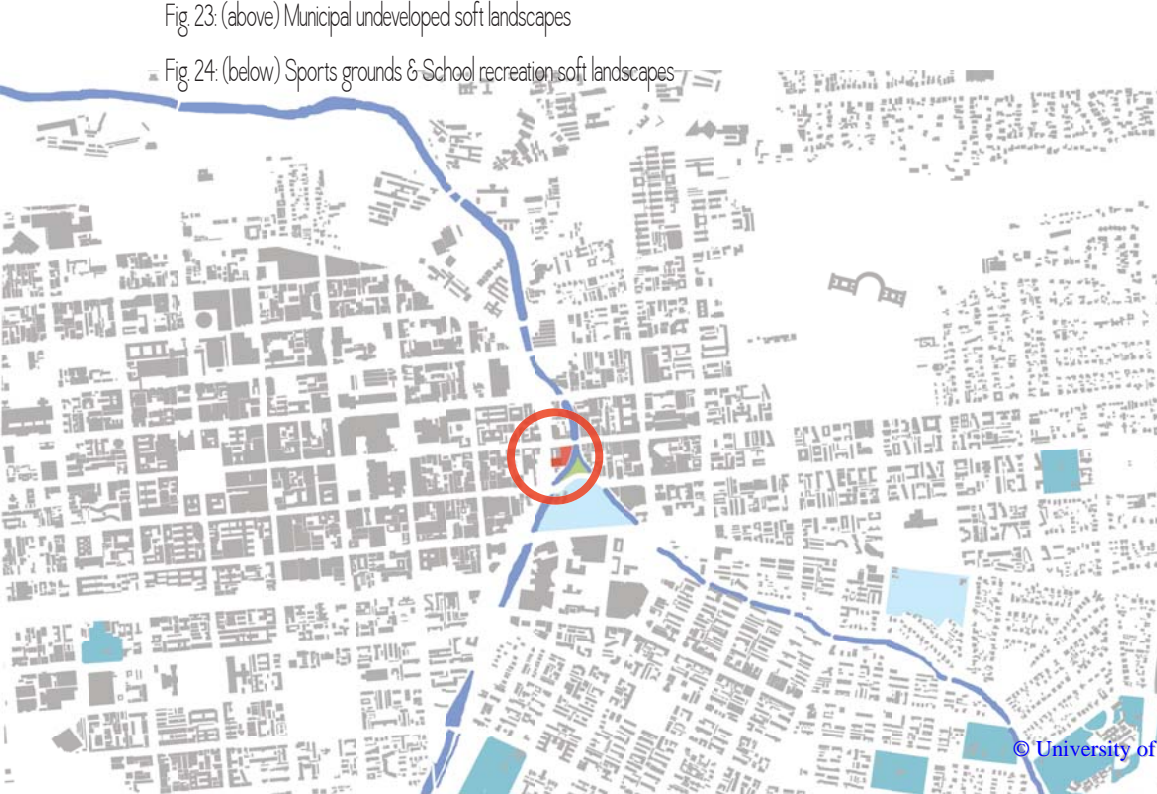


Fig. 24. (below) Sports grounds & School recreation soft landscapes

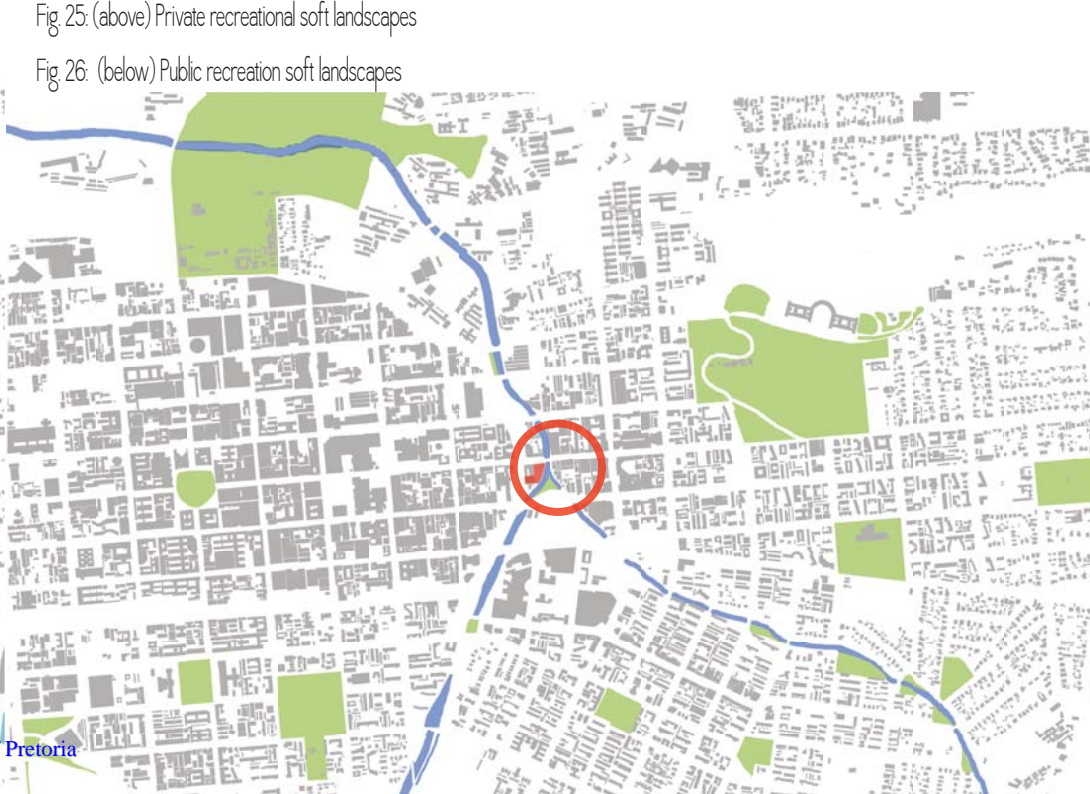


Fig. 26. (below) Public recreation soft landscapes

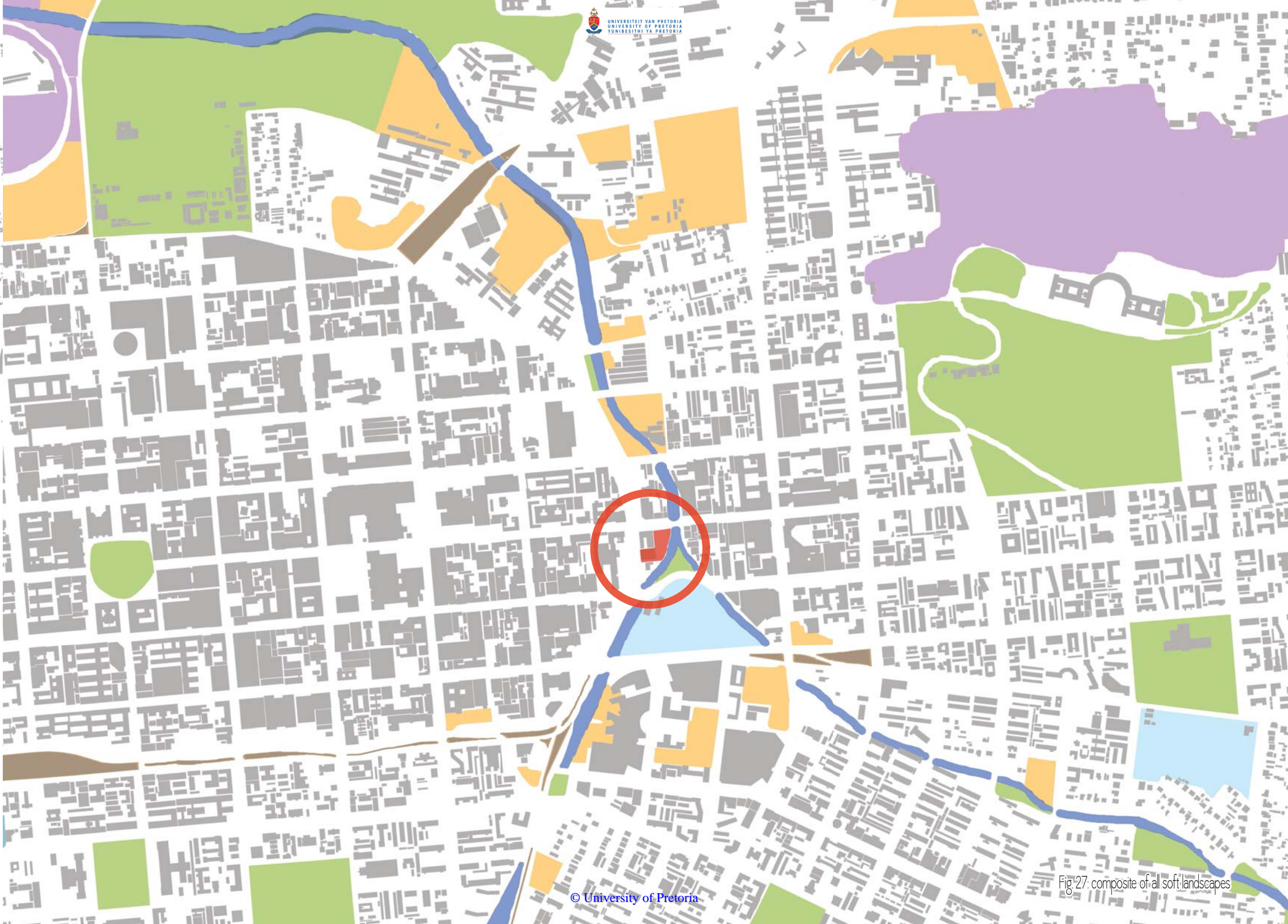


Fig 27: composite of all soft landscapes



Fig.28:River mapping

3.2 River Mapping

The theoretical position is that by understanding what happens to the open green spaces in an established residential neighbourhood one can plan the use of a site to its full potential. All the open green spaces of Pretoria were therefore mapped and their characteristics analysed to fully understand how these spaces are currently being used in the city. The area in Sunnyside along Walker Spruit is a viable study as it includes both open public green spaces as well as a stream.

A graphical analysis (Fig08) of the area was done to illustrate potential uses. It was determined that very little of the green space was currently utilized and those areas that were utilized were very sparse and neglected. Some street intersections allowed for social interaction through existing parks and informal trading but generally the buildings turned their back on the space and the pedestrian usability was especially minimal. It was determined that the programme of the thesis proposal for the selected site would have to be a drawing point that would then become a catalyst for the further full utilization of the river route through Sunnyside.



Fig 29: Apies river north of Lion Bridge



Fig 30: Apies river South of Lion Bridge

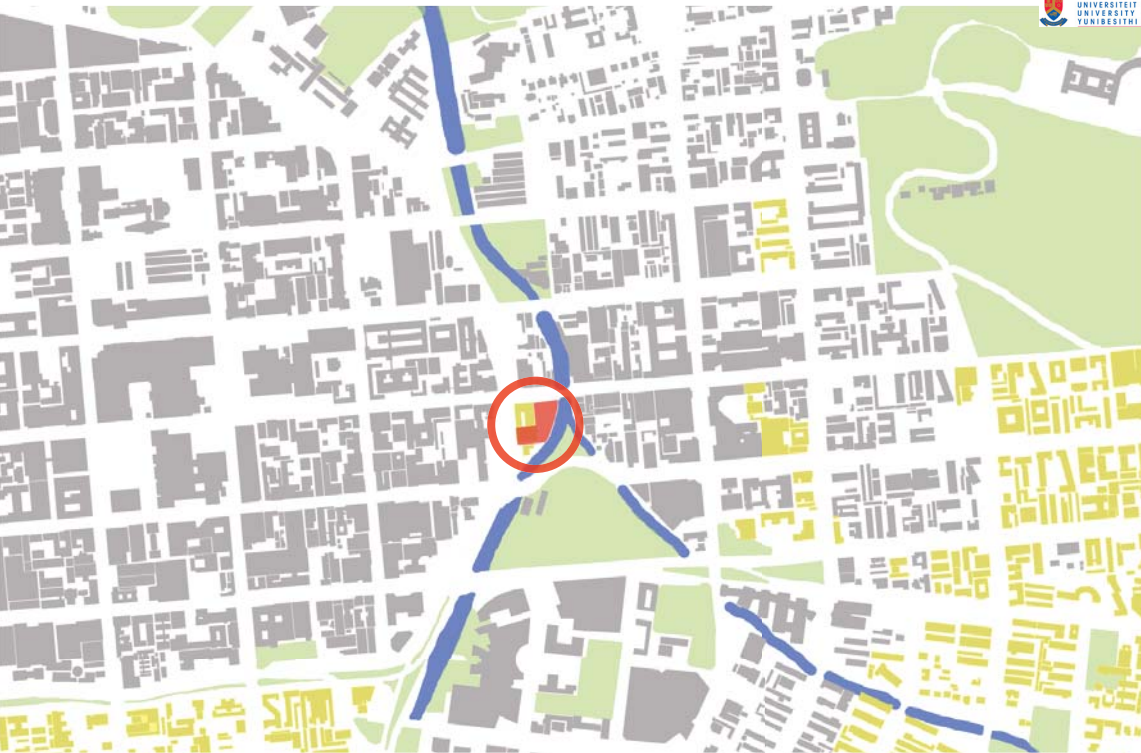


Fig 31: (above) Residential mapping

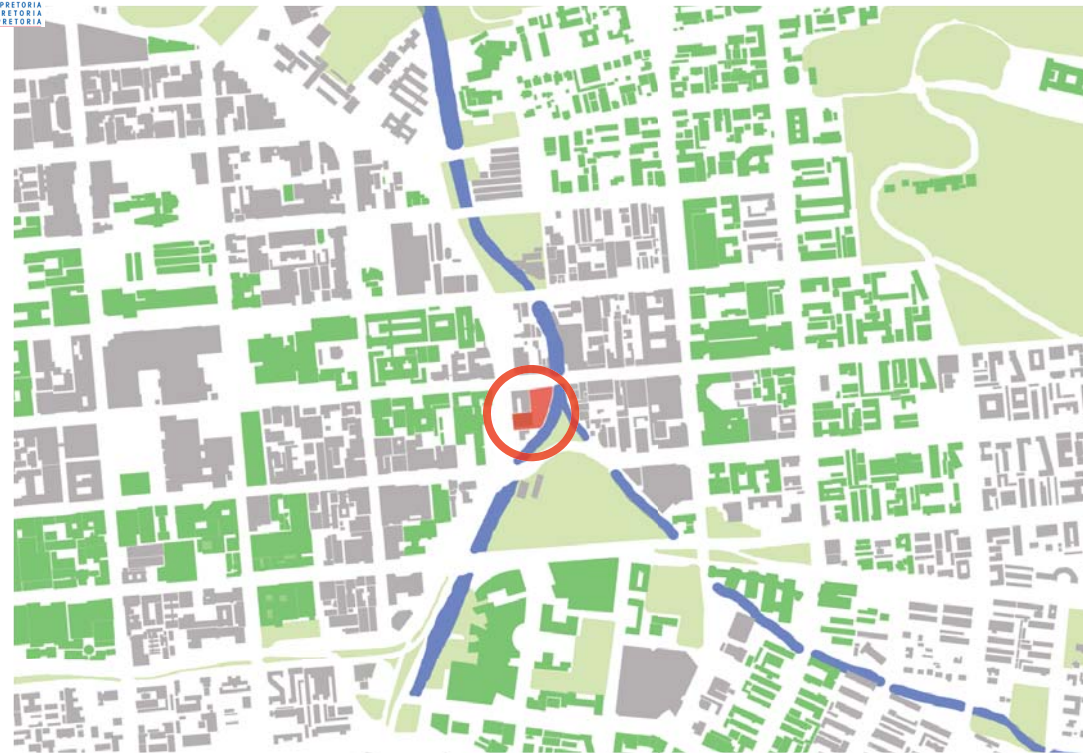


Fig 33: (above) Office mapping

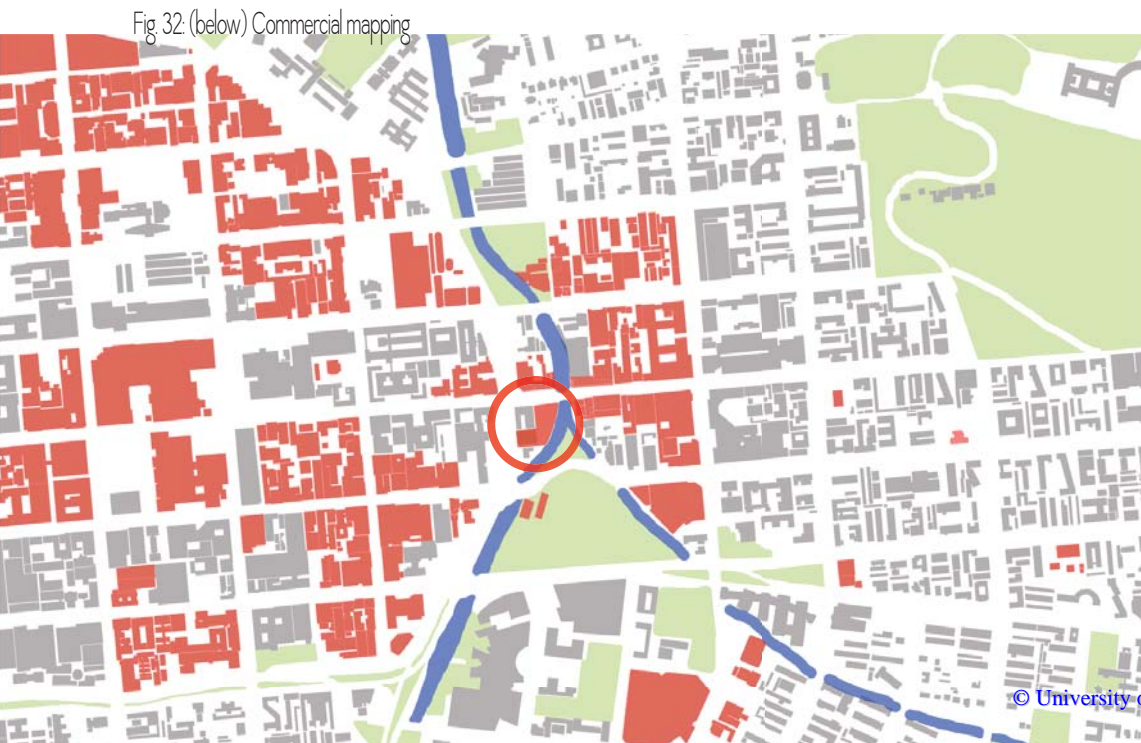


Fig 32: (below) Commercial mapping

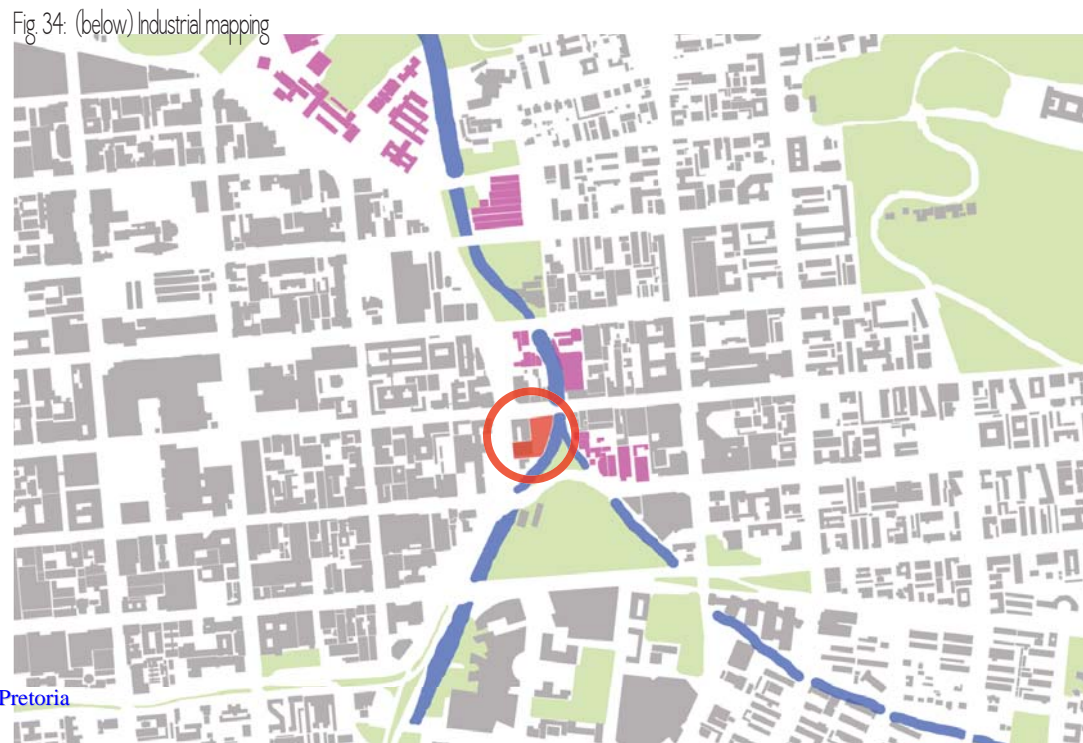


Fig 34: (below) Industrial mapping



Fig 35: Site selection criteria - river, residential, & major movement routes around site

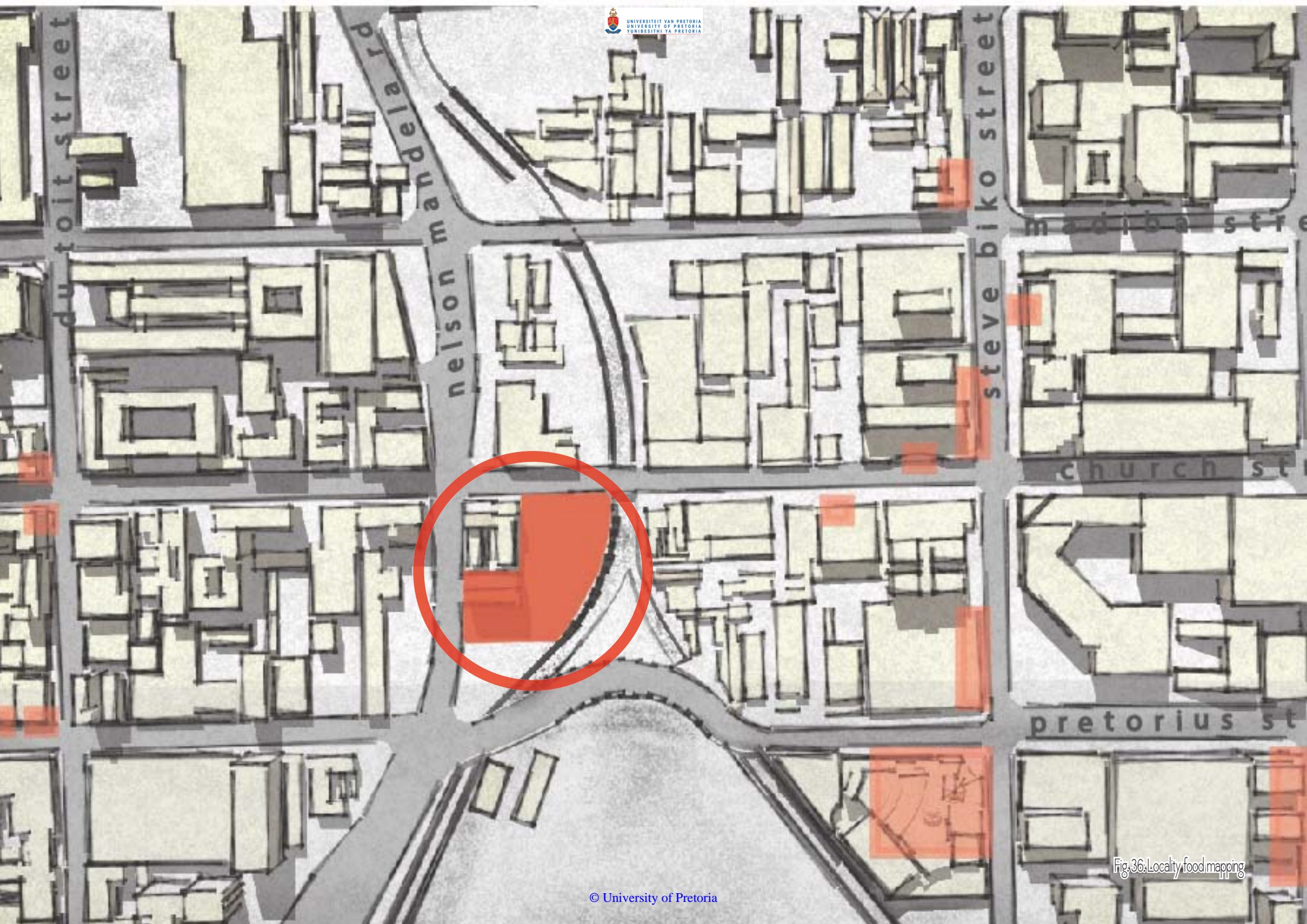


Fig.36: Locality food mapping

3.3 Site Analysis

The site has a number of challenging limitations which encourage incisive design interventions; limitations include the rivers that cut through it and high trafficked roads that separate it from pedestrian access. The site is located in a unique transitional part of the city. From Arcadia towards the CBD the buildings change in utilization from mostly residential and offices function to commercial and light industrial, with a reducing scale of buildings. Nelson Mandela Road is a threshold where the scale of the buildings starts increasing and becomes largely commercial and office block in nature. From this perspective it is apparent that the site needs to promote pedestrian movement and allow for more opportunities for people to cross the river. This will also increase the vibrancy of Walker Spruit through Sunnyside.

3.3.1 Site S.W.O.T. Analysis

Strengths:

- Ideally situated to become a valuable anchor point along a new movement route (river)
- Close to existing 24 hour node (Steve Biko Road)
- Current upgrading of commercial buildings (e.g. Sterland cinema complex along Pretorius Street)
- Brownfield site ideal for urban regeneration
- Close to Lion Bridge which has great heritage value
- Church Street identified as "red way" (a route of cultural and heritage importance as defined by the Tshwane Open Space Framework)

Weaknesses:

- Lack of pedestrian access
- River isolates part of the site
- Lack of existing movement or pedestrian use
- Pedestrians experience limited visibility of fast moving traffic around bend of Pretorius Street

Opportunities:

- Tshwane Urban Renewal framework earmarks Lion Bridge area as a future Arts, Leisure, Housing and Commerce Node
- Developments of this nature will increase pedestrian movement on Pretorius Street and make a social open space proposed on the site viable
- River: will contribute to urban regeneration by upgrading edges for pedestrian use
- Link to entertainment nodes (Sterland and Caledonian Stadium)
- Link to existing education facility (high school on Nelson Mandela Road)

Threats:

- Potential overcrowding after games at Caledonian Stadium
- Residential building which turns its back on site
- Vehicular traffic takes preference in area
- Current industrial use means large, heavy vehicles around site



Fig.37: Aerial photo of site 2011

Increased density and scale towards CBD

Changes in site topography

Decreased density and scale towards Arcadia

Nelson Mandela Road

Steve Biko Road

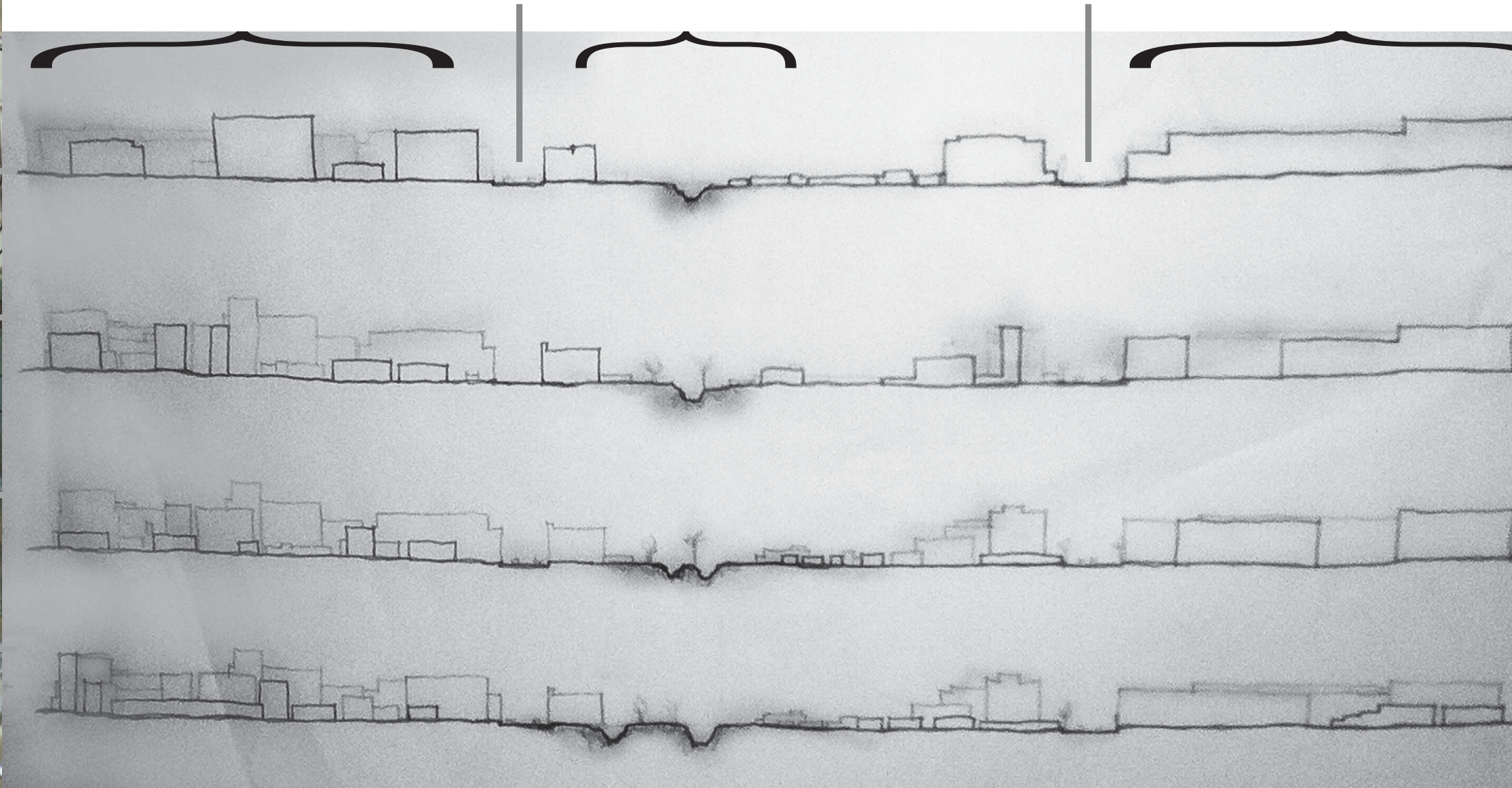


Fig 38: Site context in section

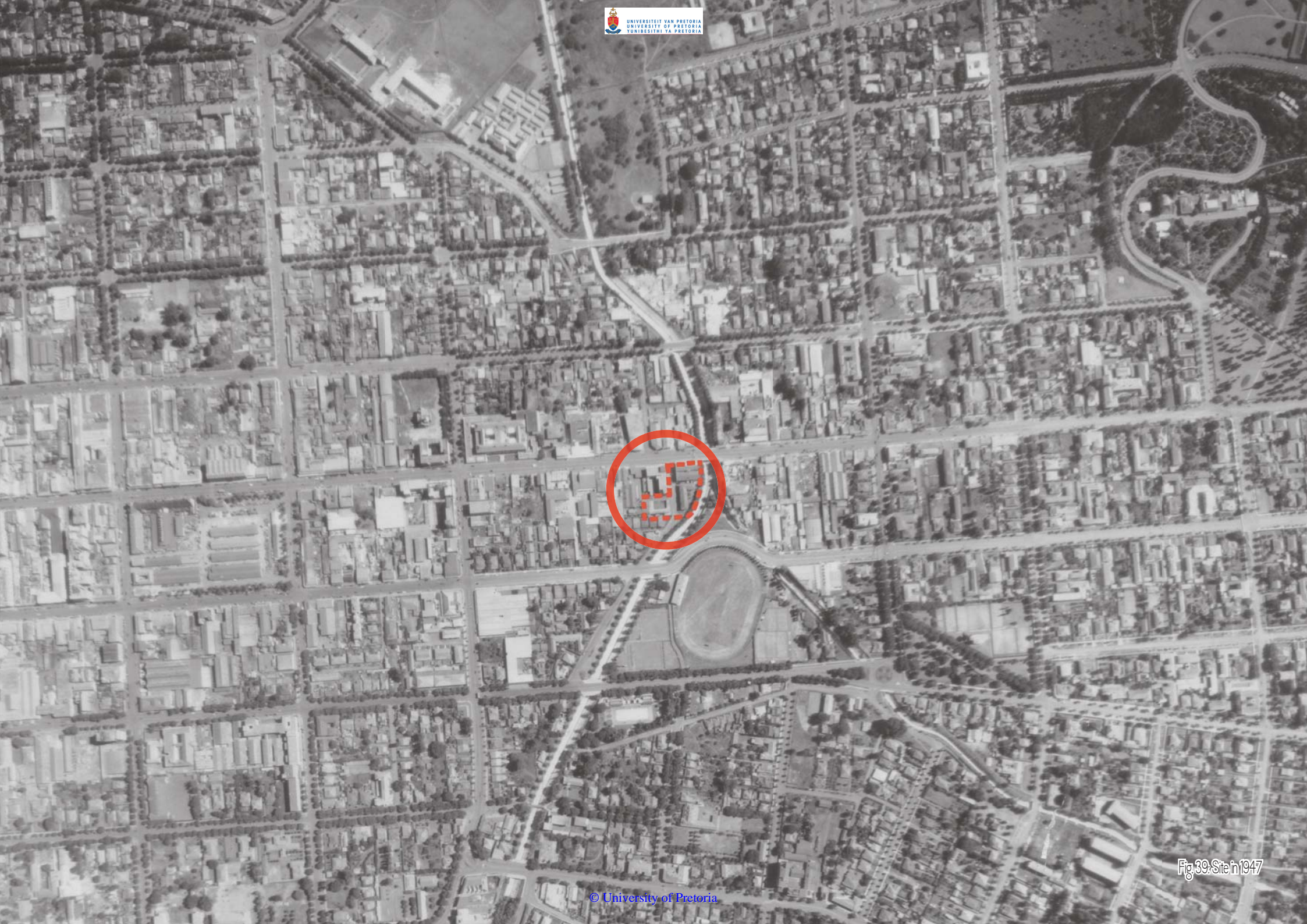


Fig 39: Stein 1947

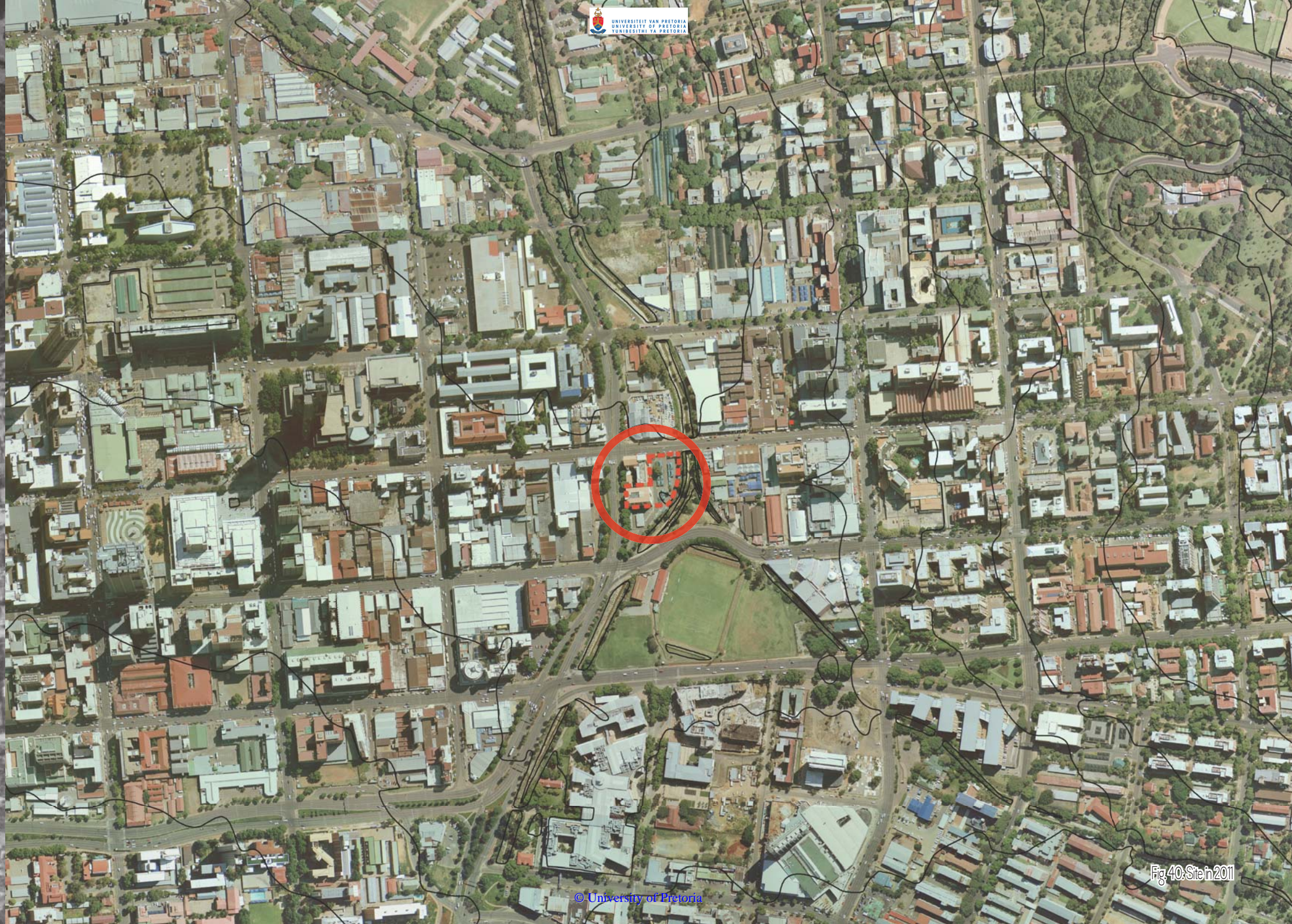


Fig.40:Stein 2011



Fig 41: (above) Meintjes House 1912

Fig 42: (below) Flour mill in 1899

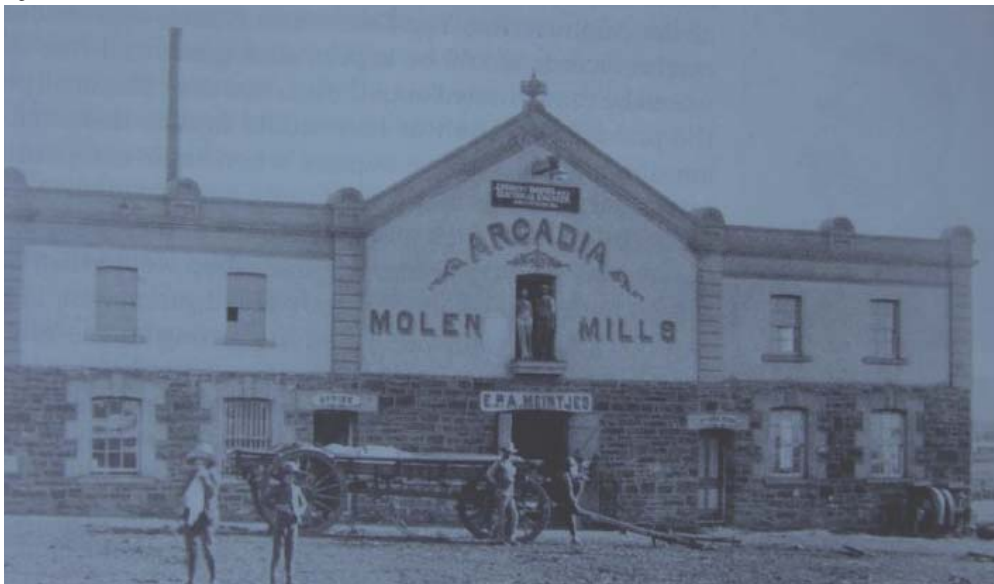


Fig 43: (above) Lion Bridge 1912

Fig 44: (below) Flour mill in 1912



3.4 Historical Background, Cultural and Heritage Context

3.4.1 Flour Mill

A strong layer of heritage relating to food is prevalent in the area. Andries Du Toit bought a part of President Pretorius' farm in 1858 and named this farm "Arcadia". It was a parcel of land south of where the Monument Buildings are now, between Du Toit Street and the Apies River (Andrews, 1999; 71).

Du Toit sold Arcadia to Stephanus Meintjes who erected Pretoria's first mill (Fig. 41) on the western bank of the Apies River (where Joel's Place apartment block is located). The Meintjes family lived across the road in Du Toit's old house, where the Chevrolet showroom now stands (Andrews, 1989; 45) (Fig. 39).

In 1887 Stephanus Meintjes sold his mill and grounds to his son, E.P.A. (Eddy) Meintjes who rebuilt the mill and renamed it "Arcadia Mill" (Swanepoel, 2007; 9) (Fig. 42).

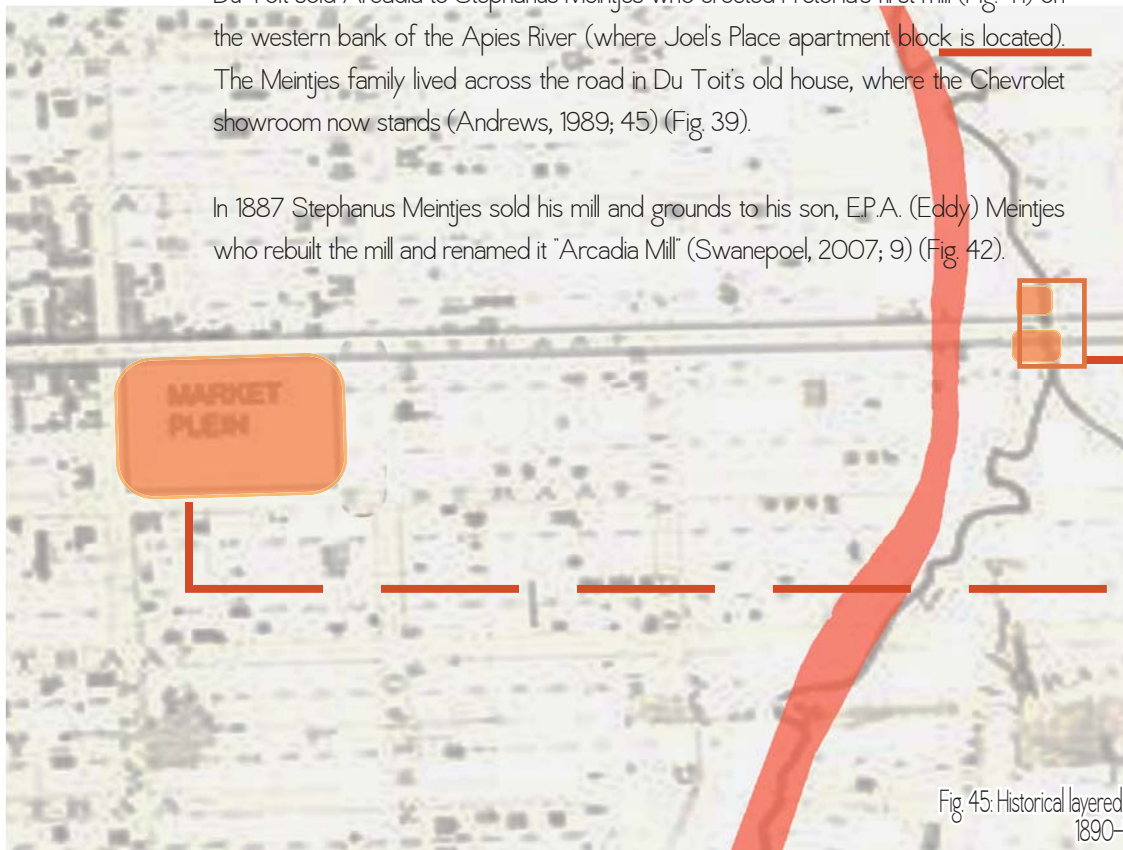


Fig. 45: Historical layered map 1890-1896

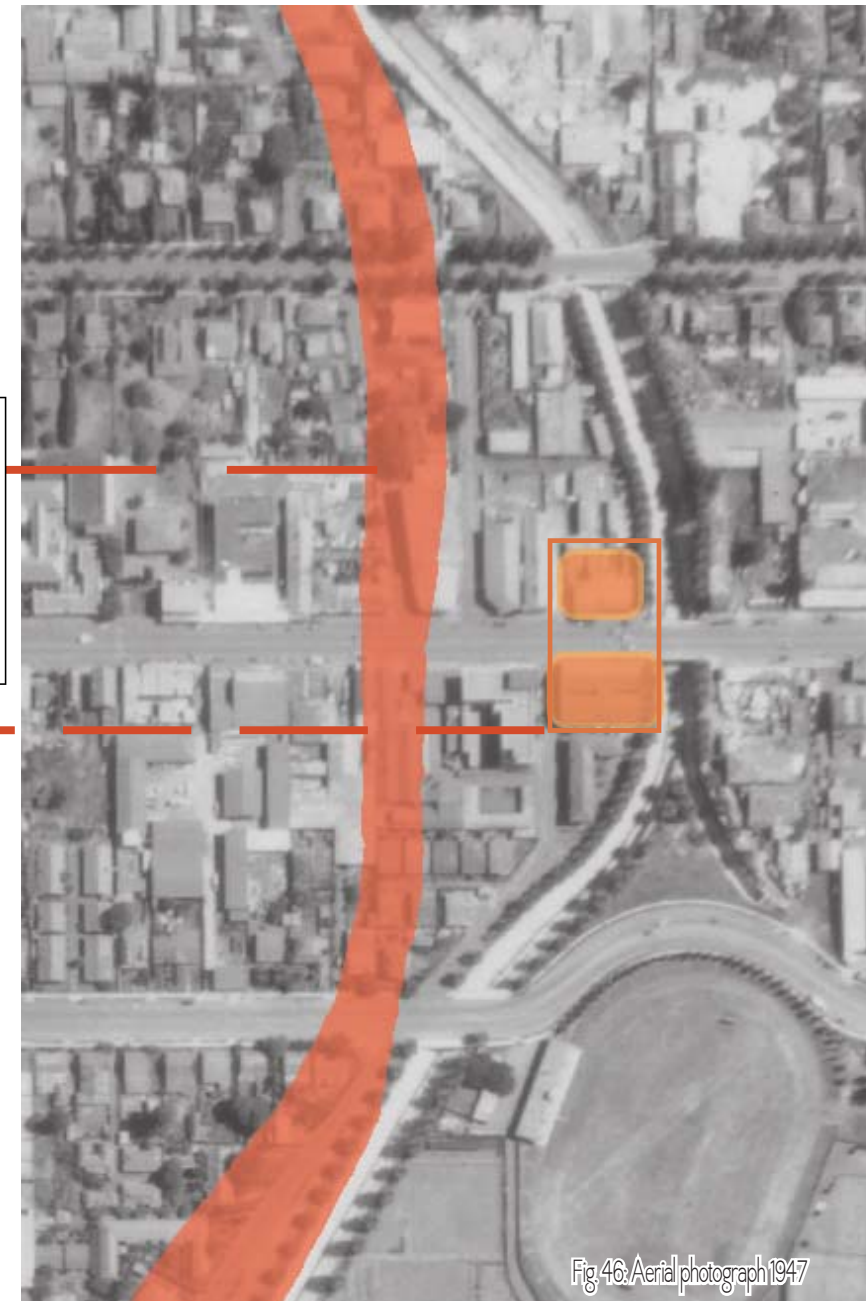


Fig. 46: Aerial photograph 1947

3.5 Design Informants

The design informants are spatial, regarding the site opportunities and weaknesses. The major elements on the site that provide opportunity are the rivers that intersect the site at three points. The Apies River and Walker Spruit converge at the apex of a triangle of green land that almost acts as an island as it is cut off from the south by Pretorius Street which is a very high traffic road.

Other opportunities to take advantage of are the low buildings to the north that will allow more sun to penetrate the site which will be beneficial for plant growth. The river itself is

a very important aspect to the intervention as it provides many enhancing characteristics to urban development (Alexander, 1977; 136). A promenade will run the length of the Apies River on the western bank through the site while the eastern bank will allow people to appreciate the river in a more relaxed atmosphere. Possibilities of water retention and open wetlands for collection and cleaning of collected/recycled water on the building site will be explored. This wetland will not be limited to the open land; the possibility of including the wetland on the building site will be explored too.

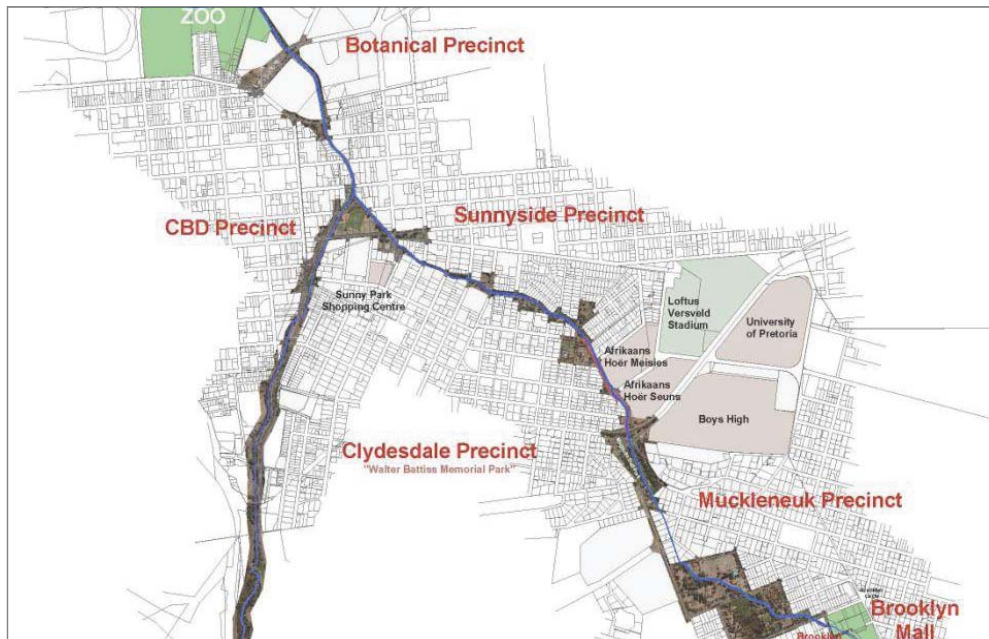


Fig 47: Consortium Fook framework phase 1

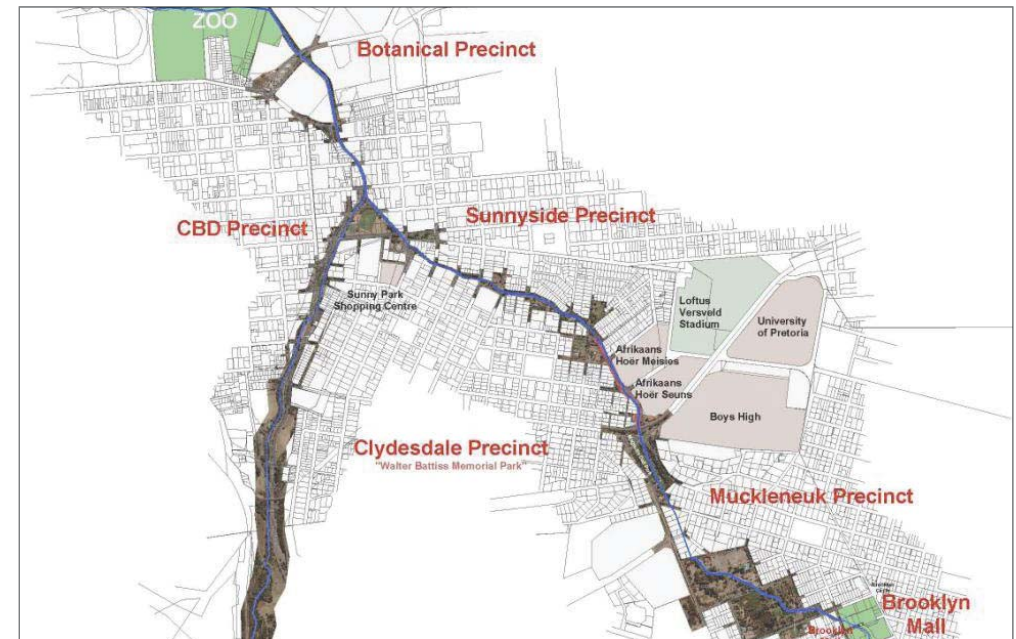


Fig 48: Consortium Fook framework phase 2

3.6 Urban Vision

The urban intentions include a proposed programmatic change of the light industrial buildings to the east to include more social activities such as dance schools, artist studios and a locally produced art market. This will strengthen the connection between the already busy Steve Biko Road and allow opportunities for pedestrian movement to become prevalent on Pretorius Road. Within the urban vision is an upgrade of Walker Spruit to become a major pedestrian route through the city in line with Consortium Fook’s proposal for “a Walter Battiss Community Park” along the banks of the river stretching from “...the Brooklyn Mall to the Pretoria Zoo” (Pretoria News, 2010). This injection of art

into the landscape will enhance the social cohesion of the site and complements Arup’s proposal for the city for an arts, leisure, housing and commercial node around Lion’s Bridge. Consortium Fook’s proposal also includes urban agriculture along the banks of the river for the surrounding community.

Architectural intentions include the building acting as a bridge for life (people) while creating an area of pause for social interaction and activity based around food (life), as well as being an attraction for people along these new routes within the city.

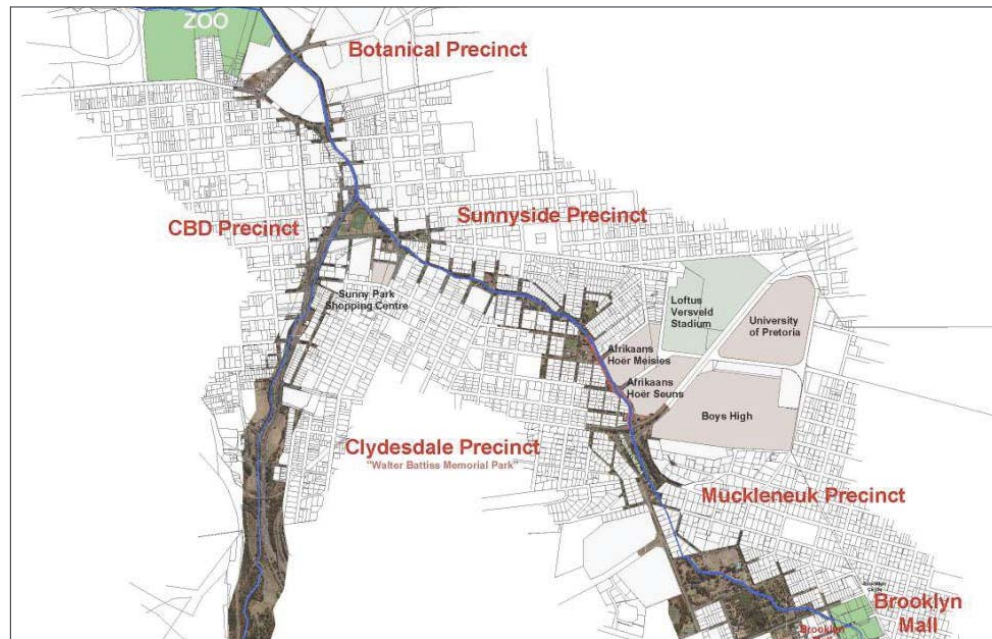


Fig. 49: Consortium Fook framework phase 3

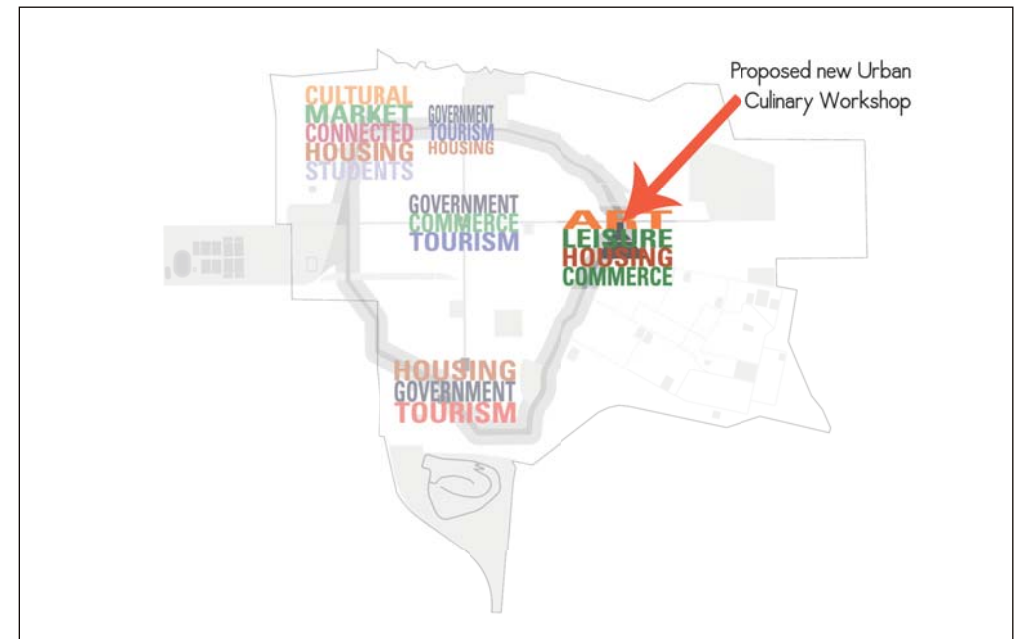
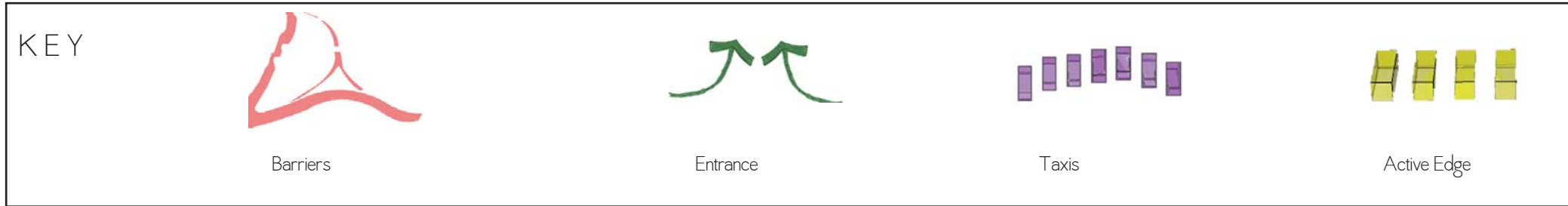


Fig. 50: Tshwane urban regeneration framework highlighting vicinity of site as art, leisure, housing & commerce node. Tshwane urban regeneration



3.6.1 Status Quo

Minimal site usage & entrances

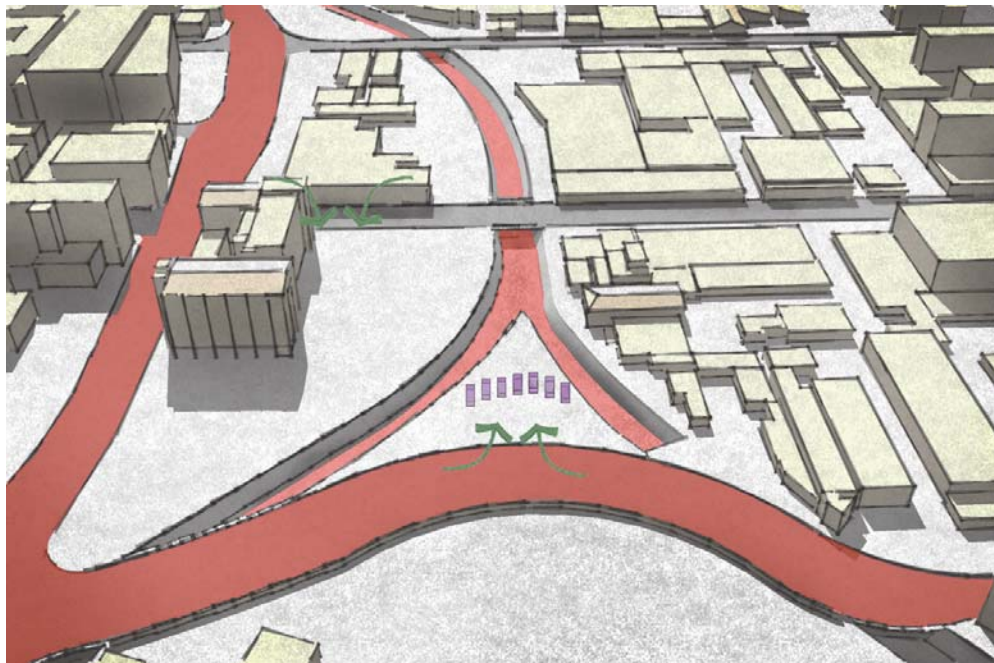


Fig 51: Site development phase 1 – status quo

3.6.2 1st intervention

Provide crossing over river allowing movement through site & activate Church Street edge

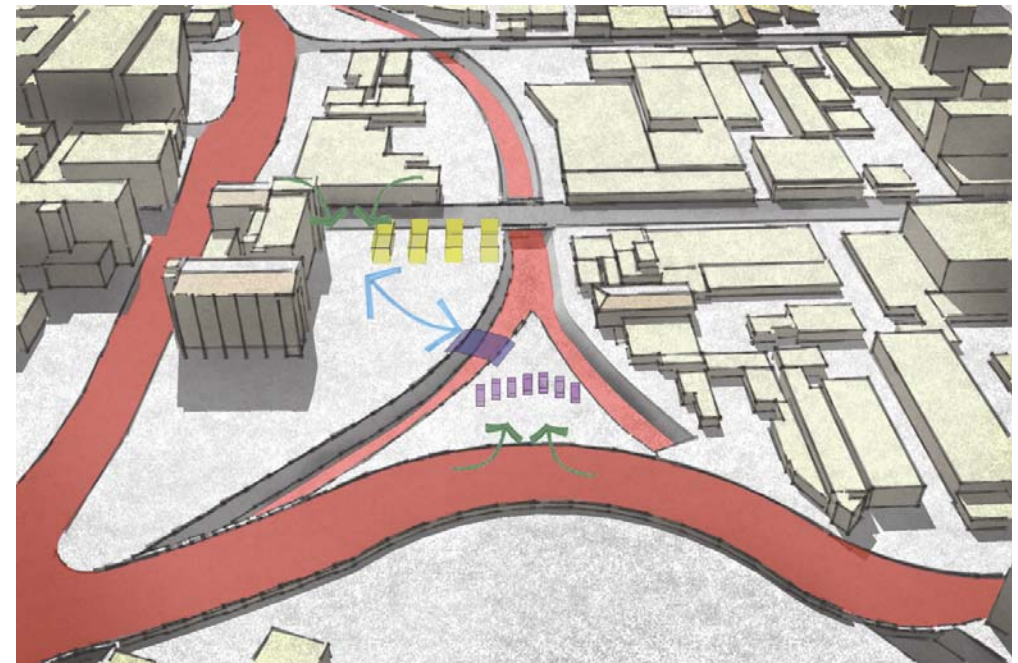


Fig 52: Site development phase 2 – active edge on Church Street & bridge river



3.6.3 2nd intervention

Provide alternative entrance to site, remove taxis & movement along river edge

3.6.4 3rd intervention

Expand activity through site, provide crossing over second river, add movement along eastern bank & re-programme light industrial buildings according to Arup Framework

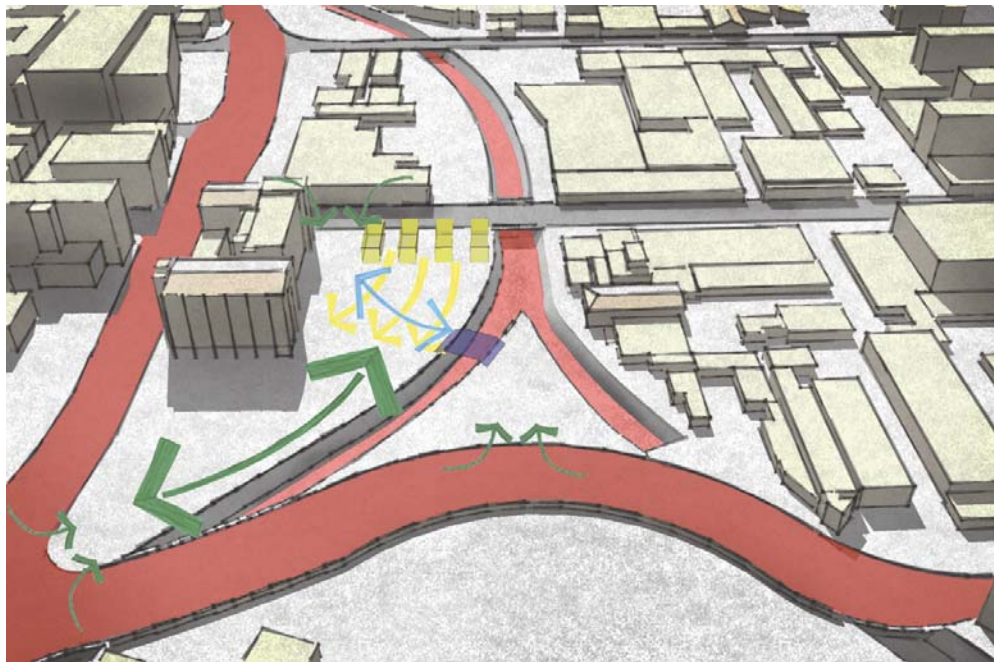


Fig. 53: Site development phase 3 – Active site, new entrance to south west & move taxis

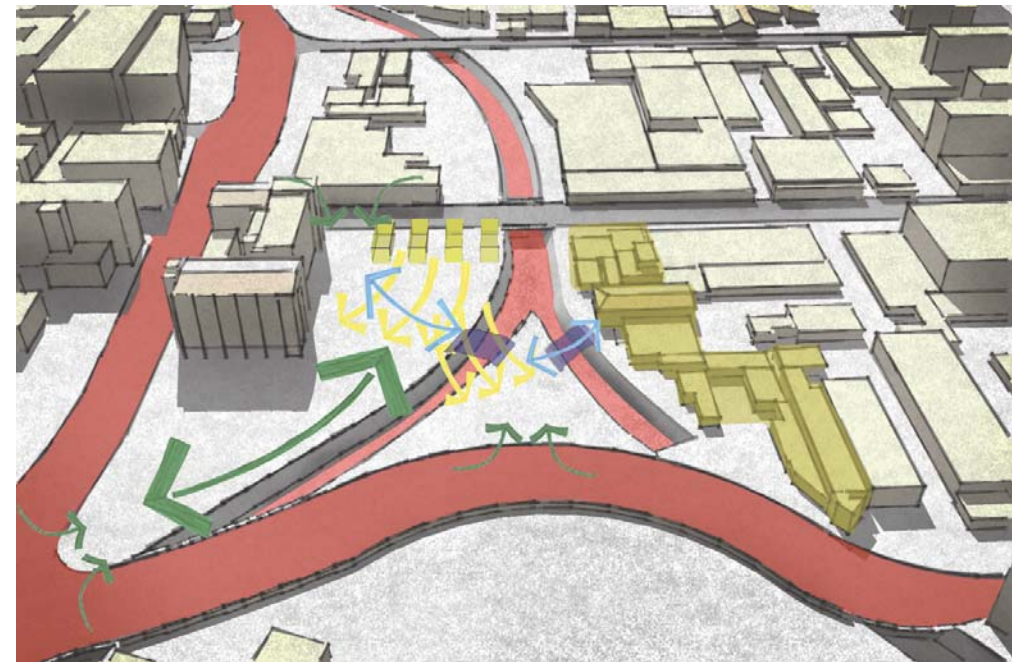


Fig. 54: Site development phase 4 – Active complete site, new bridge to west & new access to south

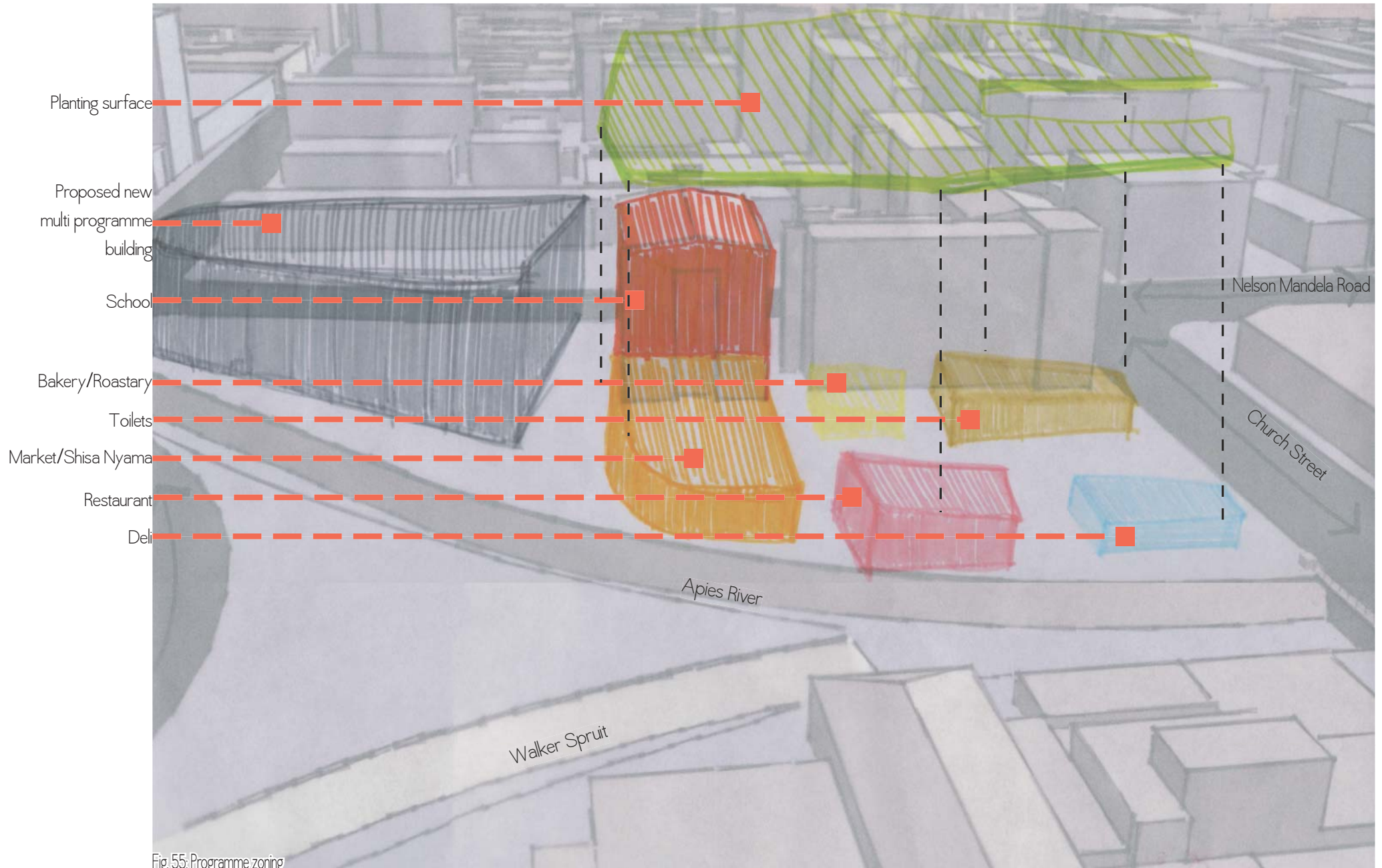


Fig. 55: Programme zoning

PROGRAMME

4.1 Urban Culinary Workshop

"Consider for instance the devices of plants to propagate themselves by seed. Effective adaptations, no doubt, but utility is not their only dimension. Can't you see the uprush of divinity as lovable and absurd? All those hooks and points, flower heads like footballs that roll in the wind, lush fruitiness that tempts the birds and baboons, who then disperse the seed by defecation. To me it is a festive carnival, the participants wearing masks or dominoes because they themselves are the masks of God." (Versfeld, 1991;37)

As discussed, the main aspect of food security that is being responded to by this dissertation is the commodification of food. The implication of commodification being that food has become an inorganic product instead of a natural product that is produced by natural ecosystems. As such, people now buy a pre-packaged, processed product that is commercialized by how convenient it is to cook inside its packaging rather than recognizable food.

The aims of a culinary workshop are twofold:

1. To remove the stigma of food production as an elitist profession and re-introduce it as a vocational trade skill, whereby the importance of food is understood from production to end product. The social importance of food will be instilled through the setting of the school and food outlets (restaurants, deli, bakery and market) and production of fresh produce in an urban environment.
2. To create an environment in an urban location where the total life process of food, from production to consumption and the importance of food education will reduce how food is seen as a simple commodity. This will also increase the understanding that food is not simply fuel for our bodies but also a nucleus of life. The consumption of food is a powerful social tool that enhances connections between people in all social aspects from business relations to birthday celebrations.

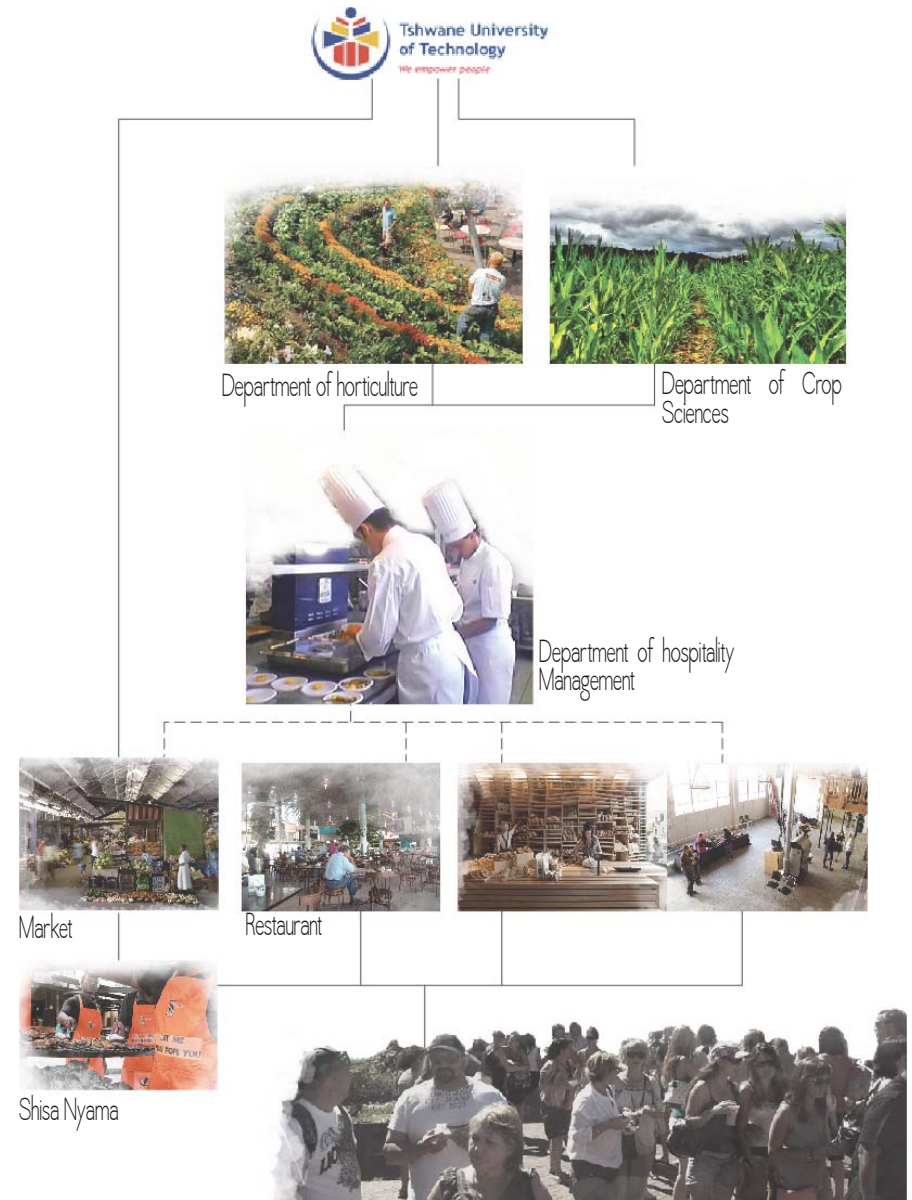


Fig. 56: Programme outline

4.2 Consultation with a Professional Chef:

Chef Helen Nomico, 2013 personal communication

1. The population of a teaching kitchen will be larger than of a professional kitchen. Therefore adequate space allowances need to be provided in an inherently hazardous environment.
2. The provision of public eateries which will serve food to the public will allow students a larger exposure to their cooking abilities and the achievement of high quality standards.
3. Separation of the different cooking departments needs to be maintained in a teaching food school. That way, there can be separate facilitators focused on a few students in one area, instead of all learning taking place in one section.
4. Provision of lecture rooms for academic subjects and a library need to be provided as per any tertiary institution.
5. The layout of a kitchen needs to be planned for optimum speed and convenience.
6. Facilities are to be provided for specialist classes such as cake decorating, where discreet spatial requirements need to be met.

4.3 Schedule of Accommodation

Schedule of accomodation		
Zone	Space	Area
Chef School	Classrooms	175
	Test Kitchen	235
	Library	476
	Exhibition Space	93
	Lecturer Offices	150
	Admin	40
	Storage	20
	WC	40
Restaurant	Kitchen	110
	Storage	23
	Bin Yard	10
	Inside Seating	150
	Mezzanine	117
	Outside Deck	250
	Office	23
Deli	Kitchen/Prep Area	60
	Storage	20
	Shop	100
	Seating	50
Bakery	Kitchen	120
	Shop	62
Coffee Roastery	Roasting area	70
	Shop	63
Farm	Processing	185
	Storage	137
	Bins + Compost	37

Fig. 57: Schedule of accommodation

4.4 Accommodation Narrative

The chef school will be housed in the existing southern building of Joel's Place apartment complex. Adjacent to the school will be a new farm structure where edible plants are grown in raised planters and in a greenhouse. Below this structure will be the commercial amenities related to the chef school described below.

The ground floor will contain the public aspects of the Culinary Workshop that will allow students an increased exposure to many aspects of the culinary world.

The northern portion of the site will contain the main restaurant where the students will acquire their formal training. There will also be a deli where the public can acquire quick meals and specialist ingredients. These amenities will be located along the movement paths of the site which will attract passing customers and allow patrons the opportunity to appreciate the vibrancy of the city.

A bakery and coffee roastery will be set further away from the traffic and attract patrons through the smells they create. By enhancing sensory attractions like this, the experience on the user will be everlasting and give the space an enticing atmosphere.

On the southern portion of the site there will be a formal market including trade of a variety of food such as meat, fish, fruit and vegetables, and more specialized produce like Mopani worms and locusts. Here the students will be exposed to the commercial side of food and spend time with butchers and fish mongers learning specific skills to enhance their education in food preparation.

The market will also have a shisa nyama (a social braai where meat is bought from a butcher and braaied and enjoyed on site by many people). Shisa nyamas often have an informal festival ambiance and can include live music. This atmosphere will be provided for in the design of the space. While shisa nyama generally allows the patron to braai the meat themselves, this establishment will be slightly formalized as the students will prepare and cook the meat for the patrons. This allows more experience for the student and more control over management of the braai facilities.

4.5 Client

The Tshwane University of Technology (TUT) has been identified as the principal client for this project. Specifically, the department of Hospitality Management will be utilizing the facility where the main focus will be on culinary studies, nutrition, food and beverage studies. There will be input from the Department of Crop Sciences and Horticulture to teach the students about basic agriculture.

TUT will lease out spaces in the market to local food producers with a clause in the contract that stipulates the vendor to take on the students as part time apprentices to expand their field of knowledge in the food industry.

The restaurant, deli, bakery, coffee roastery and shisa nyama will be owned by TUT and supervised by the teaching staff. Students will essentially run the day-to-day operation of each establishment.



Fig. 58. Square usage



Fig. 59. Bar interior

PRECEDENTS

5.1 Urban Coffee Farm and Brew Bar

HASSELL

Melbourne, Australia

2013

"The inspiration for the Urban Coffee Farm and Brew Bar comes from a desire to evoke the still somewhat mysterious and exotic geographies associated with the source of coffee. It brings to life the story about coffee, inspiring coffee drinkers to think about its origins, production and transport" (Gabriel, Cara cited in HASSELL, 2013).

In this way, the temporary intervention located on a popular public square on the banks of Melbourne's river, Yarra, creates a connection between a daily staple (coffee) that city dwellers take for granted as it is so readily available, and its natural source. The intervention creates a "jungle" of coffee trees that produce the beans used in the fresh

coffee. In this way the process of coffee making is no longer just a quick consumerist activity but is now something that the customer is a part of.

This intervention removes the idea of food being only a commodity but rather something that nourishes and brings joy to the consumer.

This intervention as an object in the urban environment also brings an element of delight and immediately attracts customers. It transforms an every-day part of the city into a destination which also permeates the rest of the city, not only as customers take their fresh brewed coffee away, but also through the intoxicating aroma of fresh roasted beans that is carried into the city. Introducing elements like these is very important and especially relevant to this dissertation as the proposed Urban Culinary Workshop will require an element of delight to attract people.

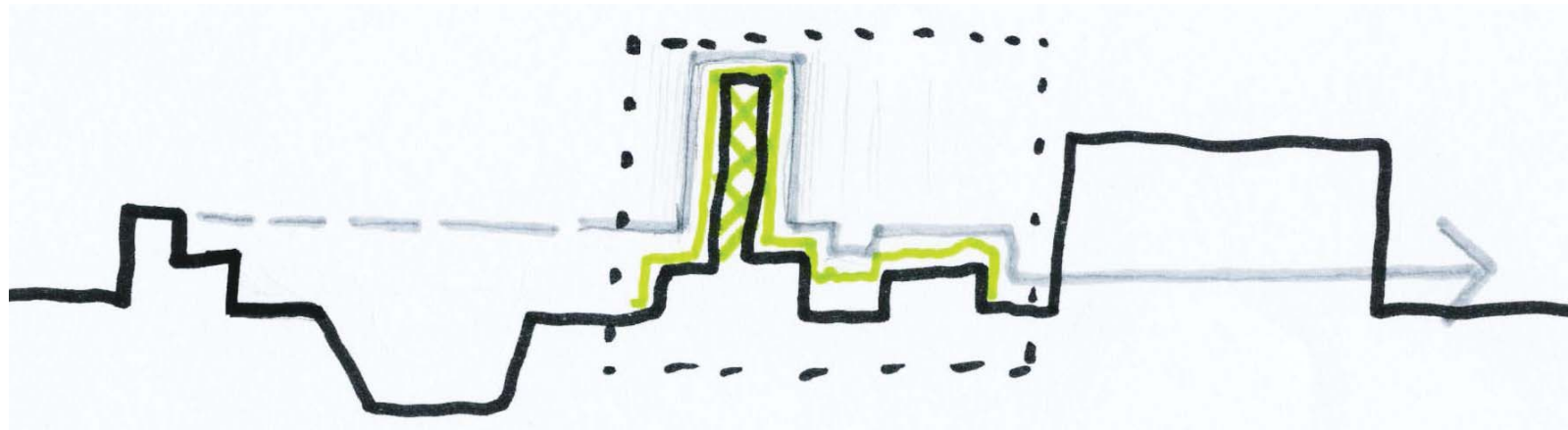


Fig. 60: Urban coffee bar essence diagram.



Fig 61: Lawned terrace



Fig 62: Terrace garden

5.2 Queen Elizabeth Roof Garden Bar & Café

Eden Project + Southbank Centre

London, England

2012

Atop the sun deck of the Queen Elizabeth Hall (which was never completed by the building's architect) which lies on the south bank of the River Thames, Eden Project produced a 1200 square meter terrace garden. The installation consists of both prefabricated and built-in planters that produce a range of vegetation from ornamental flowers to edible herbs and vegetables. There is a large patch of lawn for city dwellers to relax on while enjoying views of the river and south bank promenade. (Zimmer, 2012)

This urban intervention accomplishes many functions in the city. As an urban renewal project it re-establishes a portion of the city which was under-utilized. It creates a space for city dwellers to socialize and gives opportunity for pause in a hectic city environment.

This intervention supports biophilic theory and enhances the quality of life for city dwellers. The project also produces edible plants that can be used to feed people; another achievement of the project is the fact that it was established by employing "homeless people" in the city who later found employment in horticulture because of the experience gained in the project (Zimmer, 2012). Not only was this a social project to improve the lives of future users and tenants of the building but it also created opportunities for underprivileged people.

These important upgrading and social elements will be included in this thesis.

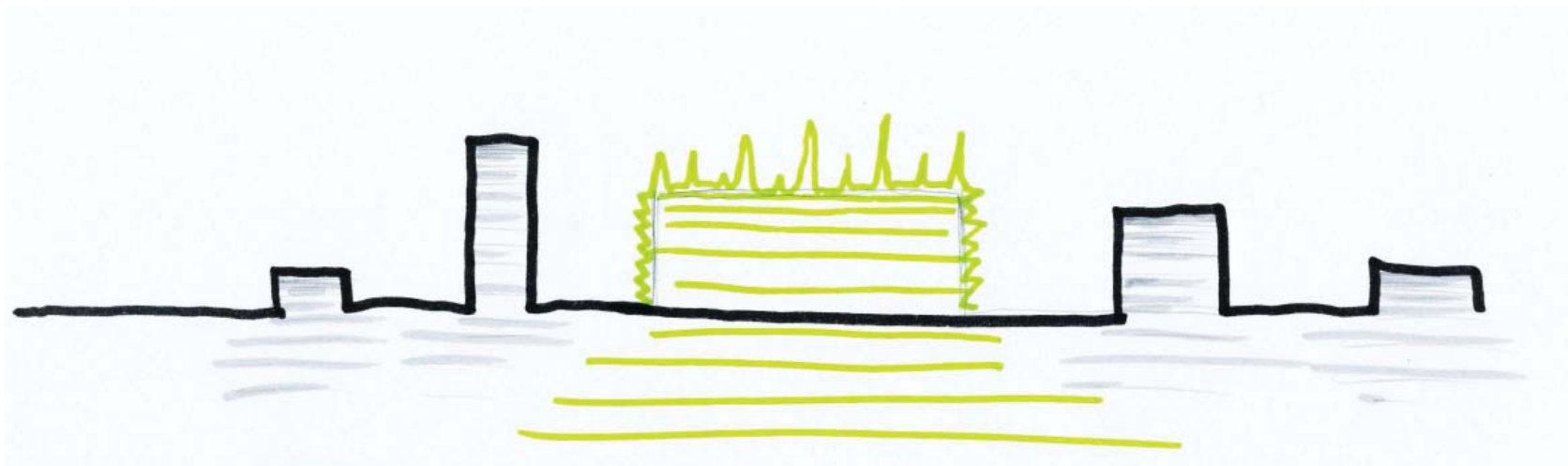


Fig. 63: Queen Elizabeth roof garden essence diagram



Fig 64: Market facade



Fig 65: Market interior

5.3 Gugulethu Meat Market

CS Studio Architects

Gugulethu – Western Cape, South Africa

1996–1998

CS Studio Architects worked very closely with the community in designing the market which is located in a very important public space in Section 3, Gugulethu (CS Studio Architects, 2010). The aim of the project was to provide a covered trading area for informal traders. The design of the market responds aptly to climatic factors by creating a protective “wall” with the services (shops, toilets offices etc.) that blocks strong winds from the south and the west. It is a largely open plan design providing minimal permanent structures (braais, sinks and some prep tables) and a large, over-sailing roof that covers the space. The roof is high, allowing ample ventilation and at the same time creating a landmark in the urban environment. The minimal intervention formalizes the existing market space allowing for overall management of trading but providing flexibility of space so that “...the initial ‘Eurocentric’ market proposal was transformed into a more appropriate local and culturally expressive solution.” (CS Studio

Architects, 2010)

This precedent informs the design market space on the proposed site in Pretoria as a “loose” space that will allow for the inherent informality of the African city. By providing minimal amenities such as storage, toilets and offices and covering it with a high roof, the trading floor can become a vibrant, exciting space without being an enclosed tight space. The suggested market is located just off the main movement path through the site allowing customers to move through the market, or hang around and enjoy the hustle and bustle of the city. The shisa nyama component will be accessible via a public park which will offer ample seating space to enjoy the freshly cooked food and will allow for other festivities to take place such as live music. As with the Gugulethu meat market, the site for the Pretoria market is surrounded by roads (one of which has high pedestrian activity) and will have a dedicated pedestrian route making it an ideal place for trading.

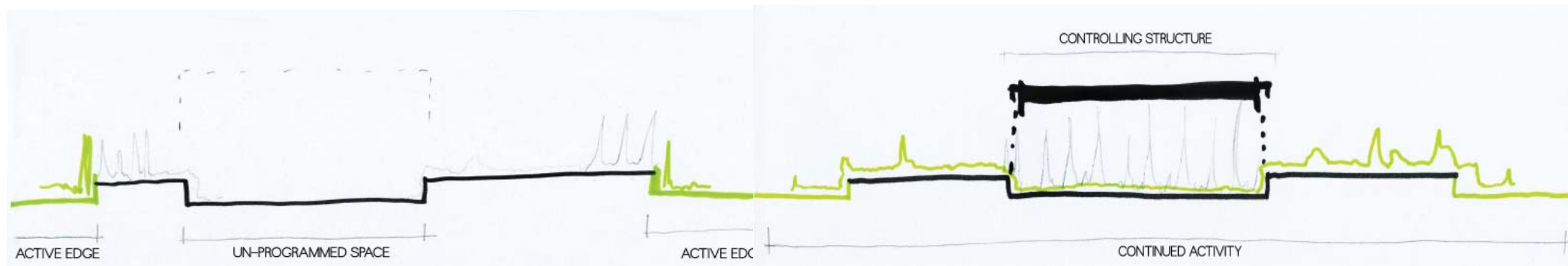


Fig 66: Gugulethu Market essence diagram

CONCEPT

6.1 Generator

The main design driver of the project stems from the issue of food and people's approach to food. Today, it is more important that food is quick and accessible than that it is healthy and nutritious. Food is brought to the consumer already cooked and ready to eat. The most work that needs to be done is heating and this is normally accomplished by a microwave that forces energy through the product causing heat, as opposed to cooking a meal from raw produce. Even advocates of proper eating like Jamie Oliver have had to resort to speed to entice people to cook whole meals, using catch lines such as "Delicious, nutritious, super-fast food" (Oliver, 2012).

This attitude towards food is, in the author's opinion, a contribution to social disconnection. If food is only seen as a commodity or a form of fuel for our bodies that needs to be created and consumed quickly so as not to take up too much time, then there is one less opportunity for people to interact and continue communal life. This idea does not solely reside in the consumption or creation of meals, but also in the distribution of food. In the past, consumers would go to the local market and talk to the farmer about the produce available before purchasing their household supplies; there was an acquired trust between buyer and seller, and the buyer then had a 'connection' to the product. Today, a consumer (buyer) generally only speaks to the shelf stocker who can direct you to a specific product in the store; there is no connection possible between the product and the consumer except that of financial terms, which is tenuous at best.

Modern-day Pretoria does offer the option of visiting the main food depot near Marabastad where huge volumes of food are trucked in from outlying farms with the intention of being distributed to local supermarkets or street vendors, but again, there isn't a strong link between end user and supplier. Perhaps then the answer is markets such

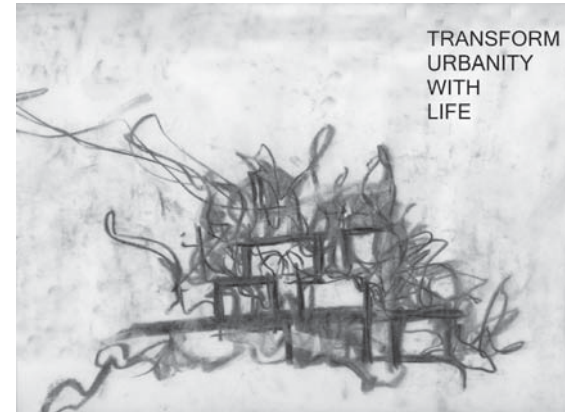


Fig 67: Urban concept

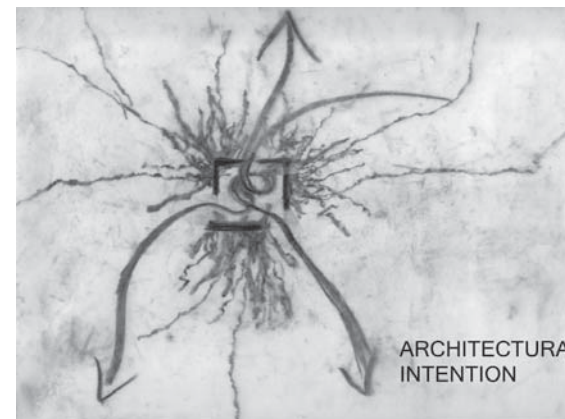


Fig 68: Site concept



Fig 69: Barriers

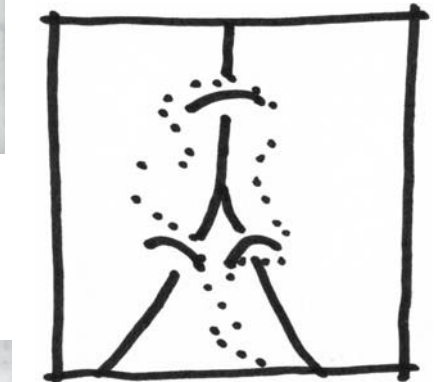


Fig 70: Access

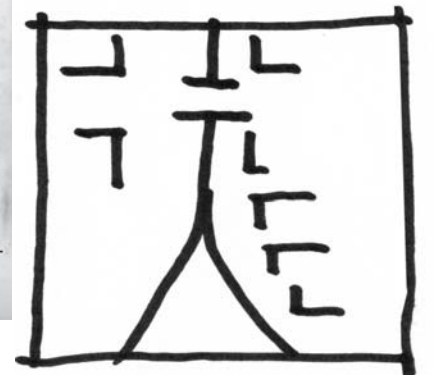


Fig 71: Active edges

as the Boeremark, where one can experience this “lost” connection between production and consumption; indeed, this is a fantastic opportunity, but unfortunately the market only occurs once a week and in order to make the market financially viable, the market includes stores that sell cheaply produced Chinese products that have nothing at all to do with fresh produce. It is suggested that what is needed is a full time facility focused on reconnecting people to food and in doing so, reconnecting them to the city.

6.2 Concept Statement

Enhancing opportunities for connections:

This statement is the basis of design decisions in the project, from urban response to planning of the facility.

Urban Condition

The site is located on a threshold between the old residential area of Arcadia and the business-oriented CBD. The implementation of Nelson Mandela Road as a main traffic route around the CBD causes a stronger divide between Arcadia and the CBD. On the southern edge of the site Pretorius Street creates another barrier that restricts movement of pedestrians along Walker Spruit.

The rivers are the main focus of movement through the site. Though the rivers can be seen as barriers which restrict movement across the site, they will become arteries through the city that connect the southern parts of Pretoria to the north by becoming pedestrian movement arteries. The convergence of the two rivers at the site suggests that this is a very important space in the city which needs to respond to the energy that moves along this axis. The architectural response to the site needs to facilitate this energy by enhancing connections made at the site by people: allowing both freedom of movement and providing refreshing spaces for people to pause and interact.

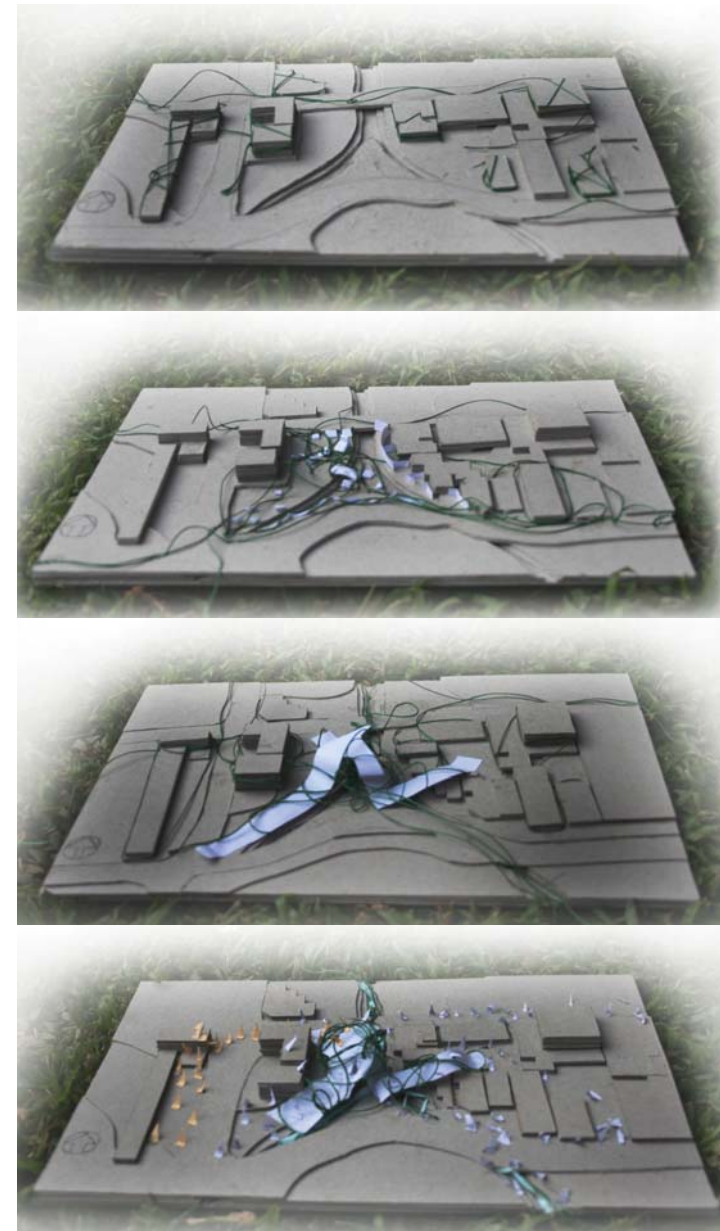


Fig 72: Concept models

Site Condition

The proposal will operate on two levels:

1. The ground floor will remain public and active and allow people to move through and around it.
2. The upper floor will become more private and house the school facility and growing area.

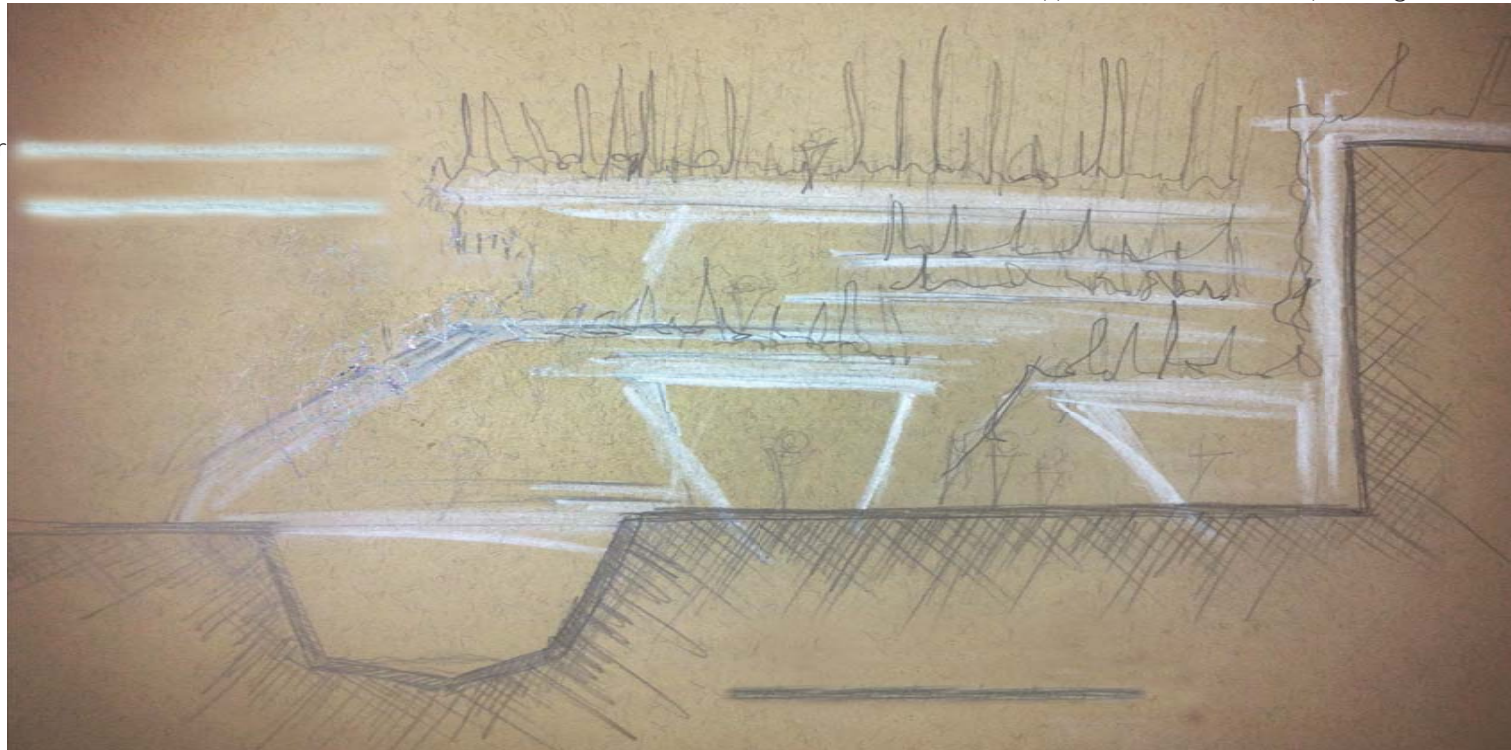
The layout of the project will respond to the activity that will occur on the site, from the bustling market hub to the refined eating space. Placing different amenities in specific areas on the site will accommodate the scale of energy from quiet to vibrant. Connections to the proposed new arts district on the eastern bank of the river will enhance the energy as it can move freely. Part of

the existing residential building, Leo's Place, will be utilized for student housing while the northern block will remain privately run. Connecting the public to the food production area will be done by visual connections from the ground floor to the production space. People will know exactly where the food comes from and have a direct connection to it as students will produce the food to be consumed.

Conclusion

By creating a space in the city focused on food and social connections, this project will enhance social activity in Pretoria. People will be able to learn from the experiences that the site and architectural proposal offer, and have a better understanding of food from production to consumption. If Pretoria City is thought of as an organism that requires nutrients to survive, then this facility can be likened to a vitamin that supplements the diet of the city, making it more healthy and vibrant.

Additional Surfaces for
multi-functionality



Mono-functional surface

Fig. 73: Architectural concept



Fig.74: Indication of farm

DESIGN DEVELOPMENT

7.1 Design Intentions

The following guidelines were determined based on the theory outlined in the theory chapter.

These intentions were filtered in the development of the design outlined in this chapter.

- Response to site, i.e. solar gain and natural ventilation possibilities: By responding to the site appropriately it allows for maximized design potential and enhances daylight opportunities and wind conditions. These in turn affect the building's thermal conditions (Yannas, 1994;49).
- Roof and terrace gardens support wildlife and sustain life through planting of vegetables: Planting included in a building can create an important link between the inhabitants of the building and nature. The use of planting will also help control solar radiation and eliminate latent heat caused by evaporating moisture (Hui, 1999). Other benefits of planted facades and roofs include: edible fruits, biomass production, dust reduction, heavy metal reduction, thermal insulation, energy savings, noise reduction and biodiversity (Köhler, 2006).
- Urban farming incorporation of permaculture principles to maximize soil nutrients, plant growth and production (multiple floors of large scale crop growth): The greatest amount of waste generated in the world is attributed to the cities of today (Girardet, 1996;86). With this in mind it is important to create cities that provide for their inhabitants as opposed to relying on standard horizontal farms to provide food and nutrients for city dwellers. Utilizing permaculture principles helps increase the production of crops by using green manure, worm ranching, recycling seeds, intercropping and integrating wildlife that aids the growth of plants (K.E.A.C., 1999).
- Rainwater harvesting for all water needs: Rainwater is free and available. To not utilize this source is to disregard the fact that humans need to rely on nature to sustain their own lives.
- Grey and black water recycling – water to be used for irrigation of crops, and flushing of toilets: Recycling water is as important as collecting it. Though water may be a renewable resource it is still extremely valuable. Recycling water from multiple buildings creates a symbiotic relationship in the sense that recycling is a service that can be shared between buildings and, as a side benefit, creates opportunities for wetlands. These wetlands can be used as features in the city where people can be unified with nature and also provide natural habitats for animals.
- Power generation – Photovoltaic cells and fuel cell systems: A building that generates its own power also creates a symbiotic relationship with the city. The building not only creates power to sustain itself, but excess power can be sold to the city. Power can also be shared between buildings, creating symbiotic relationships on a smaller scale. This expands the concept of cities being organisms that live and grow (Girardet, 1996;19) and which can sustain themselves.
- Recycling of all solid waste – cans, bottles and plastic are to be separated for recycling and biological waste to be collected and turned into compost: Recycling of solid waste allows the opportunity to give something back to the environment. Lack of education is counterproductive to waste recycling. Citizens need to understand the value of recycling waste. An incentive program is devised in this proposal such as in Curitiba whereby in exchange for recyclable waste, credits for urban transport are awarded. Composting is another option; it is the biological decomposition and stabilization of organic substrates: through biologically-produced heat a pathogen-free product is created which is beneficial to the soil and the growth of plants (Haug, 1993;1). Though composting is a fairly simple waste treatment system, the breakdown of natural waste components by natural systems is most ingenious. On site waste treatment systems can be fairly high tech and energy consuming, as will be discussed later, therefore allowing nature to take its course and being able to utilize the outcome is the most sustainable answer.

7.2 Point of Departure

The initial response of the design followed the direct route of the site vision, creating realistic site movement patterns around the proposed site development. The ground floor layout was a simplistic response to the needs of the Urban Culinary Workshop (restaurant, bakery, deli and market) but the layout was naive and did not respond to the site adequately. There was no consideration of the site's geography created by the river or any real climatic response. The river crossings were very limited and not thought out. The first floor was an intuitive response to solar gain and urban use. The terrace is large and takes over the majority of the site but by making the north section into a fork it allows light to the lower floor and creates a set-back from the street, inviting passing pedestrian traffic in. The chef school is situated on the southern side of the terrace above the market, allowing direct access through the southern block of Joel's Place which will be converted into student accommodation. A ramp running from the Nelson Mandela Road entrance up to the planted terrace and the steps projecting over the river was to allow unrestricted vertical movement of the public.



Fig 75: Departure phase models



Fig. 76: Departure phase model

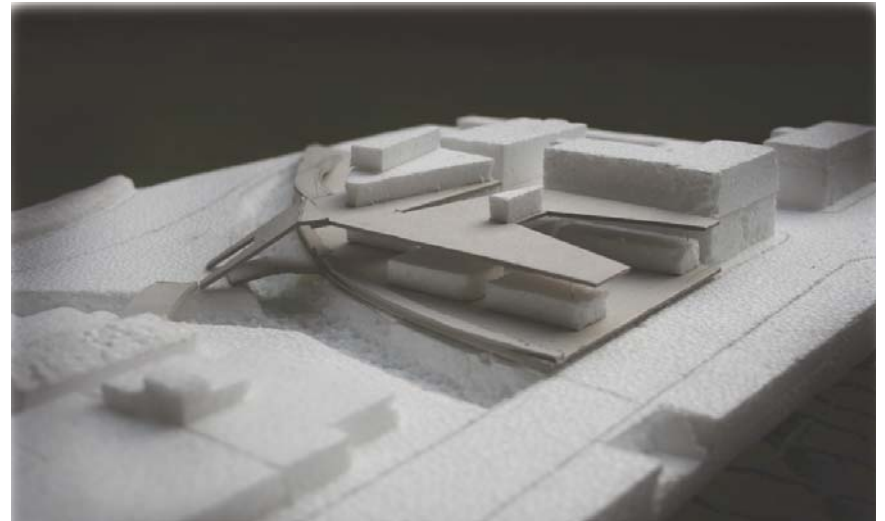


Fig. 78: Departure phase model

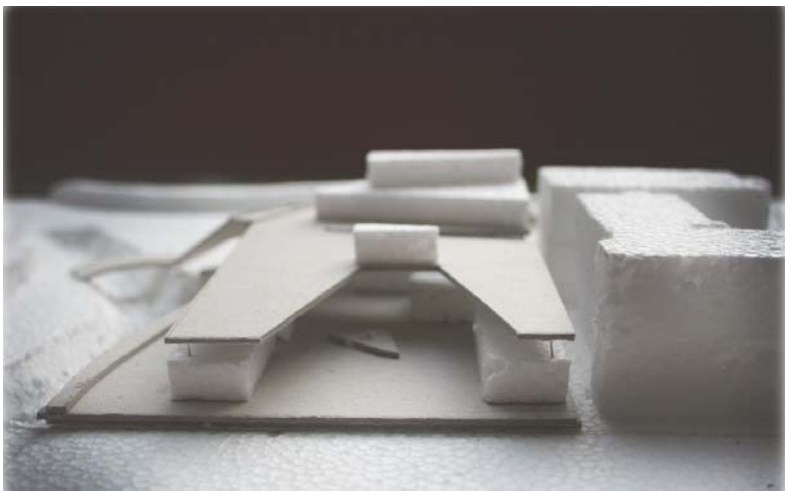


Fig. 77: Departure phase model

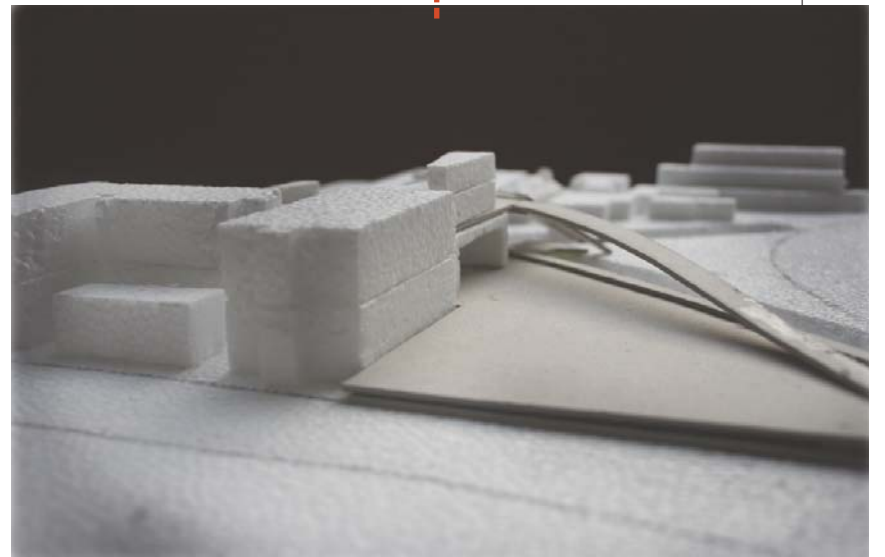


Fig. 79: Departure phase model

Further Development

A more appropriate site usage of the ground floor was explored in the second design phase. The spaces were oriented better on the site allowing for more pedestrian flow from the northern square to the southern landscape outside the market. The existing southern building was incorporated more into the design creating a direct connection on the ground and upper floors. The promenade along the river tied the ground floor restaurant and deli to the river by creating pedestrian access to the deli and a vibrant environment for the restaurant. The river crossing still remained a weak aspect of the intervention. Though it was seen as an extension to the restaurant seating, it was poorly placed and generally weak in form. The upper floor remained generally the same although the unrestricted vertical access was discarded for privacy and security reasons. A connection between the farm and the ground floor was made with the use of planted screens. This would allow the users of the building to better appreciate that the food they consumed was created on site.



Fig 80: Development models



Fig 81: Development models



Fig 82: Development models

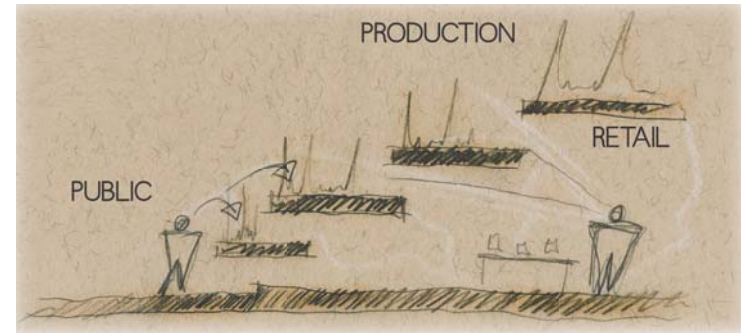
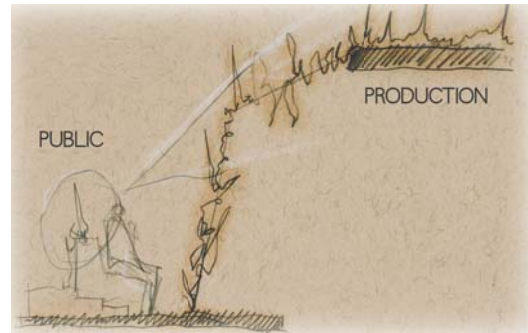
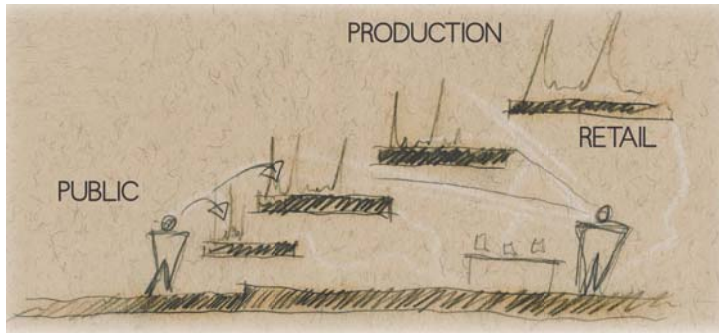


Fig 83: Design development diagrams

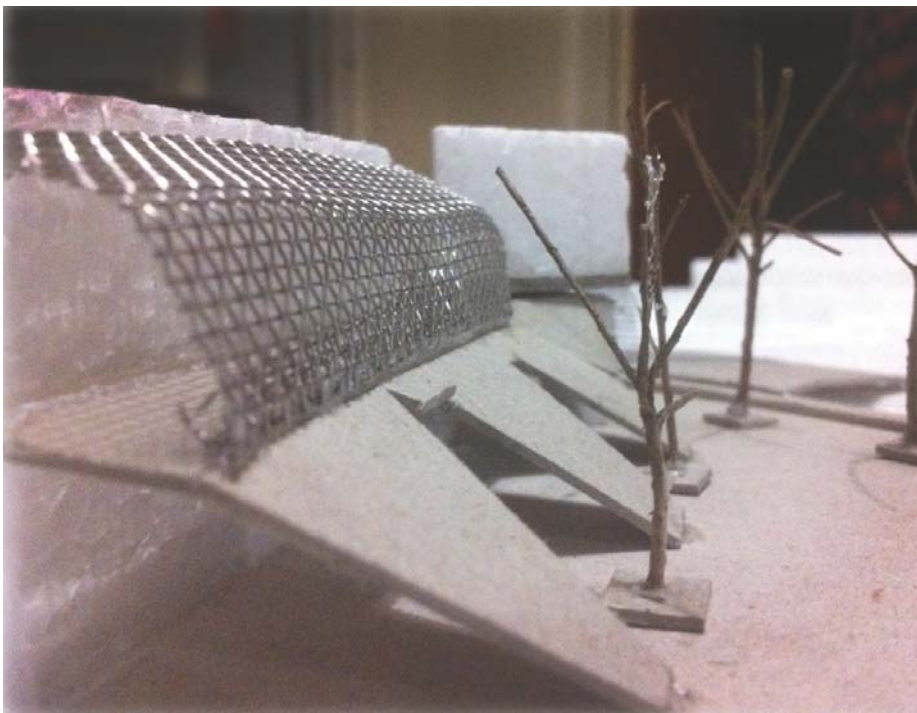


Fig 84: Development models



Fig 85: Development models

7.3 Development

The development of the design of the commercial spaces was based on two components:

1. The pedestrian usage of the site and important intersections, and
2. The controlling nature of the farm structure.

7.3.1 Ground Floor Planning

The positioning of the commercial amenities was based on the characteristics of the type of space and their proximity to people movement. The restaurant and deli need to feed off people's movement through the site so they were positioned close to busy routes and intersections. The bakery and coffee roastery create intoxicating smells so they could be positioned further away from pedestrian movement and entice people to move into the middle of the site. The market space was placed in the center of the site as a mediator between service access and people. Site lines and light are used to guide people through the large busy market and courtyard.

7.3.2 Upper Levels

The farm level is planned out for maximum production of the varied crops both in and out of the greenhouse. The greenhouse structure is placed on the eastern edge of the farm structure to mediate the abrupt height difference from the bottom of the channel to the roof of the existing adjacent six story building. The greenhouse structure is light and translucent and sits on the concrete structure of the farm conforming to Frampton's notions (1990; 518) of heavy stereotomic structure (ground) and lighter tectonic structure (sky). The school is housed in the existing southern building of Leo's Place and is planned for appropriateness of each function relating to the floor it is on. The ground floor houses the entrance off Nelson Mandela Road and the fresh produce processing for the farm. The southern side houses a variety of cultural facilities that open onto the



Fig. 86: Design development sketches

arcade created between a new proposed multi-use building and the school building itself. The first floor houses the classrooms, exhibition space and test kitchen and the second floor houses the library and lecturer offices. The top three floors are all student accommodation, the design of which is not explored as a delimitation to this dissertation. A connection between the test kitchen and the library is made by an opening in the floor slab so that there is an ever present connection between the students and the activity of cooking.

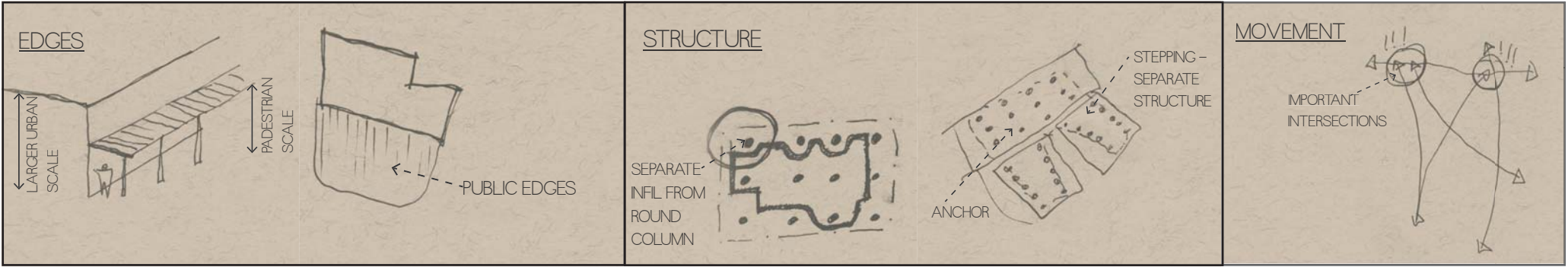
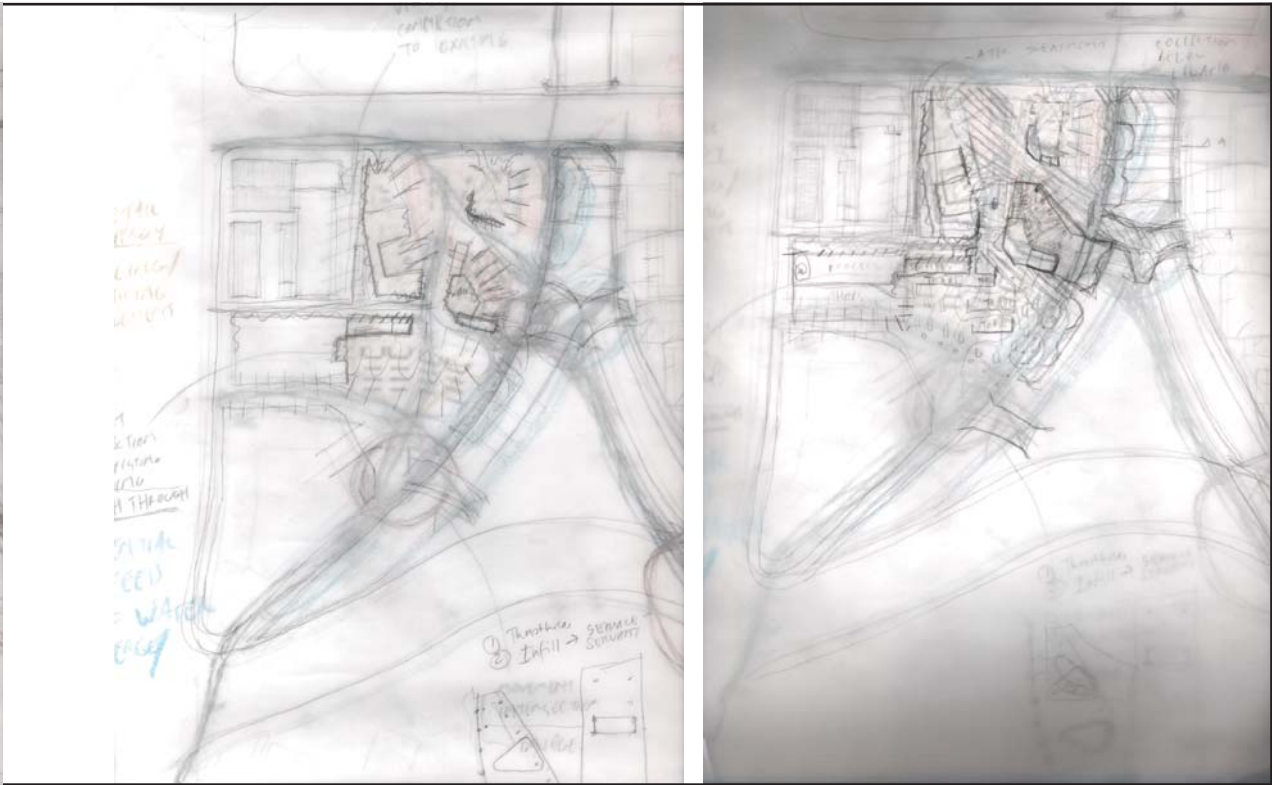


Fig 87: Design development



Fig.88: Rendered view of northern courtyard

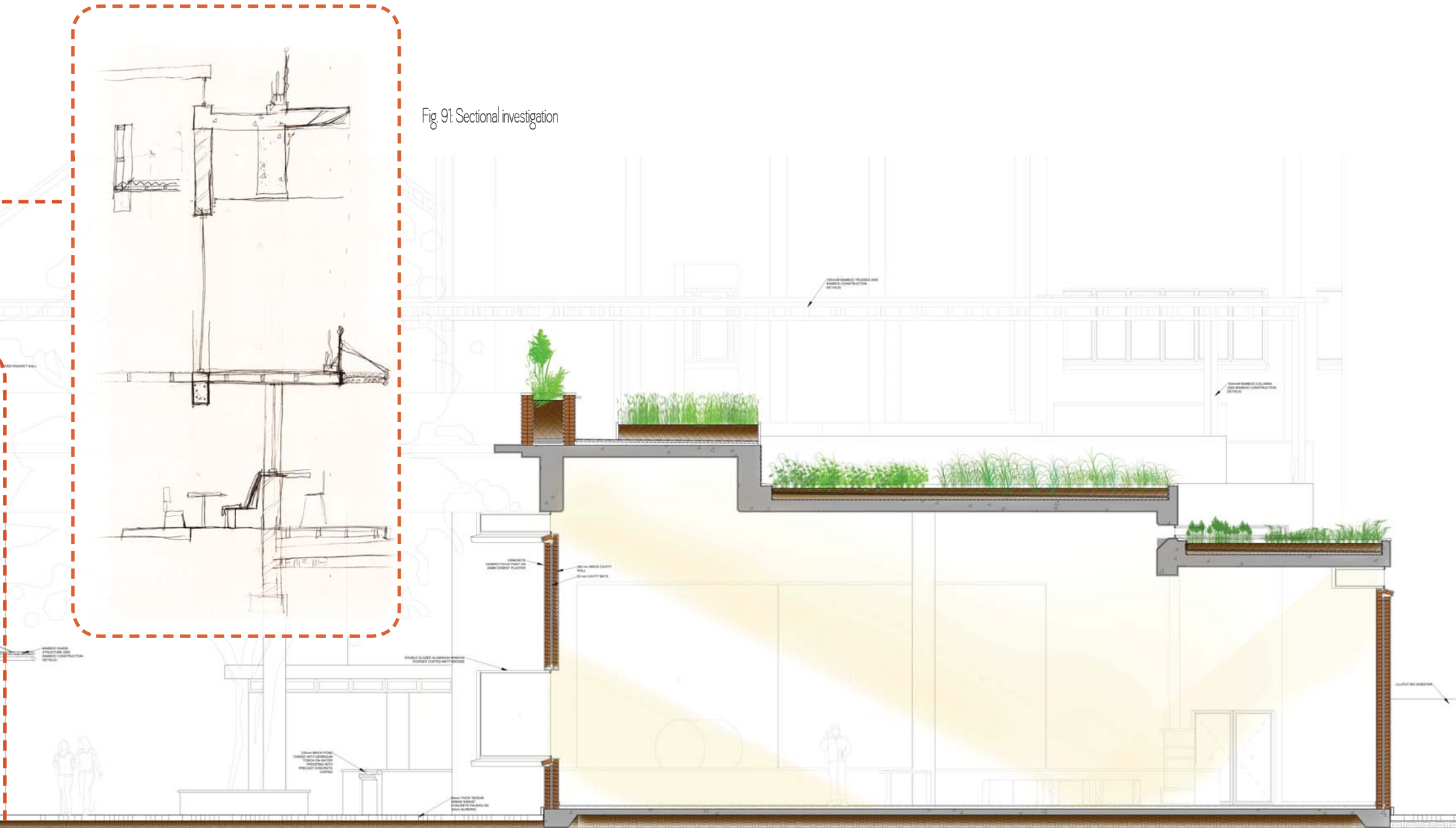


Fig. 89: Ground floor plan NTS
SCALE 1:100



Fig 90: Section A-A
Scale NTS

Fig 91: Sectional investigation



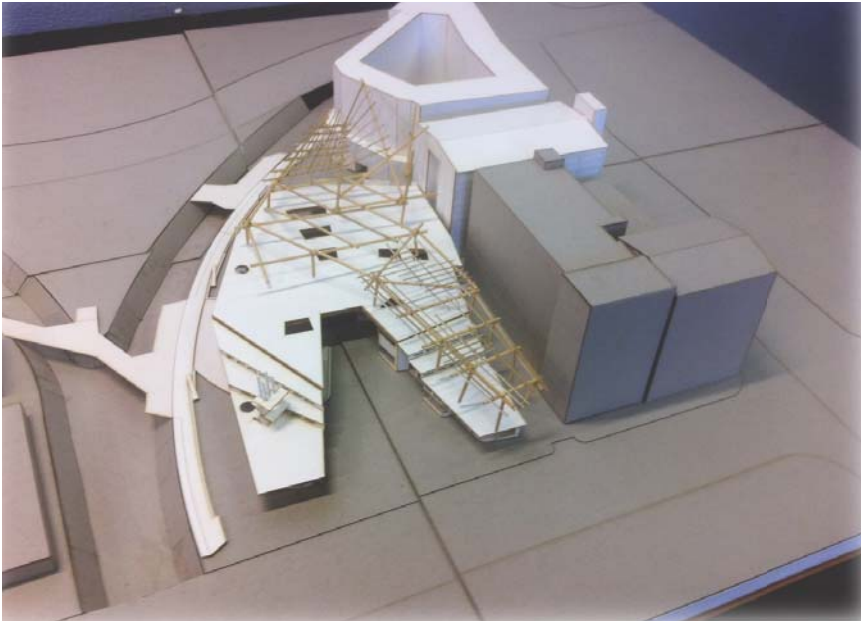


Fig. 92: Design model overview



Fig. 93: Design model view from Church Street



Fig. 94: Design model view of courtyard

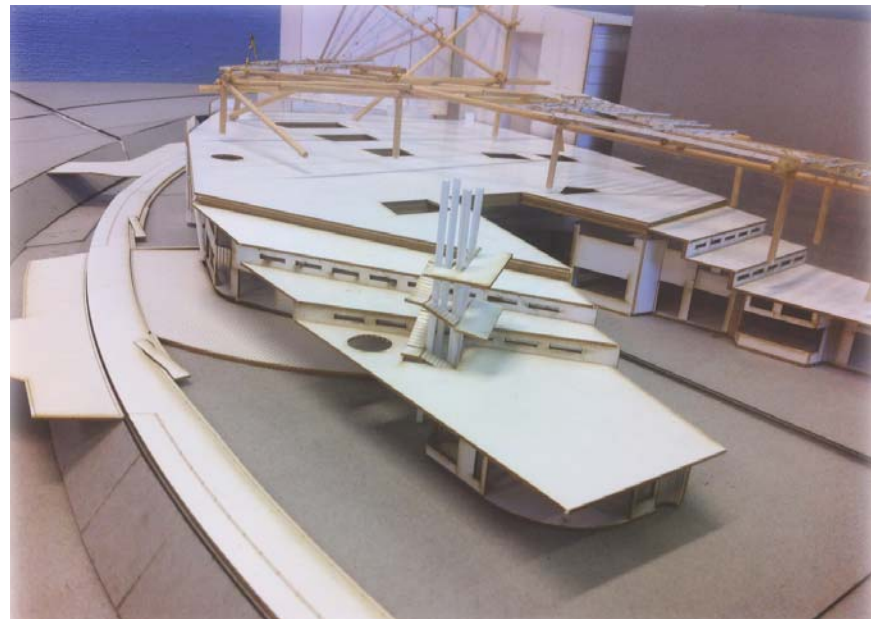


Fig. 95: Design model view of tower



Fig 96: Un-rendered perspective of development from Church Street



Fig 97: Un-rendered perspective of development along river promenade



Fig. 98: Un-rendered perspective of deli and tower



TECHNICAL RESOLUTION

8.1 Technical Concept

The design of the building is focused on promoting multi functionality and connectivity in the city. The technical concept enhances the idea of multi functionality and aims to make the building an organism. The building will not only use energy to shelter people but will recycle that energy and produce amenities that can support life. This approach determines that there are at least two uses for almost everything, be it a structural member that can be used for storage or using CO₂ gas created in the kitchens to increase crop production (see discussion of the ventilation system).

Like an organism, there is a lot of energy that is used to create the structure of the life form; in this case it is concrete and steel used in the building. Once established though, this organism will utilize the energy input wisely. Electricity is a minimal requirement as daylighting is maximized and most kitchen equipment runs on gas. As gas is used the resultant vapours are recycled. Rainwater is collected and municipal water recycled. Solid waste is sorted for recycling and organic waste is turned into compost to grow new food. These systems work together to allow people to live and thrive in an otherwise harsh environment; an organism in the city that feeds the people.

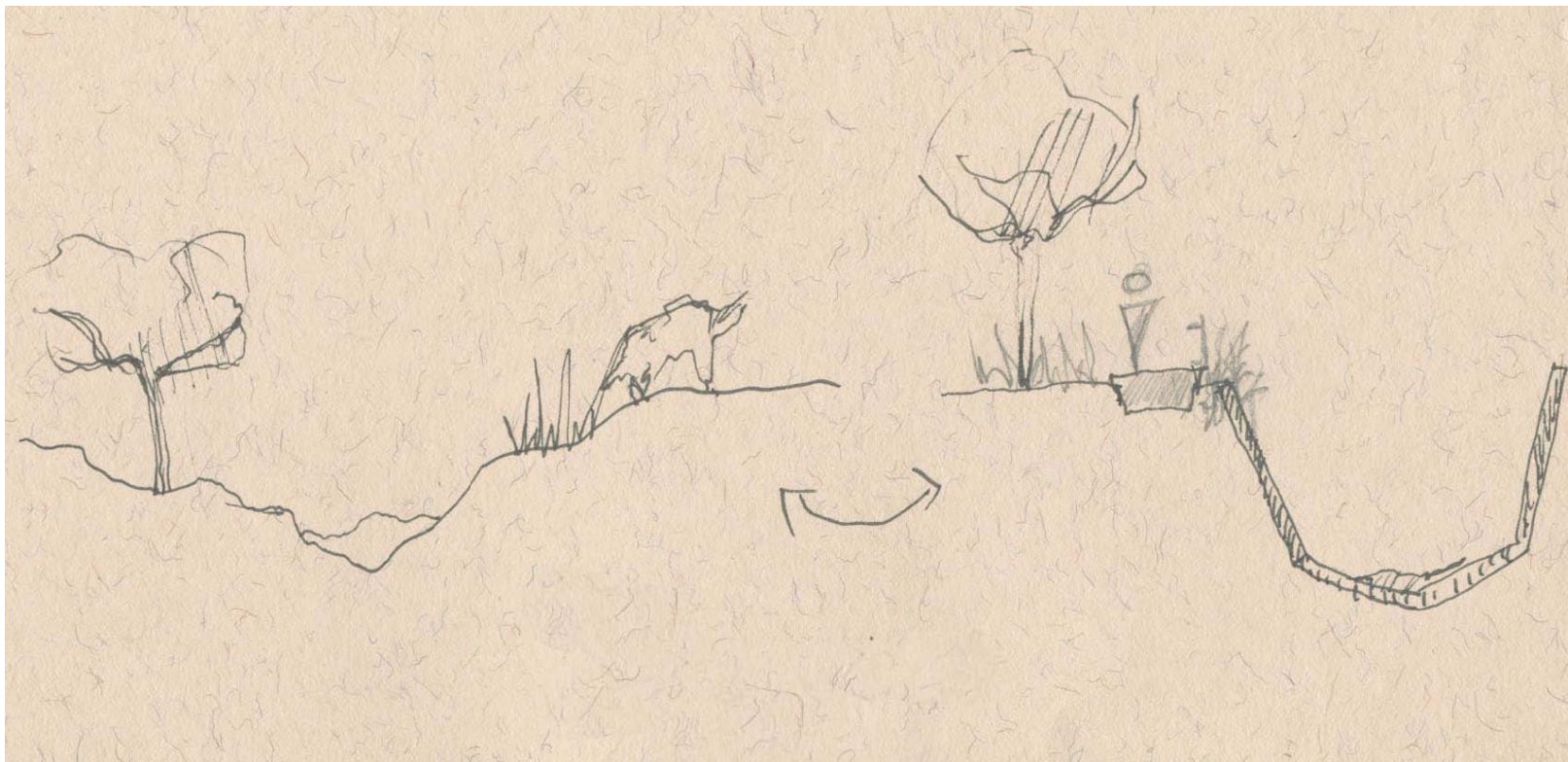


Fig 100: Technical concept - enhance multi-functionality

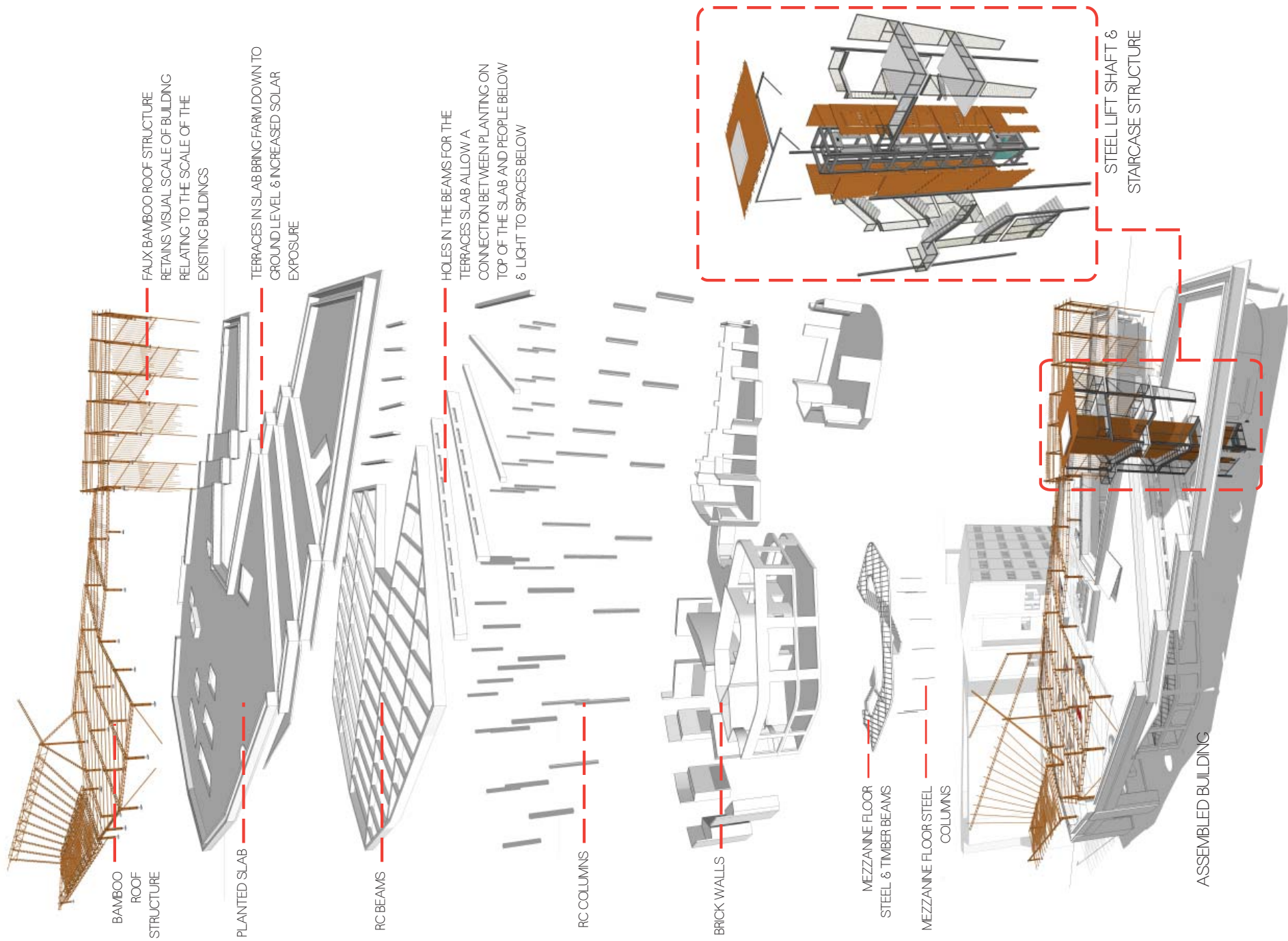


Fig 101: Structural system diagram

8.2 Structure

In this section, the building is broken down into its different elements and the structural systems are explained.

8.2.1 Concrete Frame

The controlling structure of the building is the farm slab. The maximum height of the soffit is determined by the requirements for the market space and the connection to the existing building. This height allows for maximum air movement around the busy market space and connects to the existing building on the second floor. The structure is comprised of 800mm deep primary beams at 10m centers resting on columns at 12m centers. Sub beams connect the primary beams at 4m centers, allowing a 255mm slab to span 10m by 4m. These relatively small spans mean that the slab can remain relatively thin while bearing the load of the soil, water and plants.

The commercial spaces on the ground floor adhere to the controlling nature of the farm structure but are independent structures that can be designed to respond to the context. This allows longevity to the site as these spaces can be designed to meet any number of requirements or they can be removed altogether.

8.2.2 Walls

The enclosing walls will be double skin brickwork with a 75mm cavity to be filled with glass wool cavity batt insulation. The insulating properties of the planted roof together with the insulating walls will maintain a comfortable internal temperature.

8.2.3 Mezzanine Floors

The mezzanine floor of the restaurant will be a suspended timber floor that is supported

by the brick wall on one side and by concrete columns inside the restaurant. These columns are spaced so as not to clutter the floor layout of the restaurant.

8.2.4 Windows

All windows in the intervention will be double glazing with aluminium frames. The high embodied energy of the material is mitigated by two factors:

1. The insulating properties which will assist in reducing power consumption, and
2. The high recyclable properties of aluminium.

8.2.5 Storage units in the market

The initial concept of the structure was to have a large substantial "anchor" that the farm slab would project from. On development of the structure, the slab needn't have large, thick walls to support it but the impression to the public is still important. The columns therefore are enclosed by walls that give the impression of being an anchor but are in fact storage space for traders (See Fig. 109). The spaces will provide storage for fridges and shelves depending on the needs of the traders. A second level provides a space for water tanks that collect rainwater and excess irrigation water from the farm above.

8.2.6 Bamboo Structure

The greenhouse structure on the farm level not only creates a controlled environment for intensive crop production but also becomes a connecting structure to the adjacent buildings relating the low stature of the building to the surrounding urban environment.

The primary features of the bamboo structure are columns and horizontal trusses, and to seal the greenhouse structure ETFE foil will be fixed to the bamboo. The decision to use bamboo was made in response to two aspects:

1. The main farm structure needs to support the very high static load of soil and plants particularly when the soil is wet. The greenhouse structure needs to be of light weight construction. The farm structure is very aesthetically heavy and vast therefore the structure of the greenhouse needs to be very light and open to better relate the building to the sky.
2. Due to the very high embodied energy used in creating the primary farm structure the greenhouse structure should counter this, therefore steel would only add to the embodied energy cost of the building. Bamboo is a highly renewable resource which does not need stringent care or use vast quantities of water (Brightfields Natural Trading Company, 2012). Plantations like Brightfields in the Western Cape are making moves to produce bamboo as a consumable material so it will be locally available.

8.2.6.1 Bamboo Columns

The columns of the structure will not be fixed directly into the concrete floor of the farm structure. The bamboo column will be inserted into a steel shoe which is welded to a steel base plate that will be chemically anchored to the concrete. This allows for much of the bamboo structure to be prefabricated offsite and ready for assembly on site and allows for the bamboo structure to be removed should there be any programmatic changes to the site later. This gives the farm structure a longer life as it is flexible to change.

The columns are made up of two bamboo members spaces far enough apart to allow a bamboo truss to be fixed between them (see Fig 103) The columns are fixed directly above beams to distribute the weight directly through the farm's primary structure.

8.2.6.2 Bamboo Trusses

The trusses are comprised of two bamboo members that are connected by spacer members at 1000mm (see Fig 104). The trusses span between bamboo columns and bear the load of two different members, namely the greenhouse roof infill and the shading members of the extended roof structure.

Greenhouse roof infill is comprised of ETFE foil fixed to horizontal bamboo purlins that span between trusses. The ETFE is fixed to the bamboo purlins with an aluminium clamping strip designed to be used with the foil

The shading members are very thin bamboo members that are lashed to horizontal bamboo purlins with stainless steel cable. This fixing method retains the structural integrity of the bamboo as no holes are made, thus negating the risk of splitting and cracking. Stainless steel cable will not rust therefore less maintenance is required.

The greenhouse/roof structure over the farm is thus lightweight and responsive to context, and brings a balance to the environmental impact of the building. Joining methods are responsive to the material which have very specific structural properties and to the every-day maintenance of the building. Overall, a very simple material with the added function of modern construction technology that creates a functional and beautiful feature of the building.

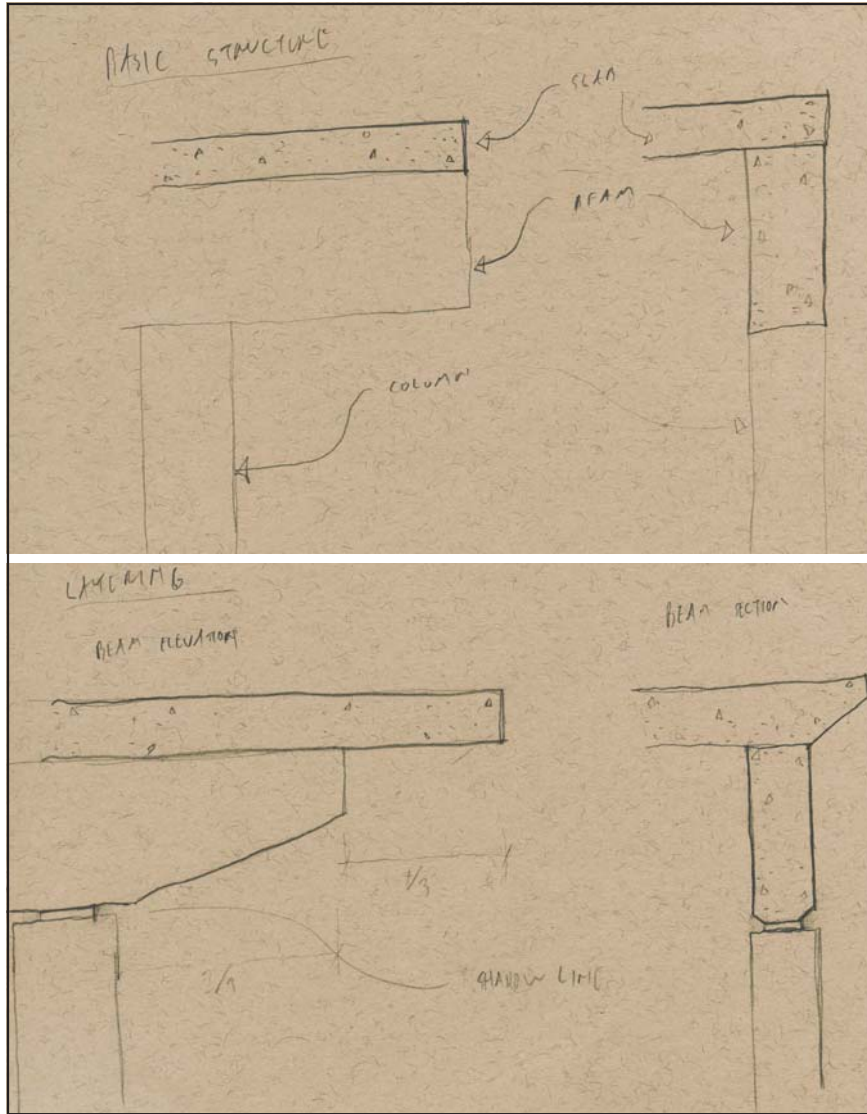


Fig 102: Concrete construction exploration

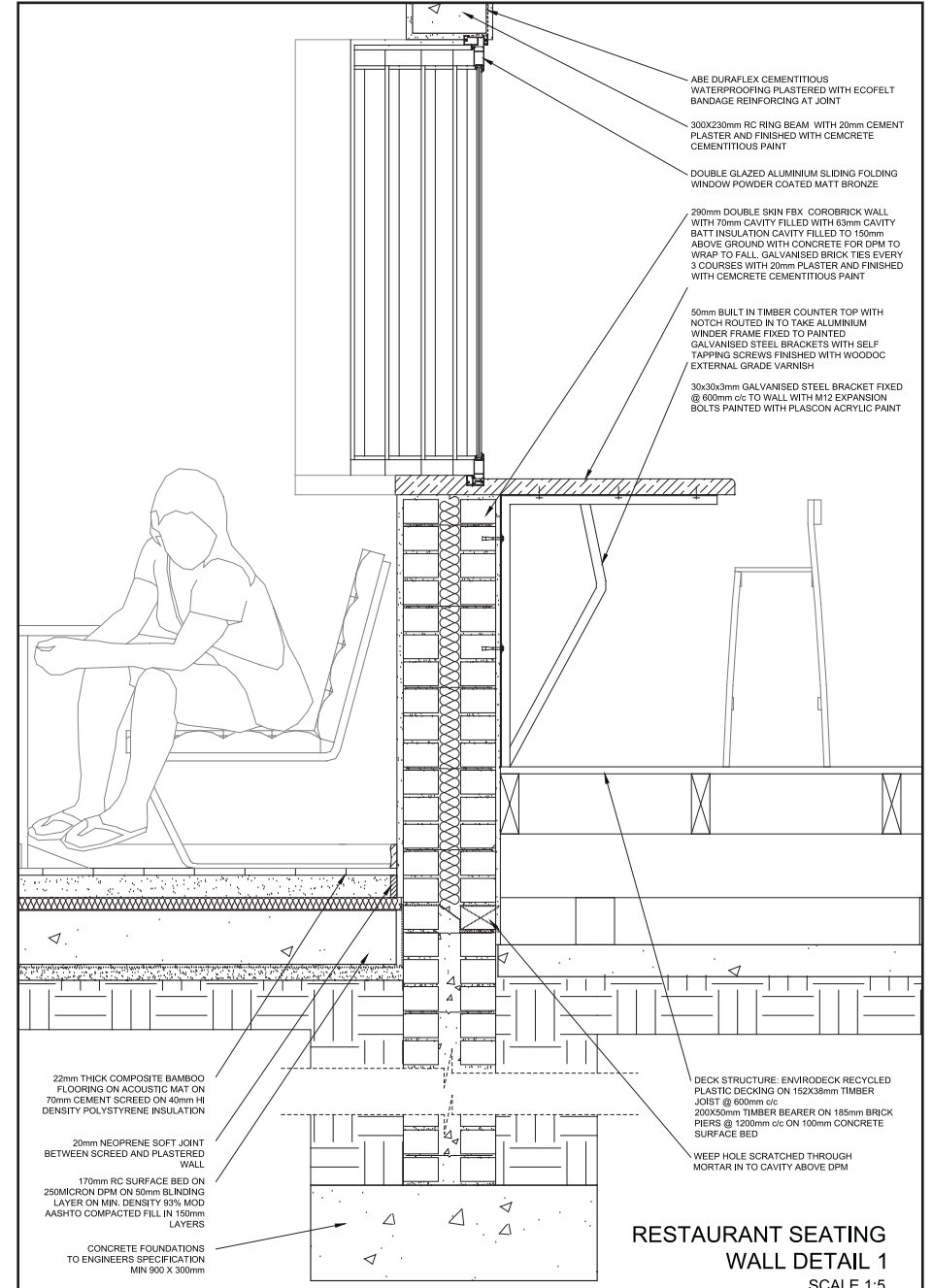


Fig 103: Restaurant seating wall detail NTS

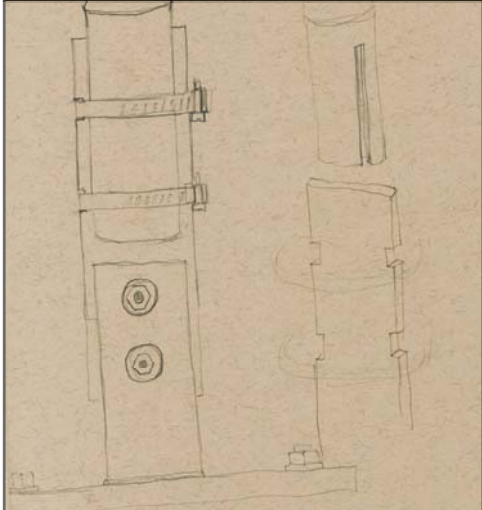
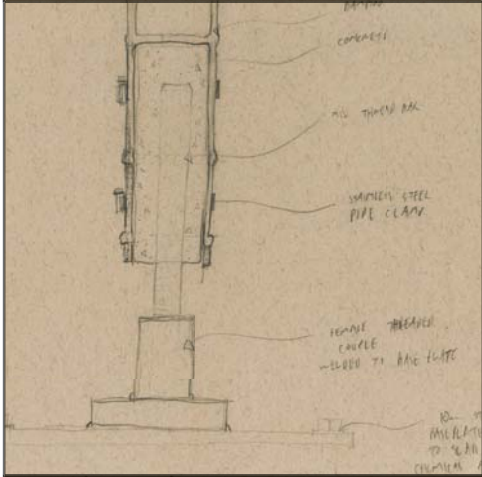
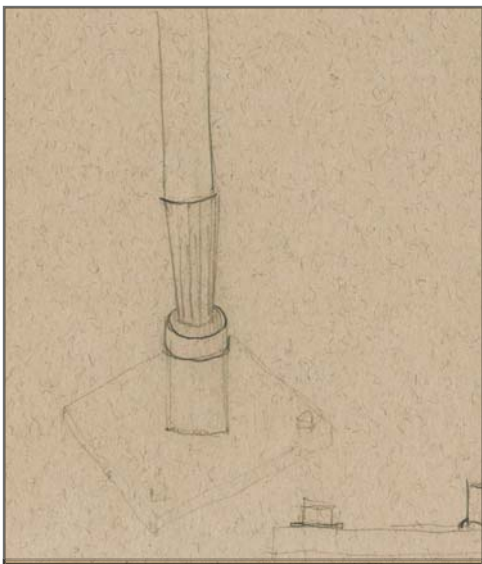


Fig 104: (left) Bamboo construction exploration
Scale NTS

Fig 104: (left) Bamboo construction exploration

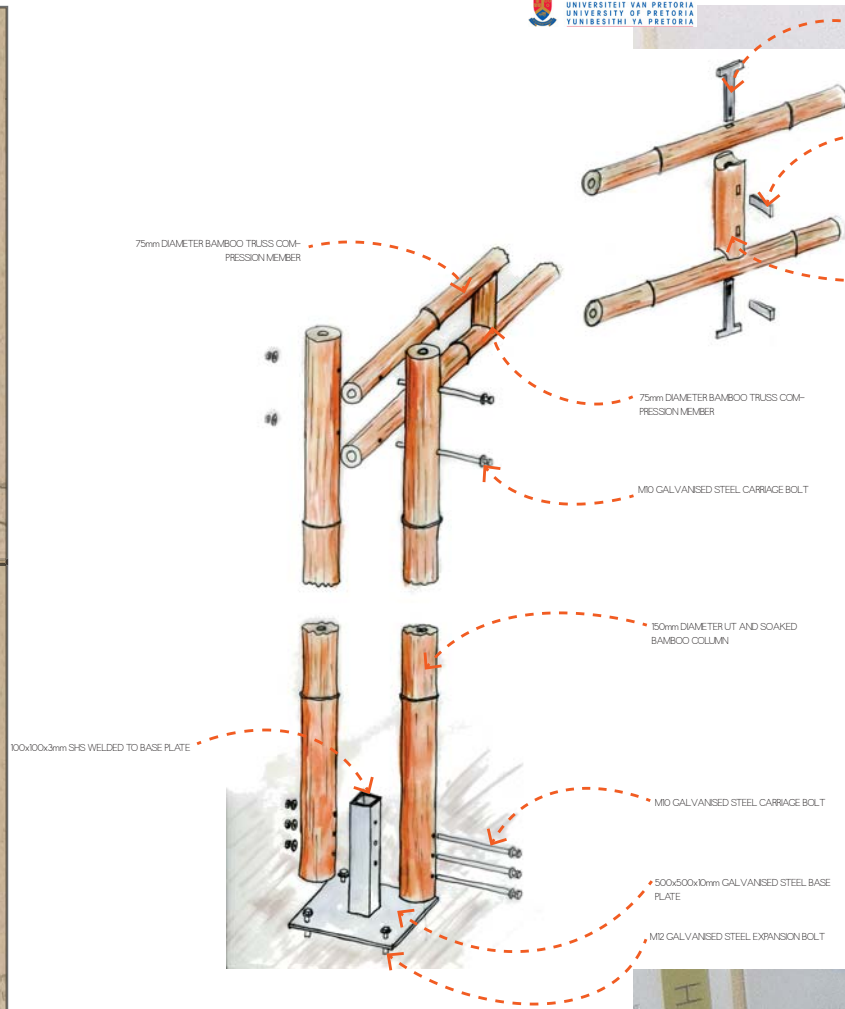


Fig 106: Bamboo details



Fig 106: Bamboo details

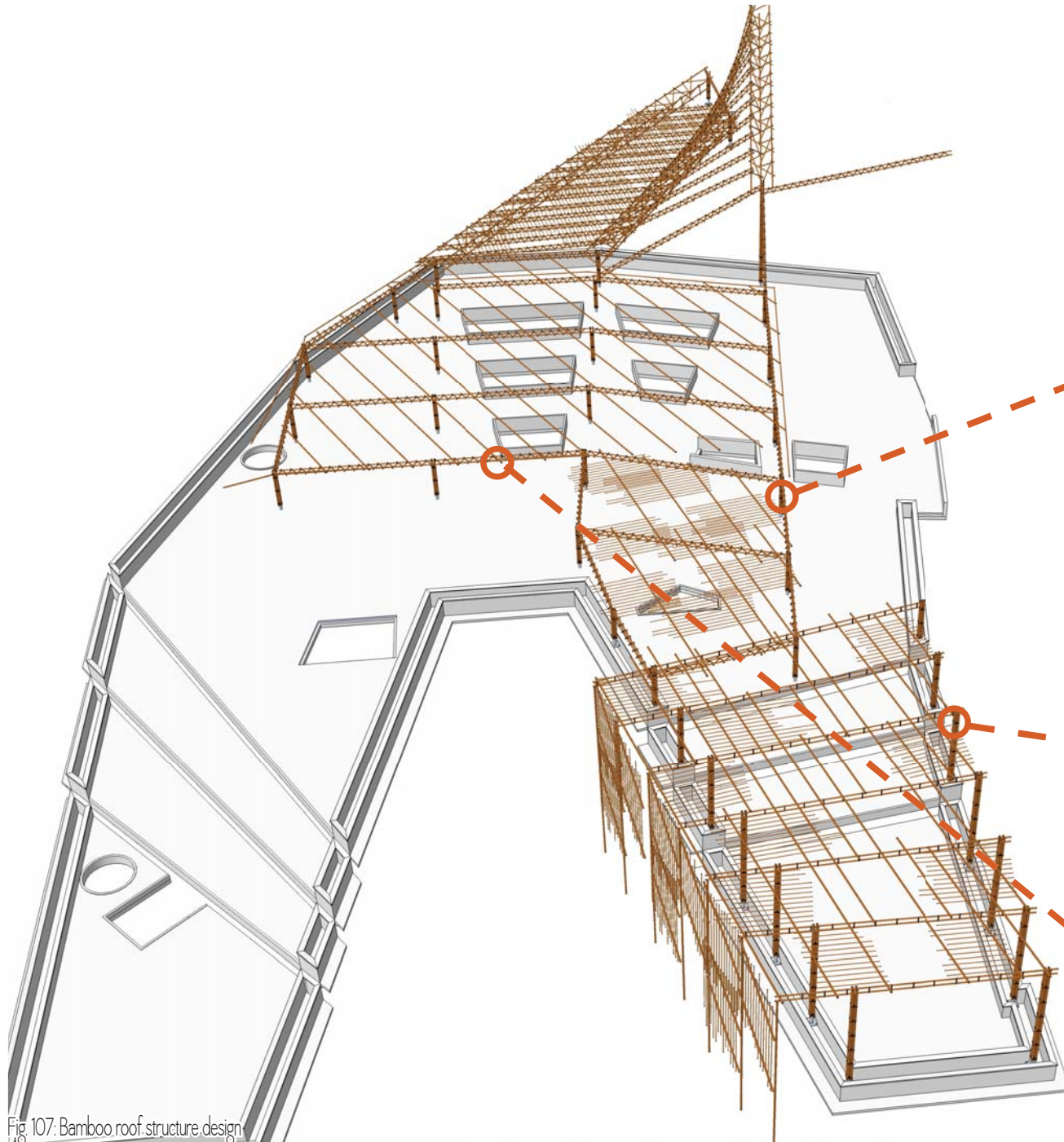


Fig. 107: Bamboo roof structure design



Fig. 108: Bamboo Column Detail



Fig. 109: Bamboo column/truss detail



Fig. 110: Bamboo truss connection detail

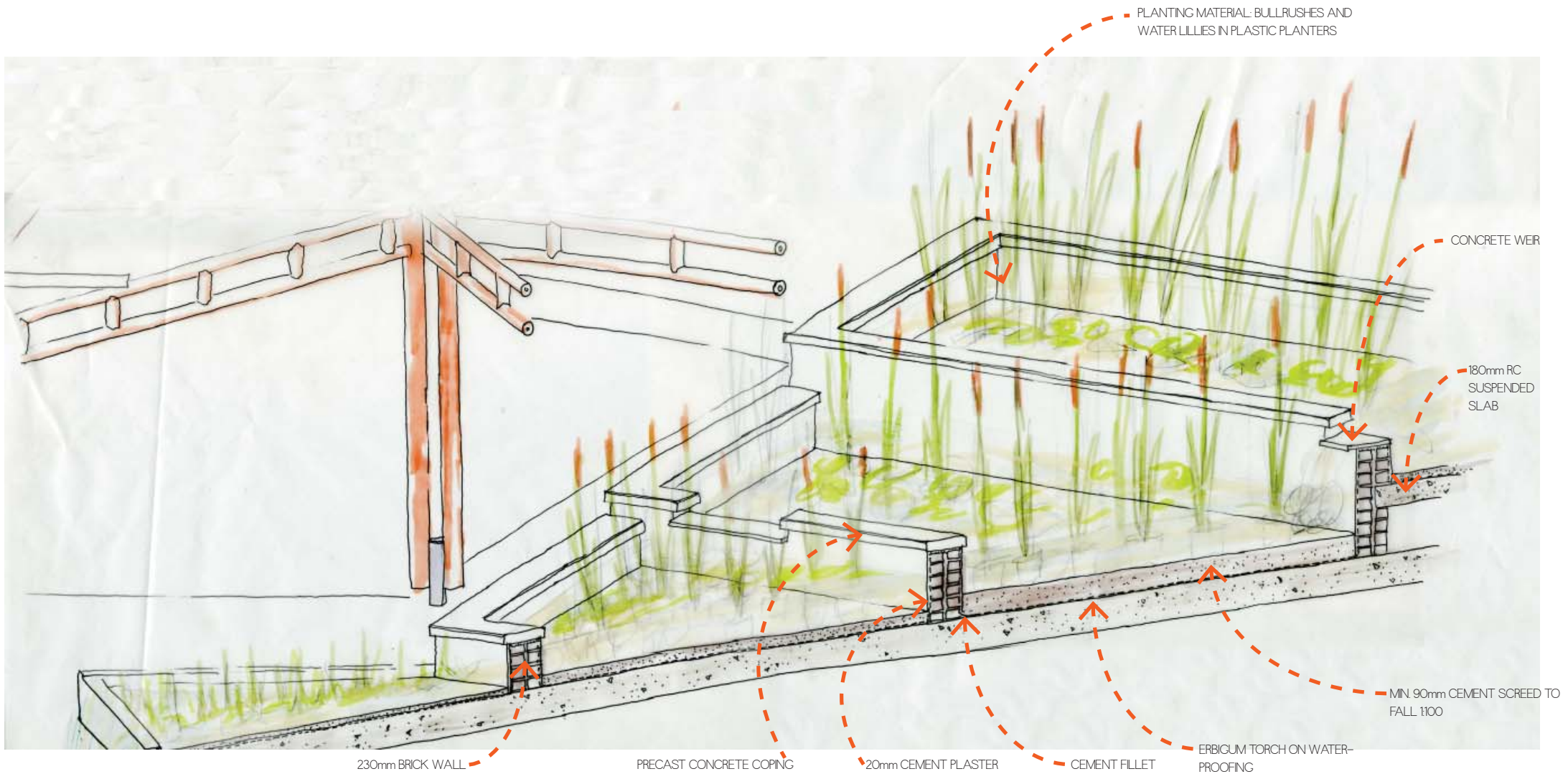


Fig 111: Wetland detail
Scale NTS

8.3 Water Strategy

8.3.1 Reduce water consumption

The water strategy aims to reduce water consumption on site by collecting rainwater and recycling grey and black water on site.

8.3.2 Process:

Rainwater will be collected off roofs of buildings on site into water tanks which will be filtered and used for non-potable uses in the market space. 1000 litre polyethylene JoJo® tanks will be arranged in series and located in storage units around the columns of the farm structure (see Fig. 108) A stop cock located on the wall near the vender will allow usage of the water whenever necessary. Municipal top up will keep the tanks full should they ever empty.

Ground runoff will be collected in underground storage tanks and used for irrigation. Water from sinks, hand wash basins and toilets will be treated in a two phase, anaerobic and aerobic digestion system (See Fig. 107) and polished in a wetland that feeds into the ground runoff storage tanks. The water in these tanks will continually circulate through the wetland, allowing it to be aerated.

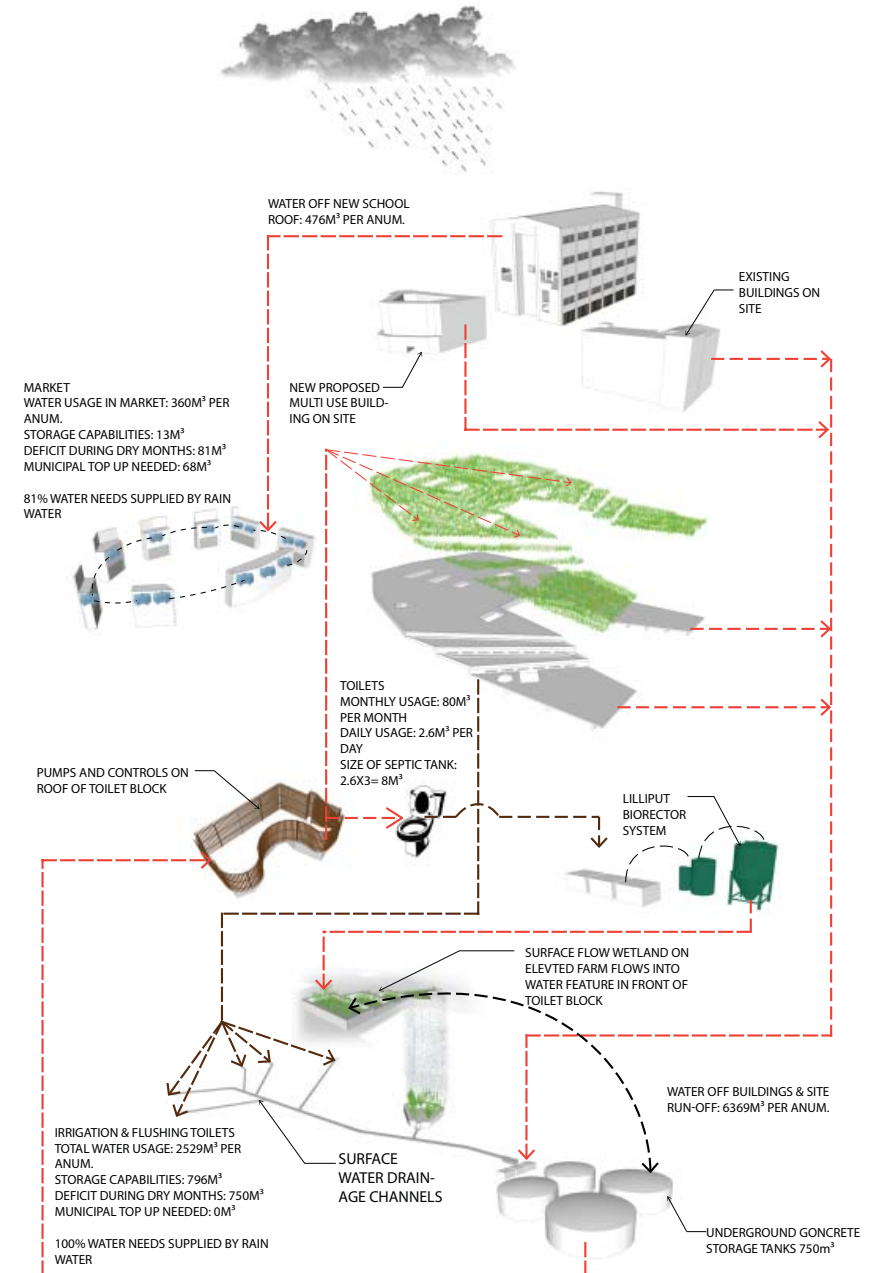


Fig. 113: Water treatment strategy diagram

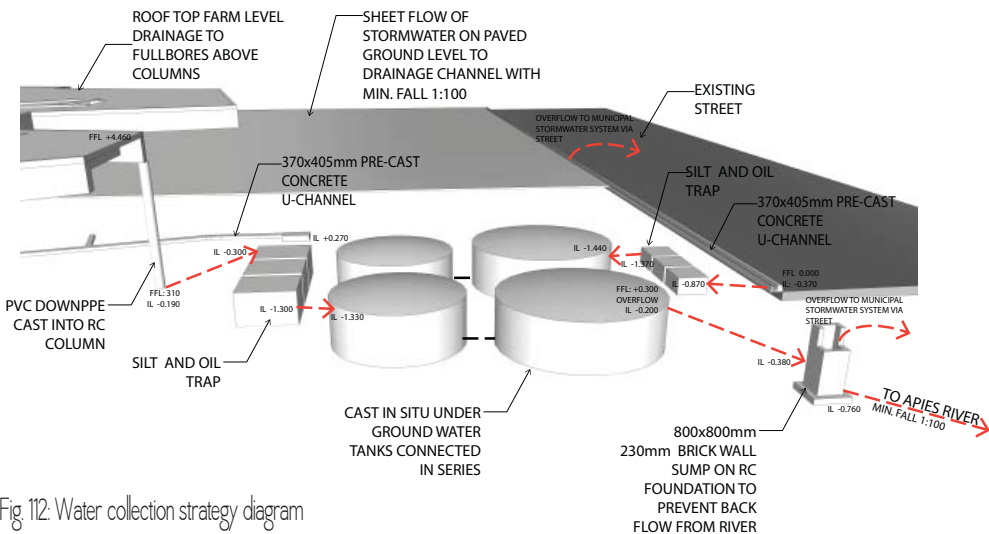


Fig. 112: Water collection strategy diagram

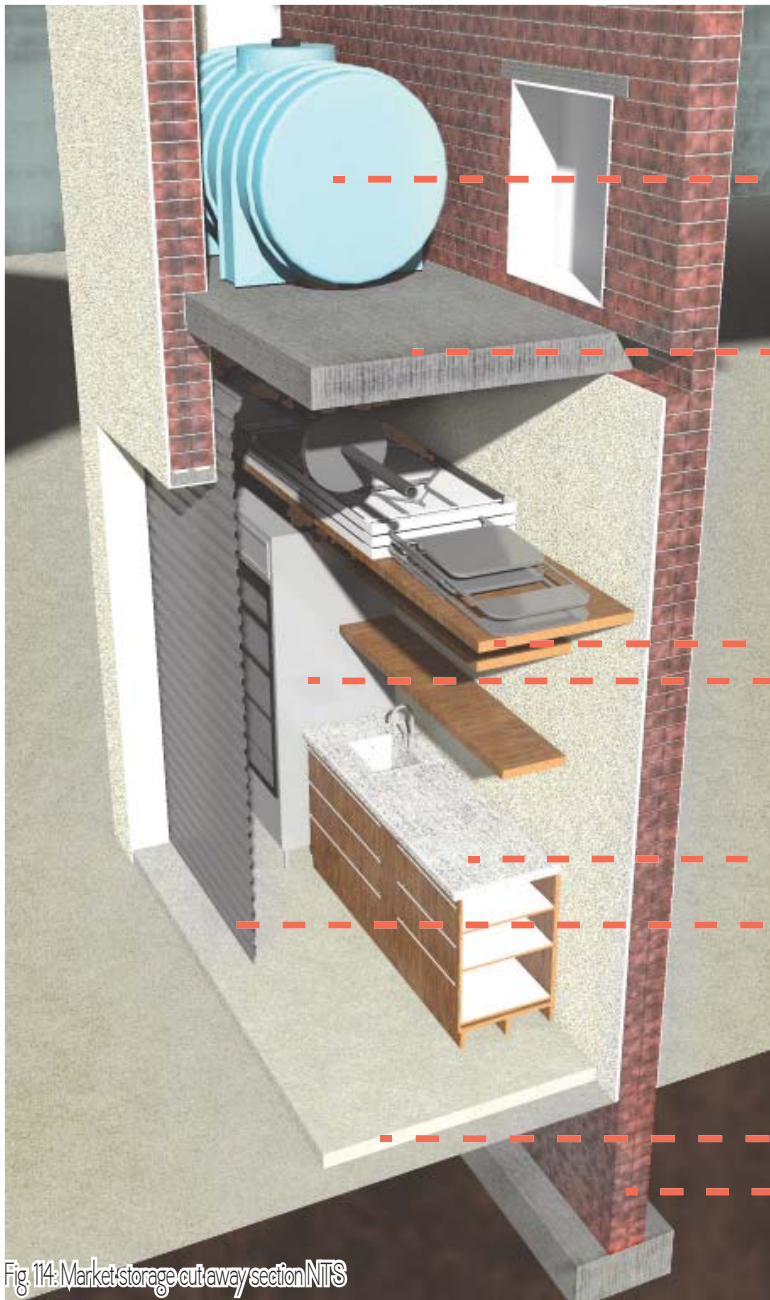


Fig. 114: Market storage cutaway section NTS

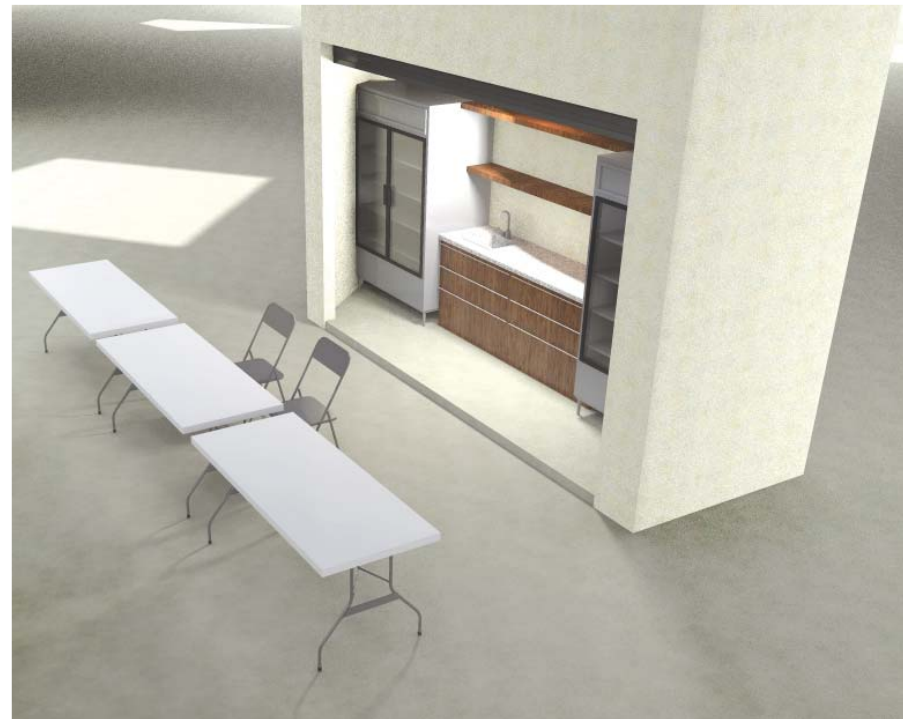


Fig. 115: Market storage

- 1000l JoJo water tank
- 185mm suspended concrete slab
- Timber storage shelves
- Stainless steel display fridge
- Built in timber cupboards with concrete counter top
- Powder coated aluminium roller shutter door
- 85mm cement screed with water proof coating
- 230mm NFX brick wall on rc concrete footing with 20mm cement plaster and cementitious paint



Fig. 116. Rendered view of the market space

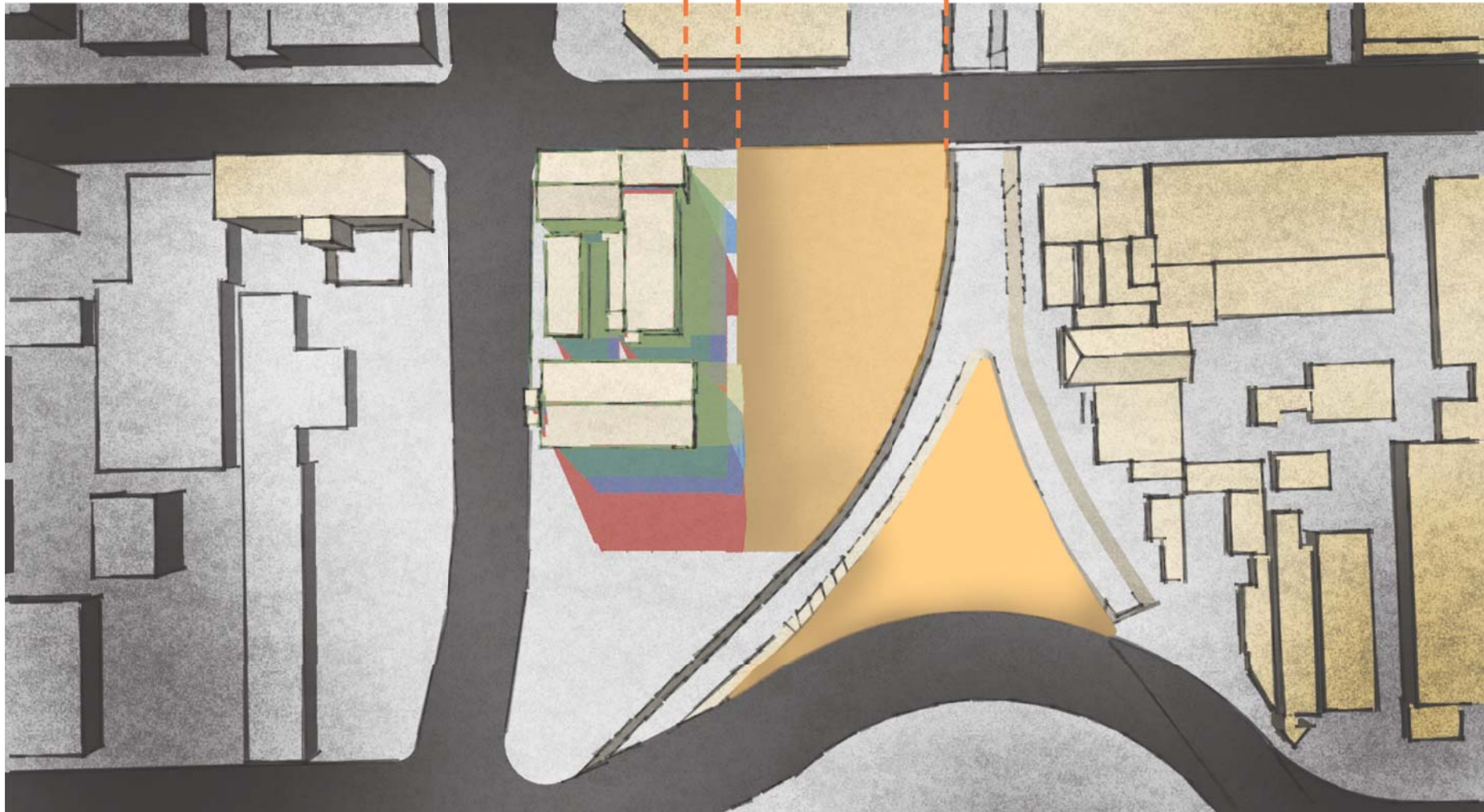


Fig 117: Daylighting analysis

8.4 Daylight Study

Next to water, the daylighting strategy of the intervention is the most important aspect. The controlling aspect of the development is the raised urban farm which needs as much daylight as possible for the production of food. The daylighting opportunities were studied on the site to determine the most appropriate position for the farm on site. As shown in Figures 86–93, the apartment buildings on the east of the site create a lot of over-shadowing, thus requiring the building to be at least 8 meters away from the existing building in order to provide 8 hours of sunlight a day all year long. The buildings also create a lot of shade on the southern portion of the site, particularly in winter. To manage this, a glazed roof structure spans between the buildings creating a space that can capture sunlight during winter to keep it warm; the roof structure can be opened in the summer allowing good ventilation.

The structure of the farm terrace maximizes on daylighting in a number of ways. Firstly, by creating a large courtyard adjacent to Church Street that allows light into the spaces below and minimizes the need for artificial lighting during the day. Similarly, over the large Market space, holes are opened in the slab so that daylight penetrates into the center of the space. The positions of the holes are set along the primary movement space, aiding circulation and allowing people to follow the light.

Secondly, where the slab steps down towards the north, holes are created in the beams providing northern light into the spaces below.

The building thus works with the opportunities of the site such as the unobstructed northern exposure and responds to challenges like overshadowing of existing buildings to enhance both functionality and comfort of spaces.



Fig. 118: Summer morning sun



Fig. 122: Summer afternoon sun



Fig. 119: Autumn morning sun



Fig. 123: Autumn afternoon sun



Fig. 120: Winter morning sun



Fig. 124: Winter afternoon sun



Fig. 121: Spring morning sun



Fig. 125: Spring afternoon sun

8.5 Farming Study

A rigorous study was done to determine which plants would be suitable for the intervention. Factors that determined the plants' appropriateness were their growing requirements (See Fig 119) and the type of food to be used in the curriculum. The table shows that the maximum depth of planting medium required is 600mm and that the planting medium should be generally well drained. This means that the surface drainage for the farm can be uniform and does not require each planting bed to be designed differently. Drainage, therefore, is implemented on the slab first and then the planting beds can be constructed later. This allows flexibility of the farm as planters can be broken down and re-built if necessary.

The vision for the farm is derived from Jamie Oliver's television series "Jamie at Home" where Jamie uses organically produced vegetables in his garden in rural England in relatively simple cooking. In some episodes he shows how to tend to specific elements of the garden with help from a professional gardener. This method will be repeated in the proposed culinary workshop. The technical detailing of the greenhouse is discussed later in this chapter.

8.5.1 Farm Vision

	Plant	Temp. (c°)	Planting Date	Harvest Date	Soil Condition	Rooting Depth (mm)	Yield (Ton/Ha)	Yield g/m ²
Vegetables	Beetroots	15-18	All Year	2 - 3 Months After planting	Sandy or Loam soils non acidic	>400	18	1800
	Brinjals	21-29	September - October	December - February	Well drained Loam Soils	>400	20	2000
	Cabbages	15-18	December - February	May - June	Moisture Retentive Loam soils	>400	50-60	5000-6000
	Carrots	15-18	September - March	January - August	Deep, Loose sandy to Loamy soil	400-600	30	3000
	Chillies / Peppers	20-30	September - October	November - January	Well drained Loam Soils	>400	10	1000
	Squashes (Butternut/Pumpkin)	18-30	October - December	February - June	Well drained Loam Soils	450-1000	17-20	1000-2000
	Green Beans	15-21	October - November	December - January	Well drained sandy to Loam Soils	400	7-8	700-800
	Green Peas	15-18	May - June	September - October	Well drained medium to heavy Loam Soils	600	5-6	500-600
	Lettuces	15-18	All Year	1.5 - 2 Months after planting	Well drained, light sand to heavy clay	400-600	20-25	2000-2500
	Onions	12-24	January - April	June - July	Sandy to clay soils	600	25-30	2500-3000
	Paprika	20-30	August - September	December - January	Well drained sandy to Loam Soils	400	2.5	250
	Sweet Peppers	20-27	September - October	December - January	Well drained sandy to Loam Soils	400	25	2500
	Sweet Potatoes	21-29	November - December	March - April	Sandy to Loamy soils	500	20	2000
	Swiss Chard	7-24	August - March	2 months after planting	Well drained soils	500	20	2000
Tomatoes	20-25	September - November	January - April	Well drained low clay soils	600	40-50	4000-5000	

Fig 126: Crop List



Fig 127: Raised planter



Fig 128: Farm Layout vision



Fig 129: Organic crops

8.6 Ventilation Systems

8.6.1 Cross Ventilation

The enclosed public spaces (restaurant, deli, bakery and roastery) are not more than 15 meters across and therefore rely solely on cross ventilation. This ensures no need for mechanical systems which reduces energy requirements of the building.

The fenestration is designed on two levels:

1. Low level windows provide light and views into the spaces while high level windows of no more than 500mm wide on each edge of a space allow the rooms to be cross ventilated.
2. The high windows ensure that rising hot air is expelled from the space (See Fig 123).

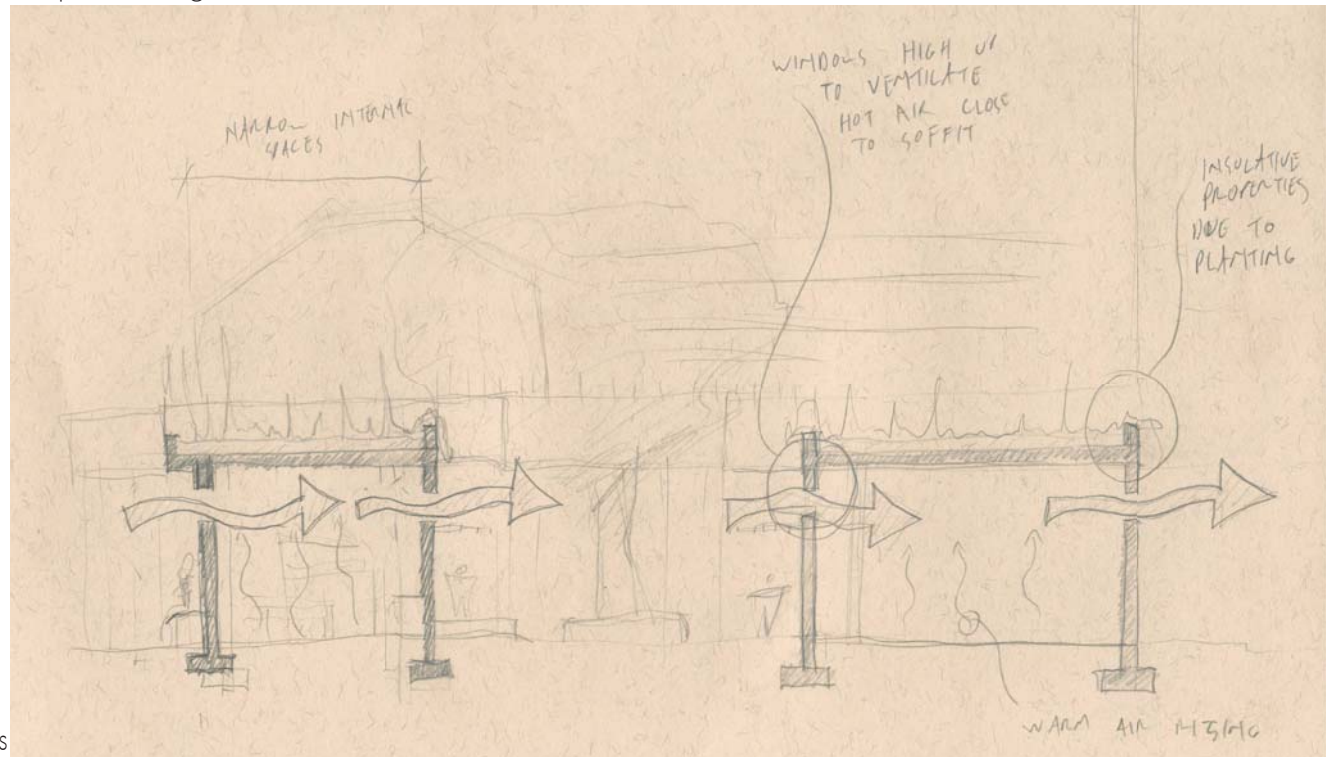


Fig 130: Cross Ventilation through spaces

8.6.2 Mechanical Extraction

The mechanical extraction strategy aims to counter the need for using energy in extracting vapours from cooking processes by using the CO₂ generated to increase crop production.

The farm includes a greenhouse that focuses solar energy to maximize crop production. A process that has been explored with greenhouses is to introduce extra CO₂ gas which increases photosynthesis, thereby increasing crop yield and earlier flowering which prolongs crop production (Blom, T.J. et al, 2002).

The only spaces in the intervention that require mechanical ventilation are the kitchens where extraction is required due to the cooking equipment. This extraction is relatively standard and requires a hood over the cooking equipment connected to a duct with an extraction fan that pulls the vapours out of the space.

As the vapours that are emitted out of ducting from the kitchen extraction have high concentrations of CO₂, these vapours will be utilized in the greenhouse. The vapours are scrubbed of any excess grease and odors in an activated charcoal chamber and then released into the greenhouse.

The excess smoke from braais in the market space will also be harvested and scrubbed in the same chambers and directed to the greenhouse.

The technological response to the building relates back to the initial concept of multi-functionality. The main structure itself is a platform that will be used for urban agriculture and it defines space for public interactions on many levels below it. The greenhouse structure creates a specific environment for crop production and it extends into a form that relates the building to its context. The materials used complement each other by creating a heavy structure but a more ecologically responsive material is used in place of steel to create a balance. The services focus on recycling water, solid waste and CO₂ gas which reduce the carbon footprint and enhances the environment. As a building that sets out to be an organism in the city, the technologies employed allow it to do just that.

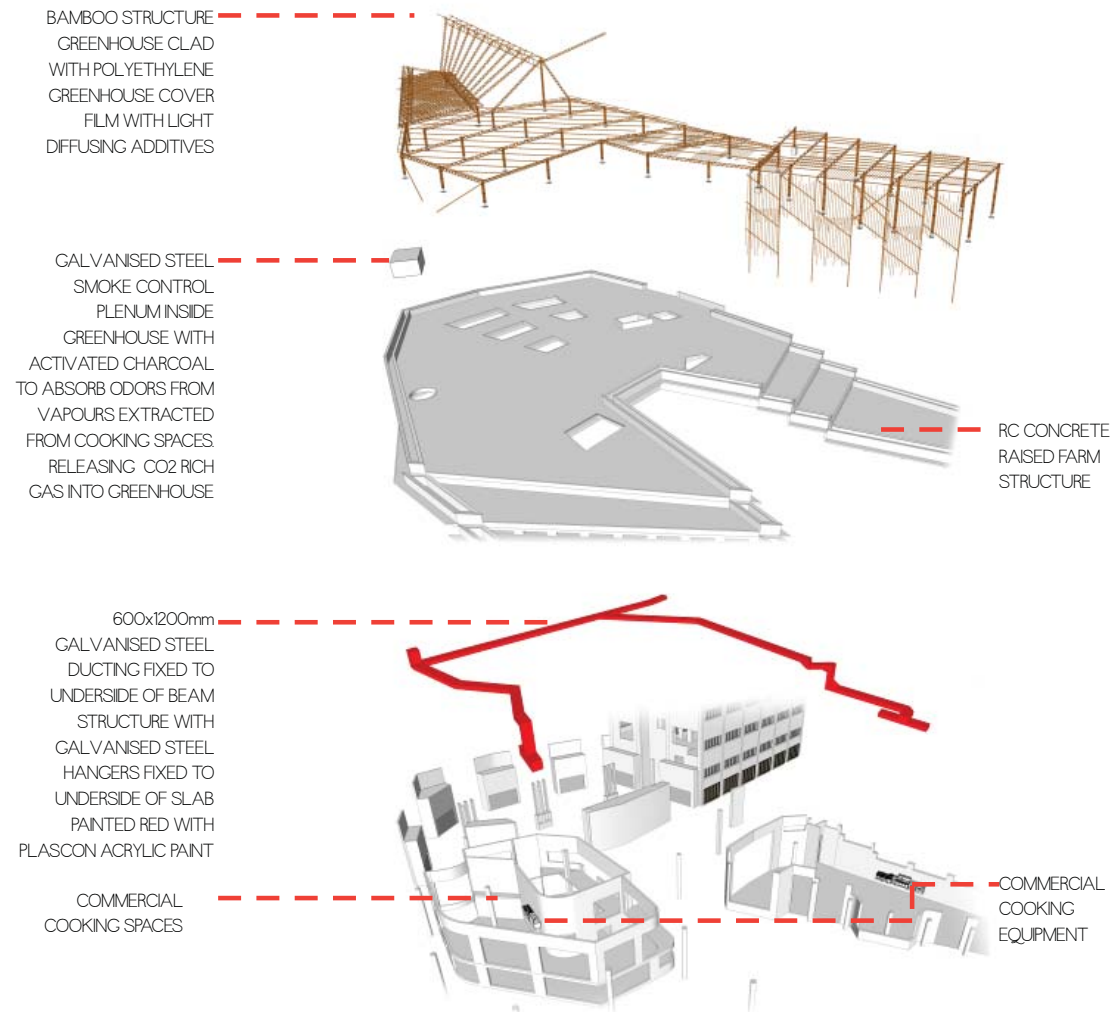


Fig. 131: Mechanical vent system diagram

CONCLUSION

This dissertation explores the architectural response to the research topic. The resultant building is a conceptual response to the design hypothesis and is realized through the research and study of technical means. The project provides insight into creating a programme that focuses on food production from agriculture to cuisine. It responds to the context of the city by creating a focused commercial place along a movement route that is envisioned by Tshwane Municipality as a viable social zone. This both enriches the urban vision of the area and strengthens the success of a culinary institute by providing an economic income for the school. The spatial qualities are focused on being an urban environment that allows people to become more socially interactive and, most importantly, they can do so around the production of food.



Fig.132: Un-rendered perspective of development from outside bakery

FINAL DRAWINGS

This section of the book will showcase the detail drawings and photographs of models and the presentation of the final exam for this dissertation. The work comprises a well rounded and full example demonstration of the design of the project and includes:

- Plans on all levels, three
- Sections at scale 1:100, 1:50 and 1:20 as well as a 3D rendered section of the deli space.
- The details show a cross section through the construction of the building and 3D details of the bamboo construction.
- Two final models were built, the first is a 1:200 scale of the entire site and immediately adjacent sites. A 1:10 scale model of a section of the bamboo structure was built with real bamboo and stainless steel hose clamps (in reality, specialized stainless steel clamps would be used)

Unfortunately due to the nature of this book's format, all drawings and photographs are not to scale.



Fig. 133: Site plan NTS
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Ground Floor Plan Mezzanine Floor Plan

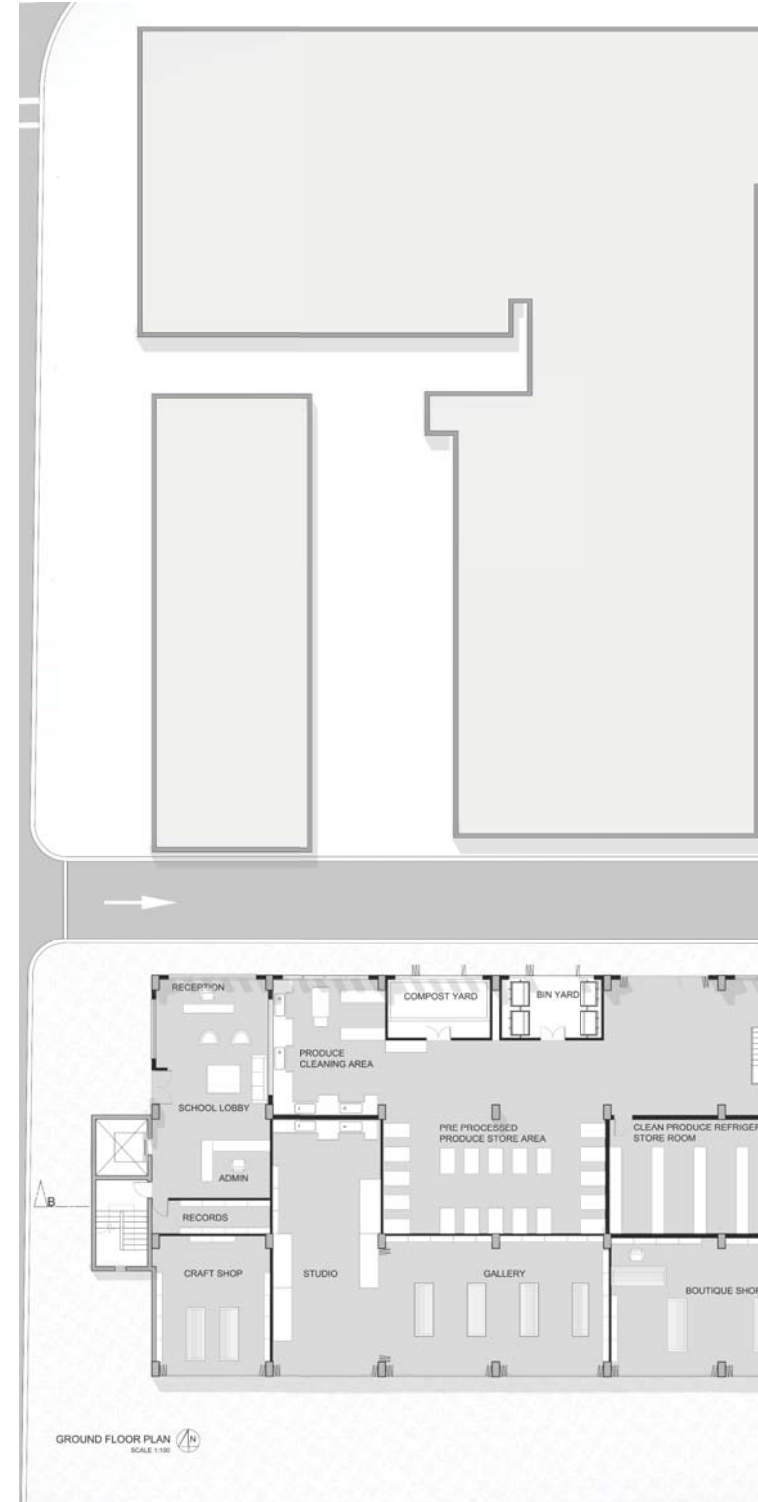
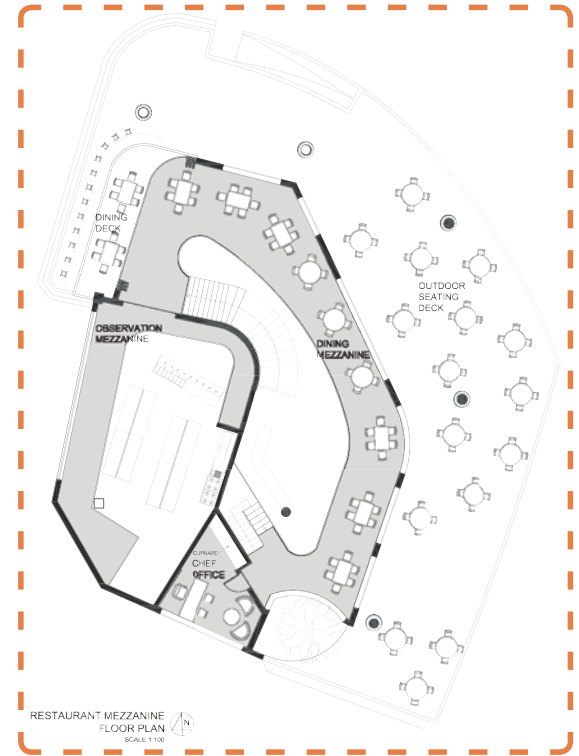


Fig 134: Ground floor & Mezzanine floor plan NTS



First Floor
 Plan
 School
 Floor Plans

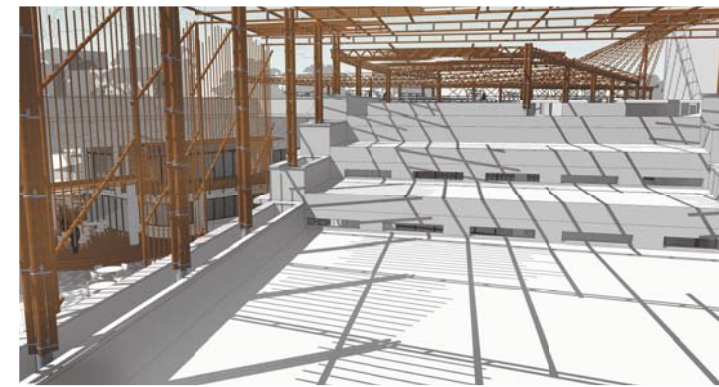
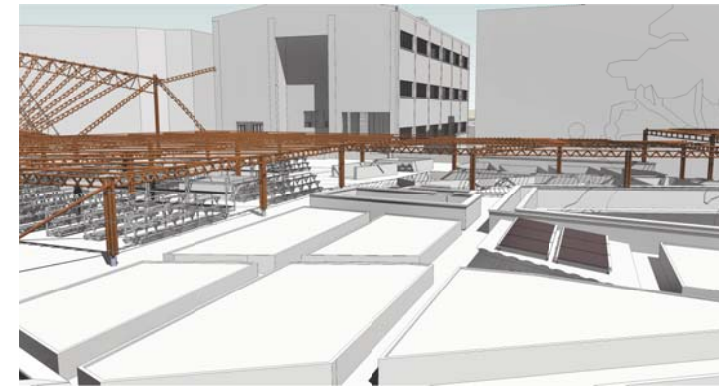
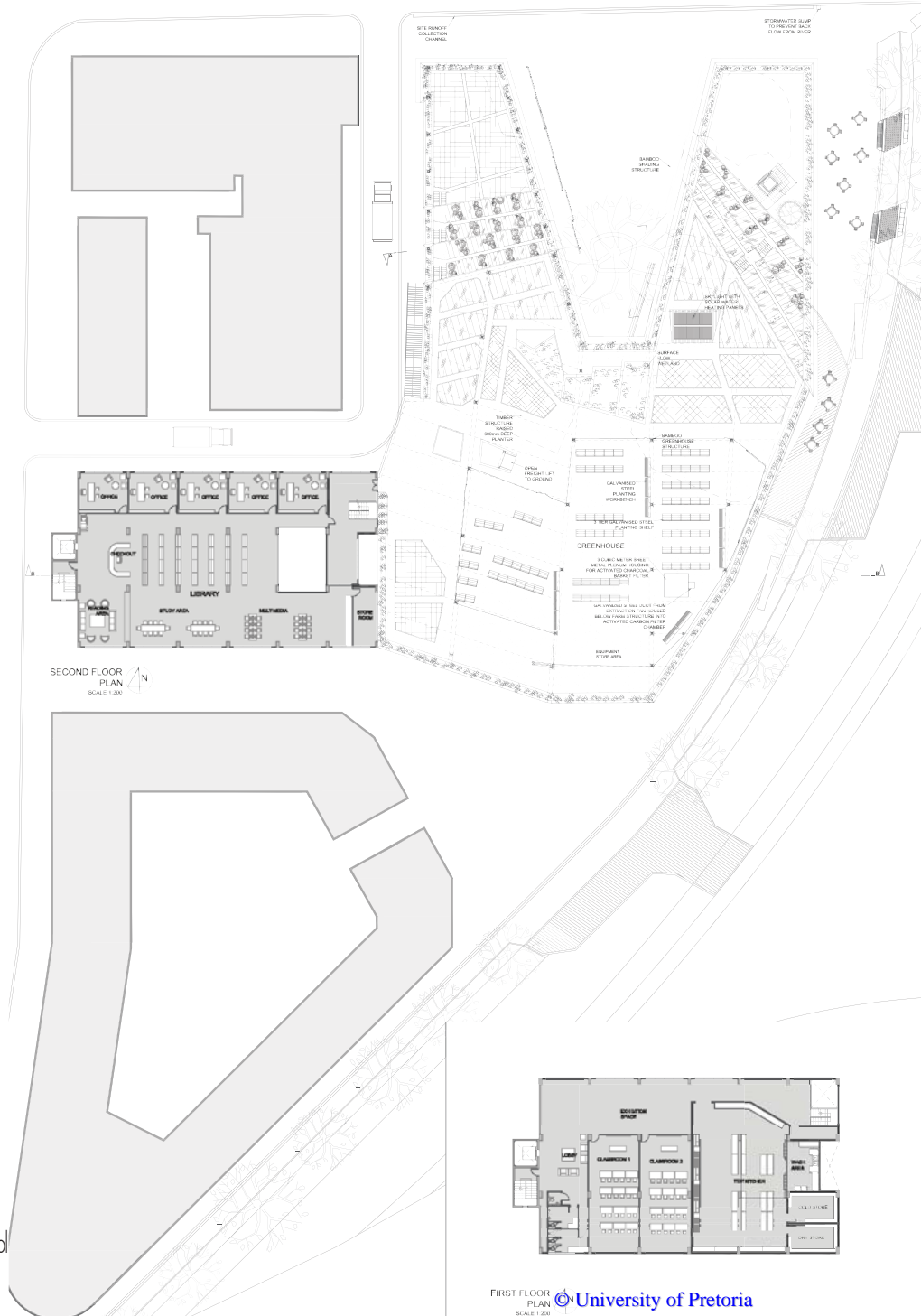
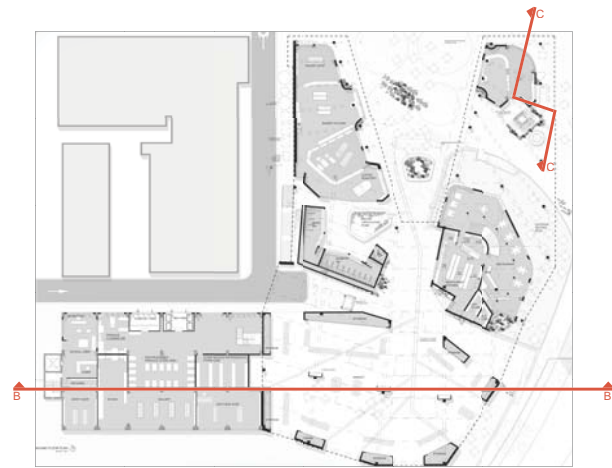


Fig 135: Farm level and School level plans NTS

3D Section C-C & Section B-B



3D SECTION C-C
NTS



Fig 136: 3D section C-C & section C-C-NTS

Section A-A

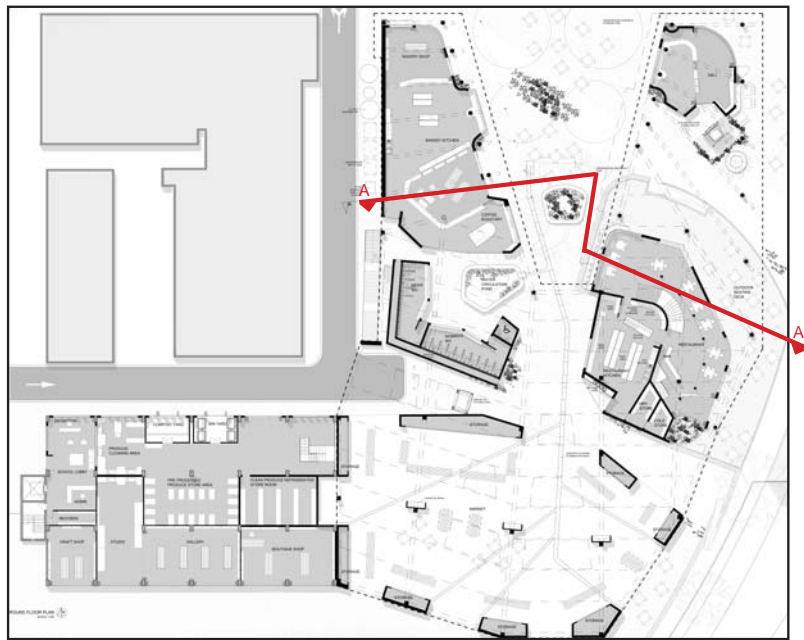
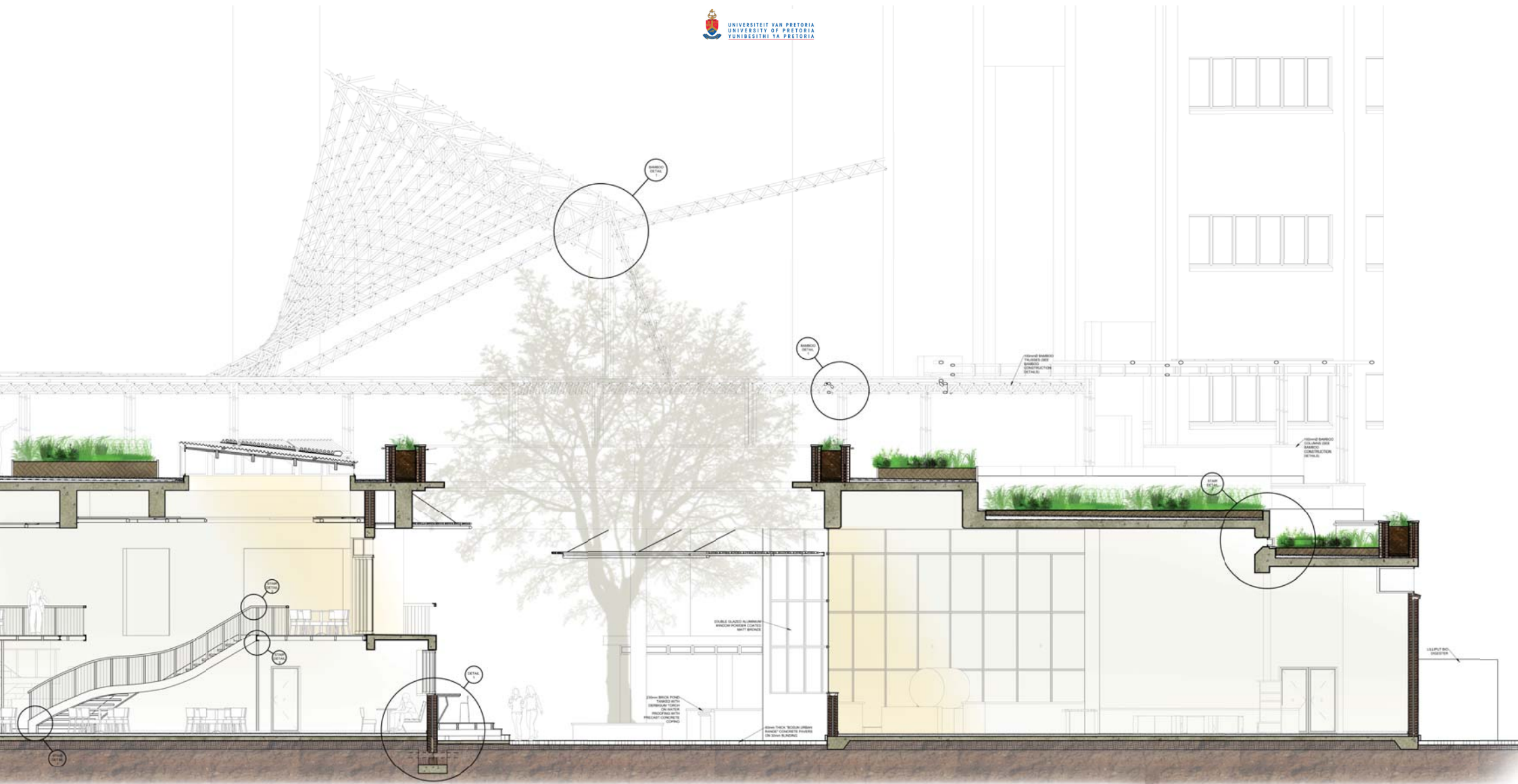


Fig 137: General section A-A NTS



Section A-A through Restaurant Only

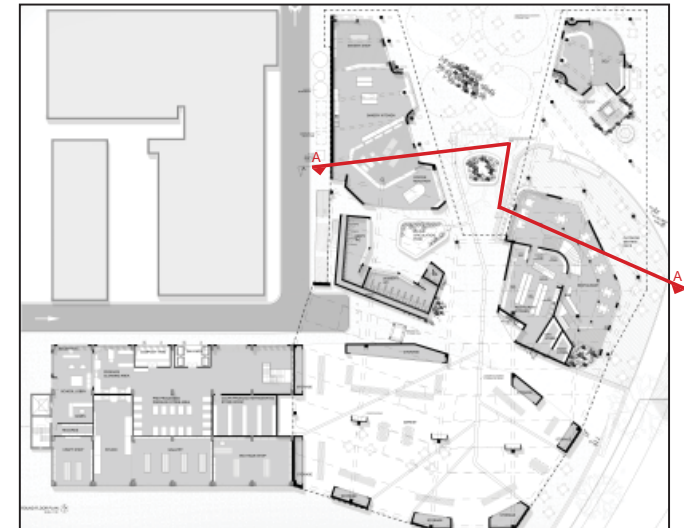


Fig. 138: Restaurant section A-A NTS
© University of Pretoria



SECT



SECTION A-A
SCALE 1:20

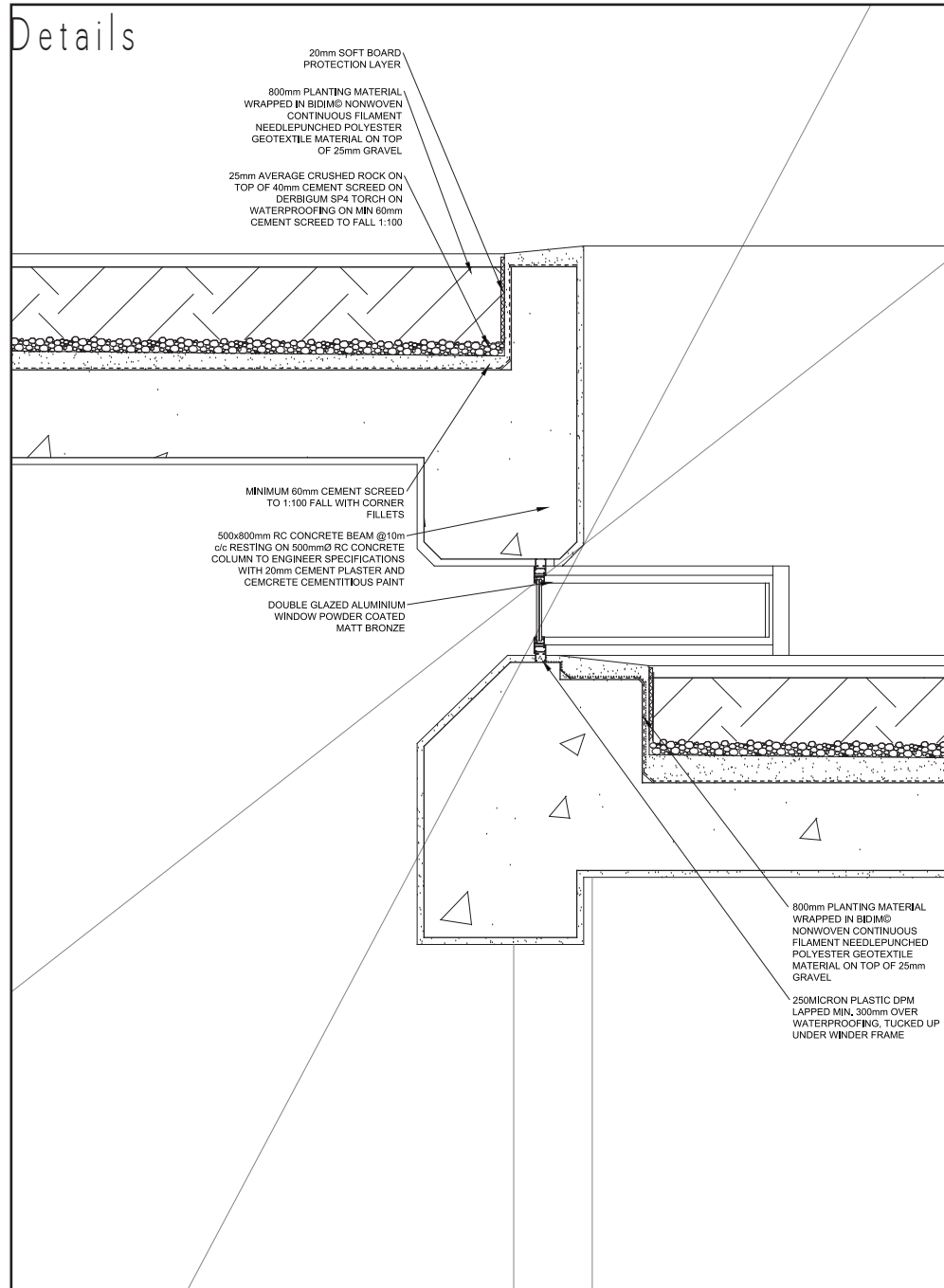


Fig 139: Stepped planter detail NTS

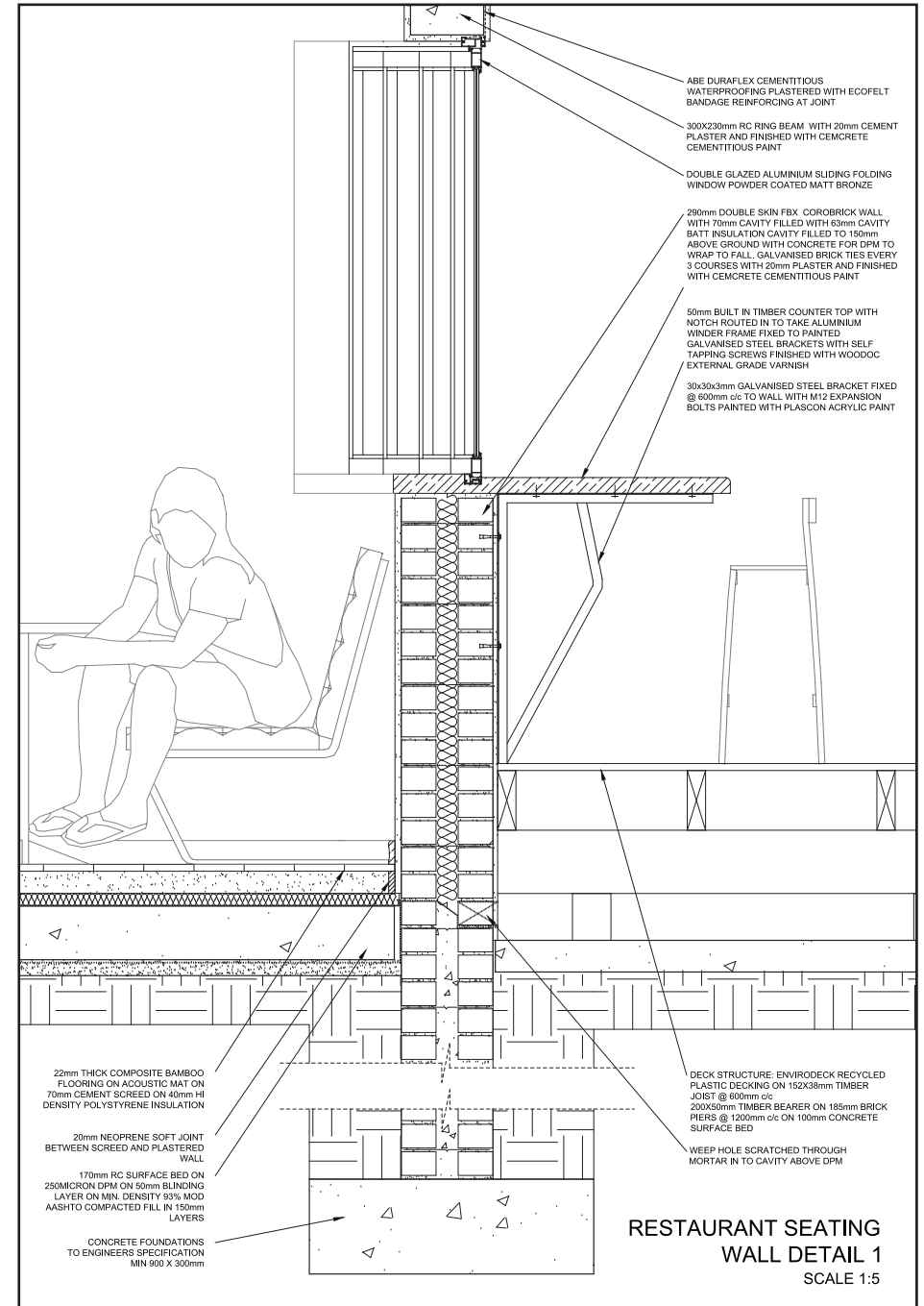


Fig 140: Restaurant seating wall detail NTS

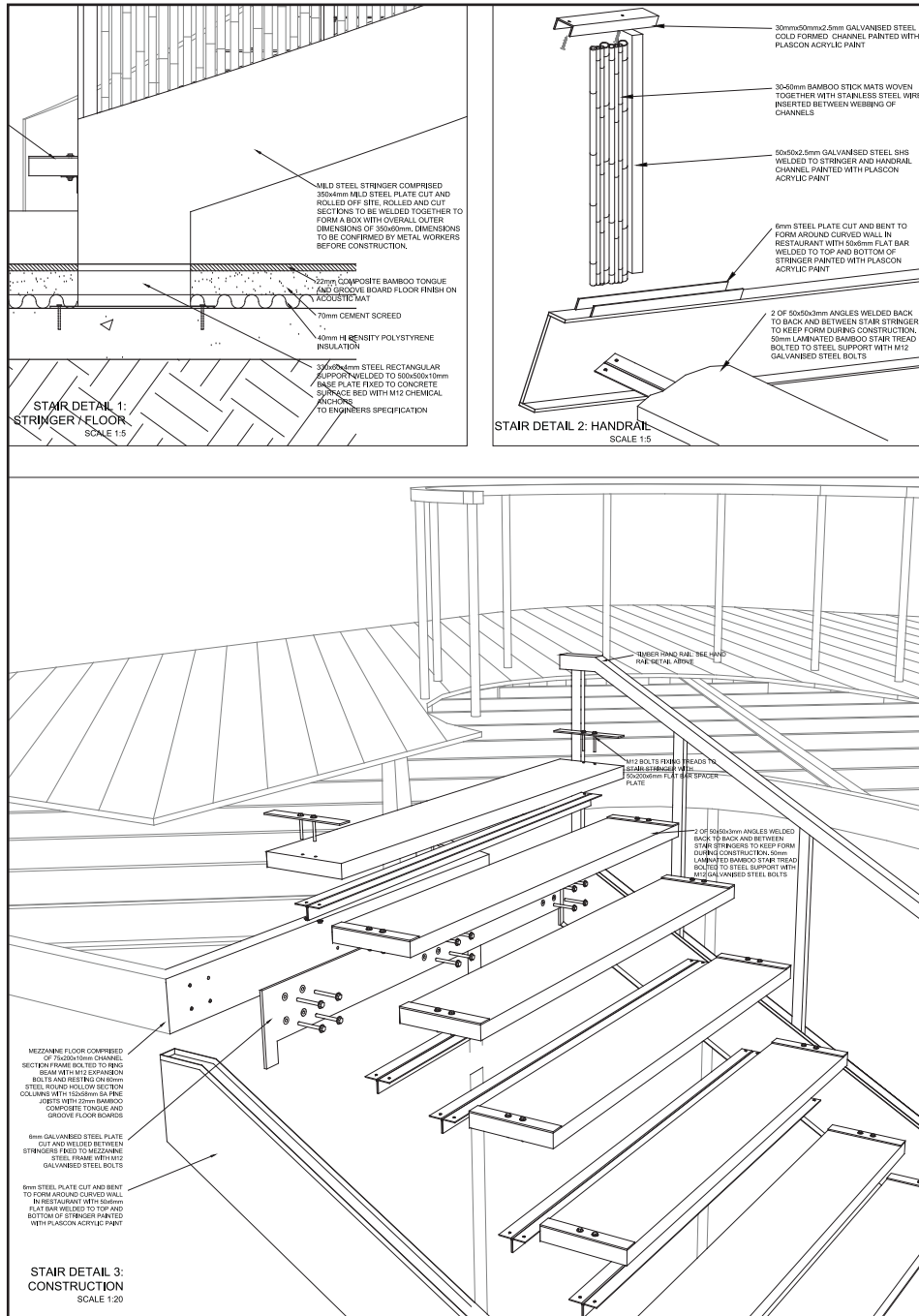


Fig 141: Restaurant stair details NTS

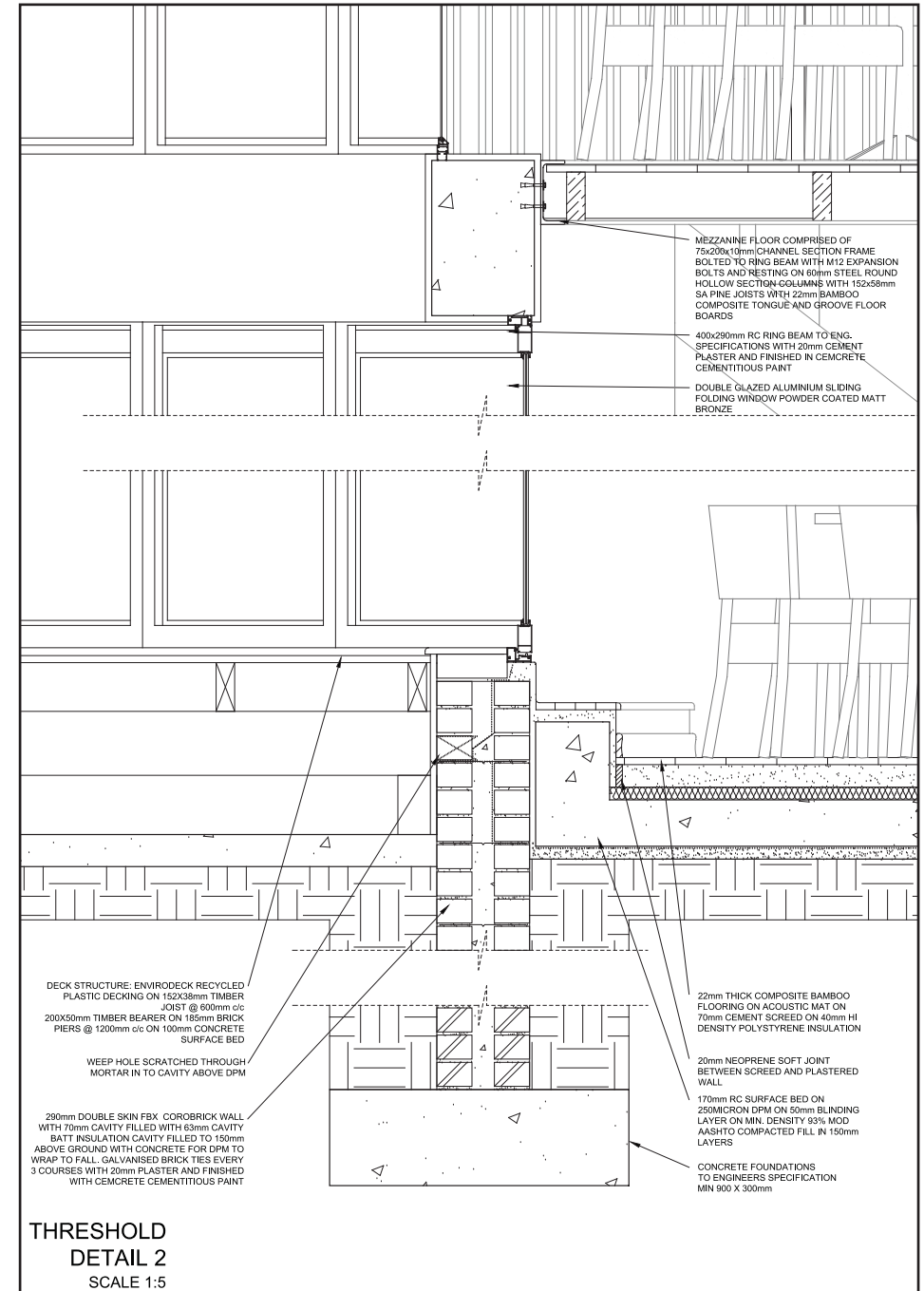


Fig 142: Restaurant threshold detail NTS

Models



Fig 143: Model overview



Fig 144: Model shot of bakery



Fig 145: Model shot of north courtyard



Fig 146: Model shot of deli/restaurant

Exhibition



Fig 147: Exam exhibition



Fig 148: Exam exhibition



Fig 149: Exam exhibition



Fig 150: Exam exhibition



Fig.151: Rendered view of northern courtyard

APPENDIXES

Appendix 01: Water Calculations No.1 For entire site

DATA SHEETS			
PRETORIA	Average Rainfall (mm)	m rain depth/month	Runoff co-efficient
January	87	0.087	buildings
February	114	0.114	paving
March	81	0.081	grass
April	45	0.045	veldgrass
May	12	0.012	
June	6	0.006	Farm
July	18	0.018	toilets
August	18	0.018	HWB
September	48	0.048	
October	51	0.051	
November	72	0.072	
December	96	0.096	

c - value	
buildings	0.9
paving	0.85
grass	0.55
veldgrass	0.35

water loss due to evapo-transpiration	
Dam	m/month

WATER IN			
m ² . (m rain depth / month) . c = m ³			
Runoff co-efficient	c - value	Collection area (m ²)	m ²
buildings On Site	0.9	1200	1080
New Proposed Building on site	0.9	1580	1422
Site Runoff	0.85	8620	7327
			9829

Month	m rain depth/month	m ²	m ³
January	0.087	9829	855
February	0.114	9829	1121
March	0.081	9829	796
April	0.045	9829	442
May	0.012	9829	118
June	0.006	9829	59
July	0.018	9829	177
August	0.018	9829	177
September	0.048	9829	472
October	0.051	9829	501
November	0.072	9829	708
December	0.096	9829	944
			6369

WATER OUT			
Irrigation/month	1500	0.16	240 m ³ /month
Toilets = 2/3 people x 1 flushes/day*30			80 m ³ /month
			320 m ³ /month

MONTH	IN	OUT	JRPLUS/DEFICIT m ³
January	855	320	535
February	1121	320	801
March	796	320	476
April	442	320	122
May	118	320	-202
June	59	320	-261
July	177	320	-143
August	177	320	-143
September	472	320	152
October	501	320	181
November	708	320	388
December	944	320	624
			2529

Total deficit With Toilets:
750 m³

STORAGE CAPACITY	area m ²	depth m	volume m ³	loss due to evaporation	TOTAL
Underground Tanks	300	2.5	750		750
wetland	75	0.3	23	1	21
Pond	26	1	26	1	25
					796

Appendix 02: Water Calculations No.1 for School building roof only

DATA SHEETS			
PRETORIA	Average Rainfall (mm)	m rain depth/month	Runoff co-efficient
January	87	0.087	buildings
February	114	0.114	paving
March	81	0.081	grass
April	45	0.045	veldgrass
May	12	0.012	
June	6	0.006	Farm
July	18	0.018	toilets
August	18	0.018	HWB
September	48	0.048	
October	51	0.051	
November	72	0.072	
December	96	0.096	

c - value	
160mm/month	0.16
7l/flush	0.007
1l/usage	0.001

water loss due to evapo-transpiration	
Dam	hm/month

WATER IN			
m ² . (m rain depth / month) . c = m ³			
Runoff co-efficient	c - value	Collection area (m ²)	m ²
buildings On Site	0.9	816	734
			734

Month	m rain depth/month	m ²	m ³
January	0.087	734	64
February	0.114	734	84
March	0.081	734	59
April	0.045	734	33
May	0.012	734	9
June	0.006	734	4
July	0.018	734	13
August	0.018	734	13
September	0.048	734	35
October	0.051	734	37
November	0.072	734	53
December	0.096	734	71
			476

WATER OUT	
Toilets = 2/3 people x 1 flushes/day*30	50 m ³ /month
	30 m ³ /month

MONTH	IN	OUT	URPLUS/DEFICIT m ³
January	64	30	34
February	84	30	54
March	59	30	29
April	33	30	3
May	9	30	-21
June	4	30	-26
July	13	30	-17
August	13	30	-17
September	35	30	5
October	37	30	7
November	53	30	23
December	71	30	41
			116

Total deficit:
81 m³

STORAGE CAPACITY	area m ²	depth m	volume m ³	loss due to evaporation	TOTAL
Tanks	300	2.5	750		13
					13

Appendix 03: CO₂ Rich Air in Greenhouses

The Telegraph

Search - enhanced by Google

Monday 02 December 2013

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Women Men Motoring Health Property Gardening Food History Relationships **Expat** Puzzles Announcements Shop

HOME » EXPAT » EXPAT NEWS

Dutch aubergine grower pipes carbon dioxide into greenhouses

Having a chemical plant sited next door to your plantation isn't what the average farmer might want for his crop.



Photosynthesis uses up CO₂ by turning it into aubergines. Photo: Martin Pope

By [Alix Rijckaert](#), in Terneuzen for AFP

11:01AM GMT 14 Dec 2009

Jan van Duijn, however, walks proudly through his greenhouse, a vast glass and metal structure spread out over five hectares (12.3 acres) where millions of aubergines are doing very nicely thank you.

He's happy because thanks to a deal with a supplier, he's getting hot water piped in from the factory, which produces ammonia, to maintain the temperature at a constant 68 degrees F (20C).

The chemical site, five kilometres (three miles away), also supplies carbon dioxide which helps his aubergines grow more abundantly.

"We're pioneers in a way," van Duijn said, while admitting that what drove him to try this business model was cost.

The water from the Yara factory, where it is used as a coolant, flows along underground pipes and into his greenhouse at a temperature of 90 degrees C.

There it is circulated in pipes between the rows of aubergines, sharing its heat among the beds of

rockwool they grow in, before being pumped back to the factory as coolant again.

Similarly, CO₂ released during the manufacture of ammonia is injected into the greenhouse to stimulate growth.

"It's the basic principle of photosynthesis," van Duijn said. Combined with water and light, the plants convert the carbon dioxide into organic compounds, releasing oxygen as a side product.

The level of CO₂ inside is three times higher than outside, giving a crop yield that according to van Duijn is two to three times greater.

He reckons the project will produce 2.5 million kilogrammes (5.5 million pounds) of aubergines a year, adding to the millions he already cultivates under glass on his land in the southern Netherlands.

Their temperature is monitored and adjustable by computer, said van Duijn, who employs 10 people in summer and 30 in winter at Terneuzen.

Using CO₂ in greenhouses is a common practice in the Netherlands but it is rarely so closely tied to industry.

The Netherlands, Europe's top exporter of horticultural products cultivated under glass – think tulips – has 10,000 hectares under cover producing flowers, fruits, vegetables and other plants.

According to the horticultural association LTO Glaskracht they produced 52 megatonnes of CO₂ last year – around 63 per cent of the agricultural sector's total emissions.

Meanwhile, keeping greenhouses at the right ambient temperatures accounted for eight to 10 per cent of the country's natural gas consumption.

"It's the first time residual heat is being reutilised on a large scale for a private, commercial venture," said Jacob Limbeek, the commercial director of WarmCO₂, the company supplying the water and carbon gas.

He said that the system allows for a 90 per cent reduction in fossil fuel energy use compared with traditional greenhouses, which are heated by oil or natural gas.

Van Duijn, whose energy bill for the new greenhouse accounts for 20 per cent of fixed costs against 25 per cent for the standard version, struck a deal with WarmCO₂ that set prices for the next 15 years.

"That gives us a certain security," he said. "Our competitors have no idea what their energy bills will be like from one year to the next, they depend on oil prices, gas prices and exchange rates."

WarmCO₂, which also supplies greenhouses producing tomatoes and peppers, is aiming eventually to pipe CO₂ to 168 hectares under glass at Terneuzen.

The sector, which is also experimenting with solar panels and geothermal energy, has committed itself to reducing its greenhouse gas emissions by 30 per cent by 2020 from its 1990 level, according to LTO Glaskracht.

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